Parallels Remote Application Server

Administrator's Guide

17.1

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CHAPTER 1

Introduction

Welcome to Parallels® Remote Application Server (Parallels RAS), an integrated solution to virtualize your applications, desktops and data. Parallels RAS publishes applications and delivers remote and virtual desktops to any device on your network, anywhere.

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Parallels RAS 17 Release History

The following table lists the Parallels RAS 17 release history. Parallels RAS documentation is updated for every release. This guide refers to the latest Parallels RAS 17 release from the table below. If you are using a newer Parallels RAS release or version, please download the current version of the guide from https://www.parallels.com/products/ras/resources/

Parallels RAS Version	Release	Date
17.0	Initial release	7/23/2019
17.1	Initial release	12/9/2019
17.1	Update 1	3/19/2020
17.1	Update 2	7/16/2020
17.1	Hotfix	9/15/2020
17.1	Update 3	3/26/2021

About Parallels RAS

Parallels RAS provides vendor independent virtual desktop and application delivery from a single platform. Accessible from anywhere with platform-specific clients and web enabled solutions, like the Parallels RAS HTML5 Gateway, Parallels RAS allows you to publish remote desktops, applications and documents, improving desktop manageability, security and performance.

Parallels RAS extends Windows Remote Desktop Services by using a customized shell and virtual channel extensions over the Microsoft RDP protocol. Parallels RAS supports all major hypervisors from Microsoft, VMware, and other vendors including Hyperconverged solutions such as Nutanix and Scale Computing and Cloud platforms and services such as Microsoft Azure and Windows Virtual Desktop, enabling the publishing of virtual desktops and applications to Parallels Client.

The product includes powerful universal printing and scanning functionality, as well as resource-based load balancing and management features.

With Parallels Client Manager Module for Parallels RAS you can also centrally manage user connections and PCs converted into thin clients using the free Parallels Client.

How does it work?

When a user requests an application or a desktop, Parallels RAS finds a least loaded RD Session Host or a guest VM on one of the least loaded VDI providers and establishes an RDP connection with it. Using Microsoft RDP protocol, the requested application or desktop is presented to the user. Note that in addition to RD Sessions Hosts and VDI, Parallels RAS can also be used to configure, manage and publish Microsoft Windows Virtual Desktop resources.

Users can connect to Parallels RAS using Parallels Client (available at no charge), which can run on Windows, Linux, macOS, Android, Chrome, iOS and iPadOS. Users can also connect via an HTML5 browser or Chromebook.

As newer versions of Windows keep on being developed as time goes by, you need to defend the migration cost to your business. Parallels RAS can help. Desktop replacement allows you to extend the lifespan of your hardware and delay migration to the latest OSs to a time that suits you best. The Parallels RAS solution allows you to be very flexible: you can lock machine configurations on the user side, placing your corporate data in an extremely secure position; or you can opt to allow users to run some local and remote applications. Parallels Client Desktop Replacement is able to reduce the operability of the local machine by disabling the most common local configuration options, while guaranteeing the same level of service and security afforded by thin clients, directly from your existing PCs.

About This Guide

This guide is intended for system administrators responsible for installing, configuring, and administering Parallels RAS. This guide assumes that the reader is familiar with Microsoft Remote Desktop Services and has an intermediate networking knowledge.

Terms and Abbreviations Used in This Guide

Term/Abbreviation	Description
RAS Console	Parallels RAS Console. The RAS console is the primary interface you use to configure, manage, and run Parallels RAS. As an administrator, you use the RAS console to manage Farms, Sites, RD Session Hosts, published resources, client connections, etc.
Category	In the RAS console, categories are displayed in the left pane of the main window. Each category consists of a number of settings related to a specific task or operation. The categories include Start, Farm, Load Balancing, Publishing, Universal Printing, Universal Scanning, Connection, Client Manager, and others.
Farm	A Parallels RAS Farm is a logical grouping of objects for the purpose of centralized management. A Farm configuration is stored in a single database which contains information about all objects comprising the Farm. A Farm consists of at least one Site but may have as many sites as necessary (see **Site** below).
Site	A Site consists of at least one RAS Publishing Agent, RAS Secure Client Gateway (or multiple gateways), and RAS agents installed on RD Session Hosts, VDI providers, and Windows PCs. Note that a given RD Session Host, VDI provider, or PC can be a member of only one Site at any given time.
Licensing Site	The Site that manages Parallels RAS licenses in a Parallels RAS Farm. By default, the server on which you install Parallels RAS becomes the Licensing Site. If you create additional sites later, you can designate any one of them as the Licensing Site. There can be only one Licensing Site in a given Farm. All other sites are called secondary sites. **Note:** Parallels RAS updates or upgrades must be applied to the Licensing Site first.
RAS Secure Client Gateway	RAS Secure Client Gateway tunnels all traffic needed by applications on a single port and provides secure connections.
HTML5 Client	HTML5 client allows users to view and launch remote applications and desktops in a web browser**. The** HTML5 client functionality is a part of RAS Secure Client Gateway.
Publishing	The act of making items installed on a Remote Desktop Server, VDI provider or Remote PC available to the users via Parallels RAS.
RAS Publishing Agent	RAS Publishing Agent provides load balancing of published applications and desktops.
RAS RD Session Host Agent	RAS RD Session Host Agent collects information from Microsoft RDS hosts required by the Publishing Agent and transmits to it when required.
Remote PC Agent	Remote PC Agent collects information from Remote PC hosts required by the Publishing Agent and transmits to it when required.
RAS Guest Agent	RAS Guest Agent collects information from the VDI desktop required by RAS Publishing Agent and transmits to it when required.

RAS VDI Agent / RAS Provider Agent	RAS VDI Agent collects information from the Parallels RAS Infrastructure and is responsible for controlling VDI through its native API. RAS VDI Agent is built into the RAS Publishing Agent and is available by default. It can be used to control multiple VDI providers in a Parallels RAS Farm. RAS Provider Agent is the same as RAS VDI Agent, but the term is used in the context of Windows Virtual Desktop (described at the end of this table).
RAS VDI Agent dedicated	RAS VDI Agent dedicated is similar to the RAS VDI Agent described above with one important difference — it is a separate component that must be installed from the Parallels RAS installer and can only control a single VDI provider.
RDSH or RD Session Host	RDSH makes applications and a full desktop accessible to a remote client that supports Remote Desktop Protocol (RDP). RDSH replaced Terminal Servicer beginning with Windows 2008 R2.
HALB	High Availability Load Balancing (HALB) is an appliance that provides load balancing for RAS Secure Client Gateways. Parallels HALB virtual appliance is available for the following hypervisors: Hyper-V, VMware. Multiple HALB Virtual Servers representing different HALB devices can be deployed in a single Site. Multiple HALB deployments can run simultaneously, one acting as the primary and others as secondaries. The more HALB deployments a Site has, the lower the probability that end users will experience downtime. Primary and secondary HALB deployments share a common or virtual IP address (VIP). Should the primary HALB deployment fail, a secondary is promoted to primary and takes its place.
Tenant Broker	Tenant Broker is a special RAS installation that hosts shared RAS Secure Client Gateways. It is an essential part of the RAS multi-tenant architecture.
Tenant	Tenants are RAS farms that join Tenant Broker (see above) and use shared RAS Secure Client Gateways and HALB thus eliminating the need to have their own Gateways and HALB deployed.
RAS Enrollment Server	RAS Enrollment Server is an essential component of the SAML SSO Authentication functionality. It communicates with Microsoft Certificate Authority (CA) to request, enroll, and manage digital certificates on behalf of the user for SSO authentication in the Parallels RAS environment.
RAS PowerShell	Parallels RAS PowerShell allows you to perform Parallels RAS administrative tasks using PowerShell cmdlets. You can execute cmdlets in the Windows PowerShell console or you can write scripts to perform common Parallels RAS administrative tasks. A complete guide to Parallels RAS PowerShell is available on the Parallels website together with other Parallels RAS documentation.
RAS REST API	Parallels RAS comes with various APIs to help you develop custom applications that integrate with it. The RAS REST API is one of them.
RAS Management Portal	Parallels RAS Management Portal is an HTML5 browser-based application that lets you manage Parallels RAS.
RAS Web Administration Service	A Web service that provides the user interface for RAS Management Portal and implements RESTful Web services for the RAS REST API (see above).
Windows Virtual Desktop	Microsoft Windows Virtual Desktop is a desktop and app virtualization service running on Microsoft Azure, providing access to RD Session Hosts and VDI. Parallels RAS 18 provides the ability to integrate, configure, maintain, support and access Windows Virtual Desktop workloads on top of the existing technical capabilities of Parallels RAS.
FSLogix	FSLogix Profile Container is a remote profile solution for non-persistent environments. Parallels RAS supports FSLogix on RD Session Hosts, VDI, and Windows Virtual Desktop.

CHAPTER 2

Installing Parallels RAS

This chapter describes how to install and activate Parallels RAS.

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System Requirements

Before installing Parallels RAS, please verify that your hardware and software meet or exceed hardware and software requirements described below. Please note that although Parallels RAS can be used in Workgroup environment, Parallels recommends using Active Directory to manage users, groups, and machine accounts via group polices.

Hardware Requirements

Parallels RAS is extensively tested on both physical and virtual platforms. The minimum hardware requirements approved to run Parallels RAS are outlined below.

- Physical Machines – Dual Core Processor and a minimum of 4GB RAM.
- Virtual Machines – Two Virtual Processors and a minimum of 4GB of RAM.

The server hardware requirements to install and configure Parallels RAS can vary according to end-user requirements.

Typically for an installation of 30 users or under, Parallels RAS can be installed on one high specification server and the resources published directly from it. For more than 30 users, multiple servers may be required.

The below should be considered during the planning stage of a Parallels RAS deployment:

- High specification servers should be used, consisting of multiple CPU cores, a high specification disk transfer rate and plenty of RAM.
- A hypervisor-based virtual machine can be used as long as the resources needed to serve end-users are calculated accordingly.

- It is recommended that RAS Secure Client Gateway does not exceed 1200 users per server for incoming connections using the Gateway SSL mode.
- HALB usage should not exceed 2000 user sessions per HALB appliance. See https://kb.parallels.com/125229.
- When planning VDI Hypervisor resource requirements, extra requirements such as RAM usage per virtual machine and disk space should be taken into account.

When configuring RD Session Hosts, VDI, or Windows Virtual Desktop, please keep in mind that different types of workloads require different session host configurations. For the best possible experience, scale your deployment depending on your users' needs. The following table gives you an idea of how different workload types affect session host configurations.

Workload	Example users	Example apps	Max users per vCPU	Minimum
Light	Basic data entry tasks	Database entry applications, command-line interfaces	6	2 vCPUs 8 GB RAM 16 GB storage
Medium	Consultants and market researchers	Database entry applications, command-line interfaces, Microsoft Word, static web pages	4	4 vCPUs 16 GB RAM 32 GB storage
Heavy	Software engineers, content creators	Database entry applications, command-line interfaces, Microsoft Word, static web pages, Microsoft Outlook, Microsoft PowerPoint, dynamic web pages	2	4 vCPUs 16 GB RAM 32 GB storage
Power	Graphic designers, 3D model makers, machine learning researches	Database entry applications, command-line interfaces, Microsoft Word, static web pages, Microsoft Outlook, Microsoft PowerPoint, dynamic web pages, Adobe Photoshop, Adobe Illustrator, CAD, CAM	1	6 vCPUs 56 GB RAM 340 GB storage

Note: Sizing guidelines are based on Microsoft recommendations on RDS or Windows Virtual Desktop multi-session hosts.

For port requirements, please see the **Port Reference** section (p. 401).

Software Requirements

RAS Publishing Agent and RAS Secure Client Gateway (64-bit versions only)

RAS Publishing Agent and RAS Secure Client Gateway are supported on the following operating systems:

- Windows Server 2019. Both Server Core and Desktop Experience installations are supported.
- Windows Server 2016. Both Server Core and Desktop Experience installations are supported.

- Windows Server 2012 R2
- Windows Server 2012
- Windows Server 2008 R2
- Windows Server 2008

Note: RAS Publishing Agent and RAS Secure Client Gateway should NOT be installed on a domain controller or any other machine where a DHCP server is running. This in general applies to any of the RAS components.

RAS Web Administration Service

Must be installed on the server where RAS Publishing Agent is running.

Before installing RAS Web Admin Service, make sure that your Windows server has the following updates installed:

- Windows Server 2012 R2 — KB2999226
- Windows Server 2008 R2: — KB2999226 and KB2533623

Newer versions of Windows Server do not require any specific updates.

RAS RD Session Host Agent

RAS RD Session Host Agent is supported on the following operating systems:

- Windows Server 2019
- Windows Server 2016 and newer must be installed using the "Desktop Experience" installation option.
- Windows Server 2012 R2. Note that Server Core installation option is NOT supported.
- Windows Server 2012
- Windows Server 2008 R2
- Windows Server 2008

RAS VDI Agent

RAS VDI Agent is supported on the following operating systems:

- Windows Server 2019
- Windows Server 2016
- Windows Server 2012 R2
- Windows Server 2008 R2
- Windows Server 2012
- Windows Server 2008

VMware, Nutanix, and Citrix Hypervisor can use Windows-based RAS VDI agent either integrated into RAS Publishing Agent or installed separately on Windows Server 2012 R2 and Windows Server 2016.

RAS VDI Agent can also be installed as a virtual appliance (OVA or VMDK), which can be downloaded from the Parallels website. For installation instructions and requirements, please see the corresponding hypervisor documentation. For the list of supported hypervisors, see **RAS VDI Agent Installation Options** (p. 115).

RAS Guest Agent

- Windows Server 2008 R2 and newer
- Windows 7 and newer

Remote PC Agent

- Windows Server 2008 R2 and newer
- Windows 7 and newer

Parallels RAS PowerShell

Windows Server 2008 with Service Pack 2 and newer. Windows Management Framework 3.0 and .NET Framework 4.5.2 must also be installed.

Parallels RAS Console

- Windows Server 2008 R2 and newer
- Windows 7 and newer

RAS HTML5 Gateway

- Windows Server 2008 R2 and newer. Note that RAS HTML5 Gateway will NOT work with Windows Server 2008 (plain, not R2).

RAS Enrollment Server

- Windows Server 2019
- Windows Server 2016
- Windows Server 2012 R2
- Windows Server 2012
- Windows Server 2008 R2

Parallels Client

Parallels Client is approved for the following operating systems (both 32-bit and 64-bit systems are supported, where applicable):

- Windows 7, 8.x, 10
- Windows Server 2008 R2 and newer
- macOS 10.11 "El Capitan" - macOS 10.15 "Catalina"
- iOS 11 and newer (Parallels Client for iOS 17.1 and above)
- iOS 9 and newer (Parallels Client for iOS 17.0.2 and below)
- Android 4.4 and newer
- Chrome OS

Parallels Client for Linux supports the following Linux distributions (x64 versions only):

- Ubuntu 16.04
- Ubuntu 18.04
- Linux Mint 19
- Debian 9.5.0
- Fedora 28
- CentOS 7.5

Changes in Parallels RAS 17

Please note that beginning with Parallels RAS 17.0, some of the versions of Parallels RAS components and some operating system versions are no longer officially supported.

The following is a quick summary of the deprecated components and operating systems:

- 32-bit RAS Secure Client Gateway
- 32-bit RAS Publishing Agent
- 32-bit Parallels Client for Linux
- Parallels RAS Web Portal
- Windows Server 2003 as a platform for publishing from RD Session Hosts
- Parallels RAS Console is no longer supported on Windows Vista and Windows Server 2008
- Parallels Client for Linux is no longer supported on ARM and Raspberry Pi
- Parallels Client for Windows is no longer supported on Windows Server 2003

Install Parallels RAS

To install Parallels RAS:

1. Make sure you have administrative privileges on the computer where you are installing Parallels RAS.
2. Double click the `RASInstaller.msi` file to launch the Parallels RAS installation wizard.

   Note: If you see a message that begins with "This version of Parallels RAS is only for testing purposes.", it means that it's not an official build and should not be used in a production environment.
3. Follow the instructions and proceed to the **Select Installation Type** page. Select from the following:
   - **Parallels Remote Application Server.** The default installation that will install all necessary components for a fully functional Parallels RAS Farm on the same machine.
   - **Parallels RAS Tenant Broker**. This option installs Tenant Broker. For more information, please see the **RAS Multi-Tenant Architecture** chapter (p. 228).
   - **Custom.** Select and install only the components that you require. You can select individual components after you click **Next**. Note that if a component cannot be installed on the current server, it will not be available for installation. See **Software Requirements**.
4. Click **Next**.
5. Review the notice on the **Important Notice** wizard page. If there's a port conflict on your computer, the information will be displayed here. You can resolve the conflict later.
6. Click **Next**.
7. On the **Firewall Settings** page, select **Automatically add firewall rules** to configure the firewall on this computer for Parallels RAS to work properly. See **Port Reference (p. 401)** for details.
8. Click **Next** and then click **Install**. Wait for the installation to finish and click **Finish**.

When you need to install a particular Parallels RAS component on a different server, run the installation wizard again, select **Custom** and choose the component(s) you wish to install.

Log In and Activate Parallels RAS

After you've installed Parallels RAS, run the RAS Console and activate your new Parallels RAS Farm.

Start the Parallels RAS Console

By default, the Parallels RAS Console is launched automatically after you click **Finish** on the last page of the installation wizard. To launch the console manually, navigate to **Start** > **Apps** > **Parallels** and click on **Parallels Remote Application Server Console**.

When the Parallels RAS Console is launched for the first time, you are presented with the login dialog. In the dialog, specify the following:

- **Farm:** A Parallels RAS Farm to connect to. Enter the FQDN or IP address of the server where you have RAS Publishing Agent installed.
- If you've installed the Parallels Single Sign-On component when installing the RAS Console, you will see the **Authentication type** field from which you can select whether to log on using your credentials or SSO. If you reboot after the installation and select SSO, select **Single Sign-On** and then click **Connect**. Your Windows credentials will be used to log in to the RAS Farm. If you select **Credentials**, enter your credentials as described below.
- **Username:** A user account with administrative privileges on the server where Parallels RAS is installed (usually a domain or local administrator). The account name must be specified using the UPN format (e.g. `administrator@domain.local`). The specified user will be automatically configured as the Parallels RAS administrator with full access rights.
- **Password:** The specified user account password.
- If you select the **Remember credentials** option, this dialog will not be shown the next time you launch the Parallels RAS Console.

The **Edit Connections** button opens a dialog where you can manage your RAS connection. This dialog becomes useful if this is not the first time you are connecting to one or more of your RAS Farms. The left pane of the dialog displays RAS Farms to which previously connected (you can remove a Farm from the list by clicking the **[-]** icon if you no longer need it). The right pane displays at least the master Publishing Agent for the selected Farm. If you've added a secondary Publishing Agents to a Farm, you can add it to this list by clicking the **[+]** icon and typing its hostname or IP address (click the "recycle" icon to verify the agent status). This way the RAS Console will try to connect to the master Publishing Agent first and if it fails (e.g. the agent is offline or cannot be reached), it will try to connect to the secondary Publishing Agent. For more information about secondary Publishing Agents, please see **Parallels RAS Publishing Agents** chapter (p. 54).

When you are done entering the connection information, click the **Connect** button to connect to the Parallels RAS Farm.

Sign in to Parallels My Account

To activate Parallels RAS, you must register for a Parallels business account. After you logged in to Parallels RAS, you'll see the **Sign In to Parallels My Account** dialog. If you already have an account, type the email address and password you used to register the account and click **Sign In**.

Note: If you use an HTTP proxy server on your network, you will see a dialog asking you to configure the proxy server connection settings. Click the **Configure Proxy** button. In the dialog that opens, select one of the following: **Use system proxy settings** (the default proxy settings from the Internet Explorer will be used) or **Manual HTTP proxy configuration** (specify the settings manually). If your proxy configuration changes, you can re-configure it later by navigating to **Administration** > **Settings** and clicking the **Configure Proxy** button.

If you don't have a Parallels business account, you can register for one as follows:

1. In the **Sign In to Parallels My Account** dialog, click **Register**. The **Register Parallels My Account** dialog opens.

   If you have an existing 2X Remote Application Server license and are upgrading to the new Parallels RAS, the **Register Parallels My Account** dialog will be prefilled with the information from your existing license. If you don't have an existing license (or if you've installed Parallels RAS on a new server), you need to fill in the registration information as described in the next step.
2. Enter your name and email address, choose and type a password, and enter your company info (all fields are required).
3. Click **Register** to register an account. This will create a personal account for yourself and a business account for your organization to which you will be assigned as administrator.

Activate Parallels RAS

After you sign in to Parallels My Account, the **Activate Product** dialog opens asking you to activate the Parallels RAS Farm.

If you already have a Parallels RAS license key, select the **Activate using license key** option and enter the key in the field provided. You can click the button next to the field to see the list of subscriptions and/or permanent license keys you have registered in Parallels My Account. If the list is empty, it means that you don't have any subscriptions or license keys and need to purchase one first.

Note: You can manage your Parallels RAS license using the **Licensing** category in the Parallels RAS console. The management tasks include viewing the license information, switching to a different Parallels My Account, and activating the Parallels RAS Farm using a different license key. For more information, please see the **Licensing** section (p. 361).

If you don't have a Parallels RAS license key, you have the following options:

- Purchase a subscription online by clicking the **Purchase a license** link.
- Activate Parallels RAS as a trial by selecting the **Activate trial version** option.

After entering a license key (or selecting to activate a trial version), click **Activate**. You should see a message that the Parallels RAS Farm was activated successfully. Click **OK** to close the message box.

The first dialog that you see informs you that you have no servers configured that can be used to host published resources. This means that to begin using Parallels RAS, you need at least one RD Session Host, VDI provider, or a Remote PC configured. We'll talk about configuring a Parallels RAS Farm in the next chapter. For now, click **OK** to close the message box. You will then see the **Applying Settings** dialog. Wait for the initial configuration of Parallels RAS to complete and click **OK**. You will now see the main Parallels RAS Console window where you can begin configuring the Parallels RAS Farm.

Read on to learn how to quickly add an RD Session Host, publish resources, and invite your users to Parallels RAS.

CHAPTER 3

Getting Started with Parallels RAS

This chapter will help you get started with Parallels RAS. Read it to learn how to use the Parallels RAS Console and how to set up a simple RAS environment.

In This Chapter

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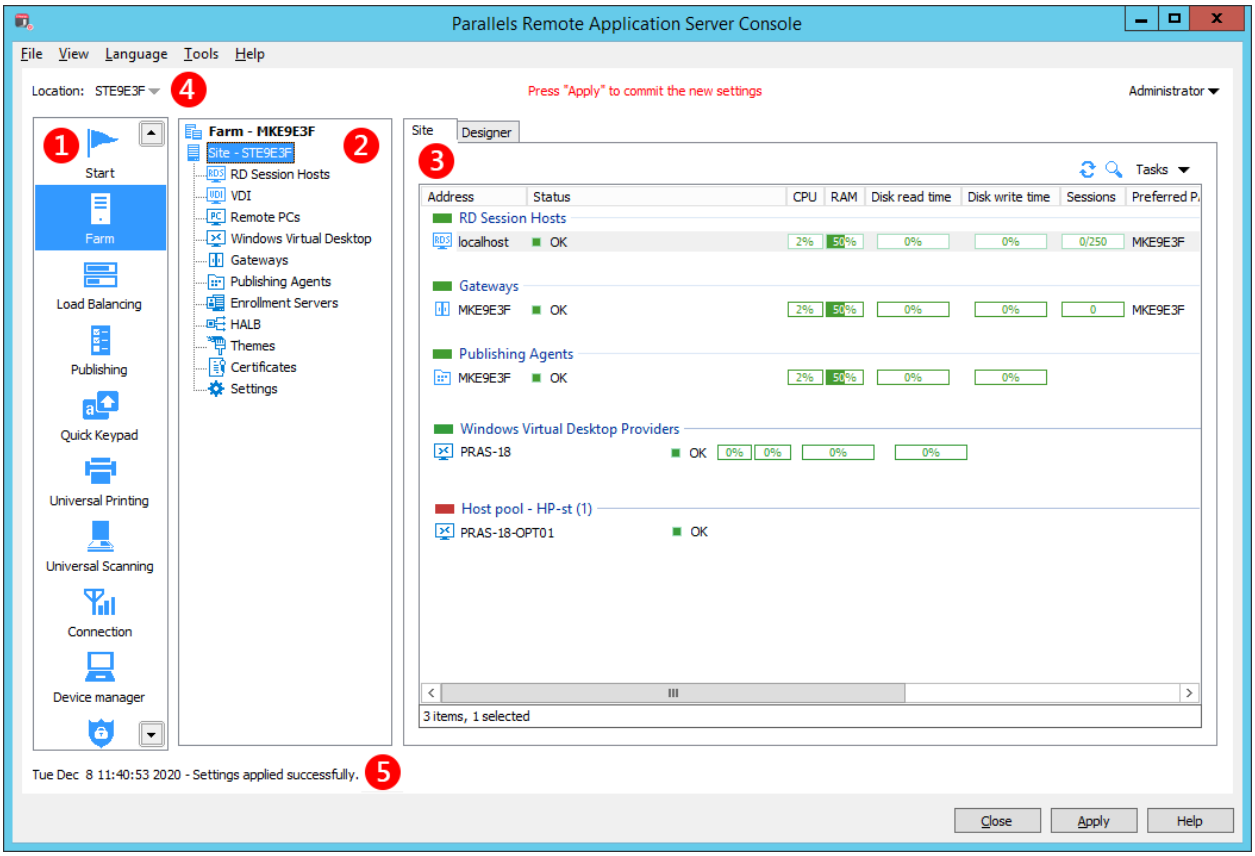
The Parallels RAS Console

The Parallels RAS Console is a Windows application used to configure and administer a Parallels RAS Farm.

To open the Parallels RAS Console, navigate to **Apps** > **Parallels** and click **Parallels Remote Application Server Console**. Note that you can open multiple instances of the Parallels RAS Console on the same computer if you want to manage more than one Farm or Site simultaneously without switching between them inside the console. This works with a locally installed Parallels RAS Console and when you run it as a remote application from Parallels Client.

Information: In addition to Parallels RAS Console, Parallels RAS 17 introduced and Parallels RAS 18 further improves Parallels RAS Management Portal, an HTML5 browser-based console that lets you manage Parallels RAS. Note that at the time of this writing, Parallels RAS Management Portal does not completely replace the desktop RAS Console as some management features are still in development. More features will be added in the upcoming releases. For more information, please refer to **Parallels RAS Management Portal Guide**, which is available on the Parallels website: https://www.parallels.com/products/ras/resources/

The following screenshot and the description below it give you an overview of the Parallels RAS Console:



The Parallels RAS Console consists of the following sections:

1. This section lists categories. Selecting a category will populate the right pane with elements relevant to that category.

2. This section (the middle pane) is available only for the **Farm** and the **Publishing** categories. The navigation tree allows you to browse through objects related to that category.

3. This section displays the selected object or category properties, such as servers in a Farm or published application properties, etc.

4. The information bar at the top of the RAS Console displays the name of the Site you are currently logged in to on the left side (the **Location** field). If you have more than one Site, you can switch between them by clicking the drop-down menu (the Site name) and choosing a desired Site. If you used the RAS Console to connect to more than one Farm, the drop-down menu will also display the other Farm name(s), clicking on which will connect the console to that Farm.

   Your administrator account name is displayed on the right side. Clicking on the name opens a drop-down menu from which you can initiate a chat with other administrators, show current sessions, and log off from the RAS Console.

   The **Press 'Apply' to commit the new settings** message in the middle (in red) appears after you make any changes to any of the components or objects. It reminds you that you need to apply these changes to Parallels RAS for them to become effective. The following describes how it works.

   When you make changes in the RAS Console, they are saved in the database as soon as you click **OK** in a dialog. If you close the console at this point, the changes will remain in the database and will not be lost. The changes, however, are not yet applied to running instances of the Parallels RAS processes, so they have no effect in the running RAS Farm. When you click the **Apply** button (at the bottom of the screen) the changes are applied to the runtime and become effective immediately.

   When modifying anything in the RAS Console, follow these rules. When you make a small change, you can click **Apply** as soon as you are done with it. If you are working on something that requires many modifications in many places, you can wait until you are done with all changes and only then press **Apply** to apply all of them at the same time.

5. The information bar at the bottom of the screen is used to display the most recent console notification (if one is available).

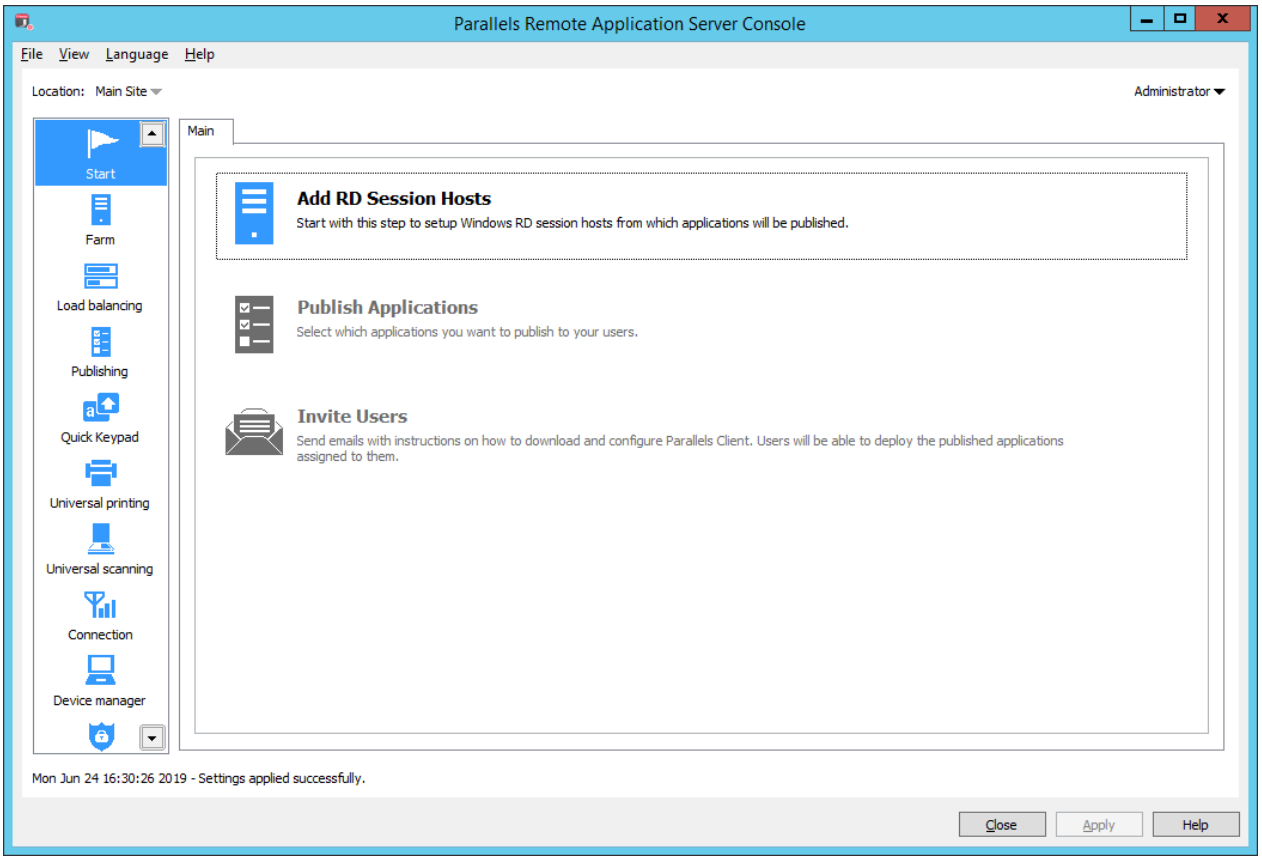
Set Up a Basic Parallels RAS Farm

In this section, we'll set up a basic Parallels RAS Farm where all required components run on a single server.

To set up a Parallels RAS Farm:

1 Log in to the Parallels RAS Console.

2 In the console, select the **Start** category. This category gives you access to three wizards that you can use to easily perform essential tasks, such as adding RD Session Hosts, publishing applications, and inviting users to Parallels RAS.



Add an RD Session Host

First, you need to add an RD Session Host to the Farm. In this tutorial, we'll add the local server on which Parallels RAS is installed.

To add an RD Session Host to the Farm:

1 Click **Add RD Session Hosts**. The **Add RD Session Hosts** wizard opens.

2 Select a server or type a server FQDN or IP address and then click the plus-sign icon to add the server to the list. If you are testing this by adding the localhost and see the FQDN warning, you can ignore it.

Note that if you enter the server FQDN, it will be used as the primary method of connecting to this server from other Parallels RAS components and clients. If you enter the IP address, it will be automatically resolved to FQDN, but only if the global option to resolve to FQDN is enabled. To see the current setting of this global option, click **Tools** > **Options** on the main menu. In the **Options** dialog, examine the **Always attempt to resolve to fully qualified domain name (FQDN) when adding hosts** option. When the option is selected, the IP address of every server/component in the RAS Farm is always resolved to FQDN. When the option is cleared, whatever is specified for a server (IP address or name) is used to communicate with a server. This makes a difference in deployments where an IP address cannot be used to access a server, such as when a server is hosted in the cloud. For more information, see **Host Name Resolution** (p. 353).

3 Click **Next**.

4 The page with general settings opens. Specify the following settings:

- **Add firewall rules**. Add firewall rules required by Parallels RAS in Windows running on the server. See **Port Reference** for details (p. 401).
- **Install RDS role**. Install the RDS role on the server if it's not installed. You should always select this option.
- **Enable Desktop Experience**. Enable the Desktop Experience feature in Windows running on the server. This option is enabled only if the Install RDS role option (above) is selected. The option applies to Windows Server 2008 R1/R2 and Windows 2012 R1/R2 on which the Desktop Experience feature is not enabled by default.
- **Restart server if required**. Automatically restart the server if necessary. You can restart the server manually if you wish.
- **Add server(s) to group**. Add the server (or servers) to a group. Select the desired group in the list box located below this option. Groups are described in detail in the **Grouping RD Session Hosts** (p. 91) section. If you are just learning how to use this wizard, you can skip this option.

5 Click **Next**.

6 The next page allows you to add users and groups to the Remote Desktop Users group in Windows running on the server. This is necessary for your Parallels RAS users to be able to access published resources hosted by an RD Session Host. To specify users and/or groups, select the option provided and then click the **[+]** icon. In the **Select Users or Groups** dialog, specify a user or a group and click **OK**. The selected user/group will be added to the list on the wizard page.

Note: If you skip this step and your users are not members of the Remote Desktop Users group on the RD Session Host, they will not be able to access resources published from this server. If you wish, you can add users to the group using the standard Windows tools. For more information, please consult the Microsoft Windows documentation.

7 Click **Next**.

8 On the next page, review the settings and click **Next**.

9 The **Install RAS RD Session Host Agent** dialog opens. Follow the instructions and install the agent. When the installation is finished, click **Done** to close the dialog.

10 Back in the wizard, click **Finish** to exit.

If you would like to verify that the RD Session Host has been added to the Farm, click the **Farm** category (below the **Start** category in the left pane of the Parallels RAS Console window) and then click **RD Session Hosts** in the navigation tree (the middle pane). The server should be included in the **RD Session Hosts** list. The **Status** column may display a warning message. If it does, reboot the server. The **Status** column should now say, "OK", which means that your RD Session Host is functioning properly.

Read on to learn how to publish an application from an RD Session Host (p. 32)

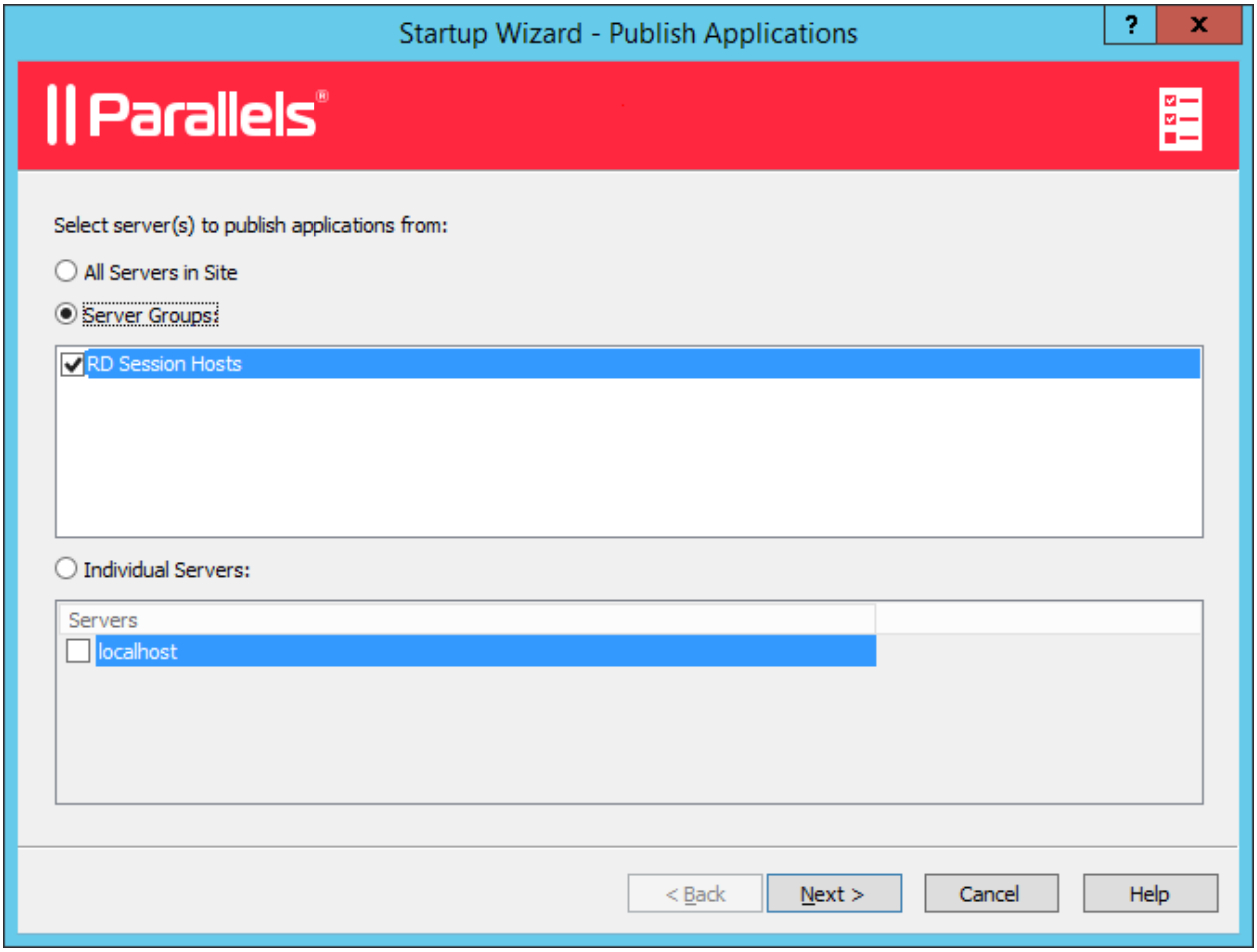
Publish Applications

After you added an RD Session Host, you can publish applications from it.

To publish an application:

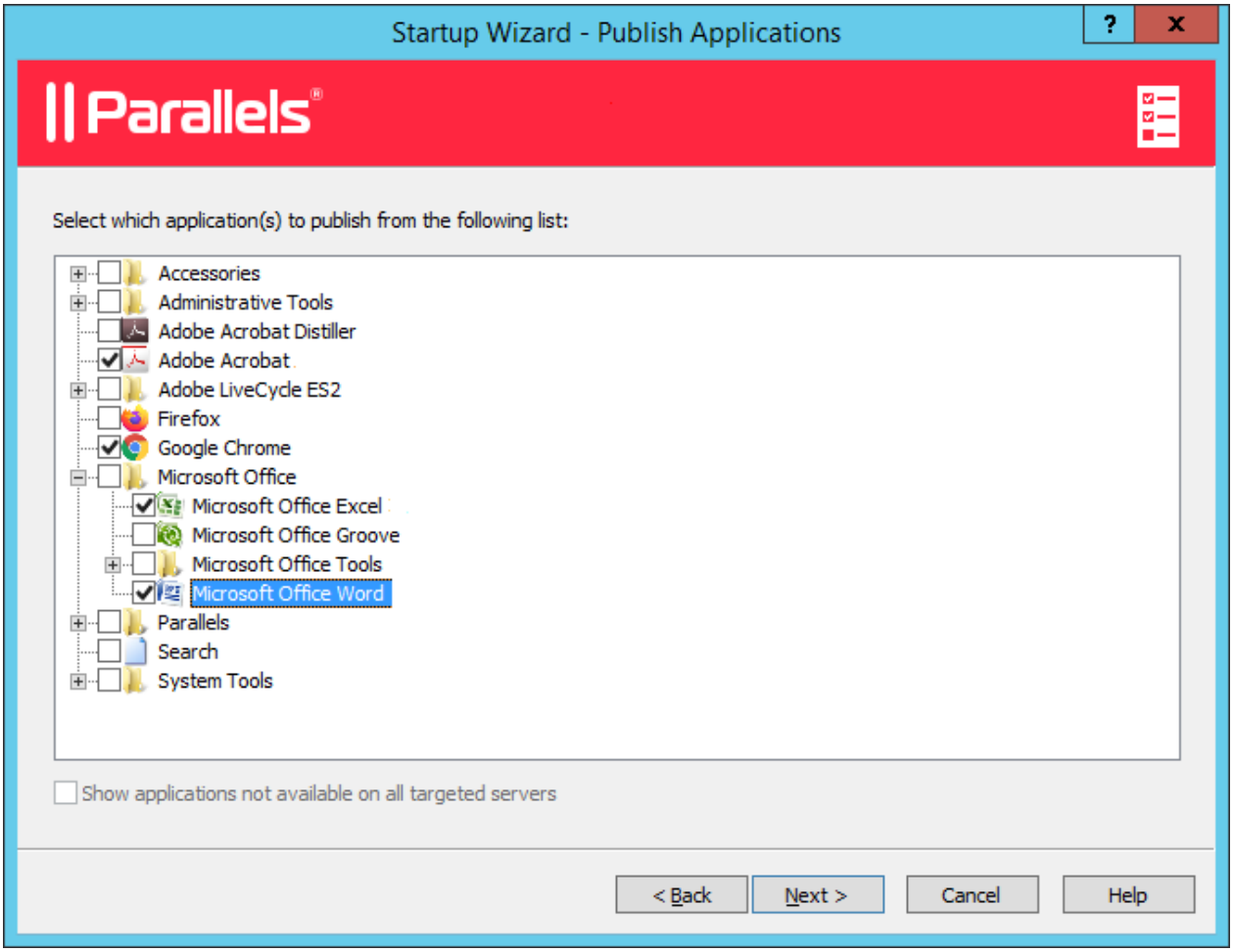
1 In the Parallels RAS Console, select the **Start** category and click the **Publish Applications** item in the right pane.

2 The **Publish Applications** wizard opens. On the first page, select one or more servers from which the application should be published. You can select all servers, server groups, or individual servers.


Startup Wizard - Publish Applications
Parallels
Select server(s) to publish applications from:
All Servers in Site
Server Groups:
RD Session Hosts
Individual Servers:
Servers
localhost
< Back
Next >
Cancel
Help

3 Click **Next**.

4 On the next page, select one or more applications you want to publish.



If you've selected more than one server on the previous screen, the **Show applications not available on all target servers** option becomes enabled. If the option is cleared (default), the folder tree will contain applications that are available on each and every server that you selected. If the option is enabled, the tree will contain applications that may be available on some server(s), but not on the others.

5 Click **Next**. Review the summary information and click **Next** again.

6 Click **Finish** when ready.

To verify that an application has been successfully published, select the **Publishing** category in the RAS Console. The application should be included in the **Published Resources** list (the middle pane).

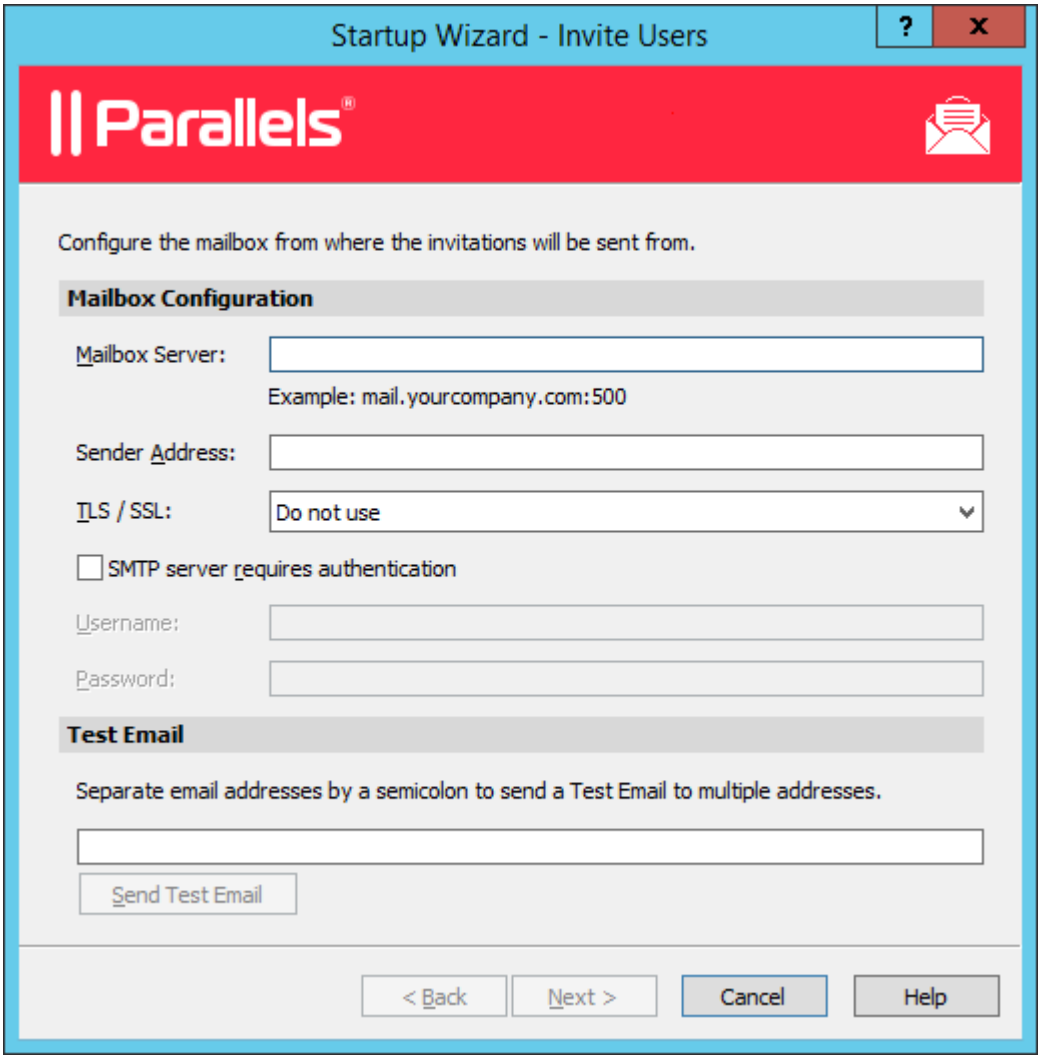
Invite Users

Your Parallels RAS Farm is now fully operational. You have an RD Session Host and published application(s). All you need to do now is invite your users to install the Parallels Client software on their devices and connect to the Parallels RAS Farm.

To invite users:

1 In the Parallels RAS Console, select the Start category and click the **Invite Users** item.

2 The **Invite Users** wizard opens:



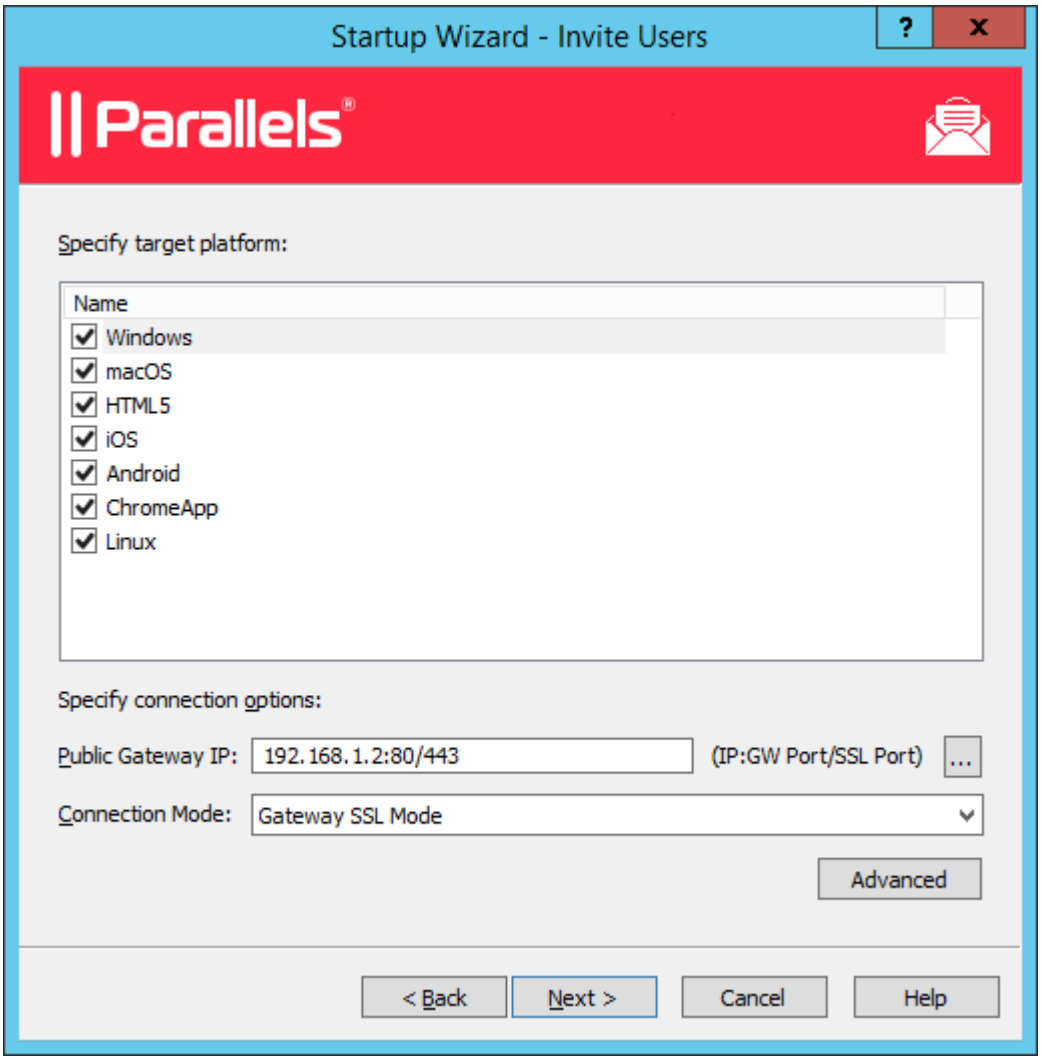
3 Specify the mailbox information that should be used to send invitation emails to users:

- **Mailbox Server:** Enter the mailbox server name. For example, mail.company.com:500
- **Sender Address:** Enter the email address.
- **TLS / SSL:** Choose whether to use the TLS/SSL protocol.
- **SMTP server requires authentication:** Select this option if your SMTP server requires authentication. If it does, also type the username and password in the fields provided.

4 In the **Test Email** section, type one or more email addresses to which a test email should be sent (separate multiple address with a semicolon). Click the **Send Test Email** button to send the email.

5 Click **Next**.

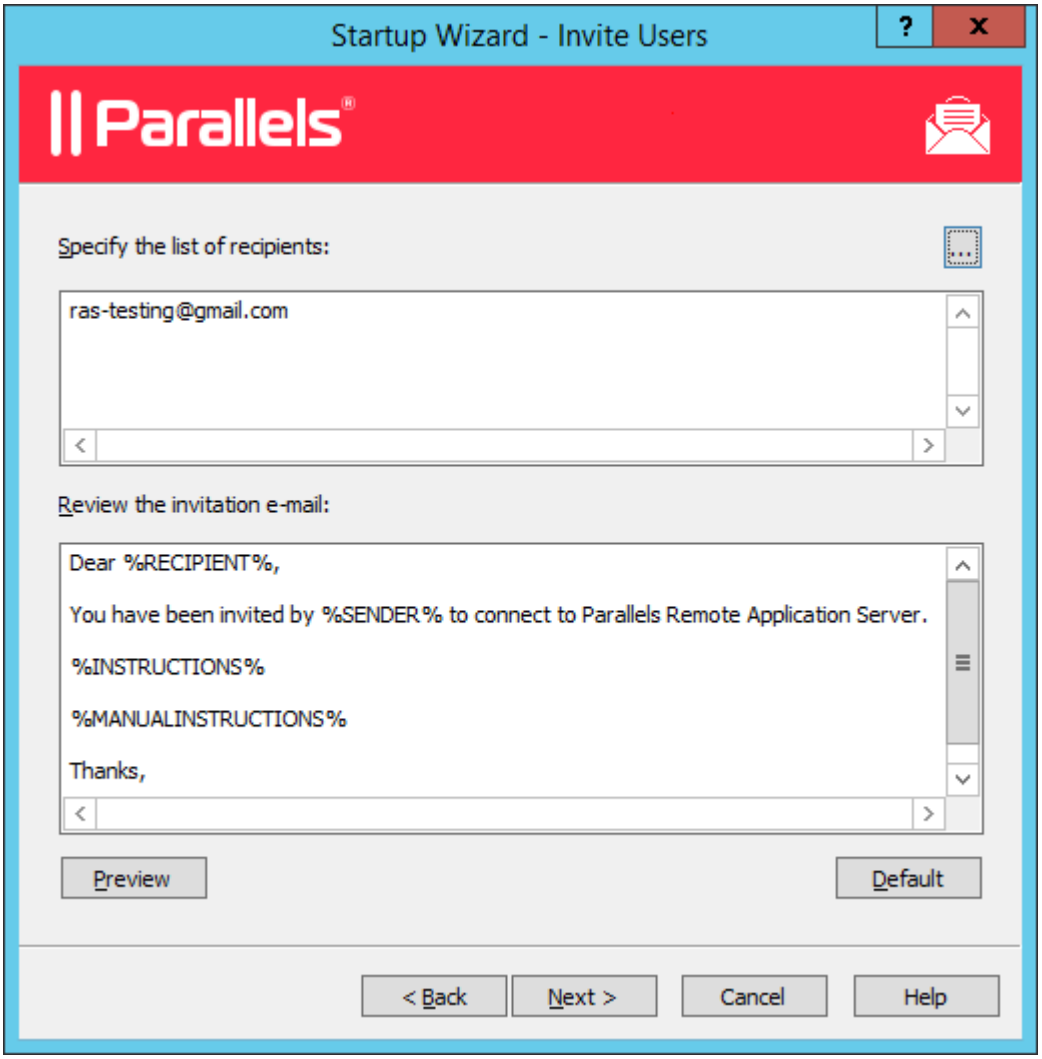
6 On the next page of the wizard, specify target devices and connection options:



- In the target devices list, select the types of devices to send an invitation to. Each target device of a particular type will receive an email with instructions on how to download, install, and configure the Parallels Client software on that device type.
- In the **Public Gateway IP** field, specify the RAS Secure Client Gateway FQDN or IP address. Please note that this can be a public IP address so it can be reached by a remote user. You can click the **[...]** button to select a gateway from the list.
- In the **Connection Mode** drop-down list, select the RAS Secure Client Gateway connection mode. Please note that SSL modes require the gateway to have SSL configured. More information can be found in the **Configuring RAS Secure Client Gateway** (p. 64) section.
- Click the **Advanced** button to open the **Advanced Settings** dialog. This dialog allows you to specify a third-party credential provider component. If you use such a component to authenticate your users, specify its GUID in this dialog. For more information, see **Configure Client Policy Options** > **Single Sign-On** (p. 330).

7 Click **Next**.

8 On the next page, specify the email recipients. Click the **[...]** button to select users or groups.



9 Review the invitation email template displayed in the **Review the invitation e-mail** box. You can modify the template text as needed. The template also uses variables, which are explained below.

- `%RECIPIENT%` — Specifies the name of a recipient to whom the email message is addressed.
- `%SENDER%` — The sender's email address that you specified in the first step of this wizard when you configured the outgoing email server settings.
- `%INSTRUCTIONS%` — Includes a custom URL hyperlink for automatic configuration of Parallels Client. The URL uses the Parallels Client URL scheme. For more info, see **RAS HTML5 Gateway API and Parallels Client URL Scheme** (p. 399).
- `%MANUALINSTRUCTIONS%` — Includes instructions for manual configuration of Parallels Client.

The variables are defined dynamically depending on the type(s) of the target devices and other settings. Normally, you should always include them in the message, so your users will receive all the necessary instructions and links. If you don't include any of the variables, you will see a warning messages, but including all of them is not a requirement. To preview the message, click the **Preview** button. This will open the HTML version of the message in a separate window. This is the email message that your users will receive.

10 Click **Next**, review the settings that you specified and click **Next** again to send the invitation email to users.

When users receive the invitation email, they will follow the instructions that it contains to install and configure Parallels Client on their devices. Once that's done, the users will be able to connect to Parallels RAS and launch published resources.

Conclusion

In this tutorial, we have configured a simple Parallels RAS Farm with a single RD Session Host and one published application. We then configured a mailbox for outgoing emails and sent an invitation email to end users with instructions on how to install Parallels Client, connect to the Parallels RAS Farm, and run the published application. Essentially, we've created a fully functional Parallels RAS Farm serving remote applications to end users.

If you wish, you can repeat the tutorial and add more RD Session Hosts, publish more applications, or send an invitation email to users who use different types of devices. The instructions remain essentially the same.

The rest of this guide explains in detail how to configure and use various features of Parallels RAS.

CHAPTER 4

Parallels RAS Farm and Sites

Parallels RAS Farm is a logical grouping of objects for the purpose of centralized management. A Farm configuration is stored in a single database which contains information about all objects comprising the Farm. A Site is the next level grouping in the Farm hierarchy which contains servers and other objects providing connection and remote application services.

In This Chapter

Connecting to a Parallels RAS Farm 39
About Sites 41
Sites in the RAS Console 42
Adding a Site to the Farm 44
Replicating Site Settings 45
Managing Licensing Site 46
Managing Administrator Accounts 47

Connecting to a Parallels RAS Farm

If you have more than one Parallels RAS Farm in your organization, you can use the same Parallels RAS Console instance to manage any of them. By default, the Parallels RAS Console is installed on the same server where you install other Parallels RAS components, but you can install the console on any computer on your network.

Connecting to a Parallels RAS Farm for the first time

When you open the Parallels RAS Console for the first time, it displays the logon dialog on which you need to specify the following:

- **Farm:** A Parallels RAS Farm to connect to. Enter the FQDN or IP address of the server where you have RAS Publishing Agent installed.
- If you've installed the Parallels Single Sign-On component when installing the RAS Console, you will see the **Authentication type** field from which you can select whether to log on using your credentials or SSO. If you reboot after the installation and select SSO, select **Single Sign-On** and then click **Connect**. Your Windows credentials will be used to log in to the RAS Farm. If you select **Credentials**, enter your credentials as described below.

- **Username:** A user account with administrative privileges on the server where Parallels RAS is installed (usually a domain or local administrator). The account name must be specified using the UPN format (e.g. administrator@domain.com). The specified user will be automatically configured as the Parallels RAS administrator with full access rights.
- **Password:** The specified user account password.
- If you select the **Remember credentials** option, this dialog will not be shown the next time you launch the Parallels RAS Console.

After entering the connection properties, click **Connect** to connect to the Farm and open the RAS Console.

Note that the **Edit Connections** button will not display any information on first connect (it is used to edit Farm connections that already exist), so you can ignore it at this point. We will talk about using this button closer to the end of this section.

Connecting to a different Parallels RAS Farm

When you need to connect to a different Parallels RAS Farm, you first need to log off from the Parallels RAS Console in order to see the logon dialog again. To do so:

1. In the Parallels RAS Console, click on the arrow icon next to your user name in the upper right-hand corner and then choose **Log Off** in the context menu.
2. The console will close and the RAS logon dialog will open. The dialog will be populated with the current Farm connection properties.
3. To connect to a different Farm, type the FQDN or IP address of the server where the other Farm is located. Once again, this should be the server where you have the RAS Publishing Agent installed.
4. Specify a username and password and click **Connect**. The Parallels RAS Console will connect to the Farm using the connection properties that you specified.

Switching between Parallels RAS Farms

After you connect to more than one Farm from the same Parallels RAS Console instance, you can easily switch between them as follows:

1. In the Parallels RAS Console, click the **Location** drop-down menu in the upper left-hand corner (right below the main application menu, where the current Site name is displayed).
2. The lower portion of the drop-down list will contain names of the Farms to which you connected at least once in the past (the upper portion contains one or more Site names for the current Farm). Click a desired Farm name to connect to it.
3. When you click the Farm name, the console will close momentarily and will re-open connected to the Farm that you selected.

Note that you can also switch between Farms by logging off from the console and choosing a desired Farm from the **Farm** drop-down list in the RAS logon dialog. The method described above is more convenient, so this one is just another way to do it.

Editing Parallels RAS Farm connections

As was mentioned in the beginning of this section, the RAS logon dialog has the **Edit Connections** button. When you click it, the **Manage Parallels RAS Farm Connections** dialog opens.

On the left side of the dialog, the **Farm Connections** pane lists Parallels RAS Farms to which you connected at least once in the past. If a connection is no longer relevant, you can remove it by selecting it and clicking the "minus sign" icon at the top. Once a connection is removed, it will no longer appear in the RAS logon dialog and in the Parallels RAS Console (the **Location** drop-down list).

On the right side of the dialog, the **Publishing Agents** pane lists RAS Publishing Agents for the selected Farm connection. By default, the primary Publishing Agent is included in the list, but you can add more Publishing Agents if needed. When connecting to a Farm, the Parallels RAS Console will try the primary Publishing Agent first. If a connection cannot be established, it will try other Publishing Agents in the order they are listed in the **Publishing Agents** pane. To add a Publishing Agent to the list, click the "plus sign" icon and then specify the server FQDN or IP address.

About Sites

A Parallels RAS Farm consists of at least one Site, but may have as many sites as necessary.

Sites are often used to separate management and/or location functions. For example, by creating a Site, you can delegate permissions to a Site administrator without granting them full Farm permissions. Or you can have separate sites for different physical locations with the ability to copy the same settings to each Site while using RD Session Hosts, VDI providers, or PCs that are closer to end users or (depending on your needs) to back-end servers. For instance, it would make sense for a client/server application querying a database to be published from an RD Session Host which is located closer to the database server.

Each Site is completely isolated from other sites within the same Farm. The Farm simply groups sites logically and stores configuration properties of each Site (and the objects that comprise it) in a single database. sites don't communicate with each other and don't share any objects or data. The only exception to this rule is the RAS Licensing Site which periodically communicates with other sites to obtain statistics.

Individual object settings in a given Site can be replicated to all other sites. This does not mean that settings will be shared between sites. The settings that you choose will simply be applied to other sites. For more information, see the **Replicating Site Settings** section (p. 45).

When you install Parallels RAS, a Farm with a single Site is created automatically. This first Site becomes the RAS Licensing Site and the host for the main Parallels RAS configuration database. When you add more sites to the Farm, the data in this database is automatically synchronized with every Site that you add. When changes are applied to a particular Site, the main configuration database is automatically updated to reflect the changes.

Each Site must have at least the following components installed in order to publish remote applications and desktops for end users:

- Primary RAS Publishing Agent
- RAS Secure Client Gateway. Note that if a Site is joined as Tenant to RAS Tenant Broker, RAS Secure Client Gateway is not needed. For details, see **RAS Multi-Tenant Architecture** (p. 228).
- RD Session Host, VDI, or PC

When you install Parallels RAS using default installation options, the primary RAS Publishing Agent and the RAS Secure Client Gateway are automatically installed on the server on which you perform the installation. You can then add one or more RD Session Hosts to the Site to host published resources. You can also add more sites to the Farm if needed and configure individual components for each Site as you desire.

Sites in the RAS Console

To view existing sites in the Parallels RAS Console, select the **Farm** category in the left pane. Existing sites are listed in the right pane.

Note: The **Farm** node will only be visible to an administrator who has full permissions to manage the Farm. For more information about Farm/Site permissions, please refer to **Managing Administrator Accounts** (p. 47).

The **Farm** category displays the configuration of only one Site at a time. If you log in as the Farm administrator, the configuration of the RAS Licensing Site will be displayed. If you log in as an administrator who has access to a specific Site (but not the Farm), the configuration of that Site will be displayed.

Current Site

Click on the **Farm** item in the middle pane to view the list of available sites. The Site which configuration is currently loaded in the console is marked as "Current Site" in the **Type** column. The column also displays other Site attributes. For example, "Licensing Site / Local Site / Current Site".

Switching between sites

To switch to a particular Site, select **Farm** in the middle pane, then right-click the Site in the right pane and choose **Switch to this Site**. The Site configuration will be loaded into the RAS Console.

The other way of switching between sites is to click the **Location** drop-down menu in the upper left-hand side of the RAS Console. The menu lists sites for the current Farm and may also list other Farms if you used this RAS Console to connect to them. For more info, see **Connecting to a Parallels RAS Farm** (p. 39).

Renaming the Site

To rename a Site, right-click it and choose **Rename Site**.

Site configuration and health view

When you select the **Site** node in the middle pane, the **Site Info** tab in the right pane displays the list of Parallels RAS components that have been configured for the Site with interactive performance monitoring metrics for each component. Depending on the Site configuration, the list may include RD Sessions Hosts, VDI, Remove PCs, Gateways, Publishing Agents, Windows Virtual Desktop, HALB Virtual Servers and devices, Tenant Broker, Host pools, and Enrollment Server.

To collapse or expand a component group, click an "arrow up" or "arrow down" icon on the right side of the list. Note that if no servers of a particular type have been added to the Site, the group name will not be displayed in the list.

The following information is displayed for each component (the information is updated at an interval of approximately 2 minutes):

- **Address:** Server FQDN or IP address.
- **Status:** Indicates whether the agent software is installed on the server and is functioning properly.
- **CPU:** Current CPU utilization.
- **RAM:** Current RAM utilization.
- **Disk Read Time:** Disk read time.
- **Disk Write Time:** Disk write time.
- **Sessions:** The number of currently active user sessions.
- **Preferred PA:** The name of the RAS Publishing Agent designated as preferred for this server.
- **Operating System:** Operating system version installed on the server.
- **Agent Version:** The agent version installed on the server.

You can customize this view by clicking **Tasks** > **Monitoring Settings**. This opens a dialog where you can specify which colors should be used to display different performance counters and their values.

Performing tasks on a component

You can perform a number of tasks on a component displayed in the **Site Info** tab. These tasks are described below.

To configure a component, do one of the following:

- While the **Site** node is selected in the middle pane, right-click a component in the right pane and choose **Show in the editor**.
- Select a component category in the middle pane (e.g. RD Session Hosts, VDI providers, etc.).

To use server management tools, right-click a component (server), click **Tools** and choose a desired tool. For the complete description of tools, see **Computer Management Tools** (p. 354).

Using the Site Designer

Select the **Site** node in the middle and then click the **Designer** tab in the right pane. The tab displays a visual representation of the Site infrastructure. Use the icons at the top to add more components to the diagram as desired. Note that adding a component to the diagram will actually add it to the Site. Double-click a component to view and configure it in a corresponding editor.

Adding a Site to the Farm

To add a Site to the Farm:

1. In the RAS Console, select the **Farm** category in the left pane and then select the Farm in the middle pane.
2. In the **Tasks** drop-down menu (the right pane, above the Site list), click **Add** (or click the **+** icon).
3. In the **Add Site** dialog:
   - In the **Site** field, specify a Site name.
   - In the Server field, specify the IP address or FQDN of the server where the Primary Publishing Agent and Secure Client Gateway should be installed.
   - Select the **Add an SSL certificate and enable HTML5 Gateway** option to automatically create a self-signed certificate, enable SSL, and enable HTML5 support. For more info, please see **Configure HTML5 Client** (p. 70).
4. Click **Next**.
5. The **Site Properties** dialog opens. First, it verifies if RAS Publishing Agent is installed on the specified Site server. If it isn't, it will indicate this in the **Status** field.
6. Click the **Install** button to install the agent.

7 In the **Install RAS Publishing Agent** dialog, highlight the server name on which the RAS Publishing Agent is to be installed.

8 (Optional) Select the option **Override system credentials** to specify and use different credentials to connect to the server and install the agent.

9 Click **Install** to install the publishing agent and gateway. Click **Done** once it has been successfully installed.

Once a new Site is created, you can view and manage its configuration by right-clicking the Site in the RAS Console and choosing **Switch to this Site**.

Replicating Site Settings

Site-specific settings configured for a given Site can be replicated to all other sites in a Farm. Refer to the table below for the information about which settings can be replicated to other sites.

Category	Section	Options
Farm	VDI > Templates	Auto removal timeout of guest VMs that fail preparation
Farm	VDI > Desktops	Auto removal timeout
Farm	Settings > Auditing	All settings
Farm	Settings > Global Logging	Logging settings
Farm	Settings > URL Redirection	All settings
Load Balancing	Load Balancing	All settings
Load Balancing	CPU Optimization	All settings
Publishing	Application	Site defaults are replicated. Other settings (name, description, icon, etc.) are global and are common to all sites
Publishing	Shortcuts	All settings
Publishing	Extensions	All settings
Publishing	Licensing	All settings
Publishing	Display	All settings
Publishing	Filtering (all types except Gateway)	All settings
Universal Printing	Universal printing	Printer renaming
Universal Printing	Printer drivers	All settings
Universal Printing	Fonts management	All settings
Universal Scanning	WIA	Scanner renaming
Universal Scanning	TWAIN	Scanner renaming
Universal Scanning	TWAIN > TWAIN applications	Scanning applications

Connection	Authentication	All settings
Connection	Settings	All settings
Connection	Multi-factor authentication	All settings
Connection	Allowed devices	All settings
Reporting	Reporting engine	Reporting engine type
Reporting	Engine specific settings	All settings

To replicate Site settings to all other sites, select **Farm** / <site> / **Settings** and then select the **Replicate settings** option (at the bottom of the **Auditing** tab). Please note that this option is disabled if you have just one Site in the Farm.

Overriding Site Replicated Settings

If an administrator who has permissions to enable or disable replication settings makes a change to a specific setting, such setting is replicated to all other sites. If an administrator has access to a particular Site only, upon modifying Site settings which have been replicated, the replicated settings are overridden and the option **Replicate Settings** is automatically cleared, therefore such settings will no longer be replicated to other sites.

Managing Licensing Site

The Licensing Site should always be online even if you have other sites in your Farm. If your Licensing Site goes offline, your other sites can still use the maximum number of individual licenses included in your subscription but only for a period of 72 hours. During this time, you need to do one of the following:

- Restore your Licensing Site.
- Promote a different Site to be the Licensing Site in the Farm (see below for instructions).

Please note that if the Licensing Site is offline from 48 to 72 hours and back online three times per month, you will be required to re-activate it using your Parallels RAS licensing key after the third time.

To promote a secondary Site to be the Licensing Site in the Farm:

1. In the RAS Console, navigate to **Farm** > **Farm**.
2. In the right pane select a Site and then click **Tasks** > **Set as licensing Site**.
3. You will be asked to activate the new Licensing Site using your Parallels RAS license. Follow the instructions and activate the Site.

Managing Administrator Accounts

You can have more than one administrator in Parallels RAS. At least one administrator (called the root administrator) must be present at all times. Other administrators can be given the following roles:

- **Root administrator**. Has full permissions to manage a Parallels RAS Farm.
- **Power administrator**. Has most permissions granted by default, but can be configured to have limited permissions to manage certain sites or categories.
- **Custom administrator**. Has no permission by default and can be granted specific permission to view or modify very specific areas or objects in the Parallels RAS Farm.

Read on to learn how to create and manage administrator accounts.

Adding an Administrator Account

To add an administrator account to the Parallels RAS Farm:

1. In the RAS Console, navigate to **Administration** / **Accounts**.
2. Click the **Tasks** drop-down menu and choose **Add** (or click the **[+]** icon).
3. The **Account Properties** dialog opens.
4. Click the **[...]** button next to the **Name** field. In the **Select User or Group** dialog, select a user or a group.
5. Specify an email address and mobile phone number. Both fields are optional and are disabled if the account specified in the **Name** field is a group.
6. In the **Permissions** drop-down list select a role to assign to the administrator:
   - **Root administrator**. Grants the administrator full permissions to manage the Farm.
   - **Power administrator**. Grants the administrator full permissions by default but allows you to limit them if needed. To grant or deny specific permissions, click the **Change Permissions** button. For additional info, see **Administrator Account Permissions** (p. 48).
   - **Custom administrator**. This role doesn't have any permissions by default and allows you grant very specific permissions for a particular category, area, or object in the RAS Console. See **Administrator Account Permissions** (p. 48) for details.
7. In the **Receive system notifications via** drop-down list, select **Email** to send all system notifications to the specified email address, or select **None** to disable email system notifications for this account.
8. Click **OK** to add the new administrator account to the Farm.

Modifying an administrator account

To modify an account, select it in the list and click **Tasks** > **Properties**. This opens the **Account Properties** dialog where you can modify the account information.

To enable or disable an account, select or clear the **Enable account** option at the top of the **Account Properties** dialog.

Administrator Account Permissions

To set permissions for a RAS administrator, do the following:

1. In the RAS Console, navigate to **Administration** / **Accounts**.
2. Select an administrator in the list and click **Tasks** > **Properties**.

When you click the **Change Permissions** button in the **Administrator Properties** dialog, the following happens depending on what is selected in the **Permissions** field:

- **Root administrator**. The **Change Permission** button is disabled because the root administrator always has full permissions.
- **Power administrator**. The **Account Permissions** dialog opens. In the left pane, select one or more sites for which to grant permissions to the administrator. In the right pane, select specific permissions. See the **Power administrator permissions** subsection below for details.
- **Custom administrator**. A different **Account Permissions** dialog opens where you can set custom permissions. Compared to the **Power administrator** role (see above), this option allows you to grant any permission (view, modify, add, etc.) for entire categories or specific areas or objects in the RAS Console. If a Custom administrator doesn't have permissions to even view a category or tab page, they will not even appear in the RAS Console. Using the **Custom administrator** role, you can limit permissions to one or more very specific tasks. For details, see **Custom administrator permissions** below.

Power administrator permissions

The following permissions can be set for a **Power administrator**:

- **Allow viewing of site information**. Whether the administrator can view the Site information.
- **Allow site changes**. Permissions to modify the following categories: **Site**, **Load Balancing**, **Universal Printing**, **Universal Scanning**. This option is disabled if the **Allow viewing of Site information** option is cleared.
- **Allow session management**. Permission to manage running sessions. This option is disabled if the **Allow viewing of site information** option is cleared.
- **Allow publishing changes**. Permission to modify the **Publishing** category.
- **Allow connection changes**. Permission to modify the **Connection** category.
- **Allow viewing of RAS reporting**. Permission to view reports generated by RAS Reporting.

- **Allow client management changes**. Permission to modify the **Client Manager** category.

In the **Global permission** area, set the following:

- **Allow viewing of policies**. Whether to allow the administrator to view the **Policies** category.
- **Allow policies changes**. Whether to allow the administrator to modify the **Policies** category.

Custom administrator permissions

To set custom administrator permissions, you must be either a root administrator or a power administrator with the "Allow site changes" permission granted.

When you first create an administrator of this type, they will have no permissions. To add permissions, select a Site in the left pane and then click the **Change permissions** button. The **Account Permissions** dialog opens. In the dialog, select a permission type in the left pane.

The permission types are:

- **RD Session Hosts**. The **RD Session hosts** tab in **Farm** / **RD Session hosts**.
- **RD Session hosts groups**. The **Groups** tab in **Farm** / **RD Session hosts**.
- **Remote PCs**. The **Farm** / **Remote PCs** view.
- **Gateways**. The **Farm** / **Gateways** view.
- **Publishing Agents**. The **Farm** / **Publishing Agents** view.
- **HALB**. The **Farm** / **HALB** view.
- **Themes**. The **Farm** / **Themes** view.
- **Publishing**. The entire **Publishing** category.
- **Connection**. The entire **Connection** category.
- **Device manager**. The entire **Device manager** category.
- **Certificates**. The **Farm** / **Site** / **Certificates** subcategory.

After you select a permission type, you can set the actual permissions in the right pane. Different permission types may have different sets of permissions. The following list describes all available permissions:

- **View**. View only.
- **Modify**. View and modify.
- **Add**. View, modify, and add new objects (e.g. servers).
- **Delete**. View, modify, and delete an object.
- **Control**. View and control an object. This permission enables the **Tasks** > **Control** menu (where available), which includes enable and disable logons, cancel pending reboot, install RDS role, reboot, and some other options. Also enables power operations (start, stop, etc., where available).

- **Manage sessions**. View and manage sessions.

The lower portion of the right pane lists individual objects (e.g. servers) if the selected permission type has them. Here, you can set individual permissions for a specific object (not the entire tab, for instance, which otherwise would include all available objects).

The **Global permissions** options at the top of the right pane enables all permissions for all objects for the selected permission type.

Clone permissions

As a root administrator (or a power administrator with sufficient privileges), you can apply (clone) permissions of an existing administrator account to another existing account. This way, you can configure permissions for one account and then quickly apply the same configuration to all other accounts that require them.

To clone permissions, select a source administrator account and click **Tasks** > **Clone permissions**. In the dialog that opens, select a destination account (or multiple accounts) and click **OK**.

Delegate permissions

There could be a situation when a power administrator needs to grant some permissions to a custom administrator. This cannot be done by modifying permissions because power administrators cannot manage administrator accounts directly. Instead, they can delegate some of their own permissions in a given Site to a custom administrator of their choice.

For example, if a power administrator wants the custom administrator to be able to manage a particular RD Session Host, he/she selects that host in the RAS Console and click **Tasks** > **Delegate permissions**. This opens a dialog where the administrator can select a custom administrator and specify which permissions (view, modify, etc.) that administrator should have. The **Tasks** > **Delegate permissions** menu option is available for many objects, such as RD Session Hosts, VDI providers, guest VMs (desktops), and some others. If the menu is not available for an object, it means that this functionality is not available for objects of this type.

Managing Administrator Accounts

To view existing administrator accounts, select the **Administration** category in the RAS Console. The **Accounts** tab lists existing accounts and their properties, including:

- **Group or user name**. Account name, which can be a user or group name.

- **Type**. Account type. Can be one of the following: **User**, **Group**, **Group User**. The User and Group are self-explanatory. The **Group User** is a user who receives Parallels RAS administrative permissions via a group membership. When you initially add a group to the list of Parallels RAS administrators, its members are not displayed on the **Accounts** tab. As soon as a member of the group logs in to Parallels RAS, the account name is added to the list of administrators as a **Group User** and remains there. Note that you cannot change Parallels RAS permissions for such an account individually outside the group permissions.
- **Permissions**. A security role assigned to an administrator.
- **Email**. Email address.
- **Mobile**. Mobile phone number.
- **Group**. Group name. This column has a value for Group Users only (see the **Type** column description above).
- **Last Modification By**. The name of the user who modified this account in Parallels RAS the last time.
- **Changed On**. The last account modification date.
- **Created By**. The name of the user who created this account in Parallels RAS.
- **Created On**. The date when this account was added to Parallels RAS.
- **ID**. Internal Parallels RAS ID.

Modifying an account

To modify an account:

1. Right-click an account and choose **Properties** in the context menu.
2. Use the **Administrator Properties** dialog to modify the necessary information. For more info, see **Adding an Administrator Account** (p. 47).

Handling locked objects

When an administrator is working with an object (e.g. a tab in the RD Session Host properties dialog), the object is locked for all other administrators. Therefore, upon trying to access a locked object, an administrator will be alerted with an error that the object is locked and will be denied access to it.

A root administrator (but not power or custom administrator) can release a locked object as follows:

1. On the **Administration** > **Accounts** tab, click the **Tasks** drop-down menu and choose **Show Sessions**.
2. In the **Sessions** dialog, select the administrator who is locking an object and then click the **Send Message** icon (at the top).
3. If the administrator doesn't reply and doesn't release the object, you have an option to click **Log Off**, which will log them off and will unlock the category.

Configure RAS Console Idle Sessions

If you have a number of administrators using the RAS Console to manage the same Farm, you can configure when an idle RAS Console session should be disconnected. By default, when an administrator opens the console and connects to a Farm but then forgets to log off and goes away, the session will stay active indefinitely possibly locking some of the categories for other administrators. You can change that by specifying the time period after which an idle session will be disconnected (thus unlocking the categories).

To configure idle sessions:

1. In the RAS Console, navigate to **Administration** > **Settings**.
2. Locate the **Miscellaneous** section (at the bottom) and choose a desired time period in the **Reset idle RAS Console session after** drop-down box.

When a session stays idle for close to the specified time period, the administrator (session owner) will be notified a few minutes in advance that the session is about to be disconnected. If the administrator chooses to stay connected, the time period is reset. If the administrator does nothing, the session will be disconnected when the time expires.

Using Instant Messaging for Administrators

Parallels RAS administrators logged on to the same Farm can communicate with each other using a built-in instant messenger.

To use the instant messenger:

1. In the RAS Console, select the **Administration** category.
2. Expand the drop-down menu next to your name (top-right corner of the console screen) and click **Chat**.
3. The **Parallels Remote Application Server Chat** window opens.

To send a message:

1. Type the message text in the lower input panel.
2. In the **Logged on administrators** list box, select a specific administrator or **All** to send the message to an individual or all logged on administrators.
3. Click **Send**.

Your message history is displayed in the **Messages** panel. To clear the history, click **Clear All**.

You can also view the chat history listing all messages between all administrators (not just your own messages). To do so, select the **Administration** node in the console and then select the **Chat History** tab.

Joining Customer Experience Program

Parallels Customer Experience Program helps us to improve the quality and reliability of Parallels RAS. If you accept to join the program, we will collect information about the way you use Parallels RAS. We will not collect any personal data, like your name, address, phone number, or keyboard input.

To join the program:

1. In the RAS Console, select the **Administration** category.
2. In the right pane, click the **Settings** tab.
3. Select the **Participate in the Customer Experience Program** option.

After you join the program, CEP will automatically start to collect information about how you use Parallels RAS. Data collected from you and other participants is combined and thoroughly analyzed to help us improve Parallels RAS.

CHAPTER 5

RAS Publishing Agent

RAS Publishing Agent provides load balancing of published applications and desktops. A RAS Publishing Agent is automatically installed on a server on which you install Parallels RAS and is designated as the primary Publishing Agent. Each Site must have a primary RAS Publishing Agent but can also have secondary Publishing Agents added to it. The purpose of a secondary Publishing Agent is to ensure that users do not experience any interruption of the service due to possible failure of the primary RAS Publishing Agent. This chapter describes how to add RAS Publishing Agents to a Site and how to configure them.

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Secondary Publishing Agents 56
Managing Secondary Publishing Agents 58
Using Computer Management Tools 60

Configuring RAS Publishing Agents

To view RAS Publishing Agents installed in a Site, navigate to **Farm** / <Site> / **Publishing Agents** in the RAS Console. The installed Publishing Agents are listed on the **Publishing Agents** tab in the right pane.

A Site must have at least the primary Publishing Agent installed, which is marked so in the **Priority** column. You can also add secondary agents to a Site for redundancy (described in the section that follows this one).

To modify the configuration of a Publishing Agent, select it and then click **Tasks** > **Properties** (or right-click > **Properties**). The **Properties** dialog opens where you can modify the following:

- **Enable Server in site:** Enables or disables the Publishing Agent. The option is enabled for secondary Publishing Agents only. It is disabled for the primary Publishing Agent.
- **Server:** Specifies the FDQN or IP address of the server that hosts the Publishing Agent. To automatically resolve IP address to FQDN, enable the global **Name Resolution** option. For details, see **Host Name Resolution** (p. 353).
- **IP:** Specifies the server IP address. Click the **Resolve** button to obtain the IP address automatically using the FQDN specified in the **Server** field. This IP address is used so that multiple Publishing Agents share information in real time.

- **Alternate IPs:** Specifies one or more alternate IP addresses separated by a semicolon. These addresses will be used if RAS Secure Client Gateways fail to connect to the RAS Publishing Agent using its FQDN or the address specified in the **IP** field. This can happen, for example, if Gateways are connecting from a network which is not joined to Active Directory.
- **Description:** A user-defined description.
- **Standby:** If selected, puts a secondary Publishing Agent into a standby mode. This means that no agent will connect to this Publishing Agent until another Publishing Agent goes offline. This option is enabled automatically for any new secondary Publishing Agent in excess of the three agents that already exist. It is not recommended to have more than three active Publishing Agents because it may degrade system performance. Using this option you can have more than three agents, but have them in standby mode until they are needed. For more information, see **Secondary Publishing Agents** (p. 56).

When done making the changes, click **OK** and then click **Apply** in the main RAS Console window.

The **Tasks** drop-down menu on the **Publishing Agents** tab has the following items:

- **Add**. Adds a RAS Publishing Agent to the Site. See the section that follows this one for the information on how to add secondary Publishing Agents.
- **Upgrade all Agents**. Upgrades agents to the current version. The item is disabled if all agents are up to date.
- **Tools**. Gives you access to a set of standard server management tools.
- **Troubleshooting**. The **Check agent** menu item verifies that the Publishing Agent is functioning properly. It opens a dialog where you can see the verification results and optionally install (or uninstall) the Publishing Agent. The **Logging** menu item allows you to configure logging and retrieve or clear log files. For more information, see **Logging** (p. 373).
- **Promote to primary**. Promotes a secondary Publishing Agent to primary. The current primary becomes a secondary Publishing Agent.
- **Refresh**. Refreshes the **Publishing Agents** list.
- **Delete**. Deletes a secondary Publishing Agent from the Site. To delete the primary Publishing Agent, you first need to promote a secondary Publishing Agent to primary.
- **Settings audit**. Opens the **Settings Audit** dialog where you can view the changes that were done to the Publishing Agent. For more information, see **Settings Audit** (p. 358).
- **Move up** and **Move down**. Changes the priority of a secondary Publishing Agent (moves it up or down in the priority list).
- **Properties**. Opens the Publishing Agent **Properties** dialog (see above).

RAS Publishing Agents Overview

In addition to the Publishing Agent editor described above, you can also see the summary about the available RAS Publishing Agents. To do so:

1 In the RAS Console, navigate to the **Farm** / <Site> .

2 The available RAS Publishing Agents are displayed in the **Publishing Agents** group on the **Site Info** tab.

3 To go to the Publishing Agents editor, right-click a RAS Publishing Agent and choose **Show in the editor**.

For additional info, see **Sites in the RAS Console** (p. 42).

Secondary Publishing Agents

A secondary Publishing Agent is added to a Site for redundancy. This way if the primary Publishing Agent fails, the secondary Publishing Agent is still available to handle the requests. Publishing Agents work in active/active manner to ensure high availability. In case of a Publishing Agent failure, the next agent is always ready to handle the load. In general, the N+1 redundancy approach should be used per Site. Note that for auto-promotion you shouldn't have more than three Publishing Agents (auto-promotion is described later in this section).

When you have one more secondary Publishing Agents installed, the runtime data is replicated on each agent, so if any service fails, the downtime is reduced to a minimum. In addition, any active Publishing Agent is used for authentication purposes with both the AD and any 2nd level authentication provider used.

The primary Publishing Agent performs the same tasks as secondary Publishing Agents but has additional responsibilities. It manages certain processes that must be managed by a single Publishing Agent. The following table lists processes managed by the primary Publishing Agent and secondary Publishing Agents:

Process	Primary Publishing Agent	Secondary Publishing Agents
Monitor PAs (counters)	Yes	Yes
Monitor RD Session Hosts (counters)	Yes	Yes
Monitor VDI providers (counters)	Yes	Yes
Monitor RDS Sessions (reconnection)	Yes	Yes
Monitor Deployed RDS applications	Yes	Yes
Monitor VDI session (reconnections)	Yes	Yes
Manage system settings	Yes	No
Send licensing information & heart beat	Yes	No
Process and send CEP information	Yes	No
Send information to reporting server	Yes	No

Manage RDS scheduler	Yes	No
Reporting engine information	Yes	Future versions
Shadowing	Yes	Future versions
Send email notifications	Yes	No

As a demonstration of how load distribution between multiple Publishing Agents works, consider the following example:

- Suppose we have two Publishing Agents: PA1 (primary) and PA2 (secondary).
- Suppose we also have 10 RD Session Hosts: RDS1, RDS2 ... RDS10

The resulting load will be distributed as follows:

- RDS1, RDS2 ... RDS4 will use PA1 as their preferred Publishing Agent.
- RDS5, RDS6 ... RDS10 will use PA2 as their preferred Publishing Agent.

Planning for secondary Publishing Agents

RAS Publishing Agents running on the same Site communicate with each other and share the load. The amount of data being transmitted from one agent to another is quite large, so a reliable high-speed communication channel must be ensured (e.g. a subnetwork can be configured for Publishing Agent communications).

When adding a secondary Publishing Agent to a Site, you specify an IP address for it. Make sure that the IP addresses of all agents belong to the same network segment. The port that Publishing Agents use to communicate with each other is TCP 20030.

There's no physical limit to how many Publishing Agents you can add to a Site. However, the best results are achieved with only two-three agents present. The three-agent scenario is highly recommended, especially when you have VDI providers and want to enable high availability for VDI (p. 129). Adding more than two secondary Publishing Agents to a Site may have a reverse effect and actually degrade the system performance. Note that this does not apply to secondary Publishing Agents in standby mode, which is explained in **Configuring RAS Publishing Agents** (p. 54).

Adding a secondary RAS Publishing Agent to a Site

To add a secondary Publishing Agent:

1. In the RAS console, navigate to **Farm** / <Site> / **Publishing Agents**.
2. Click the **Tasks** drop-down menu and choose **Add** to launch the **Add RAS Publishing Agent** wizard.

3 The **Server** field specifies the FDQN or IP address of the server that hosts the RAS Publishing Agent. To automatically resolve IP address to FQDN, enable the global **Name Resolution** option. For details, see **Host Name Resolution (p. 353).**

4 The **IP** field specifies the server IP address. Click the **Resolve** button to obtain the IP address automatically using the FQDN specified in the **Server** field.

5 The **Alternative IPs** field specifies one or more alternative IP addresses, separated by a semicolon. These addresses will be used if RAS Secure Client Gateways fail to connect to the RAS Publishing Agent using its FQDN or the address specified in the **IP** field. This can happen, for example, if Gateways are connecting from a different network, which is not joined to Active Directory.

6 Select the **Install a gateway with a publishing agent** option if you also want to install a RAS Secure Client Gateway on the specified server. If you select this option, you may also select the **Add an SSL certificate and enable HTML5 Gateway** option (for more info, see **Configure HTML5 Client (p. 70)**).

7 Select the **Add Firewall Rules** option to automatically configure the firewall on the server. See **Port Reference** (p. 401) for details.

8 Click **Next**.

9 On the next page, click **Install** to install the RAS Publishing Agent on the server. The **Installing RAS Redundancy Service** dialog opens.

10 Select the server on which the RAS Publishing Agent is to be installed and click **Install**.

11 Click **Done**.

12 Click **OK** to add the server to the Farm.

Managing Secondary Publishing Agents

Enabling or disabling a secondary Publishing Agent

To enable or disable a secondary Publishing Agent in a Site, select it in the **Publishing Agents** list and then select or clear the check box at the beginning of the row.

Changing the secondary Publishing Agent priority

Each secondary Publishing Agent is given a priority. To change the priority, select a secondary Publishing Agent and use the "Up arrow" and "Down arrow" icons (or **Tasks** > **Move up**, **Move down**) to move it up or down the list. The higher the agent is in the list, the higher the priority.

Promoting a secondary Publishing Agent to primary

If the primary Publishing Agent cannot be recovered, you can promote a secondary Publishing Agent to primary as follows:

1. Open the RAS Console on the Publishing Agent server that you would like to promote (all required files are automatically installed when a server is added to a Site as a secondary Publishing Agent).
2. Select the **Farm** category and navigate to the **Publishing Agents** node.
3. Select the Publishing Agent and then click **Tasks** > **Promote to primary**.
4. Click **OK** once the process is finished.

Configuring auto-promotion

If the primary Publishing Agent goes offline, you will need to promote a secondary Publishing Agent to take its place. The auto-promotion feature can do it automatically after a specified time period.

By default, auto-promotion is turned off. To enable it, do the following:

1. In the RAS Console, navigate to **Farm** / <Site> / **Publishing Agents**.
2. Select the **Auto-promotion** tab in the right pane.
3. Select the **Enable auto-promotion** option and specify the time period after which the next secondary Publishing Agent should be promoted to primary. The time period can be set between 15 minutes and 72 hours (the default value is 30 min).
4. Select the **Enable failback** option if you want the original Publishing Agent to become primary again should it go back online. For the Licensing Site, this eliminates license activation if failback happens within 72 hours. The license activation countdown is always displayed in the RAS Console, so the administrator can check if the original primary Publishing Agent recovers within this time period or not. If the original agent goes back online after the 72-hour period (and if the Farm has been already reactivated), it will become a secondary Publishing Agent.

Note: To enable auto-promotion, you need at least three active Publishing Agents in a Site. If you have less than three, the auto-promotion is ignored.

Please also note that auto-promotion must be disabled if you have a single Site with Publishing Agents split across different locations with bad WAN links. If there's no link between Publishing Agent located remotely, the third Publishing Agent acts as a witness to prevent split-brain.

When auto-promotion takes place, the RAS administrator will receive notifications via email about the following events:

- A secondary Publishing Agent has been promoted to primary.
- Auto-promotion of a secondary Publishing Agent has failed.
- Auto-promotion failback completed.

Deleting a secondary Publishing Agent

To delete a secondary Publishing Agent, select it in the list and then click **Delete** in the **Tasks** drop-down menu.

Using Computer Management Tools

You can perform standard computer management tasks on a server hosting the RAS Publishing Agent right from the RAS Console. These include Remote Desktop Connection, remote PowerShell, Computer Management, Service Management, Event Viewer, IPconfig, Reboot, and others.

To access the **Tools** menu, select a server, click **Tasks** (or right-click) > **Tools** and choose a desired tool. For requirements and usage information, see **Computer Management Tools** (p. 354).

CHAPTER 6

RAS Secure Client Gateway

RAS Secure Client Gateway tunnels all Parallels RAS data on a single port. It also provides secure connections and is the user connection point to Parallels RAS.

At least one RAS Secure Client Gateway must be installed and configured in every Site. Note that if a Site is joined as Tenant to RAS Tenant Broker, RAS Secure Client Gateway is not needed. For details, see **RAS Multi-Tenant Architecture** (p. 228).

Multiple gateways can exist depending on your requirements. Read this chapter to learn how to add, configure, and manage RAS Secure Client Gateways.

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RAS Secure Client Gateway Overview

You need to install at least one RAS Secure Client Gateway for Parallels RAS to work. You can add additional Gateways to a RAS Site to support more users, load-balance connections, and provide redundancy.

Installing a RAS Secure Client Gateway on a dedicated server

If you are installing a RAS Secure Client Gateway on a dedicated server, you can also install the Parallels RAS console on the same server. The console will have limited functionality but will allow you to perform some important management operations on the Gateway, including:

- Setting the Gateway operation mode (normal or forwarding, see below for details).
- Assigning a RAS Publishing Agent that will manage the Gateway.
- Setting the Gateway communication port.

- Viewing the Gateway information, such as host OS version, Parallels RAS version, available IP addresses, and other.

The RAS Console in such an installation scenario (when connected to the local computer, not the RAS Farm) will only have two categories that you can select in the left pane: **Gateway** and **Information**. To manage the Gateway settings, select **Gateway** and then click **Change Ownership** in the right pane. To view the information select the **Information** category.

When the RAS console is connected to a Parallels RAS Farm (i.e. the server where RAS Publishing Agent is running), you can manage RAS Secure Client Gateways by navigating to **Farm** / <Site> / **Gateways**.

How a RAS Secure Client Gateway works

The following describes how a RAS Secure Client Gateway handles user connection requests:

1. A RAS Secure Client Gateway receives a user connection request.
2. It then forwards the request to the RAS Publishing Agent with which it's registered (the Preferred Publishing Agent setting by default).
3. The RAS Publishing Agent performs load balancing checks and the Active Directory security lookup to obtain security permissions.
4. If the user requesting a published resource has sufficient rights, the RAS Publishing Agent sends a response to the gateway which includes details about the RD Session Host the user can connect to.
5. Depending on the connection mode, the client either connects through the gateway or disconnects from it and then connects directly to the RD Session Host server.

RAS Secure Client Gateway operation modes

RAS Secure Client Gateway can operate in one of the following modes:

- **Normal Mode.** A RAS Secure Client Gateway in normal mode receives user connection requests and checks with the RAS Publishing Agent if the user making the request is allowed access. Gateways operating in this mode can support a larger number of requests and can be used to improve redundancy.
- **Forwarding Mode**. A RAS Secure Client Gateway in forwarding mode forwards user connection requests to a preconfigured gateway. Gateways in forwarding mode are useful if cascading firewalls are in use, to separate WAN connections from LAN connections and make it possible to disconnect WAN segments in the event of issues without disrupting the LAN.

Note: To configure the forwarding mode, a Parallels RAS Farm must have more than one RAS Secure Client Gateway.

Planning for high availability

When adding RAS Secure Client Gateways to a Site, the N+1 redundancy should be configured to ensure uninterrupted service to your users. This is a general rule that also applies to other Parallels RAS components, such as Publishing Agents or RD Sessions Hosts.

Adding a RAS Secure Client Gateway

To add a RAS Secure Client Gateway to a Site, follow these steps:

1. In the RAS Console, navigate to **Farm** / <Site> / **Gateways**.
2. With the **Gateways** tab selected in the right pane, click **Tasks** > **Add** to start the **Add RAS Secure Client Gateway** wizard.
3. Enter the server FQDN or IP address (or click the **[...]** button to select a server from the list). To automatically resolve IP address to FQDN, enable the global **Name Resolution** option. For details, see **Host Name Resolution (p. 353).**
4. Select the gateway mode from the **Mode** drop down menu.
5. If you selected the **Forwarding** mode in the step above, select the destination gateway in the **Forward To** drop-down list. You can also select a specific IP address in the **On IP** drop-down list if the Gateway server has more than one.
6. Select the **Add an SSL certificate and enable HTML5 Gateway** option to automatically create a self-signed certificate, enable SSL, and enable HTML5 support. For more info, please see **Configure HTML5 Client** (p. 70).
7. Select the **Add Firewall Rules** to automatically configure the firewall on the server hosting the gateway. See **Port Reference** (p. 401) for details.
8. Click **Next**.
9. On the next page, click **Install** to start the RAS Secure Client Gateway installation.
10. Click **Done** when the installation is finished.

Manually Adding a RAS Secure Client Gateway

To manually install a RAS Secure Client Gateway and add it to the Farm, follow these steps:

1. Log into the server where you'll be installing the RAS Secure Client Gateway using an administrator account.
2. Copy the Parallels RAS installation file (`RASInstaller.msi`) to the server and double click it to launch the installation wizard.
3. Once prompted, click **Next** and accept the End-User license agreement.

4 Select the path where the RAS Secure Client Gateway should be installed and click **Next**.

5 Select **Custom** from the installation type screen and click **Next**.

6 Click on **RAS Secure Client Gateway** in the feature tree and select **Entire Feature will be installed on local hard drive**.

7 Ensure that all other components in the selection tree are cleared and click **Next**.

8 Click **Install** to start the installation.

9 When the installation is completed, click **Finish** to close the wizard.

10 Open the RAS Console and specify the RAS Publishing Agent that will manage the gateway.

Checking the RAS Secure Client Gateway Status

To check the status of a RAS Secure Client Gateway, right-click it in the list and then click **Check Status** in the context menu. The **RAS Secure Client Gateway Information** dialog opens.

The dialog displays the gateway information, including:

- **Server:** The name of the server on which the gateway is installed.
- **Gateway:** The gateway verification status (e.g. Verified).
- **Version:** The gateway software version number. The version number must match the Parallels RAS version number.
- **OS Type:** Operating system type and version.
- **Status:** Display the current RAS Secure Client Gateway status. If the status indicates a problem (e.g. the gateway did not reply or the gateway software version is wrong), click the **Install** button to push install the gateway software on the server. Wait for the installation to complete and check the status again.

Configuring RAS Secure Client Gateway

To configure a RAS Secure Client Gateway:

1 In the RAS console, navigate to **Farm** / <Site> / **Gateways**.

2 In the right pane, right-click a gateway and click **Properties**.

3 The **RAS Secure Client Gateway Properties** dialog opens.

Read on to learn how to configure the RAS Secure Client Gateway properties.

Enable or Disable a Gateway

A RAS Secure Client Gateway is enabled by default. To enable or disable a gateway, open the **RAS Secure Client Gateway Properties** dialog and select or clear the **Enable RAS Secure Client Gateway in site** option on the **Properties** tab.

Set IP Addresses for Client Connections

IP addresses for incoming client connections for a gateway are specified on the **Properties** tab of the **RAS Secure Client Gateway Properties** dialog. RAS Secure Client Gateway recognizes both IPv4 and IPv6. By default, IPv4 is used.

You can specify the following IP options:

- **Use IP version:** Select the IP version(s) to use.
- **IP(s):** Specify one or more IP addresses separated by a semicolon, or click **Resolve** to resolve the IP address automatically. These are the available addresses on the gateway server. To specify IP addresses that should be used for client connections, use the **Bind to IP** section (see below).
- **Bind to IP:** Use this section to specify on which IP address (or addresses) the gateway will listen for client connections. You can select a specific address or **<All available addresses>**, in which case all of the IP addresses specified in the **IP(s)** field will be used.
- **Remove system buffers for:** These fields (one for each IP version) can be used when the connection between the gateway and the Parallels Client has a high latency (such as the Internet). This option will optimize traffic for better experience on the Parallels Client side. You can select a specific address, all available addresses, or none. What this option will do is delay the internal socket to match the performance of the external socket. If the internal network is fast and the external is slow, RDP detects the fast internal socket and sends a lot of data. The problem is that this data cannot be sent fast enough from the gateway to the Client, thus ending up with a bad user experience. Enabling this option will optimize the data exchange.

Site Defaults (Gateways)

RAS Secure Client Gateway **Properties** dialog consists of tabs, each containing their own specific set of options. All tabs, except **Properties**, have one common option **Inherit default settings**. When you select this option, all fields on a tab are grayed out and the settings are inherited from Site defaults. To view (and modify if necessary) Site default properties for gateways, click the **Site Defaults** link, which is available on all tabs mentioned above. The link opens the **Site default properties** dialog. You can also open this dialog by clicking **Tasks** > **Site defaults** while on the **Farm** > **Site** > **Gateways** tab.

The subsequent sections describe individual tabs and available options in the gateway **Properties** dialog.

Gateway Mode and Forwarding Settings

A RAS Secure Client Gateway can operate in normal and forwarding modes (p. 61). To set the desired mode and configure related settings click the **Mode** tab in the **RAS Secure Client Gateway Properties** dialog.

Using Site defaults

To use Site default settings, click the **Inherit default settings** option. To specify your own settings, clear the option. For more info, see **Site Defaults (Gateways)** (p. 65).

Setting the normal mode

To set the normal mode, in the **Gateway mode** drop-down list, select **Normal**.

The **Forward requests to HTTP Server** option allows you to forward requests that do not belong to RAS Secure Client Gateways (gateways handle HTML5 traffic, Wyse, and URL scheme). To specify multiple servers, separate them with a semicolon. An HTTP server can be specified using an IPv6 address if necessary. Please note that the HTTP server must support the same IP version as the browser making the request.

The **Preferred Publishing Agent** drop-down list allows you to specify a RAS Publishing Agent that the gateway should connect to. This is helpful when Site components are installed in multiple physical locations communicating through WAN. You can decrease network traffic by specifying a more appropriate Publishing Agent. For the gateway to select a Publishing Agent automatically, select the **Automatic** option.

Setting the forwarding mode

To configure the forwarding mode, in the **Gateway mode** drop-down list, select **Forwarding**.

Specify (or select) one or more forwarding gateways in the **Forwarding RAS Secure Client Gateway(s)** field.

Note: The forwarding mode allows you to forward data to a gateway listening on IPv6. It is recommended that forwarding gateways are configured to use the same IP version.

Gateway Network Options

The **Network** tab is used to configure RAS Secure Client Gateway network options.

Using Site defaults

To use Site default settings, click the **Inherit default settings** option. To specify your own settings, clear the option. For more info, see **Site Defaults (Gateways)** (p. 65).

Configuring network

By default RAS Secure Client Gateway listens on TCP ports 80 and 443 to tunnel all Parallels RAS traffic. To change the port, specify a new port in the **RAS Secure Client Gateway Port** input field.

RDP port 3389 is used for clients that require basic load balanced desktop sessions. Connections on this port do not support published resources. To change the RDP port on a gateway select the **RDP Port** option and specify a new port. When setting your own port, please make sure that the port number does not conflict with the standard "RD Session Host Port" setting.

Note: If RDP port is changed, the users need to append the port number to their connection string in the remote desktop client (e.g. [ip address]:[port]).

Broadcast RAS Secure Client Gateway Address. This option can be used to switch on the broadcasting of the gateway address, so Parallels Clients can automatically find their primary gateway. The option is enabled by default.

Enable RDP UDP Data Tunneling. To enable UDP tunneling on Windows devices, select this option (default). To disable UDP tunneling, clear the option.

Client Manager Port. Select this option to enable management of Windows devices from the **Client Manager** category. The option is enabled by default.

Enable RDP DOS Attack Filter. When selected, this option denies chains of uncompleted sessions from the same IP address. For example, if a Parallels Client initiates multiple successive sessions with each session waiting for the user to provide credentials, Parallels RAS will deny further attempts. The option is enabled by default.

SSL/TLS Encryption

The traffic between Parallels RAS users and a RAS Secure Client Gateway can be encrypted. The **SSL/TLS** tab allows you to configure data encryption options.

Using Site defaults

To use Site default settings, click the **Inherit default settings** option. To specify your own settings, clear the option. For more info, see **Site Defaults (Gateways)** (p. 65).

Enforcing HSTS

The **Configure** button in the HSTS section allows you to enforce HTTP Strict Transport Security (HSTS), which is a mechanism that makes a web browser to communicate with the web server using only secure HTTPS connections. When HSTS is enforced for a RAS Secure Client Gateway, all web requests to it will be forced to use HTTPS. This specifically affects the RAS HTML5 Gateway (p. 70), which can normally accept both HTTP and HTTPS requests.

When you click the **Configure** button, the **HSTS Settings** dialog opens where you can specify the following:

- **Enforce HTTP strict transport security (HSTS):** Enables or disables HSTS for the gateway.
- **Max-age:** Specifies the max-age for HSTS, which is the time (in our case in months) that the web browser should remember that it can only communicate with the gateway using HTTPS. The default (and recommended) value is 12 months. Acceptable values are 4 to 120 months.
- **Include subdomains:** Specifies whether to include subdomains (if you have them).
- **Preload:** Enables or disables HSTS preloading. This is a mechanism whereby a list of hosts that wish to enforce the use of SSL/TLS on their Site is hardcoded into a web browser. The list is compiled by Google and is used by Chrome, Firefox, Safari, Internet Explorer 11, and Edge browsers. When HSTS preload is used, a web browser will not even try to send a request using HTTP, but will use HTTPS every time. Please also read the important note below.

Note: To use HSTS preload, you have to submit your domain name for inclusion in Chrome's HSTS preload list. Your domain will be hardcoded into all web browser that use the list. **Important:** Inclusion in the preload list cannot easily be undone. You should only request inclusion if you are sure that you can support HTTPS for your entire Site and all its subdomains in the long term (usually 1-2 years).

Please also note the following requirements:

- Your website must have a valid SSL certificate. See **Assessing SSL Server Configuration** (p. 70).
- All subdomains (if any) must be covered in your SSL Certificate. Consider ordering a Wildcard Certificate.

Configuring SSL

By default, a self-signed certificate is assigned to a RAS Secure Client Gateway when the gateway is installed. Each RAS Secure Client Gateway must have a certificate assigned and the certificate should be added to Trusted Root Authorities on the client side to avoid security warnings.

SSL certificates are created on the Site level using the **Farm** / **Site** / **Certificates** subcategory in the RAS Console. Once a certificate is created, it can be assigned to a RAS Secure Client Gateway. For the information about creating and managing certificates, refer to the **SSL Certificate Management** (p. 195) chapter.

To configure SSL for a gateway:

1. Select the **Enable SSL on Port** option and specify a port number (default is 443).
2. In the **Accepted SSL Versions** drop-down list, select the SSL version accepted by the RAS Secure Client Gateway.
3. In the **Cipher Strength** field, select a desired cipher strength.
4. In the **Cipher** field, specify the cipher. A stronger cipher allows for stronger encryption, which increases the effort needed to break it.
5. In the **Certificates** drop-down list, select a desired certificate. For the information on how to create a new certificate and make it appear in this list, see the **SSL Certificate Management** (p. 195) chapter.

   The **<All matching usage>** option will use any certificate configured to be used by gateways. When you create a certificate, you specify the "Usage" property where you can select "Gateway", "HALB", or both. If this property has the "Gateway" option selected, it can be used with a gateway. Please note that if you select this option, but not a single certificate matching it exists, you will see a warning and will have to create a certificate first.

Encrypting Parallels Client connection

By default, the only type of connection that is encrypted is a connection between a gateway and backend servers. To encrypt a connection between Parallels Client and the gateway, you also need to configure connection properties on the client side. To do so, in Parallels Client, open connection properties and set the connection mode to **Gateway SSL**.

To simplify the Parallels Client configuration, it is recommended to use a certificate issued either by a third party Trusted Certificate Authority or Enterprise Certificate Authority (CA). If an Enterprise CA certificate is used, Windows clients receive a Root or Intermediate Enterprise CA certificate from Active Directory. Client devices on other platforms require manual configuration. If a third-party certificate issued by a well-known Trusted Certificate Authority is used, the client device trusts using Trusted Certificate Authority updates for the platform.

Parallels Clients Configuration

In case the certificate is self-signed, or the certificate issued by Enterprise CA, Parallels Clients should be configured as follows:

1. Export the certificate in Base-64 encoded X.509 (.CER) format.
2. Open the exported certificate with a text editor, such as notepad or WordPad, and copy the contents to the clipboard.

To add the certificate with the list of trusted authorities on the client side and enable Parallels Client to connect over SSL with a certificate issued from an organization's Certificate Authority:

1. On the client side in the directory "C:\Program Files\Parallels\Remote Application Server Client\" there should be a file called `trusted.pem`. This file contains certificates of common trusted authorities.
2. Paste the content of the exported certificate (attached to the list of the other certificates).

Securing RDP-UDP Connections

A Parallels Client normally communicates with a RAS Secure Client Gateway over a TCP connection. Recent Windows clients may also utilize a UDP connection to improve WAN performance. To provide the SSL protection for UDP connections, DTLS must be used.

To use DTLS on a RAS Secure Client Gateway:

1. On the **SSL/TLS** tab, make sure that the **Enable SSL on Port** option is selected.
2. On the **Network** tab (p. 66), make sure that the **Enable RDP UDP Data Tunneling** option is selected.

The Parallels Clients must be configured to use the **Gateway SSL Mode**. This option can be set in the **Connections Settings** > **Connection Mode** drop-down list on the client side.

Once the above options are correctly set, both TCP and UDP connections will be tunneled over SSL.

SSL Server Configuration

When configuring RAS Secure Client Gateway to use SSL encryption, you should pay attention to how the SSL server is configured to avoid possible traps and security issues. Specifically, the following SSL components should be rated to determine how good the configuration is:

- The certificate, which should be valid and trusted.
- The protocol, key exchange, and cipher should be supported.

The assessment may not be easy to perform without specific knowledge about SSL. That's why we suggest that you use the SSL Server Test available from Qualys SSL Labs. This is a free online service that performs an analysis of the configuration of an SSL web server on the public Internet. To perform the test on a RAS Secure Client Gateway, you may need to temporarily move it to the public Internet.

The test is available at the following URL: https://www.ssllabs.com/ssltest/

You can read a paper from Qualys SSL Labs describing the methodology used in the assessment at the following URL: https://github.com/ssllabs/research/wiki/SSL-Server-Rating-Guide

Configure HTML5 Gateway

The **HTML5** tab is used to configure the HTML5 Gateway.

Parallels HTML5 Gateway is a functionality built into RAS Secure Client Gateway that allows users to connect to Parallels RAS and open published resources from a web browser using the Parallels HTML5 Client. The client works similarly to a platform-specific Parallels Client, but does not require any additional software to be installed on users' computers or devices. All that users need is an HTML5-enabled web browser.

This section describes how to configure HTML5 Gateway in the Parallels RAS Console. For the information about how to use it, please refer to the **Parallels HTML5 Client** chapter (p. 272).

Note: To use HTML5 Client, SSL must be enabled on a RAS Secure Client Gateway. When enabling the client, please verify that SSL is enabled on the **SLL/TLS** tab or on your network load balancer. Please also note that the **HTML5** tab is only available if the gateway mode is set to "Normal". For more information, see **Gateway Mode and Forwarding Settings** (p. 66).

To configure HTML5 Gateway, click the **HTML5** tab in the RAS Secure Client Gateway properties dialog and then set the options described in the subsequent sections.

For the information on how to configure the HTML5 Client URL and how to access the client from a web browser, please **Web Request Load Balancing** (p. 74).

Using Site Defaults

To use Site default settings on the **HTML5** tab, click the **Inherit default settings** option. To specify your own settings, clear the option. For more info, see **Site Defaults (Gateways)** (p. 65).

Enable or Disable HTML5 Client

To enable or disable HTML5 Client, select or clear the **Enable HTML5 Client** option. This disables the HTML5 Gateway, so users will no be able to run the HTML5 Client.

Client Settings

The **Client** section allows you to specify application launch methods and other HTML5 Client settings.

Launch sessions using: When a user tries to open a resource from the HTML5 Client web page, the resource can open right in the web browser or it can be launched in a platform-specific Parallels Client installed on the user's computer (e.g. Parallels Client for Windows). This option specifies which client will be used. Compared to HTML5 Client, platform-specific Parallels Client includes a richer set of features and provides end users with a better overall user experience. Select one of the following:

- **Launch apps in browser only (HTML5 only)** — Users can run remote applications and desktops using Parallels HTML5 Client only. Use this option if you don't want your users to install a platform-specific Parallels Client.
- **Launch apps with Parallels Client** — Users can run remote applications and desktops in Parallels Client only. When a user connects to Parallels RAS using Parallels HTML5 Client, they will be asked to install the platform-specific Parallels Client before they can launch remote applications and desktops. A message will be displayed to the user with a link for downloading the Parallels Client installer. After the user installs Parallels Client, they can still select a remote application or desktop in Parallels HTML5 Client but it will open in Parallels Client instead.

- **Launch apps with Parallels Client & fallback to HTML5** — Both Parallels Client and a browser (HTML5) can be used to launch remote applications and desktops. Parallels Client will be the primary method; Parallels HTML5 Client will be used as a backup method if a published resource cannot be launched in Parallels Client for any reason. A user will be informed if a resource couldn't be opened in Parallels Client and will be given a choice to open it in the browser instead.

Allow users to select a launch method: If selected, users will be able to choose whether to open remote applications in a browser or in Parallels Client. You can enable this option only if the **Launch session using** option (above) is set to **Launch apps in Parallels Client and fallback to HTML5** (i.e. both methods are allowed).

Allow opening applications in a new tab: If selected, a user will be able to open remote applications in a new tab in his/her web browser.

Use Pre Windows 2000 login format: If this option is selected, it allows you to use legacy (pre-Windows 2000) login format.

Restrictions

The **Restrictions** section is used to allow or restrict the following HTML5 Gateway functions:

- **Allow embedding of Web Client into other web pages:** If selected, the Parallels HTML5 Client web page can be embedded in other web pages. Please note that this may be a potential security risk due to the practice known as clickjacking.
- **Allow file transfer command:** Enables or disables the remote file transfer functionality. For more information, see **Enabling or Disabling Remote File Transfer** (p. 335).
- **Allow clipboard command:** Enables or disables the Remote Clipboard. For more information, see **Using the Remote Clipboard** (p. 288).

Network Load Balancers Access

The **Network Load Balancers access** section is intended for deployment scenarios where third-party front-end load balancers such as Amazon Web Services (AWS) Elastic Load Balancers (ELBs) are used. It allows you to configure an alternate hostname and port number to be used by the Network Load Balancer (NLB). This is needed to separate hostnames and ports on which TCP and HTTPS communications are carried out because AWS load balancers don't support both specific protocols over the same port.

The following options are available:

- **Use alternate hostname:** Select this option and specify an alternate hostname. When the alternate hostname is enabled, all platform-specific Parallels Clients will use this hostname to connect to the RAS Farm or Site.

- **Use alternate port:** Select this option and specify an alternate port number. The port must not be used by any other component in the RAS Farm or Site. To reset the port number to the default value, click **Default**. When the alternate port is enabled, all platform-specific Parallels Clients will use this port to connect to the RAS Farm or Site. Note that RDP sessions in HTML5 Client will still be connecting to the standard SSL port (443).

Note: Please note that using an alternate host or port is not suitable in a multi-tenant environment as Tenant Broker RAS Secure Client Gateways are shared between Tenants, which would require different configurations.

In addition, the AWS Application Load Balancer (ALB), which handles HTTP/s traffic required by the Parallels HTML5 Client, only supports specific cookies that are usually automatically generated. When a load balancer first receives a request from a client, it routes the request to a target and generates a cookie named `AWSALB`, which encodes information about the selected target. The load balancer then encrypts the cookie and includes it in the response to the client. When sticky sessions are enabled, the load balancer uses the cookie received from the client to route the traffic to the same target, assuming the target is registered successfully and is considered healthy. By default, Parallels RAS uses its own ASP.NET cookie named `_SessionId`, however in this case you must customize the cookie specifying the mentioned AWS cookie for sticky sessions. This can be configured using the **Web cookie** field on the **Web Requests** tab. Please note that this functionality is available in Parallels RAS 17.1 or newer.

Wyse ThinOS Support

To publish applications from the Parallels RAS to thin clients using the Wyse ThinOS, select the **Enable Wyse ThinOS Support** option on the **Wyse** tab.

Note: The Wyse tab is only available if the gateway mode is set to normal. See **Set the Gateway Mode and Forwarding Settings** for more info (p. 66).

By enabling this option, the RAS Secure Client Gateway will act as a Wyse broker. You need to make sure that DHCP option 188 on your DHCP server is set to the IP address of this gateway for thin clients that will be booting via this gateway. Once the DHCP server is configured, click the **Test** button to verify the DHCP server settings.

Gateway Security

You can allow or deny user access to a gateway based on a MAC address. This can be accomplished using the **Security** tab in the **RAS Secure Client Gateway Properties** dialog.

Using Site defaults

To use Site default settings, click the **Inherit default settings** option. To specify your own settings, clear the option. For more info, see **Site Defaults (Gateways)** (p. 65).

Configuring security

To configure a list of allowed or denied MAC addresses, click the **Security** tab and select one of the following options:

- **Allow all except.** All devices on the network will be allowed to connect to the gateway except those included in this list. Click **Tasks** > **Add** to select a device or to specify a MAC address.
- **Allow only**. Only the devices with the MAC addresses included in the list are allowed to connect to the gateway. Click **Tasks** > **Add** to select a device or to specify a MAC address.

Please note that the Gateway MAC address filtering is based on ARP, so client and server must be on the same network for the filtering to work. It does not work across network boundaries.

Web Request Load Balancing

Note: The **Web** tab is only available if the gateway mode is set to normal. See more in **Gateway Mode and Forwarding Settings** (p. 66).

The **Web** tab allows you to tweak settings necessary for load balancing in certain scenarios. Here you can specify a redirection URL for web requests and a session cookie name to maintain persistence between a client and a server.

Redirection URL

An original web request can reach the gateway one of the following two ways:

- The request is sent directly to the gateway over the local network using its IP address or FQDN. For example, https://192.168.10.10.
- The request is sent to a HALB device that load-balances this and other gateways in the Farm. The HALB device often faces the Internet (i.e. located in DMZ) and so its DNS name can be used in the original request URL. For example, https://ras.msp.com. The HALB device is then distributes the request to a gateway.

When the gateway receives the web request, it takes the URL specified on the **Web** tab and sends it back to the web browser for redirection.

Technically, you can enter any URL here, and the original web request will be redirected to that URL. The primary purpose of this field, however, is to give end users an easy way to access the HTML5 Client from their web browsers. Here's how it works:

1. A user enters the Load Balancer DNS name in a web browser. For example, https://ras.msp.com.
2. The Load Balancer receives the request and distributes it to the least-busy RAS Secure Client Gateway for processing.

3 The gateway receives the original URL and replaces it with the URL specified in the **Default URL** field. See the **Default URL format** subsection below.

4 The replaced URL is then sent back to the web browser, which uses it to open the HTML5 Client login page.

Default URL format

The default URL format is the following:

```
https://%hostname%/RASHTML5Gateway
```

- The `%hostname%` variable is automatically replaced with the name of the server that received the original request, which in our example is the Load Balancer DNS name. If you wish, you can replace the variable with a specific host name or IP address (e.g. this or some other gateway). For example, `https://192.168.5.5/RASHTML5Gateway`. If you do this, the web requests will always be forwarded to the specified host and will open the HTML5 Client on it. Hard-coding a host may not be very practical, but you can do this nevertheless.
- `RASHTML5Gateway` is a constant and is the path to the HTML5 Client login page.

In our example, the resulting URL that the web browser will use to access the HTML5 Client is the following:

```
https://ras.msp.com/RASHTML5Gateway
```

The fact is, a user could simply use the above URL from the start, but thanks to the redirection feature, users only need to enter the server DNS name (or FQDN/IP-address on the local network) instead of the entire URL.

Opening a specific HTML5 Client Theme

HTML5 Client Themes is a feature that allows you to custom design the HTML5 Client look and feel for different groups of users. Themes are described in detail in the **Parallels HTML5 Client** chapter (p. 70).

The default web request URL opens the default Theme. To make it open a specific Theme, add the Theme name at end of the URL as follows:

```
https://%hostname%/RASHTML5Gateway/?theme=<theme-name>
```

where `<theme-name>` is the name of a Theme without brackets or quotes.

For users to open a specific Theme, the URL that they enter in a web browser must contain the Theme name, but in this case the format is as simple as the following:

```
https://<server-name>/<theme-name>
```

Using our Load Balancer DNS name example from above, the URL may look like the following:

```
https://ras.msp.com/Theme-E1
```

For additional information, please see **HTML5 Client Theme Settings > URLs** (p. 274).

Web cookie

The Web cookie field is used to specify a session cookie name. RAS HTML5 session persistence is normally set by the user IP address (source addressing). If you can't use source addressing in your environment (e.g. your security policy doesn't allow it), you can use the session cookie to maintain persistence between a client and a server. To do so, you need to set up a load balancer that can use a session cookie for persistence. The default cookie name is ASP.NET_SessionId. Note that if you are using Amazon Web Services (AWS) or other third party load balancers, you may need to specify their own cookie name. See **Network Load Balancers Access** (p. 72) for more information.

Gateway Tunneling Policies

Tunneling policies can be used to load balance connections by assigning a group of RD Session Hosts to a specific RAS Secure Client Gateway or RAS Secure Client Gateway IP address.

To configure tunneling policies, navigate to **Farm** / <Site> / **Gateways** and then click the **Tunneling Policies** tab in the right pane.

The **<Default>** policy is a preconfigured rule and is always the last one to catch all non-configured gateway IP addresses and load balance the sessions between all servers in the Farm. You can configure the **<Default>** policy by right-clicking it and then clicking **Properties** in the context menu.

Adding a New Tunneling Policy

To add a new policy:

1. Click **Tasks** > **Add**.
2. Select a gateway IP address.
3. Specify to which RD Session Host(s) the users connecting to that specific gateway should be forwarded. If you select **None** (no forwarding), read the **Restricting RDP access** section below.

Managing a Tunneling Policy

To modify an existing Tunneling Policy, right-click it and then click **Properties** in the context menu.

Restricting RDP access

You can use tunneling policies to restrict RDP accesses through the RAS Secure Client Gateway port. To do so, on the **Tunneling Policies** tab, select the **None** option at the bottom of the tab (this is the default setting in a new Parallels RAS installation). By doing so, you are restricting native MSTSC from accessing the gateway through its port (the default port is 80). As a result, when someone tries to use MSTSC at IP-address:80, the access will be denied. Same will happen for an RDP connection from a Parallels RAS Client.

There are a couple of reasons why you would want to restrict RDP access. The first one is when you want your users to connect to the RAS Farm using the Parallels RAS connection only, but not RDP. The second reason is *to prevent a DDoS attack*.

A common indication of a DDoS attack taking place is when your users cannot login to a RAS Farm for no apparent reason. If that happens, you can look at the Controller.log file (located on the RAS Publishing Agent server, path C:\ProgramData\Parallels\RASLogs) and see that it is full of messages similar to the following:

- [I 06/0000003E] Mon May 22 10:37:00 2018 - Native RDP LB Connection from Public IP x.x.x.x, Private IP xxx.xxx.xx.xx, on gateway xxx.xxx.xx.xx, Using Default Rule
- [I 06/00000372] Mon May 22 10:37:00 2018 - CLIENT_IDLESERVER_REPLY UserName hello@DOMAIN, ClientName , AppName , PeerIP xxx.xxx.xx.xx, GatewayIP xxx.xx.x.xx, Server , Direct , desktop 0
- [I 05/0000000E] Mon May 22 10:37:00 2018 - Maximum amount of sessions reached.
- [I 06/00000034] Mon May 22 10:37:00 2018 - Resource LB User 'hello' No Servers Available!
- [W 06/00000002] Mon May 22 10:37:00 2018 - Request for "" by User hello, Client , Address xxx.xxx.xx.xx, was not served error code 14.

These messages tell us that a DDoS attack is in progress on the RDP port. By restricting RDP access through gateway tunneling polices, you can prevent this from happening.

Configure Logging

A RAS Secure Client Gateway is monitored and logs are created containing relevant information. To configure logging and retrieve or clear existing log files, right-click a gateway, choose **Troubleshooting** > **Logging** in the context menu, and then click **Configure**, **Retrieve**, or **Clear** depending on what you want to do. For the information on how to perform these tasks, see the **Logging** (p. 373) section.

Viewing Gateway Summary and Metrics

You can view the summary information for all available RAS Secure Client Gateways in one place as follows:

1. In the RAS Console, select the **Farm** category and then select the **Site** node in the middle pane.
2. The available RAS Secure Client Gateways are displayed in the **Gateways** group in the right pane.
3. To go to the main Gateway view/editor, right-click a server and choose **Show in the Editor**.

You can also view the detailed information about a RAS Secure Client Gateway by navigating to **Information** / **Site Information** in the Parallels RAS Console. The information on this page includes general information, such as OS version, RAS version, Gateway mode, as well as the information about various types of connections, sessions, cached sockets, and threads.

Using Computer Management Tools

You can perform standard computer management tasks on server hosting the RAS Secure Client Gateway right from the RAS Console. These include Remote Desktop Connection, PowerShell, Computer Management, Service Management, Event Viewer, IPconfig, Reboot, and others. To access the **Tools** menu, select a server, click **Tasks** (or right-click) > **Tools** and choose a desired tool. For requirements and usage information, see **Computer Management Tools** (p. 354).

CHAPTER 7

RD Session Hosts

RD Session Hosts are used to host published resources (applications, desktops, documents, etc.) in a Parallels RAS Farm. Read this chapter to learn how to add, configure, and administer RD Session Hosts.

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RD Session Host Types

Beginning with Parallels RAS v16.5, you can create and add to a RAS Farm the following types of RD Session Hosts:

- Individual servers. These can be physical boxes or virtual machines treated as physical servers.
- Virtual machines (VMs) created from a template, which is a part of RAS Virtual Desktop Infrastructure (VDI). The main advantage of using VMs is the ability to create as many of them as you require from a single template. RD Session Hosts based on a template are described in the **Grouping and Cloning RD Session Hosts** section (p. 91).

Considering that template is a part of RAS VDI, some aspects of creating, provisioning, and managing RD Session Hosts based on a template differ from the regular RD Session Hosts (individual servers). For example, template-based hosts are added to a Farm automatically from a group, not manually by the administrator. There are some other differences which are described in various sections of this chapter. When reading these sections, please pay attention to whether or not a particular functionality applies to RD Session Hosts based on a template.

Add an RD Session Host

RD Session Host requirements

An RD Session Host must have the Remote Desktop Services (RDS) role installed. You can install RDS right from the RAS Console, as described later in this section.

To push install the RAS RD Session Host Agent on a server, the following requirements must be met:

- The firewall must be configured on the server to allow push installation. Standard SMB ports (139 and 445) need to be open. See also **Port Reference (p. 401)** for the list of ports used by Parallels RAS.
- SMB access. The administrative share (\\server\c$) must be accessible. Simple file sharing must be enabled.
- Your Parallels RAS administrator account must have permissions to perform a remote installation on the server. If it doesn't, you'll be asked to enter credentials of an account that does.
- The RD Session Host should be joined to an AD domain. If it's not, the push installation may not work and you will have to install the Agent on the server manually. See **Installing the Agent manually** section (p. 82).

Note: The rest of this section applies to regular RD Session Hosts only. If you are looking for the information on how to add an RD Session Host based on a template, see **Grouping and Cloning RD Session Hosts** (p. 91).

Add an RD Session Host

To add an RD Session Host to a Site:

1. In the RAS Console, navigate to **Farm** / **Site** / **RD Session Hosts**.
2. Click **Tasks** > **Add**. This opens the **Add RD Session Hosts** wizard. Note that you can also open the wizard from the **Start** category as describe in **Set Up a Basic Parallels RAS Farm** (p. 29).

3 On the first page, select a server or type a server FQDN or IP address in the edit box and then click the plus-sign icon to add the server to the list. Note that if you enter the server name (hostname or FQDN), it will be used as the primary method of connecting to this server from other RAS components and clients. If you enter the IP address, it will be automatically resolved to FQDN, but only if the global option to resolve to FQDN is enabled. To see the current setting of this global option, click **Tools** > **Options** on the main menu. In the **Options** dialog, examine the **Always attempt to resolve to fully qualified domain name (FQDN) when adding hosts** option. When the option is selected, the IP address of every server/component in the RAS Farm is always resolved to FQDN. When the option is cleared, whatever is specified for a server (IP address or name) is used to communicate with a server. This makes a difference in deployments where an IP address cannot be used to access a server, such as when a server is hosted in the cloud. For more information, see **Host Name Resolution** (p. 353).

4 Click **Next**.

5 On the next page, specify the following options:

- **Add firewall rules**. Add firewall rules required by Parallels RAS in Windows running on the server. See **Port Reference** for details (p. 401).
- **Install RDS role**. Install the RDS role on the server if it's not installed. You should always select this option.
- **Enable Desktop Experience**. Enable the Desktop Experience feature in Windows running on the server. This option is enabled only if the Install RDS role option (above) is selected. The option applies to Windows Server 2008 R1/R2 and Windows 2012 R1/R2 on which the Desktop Experience feature is not enabled by default.
- **Restart server if required**. Automatically restart the server if necessary. You can restart the server manually if you wish.
- **Add server(s) to group**. Add the server (or servers) to a group. Select the desired group in the list box located below this option. Groups are described in detail in the **Grouping RD Session Hosts** (p. 91) section. If you are just learning how to use this wizard, you can skip this option.

6 Click **Next**.

7 The next page allows you to add users and groups to the Remote Desktop Users group in Windows running on the server. This is necessary for your Parallels RAS users to be able to access published resources hosted by an RD Session Host. To specify users and/or groups, select the option provided and then click the **[+]** icon. In the **Select Users or Groups** dialog, specify a user or a group and click **OK**. The selected user/group will be added to the list on the wizard page.

Note: If you skip this step and your users are not members of the Remote Desktop Users group on an RD Session Host, they will not be able to access published resources. If you already used (or want to use later) standard Windows tools to add users to the Remote Desktop Users group, you can skip this page.

8 Click **Next**.

9 The **User profile** page allows you to select a technology to manage user profiles. You can select from **User profile disk** or **FSlogix**. User profile disks are virtual hard disks that store user application data on a dedicated file share. Microsoft FSLogix Profile Container is the preferred Profile Management solution as the successor of Roaming Profiles and User Profile Disks (UPDs). It is set to maintain user context in non-persistent environments, minimize sign-in times and provide native profile experience eliminating compatibility issues. For complete instructions, please see **User Profile**.

10 The **Optimization** page allows you to specify settings that will be used to optimize Windows on the RD Session Host for best performance in a Parallels RAS environment. You can select Windows components, services, and other options that will be disabled, removed, or optimized to ensure a more efficient, streamlined, and improved delivery of virtual apps and desktops. For the complete description, please see **Optimization**.

11 On the next page, review the settings and click **Next**.

12 The **Install RAS RD Session Host Agent** dialog opens. Follow the instructions and install the agent. When the installation is finished, click **Done** to close the dialog.

13 Back in the wizard, click **Finish** to close it.

If you would like to verify that the RD Session Host has been added to the Farm, click the **Farm** category (below the **Start** category in the left pane of the Parallels RAS Console window) and then click **RD Session Hosts** in the navigation tree (the middle pane). The server should be included in the **RD Session Hosts** list. The **Status** column may display a warning message. If it does, reboot the server. The **Status** column should now say, "OK", which means that your RD Session Host is functioning properly.

Read on to learn how to publish an application from an RD Session Host (p. 32)

Installing the Agent Manually

You may need to install the RAS RD Session Host Agent manually if the automatic push installation cannot be performed. For instance, an SMB share may not be available or the firewall rules may interfere with the push installation, etc.

Installing RAS RD Session Host Agent Manually

1 Log in to the server where the RAS RD Session Host Agent is to be installed using an administrator account and close all other applications.

2 Copy the Parallels RAS installation file (`RASInstaller.msi`) to the server and double-click it to launch the installation.

3 Once prompted, click **Next** and accept the End-User license agreement.

4 Specify the path where the RAS RD Session Host Agent should be installed and click **Next**.

5 Select **Custom** and click **Next**.

6 Click on **RAS RD Session Host Agent** and select **Entire Feature will be installed on local hard drive** from the drop-down menu.

7 Ensure that all other components are deselected and click **Next**.

8 Click **Install** to start the installation.

9 Click **Finish** once the installation is finished.

The RAS RD Session Host Agent doesn't require any configuration. Once the agent is installed, highlight the server name in the RAS Console and click **Troubleshooting** > **Check Agent** in the **Tasks** drop-down menu to update the server status.

Uninstalling RAS RD Session Host Agent

To uninstall RAS RD Session Host Agent from a server:

1 Navigate to **Start** > **Control Panel** > **Programs** > **Uninstall a Program**.

2 Find **Parallels Remote Application Server** in the list of installed programs.

3 If you don't have any other Parallels RAS components on the server that you want to keep, right-click **Parallels Remote Application Server** and then click **Uninstall**. Follow the instructions to uninstall the program. You may skip the steps below.

4 If you have other RAS components that you want to keep on the server, right-click **Parallels Remote Application Server** and then click **Change**.

5 Click **Next** on the Welcome page.

6 On the **Change, repair, or remove** page, select **Change**.

7 On the next page, select **Custom**.

8 Select **RAS RD Session Host Agent**, then click the drop-down menu in front of it, and click **Entire feature will be unavailable**.

9 Click **Next** and complete the wizard.

Planning for High Availability

When adding RD Session Hosts to a Site, the N+1 redundancy approach should be used to ensure uninterrupted service to your users. This is a general rule that also applies to other Parallels RAS components, such as Publishing Agents, RAS Secure Client Gateways, or possibly VDI providers.

Viewing RD Session Hosts

To view the list of RD Session Hosts for the current Site:

1 In the RAS Console, navigate to **Farm** / <Site-name> / **RD Session Hosts**.

2 The available RD Session Hosts are displayed on the **RD Session Hosts** tab in the right pane.

You can filter the **RD Session Hosts** list as follows:

1. Click the magnifying glass icon, which is located on a toolbar above the list.
2. An extra row is displayed at the top of the list where you can type a string in one or more columns that will be used to filter the list.
3. For example, if you want to search for a server by its name, enter the text in the **Server** column. You can type the entire server name or the first few characters until a match is found. The list will be filtered as you type and only the matching server(s) will be displayed.
4. If you type a filter string in more than one column, they will be combined using the logical AND operator.
5. To remove the filter and display the complete list, click the magnifying glass icon again.
6. If you click the magnifying glass icon one more time, you'll see that the filter that you specified earlier is still there. To remove it completely, simply delete the filter string(s) from the column(s).

Viewing RD Session Host summary

In addition to the RD Session Hosts editor described above, you can also see the summary about the available RD Session Hosts. To do so:

1. In the RAS Console, select the **Farm** category and then select the **Site** node in the middle pane.
2. The available servers are displayed in the **RD Session Hosts** group in the right pane.
3. To go to the RD Session Host editor (described above), right-click a server and choose **Show in the Editor**.

For additional info, see **Sites in the RAS Console** (p. 42).

Available menu options

You can perform a number of tasks on the an RD Session Host using menus. To do so, click the **Tasks** drop-down menu and choose a desired option, or right-click a host and choose an option from the context menu.

Please note that not all menu options are available for RD Session Hosts based on a template. If an option is not available for this host type, it will be either disabled or hidden. These include:

- **Remove from group**. Hosts based on a template can only be removed from a group using the **Group Properties** dialog.
- **Assign to group**. Group assignment is performed automatically for template-based hosts.
- **Delete**. Deleting a host (which is a VM) can only be done on the template level (the **Guest VM List** dialog).
- **Properties**. RD Session Hosts of this type don't have individual properties. Some essential properties are inherited from **Default Server Properties** (see View and Modify RD Session Host Properties > Agent Settings (p. 86)).

- **Control** (logon commands). Drain mode is managed automatically by the group to which a template-based host belongs.

Configuring an RD Session Host

This section describes how to configure and manage an existing RD Session Host.

Read on to learn how to:

- Check RAS RD Session Host Agent Status (p. 85)
- Change an RD Session Host Site Assignment (p. 86)
- View and Modify RD Session Host Properties (p. 86)
- Configure Logging (p. 91)

Check RAS RD Session Host Agent Status

An RD Session Host must have RAS RD Session Host Agent installed in order to publish remote applications and desktop from it. In addition to this, Remote Desktop Services (formerly Terminal Services) must also be installed.

Normally when you add an RD Session Host to a Site, the RD Session Host Agent and Remote Desktop Services are installed by default. However, if you skipped the installation (or uninstalled the agent or RDS from the server), you can check their status and take appropriate actions if needed.

To check the status of RD Session Host Agent and RDS, do the following:

1. First, check the **Status** column in the **RD Session Hosts** list. The column should display "OK". If so, the Agent is installed and functioning properly. If not, read on.
2. In addition to the description, the **Status** column uses a color code to indicate the agent status as follows:
   - Red — not verified
   - Orange — needs update
   - Green — verified
3. Right-click a server and click **Troubleshooting** > **Check agent** in the context menu. The **Agent Information** dialog opens.
4. If the agent is not installed on the server, click the **Install** button and follow the instructions on the screen.

After the agent installation is complete, you may need to reboot the RD Session Host. You can do it right from the Parallels RAS Console by selecting the server and clicking **Tasks** > **Control** > **Reboot**.

Change RD Session Host Site Assignment

You can assign an RD Session Host to a different Site in your Farm if needed. Please note that this functionality is only available if you have more than one Site in your Farm.

To change the Site assignment:

1. Right-click an RD Session Host and then click **Change Site** in the context menu. The **Change Site** dialog opens.
2. Select a Site in the list and click **OK**. The server will be moved to the **RD Session Hosts** list of the target Site (**Farm** / <new-site-name> / **RD Session Hosts**).

View and Modify RD Session Host Properties

Note: The information in this section does not apply to RD Session Hosts based on a template. Hosts of that type don't have individual properties and are managed on the template level. For more information, see **Grouping and Cloning RD Session Hosts** (p. 91) and **Templates** (p. 134).

To configure an RD Session Host:

1. In the RAS Console, navigate to **Farm** / <site> / **RD Session Hosts**.
2. Select a server and click **Tasks** > **Properties**.
3. The server properties dialog opens where you can configure the RD Session Host properties.

Using default settings

The server properties dialog consists of tabs, each containing their own specific set of properties. All tabs, except **Properties**, have one common link **Site Defaults**, which allows you to view and modify Site default settings. If you want the properties on a particular tab to inherit default settings, select the **Inherit default settings** option. When you do this, the default settings will be inherited from one of the following:

- **Group defaults** if the server is assigned to an RD Session Host group. Groups are described in **Grouping and Cloning RD Session Host Servers** (p. 91).
- **Site defaults** if the server is not assigned to an RD Session Host group. Note that a group may also inherit Site defaults, but this can be overridden in the group properties dialog where you can specify custom settings for a group.

To view or modify Site default settings, click the **Site Defaults** link (available on every tab, except **Properties**). This will open either the **Group default properties** or **Site default properties dialog** depending on whether the server is assigned to a group (see above). Note that each individual tab can inherit default settings independently from other tabs.

The rest of this section describes individual tabs of the server properties dialog.

General

Select or clear the **Enable Server in Site** option to enable or disable the server. A disabled server cannot serve published applications and virtual desktops to clients.

Other elements on this tab are:

- **Server:** Specifies the server FQDN or IP address.
- **Description:** An optional server description.
- **Change Direct Address:** Select this option if you need to change the direct address that Parallels Client uses to establish a direct connection with the RD Session Host.

Agent settings

Each RD Session Host in the Farm has an RAS RD Session Host Agent installed through which it communicates with other Parallels RAS components. Use the **Agent Settings** tab to configure the agent.

To use default settings, select the **Inherit default settings** option. See the **Using default settings** subsection above.

If you want to specify custom settings for a given server, clear the **Inherit default settings** option and specify agent properties as follows:

- **Port**. Specifies a different remote desktop connection port number if a non-default port is configured on the server.
- **Max sessions**. Specifies the maximum number of sessions.
- **Publishing session disconnect timeout**. Specifies the amount of time each session remains connected in the background after the user has closed the published application. This option is used to avoid unnecessary reconnections with the server.
- **Publishing session reset timeout**. This feature allows you to control how long it takes for a session to be logged off after it is marked as "disconnected".
- **Allow Client URL/Mail redirection**. When a user tries to open a URL or an HTML Mailto link in a remote application, the link can be redirected to the client computer and open in a local default application (a web browser or email client) instead of an application on the remote host. This option allows you to enable or disable the redirection. You can choose from the following options:

a **Enabled** — select this option to enable the redirection and then select the **Support Windows Shell URL namespace objects** option (bellow the drop-down box). This is the default redirection configuration that works in most common scenarios. The Shell URL namespace objects support means that Parallels RAS can intercept actions in published applications that use Shell namespace API to open links, which is a standard behavior in most applications. The ability to disable the support for Shell URL namespace objects is for compatibility with older versions of Parallels RAS. You may disable this option if you want the behavior of an older version of Parallels RAS (RAS v16.2 or earlier).

b **Enabled (Replace Registered Application)** — this option uses an alternative method of redirecting a link. It replaces the default web browser and mail client with "dummy" apps on the remote server side. By doing so, it can intercept an attempt to open a link and redirect it to the client computer. You may try this option if the default option above doesn't work with your published application.

c **Disabled** — this option disables URL/Mail redirection, so URL or Mailto links always open on the remote host.

Please note that you can configure a list of URLs that should never be redirected, even if the redirection is enabled. This can be done on the **Farm** / **Site** / **Settings** / **URL Redirection** tab. See more in **Site Settings** (p. 357).

- **Drag and drop**. Allows you to set how the drag and drop functionality works in Parallels Clients. You can select from "Disabled" (no drag and drop functionality at all), "Server to client only" (drag and drop to a local application, but not in the opposite direction), "Client to server only" (drag and drop to a remote application only), "Bidirectional" (default). Note that this option has changed since Parallels RAS 17.1. In the past, it was a checkbox that would enable or disable drag and drop which worked in the "Client to server only" mode. When upgrading from an older version of Parallels RAS, and if the checkbox was enabled, the "Client to server only" option is selected by default. If the option was disabled, the "Disabled" option will be set. You can change it to any of the new available options if you wish.

  Note: At the time of this writing, the drag and drop functionality is only supported on Parallels Client for Windows and Parallels Client for Mac.

- **Preferred Publishing Agent**. Select a Publishing Agent to which the RD Session Host should connect. This is helpful when Site components are installed in multiple physical locations communicating through WAN. You can decrease network traffic by specifying a more appropriate Publishing Agent.
- **Allow 2XRemoteExec to send command to the client**. Select this option to allow a process running on the server to instruct the client to deploy an application on the client side. More about 2XRemoteExec in the **Using RemoteExec** subsection below.
- **Use RemoteApp if available**. Enable this option to allow use of remote apps for shell-related issues when an app is not displayed correctly. This feature is supported on the Parallels Client for Windows only.

- **Enable applications monitoring**. Enable or disable monitoring of applications on the server. Disabling application monitoring stops the WMI monitoring to reduce CPU usage on the server and network usage while transferring the information to RAS Publishing Agent. If the option is enabled, the collected information will appear in a corresponding RAS report. If the option is disabled, the information from this server will be absent from a report.
- **Allow file transfer command**. Allows you to enable or disable the remote file transfer functionality. For more information, see **Enabling or Disabling Remote File Transfer** (p. 335).
- **Enable drive redirection cache**. Improves user experience by making file browsing and navigation on redirected drives much faster. For details, see **Drive Redirection Cache Explanation**.

Using 2XRemoteExec

2XRemoteExec is a feature that facilitates the servers ability to send commands to the client. This is done using the command line utility `2XRemoteExec.exe`. Command line options include:

Command Line Parameter	Parameter Description
`-s`	Used to run the 2XRemoteExec command in 'silent' mode. Without this parameter, the command will display pop up messages from the application. If you include the parameter, the messages will not be displayed.
`-t`	Is used to specify the timeout until the application is started. Timeout must be a value between 5000ms and 30000ms. Note that the value inserted is in 'ms'. If the timeout expires the command returns with an error. Please note that the application might still be started on the client.
`-?`	Shows a help list of the parameters that 2XRemoteExec uses.
`"Path for Remote Application"`	The Application that will be started on the client as prompted from the server.

2XRemoteExec examples:

The following command displays a message box describing the parameters that can be used.

```
2XRemoteExec -?
```

This command runs Notepad on the client.

```
2XRemoteExec C:\Windows\System32\Notepad.exe
```

In this example, the command opens the `C:\readme.txt` file in the Notepad on the client. No message is shown and 2XRemoteExec would wait for 6 seconds or until the application is started.

```
2XRemoteExec C:\Windows\System32\Notepad.exe "C:\readme.txt"
```

User profile

Configure user profile settings. For complete instructions, please see **User Profile**.

Optimization

The **Optimization** tab allows you to specify settings that will be used to optimize the RD Session Host for best performance in a Parallels RAS environment. You can select Windows components, services, and other options that will be disabled, removed, or optimized to ensure a more efficient, streamlined, and improved delivery of virtual apps and desktops. For the complete description, please see **Optimization**.

Desktop access

The **Desktop Access** tab allows you to restrict remote desktop access to certain users.

To use default settings, select the **Inherit default settings** option. See the **Using default settings** subsection above.

By default, all users who have access to remote applications on an RD Session Host can also connect to the server via a standard RDP connection. If you want to restrict remote desktop access to certain users, do the following:

1. On the **Desktop Access** tab, select the **Restrict direct desktop access to the following users** option. If you have the **Inherit default settings** option selected, click the **Edit Defaults** link to see (and modify if needed) the default configuration. The rest of the steps apply to both the **Server Properties** and **Default Server Properties** dialogs.
2. Click the **Add** button.
3. Select the desired users. To include multiple users, separate them by a semicolon.
4. Click **OK**.
5. The selected users will appear in the list on the **Desktop Access** tab.

Users in this list will still be able to access remote applications using Parallels Client, but will be denied direct remote desktop access to this server.

Note: **Computer Configuration** > **Administrative Templates** > **Windows Components** > **Remote Desktop Services** > **Remote Desktop Session Host** > **Connection** > **Allow users to connect remotely using remote desktop services** must be set to **Not configured,** otherwise it takes precedence.

Please note that members of the Administrator group will still be able to connect to the remote desktop even if they are included in this list.

RDP printer

The **RDP Printer** tab allows you to configure the renaming format of redirected printers. The format may vary depending on which version and language of the server you are using.

To use default settings, select the **Inherit default settings** option. See the **Using default settings** subsection above.

The **RDP Printer Name Format** drop-down list allows you to select a printer name format specifically for the configured server.

Select the **Remove session number from printer name** and the **Remove client name from printer name** options to exclude the corresponding information from the printer name.

Configure Logging

An RD Session Host is monitored and logs are created containing relevant information. To configure logging and retrieve or clear existing log files, right-click a server, choose **Troubleshooting** > **Logging** in the context menu, and then click **Configure**, **Retrieve**, or **Clear** depending on what you want to do. For the information on how to perform these tasks, see the **Logging** (p. 373) section.

Grouping and Cloning RD Session Hosts

When you publish resources in Parallels RAS, you need to specify one or more servers that host them. Groups allow you to combine multiple RD Session Hosts and then publish the resources from the group instead of specifying individual servers.

The main benefits of using RD Session Host groups are as follows:

- They simplify the management of published resources and are highly recommended in multi-server environments.
- They allow you to use RD Session Hosts created from a template by utilizing the VDI infrastructure. More on this later in this section.

Note that an RD Session Host can be a member of one group only. You cannot add the same server to multiple groups.

Creating a group

To create an RD Session Host group:

1. In the RAS console, navigate to **Farm** / <Site> / **RD Session Hosts**.
2. Click the **Groups** tab.
3. Click **Tasks** > **New Group** (or click the **[+]** icon). To modify an existing group, right-click it and then choose **Properties** in the context menu.
4. The **Group Properties** dialog opens where you can specify the group settings as described below.

On the **General** tab, select **Enable Group in site** to enable the group. Type a name and description for the group.

You now need to add one or more servers to the group. You can do this by using the following options (both can be used at the same time):

- Specify a template on which the servers are based. This will include all RD Session Hosts that have been or will be created from a selected template. To do so, select the **RD session hosts based on a Template** option and then select a template from the drop-down list. Note that you need to create a template of type RD Session Host before you can select it here. For more information, see the **Using Templates** subsection below.
- Add servers manually one by one by clicking **Tasks** > **Add** and then selecting a server from the list. You can also add a server later by right-clicking it in the main list and choosing **Assign to group**.

Using group defaults

RD Sessions Hosts assigned to a group have various settings that they can inherit from the group defaults. This makes it simpler to configure a single set of settings for all servers instead of configuring each server individually. A Site also has its own default settings (Site defaults). Moreover, an RD Session Host group can inherit these Site defaults. This gives you the following choices when inheriting default settings by an RD Session Host:

- Configure Site defaults and make the group inherit these settings. The RD Session Hosts assigned to the group will therefore also inherit Site defaults. This is the default scenario for a new group. Site defaults can be configured by navigating to **Farm** / <Site> / **RD Session hosts** and clicking **Tasks** > **Site defaults**.
- Configure default settings for a given group. This way you can have multiple groups, each having its own group defaults (different from Site defaults). Therefore, the servers assigned to a group will inherit the group's defaults.

To configure default settings for a group, open the **Group Properties** dialog (**Tasks** > **Properties**), select a desired tab (except the **General** tab, which doesn't have any defaults) and select or clear the **Inherit default settings** option. If you clear the option, you can specify your own defaults. All servers that are (or will be) assigned to this group will inherit these settings. Note that inheritance works independently for each individual tab on the group properties dialog.

For the information on how default settings are configured for an RD Session Host, see **View and Modify RD Session Host Properties** (p. 86).

Using Templates

Templates of type RD Session Host utilize the VDI functionality available in Parallels RAS. A template is based on a virtual machine (also known as VM or guest VM) running on a hypervisor or a cloud-based VDI provider. When you create a template, you select a preconfigured VM with the operating system and applications (for publishing) already installed. Individual hosts (VMs) are then created as clones of the template. The clones can be created in advance or on as-needed basis (configurable when you create a template). This functionality allows you to essentially create and configure an RD Session Host running in a virtual machine and then create as many copies of it as you require.

For the complete information about using VDI in Parallels RAS see the **VDI and Virtual Desktops** chapter (p. 113). Once you are familiar with adding and configuring a VDI provider, read the **Templates** section (p. 134) which explains how to create a template of type RD Session Host.

After you select a template in the **Group Properties** dialog, click the **Template Settings** tab to specify additional properties described below.

Send a request to the Template when the workload threshold is above (%): Specifies the group workload threshold at which one or more additional servers (guest VMs) should be created from the template. The group workload percentage is calculated using the following formula:

Group Workload = (Current Sessions / Max Sessions) * 100

In the formula above:

- **Current Sessions** is the total number of all sessions on all servers in the group. This includes static (standalone) servers and servers created from the template (guest VMs). Note that servers that are disabled, being drained, or have the agent status of 'Not Verified' are not included in the calculation.
- **Max Sessions** is a setting that you specify on the **Agent Settings** tab (either inherited from Site defaults or overridden for this group) and the maximum number of sessions allowed for the group.

Consider the following examples:

RAS Group 1 — mixed server types (static and guest VMs), different agent status:

- RDSH-1, Status: OK, Max Sessions 10, Current Sessions: 2, Type: Static
- RDSH-2, Status: Disabled, Max Sessions 20, Current Sessions: 0, Type: Static
- RDSH-3, Status: OK, Max sessions 10, Current Sessions: 4, Type: Guest VM
- RDSH-4, Status: Drain Mode, Max sessions 10, Current Sessions: 3, Type: Guest VM

For the group above, the workload is calculated as (Current Sessions / Max Sessions) * 100 or ((2 + 4) / 20) * 100 = 30%

Note that servers RDSH-2 and RDSH-4 are not included in the workload because the former has the agent disabled and the latter is in drain mode.

RAS Group 2 — mixed server types (static and guest VMs), different agent status:

- RDSH-1, Status: OK, Max Session 10, Current Sessions: 0, Type: Guest VM
- RDSH-2, Status: OK, Max Sessions 10, Current Sessions: 2, Type: Guest VM
- RDSH-3, Status: Not Verified, Max sessions 10, Current Sessions: 0, Type: Guest VM

Group Workload = (Current Sessions / Max Sessions) * 100 or ((0 + 2) / 20) * 100 = 10%

Please note that a group will always make sure that it has at least one server available, even if the workload is zero percent.

Number of servers to be added to the group per request: The number of servers that the template should create per single request from the group. This setting works together with the **Send a request to the Template when the workload threshold is above (%)** setting described above. When a group sends a request to the template to create additional servers, the value specified here will determine the number of servers that will be created.

Max number of servers to be added to the group from the Template: This option allows you to set a limit on how many servers in total can be added to the group from the template. A template can be shared between groups. By setting a limit for each group, you can ensure that the combined number of servers in each group will not exceed the template limit. Consider the following examples:

- If the template is used by a single group, then this number can be up to the "Maximum guest VMs" setting of the template.
- If two or more groups share the same template, then the combined number from all groups must be less or equal to the "Maximum guest VMs" settings of the template.

When you save the group, a validation will be performed against other groups (if any) and you will see an error message if the numbers don't match. Note that when a server cannot be created on request due to an error, a "Template error" event is triggered and the administrator will receive an alert message.

Drain and unassign servers from group when workload is below (%): Specifies the group workload percentage value at which one or more servers should be switched to drain mode or unassigned from the group. The server(s) with the least number of sessions will be switched to drain mode. As soon as all users are logged off from a server, it is unassigned from the group. At that point, the server becomes available to other groups on demand.

Note: Parallels recommends setting viable timeouts for idle time and disconnected sessions either in Windows Group Policies or in the **Site Default Properties** dialog to make the drain mode effective.

Removing a server from a group

To remove a regular RD Session Host from a group, do one of the following:

- On the **RD Session Hosts** tab, right-click a server and choose **Remove from group**.
- On the **Groups** tab, right-click a group and choose **Properties**. In the **Group Properties** dialog, select a server and click **Tasks** > **Delete**.

To remove an RD Session Host that was added to a group from a template:

1 Go to the **Groups** tab.

2 Select a group and click **Tasks** > **Properties**.

3 In the **Group Properties** dialog, select a server and click **Tasks** > **Delete**.

Note that this is the only place in the RAS Console where you can remove an RD Session Host of this type from a group. Please also note that when you delete such a host, it is drained first and only then unassigned from the group, which may take a considerable amount of time.

After you create a group and later publish resources from it, you can view the list of resources by right-clicking a group and choosing **Show published resources** (or click **Tasks** > **Show Published Resources**). For more information, see **Viewing Published Resources Hosted by RD Session Hosts** (p. 112).

Using Scheduler

The **Scheduler** tab in the **RD Session Hosts** view allows you to reboot or temporarily disable servers according to a schedule.

To create a new scheduler task or modify an existing one:

1 In the RAS Console, navigate to **Farm** / <Site> / **RD Session Hosts.**

2 In the right pane, select the **Scheduler** tab.

3 To create a new task, click **Tasks** > **Add** and select one of the following options:
   - **Disable Server**
   - **Disable Server Group**
   - **Reboot Server**
   - **Reboot Server Group**

The **RDSH Schedule Properties** dialog opens. The dialog consists of three tabs, which are described below.

Properties

On the **Properties** tab, specify the following:

- Select **Enable Schedule** to enable the scheduled task.
- Specify the task name and an optional description.

- In the **Available** list, select target servers or groups and click **Add** (repeat to add more servers or groups). To add all servers, click **Add all**. To remove a server or servers from the **Target** list, click **Remove** or **Remove all**.

Trigger

On the **Trigger** tab, specify when the scheduled task should trigger:

- In the **Date**, **Start**, and **Duration** fields, specify the start date, time, and duration.
- In the **Recur** field, specify the task recurrence. If you select **Never**, the task will still run as scheduled but only once. If you select **On specific day(s) of the week**, you need to select one or more days of the week.

Options

On the **Options** tab, you can do the following:

- Compose a message that will be sent to users before or after (in certain scenarios) the scheduled task is triggered. Composing a message is described later in this subsection.
- Specify additional options. Please note that the options are different depending on the task type, as described below.

If the task is **Disable Server** or **Disable Server Group**, the available options are:

- **On Disable**: Use this option to specify how active sessions should be handled when the task is triggered. Please note that disabling a server group with an assigned template will drain and remove RD Session Hosts from the group. See **Maintaining RD Session Hosts based on a Template** (p. 98).
- **Enforce schedule for currently inactive RD Session Hosts**: This option is only enabled when you have an active message in the list, which is displayed above these options. If the option is enabled, RD Session Hosts that are currently offline are also monitored, and if such a server comes back online during the scheduled task execution, the task is applied to it too.
- If you enable this option, the schedule will be applied to a currently inactive RD Session Host when it comes back online. If the option is disabled (default), the schedule will have no effect on such servers. Note that it is assumed that a server is inactive (offline) if it is disabled or cannot be reached over the network (registered on RAS Publishing Agent).

If a task is **Reboot Server** or **Reboot Server Group**, the available options are:

- **Enable Drain Mode** and **Force server reboot after**: The two options work together. If you enable the drain mode, the following will happen. When the task triggers, new connections to a server are refused but active connections will continue to run. The server will be rebooted when all active users close their sessions or when **Force server reboot after** time is reached, whichever comes first. For active users not to lose their work, create a message that will advise them to save their work and log off (see below for details). Please also see **RD Session Host drain mode examples** (p. 97).

- **Enforce schedule for currently inactive RD Session Hosts**: This option is enabled when the **Enable Drain Mode** option is selected. If the option is enabled, RD Session Hosts that are currently offline are also monitored and if such a server comes back online during the scheduled task execution, the task is applied to it too.

To create a text message to be sent to users, click the **Tasks** > **Add** and specify the following:

- Select the **Enable Message** option to enable the message. If the option is cleared, the message will still exist, but will not be sent to users. You can also enable or disable an existing message by selecting or clearing a checkbox in the list on the **Options** tab.
- Specify the message title and body. This is what users will see when the message is displayed on their screens.
- In the **Send message** drop-down list, select the time interval specifying when the message should be sent. By default, this is the time "before" the task is triggered. However, for **Reboot Server** and **Reboot Server Group** tasks, it can also be the time "after" the task is triggered, i.e. the server is put to drain mode. This may be specifically useful when you want to send multiple messages to users at different time intervals while the scheduled task is already in progress. See the explanation below.

Sending multiple messages to users

For **Disable Server** and **Disable Server Group** tasks, you can only send a message before the scheduled task is triggered. Hence, when creating a message, you can only select the "before" option when specifying when the message should be sent. You can create more than one message if needed and send them at different time intervals, so the users are notified more than once before the task executes.

For **Reboot server** and **Reboot server group** tasks, you can send a message before or after the scheduled task is triggered. The "after" option is available for these tasks because you have the ability to enable the drain mode, which will keep the active sessions running for some time. During this time, you can send multiple messages to active users reminding them that they should finish their work and close their sessions. To use the "after" option, the **Enable Drain Mode** option must be selected. Please also note that the "after" time interval and the **Force server reboot after** setting should be coordinated. For example, if the force reboot occurs before the "after" time elapses, active users will not have a chance to see the message.

RD Session Host Drain Mode Examples

Example 1: Scheduling a server group for reboot without the drain mode

A server group contains 3 servers: A, B, C

- Date: 1/24/2020
- Start time: 10:45am
- Send message: 2 minutes before

Users with active sessions are notified 2 minutes before the server reboot task is triggered.

Example 2: Scheduling a server group for reboot with the drain mode enabled

A server group containing 3 servers: A, B, C

- Date: 1/24/2020
- Start Time: 10:45am
- Drain mode: enabled
- Force reboot after: 1 hour
- Send messages: 2 minutes before, 15 minutes after, 30 minutes after.

The session users are notified 2 minutes before the server reboot task is triggered and then twice more, 15 and 30 minutes after the task is triggered. Because the drain mode is enabled, the user sessions will continue to run, so they will see the messages and will be able to close their sessions before the server reboots. Note that since the force reboot time is set at 1 hour, the users will see the last message, which will be sent 30 minutes after the task is triggered.

When the task is triggered:

1. The drain mode is enabled on the servers.
2. Servers A and B have no active or disconnected sessions, so they are restarted immediately.
3. Server C still has open/disconnected sessions, so it continues to run until all users end their sessions. If in 1 hour the server still has active sessions, they are terminated and the server is restarted.

Maintaining RD Session Hosts Based on a Template

If you need to perform a scheduled maintenance of RD Session Hosts that were created from a template, please follow these steps:

1. Create a schedule that fits your maintenance window to drain a desired RD Session Host group.
2. During maintenance (or right before it) switch the template to the maintenance mode. Then apply the necessary changes.
3. The schedule disables groups provisioned by the template (while the maintenance window lasts) which leads to removing (unassigning) all guest VMs from them.
4. Release the template from maintenance and click **Yes** when asked whether to recreate all clones.
5. Enable groups which were disabled in step 3 (above). At this point, the groups will begin receiving guest VMs to comply with the **Keep Available Buffer** setting.
6. From this point forward, groups are provisioned with VMs on demand.

Managing RDSH Sessions

The **Sessions** tab allows you to view and manage current sessions for RD Session Hosts. To view the page, navigate to **Farm** / <Site> / **RD Session Hosts** / **Sessions**.

Note: You can also open the **Sessions** tab by right-clicking a server on the **RD Session Hosts** tab and choosing **Show Sessions**. This will open the **Sessions** tab with a filter applied to it to display only the sessions that belong to the selected server.

The **Sessions** lists displays current sessions and includes the following info for each session:

- **Server**. RD Session Host name.
- **Session ID**. Session ID.
- **User**. Session owner.
- **Protocol**. Protocol used: **Console** (Parallels RAS Console connection), **RDP** (remote user connected via RDP).
- **State**. Session state: **Idle**, **Active**, **Disconnected**.
- **Logon Time**. Last date and time the user logged on.
- **Session Length**. Total sessions duration.
- **Idle Time**. Total session idle time.
- **Type**. Session type: **Admin**, **Published Application**, **Published Desktop**.
- **Resolution**. Client display resolution.
- **Color Depth**. Client display color depth.
- **Device Name**. Client device name.
- **IP Address**. Client IP address.

You can sort the **Sessions** list by any session property. Simply click on a desired column heading to sort the list in ascending or descending order.

You can also filter the list using a single or multiple session properties as criteria. To do so, click the magnifying glass icon (top right) and then type a desired string in a desired column. The list will be filtered as you type.

To manage a session (or multiple sessions at the same time), select one or more sessions and then use the **Tasks** drop-down menu to choose from the following actions:

- **Refresh**. Refresh the list.
- **Disconnect**. Disconnect the selected session(s).
- **Log off**. Log off the session(s).

- **Send message**. Opens the **Send Message** dialog where you can type and send a message to the session owner(s).
- **Remote control**. Remotely control the selected user session. To establish a connection, domain or local Windows account credentials (whichever the user used to log in to this computer) of the current RAS Console administrator will be used. Note that the current user (specifically if it's the local Windows user) may not be permitted to connect to the remote computer. In such a case, use the **Remote control (prompt)** option (described below). See also the **User session remote control** subsection below for important information.
- **Remote control (prompt)**. Same as above but prompts you to enter credentials. Use this option when the current user credentials cannot be used to control a session.
- **Show processes**. Display and manage running processes. See **Managing processes** below for details.

User session remote control

The **Remote Control** and **Remote control (prompt)** menu options (see above) allow you to shadow a user RDS session. There are limitations as described below:

- Parallels RAS cannot shadow RDS sessions running on Windows 7 and Windows Server 2008 R2 (plain Windows Server 2008 is fine). This doesn't work even with native tools.
- If you need to shadow a user session running on Windows Server 2008, the RAS console must also be running on Windows Server 2008. If the RAS console is installed on a later version of Windows Server, shadowing will NOT work. As a workaround, you can add an RD Session Host running Windows Server 2008 to the Farm, publish the Parallels RAS console from it, and then use the console remotely to manage user RDS sessions running on Windows Server 2008. Please note that to finish a remote control session, the administrator must log off from the RAS console remote session. This is a limitation of the shadow.exe utility from Microsoft that doesn't take any arguments that would allow us to add a control like a bar, a button, or a key combination.

Managing processes

The **Tasks** > **Show processes** option opens the **Running Processes** dialog where you can view running processes for one or more RD Session Hosts.

Note: You can also open the **Running Processes** dialog by right-clicking a server on the **RD Session Hosts** tab and choosing **Show Processes**. This will open the **Running Processes** dialog with a filter applied to it to display only the processes that belong to the selected server.

On the **Running Processes** dialog, use the **Show processes from** drop-down menu to filter the list using the following options:

- **Selected Session**. Displays processes for the session selected in the **Sessions** list.
- **Selected Server**. Displays all running processes for the server on which the selected session is running.

- **All Servers**. Displays all running processes for all available servers.

You can also filter the list by specifying a search criteria for one or more columns. To do so, click the magnifying glass icon (top right) and then type a desired text in one or more columns. The list is filtered as you type to match the specified criteria.

The **Tasks** drop-down menu in the **Running Processes** dialog includes the following options:

- **Refresh**. Refresh the list.
- **Kill process**. Kill the selected process.
- **Go To Published Item**. Enabled when you select a process that belongs to a running published resource. Brings up the main Parallels RAS Console window and navigates to the corresponding published resource.
- **Disconnect**. Disconnect the session.
- **Log off**. Log off the session.
- **Send message**. Send a message to the session owner.
- **Remote control**. Remotely control the selected user session.

Managing Logons

The logon management feature allows you to enable or disable logons from RD Session Hosts. The feature performs the same tasks as the `change logon` command-line utility.

Note: For RD Session Hosts based on a template, the drain mode (which disables logons) is handled automatically by the group to which a host belongs. For more information see **Using Scheduler** (p. 95).

To manage logons:

1. In the Parallels RAS Console, navigate to **Farm** / <Site> / **RD Session Hosts**.
2. Select an RD Session Host, click **Tasks** > **Control** and choose one of the following:
   - **Enable logons**. This option performs the same action as the `change logon /enable` command.
   - **Disable logons and reconnections**. Disables subsequent logons. Does not affect currently logged on users. This option performs the same action as `change logon /disable` command.
   - **Disable logons until server reboot**. Disables logons until the computer is restarted, but allows reconnections to existing sessions. Same action as the `change logon /drainuntilrestart` command.

To see the current logon control mode for an RD Session Host, click **Tasks** > **Control**. The checked-out option indicates the current logon control mode of the selected RD Session Host. To do this check from the command line, execute the `change logon /QUERY` command on the server.

Please also note the following:

- When applying a logon control mode on a server, ensure that the agent status is updated accordingly.
- You must set the logon control options for the servers one-by-one. If you need to do it for a group of servers, you can use the scheduler (see **Using an RD Session Host Scheduler** (p. 95)).
- There's no option for disabling logons from new client sessions but allowing reconnections to existing sessions (`change logon /DRAIN`) because its behavior is identical to the **Disable logons until server restart option** (`change logon /DRAINUNTILRESTART`).
- **Computer Configuration / Administrative Templates / Windows Components / Remote Desktop Services / Remote Desktop Session Host / Connection / Allow users to connect remotely using remote desktop services** must be set to **Not configured,** otherwise it takes precedence.

Using Computer Management Tools

You can perform standard computer management tasks on an RD Session Host right from the RAS Console. These include Remote Desktop Connection, PowerShell, Computer Management, Service Management, Event Viewer, IPconfig, Reboot, and others. To access the **Tools** menu, select a server, click **Tasks** (or right-click) > **Tools** and choose a desired tool. For requirements and usage information, see **Computer Management Tools** (p. 354).

Publishing from an RD Session Host

This section describes how to publish resources hosted by an RD Session Host. The publishing functionality described here is accessed from the **Publishing** category in the RAS Console.

You can also publish resources using a publishing wizard in the **Start** category, as described in the **Setting Up a Simple RAS Environment** section (p. 29). The **Start** category publishing wizard is a simplified version that gives you convenient options of selecting the resources that you want to publish. You may try both approaches and choose the one that better suits your needs.

Read on to learn how to publish resources from an RD Session Host.

Publishing a Desktop from an RD Session Host

To publish a remote desktop from an RD Session Host:

1 In the RAS Console, select the **Publishing** category and click the **Add** icon below the **Published Resources** tree. This will launch the publishing wizard.

> **Note:** If the wizard has all options disabled, it means that there are no resources (servers) in the Farm from which publishing can be configured.

2 In the first step of the wizard, select **Desktop** and click **Next**.

3 In the **Select Desktop Type** step, select **RD Session Host Desktop** and click **Next.**

4 Select one or more RD Session Hosts which desktops you want to publish. You can select all available servers, server group(s), or individual servers. Please note that if you have just one RD Session Host, this page will not be displayed.

5 Click **Next**.

6 In the next step:

- Specify a name and description for the desktop, and optionally change the icon.
- Select the **Connect to administrative session** option if you want users to connect to the administrative session.
- Select the **Start automatically when user logs on** option if you want to open a desktop as soon as a user logs on.
- Specify the desired screen resolution using the **Desktop Size** drop-down list. To set a custom width and height of the screen, select **Custom** in the **Size** drop-down list and specify the desired values in the fields provided.
- In the **Multi-Monitor** drop-down list, select whether the multi-monitor support should be enabled, disabled, or whether the client settings should be used.

7 When done, click **Finish** to publish the desktop.

Publishing an Application from an RD Session Host

To publish an application from an RD Session Host follow the below procedure:

1 In the RAS Console, select the **Publishing** category and then click the **Add** icon below the **Published Resources** tree (or right-click inside the **Published Resources** box and click **Add** in the context menu). This will launch the publishing wizard.

> **Note:** If the wizard has all options disabled, it means that there are no resources (servers) in the Farm from which publishing can be configured.

2 On the **Select Item Type** wizard page, select **Application** and click **Next.**

3 On the **Select Server Type** page, select **RD Session Host** and click **Next.**

4 One the **Select Application Type** page, select one of the following available options:

- **Single Application**. Choose this option to fully configure the application settings yourself such as the executable path etc.
- **Installed Application**. Choose this option to publish an application that is already installed on the server, therefore all of the application settings are automatically configured.
- **Predefined Application**. Choose this option to publish a commonly used Windows application such as Windows Explorer.

5 Click **Next**.

6 On the **Publish From** page, specify from which RD Session Hosts the application should be published. You have the following options:

- **All Servers in Site**. If selected, the application will be published from all servers that are available on the Site.
- **Server Groups**. Select this option and then select individual server groups to publish the application from.
- **Individual Servers**. Select this option and select individual servers to publish the application from.

Please note that the **Publish From** wizard page will appear only if you have multiple RD Session Hosts. If you have just one server, this page will be skipped by the wizard. The page will also be skipped if the application type that you are installing is **Predefined Application**.

7 Click **Next**.

8 Depending on the application type that you selected on the **Select Application Type** page, the next wizard page will be one of the following:

- If you selected **Single Application**, the **Application** page will open where you have to specify the application settings manually (more about this option later in this section).
- If you selected **Installed Applications**, the **Installed Applications** page will open listing available applications (the applications are grouped by functionality). Select an application you wish to install and click **Next**. Follows the instructions to complete the wizard.
- If you selected **Predefined Application,** the **Select Predefined Applications** page will open listing available applications. Select an application you wish to publish and click **Finish**.

9 If you selected **Single Application** on the **Select Application Type** wizard page, the **Application** page will open. Specify the application settings as follows (see the screenshot below):

Note that if you populate the **Target** field first using the "browse" button (**[...]**), the application **Name**, **Description**, and icon will be chosen automatically. You can override this selection if you wish.

- **Name**. Choose and type a name for the application.
- **Description**. Type an optional description.
- **Run**. Select the application window state (normal window, minimized, maximized).

- **Start automatically when user logs on.** Select this option if you want to start an application as soon as a user logs on. This option works on desktop versions of Parallels Client only.
- **Change Icon**. Change the application icon (optional).
- **Server(s)**. Allows you to specify the rest of the server parameters individually for each server the application was published from. Select a server from the drop-down list box and specify the parameters. Repeat for other servers in the list.
- **Target**. Specify the application executable path and file name.
- **Start in**. If the **Target** field is valid, this field will be populated automatically. You can specify your own path if needed.
- **Parameters**. If the application accepts startup parameters, you can specify them in this field.

10 When done, click **Finish** to publish the application.

Publishing a Web Application from an RD Session Host

A web application is like any other application that you can publish using the standard application publishing functionality. However, to simplify publishing of straight URL links to web applications, a separate publishing item type is available that allows you to accomplish this task with minimal number of steps.

To publish a web application:

1 In the RAS Console, select the **Publishing** category and then click the **Add** icon below the **Published Resources** tree (or right-click inside the **Published Resources** box and click **Add** in the context menu). This will launch the publishing wizard.

> **Note:** If the wizard has all options disabled, it means that there are no resources (servers) in the Farm from which publishing can be configured.

2 On the **Select Item Type** wizard page, select **Web Application** and click **Next.**

3 On the **Select Server Type** page, select **RD Session Host** and click **Next**.

4 On the **Publish From** page, select the server(s) to publish from. Note that if you have just one RD Session Host, the **Publish From** page will not appear.

5 On the **Web Application** wizard page that opens, specify the web application name, description, window state, and the URL. Select the **Force to use Internet Explorer** option if needed. To browse for a specific application icon, click **Change Icon**.

6 When done, click **Finish** to publish the application.

When published, the web application will appear in the **Publishing** > **Published Resources list**, just like any other application.

Publishing a Network Folder from an RD Session Host

You can publish a filesystem folder via UNC path to open in Windows explorer. To minimize the number of configuration steps, a special publishing item is available that allows you to publish a network folder from an RD Session Host.

To publish a network folder:

1 In the RAS Console, select the **Publishing** category and then click the **Add** icon below the **Published Resources** tree (or right-click inside the **Published Resources** box and click **Add** in the context menu). This will launch the publishing wizard.

> **Note:** If the wizard has all options disabled, it means that there are no resources (servers) in the Farm from which publishing can be configured.

2 On the **Select Item Type** wizard page, select **Folder on the file system** and click **Next.**

3 On the **Select Server Type** page, select **RD Session Host** and click **Next**.

4 On the **Publish From** page, select the server(s) to publish from. Note that if you have just one RD Session Host, the **Publish From** page will not appear.

5 On the **UNC Folder** wizard page, specify the usual application properties.

6 In the **UNC path** field, enter the UNC path of the folder you wish to publish. Click the **[...]** button to browse for a folder (it may take some time for the **Browse for Folder** dialog to open).

7 Click **Finish** to publish the folder and close the wizard.

When published, the network folder will appear in the **Publishing** > **Published Resources list**, just like any other application. If you select it and then click the **Application** tab, the application settings will be as follows:

- The **Target** property will always be set to `PublishedExplorer.exe`. This binary is created automatically (via agents pushing) and is simply a copy of the standard `explorer.exe` executable.
- The **Parameters** property specifies the network folder that we want to publish. The folder path can be in any format that the `explorer.exe` can handle.

Please note that although you have all standard application property tabs enabled for this publishing item, at least the following items should be ignored, as they are completely irrelevant:

- **Publish From**
- **File Extensions**

Publishing a Document from an RD Session Host

To publish a document from an RD Session Host, follow the below procedure:

1 In the RAS Console, select the **Publishing** category and then click the **Add** icon below the **Published Resources** tree (or right-click inside the **Published Resources** box and click **Add** in the context menu). This will launch the publishing wizard.

> **Note:** If the wizard has all options disabled, it means that there are no resources (servers) in the Farm from which publishing can be configured.

2 On the **Select Item Type** wizard page, select **Document** and click **Next.**

3 Select **RD Session Host** and click **Next**.

4 Specify the content type of the document you want to publish. You can select the content type from the predefined list or specify a custom content type in the **Custom content types** input field.

5 Click **Next** when ready.

6 On the **Publish From** page, specify from which RD Session Hosts the application should be published. You have the following options:

- **All Servers in Site**. If selected, the application will be published from all servers that are available on the Site.
- **Server Groups**. Select this option and then select individual server groups to publish the application from.
- **Individual Servers**. Select this option and select individual servers to publish the application from.

Please note that the **Publish From** wizard page will appear only if you have multiple RD Session Hosts. If you have just one server, this page will be skipped by the wizard.

7 On the **Application** page, enter a name, an optional description, a Window state, and an icon if needed.

8 Use the **[...]** button next to the **Target** input field to browse for the document. All other fields will be automatically populated. To edit any of the auto populated fields, highlight them and enter the required details.

9 (Optional) In the **Parameters** input field, specify the parameters to pass to the application when it starts.

> **Note:** Use the **Server(s)** drop down list to specify different document settings for a specific server in case the document is configured differently on that particular server. The settings will be saved for each server you select individually.

10 Click **Finish** to publish the document.

Publishing Containerized Applications

Parallels RAS supports publishing of the following containerized applications:

- App-V applications (p. 108)

- Turbo.net applications (p. 109)

Publishing App-V Applications

Microsoft Application Virtualization (or App-V) is an application streaming solution from Microsoft. Beginning with Parallels RAS v16.5, a support for App-V application publishing is available in the Parallels RAS console.

At the time of this writing, the App-V support implements scenarios where application provisioning is performed by means of App-V components:

- Applications are sequenced by the administrator according to Microsoft guidelines.
- Applications are stored on a network share created by the administrator (SMB, HTTPs).
- App-V Management and Publishing servers are used to publish applications for a specific AD groups that must by synced manually by the administrator with RAS publishing groups used for App-V application publishing.
- App-V client is installed and configured manually by the administrator.

The process of deploying and publishing an App-V application is as follows:

1. Package an applications using the App-V Sequencer.
2. Deploy the application to an RD Session Host using the App-V Management Console, Microsoft SCCM, etc.
3. Provision the application.
4. Verify that users can launch the application from the RD Session Host.
5. Publish the application from RAS Console (see below for instructions).
6. Launch the application from a Parallels RAS Client.

Publish an App-V application from the Parallels RAS console

To publish an App-V application:

1. In the Parallels RAS Console, select the **Publishing** category.
2. Click the **[+] Add** icon at the bottom of the right pane. The publishing wizard opens.
3. On the **Select Item Type** page, select the **App-V application** option.
4. Click **Next**.
5. Select the server type from which to publish an application and click **Next**.
6. Select a server or a group to publish from and click **Next**.
7. On the **Installed Applications** page, select one or more App-V applications and click **Next**.
8. Review the summary and complete the wizard.

Once an App-V application is published, it can be launched from a Parallels RAS Client.

Note: To avoid launch issues, use AutoLoad=2. More details in https://blogs.technet.microsoft.com/technetsto_sup/2013/11/12/autoload-setting-in-app-v-5-0/

Publishing Turbo.net Applications

Turbo (Turbo.net) is a web-based container platform that runs applications on a Windows desktop with no installation required. Parallels RAS provides you with the ability to publish applications hosted by Turbo.net and make them available to Parallels RAS users just like regular applications hosted by RD Session Hosts.

The ability to publish container-based applications allows Parallels RAS administrators to greatly reduce TtV (time to value) and minimize investment and development resources. The integration of the solution provided by Turbo gives you the following immediate benefits:

- Instant access to an online application repository with hundreds of applications available, including:
  - Most web browsers (Chrome, Firefox, Opera, etc).
  - Most application runtimes (JRE and others).
  - Most add-ons (Flash, etc).
  - Open source applications like LibreOffice, VLC Player, etc.
  - Administrative tools like WinSCP, Putty and so on.
- Instant provisioning of all these applications in any combination possible (i.e. a particular version of Google Chrome with a specific Java runtime and Flash) to all endpoints regardless of the platform and version (supports anything from Windows 7 to Windows Server 2016).

For more information about Turbo, visit https://www.turbo.net

Licensing and supported Turbo repositories

- Parallels RAS uses the free edition of Turbo.net, so no subscription is required.
- Parallels RAS supports application publishing from the public Turbo.net repository only. Private repositories are not supported at the time of this writing.

Enabling or disabling the Turbo.net support in Parallels RAS

Before you can publish applications from Turbo.net, you need to enable this functionality in Parallels RAS as follows:

1. In the Parallels RAS Console, select the **Administration** category and then click the **Features** tab in the right pane.
2. Select the **Enable Turbo.net application publishing** option. This will enable the Turbo.net functionality in the Farm and will install the Turbo runtime on every RD Session Host, so they can download and run container-based applications.

If later you decide to disable the Turbo.net support in Parallels RAS (by clearing the **Enable Turbo.net application publishing** option), you will see a message box saying that this action will uninstall Turbo runtime from each RD Session Host that has it installed. If later you enable the Turbo.net support again, the runtime will be reinstalled. If you've already published applications from Turbo.net, the message box will also ask you what should be done with them. The available options are:

- **Disable**. All published Turbo.net applications will be disabled.
- **Delete**. All published Turbo.net applications will be removed from Parallels RAS. If you enable the Turbo.net support later, you will have to publish these applications again.
- **Keep unchanged**. Applications will remain in Parallels RAS as active applications, but end users will not be able to use them. If later you enable the Turbo.net support, the applications will continue to work normally.

Publishing from Turbo.net

To publish a Turbo.net application:

1. In the Parallels RAS Console, select the **Publishing** category.
2. Click the **[+] Add** icon at the bottom of the right pane. The publishing wizard opens.
3. On the **Select Item Type** page, select the **Turbo.net application** option. If the option is disabled (grayed out), it means that the Turbo.net support is disabled in the Parallels RAS Farm. See above for the info on how to enable it.
4. Click **Next**.
5. On the **Configure Turbo.net Repository** page, specify an application you would like to publish. Choose from the following options:
   - Double-click a desired category in the application category list to see apps that it contains. Select an application and click **Next**.
   - Expand the drop-down list (on the right side) and select from one of the predefined applications. If the app you are looking for is not in the list, type a search condition in the same field and press Enter. The search string can be a full or partial application name, a publisher name, or anything else that can possibly be a part of the app description. Applications that match the search condition will appear in the list from which you can select the one you need.
6. After selecting an application, click **Next**.
7. On the **Application** page, specify the following options:
   - **Name:** A name under which the application will be listed in Parallels RAS.
   - **Description:** An optional description.
   - **Run:** Select the application window state (normal window, minimized, maximized).

- **Start automatically when user logs on:** Select this option if you want to start the application as soon as a user logs on to Parallels RAS. This option works on desktop versions of Parallels Client only.
- **Change Icon:** Specify a different application icon (optional).
- **Server(s):** Allows you to specify **Target**, **Start In**, and **Parameters** settings individually for each RD Session Host through which this application will be published. Select an RD Session Host from the drop-down list and then specify the settings described below.
- **Target:** Specifies the application executable path and file name. This shouldn't be normally changed for Turbo.net applications.
- **Start in:** If the value in the **Target** field is valid, the **Start In** field is populated automatically. You can specify your own path if needed.
- **Parameters:** If the application accepts startup parameters, you can specify them in this field.

8 Click **Finish** to publish the Turbo.net application. The application should appear in the **Published Resources** tree in the **Publishing** category just like any other published resource.

Specifying RD Sessions Hosts through which the Turbo.net application should be published

After you publish a Turbo.net application, you can specify RD Session Hosts through which it should be published. Here's how it works. Application containers reside in the public Turbo.net repository. When you initially publish a containerized Turbo.net application in Parallels RAS, you don't really download it to an RD Session Host. However, as soon as the first user tries to launch a newly published Turbo.net application in Parallels Client, the application container is downloaded to an RD Session Host and the application is started on it. The user then gets access to it just like any other published application.

To specify one or more RD Session Hosts through which the application should be published, select the application in the **Published Resources** tree, choose the **Publishing From** tab and select one of the following options:

- **All Servers in Site**. The application will be published through all available RD Session Hosts.
- **Server Groups**. This option allows you to specify server groups through which the application should be published.
- **Individual Servers**. Select this option to specify one or more individual servers.

How Turbo.net applications are launched in Parallels Client

When a user launches a Turbo.net application in Parallels Client, the RD Session Host handling the request will attempt to start the application. If this is the first time anybody launches this particular application on this server, the server first downloads the application container from Turbo.net. In such a case, the Parallels Client user will see a message box with a progress indicator while the RD Session Host prepares the application. Once the application is running on the server, the user will see its window and can begin using it. Apart from the progress indicator box, a Parallels Client user will not be able to tell whether a published application is a regular or a Turbo.net application.

Viewing Published Resources Hosted by RD Session Hosts

When you want to remove an RD Session Host or an RD Session Host group from a Site, you might want to see the list of published resources hosted by the server or servers in a group. This way you can see which resources will be affected. You can do so as follows:

1. In the Parallels RAS Console, select **Farm** \ **RD Session hosts**.
2. To see published resources for a specific RD Session Host, select the **RD Session hosts** tab. To see published resources for a group, select the **Groups** tab.
3. Right-click a server or a group and choose **Show published resources** (or click **Tasks** > **Show published resources**).
4. The **Published Resources** window opens displaying the list of published resources for the selected server or group. Resource information includes:
   - **Name**. Resource name.
   - **Status**. Enabled or disabled.
   - **Type**. "Application" is used for published applications, URLs, network folders, etc. "Desktop" is used for published desktops.
   - **Path**. For published applications, specifies a path to the execute file, URL, or UNC path.
   - **Parameters**. Published application parameters (if any).
   - **Published from**. Site, group(s), or individual server(s).
5. To refresh the list, press F5 or click the "recycle" icon (top-right).
6. To filter the list, press Ctrl-F or click the magnifying glass icon and then specify the filter criteria for desired column(s).

CHAPTER 8

VDI and Virtual Desktops

Parallels RAS VDI (Virtual Desktop Infrastructure) enables you to use server virtualization to reduce the number of physical servers required to host published resources. Parallels RAS VDI supports numerous virtualization technologies, including hypervisor and cloud-based platforms.

Parallels RAS VDI also includes the Template functionality, which gives you the ability to create a template from a preconfigured guest VM (virtual machine) and then automatically clone guest VMs and RD Session Host VMs from it.

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Supported VDI Providers

Parallels RAS supports hypervisor-based VDI providers and cloud-based VDI providers.

Hypervisors

The following hypervisors are supported:

- Microsoft Hyper-V, including Windows Server 2019

- Microsoft Hyper-V Failover Cluster
- VMware vCenter
- VMware ESXi
- Citrix Hypervisor
- QEmu KVM with libvirt
- Scale Computing HC3
- Nutanix AHV (AOS 5.5, AOS 5.10, AOS 5.15)
- Remote PC — this is a special type that allows you to create pools of remote PCs. See **Remote PC Pools** (p. 160).

Cloud VDI providers

The only cloud VDI provider supported at this time is Microsoft Azure.

RAS VDI Agent Information

In order to function in a RAS Farm, a VDI provider (hypervisor or cloud-based) needs RAS VDI Agent to be installed in the Farm. RAS VDI Agent acts as an interface between other RAS components and a VDI provider. RAS VDI Agent conducts all communications with a VDI provider through the provider's native API.

Parallels RAS has two types of RAS VDI Agents that can be installed in a Farm:

- **Built-in:** This RAS VDI Agent is built into the RAS Publishing Agent and is installed automatically when you install Parallels RAS. The agent can handle multiple VDI providers and can also be configured for high availability.
- **Dedicated:** This RAS VDI Agent is installed manually. It can handle only a single VDI provider. If you want to use this agent type with more than one provider, you need to install a separate instance for each provider.

Both built-in and dedicated RAS VDI Agents are compatible with all types of VDI providers supported by Parallels RAS. Which agent you choose to install depends only on your requirements. When possible, it is always recommended to use the built-in VDI Agent for high availability and business continuity.

What to read next:

- If you are adding a VDI provider that will use the built-in RAS VDI Agent, you may skip to **Add a VDI Provider** (p. 116).
- If you want to install a dedicated RAS VDI Agent on a server of your choice, read the **RAS VDI Agent Installation Options** section (p. 115), which follows this one.

RAS VDI Agent Installation Options

If you are installing a dedicated RAS VDI Agent, you first need to determine where it will be installed. Depending on the VDI provider type, the following options are available:

- The host on which the hypervisor is running. This option is available for Microsoft Hyper-V only.
- A supported version of Windows Server running on a physical box or in a virtual machine. For supported Windows Server versions, see **Software Requirements** > **RAS VDI Agent**.
- A preconfigured Linux-based virtual appliance (provided by Parallels). The appliance can be deployed on any hypervisor on your network.

The following table lists RAS VDI Agent installation options for each supported VDI provider:

VDI Provider	Built-in Agent (part of PA)	Agent on a VDI Provider	Agent on a Windows Server (VM or HW)	Agent in Appliance
Microsoft Hyper-V	Yes	Yes	Yes*	No
Microsoft Hyper-V Failover Cluster	Yes	No	Yes*	No
VMware VCenter	Yes	No	Yes*	Yes (OVA or VMDK)
VMware ESXi	Yes	No	Yes*	Yes (OVA or VMDK)
Citrix Hypervisor	Yes	No	Yes*	Yes (OVA or VMDK)
QEmu KVM with libvirt	No	No	No*	Yes (VMDK)
Scale Computing HC3	Yes	No	Yes*	No
Nutanix Acropolis	Yes	No	Yes*	Yes (VMDK)
Remote PC (see the Note below)	Yes	No	Yes*	No
Microsoft Azure	Yes	No	Yes*	No

***** High Availability is not available with these VDI Agent installation options. For details, see **Enabling High Availability for VDI** (p. 129).

Note: The **Remote PC** is a special type that can be used to create and manage pools of remote PCs as part of hosted desktop infrastructure (HDI). When you add a VDI provider of this type, you can manage it like one of the real VDI providers with some limitations, such as you cannot create templates and use some other strictly VDI-specific functions. The main feature when using this type is the ability to create pools of HDI-based remote PCs and making PCs persistent by assigning an individual PC to a specific user. For more info, see **Remote PC Pools** (p. 160).

In the table above, find the VDI provider type that you are using and see where the RAS VDI Agent can be installed. Depending on the available choices, do one of the following:

- **Built-in Agent:** The agent is a part of RAS Publishing Agent, so it is already installed. When possible, it is always recommended to use the built-in VDI Agent for high availability and business continuity.

- **Agent on a VDI provider:** This option is only available if you are using Microsoft Hyper-V. You can simply install the agent on the host, as described in **Add a VDI Provider** (p. 116).
- **Agent on a Windows Server (VM or HW):** To use this option, make sure you have a physical box or a virtual machine running a supported version of Windows Server. You will need to specify its FQDN or IP address when adding a VDI provider to the Farm.
- **Agent in Appliance:** If this is your choice, you need to download and deploy a virtual appliance as described in the **Deploying a Virtual Appliance** subsection below.

Please note that if both Windows Server and virtual appliance can be used with your VDI provider, you can choose one or the other according to your preferences.

Deploying a virtual appliance

Use these instructions if you plan on deploying RAS VDI Agent as a virtual appliance.

To download and install a virtual appliance:

1. Visit `https://www.parallels.com/products/ras/download/links/`
2. On the download page, scroll down to the "VDI Agent Appliances" section and click the **VDI Agent Appliance OVA** or the **VDI Agent Appliance VMDK** link to download the appliance. See the table above for the appliance type (OVA or VMDK) compatible with the hypervisor that you are using.
3. After downloading the virtual appliance, you need to deploy it on a hypervisor. For the information about deploying a virtual appliance, please refer to your hypervisor documentation.

Add a VDI Provider

In this section:

- **Add a Hypervisor VDI Provider** (p. 116)
- **Add a Cloud VDI Provider** (p. 118)

Add a Hypervisor VDI Provider

This section describes how to add a hypervisor-based VDI provider (p. 113). For the information on how to add a cloud-based VDI provider, see **Add a Cloud VDI Provider** (p. 118).

To add a VDI provider:

1. In the RAS Console, navigate to **Farm** / **Site** / **VDI**.
2. On the **Providers** tab, click **Tasks** > **Add**.
3. The **Add VDI Provider** wizard opens.

4 On the **Select VDI provider type** page, select **Virtualization** to use a hypervisor deployed on your network. The **Cloud computing** option is described in the **Add a Cloud VDI Provider** section (p. 118).

5 Click **Next**.

6 In the **Type** field, select the hypervisor type. For the information on what the "Remote PC" type is, see **Remote PC Pools** (p. 160).

7 In the **Address** field, specify the host's FQDN or IP address.

8 Specify a user name and password to log in to the server.

9 Type an optional description.

10 Click the **Advanced Settings** link to open the **Advanced VDI Provider Settings** dialog. The dialog allows you choose the following options:

- **Use dedicated VDI Agent:** Select this option if you will install (or have installed) the RAS VDI Agent yourself. Clear the option if you will use the built-in RAS VDI Agent (p. 114).
- **Agent address:** This option becomes enabled if you select the option above it. Specify the FQDN or IP address of the server where the RAS VDI Agent is (or will be) installed. This can be either a physical box or virtual machine.
- **Preferred Publishing Agent:** Select a RAS Publishing Agent to be the preferred agent for this VDI provider. Select **Automatic** to let the system select an agent (this option is enabled and selected by default if you have at least three Publishing Agents installed). The automatic selection is especially important to ensure that the VDI provider and guest VMs always have a VDI Agent they communicate with in case of other Publishing Agent(s) failure. For more info, see **Enabling High Availability for VDI** (p. 129).

11 Click **Next**.

12 The wizard will now try to connect to the RAS VDI Agent. If you specified **Use dedicated VDI Agent** option in the previous (optional) step, but haven't installed the agent yet, click **Install** and follow the instructions to push install the agent on the specified host.

Please note that for the remote installation to work, the following requirements must be met:

- The firewall must be configured on the server to allow push installation. Standard SMB ports (139 and 445) need to be open. See also **Port Reference** (p. 401) for the list of ports used by Parallels RAS.
- SMB access. The administrative share (\\server\c$) must be accessible. Simple file sharing must be enabled.
- Your Parallels RAS administrator account must have permissions to perform a remote installation on the server. If it doesn't, you'll be asked to enter credentials of an account that does.
- The target server should be joined to an AD domain.

If push installation cannot be performed for any reason, you can install the agent manually using the installer. See **Installing RAS VDI Agent Using the Installer** (p. 124)

13 If you've selected **Microsoft Hyper-V Failover Cluster** as the VDI provider type, the page opens where you can disable MAC address management for guest VMs. Note that you should only do it if you are using Microsoft System Center Virtual Machine Manager (SCVMM) or other solution to manage MAC addresses. See the explanation below.

MAC address management is required when using Microsoft Hyper-V Failover Cluster as a VDI provider. This is to avoid duplicate MAC addresses, which may occur when a guest VM is migrated to a different node in the cluster and the MAC address is released and reused on the original node. If that happens, such a guest VM can no longer be managed in a Farm. Parallels RAS uses a pool of static MAC addresses at the VDI provider level to automatically generate and assign MAC addresses to guest VMs. This way, when a guest VM is migrated to a different node in the cluster, its MAC address will not be reused for a different VM and no duplicate MAC addresses will occur. The pool has 10,000 reserved MAC addresses in the range displayed in the **Starting MAC address** and **Ending MAC address** fields on the wizard page.

As was said above, if you are already managing MAC addresses using SCVMM or other solution, clear the **Enable MAC address management** option.

14 Click **Next**.

15 If you've selected **VMware vCenter** as the **VDI provider**, another page opens (the page will not open for any other host type). On this page, you can specify a vCenter resource pool. This allows you to enumerate VMs by selecting a cluster (root resource pool) or an individual resource pool within a cluster. To choose a resource pool, select the **Use specific resource pool** option and then click the **[...]** button next to the **Resource Pool** field. In the dialog that opens, select a desired resource pool. Note that if you leave the **Use specific resource pool** option cleared, all VMs from the entire vCenter cluster will be retrieved (max number is 35,000). Click **OK** when done.

16 Click **Finish** to close the wizard.

Add a Cloud VDI Provider

This section describes how to add a cloud-based VDI provider (p. 113). For the information on how to add a hypervisor provider, see **Add a Hypervisor VDI Provider** (p. 116).

Note: At the time of this writing, Parallels RAS supports Microsoft Azure as the only cloud VDI provider.

In this section:

- Introduction and Prerequisites (p. 119)
- Create a Microsoft Azure AD Application (p. 119)
- Add Microsoft Azure as a VDI Provider (p. 122)
- Microsoft Azure and Templates (p. 124)

Introduction and Prerequisites

Introduction

Organizations using or interested in using Microsoft Azure can provision, scale, and manage VDI and RD Session Host workloads directly from the Parallels RAS console and deploy on to Microsoft Azure using Azure Resource Manager (ARM). Parallels RAS uses a service principal with required permissions on relevant Azure resources (subscription and resource groups) to authenticate, provision and manage the resources.

Prerequisites

To use Microsoft Azure as a VDI provider, you need the following:

- An existing Microsoft Azure account and subscription.
- The necessary Microsoft Azure providers must be enabled, including Microsoft.ResourceGraph, Microsoft.Resources, Microsoft.Compute, Microsoft.Network.
- An ARM virtual network and subnet in your preferred region with connectivity to AD services. Azure Active Directory with Active Directory Domain Services (AADDS), Domain Controller in Azure IAAS or hybrid with connectivity to on-premises domain can be used.
- Site-to-site VPN or ExpressRoute is required if hybrid RAS deployment is used.
- A configured VM to be used for VDI or RD Session Host as a template.

Adding Microsoft Azure as a VDI provider is a two-step process:

1. First, you need to create an application in Microsoft Azure to access the resources in your subscription. This step is described in the **Create a Microsoft Azure AD Application** (p. 119) section.
2. Once the application is created and registered, you can add Microsoft Azure as a VDI provider in the Parallels RAS Console. This step is described in **Add Microsoft Azure as a VDI Provider** (p. 122).

Read on to learn how to perform the steps above.

Create Microsoft Azure AD Application

To complete the steps below, you must have a Microsoft Azure subscription and account. If you don't have a subscription, you need to purchase one first.

Create an Azure Active Directory application

An Azure Active Directory application is used with the role-based access control. You need to create an Azure AD application to access resources in your subscription from Parallels RAS.

To create an Azure AD application:

1 Log in to the Microsoft Azure portal.

2 Open the portal menu and select **Azure Active Directory**.

3 In the left pane, select **App registrations**.

4 Click **New registration** (at the top of the right pane).

5 The **Register an application** blade opens.

6 In the **Name** field, type a name you want to use for the application.

7 In the **Redirect URI (optional)** section, make sure that **Web** is selected in the drop-down list. Leave the URI field empty.

8 Click **Register** (at the bottom left).

9 The new Azure AD app is created and its blade is displayed in the portal.

Note the following app properties, which are displayed at the top of the right pane:

- **Display name**
- **Application (client) ID***
- **Directory (tenant) ID***
- **Object ID***

* Copy and save these properties. You will need to specify them later when adding Azure as a VDI provider in the RAS Console.

Create a client secret

A client secret is a string that the application uses to prove its identity when requesting a token. It essentially acts as an application password. You will need to specify this string in the RAS Console when adding Azure as a VDI provider.

To create a client secret:

1 If you are not on the application page anymore, navigate to it from the **Home** page by selecting **Azure Active Directory** > **App registration** and then clicking the app in the right pane.

2 In the left pane, click **Certificates & secrets**.

3 In the right pane, click **New client secret**.

4 Type a client name and select a desired expiration option.

5 Click **Add**. The new client secret appears in the **Client secrets** list.

6 **IMPORTANT:** Copy and save the client secret (the **Value** column). If you leave this page without copying the secret, it will be hidden and you will not be able to retrieve it later.

Give the application read and write access to resources

The Azure AD app that you created must have read and write access to Azure resources. The following instructions demonstrate how to give the application read and write access to a resource group. You can also give access to a specific resource or to your entire Azure subscription. For more information, please see the Microsoft Azure documentation.

To give the app write access to the resource group where new VMs will reside:

1. In the Azure portal menu, select **Resource groups**.
2. Click a resource group where the new VMs will reside.
3. In the left pane, select **Access control (IAM)**.
4. In the right pane, locate the **Add a role assignment** box and click **Add**.
5. In the **Add role assignment** dialog, select **Contributor** in the **Role** drop-down list.
6. In the **Assign access to** field, select **Azure AD user, group, or service principle**.
7. In the **Select** field, begin typing the name of the app that you created earlier. Once the app is found, select it.
8. Click **Save**.

To give the app read access to the resource group:

1. Repeat steps 1-4 from the list above.
2. In the **Add role assignment** dialog, select **Reader** in the **Role** drop-down list.
3. Select the application from the list (use the **Search** field to search for the application).
4. Click **Save**.

Note: If you would like to give the application read access to your entire subscription (not just a specific resource groups), select **All services** in the Azure portal menu, then navigate to **Categories** > **All** > **Subscriptions** and select your subscription. Select **Access control (IAM)** in the middle pane and click **Add** in the **Add a role assignment** box. Repeat steps 2-4 from the list above.

Finding your Microsoft Azure subscription ID

When you'll be adding Microsoft Azure as a VDI provider in the RAS Console, you will need to specify your Azure subscription ID. If you don't remember it, here's how to find it in the Microsoft Azure portal:

1. In the portal menu, choose **All services**.
2. In the **Categories** list, click **All**.
3. In the right pane, click **Subscriptions**.
4. Click a subscription and then copy and save the value from the **Subscription ID** field.

Summary

When you complete all of the above steps, you should have the following values saved and ready to be used to add Microsoft Azure as a VDI provider in the RAS Console:

- **App (client) ID:** Application ID.
- **Directory (tenant) ID:** Tenant ID.
- **Client secret:** Client secret (application key).
- **Subscription ID:** Your Microsoft Azure subscription ID.

Read on to learn how to add Microsoft Azure as a VDI provider in the RAS Console.

Add Microsoft Azure as a VDI Provider

To add Microsoft Azure as a VDI provider:

1. In the RAS Console, navigate to **Farm** / **Site** / **VDI**.
2. On the **Providers** tab, click **Tasks** > **Add**.
3. The **Add VDI Provider** wizard opens.
4. On the **Select VDI provider type** page, select **Cloud computing**.
5. Click **Next**.
6. The page opens where you configure Microsoft Azure as a VDI provider. The properties that you need to specify on this page are described below.

General properties

At the top of the page, you need to type a name for the new host and an optional description if you wish.

Subscription details

In the **Subscription details** section, specify the following:

- **Authentication URL:** Prepopulated with the Microsoft authentication site URL. Unless otherwise required or indicated, keep the default value provided.
- **Management URL:** Prepopulated with the Microsoft Azure management site URL. Unless otherwise required or indicated, keep the default value provided.
- **Resource URI**: Prepopulated with the Microsoft Azure resource URI. Unless otherwise required or indicated, keep the default value provided.
- **Tenant ID:** The "Directory (tenant) ID" value of the Azure AD app that you created earlier.
- **Subscription ID:** Your Microsoft subscription ID.

Service principle details

In the **Service principle details section**, specify the following:

- **Application ID:** The "App (client) ID" value of the Azure AD app that you created earlier (p. 119).
- **Application key:** The "Client secret" value of the Azure AD app that you created earlier (p. 119).

Advanced Settings

Click the **Advanced Settings** link to open a dialog where you can configure the following optional settings:

- **Use dedicated VDI Agent:** When this option is cleared (default), the built-in RAS VDI Agent will be used. If you want to use a dedicated RAS VDI Agent, select this option and specify the server FQDN or IP address.
- **Preferred Publishing Agent:** Select a RAS Publishing Agent to be the preferred agent for this VDI provider. Select **Automatic** to let the system select an agent (this option is enabled and selected by default if you have at least three Publishing Agents installed). The automatic selection is especially important to ensure that the VDI provider and guest VMs always have a VDI Agent they communicate with in case of other Publishing Agent(s) failure. For more info, see **Enabling High Availability for VDI** (p. 129).

Click **OK** to close the **Advanced VDI Provider Settings** dialog.

Complete the wizard

When done entering the Microsoft Azure information, click **Next** in the **Add VDI Provider** wizard. The wizard will display the new VDI provider information and will indicate the RAS VDI Agent status. If everything is OK, click **Finish** to exit the wizard. If something is not as expected, click **Back** and correct any mistakes if necessary.

The new VDI provider will now appear on the **Providers** tab in the RAS Console. Complete the VDI provider addition as follows:

1. Click **Apply** to apply the changes.
2. Verify the value of the **Status** column. If it's anything other than **OK**, right-click the VDI provider and choose **Troubleshooting** > **Check agent**. Verify the agent status and install it if necessary, then click **OK**. The **Status** column on the **Providers** tab should now say **OK**.

Modifying the VDI provider configuration

To view and modify the VDI provider configuration, right-click it and choose **Properties**. In the dialog that opens, view and modify the VDI provider properties.

Microsoft Azure and Templates

When creating a template for cloning VMs in Microsoft Azure, you need to select an Azure resource group where VM clones will be created. Note that this must be a group to which you granted permissions to the Azure AD application. You also need to select a VM size and disk type to be used for cloned VMs. These settings are specified on the **Advanced** page of the **Create Template Wizard**.

Both Virtual Desktop and RD Session Host templates can be created with Microsoft Azure as a VDI provider. When VMs are cloned, you will see them appear in the RAS Console. At the same time, you can also see them in the Microsoft Azure portal.

Note: If there are multiple RAS installations using the same subscription, then the workaround is to change the VDI agent application read access from subscription level to resource group level or a set of resource groups. This is necessary to avoid a situation when a given VDI Agent intersects with the set of resource groups of another VDI agent application.

For complete information about creating and using templates, including Microsoft Azure specifics, please see the **Templates** section (p. 134).

Installing RAS VDI Agent Using the Installer

This topic describes a workaround for a situation when you want to install a dedicated RAS VDI Agent on a specific server, but the push installation from the RAS Console cannot be performed for any reason. If that happens, you can install the agent by running the installer directly on the target server.

Note: You can only use these instructions to install RAS VDI Agent in Windows.

To install the dedicated RAS VDI Agent:

1 Log in to the server where you want RAS VDI Agent installed using an administrator account and close all other applications.

Copy the standard Parallels RAS installer (RASInstaller.msi) to the server and run it:

1 When you get to the **Select Installation Type** page, select **Custom** and click **Next**.

2 Click on **RAS VDI Agent dedicated** and select **Entire Feature will be installed on local hard drive** from the drop-down menu.

3 Ensure that all other components are cleared (excluded from the installation) and click **Next**.

4 Click **Install** and follow he onscreen instruction to install the agent.

The RAS VDI Agent does not require any configuration. Once it is installed, go back to the RAS Console, highlight the server name and click **Troubleshooting** > **Check Agent**. If the agent is installed properly, the status should change to **Agent Installed**.

To uninstall the RAS VDI Agent from a server:

1 Navigate to **Start** > **Control Panel** > **Programs** > **Uninstall a Program**.

2 Find **Parallels Remote Application Server** in the list of installed programs.

3 If you don't have any other Parallels RAS components on the server that you want to keep, right-click **Parallels Remote Application Server** and then click **Uninstall**. Follow the instructions to uninstall the program. You may skip the rest of these instructions.

4 If you have other RAS components that you want to keep on the server, right-click **Parallels Remote Application Server** and then click **Change**.

5 Click **Next** on the Welcome page.

6 On the **Change, repair, or remove** page, select **Change**.

7 On the next page, select **Custom**.

8 Select **RAS VDI Agent dedicated**, then click the drop-down menu in front of it, and click **Entire feature will be unavailable**.

9 Click **Next** and complete the wizard.

Checking the RAS VDI Agent Status

To verify that the RAS VDI Agent is installed and functions properly, do the following:

1 First, you can look at the **Status** column in the **Farm** / **Site** / **VDI** / **Providers** list. If there's a problem with the agent, the column will display an appropriate description. Note that in addition to the description, the **Status** column uses a color code to indicate the agent status as follows:

- Red — Not Verified
- Orange — Needs Update
- Green — Verified

2 Right-click a host and then click **Troubleshooting** > **Check agent** in the context menu.

3 The **VDI Agent Information** dialog opens displaying the information about the VDI Agent, VDI Services, and other related info.

4 If the VDI Agent is not installed, click the **Install** button and follow the onscreen instructions. See **RAS VDI Agent Installation Options (p. 115)** for more info.

Modifying VDI Provider Configuration

Read this section to learn how to modify the configuration of a VDI provider in Parallels RAS.

Configure a VDI provider

To configure an existing VDI provider:

1 In the RAS Console, navigate to **Farm** / <Site> / **VDI**.

2 Select the **Providers** tab in the right pane.

3 Select a VDI provider and click **Tasks** > **Properties**. The **Properties** dialog opens.

Note: Some of the properties described below may be unavailable on some servers. This depends on the VDI provider type.

Enable or disable a VDI provider in Site

By default a VDI provider is enabled. To enable or disable a VDI provider, use the **Enable provider in site** option on the **Properties** tab.

Properties: configure VDI provider connection settings

The **Properties** tab has different properties depending on whether it's a hypervisor-based or cloud-based provider.

Hypervisor VDI provider:

- **Type:** VDI Provider type.
- **Subtype:** Hypervisor version. If the hypervisor version that you are using is not listed, select **Other**.
- **Host:** The VDI provider host IP address.
- **Port:** Port number on which the VDI provider listens for incoming connections.
- **Resource pool:** This field is enabled for VMware vCenter only. If you've specified a vCenter resource pool while adding a VDI provider, the pool will be displayed here. The **[...]** button allows you to specify a different pool (or select one if the field is empty), but only if no guest VMs from the current pool have been created or used in Parallels RAS in any way. If Parallels RAS detects any current usage, you will see a warning message and will not be able to change it. If you still want to select a different resource pool, you'll have manually do a full clean up in the RAS Console, so that no usage of any kind exists.
- **Description:** An optional description.
- **Dedicated VDI Agent:** Select this option if you have a dedicated RAS VDI Agent installed on a different server. Enter the server FQDN or IP address in the **Agent address** field.

Cloud-based VDI provider:

- **Type:** Cloud-based VDI provider type (e.g. Microsoft Azure).
- **Name:** VDI provider name.
- **Description:** An optional description.
- For description of the remaining properties, please see **Add Microsoft Azure as a VDI Provider** (p. 122).

Credentials: configure username and password

The **Credentials** tab has different properties depending on whether it's a hypervisor-based or cloud-based host.

Hypervisor VDI provider:

- Specify the username and password to log in to the VDI provider. Click the **Check Credentials** button to verify the credentials that you've entered.

Cloud-based VDI provider:

- For description of the Microsoft Azure properties, see **Add Microsoft Azure as a VDI Provider (p. 122).**

Agent Settings: configure the RAS VDI Agent

RAS VDI Agent can be configured on the **Agent Settings** tab:

- **Max connections:** Specifies the maximum allowable number of connections.
- **Publishing session timeout:** Specifies the amount of time each session remains connected in the background after the user has closed the published application. This option is used to avoid unnecessary reconnections with guest VMs.
- **Allow Client URL/Mail Redirection**. When a user tries to open a URL or an HTML Mailto link in a remote application, the link can be redirected to the client computer and open in a local default application (a web browser or email client) instead of an application on the remote host. This option allows you to enable or disable the redirection. You can choose from the following options:

  a **Enabled** — select this option to enable the redirection and then select the **Support Shell URL namespace objects** option (bellow the drop-down box). This is the default redirection configuration that works in most common scenarios. The Shell URL namespace objects support means that Parallels RAS can intercept actions in published applications that use Shell namespace API to open links, which is a standard behavior in most applications. The ability to disable the support for Shell URL namespace objects is for compatibility with older versions of Parallels RAS. You may disable this option if you want the behavior of an older version of Parallels RAS (RAS v16.2 or earlier).

  b **Enabled (Replace Registered Application)** — this option uses an alternative method of redirecting a link. It replaces the default web browser and mail client with "dummy" apps on the remote server side. By doing so, it can intercept an attempt to open a link and redirect it to the client computer. You may try this option if the default option above doesn't work with your published application.

  c **Disabled** — this option disables URL/Mail redirection, so URL or Mailto links always open on the remote host.

Please note that you can configure a list of URLs that should never be redirected, even if the redirection is enabled. This can be done on the **Farm** / **Site** / **Settings** / **URL Redirection** tab. See more in **Site Settings** (p. 357).

- **Drag and drop:** Allows you to select how the drag and drop functionality functions in Parallels Clients. You can select from "Disabled" (no drag and drop functionality at all), "Server to client only" (drag and drop to a local application, but not in the opposite direction), "Client to server only" (drag and drop to a remote application only), "Bidirectional" (default). Note that this option has changed since Parallels RAS 17.1. In the past, it was a checkbox to enable or disable drag and drop that would only function in the "Client to server only" mode. When upgrading from an older version of Parallels RAS, and if the checkbox was enabled, the "Client to server only" option is selected by default. If the option was disabled, the "Disabled" option will be set. You can change it to any of the new available options if you wish.

  Note: At the time of this writing the drag and drop functionality is only supported on Parallels Client for Windows and Parallels Client for Mac.

- **Preferred Publishing Agent:** Select a preferred Publishing Agent to which this VDI provider should be assigned. This can be helpful when Site components are installed in multiple physical locations communicating through WAN. You can decrease network traffic by specifying a more appropriate Publishing Agent.
- **Allow file transfer command:** Allows you to enable or disable the remote file transfer functionality in HTML5 and Chrome clients. For more information, see **Enabling or Disabling Remote File Transfer (p. 335).**

RDP printer

The **RDP Printer** tab allows you to configure the renaming format of redirected printers. The format may vary depending on which version and language of the server you are using. Select the **RDP Printer Name Format** option specifically for the configured server:

- **Printername (from Computername) in Session no.**
- **Session no. (computername from) Printername**
- **Printername (redirected Session no)**

The other RDP Printing option available is **Remove session number from printer name**, which will do what it says.

Scheduler: configure VDI provider maintenance time window

The **Scheduler** tab page allows you to create a maintenance time window for the server. During this time, published resources hosted on the VDI provider will not be available to end users.

Note: When the scheduled maintenance is triggered, the server is disabled in Parallels RAS and its status on the **VDI** > **Providers** tab is displayed as "Disabled (Scheduler)". You can cancel the disabled state at any time without waiting for the maintenance time window to end. To do so, on the **VDI** > **Providers** tab, select the server, click **Tasks** (or right-click) and then choose **Cancel disabled state (scheduler)**.

To configure maintenance time window click **Tasks** > **Add** and then set the following options:

- **Start date**
- **Time**
- **Duration**
- **Repeat**

The **On disable** option allows you to specify what should happen to current sessions when a scheduled task triggers.

Configure logging

To configure logging and retrieve or clear existing log files, right-click a VDI provider, choose **Troubleshooting** > **Logging** in the context menu, and then click one of the following, depending on what you would like to do: **Configure**, **Retrieve VDA Agent logs**, or **Clear**. For the information on how to perform these tasks, see the **Logging** (p. 373) section. Please also read the important information below.

Note that logging of VDI provider operations is performed on the RAS VDI Agent level. When you configure logging for a VDI provider, you are essentially configuring it for the RAS VDI Agent that services this VDI provider. This means that if you are using the built-in RAS VDI Agent, its logging configuration applies to all VDI providers that it services. Consider the following scenarios:

- When you retrieve log files for a specific VDI provider serviced by the built-in VDI Agent, the files will contain logs for all VDI providers serviced by the same agent.
- If you clear log files for a particular VDI provider, you should be careful because the logs will be cleared for all VDI providers if they are serviced by the same built-in VDI agent. The RAS Console will prompt you if you try to delete such a shared log.

If a VDI provider has a dedicated VDI Agent, which services this host only, none of the above applies.

Enabling High Availability for VDI

High availability for VDI means that a VDI provider must never lose a connection with a VDI Agent. If the connection is lost, the guest VMs will become unavailable for user connections. High availability for VDI is accomplished by installing at least three RAS Publishing Agents and configuring a VDI provider to automatically select one of them. This way, if one of the Publishing Agents goes offline (and with it the built-in VDI Agent), the VDI provider will be automatically assigned to the VDI Agent running in the next available Publishing Agent.

To configure high availability for VDI, use the information and instructions below.

At least three Publishing Agents are required

Make sure you have at least three RAS Publishing Agents installed and running. You may also have additional Publishing Agents in standby mode, but you must have at least three agents in the active state for the high availability functionality to work. All Publishing Agents must be able to communicate with each other.

An odd number of agents is recommended

To properly control a possible split-brain situation, strictly more than half of all available Publishing Agents should be able to communicate with each other at any given time. Consider the following examples:

- Let's say there are three Publishing Agents in a Site. All of them can communicate with each other. If one of the agents suddenly loses a connection with the other two, the two agents will know that they are in the majority and will take over the VDI provider hosts that are currently managed by the first agent.
- Let's now say that there are four Publishing Agents. If one of them loses a connection to the remaining three, the same scenario will occur as in the example above. But if two agents simultaneously lose a connection to the other two, none of the two groups will be in the majority and therefore none will be able to make a decision who should take over the VDI provider hosts. In a situation like this, steps must be taken to prevent a split-brain scenario, which will happen if the agents continue to operate independently from each other. As a solution to this problem, all agents will simply abandon all VDI providers at the same time, so no data loss or any other problem can possibly happen.

For the reasons explained above, you should always install an odd number of Publishing Agents. This way, one of the groups of agents will always be in the majority and will continue to handle all VDI providers. Please note that the general recommendation (regardless or the high availability functionality described here) is to have three RAS Publishing Agents running in a Site. For details, see **Secondary Publishing Agents** (p. 56).

Please also note that Publishing Agents in standby mode (p. 54) don't participate in the high availability operations. These agents stay inactive until one of the active Publishing Agent goes completely offline. When that happens, an agent in standby mode is activated and takes place of the lost agent. From this point forward, it is considered a part of the high availability setup. When the lost agent is brought back online, everything goes back to what it was before.

Configuring a VDI provider for high availability

Use one of the following to configure a VDI provider for high availability:

- For an existing VDI provider, open the **Properties** dialog, select the **Agent Settings** tab and in the **Preferred Publishing Agent** field, select **Automatic**.

- When adding a new VDI provider, on the second wizard page where you specify the host type and address, click the **Advanced Settings** link and then select **Automatically** in the **Preferred Publishing Agent** drop-down box. Note that the **Automatic** option is selected by default when there are three or more Publishing Agents available.

If initially you have less than three RAS Publishing Agents in a Site, a VDI provider is assigned a specific preferred Publishing Agent. When at some point you increase the number of Publishing Agents to three or more and want to enable high availability for one or more VDI providers, you need to reconfigure each host so that the **Preferred Publishing Agent** property is set to **Automatic**.

Change VDI Provider Site Assignment

You can assign a VDI provider to a different Site in your Farm if needed. Please note that this functionality is only available if you have more than one Site in your Farm.

Note: You cannot assign a VDI provider to a different Site when there are templates, pools, or guest VMs that are in use on the current Site. If you try to do so, you will get an error and will not be able to proceed. To assign such a VDI provider to a different Site, you need to remove all dependencies in the current Site first.

To change the Site assignment:

1. Right-click a VDI provider and then click **Change Site** in the context menu. The **Change Site** dialog opens.
2. Select a Site in the list and click **OK**. The server will be moved to the **Providers** list on the target Site (**Farm** / <new-site-name> / **VDI** / **Providers**).

Site Defaults (VDI)

Site defaults are settings that are defined on a Site level and can be used by templates and guest VMs (both template-based and non-template based). By default, templates (described later in this chapter) inherit Site default settings, but you can override them if needed when you configure a template. Non-template based guest VMs also use Site default settings by default and you can also override them if needed when you configure these VMs.

To view and modify Site defaults, do the following:

1. Navigate to **Farm** / <Site> / **VDI**.
2. Select the **Desktops** tab in the right pane.
3. Click **Tasks** > **Site defaults**. This opens the **Site Default Properties** dialog, which is described below.

Note that any modifications you make to Site defaults are immediately applied to all guest VMs in the current Site that use them.

General

The **General** tab contains the following properties:

- **Session readiness timeout:** The maximum amount of time it should require to establish a session. If the specified timeout is reached, and the session is still not ready, the user will see an error message and will have to try to log in again.
- **Protocol:** Specifies a protocol that Parallels RAS uses to communicate with a guest VM.
- **Auto remove guest VMs which failed preparation after:** If a guest VM encounters a problem during the preparation stage (for any reason), it remains on the server but cannot be used. You can identify such VMs by the "Failed to create" value in the **Guest VM state** column (**Farm** / <Site> / **VDI** / **Desktops**). Unless a VM like this is repaired, it will be automatically removed after the time period specified in this field. You can set any of the available time periods by selecting it from the drop-down list or you can type a desired value, such as "8 days" or "12 hours"
- **Auto remove persistence if guest was not used for:** The time period after which persistence should be automatically removed. You can also type any desired time period, such as "1 week 3 days".

  Note: Beginning with RAS 17, the default setting for this option is **Never**. Please keep that in mind.

Settings

The **Settings** tab contains the following:

- **Publishing session timeout:** The amount of time a session remains logged in after the user closes a published application. The default timeout is 25 seconds. Note that this only works for applications, but not published desktops (when a user closes a desktop, the session is logged off). This timeout is used to avoid unnecessary logins when a user closes one application and then opens another.
- **Actions:** The two drop-down lists here specify an action to perform on session disconnect or logoff.

  Note for Nutanix Acropolis users: Nutanix Acropolis does not support the suspend operation for its VMs. If **Suspend** is selected in the **Perform action** field, no action will be applied to a Nutanix Acropolis VM when a session disconnect occurs (a corresponding error will be recorded in the VDI Agent log).

Security

On the **Security** tab, you can specify whether to automatically grant users Remote Desktop connection permissions on guest VMs. Here's how it works. Instead of manually adding each user to the Remote Desktop Users (or Administrators) group, you can enable this option to do it automatically. When a user logs on, he/she will be automatically added to the specified group and will therefore have the Remote Desktop connection (or full Administrator) permissions on the server. When the user logs off, they will be removed from the group (i.e. the group membership will only exist for the duration of the session).

The more important benefits of this feature are as follows:

- You don't have to permanently add your users to the Remote Desktop Users groups. This way, a user will never be able to establish a Remote Desktop session with a server outside of Parallels Client.
- By automatically adding a user to the Administrators group, you can give them rights to install applications and perform other administrative tasks. Once again, the user will only be able to do it from Parallels Client but never by connecting to the server using standard Remote Desktop tools.

Viewing Guest VMs on a VDI Provider

To view all guest VMs that exist on a VDI provider, including VMs that are NOT currently managed in Parallels RAS, do the following:

1. Navigate to **Farm** / <Site> / **VDI** / **Providers**.
2. Select a VDI provider for which you want to see the guest VM information and click the **Guest VM list** button (at the bottom of the window, below the VDI provider list).
3. The **Guest VM List** dialog opens listing guest VMs.

The dialog displays all guest VMs that exist on the selected VDI provider. This includes template-based and non template-based VMs (which are already managed in Parallels RAS) but also includes virtual machines that were created using native VDI provider tools outside Parallels RAS. The main purpose of this list is to give a RAS administrator a convenient overview of which virtual machines are available on the VDI provider.

While in **Guest VM List** dialog, you can perform the following tasks on guest VMs:

1. Install or update the RAS Guest Agent in any guest VM, including unmanaged VMs.
2. Perform power operations on guest VMs (start, stop, suspend, reset). Please note that the following requirements and rules/exceptions apply:
   - If you are using **Nutanix Acropolis**, the suspend operation is not available. The reason for this is Nutanix Acropolis does not support the suspend operation on its virtual machines.

- If you are using **Citrix Hypervisor**, guest tools must be installed in a guest VM for the **Suspend** operation to work. In addition, if guest tools are not installed, the guest VM cannot be shut down gracefully and will be stopped forcefully when you use the **Stop** option.

3 Use the provided tools to perform standard computer management tasks on a guest VM, such as establishing a remote desktop connection, pinging, and others.

4 Viewing guest VM properties.

Please note that the same tasks (and more) can be performed on managed guest VMs in the **VDI** / **Desktops** tab. For more information, see **Managing Guest VMs** (p. 150).

Templates

Templates are used to automate the creation and deployment of guest VMs in Parallels RAS. A template is based on an existing virtual machine created with one of the hypervisors supported by Parallels RAS. Once a template is ready, it can be used to create clones (guest VMs) that will inherit all properties of the template. The resulting guest VMs can then be used to host published resources.

Read the following topics to learn how to create and use a template:

- Template Types and Guest OS Requirements (p. 134)
- Creating a Template (p. 134)
- How Guest VMs are Created From a Template (p. 144)
- Manually Adding a Guest VM (p. 144)
- Template Maintenance (p. 145)
- Template Status
- Managing Multi-Provider Template Distribution
- Managing Template-based Guest VMs (p. 148)

Template Types

There are two types of templates in RAS VDI: **Virtual desktop** and **RD Session Host**. They are described in the following subsections.

Creating a Template

Requirements

To complete the tasks described in this section, the following requirements must be met:

- For hypervisor-based hosts, make sure the hypervisor tools are installed and running in the guest VM.
- Make sure you know account credentials that will allow you to push install the agent software on a VM. If you run the Parallels RAS console using such credentials (e.g. a domain admin), you will not be asked to enter them during the agent installation. If you run the console using a different account, you'll be asked to enter credentials when you install the agent.
- The guest OS (Windows) running in the VM must be configured to obtain an IP address from a DHCP server.
- For users to access published resources in a guest VM, the RDP port must be open locally or via Group Policy in Windows running in the VM. The default RDP port is 3389.
- For RD Session Host templates, Network Discovery UDP port 137 must be enabled for a domain firewall profile in the guest OS. This can be done via domain group policies or manually in the guest OS.

Manual agent installation

Normally, you will push install the necessary agent software in a source VM right from the Parallels RAS console (as described later in this section). However, you can also install the software manually by running the Parallels RAS installer in Windows in the VM. When doing so, use the **Custom** installation option and select the following agent components depending on the type of the template (p. 134) that you are creating:

- **Virtual desktop**. This template type requires RAS Guest Agent to be installed in the source VM.
- **RD Session Host**. This template type requires RAS Guest Agent and RAS RD Session Host Agent to be installed in the source VM.

Create a template

The process of creating a template consists of two stages:

Stage 1: During the first stage, the wizard will verify if the agent software is installed and will give you an option to install it if needed.

Stage 2 (p. 137): During the second stage, you configure the template.

Each stage is described in detail in the sections that follow this one (or follow the links above).

Stage 1: Check and Install the Agent Software

To begin creating a template:

1. In the RAS Console, navigate to **Farm** / <Site> / **VDI**.
2. Select the **Templates** tab in the right pane.
3. In the **Tasks** drop-down menu, click **Add** (or click the "+" icon)

4 In the dialog that opens, select a guest VM from which you would like to create a template and click **OK**.

5 The **Create Parallels Template Wizard** opens. Each wizard page is described below in the order they appear on the screen.

Template type

On the first page of the wizard, select a template type to create: **Virtual desktop** or **RD session host.** For details, see **Template Types** (p. 134).

Check agent

On the next page, the wizard will check if the selected VM has the RAS Guest Agent installed. Wait for it to finish and then examine the **Status** field (closer to the bottom of the page). Depending on the result, do one of the following:

- If the agent is installed, click **Next** to continue. You may stop reading here and jump to **Stage 2: Configure the Template** (p. 137).
- If the agent is not installed, you need to install it as described below.

To install the agent, first click the **Customize Guest Agent deployment settings** link and specify the options in the dialog that opens. None of the options are forced, so you can select or clear them depending on your needs. Note that depending on the template type, the options are different, as described below.

Virtual desktop:

- **Add firewall rules:** Automatically configure firewall rules in the guest VM.
- **Allow remote desktop connections:** Select to automatically configure remote desktop access in the VM.
- **Specify users or groups to be added to the Remote Desktop Users group:** Select this option and then click the **[+]** icon to add specific users to the group.

RD Session Host:

- **Add firewall rules:** Automatically configure firewall rules in the guest VM.

  Note: Network Discovery UDP port 137 must be enabled for a domain firewall profile in the guest OS as a separate step. This can be done via domain group policies or manually in the guest OS.

- **Install RDS role:** Install the RDS role in the guest VM.
- **Enable Desktop Experience:** Enable the Desktop Experience feature in Windows.
- **Restart server if required:** Restart the VM if required.
- **Specify users or groups to be added to the Remote Desktop Users group:** Select this option and then click the **[+]** icon to add specific users to the group.

When done specifying the options, click **OK** to close the dialog.

Now click the **Install** button and follow the onscreen instructions to install the agent software.

Hint: If the guest VM cannot be reached by its name specified as hostname, double-click the guest VM name and change it to the correct IP address.

Once done, verify that the agent is installed by looking at the **Status** field on the **Check Agent** wizard page. If so, continue to the next section that describes **Stage 2: Configure the Template** (p. 137).

Stage 2: Configure the Template

Once the agent is installed, and the **Status** field on the **Check Agent** wizard page confirms this, click **Next**. The VM will now be powered off (wait for the power off operation to finish). Once the VM is powered off, the template configuration stage begins. The subsequent wizard pages are described below.

Properties

On this page, specify the following options:

- **Template name:** Choose and type a template name.
- **Maximum guest VMs:** Specify the maximum number of guest VMs that can be created from this template.
- **Number of guest VMs deployed on the wizard completion:** The number of guest VMs to deploy once the template is created. Please keep in mind that this will take some time because the VMs will be created one at a time.
- **Guest VM name:** A pattern to use when naming new guest VMs. For details, see **Guest VM naming** (p. 141).
- **Keep available buffer:** The minimum number of guest VMs to always keep on the VDI provider and ready to be used in order to provide the fastest access to end users.
- **Delete unused guest VMs after:** Specify when to delete unused guest VMs to save resources.
- **Clone method:** Whether to create linked or full clones. A full clone is a complete copy of a template. As such, it occupies as much space on the physical hard drive as the source template and takes a significant time to create. A linked clone is a copy of a template made from a snapshot that shares virtual disk with the source template, therefore it takes much less space on the physical hard drive and it takes only a couple of minutes to create.

  You should use full clones if your application and OS updates are too slow (full clones take longer to create, but they provide the best possible performance). Otherwise if your updates are fast enough, use linked clones as it takes much less time to create them.

  Note: If the **Create a linked clone** option is grayed out, it means that the current version or Parallels RAS does not support linked clones with the VDI provider that you are using. At the time of this writing, support for linked clones is available for VMware, Microsoft Hyper-V, KVM, Scale Computing HC3, and Nutanix.

Advanced

The **Advanced** page has different properties for different VDI providers. The differences are described below.

Hypervisor-based VDI providers:

- **Cluster Shared Volume (CSV)**, **Network share**: These two options appear if you are using Hyper-V Failover Cluster. They allow you to select a type of storage where guest VMs will be created. Select a desired option and then click the **[...]** button next to the edit field. Depending on the option selected, specify a Cluster Shared Volume or a network folder. Note that a shared folder must be compatible with SMB 3.0. Please also read the important note below.

  Note: To use this functionality, you need to set SMB constrained delegation (resource-based) using Windows PowerShell. **Important:** Windows Server 2012 forest functional level is required.

  On a server running Windows 2012 R2 and above install the Active Directory PowerShell module using Powershell. Note that you don't need the module on a Hyper-V host or SMB file servers.

  Run the following cmdlet:

  ```
  Install-WindowsFeature RSAT-AD-PowerShell
  ```

  Delegate SMB delegation on a file server (cluster) for every node of Hyper-V cluster. For example if you are running a four-node Hyper-V cluster and you use a Scale-Out File Server cluster FS-CL01 as virtual machine storage:

  ```
  Enable-SmbDelegation –SmbServer FS-CL01 –SmbClient Hyperv-01
  Enable-SmbDelegation –SmbServer FS-CL01 –SmbClient Hyperv-02
  Enable-SmbDelegation –SmbServer FS-CL01 –SmbClient Hyperv-03
  Enable-SmbDelegation –SmbServer FS-CL01 –SmbClient Hyperv-04
  ```

  Mandatory: verify applied settings (the actual delegations) as follows:

  ```
  Get-SmbDelegation –SmbServer FS-CL01
  ```

- **Folder:** This option is available if you are using Hype-V, VMware vCenter, KVM, or Nutanix. It specifies a folder where guest VMs will be created.
- **Native Pool:** This option is available if you are using VMware ESXi and VMware vCenter. It specifies a native VM pool.
- **Resource Pool:** This filed is shown instead of the **Native Pool** filed (above) only if the VDI provider type is VMware vCenter and you have specified a resource pool when you configured the VDI provider. For more info, see **Add a VDI Provider** (p. 116). The field allows you to select a specific vCenter resource pool that exists at the same or lower lever in the pool hierarchy. Click the **[...]** button to select a resource pool.
- **Physical Host:** Available for VMware vCenter. Specifies a physical host where guest VMs will be created.

Microsoft Azure VDI provider:

- Resource group: Select an Azure resource group where the cloned VM will be created. Note that this must be a group to which you granted permissions to the Azure AD app. For details, see Create a Microsoft Azure AD Application (p. 119).
- **Size:** Select a VM size to be used for cloned VMs.
- **OS disk type:** Select a disk type to be used for cloned VMs.

Preparation

Use the **Preparation** page to select and configure an image preparation tool.

Note: When you specify properties on this page, they are remembered in your personal configuration file on the local machine. The next time you decide to create another template, the fields here will be populated automatically using the values you used the last time.

First, select whether you want to use RASprep or Sysprep. The advantages of using RASprep and the differences between the two tools are described below.

RASprep is the Parallels RAS tool for preparing Windows in a VM after cloning it from a base image. RASprep performs the following tasks during the initial startup of each new VM:

- Creates a new computer account in Active Directory for each guest VM.
- Gives the guest VM a new name.
- Joins the guest VM to the Active Directory domain.

Compared to Sysprep, RASprep works much faster because it modifies a lower number of configurable parameters and requires less reboots.

Note: Due to API limitations, RASprep cannot be used on Windows Server 2008 machines.

The following table lists the main differences between RASprep and Sysprep:

Operation	RASprep	Sysprep
Delete local accounts	No	Yes
Generate new SIDs	No	Yes
Unjoin the parent guest VM from the domain	No	Yes
Change computer name	Yes	Yes
Join the new instance to the domain	Yes	Yes
Language, regional settings, date and time customization	No	Yes
Number of reboots	1	2 (seal, mini-setup and domain joining)

After selecting the preparation tool, specify the following options:

- **Computer name:** A name pattern that should be used to assign a computer name. For example, Windows10-RAS-%ID%.
- **Owner name:** Owner name (optional).
- **Organization:** Organization name (optional).
- **Administrative password:** Local Windows administrator password.
- **Join domain:** A domain name for the VM to join.
- **Administrator:** Domain account.
- **Password:** Domain account password.
- **Target OU:** Full DN of an organizational unit. Click the **[...]** button to browse Active Directory and select an OU.

License Keys

On the **License Keys** page, specify the license key information that will be used to activate virtual machines created from this template.

First, select the license key management type that you are using in your organization (KMS or MAK). Parallels recommend to use KMS because MAK has limited activations.

Key Management Service (KMS): If you are using KMS, click the **Finish** button to save the template configuration information. Virtual machines that will be created from this template will look for KMS in DNS (at the end of the OS mini-setup and domain joining) and will be activated accordingly.

Note: If you are using KMS activation and RASPrep, the source guest VM must be activated using KMS before you create a template from it. If the guest VM has already been activated using another method (retail key or MAK), you need to convert it to KMS activation. For the information on how to do it, please read the following article from Microsoft: https://technet.microsoft.com/en-us/library/ff793406.aspx

Multiple Activation Keys (MAK): If you are using MAK, do the following:

1. Click the **Add** button and type a valid key in the **License key** field.
2. In the **Max. guests** field, specify the key limit. The limit should be greater than or equal to the max guests in the template (which you set on the first page of the wizard)
3. Click **OK**.

Note: Parallels RAS does not keep the old MAK key in guest VMs if it was updated in the Parallels template properties.

Settings

Specify the following additional settings on this tab:

- **Publishing session timeout:** Specifies the session timeout.

- **Actions:** Allows you to select an action that will be performed on a selected session event. The **After** field, specifies the time period after which the action will be initiated.

Security

Allows you specify the following security settings:

- **Grant users remote desktop connection permissions:** This option allows you to automatically grant a user permissions for a remote desktop connection. This is achieved by temporarily adding a user to a local group on connect and then removing him/her on logoff or disconnect. To enable this option, select the checkbox and then select one of the available local groups (Remote Desktop Users or Administrators) to which users will be added.

Summary

On the **Summary** wizard page, review the template summary information. You can click the **Back** button to correct some of the information if needed.

Select the **Launch Parallels Test Template Wizard on completion** option to start a wizard allowing you to test the health of the template. The wizard allows you to see upon completion that all post-prep activities complete correctly. This includes checking DHCP settings, DNS registration, correct VLAN, joining the AD domain, correct target OU, etc. The wizard is described in the section that follows this one (p. 143).

Finally, click **Finish** to create the template and close the wizard.

Guest VM naming

This section describes the guest VM naming pattern that you specify on the **Properties** page of the template creation wizard.

Each time a new guest VM is created, a name for it is generated automatically based on the pattern that you specify in the **Guest VM name** field (p. 137). The complete name format is as follows:

```
<prefix>%ID:N:S%<ending>
```

where:

- **<prefix>** is an alphanumeric string that must begin with a letter (not a digit).
- **%ID:N:S%** is a numeric pattern used to automatically generate a unique guest VM ID. See the **Numeric pattern** subsection below.
- **<ending>** is a free-form alphanumeric string.

Numeric pattern

The numeric pattern in the VM name has the following format:

`%ID:N:S%`

The elements in the pattern above are:

- **ID** — Must be included as is.
- **N** — The number of digits to use, including leading zeros. Use "0" if you don't want to insert leading zeros.
- **S** — The starting number. This element is optional. If you don't include it, the number will start with 1.

Examples:

- `%ID:3%` — This pattern will generate 3 digit numbers with leading zeros, such as "001", "002", "003"...."998", "999".
- `%ID:3:200%` — This example will generate 3 digit numbers starting from 200, such as "200", "201", "202"..."998", "999".
- `%ID:0%` — This pattern will generate numbers with no leading zeros. It will start at 1 and will (theoretically) go up until the length limit is reached, which is 15 characters for the entire name.
- VDI-R1-%ID:3:100% — This is a complete name with an alphanumeric prefix and a numeric pattern. The resulting names will look like the following: "VDI-R1-100", "VDI-R1-101", etc.

When crating a name pattern, follow the rules listed below. If any of these rules are not observed, you will see an error message and will have to correct it:

- The name must start with a letter. A digit is not allowed as the first character.
- The alphanumeric part of a name can contain letters, digits, and a hyphen. No other characters are allowed.
- The total length of the name must not exceed 15 characters.
- The name can include just one numerical pattern (`%ID:N:S%`), which must be placed at the end or in the middle of the name.

The pattern that you specify is also validated against the value of the **Maximum guest VMs** field. If the pattern doesn't cover the maximum number of guest VMs, you will get an error and will have to correct it.

Reusing VM names

When you delete a guest VM, the number that was assigned to it becomes unused, while the total number of guest VMs is reduced. When you reach the maximum number (as defined by the pattern), the unused numbers will be reused and assigned to new guest VMs. This way the total number of guest VMs that you can create will be unaffected.

Parallels Test Template Wizard

The **Parallels RAS Test Template Wizard** is used to test the health of a template. The wizard allows you to see that all post-prep activities for a template complete correctly. This includes checking DHCP settings, DNS registration, correct VLAN, joining the AD domain, correct target OU, etc.

To open the wizard, right-click a template in the Parallels RAS console and choose **Test**. The test procedure consists of the following steps:

1. The template is switched temporarily to the "Test" mode designed specifically for this purpose. Please note that while the template is in this mode, all other operations are blocked until the test is finished and the template exits the test mode.
2. A guest VM is cloned from it to be used for testing. The VM is kept on the server for the duration of the test and will be deleted afterwards.
3. A series of tests is then run on the guest VM to test the template from which it was created.
4. Once the test is complete, a report is displayed on the screen showing the test results.

When the wizard starts:

1. The **Welcome** page opens. Read the info that it contains and click **Next** when ready.
2. The next page displays the list of individual tests that will be performed, including:
   - **Check guest VM Agent:** This test tries to communicate with the RAS Guest Agent installed in the VM. If the agent responds, it means that the VM has been created and started successfully.
   - **Check domain membership:** Checks that the computer has joined the AD domain.
   - **Check target OU:** Checks that the RDP connection to the computer is possible with domain credentials.
   - **Launch Parallels Client:** This test launches Parallels Client and establishes a connection with the guest VM.
3. While the test is running, the progress indicator is displayed on the screen. If needed, you can cancel the test at any time by clicking the **Cancel** button.
4. Once all tests are completed, you will see a page displaying the test results:
   - **Success:** If all tests complete successfully, the temporary guest VM will be marked for deletion and the template will be switched back to the normal operation mode.
   - **Failure:** If one or more tests fail, you will see the corresponding info and will be able to download the log file by clicking the **Download log file** link. You will also have an option to switch the template to maintenance mode, which will prevent creating guest VMs from it until it is fixed.
5. Click **Finish** to close the wizard.

Modifying Template Properties

If you need to change the configuration of an existing template, select it in the **Templates** list and click **Tasks** > **Properties**. This opens the **Template Properties** dialog, which consists of tabs containing the same properties as the wizard pages described in **Stage 2: Configure the Template** (p. 137).

How Guest VMs Are Created From a Template

After a template is created, Parallels RAS begins creating guest VMs from it, one virtual machine at a time. The number of VMs created at this time is determined by the **Number of guest VMs deployed on the wizard completion** property (all property names here and later refer to the **Create Template Wizard** described earlier).

The number of VMs available at any time will never go below the number specified in the **Keep available buffer** property. To comply with this rule, a new VM is automatically created when needed. At the same time, the total number of VMs will never exceed the number specified in the **Maximum guest VMs** property.

Please note that creating a new guest VM from a template takes some time, especially when a template is configured to create full clones (linked clones are created much faster). If a guest VM is in the middle of being created, and no other VMs are available, a user (or users) who need it will have to wait until the VM is ready.

If a guest VM encounters a problem during the preparation stage, it will remain on the server in unusable state. You can identify such VMs by the "Failed to create" value in the **Guest VM State** column. Unless a VM like this is repaired or recreated, it will be automatically removed after the time period specified in the **Auto remove guest VMs which failed preparation after** field in Site defaults (Farm / <Site> / **VDI** / **Desktops** > **Tasks** > **Site defaults**). For more information on how to recreate a guest VM, please see the **Template Maintenance** section (p. 145).

Auto-deletion of guest VMs

A guest VM is automatically deleted when it is not used longer than specified in the **Delete unused guest VMs after** field in template properties.

Manually Adding a Guest VM

Guest VMs are created from a template automatically. In a situation when one or more additional guest VMs are required, you can add (create) them manually.

To add a guest VM:

1. In the RAS Console, navigate to **Farm** / <Site> / **VDI** / **Desktops**.
2. Click the **[+]** icon at the top of the list.

3 In the **Add Guest VMs** dialog that opens, select a template from which to create a new guest VM,

4 Specify the number of guest VMs to create. If the number you specify exceeds the "Maximum guest VMs" value set in template properties (taking into account the number of VMs that already exist), you'll see a warning message and will need use a lower number or change the max number in template properties.

5 Click **OK** to close the dialog.

6 After you click **Apply** in the RAS Console, the new guest VMs will appear in the list on the **Desktop** tab with the **Guest VM state** column saying "Cloning". Once the cloning is complete, the new guest VMs become available to users.

Template Maintenance

A template can be put into to a special mode called "maintenance", which is primarily used to update or install software in the guest operating system. While in this mode, the template becomes unavailable for all normal tasks, including creating new guest VMs, and it becomes possible to start it as a regular virtual machine. Once the virtual machine is running, you can install or update software in the guest OS or perform administrative tasks in the operating system.

Depending on whether a template is configured for full or linked clones, the maintenance mode is used slightly differently, as described below.

Full clones

If your template is configured to create full clones, do the following:

1 Select a template and click **Tasks** > **Maintenance**. The template becomes disabled (grayed out) all operations on it are suspended.

2 Using native tools of the hypervisor, start the template as a normal virtual machine.

3 Install Windows updates or software as necessary.

4 When done, shut down the virtual machine.

5 Back in the RAS Console, select the template and click **Tasks** > **Maintenance** again to exit the maintenance mode.

6 At this point, you may see a message asking whether you would like to recreate existing guest VMs. The message is displayed when there's one or more existing guest VMs that were already created from this template. When you update a full clone template, the changes will only affect future clones. For existing clones to have these updates, they must be recreated. You can choose to recreate existing guest VMs now or you can postpone it. Please note that recreating a full clone is a time consuming process. Also, n new app may be installed in a full clone VM or a user profile may be changed while the recreation is in progress, all of which will be lost. To minimize impact on users, it makes sense to schedule a maintenance window during which the clones can be recreated.

Linked clones

Since linked clones share the virtual hard disk with a snapshot of a template, you need to take additional steps compared to full clones.

First, you need to notify guest VM users to save their data and log off. This is necessary for existing guest VMs to include the updates that you will install in the template. Once all users are logged off, do the following:

1. Select the template and click **Tasks** > **Maintenance**. The template becomes disabled (grayed out) and all operations on it are suspended.
2. Using native tools of the hypervisor, start the template as a normal virtual machine.
3. Install Windows updates or software as necessary.
4. When done, shut down the virtual machine.
5. Back in the RAS Console, select the template and click **Tasks** > **Maintenance** again to exit the maintenance mode. A dialog is displayed asking if you would like to recreate existing guest VMs. If you click **No**, then the dialog is closed and the existing guest VMs are left in their current state, which means that the updates that you installed will not appear in the existing VMs. If you click **Yes**, read on.
6. If you click **Yes** in the previous step, existing guest VMs will be examined for active connections. If an active connection exists, another dialog opens asking if you want to proceed:
   - If you click **Yes**, all active sessions are forcibly logged off and existing guest VMs (linked clones), together with the corresponding snapshot, are deleted and a new snapshot and VMs are created from the updated template.
   - If you click **No**, the **Template Guest VMs List** dialog opens where you can view the current state of each available guest VM. The dialog gives you control over a guest VM. You can send a message to the user and you can log the user off. Once all active sessions are logged off, click **OK**. The existing guest VMs and the corresponding snapshot are deleted and a new snapshot and VMs are created from the updated template.

When you are done configuring a template, click the **Apply** button on the main RAS Console window to commit the changes to Parallels RAS.

Please note that if you leave the maintenance mode without recreating linking clones, you will have to enter the maintenance mode again to apply the updates.

Updating RAS Guest Agent inside a template

A template must have the latest version of RAS Guest Agent installed in it. The agent is installed when you create a template. When a new version of RAS Guest Agent becomes available, it should be updated. To update the agent, the maintenance mode must be used as described above. To simplify agent updates, Parallels RAS monitors all installed agents and notifies the administrator when an update is available.

When the RAS Console starts, all installed agents are checked and a message is displayed if one or more agents need to be updated. This applies to servers in the RAS infrastructure and the templates. The message will ask if you want to update all agents. If you click **Yes**, you are presented with a dialog listing all servers and templates on which an agent needs to be updated. You can select or un-select a server/template to include it in the bulk update procedure or exclude it. Once you've made your selection, click **OK** to start the update. Follow the onscreen instructions and update the agents.

Full vs. linked clone templates: When you update RAS Guest Agent in a template, you also need to update Agents in guest VMs that were created from this template. This update is done differently for full and linked clone templates. Please read the instructions below for the explanation.

When you update the Agent in a linked clone template, you'll be asked if you want to recreate all guest VMs that were created from this template. You can click **Yes** and they will be automatically recreated to match the template.

When you update the Agent in a full clone template, full clone guest VMs are not automatically recreated. You will be asked if you want to recreate them. If you decide to do so, please note that full clone VMs are complete machines, so recreating them is a time-consuming process. Alternatively, you can update the agent in these VMs by push-installing it from the RAS Console. This can be done by clicking **Tasks** > **Upgrade all Agents** while on the **VDI** > **Desktops** tab.

To manually check the RAS Guest Agent status in a template, click **Tasks** > **Check agent**. If the agent is up to date, a message box is displayed confirming this. If a newer version of RAS Guest Agent is available, you'll see a dialog asking you to update it. Please note that the difference in updating full and linked clone templates (as described above) applies to this scenario as well.

Maintaining RD Session Hosts based on a template

If you need to do a scheduled maintenance of RD Session Hosts that were created from a template, please follow these steps:

1. Create a schedule that fits your maintenance window to drain a desired RD Session Host group.
2. During maintenance (or right before it) switch the template into maintenance mode. Then apply the necessary changes.
3. The schedule disables groups provisioned by the template (while the maintenance window lasts) which leads to removing (unassigning) all guest VMs from them.
4. Release the template from maintenance and click **Yes** when asked whether to recreate all clones.
5. Enable groups which were disabled in step 3 (above). At this point, the groups will begin receiving guest VMs to comply with **Keep Available Buffer** setting
6. From this point forward, groups are provisioned with VMs on demand.

Managing Template-based Guest VMs

Guest VMs and other desktops are managed on the **VDI** > **Desktops** tab, where you can perform all of the standard desktop management operations from the **Tasks** menu. The operations include Recreate, Delete, Upgrade all Agents, Assign, Unassign, Show sessions, Start, Stop, Suspend, Reset, and others.

By default, the **Desktops** tab displays all of the desktop available in the Farm (you may need to scroll the list to see all available desktops). To see just the guest VMs that belong to a specific template, select a template in the **Templates** tab and click **Tasks** > **Show guest VMs**. This will switch you to the **Desktops** tab where the list will be automatically filtered to include only the VMs that belong to the selected template.

For more information, see **Managing Guest VMs** (p. 150).

VDI Pool Management

Pools offer administrators more flexibility when managing an extensive number of guest VMs, especially when they are implemented in large company infrastructures. The RAS Console provides you with the framework and tools needed to create a complete pool management foundation. To manage pools, in the RAS Console, navigate to **Farm** / <Site> / **VDI** and then click the **Pools** tab.

Read on to learn how to:

- Add and delete pools (p. 148)
- Add and delete pool members (p. 148)
- Use a wildcard to filter VMs (p. 149)
- Manage guest VMs in a pool (p. 149)

Adding and Deleting Pools

To add a pool, click the **Tasks** drop-down menu above the **Pools** list and then click **Add** (or click the plus-sign icon). Type a pool name and then click anywhere outside the edit field.

To delete a pool, right-click it and then click **Delete** (or click the minus-sign icon, or **Tasks** > **Delete**).

Adding and Deleting Pool Members

A VDI pool can contain different types of members. These could be all available guest VMs, specific guest VMs, and guest VMs created from a template.

To add a member to a pool:

1 Select a pool in the **Pools** list.

2 In the **Tasks** drop-down menu above the **Members** list (the upper right-hand corner of the **Members** area), click **Add** and choose a member type from the following list:

- **All guest VMs in Host**. All guest VMs that are located on a given VDI provider. After clicking this options, you'll be able to select a VDI provider.

  Note: Parallels does not recommend to use this type because there's a possibility that guest VMs with unsupported OS will be added (e.g. Linux, HALB etc). If you need to use this type, please do it carefully or use a wildcard with appropriate guest VMs names (p. 149).

- **Guest VM**. A specific guest VM located in the Farm. After clicking this options, you'll be able to select a guest VM from the list.
- **Resource pool**. A group of guest VMs that were natively configured in the hypervisor as a pool. Please note that a hypervisor may use a different term for pools (e.g. "resource pools"). After clicking this option, you'll be able to select a resource pool from the list, if any are available.
- **Template**. Guest VMs that are automatically created from a template. After selecting this option, you'll be able to select a template. For more information about templates, refer to **Managing Templates** (p. 134).

3 After you click one of the above menu items, you will be presented with the list of the available hosts, guest VMs, or templates from which you can make your selection.

Note: To avoid issues with overlapping members, a given pool can have members of the same type only. For example, if the first member that you add to a pool is a guest VM, any additional member can be a guest VM, but not a template, Resource pool, or all guest VMs on a specified host. If you want to use members of different types, you must create a separate pool for each member type (i.e. one pool for guest VMs, another pool for templates, etc.). This requirement is enforced in the UI by disabling the member type choices once the first member is added to a pool.

To delete a member from a pool, select the pool, then select a pool member you wish to delete, and then click **Tasks** > **Delete**.

Using a Wildcard to Filter VMs

Use the **Wildcard** input field at the bottom of the **Pools** tab to specify a wildcard to indicate which guest VMs should be available for users. If a VM name matches the wildcard, it will be available. If not, the users will not be able to use it. Use the asterisk operator (*) to specify a wildcard (e.g. `ABC*`, `*ABC*`).

Managing Guest VMs in Pools

Guest VMs that belong to a pool (and other guest VMs and desktops) are managed on the **VDI** > **Desktops** tab, where you can perform all of the standard desktop management operations from the **Tasks** menu. The operations include Recreate, Delete, Upgrade all Agents, Assign, Unassign, Show sessions, Start, Stop, Suspend, Reset, and others.

By default, the **Desktops** tab displays all of the desktop available in the Farm (you may need to scroll the list to see all available desktops). To see just the guest VMs that belong to a specific pool, select a pool in the **Pools** tab and click **Tasks** > **Show guest VMs in Pool**. This will switch you to the **Desktops** tab where the list will be automatically filtered to include only the VMs that belong to the selected pool.

Managing Guest VMs

There are two basic types of guest VMs when using Parallels RAS VDI: template-based and non-template based. This topic describes management tasks for both guest VM types, indicating whether a task applies to a particular guest VM type.

Viewing guest VM list

To view the list of non-template based guest VMs, select **Farm** / <Site> / **VDI** / **Desktops**. If you have a filter applied to the list, remove it by click the magnifying glass icon. Without the filter, the list shows all desktops available in this RAS Farm, including guest VMs (both template-based and non-template based), guest VMs from a pool (RAS or native), and pool-based Remote PCs. Therefore, the **Desktops** tab is a location where you can view all of your desktops in one place. Here you can perform all of the standard desktop management tasks accessible from the **Tasks** menu, including Recreate, Delete, Assign, Unassign, Start, Stop, Suspend, Reset, Show sessions, and others.

To view the list of guest VMs created from a template, select **Farm** / <Site> / **VDI** / **Templates.** Select a template and click **Tasks** > **Show guest VMs**. You will be switched to the **Desktops** tab where the list of desktops will be filtered to include only those that belong to the template. As was mentioned above, you can perform all of the standard desktop management operations on this tab, including power operations, which are described in detail later in this section.

For the list to include only the guest VMs from a particular pool, select a pool in the **Pools** tab and click **Tasks** > **Show guest VMs in Pool**.

The filter in the **Desktop** tab can also be applied manually by clicking the magnifying glass icon and entering the filter criteria in the fields that appear at the top of the list.

Site Defaults

Guest VMs created from a template inherit the template settings. To view the settings, note on which template a guest VM is based and then view properties of that template, specifically the **Settings** and **Security** tabs. For more information, see **Site Defaults** (p. 131). Note that you a template can inherit Site default settings or you can specify your own custom settings for it.

Non-template based guest VMs have their own settings, some of which (specifically Settings and Security) are inherited from Site defaults (p. 131). To see settings for a non-template based VM, navigate to **Farm** / <Site> / **VDI** / **Desktops**. A guest VM that doesn't belong to a template is identified by an empty value in the **Template** column. Right-click a template and choose **Properties** (note that template-based guest VMs do not have this menu option).

Performing guest VM power operations

To perform power operations on a guest VM (start, stop, suspend, reset), open the **VDI** / **Desktops** tab, select a guest VM, then click **Tasks** and choose an operation that you want to perform (for start and stop operations, you can click the corresponding icons at the top).

Please note that the following requirements and rules/exceptions apply:

- If you are using **Nutanix Acropolis**, the suspend operation is not available (the **Suspend** icon is disabled). The reason for this is Nutanix Acropolis does not support the suspend operation on its virtual machines.
- If you are using **Citrix Hypervisor**, guest tools must be installed in a guest VM for the **Suspend** operation to work. In addition, if guest tools are not installed, the guest VM cannot be shut down gracefully and will be stopped forcefully when you click the **Stop** icon.

Checking the RAS Guest Agent status

A guest VM must have the RAS Guest Agent installed and the agent must match the Parallels RAS version. The agent is installed by default when a guest VM is created from a template. If a guest VM was created using the native hypervisor tools, it may not have the agent installed in it. In such a case, the guest VM will be able to serve only the remote desktop. To enable it to server applications or documents, you'll need to install the agent yourself.

Note: Guest VMs based on an RD Session Host template must also have the RAS RD Session Host Agent installed. The functionality described here does not verify if this agent is installed. If needed, you can use **Tasks** > **Check Agent** on the template itself.

To check if the RAS Guest Agent is installed in a guest VM and is up to date:

1. Select a guest VM in the list and then click **Tasks** > **Troubleshooting** > **Check agent**.
2. The **Guest Agent Information** dialog opens displaying the information about the RAS Guest Agent.
3. If the agent is not installed, click the **Install** button and follow the instructions. The agent will be push installed in Windows running inside the guest VM.

Deleting a guest VM

To delete a template-based guest VM, select it and then click the **Tasks** > **Delete**.

Important: You should delete a guest VM only from the RAS Console. You should NOT try to delete a guest VM using the hypervisor's native client or web interface. If you do, it may delete not only the VM but its parent template as well (which will also invalidate all other guest VMs created as linked clones from this template). The reason for this is some native hypervisor clients treat linked clones as standalone VMs. Parallels RAS treats linked clones as clones, not as standalone VMs.

Managing guest VMs that failed preparation

If a template-based guest VM encounters a problem during the preparation stage, it remains on the server but cannot be used. You can identify such VMs by the "Failed to create" value in the **Guest VM State** column. Unless a VM like this is repaired, it will be automatically removed after the time period specified in the Site defaults (p. 131). To see Site defaults:

1. Select **Farm** / <Site> / **VDI** / **Desktop** and then click **Tasks** > **Site defaults**.
2. In the dialog that opens, on the **General** tab, view or modify (if needed) the **Auto remove guest VMs which failed preparation after** option. You can set any of the available time periods by selecting it from the drop-down list or you can type a desired value, such as "8 days" or "12 hours".

Recreating a guest VM

If something happens to a template-based guest VM and it becomes unusable, you don't have to delete it and create a new one. Instead, you can recreate it keeping its name and MAC address (to guarantee that VM will get the same IP address from the DHCP server). This way none of the other Site settings, which may rely on a broken guest VM, will be affected. Another reason for recreating a guest VM is to apply changes made to the template (when you exit from maintenance without executing the Recreate command). Please note that keeping the MAC address is supported on ESXi, vCenter, Hyper-v and Hyper-v Failover Cluster only.

Note: If a guest VM was created from an RD Session Host template and was already assigned to an RD Session Host group, it cannot be recreated.

To recreate one or more guest VMs:

1. In the Parallels RAS Console, navigate to **Farm** \ <Site> \ **VDI** \ **Templates**.
2. To recreate all deployed guest VMs, click the **Tasks** drop-down menu and choose **Recreate all guest VMs**.
3. To recreate a specific guest VM (or multiple guest VMs), click **Tasks** > **Show guest VMs**. This will open the **Desktops** tab, which will list guest VMs. Select one or more guest VMs and then click the **Tasks** > **Recreate**.

When you recreate a guest VM:

- The procedure deletes a VM and creates a new one from the same template.
- The new guest VM retains the same computer name as the one it replaces.

- If a guest VM is running, all unsaved data in its memory will be lost. For this reason, an important data should be saved to an external storage.

Persistent Guest VMs

A guest VM is called persistent when it is assigned to a particular user. To make a guest VM persistent, do the following:

1. Begin publishing a desktop or a resource from a guest VM.
2. When specifying **Virtual Guest Settings** options, select **Persistent**.
3. Complete the publishing wizard.
4. As a result, the first user who uses a desktop or a resource from this guest VM will become the owner of the VM (i.e. the VM will be assigned to the user).

You can also manually assign a guest VM to a user. To do so:

1. Navigate to **Farm** / <Site> / **VDI** / **Desktops**.
2. Select a guest VM and click **Tasks** > **Assign**.
3. Select a user (enter your network credentials if asked) and click **OK**.
4. As a result, the guest VM will be assigned to the selected user.

To view persistent guest VMs, navigate to **Farm** / <Site> / **VDI** / **Desktops**. A persistent guest VM is identified by the "Persistent" value in the **Assignment** column.

To remove persistence from a guest VM, do one of the following:

- Select a guest VM on the **Desktops** tab and then click **Tasks** > **Unassign**.
- Navigate to **Farm** / <Site> / **VDI** / **Desktops** and click **Tasks** > **Site defaults.** In the dialog that opens, use the **Auto remove persistence if guest VM was not used for** option to select the time period after which persistence should be automatically removed. You can also type any desired time period, such as "1 week 3 days".

Using Computer Management Tools

You can perform standard computer management tasks on server right from the RAS Console. These include Remote Desktop Connection, PowerShell, Computer Management, Service Management, Event Viewer, IPconfig, Reboot, and others. To access the **Tools** menu, select a server, click **Tasks** (or right-click) > **Tools** and choose a desired tool. For requirements and usage information, see **Computer Management Tools** (p. 354).

Publishing from a Guest VM

This section describes how to publish resources hosted by a guest VM. The publishing functionality described here is accessed from the **Publishing** category in the RAS Console.

Publishing a Desktop from a Guest VM

Note: When you publish one or more applications from a pool or template, you cannot publish a desktop from it. Likewise, if you publish a desktop from a VDI pool or specific template, you cannot publish individual applications from it.

To publish a remote desktop from a guest VM, follow the below procedure:

1. In the RAS Console, select the **Publishing** category and click the **Add** icon below the **Published Resources** tree. This will launch the publishing wizard.
2. In the first step of the wizard select **Desktop** and click **Next**.
3. On the **Select Desktop Type** page, select **Virtual Desktop** and click **Next.**
4. On the **Virtual Desktop** page, enter a desktop name, an optional description, and change the icon if needed.
5. In the **Guest VM settings** section, specify from where the desktop should be published. First, you need to select an option in the **Connect to** drop-down list and then specify an additional parameter in the field below it as follows:
   - **Any guest VM**. Use the **from Pool** drop-down list to specify a pool.
   - **Specific Template**. Select a template by expanding the template drop-down list.
6. Select the **Persistent** option to mark a guest VM as persistent the first time a user connects to it.
7. In the **Desktop Size** section, specify the desktop screen resolution and size.
8. In the **Multi-Monitor** field, select the desired option (enable, disable, use client settings).
9. If needed, select the **Persistent** option (lower right) to make a guest VM persistent. For more information, see **Persistent Guest VMs** (p. 153).
10. Click **Finish** when done.

Publishing an Application from a Guest VM

Note: When you publish a desktop from a VDI pool or specific template, you cannot publish individual applications from it. Likewise, if you publish one or more applications from a pool or template, you cannot publish a desktop from it.

To publish an application from a guest VM or guest VM clone:

1. In the RAS Console, select the **Publishing** category and then click the **Add** icon below the **Published Resources** tree (or right-click inside the **Published Resources** box and click **Add** in the context menu). This will launch the publishing wizard.
2. On the **Select Item Type** wizard page, select **Application** and click **Next.**
3. On the **Select Server Type** page, select **Virtual Guest** and click **Next**.
4. On the **Select Application Type** page, select **Single application** and click **Next**. The **Application** page opens.
5. Enter a name and an optional description.
6. In the **Run** drop-down menu, specify if the application should run in a normal window, maximized, or minimized.
7. In the **Target** field, specify the application that you want to publish. You may click the **[...]** button to browse for it.
8. In the **Start in** field, specify (or browse for) the "start in" folder. Use Windows environment variables if you are manually entering the path.
9. (Optional) In the **Parameters** input field, specify the parameters to pass to the application when it starts.
10. In the **Virtual Guest Settings** section, specify from where the application should be published. First, you need to select an option in the **Connect to** drop-down list and then specify an additional parameter in the field below it, as explained below:
    - **Any guest VM**. Use the **from Pool** drop-down list to specify a pool.
    - **Specific Template**. Select a template by expanding the template drop-down list.
11. If needed, select the **Persistent** option to make a guest VM persistent. For more info, see **Persistent Guest VMs** (p. 153).
12. When done, click **Finish** to publish the application.

Publishing a Web Application from a Guest VM

A web application is like any other application that you can publish using the standard application publishing functionality. However, to simplify publishing of straight URL links to web applications, a separate publishing item type is available that allows you to accomplish this task with minimal number of steps.

To publish a web application:

1. In the RAS Console, select the **Publishing** category and then click the **Add** icon below the **Published Resources** tree (or right-click inside the **Published Resources** box and click **Add** in the context menu). This will launch the publishing wizard.
2. On the **Select Item Type** page, select **Web application** and click **Next.**
3. On the **Select Server Type** page, select **Virtual Guest** and click **Next**.

4 On the **Virtual Desktop Web Application** page, specify the web application name, description, window state, and the URL. Select the **Force to use Internet Explorer** option if needed. To browse for a specific application icon, click **Change Icon**.

5 Use the **Virtual Guest Settings** section to specify from where the application should be published.

The options are:

- **Any guest VM**. Publish the application from any guest VM in the selected pool. Select this option and then select a pool in the **from Pool** drop-down list.
- **Specific template**. Publish the application from a specific template. Select this option and then select a template in the **Template** drop-down list.

6 Select the **Persistent** option to make a guest VM persistent. For more info, see **Persistent Guest VMs** (p. 153).

7 When done, click **Finish** to publish the application.

Publishing a Network Folder from a Guest VM

You can publish a filesystem folder via UNC path to open in Windows explorer. To minimize the number of configuration steps, a special publishing item is available that allows you to publish a network folder from a guest VM.

To publish a network folder:

1 In the RAS Console, select the **Publishing** category and then click the **Add** icon below the **Published Resources** tree (or right-click inside the **Published Resources** box and click **Add** in the context menu). This will launch the publishing wizard.

2 On the **Select Item Type** page, select **Folder on the file system** and click **Next**.

3 On the **Select Server Type** page, select **Virtual Guest** and click **Next**.

4 On the **Virtual Desktop UNC Folder** page, specify the usual application properties.

5 In the **UNC path** field, enter the UNC path of the folder you wish to publish. Click the **[...]** button to browse for a folder (it may take some time for the **Browse for Folder** dialog to open).

6 In the **Virtual Guest Settings** section, specify from where the virtual desktop should be published. First, you need to select an option in the **Connect to** drop-down list and then specify an additional parameter in the field below it, as explained below:

- **Any guest VM**. Use the from Pool drop-down list to specify a pool.
- **Specific Template**. Select a template by expanding the template drop-down list.

7 Select the **Persistent** option to make a guest VM persistent. For more info, see **Persistent Guest VMs** (p. 153).

8 Click **Finish** to publish the folder and close the wizard.

When published, the network folder will appear in the **Publishing** > **Published resources** list, just like any other application. To view its properties, select it and then click the **Virtual Desktop Application** tab:

- The **Target** property will always be set to PublishedExplorer.exe. This binary is created automatically (via agents pushing) and is simply a copy of the standard explorer.exe executable.
- The **Parameters** property specifies the network folder that we want to publish. The folder path can be in any format that the explorer.exe can handle.

Publishing a Document from a Guest VM

To publish a document from a guest VM or guest VM clone:

1. In the RAS Console, select the **Publishing** category and then click the **Add** icon below the **Published Resources** tree (or right-click inside the **Published Resources** box and click **Add** in the context menu). This will launch the publishing wizard.
2. On the **Select Item Type** wizard page, select **Document** and click **Next.**
3. Select **Virtual Guest** and click **Next**.
4. Specify the content type of the document you want to publish. You can select the content type from the predefined list or specify a custom content type in the **Custom content types** input field.
5. Click **Next**.
6. On the **Virtual Desktop Application** page, enter a name, optional description, Window state, and an icon if needed.
7. Use the **[...]** button next to the **Target** input field to browse for the document. All other fields will be automatically populated. To edit any of the auto populated fields, highlight them and enter the required details.
8. (Optional) In the **Parameters** input field, specify the parameters to pass to the application when it starts.

   Note: Use the **Server(s)** drop down list to specify different document settings for a specific server in case the document is configured differently on that particular server. The settings will be saved for each server you select individually.

9. In the **Virtual Guest Settings** section, specify from where the virtual desktop should be published.

   First, you need to select an option in the **Connect to** drop-down list and then specify an additional parameter in the field below it, as explained below:

   - **Any guest VM**. Use the **from Pool** drop-down list to specify a pool.
   - **Specific Template**. Select a template by expanding the template drop-down list.

10. Select the **Persistent** option to make a guest VM persistent. For more info, see **Persistent Guest VMs** (p. 153).

11 Click **Finish** to publish the document.

Viewing VDI Provider Summary

In addition to the VDI provider editor described earlier in this chapter, you can also see summary about the available VDI providers. To do so:

1 In the RAS Console, select the **Farm** category and then select the **Site** node in the middle pane.

2 The available servers are displayed in the **VDI** section in the right pane.

3 To go to the VDI provider editor, right-click a server and choose **Show in the Editor**.

For additional info, see **Sites in the RAS Console** (p. 42).

Managing VDI Sessions

The **VDI** / **Sessions** tab allows you to view and manage current VDI sessions. To view the page, navigate to **Farm** / <Site> / **VDI** / **Sessions**.

The **Sessions** list displays current sessions and includes the following info for each session:

- **Guest VM**. Guest VM name.
- **Session ID**. The unique session ID.
- **Theme**. The Theme used.
- **User**. The session owner.
- **Protocol**. Communication protocol.
- **State**. Session state: **Idle**, **Active**, **Disconnected**.
- **Logon time**. Last date and time the user logged on.
- **Session length**. Total sessions duration.
- **Idle time**. Total (counted) session idle time.
- **Type**. Session type: Admin, Published Application, Published Desktop.
- **Resolution**. Client display resolution.
- **Color depth**. Client display color depth.
- **Device name**. Client device name.
- **IP Address**. Client IP address.
- **Template**. The name of the template used.
- **Pool**. The name of the guest VM pool.

You can sort the list by any session property. Simply click on a desired column heading to sort the list in ascending or descending order.

You can also filter the list using a single or multiple session properties as criteria. To do so, click the magnifying glass icon (top right) and then type a desired string in a desired column. The list will be filtered as you type.

To manage a session (or multiple sessions at the same time), select one or more sessions and then use the **Tasks** drop-down menu to choose from the following actions:

- **Refresh**. Refresh the list.
- **Disconnect**. Disconnect the selected session(s).
- **Log Off**. Log off the session(s).
- **Send message**. Opens the **Send Message** dialog where you can type and send a message to the session owner(s).
- **Remote control**. Remotely control the selected user session. See **User session remote control** below for important information. The local Windows user credentials will be used to establish a connection.
- **Remote control (prompt)**. Same as above but prompts you to enter credentials. Use this option when the local user credentials cannot be used to control a session.
- **Show processes**. Display and manage running processes. See **Managing processes** below for details.

User session remote control

The **Remote Control** and **Remote control (prompt)** menu options (see above) allow you to shadow a user session. There are limitations as described below:

- Parallels RAS cannot shadow sessions running on Windows 7 and Windows Server 2008 R2 (plain Windows Server 2008 is fine). This doesn't work even with native tools.
- If you need to shadow a user session running on Windows Server 2008, the RAS console must also be running on Windows Server 2008 or 2008 R2. This is due to the fact that shadowing is not available on Windows Server 2012 (plan), but is available on Windows Server 2008 and 2008 R2. If the RAS console is installed on a later version of Windows Server, shadowing will NOT work. As a workaround, you can add a host running Windows Server 2008/2008 R2 to the Farm, publish the Parallels RAS console from it, and then use the console remotely to manage user sessions running on Windows Server 2008. Please note that to finish a remote control session, the administrator must log off from the RAS console remote session. This is a limitation of the shadow.exe utility from Microsoft that doesn't take any arguments that would allow us to add a control like a bar, a button, or a key combination.

Managing processes

The **Tasks** > **Show processes** option opens the **Running Processes** dialog where you can view running processes for one or more guest VMs.

On the **Running Processes** dialog, use the **Show processes from** drop-down menu to filter the list using the following options:

- **Selected session**. Displays processes for the session selected in the **Sessions** list.
- **Selected server**. Displays all running processes for the server on which the selected session is running.
- **All servers**. Displays all running processes for all available servers.

You can also filter the list by specifying a search criteria for one or more columns. To do so, click the magnifying glass icon (top right) and then type a desired text in one or more columns. The list is filtered as you type to match the specified criteria.

The **Tasks** drop-down menu in the **Running Processes** dialog includes the following options:

- **Refresh**. Refresh the list.
- **Kill process**. Kill the selected process.
- **Go To Published Item**. Enabled when you select a process that belongs to a running published resource. Brings up the main Parallels RAS Console window and navigates to the corresponding published resource.
- **Disconnect**. Disconnect the session.
- **Log off**. Log off the session.
- **Send message**. Send a message to the session owner.
- **Remote control**. Remotely control the selected session.

Remote PC Pools

Remote PC pools is a Parallels RAS feature that allows you to create pools of standalone (preferably domain-joined) PCs and optionally assign them to a specific user. The Remote PC pools functionality is integrated into RAS VDI to take advantage of the infrastructure that already handles host pools.

Remote PC pools vs. Remote PCs

Remote PCs are standalone machines (physical or virtual) that can be used to host published resources in Parallels RAS. Remote PCs are managed in the Parallels RAS Console in the **Farm** / <Site> / **Remote PCs** section. The **Remote PCs** chapter (p. 167) describes this functionality in detail. Remote PC pools described in this section are handled separately and differently from standalone remote PCs. They are managed in the **Farm** / <Site> / **VDI** section of the RAS Console.

In this section:

- Adding a VDI provider (p. 161)
- Configuring the VDI provider (p. 162)

- Adding Remote PCs to a pool (p. 163)
- Managing Remote PCs in a pool (p. 164)
- Persistent Remote PCs (p. 164)
- RAS Guest Agent installation options (p. 165)
- Publishing from a pool-based Remote PC (p. 165)

Adding a VDI Provider

To set up a Remote PC pool in the RAS Console, you first need to add a VDI provider of type **Remote PC**. This is a special type that exists specifically for the purpose of creating and managing Remote PC pools. It is not a real VDI provider, so it doesn't need a hypervisor installed. It simply uses the existing VDI functionality to create and manage computer pools. Note that when you add a VDI provider of this type, you can manage it like any other real VDI provider with some limitations, such as you cannot create templates and use some other strictly VDI (hypervisor)-specific functionality.

To add a VDI provider of type **Remote PC**:

1. Navigate to **Farm** / <Site> / **VDI**.
2. On the **Providers** tab, click **Tasks** > **Add**.
3. On the first page of the **Add VDI Provider** wizard, select **Remote PC** in the **Type** drop-down list.
4. In the **Address** field, specify FQDN or IP address of a server that will manage Remote PC pools. This must be a server with RAS VDI Agent installed. You can use the RAS Publishing Agent server, since it has the RAS VDI Agent built in, but it can be any other server running a dedicated RAS VDI Agent.
5. Enter the account name in the UPN format (e.g. `administrator@domain.local`). This must be a domain user account with sufficient rights to manage individual remote PCs that will be assigned to this host. Using a local Windows account is also possible with some limitations and only when using the static PC assignment (see **Configuring the VDI Provider** (p. 162)). Using a domain account is recommended.
6. Enter the account password and an optional description.
7. Click **Next** and then click **Finish**.

The wizard closes and the server **Properties** dialog opens where you need to configure the new VDI provider. You can configure it now or you can configure it later by right-clicking the host on the **Providers** tab and choosing **Properties**. The configuration steps are described in detail in the section that follows this one.

Configuring the VDI Provider

If you don't have the VDI provider properties dialog open, right click a VDI provider that you created and choose **Properties**.

On the **Properties** tab of the dialog, select **Enable host in site** to enable the host.

In the **VDI subtype** drop-down list, select how remote PCs will be assigned to this VDI provider, so they can be later added to a Remote PC pool. The following options are available:

- **Static** — using this approach, remote PCs are assigned to the VDI provider by entering their FQDN or IP address (one by one) or by importing a list from a CSV file.
- **Dynamic** — this approach assigns PCs using the information from Active Directory. All you have to do is specify an organizational unit (OU) containing computer accounts to be assigned to the host.

Please note that once you choose one of the options above and assign PCs to the host later, you cannot switch from static to dynamic or vice versa later.

Depending on which **VDI subtype** you select on the **Properties** tab (see above), the **Remote PCs** tab will look differently. The subsections below describe **Static** and **Dynamic** scenarios respectively.

Static (VDI subtype)

Using this approach, remote PCs are assigned to the VDI provider manually one by one or are imported from a CSV file.

Note: To be manageable, Remote PCs should be domain-joined. In case of static assignment described here, it is possible to add non-domain joined PCs, but you will have to create the same local user account on each and everyone of them. Using a domain account and domain-joined PCs is recommended.

To add a PC, select the **Remote PCs** tab and do one of the following:

- Click **Tasks** > **Add** and type FQDN or IP address of a PC you want to add. You can click the **[...]** button to search for it. Next, enter the MAC address of the computer you are adding. Note that both fields are mandatory.
- Click **Tasks** > **Import from CSV file** and then select a CSV file containing the list of computers. The CSV file must have two columns: (1) FQDN or IP address; (2) MAC address. Once again, both columns are mandatory and must contain a valid value.

Dynamic (VDI subtype)

To use dynamic assignment, you need to specify an organizational unit (OU) containing computer accounts to be assigned to the host. To do so, select the **Remote PCs** tab and specify the organizational unit in the **Target OU** field. You can click the **[...]** button to browse Active Directory.

Note: When using dynamic assignment, remote PCs must be domain-joined. You cannot manage such PCs using a local Windows user account.

When you use the dynamic assignment, you have an option to install RAS Guest Agent on every PC by adding a Group Policy to the organizational unit with a script to deploy RAS Guest Agent. The following is an example of such script:

```
msiexec /i RASInstaller-<version & build>.msi ADDLOCAL=F_GuestAgent /qn+ /norestart
```

Other agent installation options are described in **RAS Guest Agent Installation Options** (p. 165).

Adding Remote PCs to a Pool

Note: To be managed in a remote PC pool, a remote PC must have RAS Guest Agent installed. For more information, see the **RAS Guest Agent Installation Options** (p. 165).

Once you assigned PCs to a VDI provider, you can add them to a remote PC pool as follows:

1. In **Farm** / <Site> / **VDI**, select the **Pools** tab.
2. Add a new pool by clicking **Tasks** > **Add** in the **Pools** pane.
3. Select the pool that you've created and then in the **Members** pane, click **Tasks** > **Add** and choose one of the following:
   - **All Guest VMs in Host** — adds all remote PCs assigned to the VDI provider. When you click this option, a dialog opens allowing you to select a VDI provider. Select the host and click **OK**.
   - **Guest VM** — adds an individual remote PC. In the dialog that opens, select a desired remote PC and click **OK**. Another dialog may open asking you to upgrade RAS Guest Agent on a remote PC (the agent is required for a PC to be managed in a pool). Click **OK** to upgrade (or install) the agent. You can also upgrade the RAS Guest Agent on one or more PCs at another time as described in **RAS Guest Agent Installation Options** (p. 165).

Once you add one or more remote PCs to a pool, they will appear in the **Pool management** tab and in the **Desktops** tab.

Tip: If you need to disable the pool for maintenance, you can do so by clearing the checkbox in front of the pool name.

Managing Remote PCs in a Pool

Management of pool-based remote PCs includes assigning a PC to a specific user, upgrading the RAS Guest Agent, viewing and modifying PC properties, performing some standard administrative tasks, and some others.

To manage Remote PCs in a pool:

1. In **Farm** / <Site> / **VDI**, select the **Desktops** tab.
2. Note that the list on this tab includes all managed desktops, including guest VMs and pool-based remote PCs. You can order the list by the **Pool** column to see remote PCs assigned to a particular pool.
3. Select a remote PC, click the **Tasks** drop-down menu and choose one of the options described below. Note that not all options available in the **Tasks** menu are applicable to remote PCs. The list below describes only the options that you can use with pool-based remote PCs.

The **Tasks** menu options that apply to remote PCs are:

- **Upgrade all Agents**. Upgrade RAS Guest Agent in all remote PCs (and guest VMs) in the list.
- **Assign**. Assign a remote PC to a specific user (make a PC persistent). Click the menu option and specify a user.
- **Unassign**. Remove the user assignment (persistence) from a remote PC.
- **Show sessions**. Switches the view to the **Sessions** tab and displays the session information.
- **Tools**. Allows to perform a set of standard operations, such as establishing a remote desktop connection, pinging, rebooting/shutting down a remote PC, and others.

  Note: Please note that apart from rebooting and shutting down (see above), no other power operations (start, stop, suspend, reset) are possible with pool-based remote PCs. This functionality will be added in the upcoming Parallels RAS releases.

- **Troubleshooting**. Check and install/upgrade the RAS Guest Agent in a remote PC.
- **Reset properties**. Resets remote PC properties to their default values. See **Properties** below.
- **Properties**. Opens a dialog where you can view and modify remote PC settings. The **General** tab allows you to temporarily disable the remote PC in a pool (use the **Do not use this guest VM** option). This is specifically useful when you need to perform maintenance tasks on a PC. You can also view and modify the remote PC display name, computer name, and the port number on which it communicates with the VDI provider. For the description of **Settings** and **Security** tabs, see **Site Defaults** (p. 131).

Persistent Remote PCs

A persistent remote PC is a PC assigned to a particular user. Once a PC is assigned, no other user can connect to it.

There are two ways to make a remote PC persistent:

- When you publish a resource (application, desktop, etc.) from a pool-based remote PC using the publishing wizard, you can select the **Persistent** option in the **Virtual Guest Settings** section. This way, a remote PC in a pool will be assigned to the first user that opens the published resource. For more info, see **Publishing From a Pool-Based Remote PC** (p. 165).
- You can also assign a remote PC to a user manually. To do so, navigate to **Farm** / <Site> / **VDI**, select the **Desktops** tab, then select a remote PC in the list and click **Tasks** > **Assign**. In the dialog that opens, specify the target user.

To remove persistence from a remote PC, select it in the **Desktops** tab and click **Tasks** > **Unassign**.

RAS Guest Agent Installation Options

To be managed in a remote PC pool, a remote PC must have RAS Guest Agent installed. This can be done using one of the following options:

- When you add an individual remote PC to a pool, you'll be asked to upgrade the agent. Follow the onscreen instructions and install or upgrade it.
- When you add all remote PCs in a host to a pool at once, you can add them first and then use the **Tasks** > **Upgrade all Agents** menu option in the **Desktops** tab.
- When you assign remote PCs to a VDI provider via Active Directory, you can have a Group Policy in the OU with a script to deploy the agent. See **Configuring the VDI Provider** > **Dynamic (VDI subtype)** (p. 162).
- To install or upgrade the agent on an individual remote PC, select it in the **Desktops** tab and click **Tasks** > **Troubleshooting** > **Check agent** option. In the dialog that opens, click **Install**.
- Finally, you can install RAS Guest Agent manually by running the Parallels RAS installer on a remote PC and selecting to install the RAS Guest Agent component.

Publishing From a Pool-Based Remote PC

To publish a resource (application, desktop, etc.) from a pool-based remote PC, do the following:

1. In the RAS Console, select the **Publishing** category.
2. Click the **Add** icon (lower left-hand corner).
3. Select a resource type and click **Next**.
4. On the **Server Type** page, select **Virtual Guest**. The **Remote PC** option there is for standalone remote PCs. To publish from a pool-based remote PC, the **Virtual Guest** is the correct type.
5. Advance to the page where you specify the resource name and properties (e.g. **Virtual Desktop Application** page).
6. In the **Properties** section, select **Any Guest VM** in the **Connect to** field and then select a Remote PC pool in the **from Pool** field.

7 To make a remote PC persistent, select the **Persistent** option. This will assign a remote PC in a pool to the first user who will use this published resource.

8 Populate the rest of the fields as usual and click **Finish** to publish the resource.

CHAPTER 9

Remote PCs

In addition to RD Session Hosts and VDI guest VMs, resources can also be published from a standalone remote PC running a supported version of Windows (p. 19). A remote PC can be a physical box or a virtual machine treated as a physical PC, but typically they are physical computers. If you have virtual machines on your network, it makes sense to use them as part of the VDI infrastructure as was described in the **VDI and Virtual Desktops** chapter (p. 113). However, if you don't need the guest VM cloning functionality or, for example, if your end users require full administrative permissions for customization, you can use a virtual machine as a remote PC. It's up to you.

Note: Remote PCs can also be combined into pools and managed as pool members. Remote PC pools use the RAS VDI infrastructure and work differently than individual Remote PCs described in this chapter. For more information see **Remote PC Pools** (p. 160).

This chapter describes how to add a remote PC to a Site and how to publish remote applications and desktop from it.

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Adding a Remote PC

Requirements to push install RAS Remote PC Agent on a PC

To push install the RAS Remote PC Agent on a PC, the following requirements must be met:

- The firewall must be configured on the server to allow push installation. Standard SMB ports (139 and 445) need to be open. See also **Port Reference** (p. 401) for the list of ports used by Parallels RAS.
- SMB access. The administrative share (\\server\c$) must be accessible. Simple file sharing must be enabled.

- Your Parallels RAS administrator account must have permissions to perform a remote installation on the PC. If it doesn't, you'll be asked to enter credentials of an account that does.
- The PC should be joined to an AD domain. If it's not, the push installation may not work and you will have to install the Agent on it manually. Please see **Installing Remote PC Agent Manually** (p. 168).

Add a Remote PC to the Farm

Follow the below procedure to add a remote PC to the Farm:

1. In the RAS Console, select the **Farm** category and click the **Remote PCs** node in the navigational tree.
2. Click **Add** in the **Tasks** drop-down menu to launch the setup wizard.
3. Specify the IP address or FQDN of a remote PC. Click the Get MAC button to obtain the PC's MAC address. To automatically resolve IP address to FQDN, enable the global **Name Resolution** option. For details, see **Host Name Resolution (p. 353).**
4. Click **Next**.
5. In this step, the Parallels RAS checks if the Remote PC Agent is installed on the specified PC. If it's not installed, click **Install** to push install the agent on the PC. If the push installation of Remote PC Agent fails for any reason, you can install it manually. See **Installing Remote PC Agent Manually** for details (p. 168).
6. Click **Add** to add the Remote PC to the Parallels RAS Farm.

Installing Remote PC Agent Manually

You may need to install the Remote PC Agent manually if the automatic push installation cannot be performed for any reason.

Installing Remote PC Agent Manually

1. Log into the PC where the Remote PC Agent is to be installed using an administrator account and close all other applications.
2. Copy the Parallels RAS installation file (`RASInstaller.msi`) to the PC and double click it to launch the installation.
3. Once prompted, click **Next** and accept the End-User license agreement.
4. Specify the path where the Remote PC Agent should be installed and click **Next**.
5. Select **Custom** and click **Next**.
6. Click on the **Remote PC Agent** and select **Entire Feature will be installed on local hard drive** from the drop down menu.
7. Ensure that all other components are deselected and click **Next**.

8 Click **Install** to start the installation. Click **Finish** once the installation is finished.

Remote PC Agent does not require any configuration. Once the agent is installed, select the Remote PC name in the Parallels RAS Console and click **Troubleshooting** > **Check Agent**. If the agent is installed properly, the status should change to **Agent Installed**.

Uninstalling Remote PC Agent

To uninstall Remote PC Agent from a server:

1 Navigate to **Start** > **Control Panel** > **Programs** > **Uninstall a Program**.

2 Find **Parallels Remote Application Server** in the list of installed programs.

3 If you don't have any other Parallels RAS components on the server that you want to keep, right-click **Parallels Remote Application Server** and then click **Uninstall**. Follow the instructions to uninstall the program. You may skip the rest of these instructions.

4 If you have other RAS components that you want to keep on the server, right-click **Parallels Remote Application Server** and then click **Change**.

5 Click **Next** on the Welcome page.

6 On the **Change, repair, or remove** page, select **Change**.

7 On the next page, select **Custom**.

8 Select **Remote PC Agent**, then click the drop-down menu in front of it, and click **Entire feature will be unavailable**.

9 Click **Next** and complete the wizard.

Configuring a Remote PC

To view the properties of a Remote PC, highlight the computer in the navigation tree and click **Tasks** > **Properties**. This opens the Remote PC properties dialog.

Properties

By default, a PC is enabled in the Farm. When it is disabled, published applications and virtual desktops cannot be served from it. To enable or disable a PC in the Farm, select or clear the **Enable Remote PC** option.

If the IP or MAC address of a remote PC has changed, modify them using the **Remote PC** and **MAC Address** input fields.

The **Change Direct Address** option allows you to specify an IP address that Parallels Client can use to connect to the PC directly. This address is only used in the Direct Connection mode and it could be an internal or external IP address.

Note: The Wake On Lan option should be enabled in BIOS so the machine could be automatically turned on. If you are using a virtual machine, the option is usually supported by a hypervisor natively or via a 3rd party software. To test if the Wake On Lan option is turned on, close the **Remote PC Properties** dialog and then click the **Test Wake on LAN** button, which is located below the **Remote PCs** list.

Agent Settings

Each Remote PC in the Farm has a RAS Remote PC Agent installed to conduct communications between Parallels RAS and the PC. The agent can be configured on the **Agent Settings** tab page.

- **Port**. Specify a different remote desktop connection port number if needed.
- **Connection Timeout**. Select the desired Remote PC connection timeout value.
- **Publishing Session Timeout**. Specify the amount of time each session remains connected in the background after the user has closed the published application. This option is used to avoid unnecessary reconnections with the PC.
- **Allow Client URL/Mail Redirection**. When a user tries to open a URL or an HTML Mailto link in a remote application, the link can be redirected to the client computer and open in a local default application (a web browser or email client) instead of an application on the remote host. This option allows you to enable or disable the redirection. You can choose from the following options:

  a **Enabled** — select this option to enable the redirection and then select the **Support Windows Shell URL namespace objects** option (bellow the drop-down box). This is the default redirection configuration that works in most common scenarios. The Shell URL namespace objects support means that Parallels RAS can intercept actions in published applications that use Shell namespace API to open links, which is a standard behavior in most applications. The ability to disable the support for Shell URL namespace objects is for compatibility with older versions of Parallels RAS. You may disable this option if you want the behavior of an older version of Parallels RAS (RAS v16.2 or earlier).

  b **Enabled (Replace Registered Application)** — this option uses an alternative method of redirecting a link. It replaces the default web browser and mail client with "dummy" apps on the remote server side. By doing so, it can intercept an attempt to open a link and redirect it to the client computer. You may try this option if the default option above doesn't work with your published application.

  c **Disabled** — this option disables URL/Mail redirection, so URL or Mailto links always open on the remote host.

  Please note that you can configure a list of URLs that should never be redirected, even if the redirection is enabled. This can be done on the **Farm** / **Site** / **Settings** / **URL Redirection** tab. See more in **Site Settings** (p. 357).

- **Drag and drop**. Allows you to select how the drag and drop functionality functions in Parallels Clients. You can select from "Disabled" (no drag and drop functionality at all), "Server to client only" (drag and drop to a local application, but not in the opposite direction), "Client to server only" (drag and drop to a remote application only), "Bidirectional" (default). Note that this option has changed since Parallels RAS 17.1. In the past, it was a checkbox that would enable or disable drag and drop that would only function in the "Client to server only" mode. When upgrading from an older version of Parallels RAS, and if the checkbox was enabled, the "Client to server only" option is selected by default. If the option was disabled, the "Disabled" option will be set. You can change it to any of the new available options if you wish.

  Note: At the time of this writing, the drag and drop functionality is only supported on Parallels Client for Windows and Parallels Client for Mac.

- **Preferred Publishing Agent**. Select a Publishing Agent with which the Remote PC Agent should communicate. This can be helpful when Site components are installed in multiple physical locations communicating through WAN. You can decrease network traffic by specifying a more appropriate Publishing Agent.
- **Allow file transfer command**. Allows you to enable or disable the remote file transfer functionality. For more information, see **Enabling or Disabling Remote File Transfer** (p. 335).
- **Enable drive redirection cache:** Improves user experience by making file browsing and navigation on redirected drives much faster. For details, see **Drive Redirection Cache Explanation**.

RDP Printer

The **RDP Printer** tab allows you to configure the renaming format of redirected printers. The format may vary depending on which version and language of the server you are using.

Set your RDP Printer Name Format specifically for the configured server by choosing any of the below options from the RDP Printer Name Format drop down menu:

- Printername (from Computername) in Session no.
- Session no. (computername from) Printername
- Printername (redirected Session no)

The other RDP Printing options available in the RDP Printer tab are:

- Remove session number from printer name
- Remove client name from printer name

Configure logging

A Remote PC is monitored and logs are created containing relevant information. To configure logging and retrieve or clear existing log files, right-click a Remote PC, choose **Troubleshooting** > **Logging** in the context menu, and then click **Configure**, **Retrieve**, or **Clear** depending on what you want to do. For the information on how to perform these tasks, see the **Logging** (p. 373) section.

Viewing Remote PC Summary

In addition to the Remote PCs editor described in this chapter, you can also see the summary about the available Remote PCs. To do so:

1. In the RAS Console, select the **Farm** category and then select the **Site** node in the middle pane.
2. The available servers are displayed in the **Remote PCs** group in the right pane.
3. To go to the Remote PCs editor, right-click a server and choose **Show in the Editor**.

For additional info, see **Sites in the RAS Console** (p. 42).

Using Computer Management Tools

You can perform standard computer management tasks on a server right from the RAS Console. These include Remote Desktop Connection, PowerShell, Computer Management, Service Management, Event Viewer, IPconfig, Reboot, and others. To access the **Tools** menu, select a server, click **Tasks** (or right-click) > **Tools** and choose a desired tool. For requirements and usage information, see **Computer Management Tools** (p. 354).

Publishing from a Remote PC

This section describes how to publish resources hosted by a standalone remote PC. The publishing functionality described here is accessed from the **Publishing** category in the RAS Console.

Read on to learn how to publish resources from a remote PC.

Publishing a Desktop from a Remote PC

To publish a desktop from an RD Session Host:

1. In the RAS Console, select the **Publishing** category and click the **Add** icon below the **Published Resources** tree. This will launch the publishing wizard.
2. In the first step of the wizard select **Desktop** and click **Next**.
3. On the **Select Desktop Type** page, select **Remote Desktop PC** and click **Next.** The **Remote PC Desktop** page opens.
4. Specify a name, an optional description, and change the icon if needed.

5 Click the **[...]** button next to the **Selected Remote PC** field to specify from which remote PC the desktop should be published. In the box that opens, double-click a PC to select it.

6 Select the desired **Desktop Size** properties.

7 Click **Finish** to publish the desktop.

Publishing an Application from a Remote PC

To publish an application from a remote PC:

1 In the RAS Console, select the **Publishing** category and then click the **Add** icon below the **Published Resources** tree (or right-click inside the **Published Resources** box and click **Add** in the context menu). This will launch the publishing wizard.

2 On the **Select Item Type** wizard page, select **Application** and click **Next**.

3 On the **Select Server Type** page, select **Remote PC** and click **Next**.

4 On the **Select Application Type** page, select **Single Application** and click **Next**. The **Remote PC Application** page opens.

5 Enter a name and an optional description.

6 In the **Run** drop-down menu, specify if the application should run in a normal window, maximized, or minimized.

7 In the **Target** field, specify the application that you want to publish. You may click the **[...]** button to browse for it.

8 In the **Start in** field, specify (or browse for) the "start in" folder. Use Windows environment variables if you are manually entering the path.

9 (Optional) In the **Parameters** input field, specify the parameters to pass to the application when it starts.

10 Click the **[...]** button in the **Remote PC Settings** section to select a remote PC from which the application should be published. In the box that opens, double-click a PC to select it.

11 Select the **Persistent** option to mark a guest VM as persistent the first time the user connects to it.

12 When done, click **Finish** to publish the application.

Publishing a Web Application from a Remote PC

A web application is like any other application that you can publish using the standard application publishing functionality. However, to simplify publishing of straight URL links to web applications, a separate publishing item type is available that allows you to accomplish this task with minimal number of steps.

To publish a web application:

1. In the RAS Console, select the **Publishing** category and then click the **Add** icon below the **Published Resources** tree (or right-click inside the **Published Resources** box and click **Add** in the context menu). This will launch the publishing wizard.
2. On the **Select Item Type** wizard page, select **Web Application** and click **Next.**
3. On the **Select Server Type** page, select **Remote PC** and click **Next**.
4. On the **Remote PC Web Application** wizard page that opens, specify the web application name, description, window state, and the URL. Select the **Force to use Internet Explorer** option if needed. To browse for a specific application icon, click **Change Icon**.
5. In the **Remote PC Settings** section, click the **[...]** button to select a remote PC.
6. Click **Finish** to publish the application.

Publishing a Network Folder from a Remote PC

You can publish a filesystem folder via UNC path to open in Windows explorer. To minimize the number of configuration steps, a special publishing item is available that allows you to publish a network folder from a PC.

To publish a network folder:

1. In the RAS Console, select the **Publishing** category and then click the **Add** icon below the **Published Resources** tree (or right-click inside the **Published Resources** box and click **Add** in the context menu). This will launch the publishing wizard.
2. On the **Select Item Type** wizard page, select **Folder on the file system** and click **Next.**
3. On the **Select Server Type** page, select **Remote PC** and click **Next**.
4. On the **Remote PC UNC Folder** wizard page, specify the usual application properties.
5. In the **UNC path** field, enter the UNC path of the folder you wish to publish. Click the **[...]** button to browse for a folder (it may take some time for the **Browse for Folder** dialog to open).
6. In the **Remote PC Settings** section, select the **[...]** button and then select a remote PC from the list.
7. Click **Finish** to publish the folder and close the wizard.

Publishing a Document from a Remote PC

To publish a document from a remote PC clone:

1. In the RAS Console, select the **Publishing** category and then click the **Add** icon below the **Published Resources** tree (or right-click inside the **Published Resources** box and click **Add** in the context menu). This will launch the publishing wizard.
2. On the **Select Item Type** wizard page, select **Document** and click **Next.**
3. Select **Remote PC** and click **Next**.

4 Specify the content type of the document you want to publish. You can select the content type from the predefined list or specify a custom content type in the **Custom content types** input field.

5 Click **Next**.

6 On the **Remote PC Application** page, enter a name, an optional description, a desired window state, and an icon if needed.

7 Use the **[...]** button next to the **Target** input field to browse for the document. All other fields will be automatically populated. To edit any of the auto populated fields, highlight them and enter the required details.

8 (Optional) In the **Parameters** input field, specify the parameters to pass to the application when it starts.

9 Click the **[...]** button in the **Remote PC Settings** sections to browse for a remote PC from which the document should be published. In the box that opens, double-click a PC to select it.

10 Click **Finish** to publish the document.

CHAPTER 10

Published Resources Management

Resources that you can publish in Parallels RAS include:

- Applications
- Containerized applications
- Desktops
- Documents
- Web applications
- Network folders

For the information on how to publish resources from various types of servers, follow the links below:

- **Publishing from an RD Session Host** (p. 102)
- **Publishing from a Guest VM** (p. 154)
- **Publish from Windows Virtual Desktop**
- **Publishing from a Remote PC** (p. 172)

This chapter describes management tasks that you can perform on resources that have been already published.

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General Management Tasks

To view published resources, select the **Publishing** category in the Parallels RAS Console. In the middle pane, expand the **Published Resources** node (if it's collapsed) to see the resources.

Right-click a resource to open a context menu. The menu has the following options:

- **Add**. Starts the publishing wizard, which you can use to publish a resource.
- **New Folder**. Allows you to add a folder to the **Published Resources** tree. Folders are described in the **Manage Folders** section (p. 184).
- **Find**. Allows you to search the list for a resource by name.
- **Duplicate**. Duplicates a selected resource. You can publish multiple resources of the same type, but configure them differently according to your needs.
- **Disable** or **Enable**. Disables or enables a selected resource. A disabled resource is unavailable to end users.
- **Delete**. Deletes a published resource from the Parallels RAS Farm. This only removes the published resource item from the Farm. The actual application is not affected. To avoid accidental deletions, a dialog box is displayed asking for your confirmation.
- **Settings audit**. Allows you to see recent changes to published resources and revert them. The changes that can be reverted include Create, Delete, and Update.
- **Verify Target(s)**. Verifies that the target specified for the selected resource is valid. To see the target, select a resource and then click the **Application** tab.
- **Convert Filters to Secure Identifiers**. If filtering for a resource is specified using WinNT or LDAP, you can use this option to convert it to SID (Secure Identifier). For more information, see **Using Filtering Rules** (p. 188).
- **Running Instances**. Opens the **Running Processes** dialog. For more information about the dialog, please see **Managing Sessions** > **Managing running processes** (p. 99). When the dialog is opened, a filter is applied to the process list to include only the processes for the selected published resource (a resource ID is used as a value). You can further filter the list to include only the process for a particular user (the **Username** column).

The action items at the bottom of the screen allow you to perform the following actions:

- **Add**. Same action as the **Add** menu item described above.
- **New Folder**. Same action as the **New Folder** menu item described above.
- **Delete**. Same as the **Delete** menu item described above.
- **Move Up**. Moves a selected published resource item up the list.
- **Move Down**. Moves a selected published resource item down the list.
- **Disable**. Same as the **Disable** menu item described above.

- **Sort**. Sorts resources alphabetically. For this action item to become enabled, you must select the **Published Resources** node (the topmost one) or a folder containing individual items.
- **Find**. Same as the **Find** menu item described above.
- **Running Instances**. Same as the **Running Instances** menu item described above.
- **Effective Access**. Allows you to view which published resources are available for a specific user. For complete details, see **Checking Effective Access** (p. 191).

After making any changes to published resources, please don't forget to click the **Apply** button to commit them to the Parallels RAS Farm.

Manage Published Applications

Configuring a published application

When publishing an application using a wizard, you specify multiple application parameters such as name, executable path, etc. You can modify these options after the application has been published.

To modify a published application:

1. In the RAS Console, select the **Publishing** category and then select the application in the **Published Resources** tree.
2. Use the tabs in the right pane to change the application options as described in the following subsections.

Publish from — configuring from which servers the application is published

You can specify RD Session Hosts from which an application is published on the **Publish From** tab. The following options are available:

- **All Servers in Site**. The application will be published from all servers on which it is installed.
- **Server Groups**. Select this option and then select one or more RD Session Host groups from which the application should be published.
- **Individual Servers**. Select this option and then select one or more individual RD Session Hosts.

Application — configuring application and server settings

The **Application** tab displays application- and server-specific settings.

You can modify the basic application settings (name, description, etc.) as needed. Select the **Start automatically when user logs on** option to start an application as soon as a user logs on. This option works on desktop versions of Parallels Client only.

For the information about **Exclude from session prelaunch** option, see **Understanding Session Prelaunch**.

The **Server Settings** section contains server-specific options that you can configure. If an application was published from multiple servers, the **Server(s)** drop-down list can be used to select individual servers and set **Target**, **Start in**, and **Parameters** values for a particular server. As an example, you should do this when different servers have the application installed in different folders, so that the **Target** and **Start in** field values would be valid on each server.

To save the currently displayed server settings as default, click the **Save as Default Settings** button. To apply the saved default settings to a server, click the **Use Default Settings** button. These two buttons give you the flexibility of using custom settings or defaults in different server configuration scenarios. Please note that when you save settings as default, Parallels RAS will check if this Site has applications with per-server settings and will display a message asking if you would like those servers to use the new default settings. If you say, "No", the servers will keep their unique settings. The defaults will still be saved.

To verify that the specified **Target** and **Start In** values are correct for all servers, click the **Verify Target(s)** button. The **Target Verifier** dialog opens listing each server and the verification status in the **Progress** column. If the application is installed at a different path on one of the servers, the **Progress** column will indicate an error. In such a case, close the **Target Verifier** dialog and then select the server in the **Server(s)** drop-down list. Specify new values in the **Target**, **Start In,** and (if necessary) **Parameters** fields specific for that server. Click **Apply** to save your changes.

The **Target Verifier** dialog can also be used to verify the targets for all published applications at once. To do so, right-click **Published Resources** (the root node of the **Published Resources** tree) and then click **Verify Target(s)** in the context menu. This time, the **Target Verifier** dialog will contain all published applications and their verification status.

The **Quick Keypad** section allows you to select a Quick Keypad template that should be assigned to this application. The **Quick Keypads** link below the drop-down list takes you to the **Quick Keypad** category in the console where you can configure Quick Keypad templates. If you don't see the **Quick Keypad** section, try to maximize the console window. For more information, please see the **Quick Keypad** section (p. 193).

To replicate the currently selected application settings to all sites, select the **Replicate settings** option in the lower right-hand corner. This will make the default application settings on every Site to be the same as the displayed settings. If some of the servers on other sites use server-specific settings (not defaults), you will see a message asking if you would like those servers to use the default settings. If you select "No", the servers will keep their unique settings. The default settings will still be synchronized with the selected application settings.

Filtering

Filtering is comprehensively described in the **Using Filtering Rules** (p. 188).

Shortcuts — configuring shortcut options for a published application

Click the **Shortcuts** tab to enable the creation of the application shortcut on the user's desktop and in the Start and Auto Start folders. When the **Auto Start** option is selected, the application will start automatically on computer startup. To use Site default settings, select the **Inherit default settings** option. You can view or modify Site defaults by clicking the **Site Defaults** link. See **Site Defaults (Publishing)** for more info (p. 186).

Note: Shortcuts are not available on all operating systems.

File extension — configuring file extension associations

To modify file extension association for a particular published application, click the **File Extensions** tab.

To add, remove, or modify an entry, select the **Associate File Extensions** option. To add a new extension to the list, click **Add** in the **Tasks** drop-down menu (or click the + icon) and specify the desired extension.

To modify an existing association, highlight the extension and click **Properties** in the **Tasks** drop down menu (or double-click the **Parameters** column) and type the parameter.

Licensing — configuring licensing options for published applications

Click the **Licensing** tab to configure the following licensing options:

- **Disable session sharing.** If this option is enabled, it allows you to isolate the published application to one session. Therefore if the same application is launched twice, the two instances of the application will run in two isolated sessions.
- **Allow users to start only one instance of the application.** If this option is enabled, a user can only launch a single instance of the application.
- **Concurrent Licenses.** Use this option to specify the maximum number of concurrent instances the application can run. E.g. if the license of the application allows you to only run 10 instances of the application, set the Concurrent licenses option to 10 so once such limit is reached, other users cannot initiate other instances.
- **If limit is exceeded**. From this drop down menu you can specify what action should the Parallels RAS take in case any of the above licensing configured limits are exceeded.

To use Site default settings, select the **Inherit default settings** option. You can view or modify the default settings by clicking the **Site Defaults** link. See **Site Defaults (Publishing)** for more info (p. 186).

Display — configuring display settings for a published application

On the **Display** tab, you can configure the following options:

- **Wait until all RAS Universal Printers are redirected before showing the application**. Enable this option to wait for printers to be redirected before the application is loaded. You can also specify the maximum wait time (in seconds) for the Universal Printers to be redirected. Please note that redirecting a printer may take some time. To avoid confusion, a progress bar is shown to the user while the printers are being redirected.
- **Color Depth, Resolution, Width, Height**. Select the desired display settings for the application.
- **Start the application as maximized when using mobile clients**. This option applies only to Parallels Client running on mobile devices. When the option is selected, the application will start on a mobile device in the maximized state. This gives users the best experience while working with a remote application. This option gives the RAS administrator an easy way to always maximize an application without taking any additional steps.

Note that to specify custom display values, the **Inherit default settings** checkbox must be cleared; otherwise Site defaults settings are used. To view and modify Site defaults, click the **Site Defaults** link. See **Site Defaults (Publishing)** for more info (p. 186).

Manage Published Desktops

Configuring a published desktop

When publishing a desktop using a wizard, you have to specify the desktop settings, such as display size, etc. You can modify these options after the desktop has been published.

To modify a published desktop, select it in the **Published Resources** tree in the **Publishing** category.

Sites — configuring from which sites a published desktop is available

By default, a published desktop is available through all of the available sites. To restrict access to a specific Site or a Site group, select a desktop in the **Published Resources** tree and then click the **Sites** tab in the right pane. Select the sites from which the desktop should be available.

Note: For the **Sites** tab to be available, you need more than Site in a farm.

Publish from — configuring from which RD Session Hosts a desktop is published

When configuring an RD Session Host desktop, you can specify from which servers it should be published. To do so, click the **Publish From** tab and select the desired servers.

Desktop — configuring desktop name, size and other properties

Depending on the desktop type, click the **Desktop**, **Remote PC Desktop**, or **Virtual Desktop** tab to configure the desktop name, description, icon, and resolution.

Connect to administrative session: Select this option if you want users to connect to the administrative session. Note that a user connecting to a desktop with this option enabled must have administrative privileges; otherwise "Access is denied" error will be shown to the user.

Start automatically when user logs on: Select this option if you want to open a desktop as soon as a user logs in. For the information about **Exclude from session prelaunch** option, see **Understanding Session Prelaunch**.

Desktop Size: Select a desired desktop size from the drop-down list.

Multi-Monitor: Select whether the multi-monitor should be enabled, disabled, or whether the client settings should be used.

Filtering

Filtering is comprehensively described in the **Filtering Rules by User, Client, MAC, and Gateway** section (p. 188).

Shortcuts — configuring shortcut options for a published desktop

Click the **Shortcuts** tab to enable the creation of a shortcuts on the user's desktop and in the Start and Auto Start folders. When the Auto Start shortcut is enabled, the application will start automatically on computer startup. To use Site default settings, select the **Inherit default settings** option. See **Site Defaults (Publishing)** for more info (p. 186).

Note: This option is not available on all operating systems.

Manage Published Documents

Configuring a published document

When publishing a document using a wizard, you have to specify the document settings. These options can be modified after the document has been published.

To modify a published document, select it in the **Published Resources** tree in the **Publishing** category and then use the tabs in the right pane to configure the published document settings.

Sites — configuring from which sites a published document is available

By default, a published document is available through all available sites. To restrict access to a specific Site or a Site group, click the **Sites** tab in the right pane. Select the sites from which the document should be available.

Note: For the **Sites** tab to be available, you need more than one Site in a Farm.

Publish from — configuring from which servers a document is published

Click the **Publish From** tab and select the servers from which the document should be published. Please note that a server must have the application installed that can open this particular document type.

Application — configuring server-specific document settings

By default, the settings configured in the **Target** (application path), **Start In**, and **Parameters** fields apply to all servers a document is published from. If a document exists in a different folder on one (or more) of the servers, you can specify the above settings for a specific server or servers individually.

To do so:

1. Click the **Application** tab and.
2. Select a server in the **Server(s)** list.
3. Specify the **Target**, **Start In**, and **Parameters** (optional) properties. The values that you specify will apply to the selected server only. Repeat the steps for other servers if needed.
4. Click the **Verify Target(s)** button to verify the document path on all servers from which this application is published. The results are displayed in the **Target Verifier** dialog where you can see whether the target is correct or not for each server.

Filtering

Filtering is comprehensively described in the **Filtering Rules by User, Client, IP, MAC and Gateway** section (p. 188).

Shortcuts — configuring shortcut options for a published document

Click the **Shortcuts** tab to enable the creation of shortcuts on the user desktops, shortcuts in the **Start** folder and shortcut in the **Auto Start** folder. When the **Auto Start** shortcut is enabled, the application will start when the user's computer is started.

Note: This option is not available on all operating systems.

File extension — configuring file extension associations

To modify file extension association for a particular published document, click the **File Extensions** tab. To add a new extension to the list, click **Tasks** > **Add** and specify the extension. To modify the extension parameters, highlight the extension and click **Tasks** > **Properties**.

Licensing — configuring licensing options for published documents

Click the **Licensing** tab to configure any of the below licensing options:

Select the **Inherit default settings** option to use the defaults. To specify your own settings, clear the option and set the following options:

- **Disable session sharing**. If this option is enabled, it allows you to isolate the published application to one session. Therefore if the same application is launched twice, the multiple instances of the application will run in the same isolated session.
- **Allow users to start only one instance of the application**. If this option is enabled, a user can only launch a single instance of the application.
- **Concurrent Licenses**. Use this option to specify the maximum number of concurrent instances the application can run. E.g. if the license of the application allows you to only run 10 instances of the application, set the Concurrent licenses option to 10 so once such limit is reached, other users cannot initiate other instances.
- **If limit is exceeded**. From this drop down menu you can specify what action should the Parallels RAS take in case any of the above licensing configured limits has been exceeded.

To use Site default settings, select the **Inherit default settings** option. See **Site Defaults (Publishing)** for more info (p. 186).

Display — configuring display settings for a published document

Click the **Display** tab to configure the color depth of the published document, resolution, width and height. If these options are left at their default values, the client-specified options will take over.

You can also enable the option to wait for the Universal Printers to be redirected before the application is loaded. When enabling this option, you can also configure the maximum wait time (in seconds) for the Universal Printers to be redirected. To use Site default settings, select the **Inherit default settings** option. See **Site Defaults (Publishing)** for more info (p. 186).

Manage Folders

Folders are used to organize published resources and to facilitate filtering options.

There are two types of folders that you can create in the **Published Resources** tree in the Parallels RAS Console:

- **Folders for administrative purposes**. Folders of this type are intended for Parallels RAS administrators (users of the Parallels RAS Console). They are used to logically organize published resources in the Parallels RAS Console but they do not appear in the Parallels Client launchpad on user devices. These folders are used to help administrators manage published resources more efficiently.
- **Regular folders**. These folders are similar to administrative folders described above but they do appear in the launchpad on user devices. You normally use these folders to group published resources by type (e.g. office applications, specific business applications, utilities, etc.).

Creating a folder

To create a new folder:

1. In the RAS Console, select the **Publishing** category.
2. Right-click anywhere in the **Published Resources** tree and choose **New Folder** (or click the **[+] New Folder** icon at the bottom).
3. In the **Folder** dialog, specify a folder name and an optional description.
4. To make it a folder for administrative purposes, select the **Use for administrative purposes** option. To publish a regular folder, clear the option. See above for the explanation of the two folder types.
5. When creating a regular folder, you can change its icon by clicking the **Change icon** button. Administrative folders use a built-in icon that cannot be changed. Icons appear in the **Publishing** category in the Parallels RAS Console and in the Parallels Client launchpad (regular folders only).
6. Click **Finish** to create the folder.

Managing folders

To modify an existing folder:

1. Select a desired folder in the **Published Resources** tree.
2. The **Information tab** in the right pane displays the folder information (read-only).
3. On the **Folder** tab, you can see and modify the folder name and description. You can also select or clear the **Use for administrative purposes** option to change the folder type (see above for an explanation). To change the folder icon, click the **Change icon** button. Note that the button is disabled if the **Use for administrative purposes** option is selected.
4. The **Filtering** tab specifies filtering options. Once set, these options will be inherited by all published resources in that folder. For more information about filtering, please see **Using Filtering Rules** (p. 188).

Adding published resources to a folder

To add a published resource to a folder, first add it to the root location and then drag it to the desired folder.

Delegating permissions to custom administrators

If you have custom administrators in your Farm, you can delegate permissions to them to manage a folder. This is specifically useful when a power administrator needs to grant permissions to a custom admin (they couldn't otherwise do it because they cannot manage user account directly). To grant folder rights, right-click anywhere in the **Published Resources** pane and then click **Delegate Permissions**. In the dialog that opens, select a user to grant folder permissions to. In the lower right pane of the **Delegate Permission - Publishing** dialog, select permissions (view, modify, add, delete) for a desired folder you want the user to have. Note that the custom administrator will be granted permissions to manage the folder and all its child items, including sub-folders. For more information about custom administrators, see **Managing Administrator Accounts** (p. 47).

Site Defaults (Publishing)

The **Default Settings** dialog allows you to view and modify Site default settings for publishing. Published applications, desktops, or documents can inherit the following groups of settings from Site defaults:

- Shortcuts
- Licensing
- Display

To open the **Default Settings** dialog, select a published resource, then select the **Shortcuts**, **Licensing**, or **Display** tab and click the **Site Defaults** link in the upper right. The dialog consists of the same **Shortcuts**, **Licensing,** and **Display** tabs that you can see in the RAS Console when you configure a published resource.

When the **Inherit default settings** option is selected in a tab in the main published resource view, the corresponding settings are inherited from Site defaults. Note that each tab is inherited by a published resource separately. For example, if the **Inherit default settings** option is selected on the **Shortcuts** tab, but cleared on the **Licensing** tab, only the **Shortcuts** settings are inherited, while **Licensing** uses custom settings. Each tab is described in detail below.

Shortcuts

In this tab specify whether and how the published resource shortcuts should be created on the user's computer. The following options are available:

- **Create shortcut on Desktop**. If selected, a shortcut will be created on the user's desktop.

- **Create shortcut in Start folder**. If selected, a shortcut will be added to the **Start** folder. You can specify the target subfolder name and path in the field provided. The default (and only) %Groups% variable will add additional subfolders as they appear on the host server where the published resource is hosted. For example, if the resource is located in "Myapps > Games" on the host server, the same folder structure will be added to the path. Note that you cannot use any custom variables.
- **Create shortcut in Auto Start folder**. If selected, the published resource will start automatically on computer startup.

Licensing

The **Licensing** tab contains the following options:

- **Disable session sharing.** If selected, the published resource will be isolated to one session. This means that if the same resource is launched twice, the two instances of it will run in two isolated sessions.
- **Allow users to start only one instance of the application.** If this option is enabled, a user can only launch a single instance of the published resource.
- **Concurrent Licenses.** Use this option to specify the maximum number of concurrent instances the published resource can run. For example, if the license of the application allows you to only run 10 instances of the application, set the **Concurrent licenses** option to 10, so once this limit is reached, other users cannot initiate other instances.
- **If limit is exceeded**. Specifies which action should Parallels RAS take in case any of the licensing limits configured above are exceeded.

Display

The **Display** tab contains the following options:

- **Wait until all RAS Universal Printers are redirected before showing the application**. Enable this option to wait for printers to be redirected before the application is loaded. You can also specify the maximum wait time (in seconds) for the Universal Printers to be redirected. Please note that redirecting a printer may take some time. To avoid confusion, a progress bar is shown to the user while the printers are being redirected.
- **Color Depth, Resolution, Width, Height**. These options specify the desired display settings for the application.
- **Start the application as maximized when using mobile clients**. This option applies only to Parallels Client running on mobile devices. When the option is selected, the application will start on a mobile device in the maximized state. This gives users the best experience while working with a remote application. This option gives the RAS administrator an easy way to always maximize an application without taking any additional steps.

Note that you can replicate the Site settings described above to other sites in your Parallels RAS Farm. To do so, select the **Replicate settings** option in a desired tab. All settings contained in the tab will be replicated.

Using Filtering Rules

Filtering is a feature that allows you to control who can access a particular published resource. You can define filtering rules based on any of the following:

- User
- Client device name
- Client device operating system
- IP address
- MAC address
- Gateway

By default, no filtering rules exist for a published resource, therefore the resource is available to anyone who is connected to the Parallels RAS Farm. Once you specify a filtering rule for a published resource, only those users/computers who satisfy the criteria will be able to use it.

To create a filtering rule, select a published resource in the **Published Resources** tree and click the **Filtering** tab. In the **Select Filtering Type** drop-down list, select criteria and then define a filtering rule as described below.

Filtering by user

To allow individual users or a user group to access the published resource:

1. Select **User** in the **Search Filtering Type** drop down list.
2. Select the **Allow the following Users** option.
3. Click **Tasks** > **Add** and specify a user or a group in the **Select Users** dialog. Click **OK** to add a user/group to the list on the **Filtering** tab.
4. In the **Default Object Type** drop-down list, select whether this rule will applies to users, groups, or both.
5. In the **Browse Mode** drop-down list, select the browsing mode you would like to use to connect to Active Directory or Windows.

   The options are:

   - **WinNT**. WinNT is faster than LDAP but does not support group nesting. Used only for backward compatibility.
   - **LDAP.** LDAP supports group nesting but is slow. Used only for backward compatibility.
   - **Secure Identifier**. This is the preferred and fastest method. It supports group nesting and renaming.

To convert users or groups specified using WinNT or LDAP, select a user entry and then click **Tasks** > **Convert**.

Filtering by client device name

To allow a specific client device or a list or client devices to access the published resource, follow these steps:

1 Select **Client** device name in the **Search Filtering Type** drop-down list.

2 Select the **Allow the following Clients** option. You can use the asterisk character (*) as a wildcard in a name. To include a wildcard in a name, select a client in the list and then click **Tasks** > **Edit**.

3 Click **Tasks** and choose one of the following:

- **Add from network browse**. Opens a dialog where you can select a client from the list populated from the network.
- **Add from Active Directory**. Opens a dialog where you can specify a computer or search the Active Directory for it.
- **Add from known devices**. Opens a dialog where you can select a client from the list populated by previously connected clients.
- **Add custom entry**. Allows you to type the name of a client. To modify the name, select it and then click **Tasks** > **Edit**.
- **Edit**. Allows you to modify the name of a selected client. If you want to include a wildcard (*) in a name, you can do it using this option. If no client is selected in the list, the option is disabled.
- **Import from CSV**. Allows you to select a CSV file containing the list of names of client devices. The file should contain a single device name on each row. The names must be unique (no duplicates) or you will see an error message.
- **Export to CSV**. Allows you to export the list of client device names to a CSV file.
- **Delete**. Allows you to delete a selected client. If no client is selected in the list, the option is disabled.

4 Click **OK** to add your selection to the **Client** list.

Filtering by Client device operating system

To allow client devices running a particular operating system to access the published resource, follow these steps:

1 Select **Client device operating system** in the drop-down list.

2 Select the **Allow access to clients on the following operating system:** option to enable the filtering rule.

3 Select one or more operating systems.

4 Click **Apply** at the bottom of the RAS Console window to save the changes.

When using the **Checking Effective Access** (p. 191) functionality, the filtering rule information will be displayed as "Client device operating system filtering is enabled".

Filtering by IP address

To allow a specific IP address (or multiple addresses) or a range of IP addresses to access the published resource, follow these steps:

1. In the **Search Filtering Type** drop-down list, select **IP Address**.
2. Select the **Allow the following IPs** option.
3. Click **Tasks** > **Add** in the IPv4 and/or IPv6 sections to specify the IP address or a range of IP addresses and click **OK**.

Filtering by MAC address

To allow a MAC address or a specific list of MAC addresses to access the published resource, follow these steps:

1. In the **Select Filtering Type** drop-down list, select **MAC**.
2. Select the **Allow the following MACs** option.
3. Click **Tasks** > **Add** and choose one of the following:
   - **Add**. Select clients to add to the list **OK**.
   - **Import from CSV**. Select a CSV file containing the list of names of client devices. The file should contain a single MAC address on each row. The addresses must be unique (no duplicates) or you will see an error message.
   - **Export to CSV**. Allows you to export the list of MAC addresses to a CSV file.

Filtering by gateway

To allow users to connect to a published resource through a specific gateway, follow these steps:

1. Select the **Gateway** filtering type.
2. Select the **Allow connections from the following gateway** option.
3. Click **Tasks** > **Add** to specify the gateway and its IP address (if it has multiple IP addresses).

Configuring multiple filtering rules

If multiple filtering rules are configured for a specific published resource, the connecting user has to match ALL of them to be allowed access to the published resource.

Please note that if you applied multiple filters, all of them will be visible in the **Information** tab of a published item.

Checking Effective Access

Filtering rules described in the previous section (p. 188) allow you to configure who can access a particular published resource. If a Parallels RAS user cannot see one or more published resources in Parallels Client, you would normally have to check filtering settings for each resource to make sure that it is published for a given user. The Effective Access functionality simplifies this task by allowing you to view in one place which published resources are available for a user and which are not.

To open the **Effective Access** dialog, select the **Publishing** category in the Parallels RAS Console and then click the **Effective Access** item in the toolbar at the bottom of the window (if you don't see the item, maximize the console window). You can also open the dialog by right-clicking anywhere in the **Published Resources** pane and choosing **Effective Access** in the context menu.

The **Effective Access** dialog allows you to specify a user (and optionally additional criteria) and then view published resources this user is allowed to access. To choose a user, do one of the following:

- Type the user name in the **User** field, or click the **[...]** button next to it and use the **Select User or Group** dialog to select a user.
- Select a device owned by this user from the list of known devices. To do so, click the **Select a Device** button then select a device. Note that if a device has never been used to connect to this Parallels RAS Farm, it will not be included in the list. For more information, see the **Monitoring Devices** section. (p. 306) After selecting a device, click **OK** to return to the **Effective Access** dialog. All of the fields will be automatically populated using properties of the selected device.

Once you specify a user, enter the additional criteria if needed (all fields except **User** are optional):

- **Client**. Client name assigned to a device. This could be a computer name, FQDN, or a custom name that the user could have set in Parallels Client.
- **IP Address**. Client IP address.
- **MAC**. Client MAC address.
- **Gateway**. RAS Secure Client Gateway name through which the client connects to the Farm.

The **Manage groups** button allows you to preview how user access changes if the user is added to one or more groups. When you click the button:

1. The **Manage Groups** dialog opens listing groups to which the user already belongs.
2. Click the **[+]** button to add the user to one or more additional groups. Note that this will only be a simulation; the user will not be actually added to any additional group.
3. To remove a "simulated" group, select it in the lower pane and click the **[-]** button.
4. Click **Close** to return to the **Effective Access** dialog.

Finally, to view the effective access information for the specified user, click the **View** button. This opens the **Effective Access - Summary** dialog, which displays the following information:

- The left pane contains the complete list of resources published in the current Site. To view only the resources that the specified user can access, select the **Show only allowed published resources** option. If the user is not allowed to access a resource, the resource name is highlighted in red.
- The right pane contains information whether the user is allowed to access a resource selected in the left pane and whether filtering is enabled for the selected resource. Additional information may include filtering details and extended group membership.

By looking though the resource list, you can see which resources the user can or cannot access and take appropriate actions if necessary. If needed, you can export the effective access information to a CSV file. To do so, click the **Export** button and specify a file name. The CSV file has the following columns:

- **Name**. Application name.
- **ID**. Application ID.
- **Accessible**. Whether the application is accessible to the user (Yes or No).
- **Rule**. Filtering rule. If no rules are configured for the application, the column will have no value.

Specifying Client Settings

To specify client settings for published resources, navigate to **Farm** / <Site> / **Settings** and select the **Client Settings** tab. On this page, you can specify how published application icons are displayed on the client side and some other options.

Select icon resolution

Published resources are displayed in Parallels Client as icons or as a list. You can specify which resolution should be used when the resources are displayed as icons. Select from the following options:

- **Send standard resolution icons**. Standard resolution icons.
- **Send high resolution icons**. High resolution icons. Please note that this option will use more network bandwidth.

Enable or disable the overlay icon

Note: This option is applicable to desktop clients only (Windows, Mac, Linux). It has no effect on mobile and HTML5 clients.

The other option on this tab is **Enable overlay icon.** An overlay icon is placed on a standard application icon to indicate that it's a remote application served by Parallels RAS. When you launch a remote application from Parallels Client, the application icon is displayed on the local desktop (e.g. on the taskbar in Windows or Dock in macOS). By using an overlay icon, you give the user the ability to tell at a glance which of their running applications are remote Parallels RAS applications and which are local (or any other kind).

Parallels RAS uses the Parallels logo as the overlay icon. When the overlay icon option is enabled, an application icon on a local computer will look like the following sample icons:

As you can see, these are standard icons used by the Windows Calculator and Paint applications with the Parallels logo icon (red parallel lines) in the corner. When a user notices the overlay, they'll know right away that this is a remote application served by Parallels RAS, not a local Windows app.

Show password expiration reminder

You can automatically remind your Parallels RAS users to change their domain password when it nears the expiration date. To enable this functionality, select the **Show password expiration reminder** option. When it is enabled, a Parallels Client user whose password is about to expire will see a notification right after they connect to Parallels RAS. Note that the option is disabled by default.

Quick Keypad

The **Quick Keypad** category in the Parallels RAS Console allows you to define custom keys to perform common actions in published applications running on mobile devices. Custom keys appear above the standard keyboard in iOS and Android and can be tapped just like any other key on the virtual keyboard.

This feature is designed for users who run published applications on a phone or a tablet. When a particular software requires repeated selection of certain menu or toolbar items, using custom keys can significantly improve user experience. For example, let's say a user has some data entry task which requires them to press **File** > **New** and **File** > **Save** menu items over and over again. If you define two custom keys to perform these actions, the user will see them above the standard keyboard in iOS or Android, so instead of tapping the application's native menu items (which can be cumbersome), they can tap these keys, which is much easier and quicker.

To define custom keys, select the **Quick Keypad** category in the Parallels RAS Console. The **Quick Keypads** view in the right pane allows you to create a Quick Keypad template. A template is created for a specific application (or a group of applications with the identical UI design) and contains shortcuts to perform common actions in an application. Once a template is created, you assign it to a published application or a group of applications, so each application (or a group) has its own Quick Keypad.

To create a Quick Keypad template:

1. Click the **Tasks** drop-down menu and choose **New Quick Keypad** (or click the **[+]** icon).
2. Specify a Quick Keypad template name (e.g. "Office apps").
3. You can organize a Quick Keypad using a multi-level menu system. If you want to do this, click the **New menu** item and specify the menu item name. You can add sub-menu items too. To move a menu item across the tree, simply drag and drop it to the desired tree node.
4. When you have your basic menu structure defined, you can add shortcuts (or you can do it any order you like).
5. To add a shortcut, click the **New shortcut** item.
6. In the **Label** field, enter the name (e.g. "New").
7. Click the **Shortcut** field and press a shortcut on the keyboard as you would in the target application. For example, the standard shortcut to create a new document in many applications is Ctrl+N, so to input this shortcut, you would press and hold Ctrl and then press N. The shortcut will appear in the field as "Ctrl+N". You can input up to three shortcuts in this field.
8. To add another shortcut to the template, click the **New shortcut** item again. Repeat until all desired shortcuts are defined.
9. Click **OK** to close the dialog. The new template will appear in the **Quick Keypads** list.

To modify the template, right-click it and choose **Properties**.

You now need to assign the template that you created to an application (or multiple applications). To do so:

1. Right-click a template and choose **Assign to Application** (you can also use the **Tasks** drop-down menu or click the "link" icon).
2. In the **Assign Quick Keypad Template** dialog, select one or more applications to which the template should be assigned.
3. Click **OK** when done.

When a remote user runs an application on their mobile device and opens a virtual keyboard, they will see the extra keys corresponding to shortcuts that you defined for a Quick Keypad template. Tapping a key will perform the corresponding action (e.g. Ctrl-N, which will open a new document).

Exporting and importing a Quick Keypad template

To easily move a Quick Keypad template from one Parallels RAS Farm to another, use the Import and Export functionality. To export a template, right-click a template and choose **Export**. Specify the file name and location and click **Save**. To import a template, right-click on an empty space in the **Quick Keypads** list and choose **Import**. You can also perform these actions using the **Tasks** drop-down menu.

CHAPTER 11

SSL Certificate Management

The Parallels RAS Console includes a certificate management interface that allows you to manage all of your SSL certificates in one place.

Certificates are managed on a Site level. Once a certificate is added to a Site, it can be used with any RAS Secure Client Gateway or HALB that also exist in this Site.

To manage certificates, in the RAS Console, navigate to **Farm** / **Site** / **Certificates**. The **Certificates** tab in the right pane displays the existing certificates. When you install Parallels RAS, the <Default> self-signed certificate is created automatically, so you will see at least this certificate in the list. The default certificate is also automatically assigned to all new RAS Secure Client Gateways and HALB.

You can perform the following certificate management tasks in the **Certificates** sub-category:

- Generate a self-signed certificate (p. 196)
- Generate a certificate signing request (CSR) (p. 196)
- Import a certificate from file (p. 197)
- Export a certificate to a file (p. 198)
- Assigning a Certificate to Gateways and HALB (p. 198)
- Audit Certificates (p. 200)
- Set permissions to manage certificates (p. 200)

The subsequent sections describe certificate management tasks in detail and provide additional certificate information and instructions.

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Generating a Self-Signed Certificate

To generate a self-signed certificate, navigate to **Farm** / **Site** / **Certificates**. Click **Tasks** > **Generate self-signed certificate**. In the dialog that opens, specify the following options:

- **Name:** Type a name for this certificate. This field is mandatory.
- **Description**: An optional description.
- **Usage**: Specify whether the certificate should be used for RAS Secure Client Gateways or HALB, or both. This selection is mandatory.
- **Key size:** The certificate key size, in bits. Here you can select from the predefine values. The default is 2048 bit, which is the minimum required length according to current industry standards.
- **Country code**: Select your country.
- **Expire in**: The certificate expiration date.
- **Full state or province:** Your state or province info.
- **City:** City name.
- **Organization:** The name of your organization.
- **Organization unit:** Organizational unit.
- **E-mail:** Your email address. This field is mandatory.
- **Common name:** The Common Name (CN), also known as the Fully Qualified Domain Name (FQDN). This field is mandatory.

Click **Save** to generate the certificate. When done, the certificate will appear in the **Certificates** list in the RAS Console with the **Status** column indicating **Self-signed**.

To view the certificate info, right-click it and choose **Properties**. In the dialog that opens, examine the properties and then click the **View certificate info** button to view the certificate trust information, details, certification path and the certificate status. You can also view the certificate info by right-clicking it and choosing **View certificate info**.

Generating a Certificate Signing Request (CSR)

To generate a CSR, navigate to **Farm** / **Site** / **Certificates**. Click **Tasks** > **Generate a certificate request**. In the dialog that opens, specify the required information. The information is exactly the same as for the self-signed certificate described above (p. 196). If you need an explanation, please refer to the list of options described in that section.

After entering the information, click **Generate**. Another dialog will open displaying the request. Copy and paste the request into a text editor and save the file for your records. The dialog also allows you to import a public key at this time. You can submit the request to a certificate authority now, obtain the public key, and import it without closing the dialog, or you can do it later. If you close the dialog, the certificate will appear in the RAS Console with the **Status** column indicating **Requested**.

To submit the request to a certificate authority and import a public key:

1. If the certificate request **Properties** dialog is closed, open it by right-clicking a certificate and choosing **Properties**. In the dialog, select the **Request** tab.
2. Copy the request and paste it into the certificate authority web page (or email it, in which case you will need to come back to this dialog later).
3. Obtain the certificate file from the certificate authority.
4. Click the **Import public key** button and finalize the certificate registration by specifying the key file and the certificate file.

Importing a Certificate

To import a certificate from a file, on the **Certificates** tab, click **Tasks** > **Import certificate**. In the dialog that opens, specify the following:

- **Name:** Type a name for the certificate.
- **Description:** An optional description.
- **Private key file:** Specify a file containing the private key. Click the **[...]** button to browse for the file.
- **Certificate file:** When you specify a private key file (above) and have a matching certificate file, it will be inserted in this field automatically. Otherwise, specify a certificate file.
- **Usage:** Specify whether the certificate will be used for RAS Secure Client Gateways or HALB, or both.

Click **OK** when done. The certificate will appear in the list in the RAS Console with the **Status** column indicating **Imported**.

To view the certificate info, right-click it and choose **Properties**. In the dialog that opens, examine the properties and then click the **View certificate info** button to view the certificate trust information, details, certification path and the certificate status. You can also view the certificate info by right-clicking it and choosing **View certificate info**.

For imported certificates, the **Properties** dialog has an additional tab **Intermediate**. If the original certificate included an intermediate certificate (in addition to the root certificate), it will be displayed here. You can paste a different intermediate certificate here if you wish.

Exporting a Certificate

To export a certificate to a file, on the **Certificates** tab, click **Tasks** > Export certificate, specify a filename and click **Save**. You can later import the certificate in a different Farm or Site by clicking **Tasks** > **Import certificate** and specifying the certificate file in the **Private key file** field.

Assigning a Certificate to Gateways and HALB

After you add a certificate to a Site, you can assign it to a RAS Secure Client Gateway, HALB, or both depending on the usage type that you specified when you created the certificate (described in the beginning of this chapter). More on the certificate **Usage** option below.

Certificate Usage

Certificate **Usage** is an option that you specify when you create a certificate. It specifies whether the certificate should be available for RAS Secure Client Gateways, HALB, or both. When setting this option, you can choose from the following:

- **Gateway**: If selected, makes the certificate available for RAS Secure Client Gateways.
- **HALB**: If selected, makes the certificate available for HALB.

You can select one of the options above or both, in which case the certificate becomes available for both, Gateways and HALB. For details on how to create a certificate and choose these options, please see Generating a self-signed certificate (p. 196) and Generating a certificate signing request (CSR) (p. 196).

When you configure SSL for a RAS Secure Client Gateway or HALB later, you need to specify an SSL certificate. For the information on how to do this, please see SSL/TLS Encryption (p. 67) and Configuring HALB in the RAS Console (p. 294). When you select a certificate, the following options will be available depending on how the **Usage** option is configured for a particular certificate:

- **<All matching usage>**: This is the default option, which is always available. It means that any certificate on which the **Usage** selection matches the object type (Gateway or HALB) will be used. For example, if you are configuring a Gateway and have a certificate that has **Usage** set to "Gateway", it will be used. If a certificate has both, Gateway and HALB usage options selected, it can also be used with the given gateway. This works the same way for HALB when you configure the LB SSL Payload. Please note that if you select this option for a Gateway or HALB, but not a single matching certificate exists, you will see a warning and will have to create a certificate first.

- Other items in the **Certificates** drop-down list are individual certificates, which will or will not be present depending on the certificate's **Usage** settings. For example, if you configure LB SSL Payload for HALB and have a certificate with the **Usage** option set to "HALB", the certificate will appear in the drop-down list. On the other hand, certificates with **Usage** set to "Gateway" will not be listed.

As another example, if you need just one certificate, which you would like to use for all of your Gateways, you need to create a certificate and set the **Usage** option to "Gateways". You can then configure each Gateway to use this specific certificate or you can keep the default **<All matching usage>** selection, in which case the certificate will be picked up by a Gateway automatically. Same exact scenario also works for HALB.

Gateways

To assign a certificate to a RAS Secure Client Gateway:

1. Navigate to **Farm** / **Site** / **Gateways**.
2. Right-click a gateway and choose **Properties**.
3. Select the **SSL/TLS** tab.
4. In the **Certificates** drop-down list, select the certificate that you created.
5. Click **OK**.

Please note that you can also select the **<All matching usage>** option, which will use any certificate that either has the usage set to Gateway or both Gateway and HALB.

HALB

To assign a certificate to a HALB, navigate to **Farm** / **Site** / **HALB**. Assuming that your HALB is enabled and configured, and the **LB SSL Payload** option is selected, follow the instructions below:

1. Click **Configure** next to the **LB SSL Payload** option.
2. A certificate must be used when the **Mode** option is set to **SSL Offloading**. Once again, assuming it is selected, continue to the next step.
3. Click **Configure**.
4. In the **SSL** dialog, select the certificate in the **Certificates** drop-down list.

As with gateways, you can also select the **<All matching usage>** option, which will use any certificate that has the usage set to HALB or both HALB and Gateway.

Auditing Certificates

All actions that you perform on certificates are audited and can be viewed later. Note that reverting certificate changes is not possible. If you need to revert to a previous state, you'll have to delete a certificate and create a new one.

To audit certificates:

1. In the RAS Console, navigate to **Farm** / **Site** / **Certificates**.
2. Click **Tasks** > **Settings audit**.
3. The dialog opens where you can view the history of certificate actions. Note that the **Revert** button is disabled. As noted at the beginning of this section, reverting a certificate action is not possible.
4. To view details for a particular audit entry, double-click it.

Permissions to Manage Certificates

Root and Power administrators always have rights to manage certificates. Custom administrators don't have them by default. To grant permissions to manage certificates to Power administrators, the **Certificates** global permission type is used.

If you are a Root or Power administrator, you can set certificate permissions as follows:

1. In the RAS Console, navigate to **Administration** / **Accounts**.
2. Select a Custom administrator account and click **Tasks** > **Properties**.
3. In the **Account Properties** dialog, click **Change Permissions**.
4. In the **Account Permissions** dialog, select a Site in the left pane and click **Change permissions** (or click the **Edit** link in the right pane).
5. In the left pane (Permission type), select **Certificates**.
6. In the right pane (Global permissions), select one or more permissions.
7. When done, close all dialogs.

A RAS administrator can also delegate his/her permissions to a custom administrator. To do so, navigate to **Farm** / **Site** / **Certificates** and click **Tasks** > **Delegate permissions**. In the dialog that opens, delegate permissions to a desired Custom administrator.

Upgrading from an older RAS version

When you upgrade Parallels RAS from a version prior to RAS 17.1 to a RAS 17.1 (or newer), every certificate that is used by RAS Secure Client Gateways and HALB is enumerated and only unique certificates are added to the **Certificates** subcategory. Gateways and HALB are then linked 1-to-1 to the certificates they were using before the upgrade.

Other actions related to an upgrade include the following:

- The **Inherit defaults** option in gateways is turned off after the upgrade.
- If a gateway is disabled during an upgrade, the Publishing Agent still has the information about the certificate that the gateway uses, so the gateway is configured properly when it comes back online.
- Site defaults settings are configured to use the default self-signed certificate.
- When a new gateway is added, it is configured to use the default self-signed certificate, provided the Site defaults are not changed afterwards.

CHAPTER 12

Connection and Authentication Settings

A Parallels RAS administrator has the ability to customize how users connect to Parallels RAS. This chapter describes connection and authentication settings that can be configured according to your organization requirements. It then explains how to use two-factor authentication for higher level of security.

In This Chapter

RAS Publishing Agent Connection Settings 202
Remote Session Settings 203
Restricting Access by Parallels Client Type and Build Number 205
Multi-Factor Authentication 205

RAS Publishing Agent Connection Settings

RAS Publishing Agent connection settings can be accessed from the **Connection** category.

Choosing Authentication Type

Select the **Authentication** tab. In the **Allowed authentication types** section, select one of the following options:

- **Credentials**. The user credentials are validated by the Windows system on which RAS is running. The credentials used for Windows authentication are also used to log in to an RDP session.
- **Smart Card**. Smart card authentication. Similar to Windows authentication, smart card credentials can be shared between both RAS and RDP. Hence, smart card credentials only need to be entered once. Unlike Windows authentication, the user only needs to know the smart card's PIN. The username is obtained automatically from the smart card, so the user doesn't need to provide it.
- **Web (SAML)**. SAML SSO authentication.

Note that if smart card authentication is disabled, RAS Publishing Agent will not hook the Local Security Authority Subsystem Service (LSASS). Smart card authentication can be used in Parallels Client for Windows, Mac, and Linux. Please also note that smart cards cannot be used for authentication if Parallels Client is running inside an RDP session.

Smart card certificate

A valid certificate must be installed on a user device in order to use smart cards. To do so, you need to import the certificate authority root certificate into the device's keystore.

A certificate must meet the following criteria:

- The "Key Usage" field must contain digital signature.
- The "Subject Alternative Name" (SAN) field must contain a user principal name (UPN).
- The "Enhanced Key Usage" field must contain smart card logon and client authentication.

Authentication domains

To specify authentication domains, select one of the following:

- **Specific:** Select this option and type a specific domain name.
- **All Trusted Domains**. If the information about users connecting to Parallels RAS is stored in different domains within a forest, select the **All Trusted Domains** option to authenticate against multiple domains.
- **Use client domain if specified**. Select this option to use the domain specified in the Parallels Client connection properties. If no domain name is specified on the client side, the authentication is performed according to the settings above.
- **Force clients to use NetBIOS credentials**. If this option is selected, the Parallels Client will replace the username with the NetBIOS username.

  Note: If a certificate on your smart card does not contain a user principal name (UPN) in the "Subject Alternative Name" (SAN) field (or if it doesn't have the "Subject Alternative Name" field at all) you have to disable the **Force clients to use NETBIOS credentials** option.

Recommendation: After changing the domain names or some other authentication related changes, click the **Clear cached session IDs** button on the **Settings** tab.

Authenticating Against Non Domain Users

In order to authenticate users sessions against users specified on a standalone machine you must enter the [workgroup_name] / [machine_name] instead of the domain name. For example if you would like to authenticate users against a list of local users on a machine called SERVER1 that is a member of the workgroup WORKGROUP, enter the following in the domain field: WORKGROUP/SERVER1.

Remote Session Settings

The **Settings** tab in the **Connection** category allows you to configure the following remote session options:

- **Declare remote session idle after:** This option affects reporting statistics, whereby a session is declared idle after the amount of time specified without any activity.
- **Automatically logoff RAS idle session after:** Specifies the time period after which an idle session (a user RAS connection) should be logged off. Once the session is logged off, the user is disconnected from Parallels RAS and is presented with the **Connections** dialog in Parallels Client as a way to notify them that they were logged off. They can use the dialog to log back on if desired.
- **Cached Session Timeout:** Specify the amount of time that a session is cached for (higher amount of time reduces AD transactions).
- **Clear cached session IDs:** Clears all cached session information.

FIPS 140-2 encryption

The **FIPS 140-2 encryption** property allows you to specify whether FIPS-encrypted connections are allowed or even enforced on RAS Secure Client Gateways. When you allow (or enforce) the encryption, the Gateways will use the FIPS 140-2 encryption module. You can choose from the following options:

- **Disabled**. FIPS 140-2 encryption is disabled on RAS Secure Client Gateways.
- **Allowed**. RAS Secure Client Gateways accept both FIPS-encrypted and non-FIPS-encrypted connections.
- **Enforced**. RAS Secure Client Gateways accept FIPS-encrypted connections and will drop any non-FIPS-encrypted connection.

Note: For FIPS 140-2 encryption to work, a FIPS compliant certificate must be installed on each RAS Secure Client Gateway.

When you enable FIPS 140-2 encryption, the encryption status is displayed on the **Information** / **Site Information** tab in the RAS Console. Look for the **Encryption** property of a RAS Secure Client Gateway.

The following versions of Parallels Client support FIPS 140-2 encryption:

- Parallels Client for Windows 64-bit
- Parallels Client for Linux 64-bit

Please note that HALB is not supported when using a FIPS-encrypted connection.

By default, the values on the **Settings** tab are replicated to all sites in a Parallels RAS Farm (the **Replicate settings** option in the lower right corner is enabled). If you would like to have these settings defined differently for different sites, clear the **Replicate settings** option in all sites and then set the options for each Site individually.

Restricting Access by Parallels Client Type and Build Number

You can specify a minimum requirement for the Parallels Client type and version number in order for it to connect to the Parallels RAS Farm or to list published resources. In addition, you can set the Parallels Client security patch level (described later in this section).

To specify Parallels Client requirements:

1. In the RAS Console, select the **Connection** category and click the **Allowed Devices** tab.
2. The **Allow only clients with latest security patches** option specifies the Parallels Client security patch level. If the option is selected, only clients with latest security patches applied will be allowed to connect to Parallels RAS. This option must normally be selected to protect your environment from vulnerabilities. You should only clear it if you must use an older version of Parallels Client with no security patches installed. For more information, please see the following KB article: https://kb.parallels.com/en/125112.
3. In the **Mode** drop-down list, select from the following options:
   - **Allow all clients to connect to the system**. No restrictions. All Parallels Client types and versions are allowed full access.
   - **Allow only the selected clients to connect to the system**. Allows you to specify Parallels Client types and versions that are allowed to connect to the Parallels RAS Farm. Select the desired Parallels Client types in the **Clients** list. To set the **Minimum build** value, right-click the client type and choose **Edit**. Type the version number directly in the **Minimum build** column.
   - **Allow only the selected clients to list the published items**. Allows you to specify Parallels Client types and versions that can list published resources. Compared to the option above, this one does not restrict Parallels Clients connecting to Parallels RAS. Select this option and then select the desired Parallels Client types in the **Clients** list. To set the **Minimum build** value, right-click the client type and then click **Edit** in the context menu. Type the version number directly in the **Minimum build** column.

If a restriction is configured and a Parallels Client is excluded from the list, the user running it will receive a corresponding error message and will be advised to contact the system administrator.

Multi-Factor Authentication

Parallels RAS allows you to use multi-factor authentication for access control. When multi-factor authentication is used, users will have to authenticate through two successive stages to get the application list. While the first level will always use native authentication (Active Directory / LDAP), the second level can use one of the following solutions:

- Azure MFA (RADIUS) (p. 206)
- Duo (RADIUS) (p. 206)
- FortiAuthenticator (RADIUS) (p. 206)
- TekRADIUS (p. 206)
- Deepnet
- SafeNet (p. 223)
- Google Authenticator (p. 224)

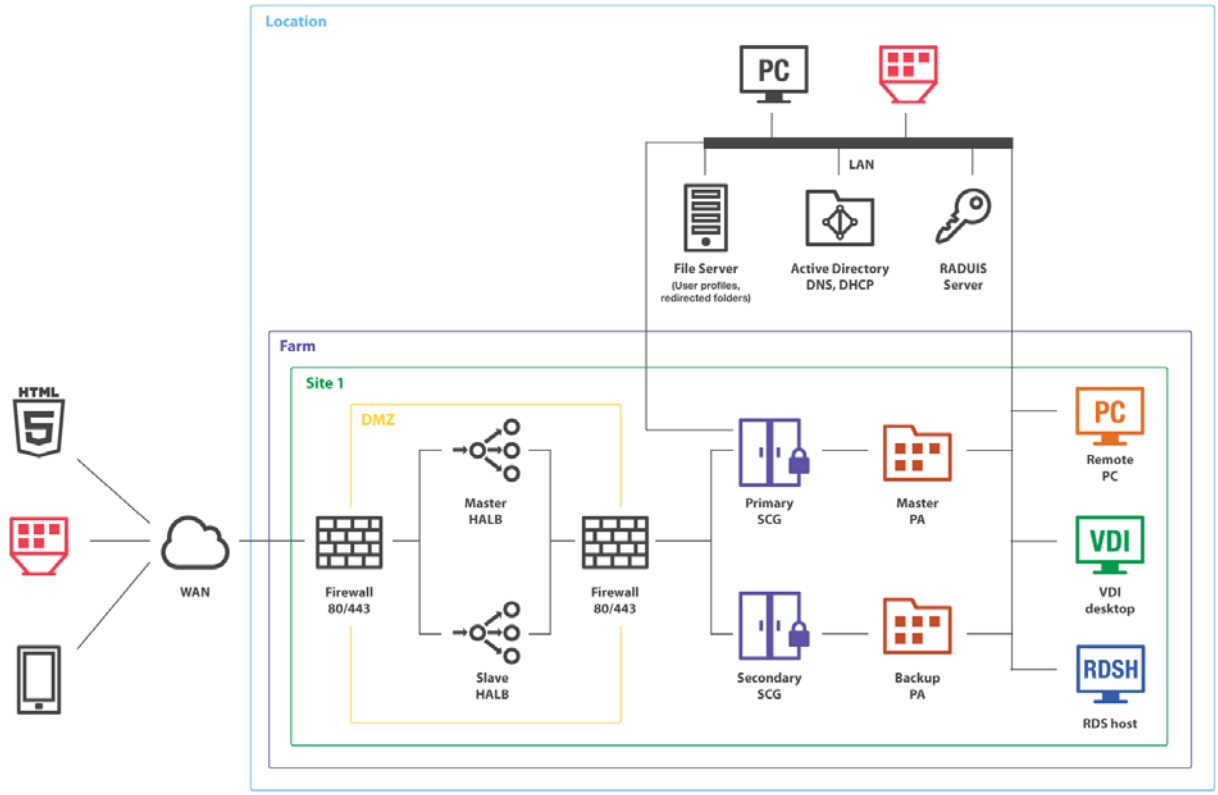
Multi-factor authentication is more secure because instead of using a standard user name and password, it uses a static user name and a one-time password generated by a token.

Multi-factor authentication can be configured in the Parallels RAS Console in **Connection** / **Multi-factor authentication**.

See also **Configuring Exclusion Rules** (p. 226).

Using RADIUS

The below diagram shows the double hop perimeter network scenario with RAS Publishing Agent connected to a RADIUS server (RADIUS is located in Intranet but it can be placed in DMZ).



To configure RADIUS properties:

1 In the Parallels RAS Console, navigate to **Connection** / **Multi-factor authentication**.

2 In the **Provider** drop-down list, select a RADIUS solution that you use in your organization. The following options are available:

- Azure MFA server (RADIUS)
- Duo (RADIUS)
- FortiAuthenticator (RADIUS)
- TekRADIUS
- RADIUS

> **Note:** For specifics about configuring some of the solutions, please read corresponding subsections at the end of this section.

3 Click the **Settings** button. In the dialog that opens, select the **Connections** tab and specify the following options:

- **Type Name:** Specify the name of the OTP connection type that will be displayed on the Logon screen on the client side. This should be the name that your users will clearly understand.
- **Server:** Enter the hostname or IP address of your RADIUS server.
- **Port:** Enter the port number for the RADIUS Server. Click the **Default** button to use the default value.
- **Timeout:** Specify the packet timeout in seconds.
- **Retries:** Specify the number of retries when attempting to establish a connection.
- **Secret Key**: Type the secret key.
- **Password Encoding:** Choose from PAP (Password Authentication Protocol) or CHAP (Challenge Handshake Authentication Protocol), according to the setting specified in your RADIUS server.

4 Click the **Check connection** button to validate the connection. If the connection is configured correctly, you will see a confirmation message.

5 Select the **Forward username only to RADIUS server** as required.

6 Select the **Forward the first password to Windows authentication provider** option to avoid a prompt to enter the password twice (RADIUS and Windows AD). Note that for Azure MFA server, this option is always enabled and cannot be changed.

7 Please also read a note at the bottom of the dialog (if available) suggesting a certain setting specific for your RADIUS solution.

8 If your RADIUS solution requires configuring attributes, click the **Attribute** tab and then click **Add**. In the dialog that opens, specify the following:

- In the **Vendor** drop-down list, select a vendor.

- In the **Attribute** list, select a vendor attribute.
- In the **Value** field, enter a value for the selected attribute type (numeric, string, IP address, date, etc).

9 Click **OK** and then click **OK** again to close all dialogs.

Configuring Azure MFA

Before reading this section, please read the following important note.

Note: As of July 1, 2019, Microsoft will no longer offer MFA Server for new deployments. New customers who would like to require multi-factor authentication from their users should use cloud-based Azure Multi-Factor Authentication. Existing customers who have activated MFA Server prior to July 1 will be able to download the latest version, future updates and generate activation credentials as usual. https://docs.microsoft.com/en-us/azure/active-directory/authentication/howto-mfaserver-deploy

For new deployments, it is recommended to use Azure NPS Extension https://docs.microsoft.com/en-us/azure/active-directory/authentication/howto-mfa-nps-extension or Azure MFA Service along with SAML configuration in RAS.

Configure Azure MFA

Depending on the user location, there are four scenarios for the cloud MFA service:

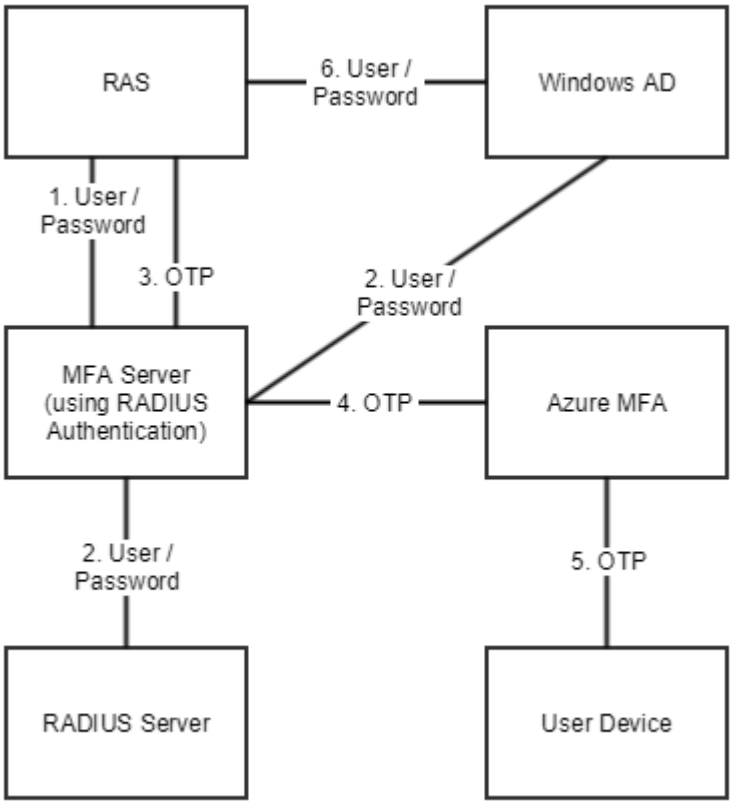
User Location	MFA in the cloud	M FA Server
Azure Active Directory	Yes	
Azure AD and on-premises AD using federation with AD FS (is required for SSO)	Yes	Yes
Azure AD and on-premises AD using DirSync, Azure AD Sync, Azure AD Connect - no password sync	Yes	Yes
Azure AD and on-premises AD using DirSync, Azure AD Sync, Azure AD Connect - with password sync	Yes	
On-premises Active Directory		Yes

An Azure account with Global Administrator role is required to download and activate MFA Server. Syncing with Azure AD (via AD Connect) or a custom DNS domain aren't required to setup an MFA Server which runs exclusively on-premises.

Users need to be imported into MFA Server and be configured for MFA authentication.

Parallels RAS authenticates users with MFA Server using the RADIUS second level authentication provider. MFA Server thus needs to be configured to allow RADIUS client connections from the RAS server.

The authentication process goes through the following stages:



In stage 2 the user can be authenticated using either RADIUS or Windows AD. A prompt to enter the credentials twice (in stage 1 and 6) is avoided by enabling the option to forward the password.

Configuring Duo

For instructions on how to configure Parallels RAS with Duo RADIUS, please read the following Parallels KB article: `https://kb.parallels.com/124429`

Using Deepnet DualShield

This section explains how to integrate Deepnet DualShield Authentication Platform 5.6 or higher with Parallels RAS.

In this section:

- **Supported Tokens**
- **Configuring DualShield 5.6+ Authentication Platform** (p. 216)
- **Configuring Parallels RAS to Use the DualShield Authentication Platform** (p. 220)

- **Connect to a RAS Farm** (p. 222)

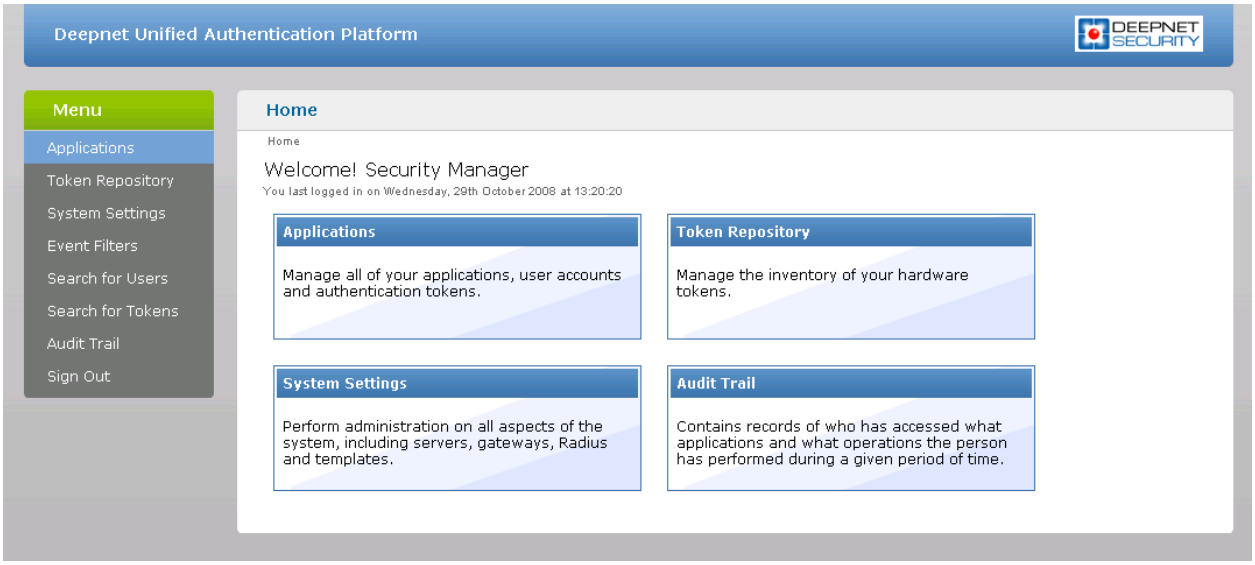
You may also read the following documentation on DualShield Authentication Platform:

- DualShield Authentication Platform – Installation Guide
- DualShield Authentication Platform – Quick Start Guide
- DualShield Authentication Platform – Administration Guide

Configuring Deepnet

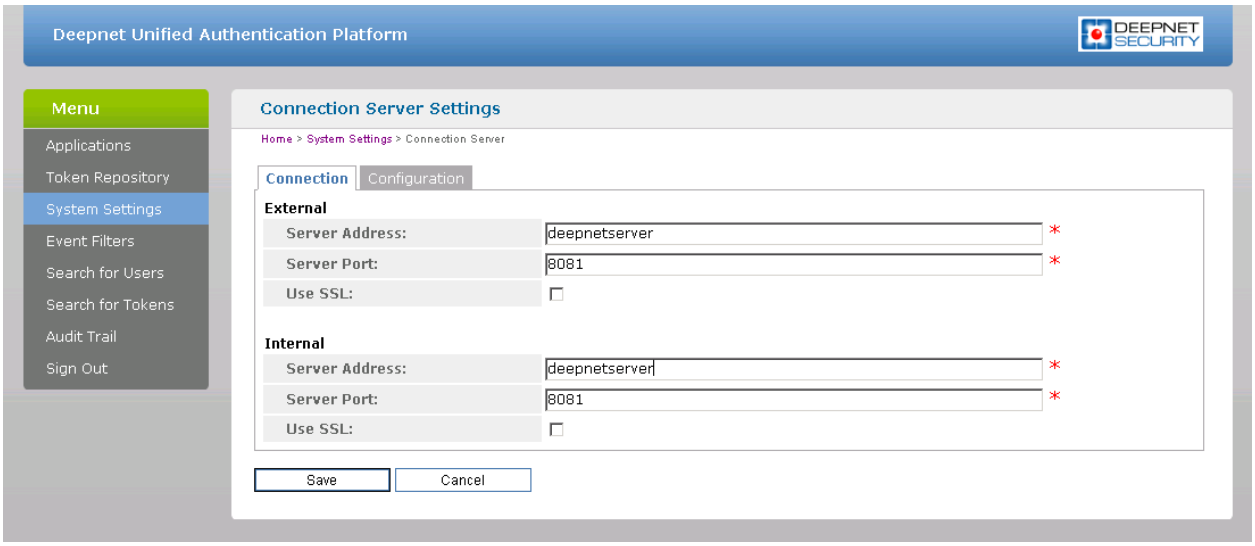
Start by logging into the machine where Deepnet Unified Authentication is installed and open your Internet browser. Since Deepnet is installed locally, use 'localhost' as the URL followed by the port number which the Deepnet server will use to communicate with your applications (ex: http://localhost:8080/).

You must then log into the Deepnet Management Console with the credentials that you had set during the installation.



Servers

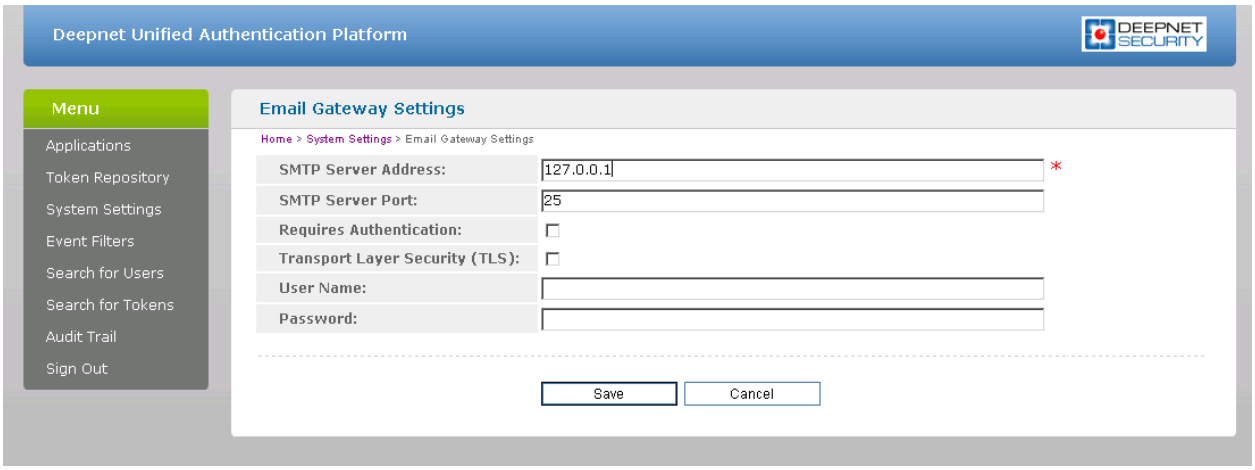
Ensure that the Communication Server, Connection Server and Authentication Server are properly configured. For further information please refer to Deepnet Unified Authentication Platform Administration Guide.



RAS Publishing Agent will communicate with the Authentication Server. It is highly recommended to have this behind a Firewall for security reasons. Make sure that the **Server Address** and **Server Port** are correct.

Gateways

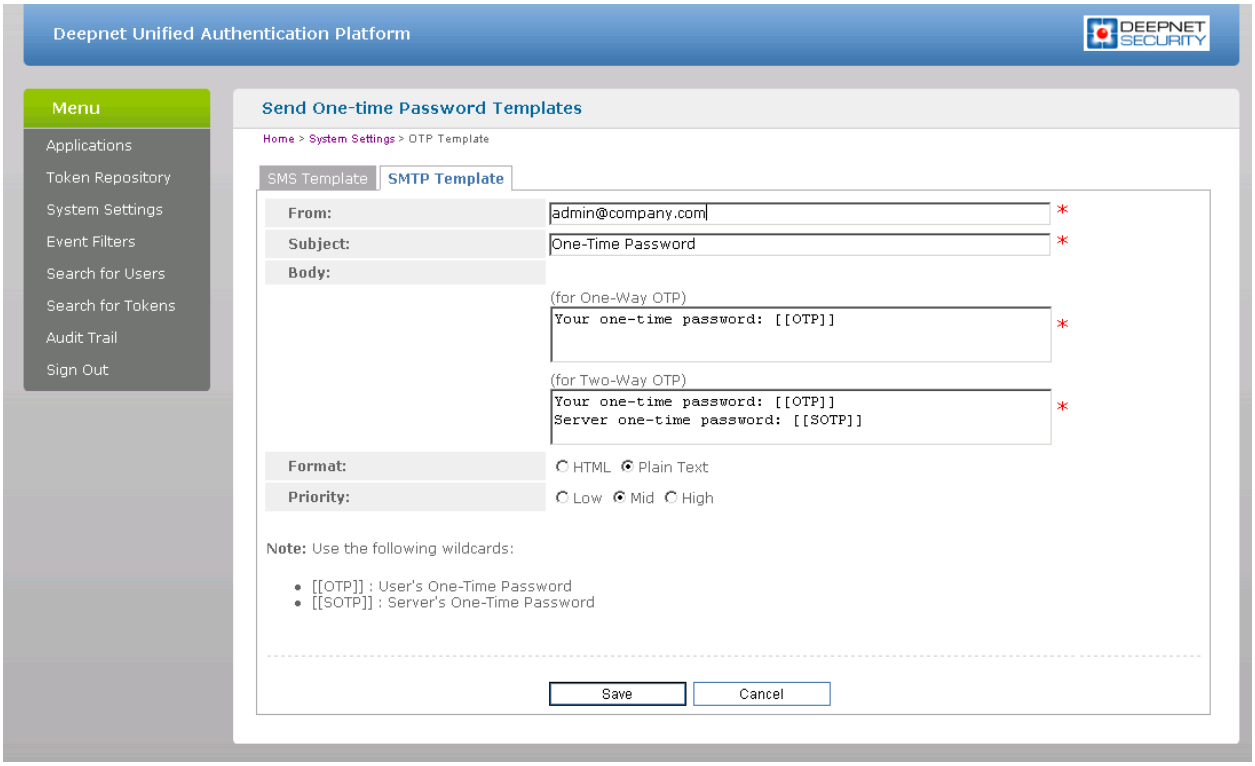
Email or SMS Gateways must be configured correctly so that the Deepnet server is able to send information, such as Activation codes, to the users.



The E-Mail Gateway and/or SMS Gateway must be configured to be able to send messages to the user. Enter the **SMTP Server Address** and **SMTP Server Port** of the server which will be used by the Deepnet Unified Authentication to send e-mails. Remember to enter any username or password used for the SMTP server.

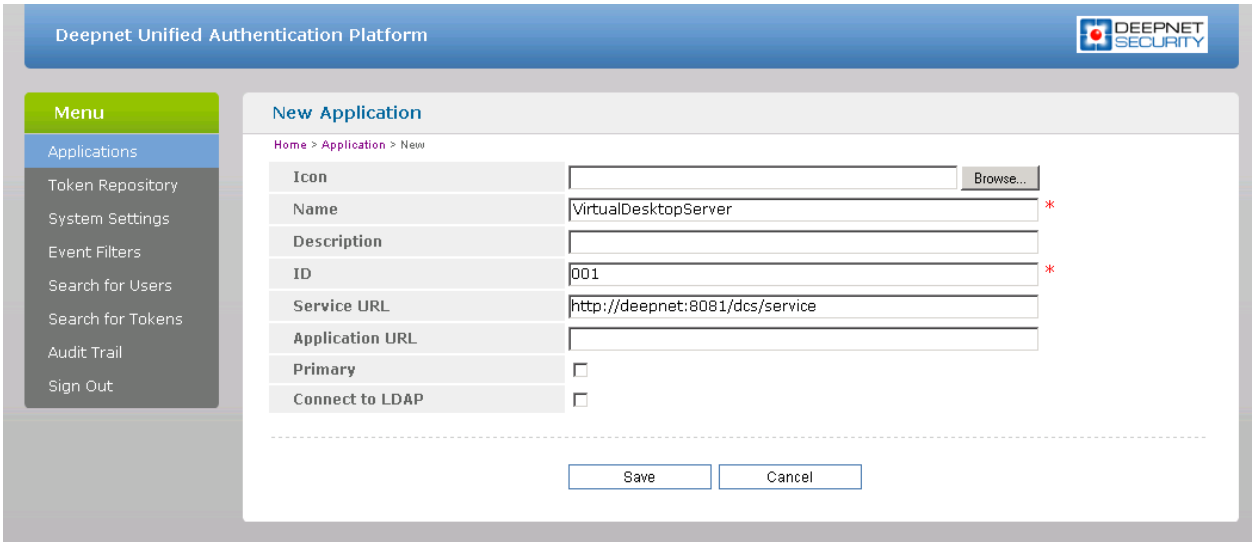
Templates

Templates are used to set the structure of e-mails and SMS messages sent by the server. The SMS template allows you to set the text for the **Sender** field, the message content and an optional subject. Make sure that you use the preset wildcards to send unique information such as the One-Time Password ([[OTP]]).



The E-mail template allows you to set the e-mail address that the user can reply to. This should be set to the administrator's e-mail. You can also set the e-mail's **Subject**, **Priority** and **Format**. The **Body** contains the actual content of the e-mail which should include the preset wildcard for the unique information along with a message.

Applications



Click on **New** to add a new application. From the new form that loads you only need to set a **Name** and an **ID**. Once this is done, click **Save** to save your settings.

Token Repository

If using hardware tokens such as SafeID the token information must first be imported using the XML file provided. Click on **Import** and browse for the XML file provided. After the XML file has been imported each hardware token must be assigned to a user.

Configuring Parallels RAS for Deepnet

List of Supported Tokens

- SafeID
- FlashID
- MobileID
- QuickID
- GridID
- SecureID (RSA)
- DigiPass (Vasco)

Connect to Deepnet Unified Authentication

1 In the RAS Console, select the **Connection** category and then click the **Multi-factor authentication** tab.

2 In the **Provider** drop-down list, select **Deepnet** and click the **Settings** button. The **Deepnet Properties** dialog opens.

3 On the **Connection** tab, enter the server name and port that you saved while setting up your authentication sever. By default, the port number is set to 8080. Click on **Check Connection** to test that your Authentication Server can be reached. You can choose to connect over SSL to your authentication server.

4 Click the **Application** tab.

5 Select the application profile that will use Deepnet to authenticate its users. You can also create an application which will be added on the Deepnet server.

6 The **Default Domain** field enables you to choose the default domain user for authentication and when users are added. Any Deepnet user accounts imported or verified will be done so using this default domain.

7 Select the **Use LDAP** option when importing Deepnet user accounts and a group that contains other sub-groups.

8 Click the **Import Deepnet user accounts…** button to automatically add the specified users/groups to the Deepnet application.

9 Click the **Verify Deepnet user account names** button to check that all users in the Deepnet application are in the following format: \\domain\username. Users added in the format of username@domain will be automatically changed to the appropriate format and users without a domain will have the default domain assigned to them.

10 Click the **Authentication** tab.

11 In the **Mode** drop-down list, select the mode how you want your users to be authenticated:

- **Mandatory for all users** means that every user using the system must log in using two-factor authentication.
- **Create token for Domain Authenticated Users** will allow Parallels RAS to automatically create software tokens for Domain Authenticated Users. Choose a token type from the drop down list. Note that this option only works with software tokens.
- **Use only for users with a Deepnet account** will allow users that do not have a Deepnet account to use the system without having to log in using two-factor authentication. Note that if a user has a Deepnet account, but the account is configured as not required to use 2FA, the AD authentication will be used instead.

12 In the **Allow Channels** section, you can specify what channels are available to the user to activate the token or when requesting a Quick ID OTP. For example, if you select **Email**, the activation code can be sent only via email. If you select **SMS**, the activation code is sent via SMS.

Creating User Accounts on Deepnet

When adding new user accounts on Deepnet, it is important that the domain name is included with the **Login Name** of the user, therefore the entry should be in the following format: \\domain\username.

Users created automatically by Parallels applications are already in that format but users imported from the Deepnet console must be corrected.

To correct the usernames:

1 Open the **Deepnet Properties** dialog (**Connection** >**Multi-factor authentication** > **Settings**).

2 Select the **Application** tab.

3 Click the **Verify Deepnet user account names** button.

Note that users added in the format of username@domain will be automatically changed to the appropriate format (\\domain\username).

Connecting to a RAS Farm with Deepnet

Parallels Client

Once Deepnet is enabled, the users will have two-factor authentication. If using software tokens such as QuickID the administrator does not have to create a token for each user. RAS Publishing Agent will automatically create the token when the user tries to log in for the first time.

When a user tries to access a Parallels Connection from Parallels Client, he/she is first prompted for the Windows username and password. If the credentials are accepted, RAS Publishing Agent will communicate with the Deepnet server to create a unique token for that user.

The token then needs to be activated. Click on a button to send the activation code by e-mail or by SMS depending on the channel selected when configuring Authentication section. A message will then be sent containing the token activation code which will need to be inserted in the **Activation code** text box.

If using MobileID or FlashID, an email about where you can download the appropriate software will be sent to the user.

If using QuickID tokens, the application will ask for a One-Time Password which is sent by e-mail or SMS.

If using a GridID, the user is given the opportunity to print the grid from the client itself. Note that this is only available the first time the user logs on.

Working with DualShield

This section explains how to integrate Deepnet DualShield Authentication Platform 5.6 or higher with Parallels RAS.

You may also read the following documentation on DualShield Authentication Platform:

1 DualShield Authentication Platform – Installation Guide

2 DualShield Authentication Platform – Quick Start Guide

3 DualShield Authentication Platform – Administration Guide

List of Supported Tokens by Parallels RAS

MobileID (FlashID is not integrated with MobileID)

1 QuickID
2 GridID
3 SafeID
4 SecureID (RSA)
5 DigiPass (Vasco)

If using hardware tokens such as SafeID the token information must first the XML file provided. Click on 'Import' and browse for the XML file provided. After the XML file has been imported each hardware token must be assigned to a user.

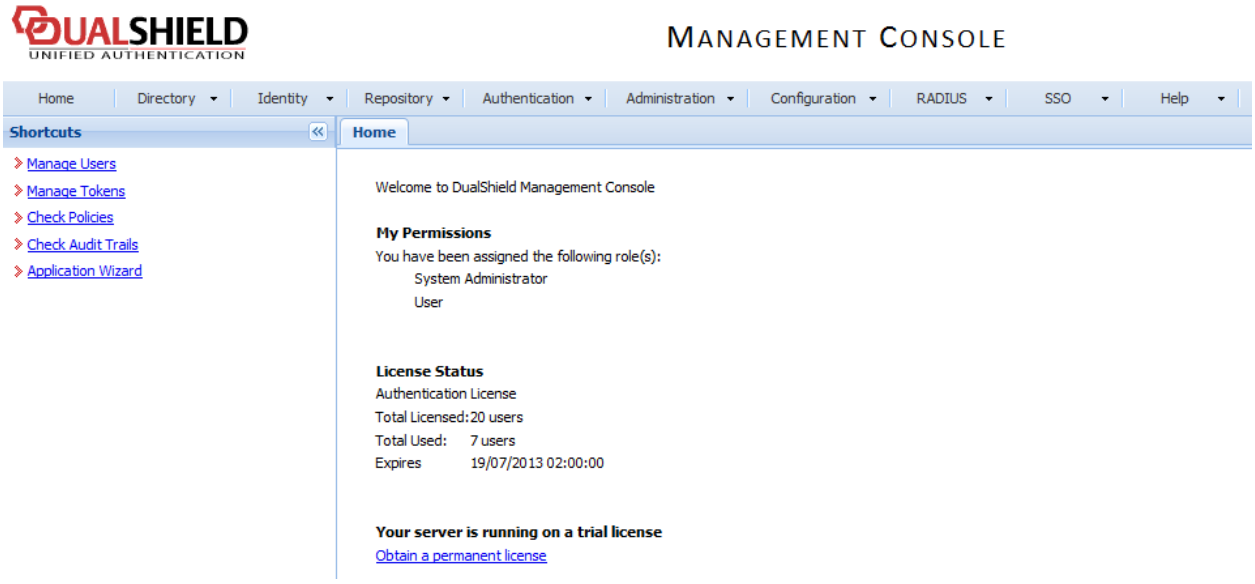
In this section:

- Configuring DualShield 5.6+ Authentication Platform (p. 216)
- Configuring Parallels RAS to Use DualShield Authentication Platform (p. 220)
- Connect to a RAS Farm (p. 222)

Configuring DualShield 5.6+ Authentication Platform

After following all the specified steps in "DualShield Authentication Platform – installation Guide" a URP is automatically opened in your internet browser (http:// LOCALHOST:8073) which allows you to logon to the Management Console of DualShield.

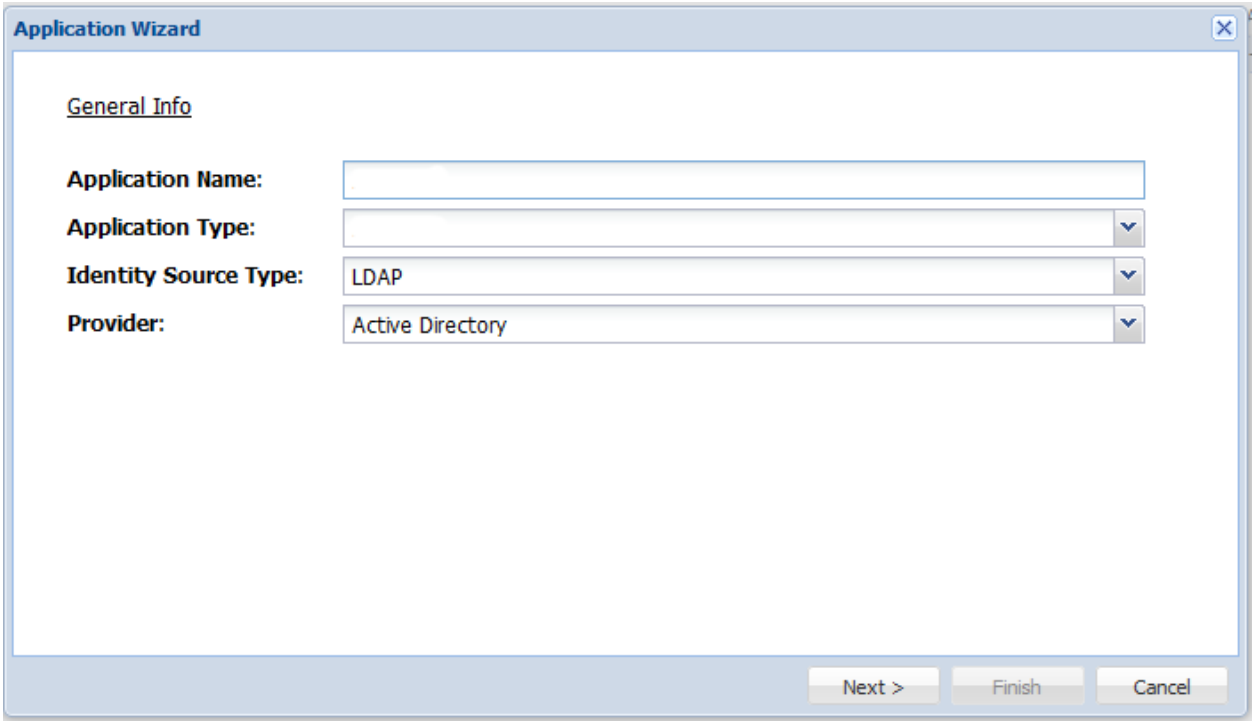
Login in to the DualShield Management Console with the default credentials (User: sa, Password: sa). You will be prompted to change the default password.



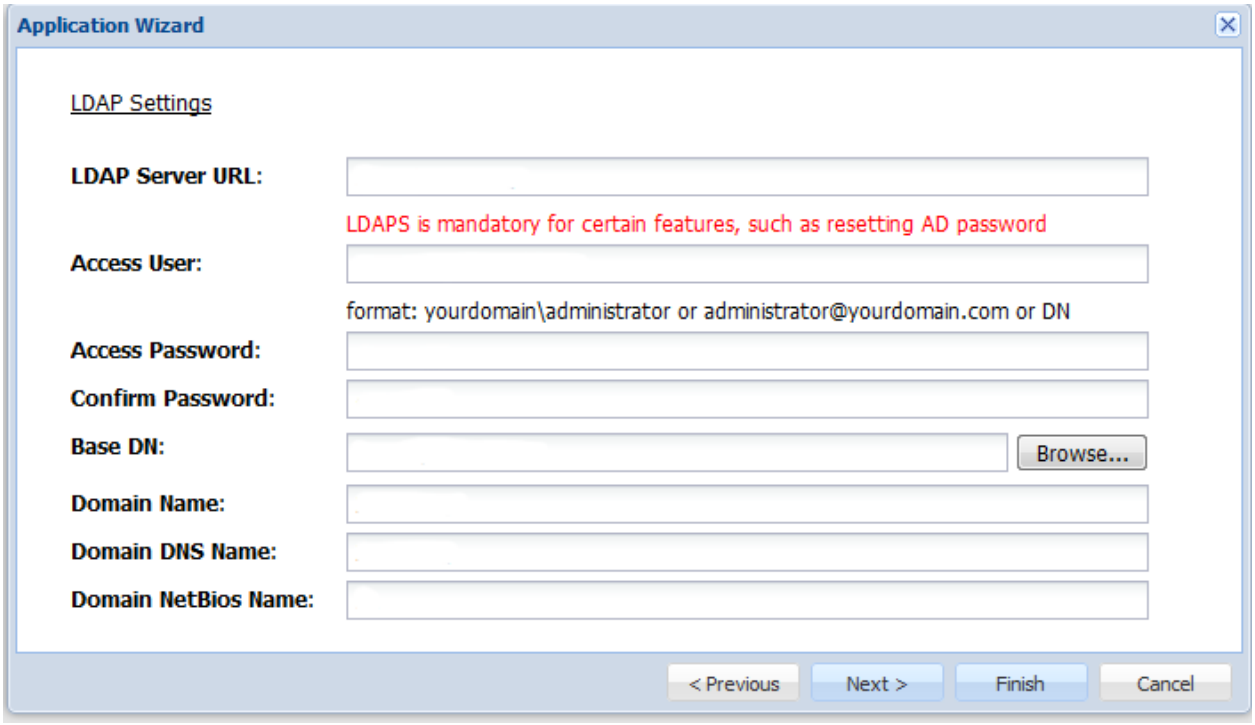
Applications are set to provide a connection to realm, as the realm contains domains of users who will be allowed the access to the application.

Realm is set for multiple domain users to be able to access the same application.

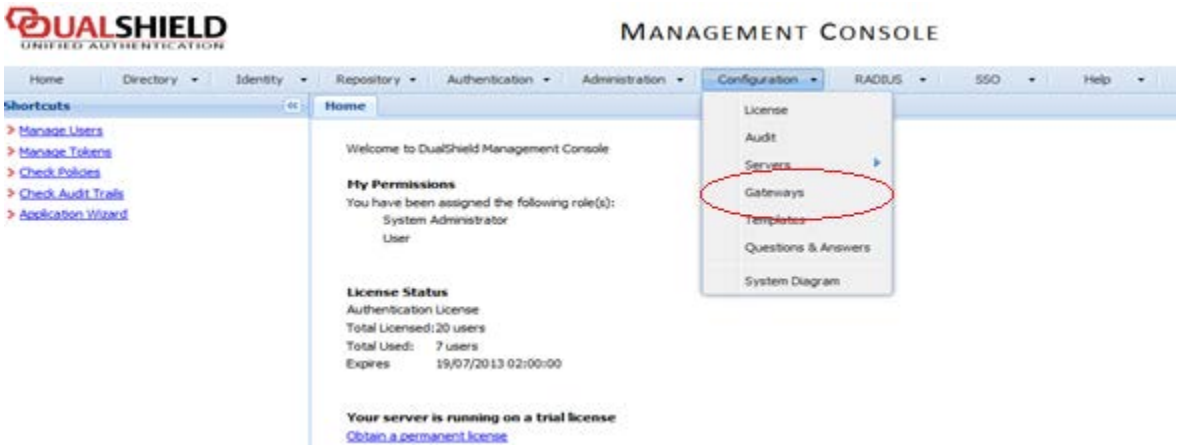
You need to create an Application which Parallels RAS will communicate with. Click on **Authentication** > **Application Wizard** and enter the information shown below and press **Next**.



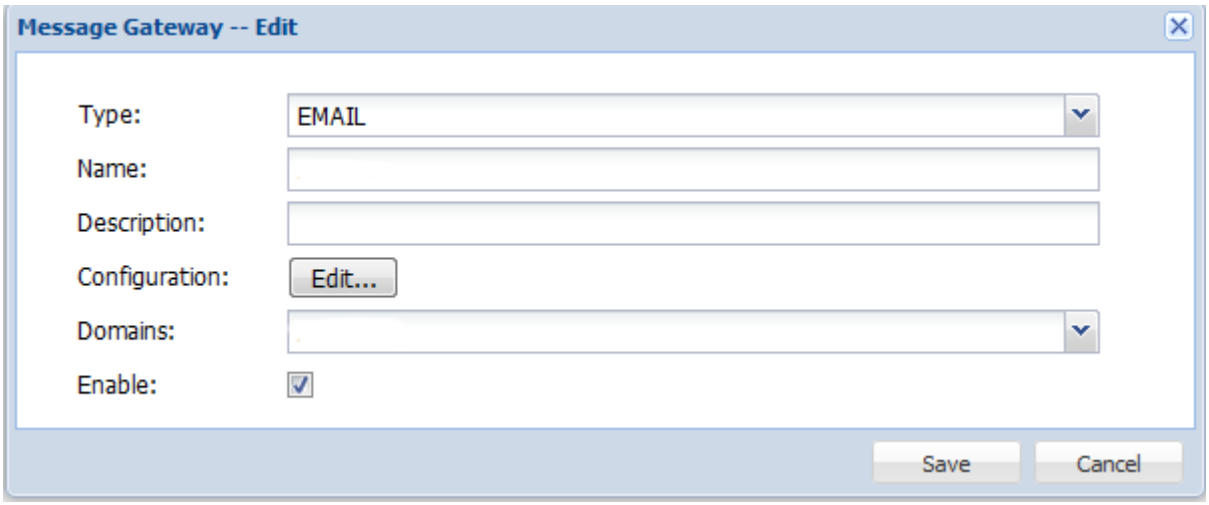
Specify the LDAP Server settings as shown below and press **Finish.**



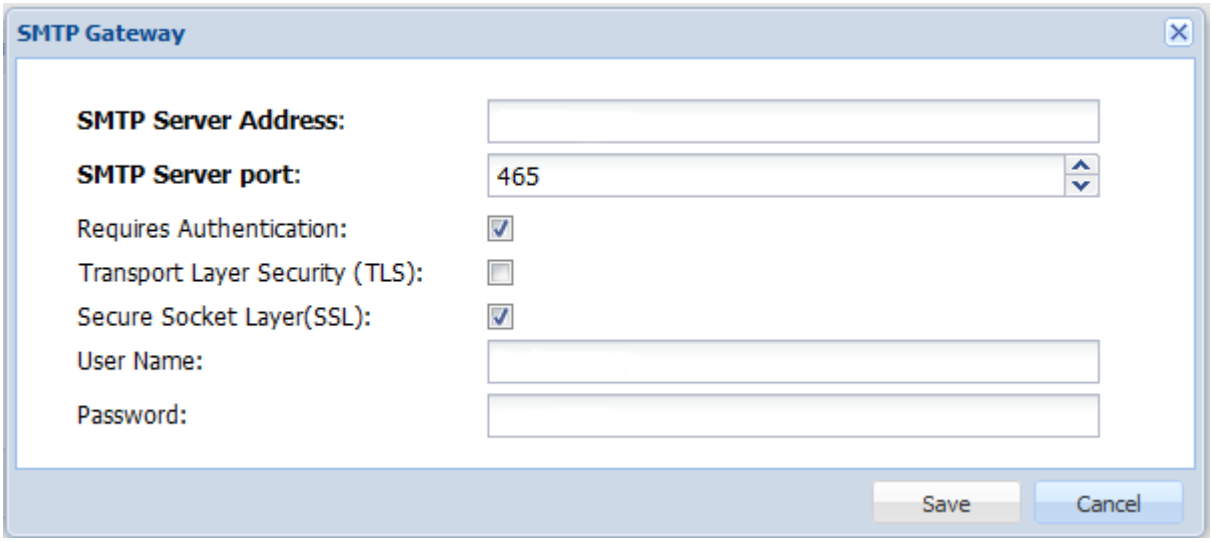
After you have configured the application you need to configure an Email or SMS gateway which are used by DualShield server to communicate with the end user. In this document we will be using an Email gateway. Select Gateways from the Configuration menu.



Configure your email gateway.



Click **Edit** to enter your SMTP server information

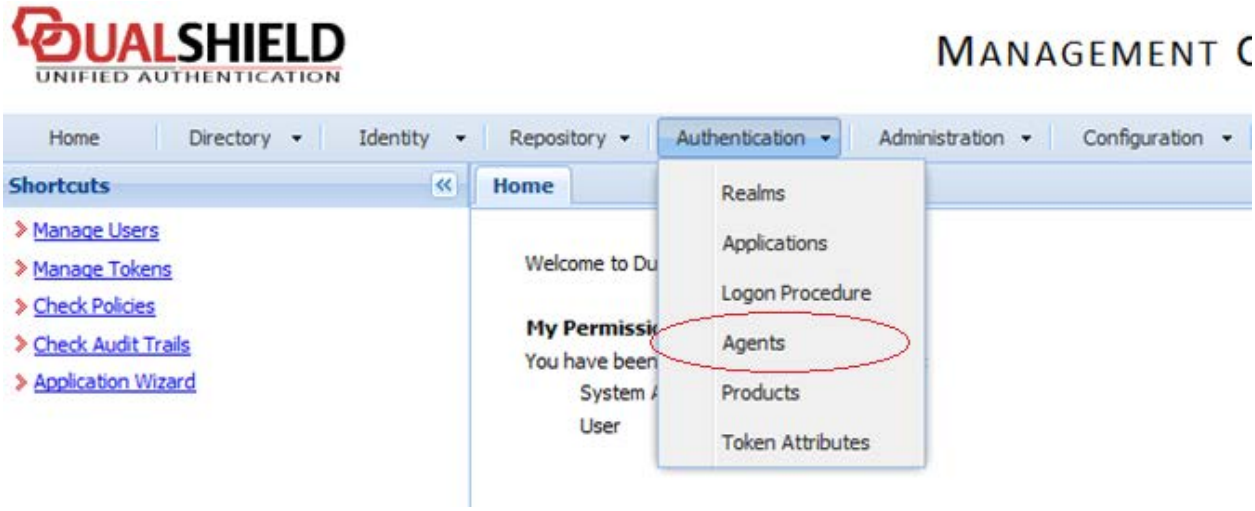


Configuring Parallels RAS to Use the DualShield Authentication Platform

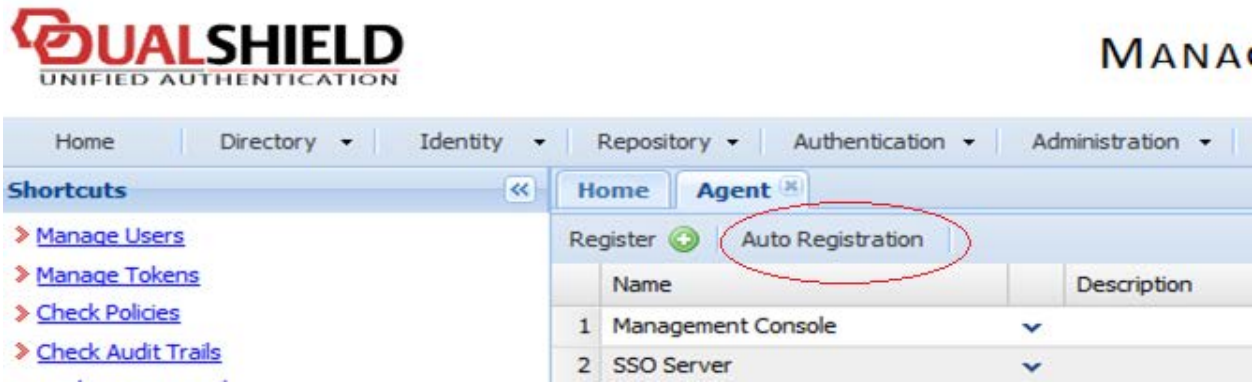
To begin:

1. In the RAS Console, navigate to the **Connection** / **Multi-factor authentication** tab.
2. In the **Provider** drop-down list, select **Deepnet**.
3. Click the **Settings** button.
4. Click the **Check Connection** button to test that the authentication server can be reached and to verify that the RAS Console is registered as a DualShield agent. If you see the "DeepNet server not valid" message, you have either specified an incorrect server information or you need to allow auto registration of the Parallels components as a DualShield agent.

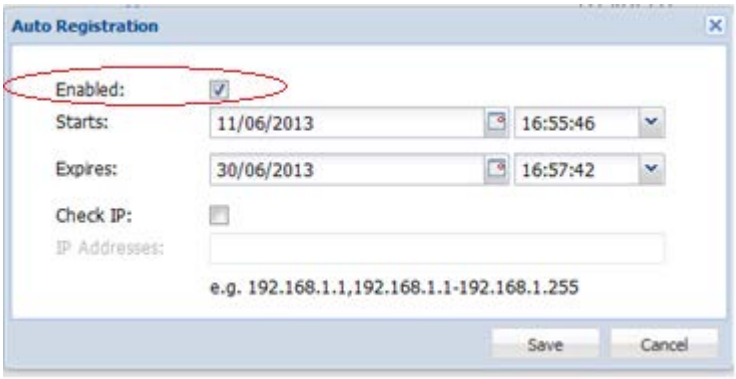
5 Go back to the DualShield Management Console and select **Agents** from the **Authentication** menu as shown below.



6 Select **Auto Registration**.



7 Select the **Enabled** option and set the date range.



8 Once the Agent Auto Registration is set, go back to the RAS Console and select **Yes**. You should see a message that the Dual Shield agent has been successfully registered.

Please note that all RAS Publishing Agents must be registered with Deepnet DualShield server. If you are using secondary Publishing Agents, you need to close all open windows until you can press **Apply** in the RAS Console. This will inform all the agents to self-register as DualShield agents.

9 In the Deepnet Properties dialog, click the **Applications** tab and browse for the Application name previously created from the DualShield Management Console.

10 Click the **Authentication** tab and select how you want your users to be authenticated:

- **Mandatory for all users** means that every user using the system must log in using two-factor authentication.
- **Create token for Domain Authenticated Users** will allow Parallels RAS to automatically create software tokens for Domain Authenticated Users. Choose a token type from the drop down list. Note that this option only works with software tokens, such as QuickID and MobileID
- **Use only for users with a DualShield account** will allow users that do not have a DualShield account to use the system without have to login using two-factor authentication.

11 Go back to the **Connection** > **Multi-factor authentication** tab.

12 In the Exclusion section, specify the exclusion rules:

- **User / Group exclude list** allows you to add users or groups within your active directory that will be excluded from using DualShield Authentication.
- **Client IP exclude list** allows you to add IP addresses or a range of IP addresses that will be excluded from using DualShield Authentication.
- **Client MAC exclude list** allows you to add MAC addresses that will be excluded from using DualShield Authentication. You can also specify a MAC address range using double question marks as a wildcard in any part of the address. For example, 00-14-22-01-23-??, 00-14-22-01-??-??, or 00-14-22-??-??-??.
- **Connection to the following Gateway IPs** allows you to set a Gateway where users connected to the Gateway will be excluded from using DualShield Authentication.

Connect to a RAS Farm

Parallels Client

Once DualShield has been enabled the users will have two-factor authentication. If using software tokens such as QuickID the administrator does not have to create a token for each user. RAS Publishing Agent will automatically create the token when the user tries to log in for the first time.

When a user tries to access a RAS Connection from Parallels Client, they are first prompted for the Windows username and password. If the credentials are accepted, RAS Publishing Agent will communicate with the DualShield server to create a unique token for that user.

If using MobileID or QuickID, an email about where to download the appropriate software will be sent to the user.

If using QuickID tokens, the application will ask for a One-Time Password which is sent by e-mail or SMS.

When asked for OTP, enter the One-Time Password to log in to the Parallels ApplicationServer XG Gateway.

Using SafeNet

SafeNet Token Management System provides a high-value of protection via secure tokens which makes it a perfect tool for second-level authentication in Parallels RAS.

In this section:

- Configuring SafeNet (p. 223)

Configuring SafeNet

To configure SafeNet:

1. In the Parallels RAS console, navigate to the **Connection** / **Multi-factor authentication** tab.
2. In the **Provider** drop-down list, select **SafeNet**.
3. **C**lick the **Settings** button. The **SafeNet Properties** dialog opens.
4. On the **Connection** tab, enter the valid URL into the **OTP Service URL** field. To verify that the connection with the OTP Service can be established, click the **Check connection** button.

   Note: RAS Publishing Agent communicates with the SafeNet Token Management System Server. It is highly recommended to have this behind a firewall for security reasons.
5. Click the **Authentication** tab.
6. In the **Mode** drop-down list, select how you want your users to be authenticated.

   Mandatory for all users: every user using the system must login using two-factor authentication.

   The available modes are:

   - **Create token for Domain Authenticated Users**: Allows Parallels RAS to automatically create software tokens for Domain Authenticated Users. Choose a token type from the drop down list. Note that this option only works with software tokens.
   - **Use only for users with a SafeNet account**: Allows users that do not have a SafeNet account to use the system without having to login using two-factor authentication.
7. In the **TMS Web API URL** field, enter the location of the SafeNet API URL.
8. In the **User Repository** field, enter the user repository destination.
9. Click **OK** to save the values and close the **SafeNet Properties** dialog.

Parallels Client

In **Parallels Client — New Account Info** dialog:

1. Enter any four digits in the **OTP PIN** number field (these digits will be required further on in the process).
2. Enter your email address and then click on **OK**.
3. Log into your email account and retrieve the email containing the information you will need to activate your SafeNet authentication. An example of this email is shown below.

   Activation Key: YZQHoczZWw3cBCNo

   Token Serial: 4F214C507612A26A

   Download MobilePASS client from:
   http://localhost:80/TMSService/ClientDownload/MobilePASSWin.exe

   **Login with domain credentials.*

   **Place the attached seed file in the same folder as the MobilePASS client.*

   Enter the One-Time Password to log into the RD Session Host Connection.

   Application PIN: 4089
4. Download the MobilePASS client from the URL provided in the email.
5. Enter the Activation Key found in the SafeNet email.
6. Next, input the application PIN found in the email into the **MobilePASS PIN** field.
7. Click **Generate** to generate the eToken number and then click **Copy**.
8. Combine the OTP PIN and eToken in this order: OTP + eToken.
9. Enter this value into the Parallels Client and click **OK** to log in.

Using Google Authenticator

This section explains how to use Google Authenticator as a second-level authentication solution in Parallels RAS.

To configure Google Authenticator:

1. In the Parallels RAS Console, navigate to **Connection** / **Multi-factor authentication**.
2. In the **Provider** drop-down list, select **Google Authenticator**.
3. Click the **Settings** button.
4. In the **Google Authenticator Properties** dialog that opens, specify the following options:

- **Type Name:** The default name here is Google Authenticator. The name will appear on the registration dialog in Parallels Client in the following sentence, "Install Google Authenticator app on your iOS or Android device". If you change the name, the sentence will contain the name you specify, such as "Install <new-name> app on your iOS or Android device". Technically, you can use any authenticator app (hence the ability to change the name), but at the time of this writing only the Google Authenticator app is officially supported.
- The **User enrollment** section allows you to limit user enrollment via Google Authenticator if needed. You can allow all users to enroll without limitations (the **Allow** option), allow enrollment until the specified date and time (**Allow until**), or completely disable enrollment (the **Do not allow** option). If enrollment is disabled due to expired time frame or because the **Do not allow option** is selected, a user trying to log in will see an error message saying that enrollment is disabled and advising the user to contact the system administrator. When you restrict or disable enrollment, Google authenticator or other TOTP provider can still be used, but with added security which would not allow further user enrollment. This is a security measure to mitigate users with compromised credentials to enroll in MFA.
- The **Authentication** section allows you to configure TOTP tolerance. When using Time-based One-Time Password (TOTP), it is required to have the time synchronized between the RAS Publishing Agent and client devices. The synchronization must be performed against a global NTP server (e.g. time.goole.com). Using the **TOTP tolerance** drop-down box, you can select a time difference that should be tolerated while performing authentication. Expand the drop-down box and select one of the predefined values (number of seconds). Note that changing time tolerance should be used with caution as it has security implications since the time validity of a security token can be increased, thus a wider time window for potential misuse.

  Note: When using Time-based One-time Passwords (TOTP) providers, it is required to have both Publishing Agents and client devices time synchronized with a global NTP server (e.g. time.google.com). Adding TOTP tolerance increases the one-time password validity, which might have security implications.

- The **Reset User(s)** field in the **User management** section is used to reset the token that a user receives when they log in to Parallels RAS for the first time using Google Authenticator. If you reset a user, they'll have to go through the registration procedure again (see **Using Google Authenticator in Parallels Client** below). You can search for specific users, reset all users, or import the list of users from a CSV file.

5 Click **OK** when done.

Please also note that the TOTP available time is calculated as the default 30 seconds + x amount of seconds in the past + x amount of second in the future.

Using Google Authenticator in Parallels Client

Important: To use Google Authenticator or other TOTP provider, the time on a user device must be in sync with the time set on the RAS Publishing Agent server. Otherwise, Google authentication will fail.

Google Authenticator is supported in Parallels Client running on all supported platforms, including mobile, desktop, HTML5.

To use Google Authenticator, a user needs to install the Authenticator app on their iOS or Android device. Simply visit Google Play or App Store and install the app. Once the Authenticator app is installed, the user is ready to connect to Parallels RAS using two-factor authentication.

To connect to Parallels RAS:

1. The user opens Parallels Client or HTML5 Client and logs in using his/her credentials.
2. The multi-factor authentication dialog opens displaying a barcode (also known as QR code) and a secret key.
3. The user opens the Google Authenticator app on their mobile device:
   - If this is the first time they use it, they tap **Begin** and then tap **Scan a barcode**.
   - If a user already has another account in Google Authenticator, they tap the plus-sign icon and choose **Scan a barcode**.
4. The user then scans the barcode displayed in the Parallels Client login dialog.

   If scanning doesn't work for any reason, the user goes back in the app, chooses **Enter a provided key** and then enters the account name and the key displayed in the Parallels Client login dialog.
5. The user then taps **Add account** in the app, which will create an account and display a one time password.
6. The user goes back to Parallels Client, clicks **Next** and enters the one time password in the **OTP** field.

On every subsequent logon, the user will only have to type their credentials (or nothing at all if the **Save password** options was selected) and enter a one time password obtained from the Google Authenticator app (the app will continually generate a new password). If the RAS administrator resets a user (see the **Reset Users(s)** field description at the beginning of this section), the user will have to repeat the registration procedure described above.

Configuring Exclusion Rules

When configuring multi-factor authentication, you have the ability to create exclusion rules to allow some users to be exempt from multi-factor authentication enforcement. To specify exclusion rules, select the **Connection** category and then select the **Multi-factor authentication** tab in the right pane. The types of exclusion rules that can be configured are described below.

Exclude users or groups

1. Select the **User or group exclude list** option and click **Configure**.
2. In the dialog that opens, click **Tasks** > **Add**.
3. Select the required location and enter a user or group name in the UPN format (username@domain.com).
4. Click **OK**.

When you enable the user or group exclusion option, please note the following:

- For users to connect, the **Force clients to use NetBIOS credentials** option must be disabled (the option is located in **Connection** > **Authentication**). Users must log in using their names in the UPN format (username@domain.com).
- The exclusion requires a domain environment and doesn't work in Workgroup.
- Group nesting is not supported when configuring an exclusion.

Exclude client IP addresses

1. Select the **Client IP exclude lit** option and click **Configure**.
2. In the dialog that opens, click **Tasks** > **Add** in the desired section (IPv4 or IPv6).
3. Specify a single IP address or a range of addresses.
4. Click **OK.**

Exclude client MAC addresses

1. Select the **Client MAC exclude list** option and click **Configure**.
2. In the dialog that opens, click **Tasks** > **Add**.
3. Select a client MAC address from the list. You can also specify a MAC address range using a double question mark as a wildcard in any part of the address. For example, 00-14-22-01-23-??, 00-14-22-01-??-??, or 00-14-22-??-??-??.

Exclude gateway IP addresses

1. Select the **Connection to the following Gateway IPs** option.
2. In the field below the checkbox, type a gateway IP address or expand the drop-down list and select one or more IP addresses (if available). Click the plus sign icon to add the available gateways to the list.
3. Click **OK** to save the selection and close the dialog. The IP addresses will appear in the **Connection to the following Gateway IPs** edit box.

CHAPTER 13

RAS Multi-Tenant Architecture

In This Chapter

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Managing Tenants 240
Shared Gateways 241
Third Party Network Load Balancers 242
HTML5 Client and Themes 243
Monitoring Tenants 244
Upgrading from an older RAS version 244
Configuring Notifications 245
Communication Ports 246

Introduction

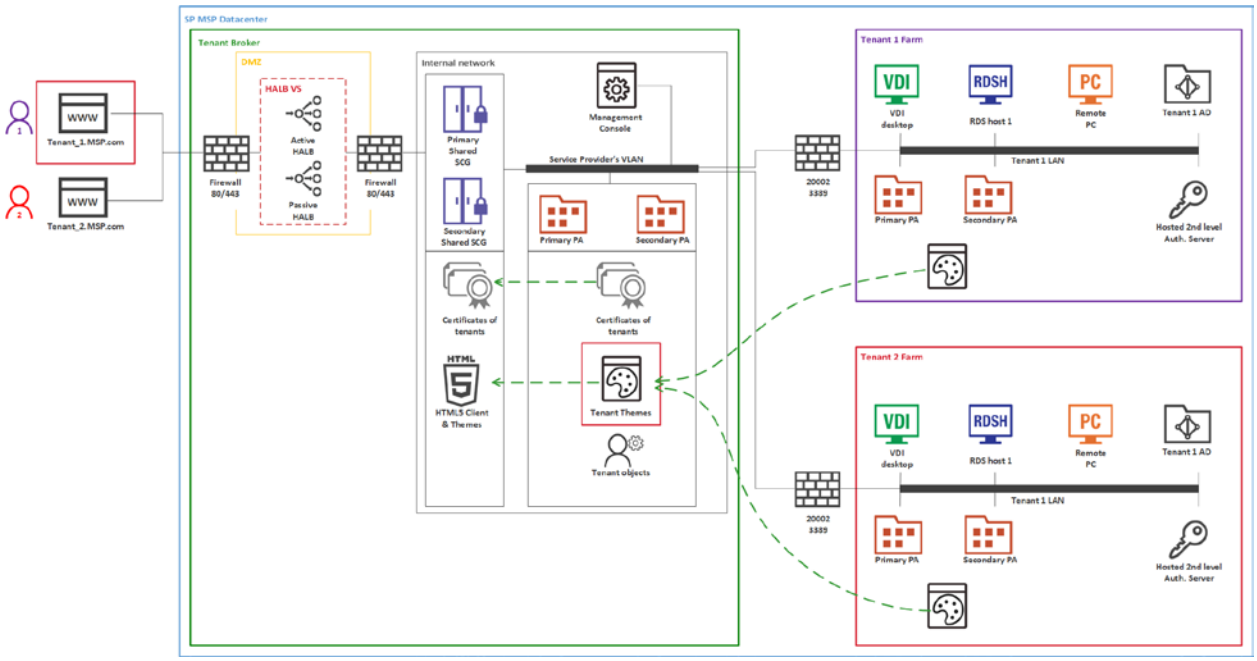
Beginning with RAS 17.1, Parallels introduces a new multi-tenant architecture, with the addition of Parallels RAS Tenant Broker, enabling organizations to share components from the same RAS infrastructure among different Tenants while keeping client data segregated and reducing costs.

The RAS multi-tenant architecture offers the following advantages to Service Providers and organizations:

- **Cost savings** due to reduction of number of RAS Secure Client Gateways and High Availability Load Balancers (HALBs) while maximizing resource usage and consolidation.
- **Faster onboarding** of new tenants/customers.
- **Simplified centralized management** of multi-tenant environments.
- **Extended market reach** through reduction of operational costs for organizations of any size by allowing cost scaling through shared infrastructure.

Architecture Description

The following diagram illustrates a typical Parallels RAS deployment that uses the RAS multi-tenant architecture.



- Firewalls and HALB are installed in a DMZ and are shared by Tenants.
- Tenant Broker is a special RAS installation that hosts shared RAS Secure Client Gateways and HALB, and can also use RAS access layer. Tenant Broker is installed using the **Parallels RAS Tenant Broker** option in the Parallels RAS installer. Tenant Broker can be installed in its own domain or outside of a domain.
- Tenant farms are deployed just like traditional on-premises RAS environments and are joined to the Tenant Broker. Each Tenant Farm has its own RAS Publishing Agents and servers hosting published resources (VDI, RD Session hosts, or Remote PCs). No local RAS Secure Client Gateways and HALB (or third-party load balancers) are needed.
- Tenants are joined to the Tenant Broker and each Tenant is represented as a Tenant object in the Tenant Broker.
- Parallels Clients (both platform-specific and HTML5) connect to shared gateways in the Tenant Broker. When a client connects to an HTML5 gateway, a Theme from the corresponding Tenant is always used depending on which Tenant the client belongs to.

Implementation Overview

The following is an implementation overview of the RAS multi-tenant architecture:

- Tenants are deployed as separate individual Farms or Sites. Tenants deployed as separate Farms are completely independent and never communicate with each other. If tenants are deployed as Sites, every Site must join the Tenant Broker separately.
- Shared resources include RAS Secure Client Gateways (including HTML5 gateways) and High Availability Load Balancers (HALB).
- A Tenant Farm doesn't need its own RAS Secure Client Gateways and HALB. However, deployments with Gateways and HALB are possible if you need them for internal connections. For example, if you have different policies for internal and external connections, you might want to install a Gateway and HALB to serve local users.
- The network configuration of a Tenant requires the Tenant Publishing Agent to Tenant Broker Publishing Agent connectivity. Additionally, shared RAS Secure Client Gateways need to communicate with servers hosting published resources and the Tenant's Publishing Agent. Depending on the implemented network architecture, it might require a VLAN to VLAN connectivity, VPN, etc. These communications require only a limited number of open ports. For the complete list, see **Communication Ports** (p. 246).
- Communications with a Tenant domain are always performed from a local Tenant Publishing Agent and never from the Tenant Broker infrastructure.
- Every Tenant must have a unique public domain address, which can be assigned a number of different ways. For example, a service provider can register a subdomain (e.g. Tenant1.Service-Provider.com) and assign it to a Tenant. Another approach could be using a private domain address (e.g. RAS.Tenant1.com) and have it routed to RAS Secure Client Gateways in the Tenant Broker. Note that different public domain addresses can resolve to the same IP address if needed.
- When a Tenant is joined to the Tenant Broker, shared RAS Secure Client Gateways become aware of the Tenant and its configuration and can connect to the Tenant's RAS Publishing Agent(s). A route must be set for the incoming Tenant's traffic from the Internet to RAS Secure Client Gateways (or HALB) in the Tenant Broker.
- Tenant Broker comes with its own RAS Console allowing you to manage shared resources, Tenant objects and certificates, monitor Tenant performance, and carry out standard RAS administration tasks.
- All Tenant Themes are made available in the Tenant Broker. When user connects via a shared RAS Secure Client Gateway in the Tenant Broker, the corresponding Tenant Theme is presented to the user.
- Different SSL certificates can be used for different Tenants.

Licensing

Tenant Broker doesn't need a license. Licenses are managed on a Tenant level.

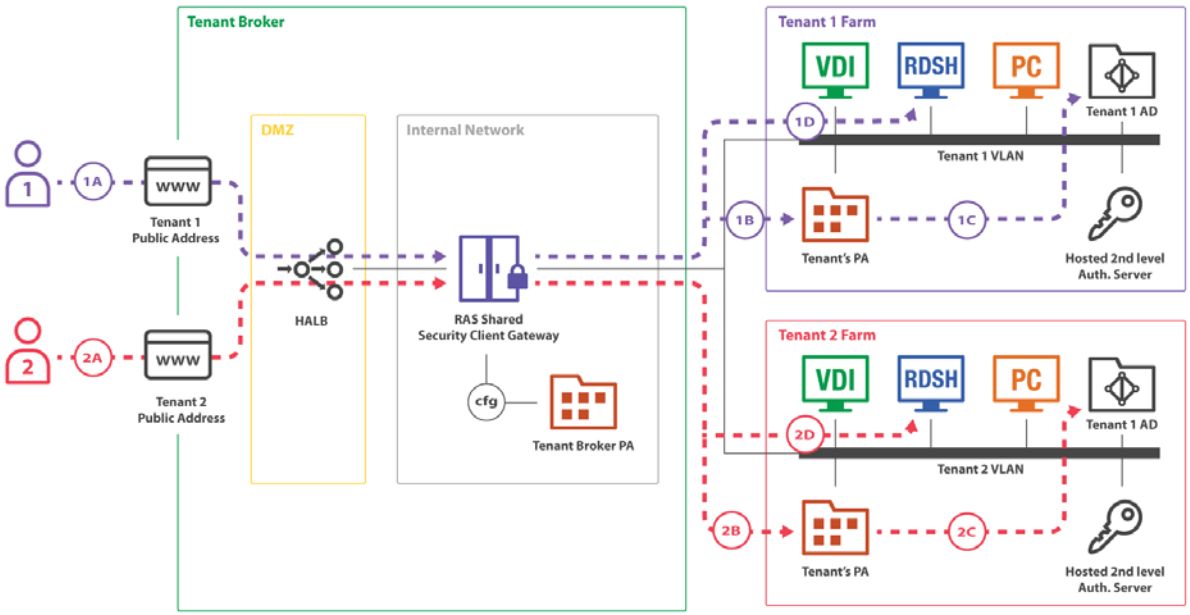
RAS version compatibility

Parallels RAS multi-tenant architecture is available in Parallels RAS 17.1 and newer. The following limitations apply when using older versions of Parallels RAS:

- Parallels Clients older than RAS 17.1 are incompatible with shared gateways and therefore cannot be used to connect to a Tenant Farm via the Tenant Broker.
- Parallels RAS installations older than RAS 17.1 are incompatible with Tenant Broker and cannot be joined as Tenants.

User Connection Flow

The following diagram illustrates the RAS user connection flow through Tenant Broker:



Shared RAS Secure Client Gateways installed in Tenant Broker are able to work with multiple concurrent user sessions in multiple Tenant farms. On the diagram above, you can see two users (1 and 2) connecting to different Tenant Farms (Tenant 1 Farm and Tenant 2 Farm). Both connections are tunneled through the same Gateway and then delivered to the correct Tenant Farm.

The connection flow consists of the following steps:

1. (1A), (2A) — A user initiates a RAS connection to a public address registered in the Tenant Broker. The (1A) connection goes to the Tenant 1 public address; the (2A) connection goes to the Tenant 2 public address.
2. (1B), (1C) — The shared Gateway makes a decision where to forward a user connection based on a hostname used in the initial connection (1A, 2A). After that each client establishes a RAS session with a Publishing Agent of their respective Tenant Farm. Tenant's Publishing Agent authenticates the user against Active Directory of the Tenant. After that, the user receives the list of published applications available to him or her.

3 (1D), (2D) — A user start a Remote User Session to a published application. The shared Gateway requests from Tenant's Publishing Agent an address of a server to forward the remote session to and forwards it.

The mapping of public addresses to Tenants is configured on shared Gateways by the Tenant Broker Publishing Agent.

Deploying Tenant Broker and Tenants

A typical scenario of deploying the multi-tenant architecture of Parallels RAS consists of the following steps:

1 Deploy Tenant Broker.

2 Deploy a traditional RAS Farm to operate as a Tenant.

3 Configure network between the Tenant Broker and the Tenant to allow the following connections:

- Shared RAS Secure Client Gateways to Tenant RAS Publishing Agents.
- Shared RAS Secure Client Gateways to resources hosts.
- Tenant RAS Publishing Agents to Tenant Broker RAS Publishing Agent.

For the information about ports numbers, please see **Communication Ports** (p. 246).

4 Create a Tenant object and a corresponding invitations hash in the Tenant Broker console, or create a secret key (more on this later in this chapter).

5 Join the Tenant to the Tenant Broker using the invitation hash or the secret key.

6 Assign a public domain address to the Tenant. This can be done at this point (after you join a Tenant) or it can be done in advance if you wish. Either way it has to be done or the clients will not be able to connect to the Tenant Farm.

7 Set up routing for incoming Tenant traffic from the Internet to shared RAS Secure Client Gateways and HALB.

8 Configure a certificate for the Tenant. By default, a self-signed certificate created during the installation will be used.

9 Test the client connectivity.

The subsequent sections describe the steps above in detail.

Deploying Tenant Broker

First you need to install Tenant Broker on a dedicated server. Please note that if you have Parallels RAS already installed on a computer where you are planning to install Tenant Broker, you need to uninstall it first. The two installation versions cannot coexist on the same machine.

To install Tenant Broker:

1 Run the standard Parallels RAS installer.

2 On the **Select Installation Type** page, select **Parallels RAS Tenant Broker**.

3 Click **Next** and follow the onscreen instructions.

Once the installation is finished, run the Parallels RAS Console.

When the console starts, you'll see that it has a different set of categories and managed objects compared to the standard RAS Console. The purpose of the Tenant Broker console is to manage shared resources and Tenants. It is not used to manage RD Sessions Hosts, VDI, or any other standard RAS resources because they are deployed and managed in individual Tenant Farms.

The Tenant Broker console

You can manage the following categories and object in the Tenant Broker console:

- **Farm**. This category allows you to manage Tenants, Gateways, Publishing Agents, HALB, and Certificates. The **Settings** subcategory allows you to manage global logging and the Tenant Broker itself.
- **Administration**. Allows you to perform management tasks similar to the standard RAS Console: Accounts, Settings, Mailbox, Reporting, Settings Audit.
- **Information**. Lists services and components running in the Tenant Broker and their status.

As with the standard RAS Console, every time you modify any of the objects, you need to click the **Apply** button for the changes to be saved in the configuration database.

Install RAS Secure Client Gateways

By default, Tenant Broker does not have any RAS Secure Client Gateways installed. To add a Gateway, log in to the Tenant Broker console, navigate to **Farm** > **Gateways** and click **Tasks** > **Add**. If you already have one or more RAS Secure Client Gateways, which are not used in any other RAS Farm, you can also add such a Gateway to the Tenant Broker. Please note that existing RAS Secure Client Gateway installations must be RAS version 17.1 or newer. Gateways from older RAS versions cannot operate as shared gateways.

To install a new gateway, run the Parallels RAS installer on a desired server, choose **Custom** and select the **RAS Secure Client Gateway** component. After the installation is finished, go back to the Tenant Broker console and add the gateway to the Tenant Broker.

Deploying a Tenant

A Tenant Farm is deployed just like a traditional Parallels RAS Farm. The only difference is, when installing the Farm, you don't need to install RAS Secure Client Gateways in it.

Note: If you decide to install a local (private) RAS Secure Client Gateway in a Tenant Farm (e.g. for local connections), you can do that, but please keep in mind that you cannot mix HALB and Gateways from the Tenant Broker and a Tenant Farm. The HALB appliance installed in the Tenant Broker will not support this scenario.

To set up a Parallels RAS Farm to be used as a Tenant:

1 Run the Parallels RAS installer.

2 On the **Select Installation Type** page, select **Custom**.

3 Click **Next**.

4 Make sure that the following components are selected for installation:

- RAS Publishing Agent
- Parallels RAS Console (optional; you can have the RAS Console installed on a different machine)

Other components are optional. You can install them now or you can install them later if needed.

5 Click **Next** and follow the onscreen instructions to complete the installation.

Join a Tenant to Tenant Broker

Once the Tenant Farm is operational, you can join one or more sites in it to the Tenant Broker.

Note: A Tenant is a Site in a separately deployed Parallels RAS Farm. When you join a Tenant to Tenant Broker, you join a Site. When you want to join the whole Farm, you do it one Site at a time. Of course, if you have just one Site in a Farm (and have no plans to create more sites), you are essentially joining the whole Farm.

There are two ways you can join a Tenant: (1) Using an invitation hash or (2) Using a shared secret key. The difference between the two is as follows:

- **Invitation hash**. An invitation hash is an automatically generated encrypted string that can be used to join a single Tenant to Tenant Broker. Invitation hash is a property of a Tenant object, which is created in the Tenant Broker console. You email the hash to the Tenant Farm administrator, so they can use it to join the Tenant Broker. Once used, an invitation hash cannot be used again by any other Tenant.
- **Shared secret key**. A shared secret key is similar to an invitation hash, with one important difference. It can be used to join an unlimited number of Tenants. A Tenant object is not pre-created for a secret key in the Tenant Broker. Instead, the object is created when the key is used to join a Tenant. Because of its unlimited usage capability, only the Tenant Broker admins should have access to a shared secret key. This scenario is useful when there are multiple Tenants, all managed by the same Tenant Broker administrator.

The invitation hash scenario is described below. For the secret key scenario see **Joining with a Secret Key** (p. 236).

First, you need to generate an invitation hash and create a Tenant object on the Tenant Broker side:

1. Log in to the Tenant Broker.
2. In the RAS Console, navigate to **Farm** > **Tenants**.
3. Click **Tasks** > **Add**.
4. In the **Tenant properties** dialog, specify the following:
   - **Name:** Type a Tenant name (this can be any name that you like).
   - **Public domain address:** If you've already assigned a public domain address to the Tenant, specify it here. If not, you can leave it blank. The address is not required for the Tenant to join the Tenant Broker. However, without the address specified here, end users will not be able to connect to the Tenant, so you will need to come back and fill it in later. For details, see **Assign a Public Domain Address** (p. 238).
   - **Description:** Type an optional description.
   - **Publishing Agents:** This filed is disabled and will be populated automatically when the Tenant joins the Tenant Broker. See more in **Tenant Configuration** (p. 240).
   - **Tenant invitation hash:** This is the hash that the admin of the Tenant Farm will need to use to join the Tenant Broker. A hash is generated automatically when you open this dialog. To generate a new hash, click **Create new hash**.
   - **Send via email**. You can give the invitation hash to the Tenant admin directly or you can use this button to send it via email. When you click the button, you'll see a dialog where you can enter the recipients and where you can review and modify the email message. By default, the message contains instructions on how to join the Tenant Broker. Please note that SMTP settings must be configured in the RAS Console before you can use the email option. You can configure SMTP first and then return to this screen to complete this step.
5. Click **OK** to close the **Tenant properties** dialog. The new Tenant will appear in the **Tenants** list in the console. At this time, the Tenant is not joined yet. Read on to learn how to join it.

To join the Tenant to the Tenant Broker:

1. Log in to the Tenant Farm.
2. In the RAS console, navigate to **Farm** / **Site**. Note that you are joining a Site to the Tenant Broker, not the whole Farm, so if you have more than one Site, you need to join them one by one.
3. Click **Tasks** > **Join Tenant Broker**.
4. In the **Join Tenant Broker** dialog, enter the invitation hash that you obtained from the Tenant Broker in the previous steps (or, if you are an admin of a Tenant Farm, the one your received in the invitation email).
5. Click **Join**.

On successful join, you will see a message welcoming you to the Tenant Broker. If the primary Publishing Agent in your Tenant Farm can't reach the Tenant Broker, you will see a corresponding error message. Make sure that the Tenant Broker computer is reachable from the machine where you have the Tenant's RAS Publishing Agent running.

Overriding Tenant Broker IP address

The Tenant Broker IP address is detected automatically when you generate an invitation hash (or a secret key) and is embedded into the hash. If a Tenant can't reach the Tenant Broker using this address, you have the ability to override it as follows:

1. Log in to the Tenant Broker.
2. In the RAS Console, navigate to **Farm** / **Settings** and click the **Tenant broker** tab.
3. Select the **Override Tenant Broker address in tenant invitations and secret keys** option.
4. Enter the desired IP address in the field provided.

When done, the specified IP address will be used instead of the auto-detected address when generating an invitation hash or secret key. When the hash is used on the Tenant side to join the Tenant Broker, the Tenant will use this address to connect to the Tenant Broker.

Once used on the Tenant side, an invitation hash binds the Tenant Farm to the corresponding Tenant object in the Tenant Broker and the tenancy becomes effective.

Joining with a Secret Key

In addition to an invitation hash, you can join a Tenant to the Tenant Broker using a secret key. As described earlier (p. 234), a secret key can be used to join an unlimited number of Tenants to the same Tenant Broker.

To create a secret key:

1. Log in to the Tenant Broker console.
2. In the RAS Console, navigate to **Farm** / **Settings**.
3. Select the **Tenant broker** tab.
4. Select the **Allow RAS Farms to register in Tenant Broker using a secret key**.
5. The secret key is generated automatically. To generate a different key, click **Generate**.

Once you have the key, you can use it to join one or more Tenants to the Tenant Broker.

Note: Due to its unlimited usage capability, only the Tenant Broker administrator should have access to a shared secret key. Secret keys can be practical when the Tenant Broker administrator manages Tenant Farms, so instead of generating a hash for every Tenant, he/she can use a single secret key to join all of them to the Tenant Broker.

To join a Tenant using a secret key:

1. Log in to the Tenant Farm.
2. In the RAS Console, navigate to **Farm** / **Site**.
3. Click **Tasks** > **Join Tenant Broker**.
4. In the **Join Tenant Broker** dialog, enter the secret key and then enter a Tenant name of your choosing. The name you enter will be used in the Tenant Broker to name the corresponding Tenant object.
5. Click **Join**.

On successful join, you will see a message welcoming you to the Tenant Broker. If the primary Publishing Agent in your Tenant Farm can't reach the Tenant Broker, you will see a corresponding error message. Make sure that the Tenant Broker computer is reachable from the machine where you have the primary Publishing Agent running.

Overriding the Tenant Broker IP address

The Tenant Broker IP address is detected automatically when you generate a secret key and is embedded into it. If a Tenant can't reach the Tenant Broker using this address, you have the ability to override it as follows:

1. Log in to the Tenant Broker.
2. In the RAS Console, navigate to **Farm** / **Settings** and click the **Tenant broker** tab.
3. Select the **Override Tenant Broker address in tenant invitations and secret keys** option.
4. Enter the desired IP address in the field provided.

Verify Join Status

After you join a Tenant to the Tenant Broker, you should verify that the procedure was successful.

First, verify the Tenant Broker status in the Tenant console:

1. Log in to the Tenant Farm.
2. In the RAS Console, navigate to **Farm** / **Site** and select the **Site** tab in the right pane.
3. You should see the **Tenant Broker** section with the **Status** column, which should say **OK**. If the status is **Not verified**, make sure that the Tenant Broker is operational (or contact the Tenant Broker admin if you are not him or her).

You can also see additional Tenant Broker information by right-clicking it and choosing **Properties**. The information includes the following:

- **Name:** The Tenant Broker name.
- **Primary address:** The primary RAS Publishing Agent address.
- **Secondary address:** The secondary RAS Publishing Agent address (if available).

You should then verify the Tenant status in the Tenant Broker console:

1. Log in to the Tenant Broker.
2. In the RAS Console, navigate to **Farm** > **Tenants**.
3. In the **Tenants** tab, find the Tenant of interest and examine the **Status** column, which should say **OK** if the Tenant is joined properly. For other possible **Status** column values, see **Tenant Configuration** (p. 240).

Configure Network

After deploying a Tenant, you need to configure network between Tenant Broker and Tenant in order to allow the following communications:

- Tenant Publishing Agent > Tenant Broker Publishing Agent: port 20003
- Tenant Broker Gateway > Tenant Broker Publishing Agent: port 20002
- Tenant Broker Gateway > Tenant Publishing Agent: port 20002
- Tenant Broker Gateway > Servers hosting published resources: port 3389

These are standard RAS ports, which are also described in the **Port Reference** section (p. 401).

Assign a Public Domain Address

Every Tenant must have a unique public domain address for end users to connect to it through Tenant Broker. Although every Tenant must have a unique public domain address, it is not required for every Tenant to have a unique IP address. Different public domain address can be configured to resolve to the same IP address to reach the Tenant Broker shared Gateways. This way the Tenant Broker is still able to forward traffic to the right tenant based on the hostname requested by an end user.

A public domain address can be chosen a number of different ways. For example, a service provider can register a subdomain (e.g. Tenant1.Service-Provider.com) and assign it to a Tenant. Another approach could be using a private domain address (e.g. RAS.Tenant1.com) and have it routed to RAS Secure Client Gateways in the Tenant Broker. For testing purposes, you can even use an IP address.

The **Public domain address** is also a property of a Tenant object in the Tenant Broker console. After joining a Tenant to the Tenant Broker, you must ensure that this property contains the correct address. Otherwise end users will not be able to connect to the Tenant through the Tenant Broker.

To verify (and set if necessary) the Tenant's public domain address:

1. Log in to the Tenant Broker.
2. In the RAS Console, navigate to **Farm** / **Tenants**.
3. Right-click a Tenant and choose **Properties**.
4. In the **Properties** dialog, verify that the **Public domain address** field contains the correct address.

Configure an SSL Certificate

The public domain address assigned to a Tenant must have a matching certificate. The Tenant Broker admin must create a certificate for every Tenant in the Tenant Broker console. Shared RAS Secure Client Gateways must then be configured to use these certificates. Tenant certificates are created and managed in Parallels RAS the same way as other certificates using the **Farm** / **Site** / **Certificates** subcategory. For the complete information about how to create certificates and how to assign them to RAS Secure Client Gateways and HALB, please see the **SSL Certificate Management** chapter (p. 195).

When a user connects to the Tenant's public domain address, a certificate with the common name matching the requested public domain address is selected automatically for every connection. The first available certificate is used which might not be the self-signed (say it was deleted)

If no matching certificate is found, the default self-signed certificate will be used, but the user will see a certificate warning in the web browser.

Set up Routing for Incoming Traffic

One other thing that you have to do after you join a Tenant to the Tenant Broker, is set up routing for the incoming traffic from the Internet to shared RAS Secure Client Gateways or HALB.

User Authentication

User authentication in the RAS multi-tenant architecture is performed by the RAS Publishing Agent running in the Tenant Farm. The Publishing Agent is selected randomly by a shared RAS Secure Client Gateway. If the Publishing Agent is unavailable, then it's marked accordingly and no communication is conducted with it from the same shared gateway for a period of time. The gateway checks the Publishing Agent status periodically and resumes communications as soon as the agent becomes available.

Unjoining from Tenant Broker

To unjoin a Tenant from the Tenant Broker, do the following:

1. Log in to the Tenant Farm.
2. In the RAS Console, navigate to **Farm** / **Site**.
3. Click **Tasks** > **Unjoin from Tenant Broker**.

The Tenant will be unjoined from the Tenant Broker. As a result, the Tenant users will no longer be able to connect to the Tenant Farm through the Tenant Broker.

Managing Tenants

In this section:

- Tenant Configuration (p. 240)
- Deleting a Tenant Object (p. 241)
- Opening a Tenant Console (p. 241)

Tenant Configuration

To see the list of existing Tenants in the Tenant Broker console, select **Farm** > **Tenants**.

The **Status** column indicates the Tenant status, which can be one of the following:

- **OK** — The Tenant has joined and has been verified.
- **Not Joined** — The Tenant object was created for the Tenant and the invitation hash was generated, but the Tenant has not joined the Tenant Broker yet.
- **Not Verified** — The Tenant has joined, but no connection to the Tenant's RAS Publishing Agent has been established yet. This status is usually displayed for a minute or so immediately after the Tenant joins the Tenant Broker. Once the connection is established, the status changes to **OK**.

  This status can also appear when the Tenant Broker loses a connect with the Tenant's primary Publishing Agent. Shared gateways will be able to process connections only if they are still able to communicate with the Tenant's Publishing Agent on their own. They are independent from the Tenant Broker's Publishing Agent, but Tenant's Publishing Agent is still required to authenticate users.
- **Disabled** — The Tenant is disabled in the Tenant Broker configuration. You can enable and disable Tenant objects as described below.

To see and modify Tenant properties, click **Tasks** > **Properties** (or right-click > **Properties**). The **Properties** dialog opens where you can view and modify the following properties:

- **Enable Tenant:** Enable or disable the Tenant object in the Tenant Broker.
- **Name:** The Tenant name (must be unique).
- **Public domain address:** The unique address that end users connect to from the outside (e.g. RAS.tenant.com, tenant1.MSP-FARM.com, etc.). See more in **Assign a Public Domain Address** (p. 238).
- **Clients in gateway mode connect to published tenant resources by server IP:** When selected, clients will use the Tenant IP address instead of the DNS name. You can use this option when a Tenant farm does not share the same DNS provider as the Tenant Broker farm.

- **Forward tenant sessions tunneled through gateway using server IP:** When a client session is forwarded to a server hosting published resources, either the server name (FQDN, hostname) or IP address can be used. When this option is selected (default) the IP address is used to forward the session internally. When the option is cleared, the configured host name is used.
- **Description:** An optional Tenant description. The Tenant description is a property that exists and can be viewed only in the Tenant Broker console.
- **Publishing Agents:** An IP address of one or more RAS Publishing Agents installed in the Tenant Farm. This is a read-only field.
- **Tenant invitation hash:** The hash that was used to join the Tenant to the Tenant Broker. This is a read-only field.

Deleting a Tenant Object

A Tenant object can be deleted any time. To delete an object, click **Tasks** > **Delete** (or right-click > **Delete**). This deletes the Tenant configuration from shared RAS Secure Client Gateways, so no RDP sessions can be established from the gateway to the deleted Tenant anymore. The Tenant's RAS Console will show the Tenant Broker status as "Join Broken" after this. To completely remove any references to the Tenant Broker, the Tenant admin needs to unjoin the Tenant from the Tenant Broker (p. 239).

Opening a Tenant Console

As a Tenant Broker admin, you can open the Tenant console right from the Tenant Broker console. To do so, navigate to **Farm** / **Tenants**, right-click a Tenant and choose **Open tenant console**. This will open a new instance of the RAS Console and will prompt you to log in to the Tenant Farm. Please note that the Tenant Farm must be configured to allow remote console connections, which means that the corresponding port must be open on the Tenant Publishing Agent and you need to know the credentials of the Tenant Farm administrator.

When you log in to a Tenant from the Tenant Broker console, the Tenant Farm is automatically added to the **Location** drop-down list (in the upper left-hand corner of the RAS Console window), so you can connect to the Tenant again by simply selecting it in the **Location** list.

Shared Gateways

All RAS Secure Client Gateways that exist in the Tenant Broker are shared among Tenants. For the most part, shared gateways operate similarly to standard RAS Secure Client Gateways but there are differences, which are described below.

Tunneling policies

Tunneling policies are allowed. Tunneled connections are sent to a Tenant Farm mapped to the public address used. The policies however are limited to "None" and "All servers in Site".

WYSE

WYSE is not supported.

Session counters

For each shared gateway, a session counter is displayed in the Tenant Broker console. To see how many sessions a gateway is running, navigate to **Farm** > **Site** and examine the **Sessions** column in the **Gateways** section.

Client connection routing

Each shared gateway is aware of a configuration of each existing Tenant and is able to route client connections to a correct RAS Publishing Agent running in a Tenant Farm. The routing works as follows:

1. A new client connection is established.
2. A shared gateway determines which Tenant the client belongs to based on the Tenant configuration.
3. The correct RAS Publishing Agent in the Tenant Farm is selected for this connection.
4. Two-factor authentication and application listing requests are forwarded to the selected RAS Publishing Agent. All subsequent client operations are also carried out using that Publishing Agent. See also **User Authentication** (p. 239).

Shared gateway maintenance

When you need to take a shared RAS Secure Client Gateway offline for maintenance, you can do it the same way it's done in a traditional Parallels RAS Farm. You disable the gateway and wait for active sessions to drain. To see the number of active sessions for a gateway, navigate to **Farm** > **Site**. The session count is displayed in the **Sessions** column.

You can safely take shared Gateways offline. Parallels Clients will reconnect to the same sessions automatically.

Third Party Network Load Balancers

Third party network load balancers are possible to use with shared RAS Secure Client Gateways the same way they are used with traditional (not shared) RAS Secure Client Gateways.

HTML5 Client and Themes

One of the important features of the RAS multi-tenant architecture is the ability to use a shared HTML5 gateway (which is a part of the RAS Secure Client Gateway) for all browser-based client connections, while at the same time using tenant-specific HTML5 client Themes defined on the Tenant side. This allows Service Providers to implement white-labeling by creating unique custom Themes for individual Tenants.

An HTML5 client Theme is created in a Tenant Farm. The user interface and the functionality remain the same as with a traditional Parallels RAS Farm. When Tenants join the Tenant Broker, Themes are pulled from the Tenant's RAS Publishing Agent and added to the configuration of every shared RAS Secure Client Gateway.

When connecting to a Tenant Farm via the HTML5 gateway, a user must enter the Tenant public domain address (not the gateway address). The correct Theme is then used by the shared gateway as follows:

- The default Tenant Theme is used when the user enters the default URL: https://<public-tenant-address>.
- A specific Theme is used when the user adds the Theme name after the Tenant address: https://<public-tenant-address>/<Theme-name>

HTML5 configuration

The HTML5 Client is normally configured on the RAS Secure Client Gateway level (the **HTML5** tab in the gateway **Properties** dialog). When configuring a Theme, you have the ability to override the gateway settings by specifying them for a specific Theme in a Tenant Farm. To do so, in the Tenant RAS Console, select a Theme, open its properties and then select the **Gateway** category where you can specify your own settings. For more information, see **HTML5 Client Theme Settings** > **Gateway** (p. 275).

Viewing Tenant Themes in Tenant Broker

If you are a Tenant Broker administrator, you can view Tenant Themes right in the Tenant Broker console:

1. In the Tenant Broker console, select **Farm** > **Tenants**.
2. Select a Tenant and click **Tasks** > **View tenant themes**.
3. The dialog opens where you can view Themes that were pulled from the Tenant and added to the configuration of every RAS Secure Client Gateway in the Tenant Broker.

Use this functionality to ensure that all Tenant Themes are properly synchronized on the Tenant Broker side, so when users connect to a Tenant through Tenant Broker, the appropriate Theme is used.

Monitoring Tenants

Parallels RAS Performance Monitor is a RAS component used to analyze Parallels RAS deployment bottlenecks and resource usage. RAS Performance Monitor can be used to monitor Tenants and view their performance metrics right from the Tenant Broker console.

To configure RAS Performance Monitor to collect information about Tenants:

1. Install RAS Performance Monitor as described in **Parallels RAS Performance Monitor** chapter (p. 345).
2. Log in to the Tenant Broker console.
3. In the console, navigate to **Administration** > **Reporting**.
4. Select the **Enable RAS Performance Monitor** option (the **RAS Performance Monitor configuration** section).
5. In the **Server** and **Port** fields, specify the name or IP address of the server where you have RAS Performance Monitor installed.
6. Click **Apply**.
7. Now open a Tenant console and repeat steps 3 to 6 above, so both Tenant Broker and the Tenant are configured to use the same RAS Performance Monitor. This way, when Tenant(s) report their performance data to the RAS Performance Monitor, it can be viewed on the Tenant Broker side.

Tenants will report statistics to RAS Performance Monitor and you can view these statistics in the Tenant Broker console. When viewing the data in the RAS Performance Monitor dashboard, you can switch between Farms and sites, so you can select a specific Tenant and view its performance metrics.

Upgrading from an older RAS version

If you have an existing Farm running RAS v16.x and would like to join it as a Tenant to Tenant Broker, follow these steps:

1. Upgrade the Farm to RAS 17.1 (or newer).
2. To join your Farm as a Tenant to Tenant Broker, follow the instructions in the **Deploying Tenant Broker and Tenants** section (p. 232).
3. Once the Farm is joined, you can remove local RAS Secure Client Gateways if you are not planning on using them for local connections. See **Implementation Overview** (p. 229) for additional info.

Configuring Notifications

System event notifications are used to alert RAS administrators about system events via email. You can configure system event notifications in **Farm** / **Site** / **Settings** / **Notifications**. For the complete description of this functionality, please see **System Event Notifications** (p. 363). The rest of this section describes notifications, which are specifics to Tenant Broker and Tenants.

Tenant event notifications

As a Tenant Broker administrator, you can receive notifications about the following Tenant events:

- **New Tenant enrollment**. Triggers when a new Tenant joins the Tenant Broker.
- **Tenant unjoins the broker**. Triggers when a registered Tenant unjoins the Tenant Broker.
- **Tenant status alert**. Triggers when the RAS Publishing Agent in a Tenant Farm goes offline.

When a Tenant event occurs, the Tenant Broker administrator receives an email containing the following information (depending on the event type):

- Tenant name.
- Tenant Broker name.
- Tenant enrollment method (invitation hash or secret key).
- Tenant status.
- Date.

To enable Tenant notifications, do the following:

1. Log in to the Tenant Broker.
2. In the RAS Console, navigate to **Farm** / **Site** / **Settings** / **Notifications**.
3. In the **Notification handlers** section, click **Tasks** > **New** > **Tenant events**.
4. In the **Tenant Events Notification Handler Properties** dialog, specify the following:
   - On the **General** tab, select the **Send email to RAS administrators** option and specify one or more email addresses separated by a semicolon.
   - On the **Settings** tab, either select the **Use the default settings** option (to use Site defaults) or clear it and specify your own settings.
5. Click **OK** to save your settings and close the dialog.

Tenant Broker event notifications

A Tenant Farm administrator can receive notifications when the Tenant Broker becomes unavailable. This usually happens when the RAS Publishing Agent in the Tenant Broker goes offline. The notification handler is configured the same way as described above, but this one is configured in the Tenant Farm (not the Tenant Broker).

Common event notifications

In addition to the **Tenant events** handler, you can configure notifications for common events, such CPU utilization, Memory utilization, RAS Agent events, etc. The only limitation here when it comes to Tenant Broker is the Tenant Broker has a limited set of system events for which notification handlers can be configured (see the list of available handlers below). This is due to the fact that the Tenant Broker doesn't have RD Sessions Hosts, VDI provider, licensing limits, published resources, etc. A Tenant Farm has the complete set of notification handlers, so the Tenant admin can configure any of them.

The following notification handlers are available in the Tenant Broker:

- CPU utilization
- Memory utilization
- Number of gateway tunneled sessions
- Failed gateway tunneled sessions
- RAS Agent events

For additional information, please see **System Event Notifications** (p. 363).

Communication Ports

Tenant Broker and Tenants communicate with each other using the following ports:

- Tenant Publishing Agent > Tenant Broker Publishing Agent: port 20003
- Tenant Broker Gateway > Tenant Broker Publishing Agent: port 20002
- Tenant Broker Gateway > Tenant Publishing Agent: port 20002
- Tenant Broker Gateway > Servers hosting published resources: port 3389

These are standard RAS ports, which are also described in the **Port Reference** section (p. 401).

CHAPTER 14

SAML SSO Authentication

Parallels RAS 17.1 and newer support the Security Assertion Markup Language (SAML) authentication mechanism. SAML is an XML-based authentication that provides single sign-on (SSO) capability between different organizations by allowing user authentication without sharing the local identity database.

As part of the SAML SSO process, the new RAS Enrollment Server communicates with Microsoft Certificate Authority (CA) to request, enroll, and manage digital certificates on behalf of the user to complete authentication without requiring the users to put in their Active Directory credentials. Service providers and enterprises with multiple subsidiaries don't have to maintain their own internal Identity Management solutions or complex domains/forest trusts. Integrating with third party Identity Providers allows customers and partners to provide end users with a true SSO experience.

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SAML Basics

Security Assertion Markup Language (SAML) is a standard for exchanging authentication information between identity and service providers. SAML authentication is a single sign-on mechanism where a centralized identity provider (IdP) performs user authentication, while the service provider (SP) only makes access control decisions based on the results of authentication.

The main benefits of using SAML authentication are as follows:

- Service providers don't need to maintain their own user databases. User information is stored in a centralized database on the identity provider side. If a user has to be added or removed, it only needs to be done in a single database.
- Service providers don't need to validate users themselves, so there's no need for a secure authentication and authorization implementation on the provider's side.
- Single sign-on means that a user has to log in once. All subsequent sign-ons (when a user launches a different application) are automatic.

- Users don't have to type in credentials when signing in.
- Users don't have to remember and renew passwords.
- No weak passwords.

The single sign-on process

SAML single sign-on can be initiated on the service provider side or on the identity provider side. The two scenarios are outlined below.

The SAML single sign-on process initiated on the service provider side consists of the following steps:

1. A user opens RAS HTML5 Client and connects to the service provider.
2. The service provider sends a message to the identity provider, asking to authenticate the user.
3. The identity provider asks the user for a username and password.
4. If the user credentials are correct, an authentication response (assertion) is sent to the client and then passed to the service provider. The response contains a message that the user has logged in successfully; the identity provider signs the assertion.
5. The user is presented with the published applications list. When the user launches an application, there's no prompt for credentials.

Single sign-on can also be initiated on the identity provider side, in which case the basic steps are the following:

1. A user logs in to identity provider via a web browser and is presented with a list of enterprise applications, including Parallels RAS.
2. Once Parallels RAS is selected, the assertion is sent to the client, then passed to the service provider configured for Parallels RAS.
3. Users are presented with the RAS published applications list.
4. When the user launches an application, there is no prompt for credentials.

System Requirements

RAS Enrollment Server

- Windows Server 2019
- Windows Server 2016
- Windows Server 2012 R2
- Windows Server 2012
- Windows Server 2008 R2

RD Session Hosts

- Windows Server 2019
- Windows Server 2016
- Windows Server 2012 R2
- Windows Server 2012
- Windows Server 2008 R2
- Windows Server 2008 (x64 bit versions)

Desktop operating systems (guest VMs and Remote PCs)

- Windows 10
- Windows 8.1
- Windows 8
- Windows 7

Please note that 32-bit operating systems are not supported.

Note: At the time of this writing, SAML SSO has limited support on VDI desktops and Remote PCs. Full support will be available in the upcoming Parallels RAS release.

SAML Configuration

In this section:

- Prerequisites (p. 249)
- IdP Side Configuration (p. 250)
- SP Side Configuration (RAS side) (p. 251)
- Active Directory User Account Configurations (p. 254)
- Configure Certificate Authority Templates (p. 257)
- RAS Enrollment Server Configuration (p. 266)
- RAS Enrollment Server High Availability (p. 268)
- SAML Integration Examples and Tips (p. 268)

Prerequisites

To configure SAML in Parallels RAS, you need the following:

1 Microsoft Active Directory with the following two user accounts present:

- **Enrollment agent user**: used to enroll certificates through RAS Enrollment Server (ES) on behalf of the authenticated user.
- **NLA User**: used to initiate the NLA connection with RD Session Hosts and/or VDI guests.

See **Active Directory User Account Configuration** (p. 254) for required permissions and delegations. Note that Azure Active Directory Domain Services (AADDS) are not supported to be used with SAML SSO.

2 Microsoft Enterprise Certification Authority (CA) including the following templates:

- Enrollment Agent Certificate Template
- Smartcard Logon Certificate Template

3 Third-party Identity Provider (IdP) such as Azure, Okta, Ping Identity, Gemalto SafeNet, and others. This is where the user accounts will reside. User accounts in IdP must be synchronized with the Microsoft Active Directory environment. Please consult with the provider on how to properly synchronize users.

4 Domain Controllers must have Domain Controller certificates. The certificates on the Domain Controllers must support smart card authentication. Certificates are created using the Microsoft CA certificate template named Domain Controller Authentication. Manually created Domain Controller certificates might not work. If you get an error "Request Not Supported", you may need to recreate Domain Controller certificates. Make sure RD Session Hosts and VDIs have the root certificate issued by the CA in the Trusted Root Certification Authorities store.

5 A Parallels RAS Farm with RD Session Host and/or VDI workloads (running on 64-bit OS).

6 For security reasons, the RAS Enrollment Server is recommended to be installed on a dedicated host. The host should be a standalone server that does not have any other components and roles installed.

7 Both SAML and RAS Enrollment Server configurations are Site-specific settings within the RAS environment. RAS administrators must have "Allow viewing of site information" and "Allow site changes" permissions delegated.

Note: Prerequisite knowledge of Microsoft Active Directory and Group Policy configuration is required for some of the above tasks.

Azure Active Directory Domain Services (AADDS) and Windows Virtual Desktop access are not currently supported with Parallels RAS SAML SSO.

IdP Side Configuration

On the identity provider side, you need to do the following:

1 Log in to your preferred IdP platform and create a generic or RAS specific SAML-based application to be used with the Parallels RAS environment.

2 Configure the application and take note of the following configuration properties to be added in Parallels RAS later:

- **Entity ID**

- **Logon URL**
- **Logout URL**
- **Certificate (base64)**

3 Alternatively, you can export a metadata file to be imported in Parallels RAS. For additional help, see **IdP Example and Tips**.

SP Side Configuration (RAS side)

On the service provider side (the Parallels RAS side), you need to enable Web (SAML) authentication and add the identity provider to the RAS Farm.

Enable Web (SAML) authentication

1 In the RAS Console, navigate to **Connection** > **Authentication**.

2 In the **Allowed authentication types** section, select the **Web (SAML)** option.

Adding an IdP to the RAS Farm

To add an IdP:

1 In the RAS Console, navigate to **Connection** > **SAML**. If the tab page is disabled, make sure you enabled Web (SAML). See above.

2 Click **Tasks** > **Add**.

3 In the **Add Identity Provider** wizard, specify a provider name.

4 In the **Use with Theme** drop-down box, select a Theme (p. 273) to which the IdP will be assigned. If you don't have a specific Theme yet, you can use the default Theme or you can select "<not used>" and assign a Theme later. Note that there can be multiple IdPs configured in the same RAS Farm. However, at this time, one IdP can be assigned to one Theme.

5 Select one of the following methods that the wizard will use to obtain the IdP information:

- **Import published IdP metadata**: Import from an XML document published on the Internet. Specify the document URL taken from the IdP side configuration.
- **Import IdP metadata from file**: Import from a local XML file downloaded from the IdP application. Specify the file name and path in the field provided.
- **Manually enter the IdP information:** Select this option and then enter the information manually on the next wizard page.

6 Click **Next**.

7 If the configuration was imported in the previous step, the next page will be populated with data obtained from the XML file. If you've selected to enter the IdP data manually, you'll have to enter the values yourself:

- **IdP entity ID:** Identity provider entity ID.

- **IdP certificate:** Identity provider certificate data. To populate this field, you need to download the certificate from the IdP side, then open the downloaded file, copy its contents and paste it into this field.
- **Logon URL:** Logon URL.
- **Logout URL:** Logout URL.

Select the **Allow unencrypted assertion** option if needed.

> **Note:** By default, the **Allow unencrypted assertion** option is disabled. Ensure that the IdP configuration is set to encrypt assertion or change the default setting within the RAS configuration.

8 At this point, you can configure service provider (SP) settings to be imported on the IdP side (IdP portal). You can do it now or you can do it later. To do it now, follow the steps below. To do it later, click **Finish** and then, when needed, open the identify provider object properties, select the **SP** tab and do the same steps as described below.

9 To configure SP settings, click the **Service provider information** button.

10 In the dialog that opens, enter the host address. The IdP will redirect to this address, which should be accessible from the end user browser.

11 The other fields including **SP Entity ID**, **Reply URL**, **Logon URL** and **Logout URL** are prepopulated based on the host address. The SP Certificate is autogenerated.

12 Next step is to complete the IdP configuration based on the values above. These values can be manually copied or exported as a metadata file (XML). Click the **Export SP metadata to file** link. Save the metadata as an XML file. Import the XML file into your IdP.

13 Close the dialog and click **Finish**.

Configuring user account attributes

When user authentication is performed by the IdP, user account attributes in Active Directory are compared with the matching attributes in the IdP user database. You can configure which attributes should be used for comparison as described below.

The following table lists available attributes:

RAS name	SAML name *	AD name	Description
UserPrincipalName	NameID	userPrincipalName	User Principal Name (UPN) is the name of a system user in an email address format.
Immutable ID	ImmutableID	objectGUID	A Universally Unique Identifier.
SID	SID	objectSid	An ObjectSID includes a domain prefix identifier that uniquely identifies the domain and a Relative Identifier (RID) that uniquely identifies the security principal within the domain.
sAMAccountName	sAMAccountName	sAMAccountName	The sAMAccountName attribute is a logon name used to support clients and servers from previous version of Windows, such as Windows NT 4.0 and others.

Custom	Email	Mail	A custom attribute that can be used to allow any SAML attribute name to match any AD attribute value. By default, it is the email address.

* The attributes in the **SAML name** column are editable and can be customized based on the IdP that you are using.

To configure attributes:

1 In the RAS Console, right-click an IdP that you've added in previous steps.

2 In the IdP **Properties** dialog, select the **Attributes** tab. On this tab, you can select or clear the attributes to be used for comparison or create custom ones:

- Attributes that are selected will be compared for a match.
- The names of all of the preconfigured SAML attributes (the IdP side) can be modified to match the AD attributes as required.
- The custom attribute can be used to allow any SAML attribute name to match any AD attribute value. By default, it is the email address.

3 Configure and enable the desired attributes as needed based on the attributes configured on the IdP side.

4 Click **OK** to close the dialog.

Note 1: Multiple attributes are used in the presented order. If an attribute fails, the next configured attribute is used. Only one attribute is used at a time (in either/or fashion).

Note 2: If multiple AD users are configured with the same AD attribute value, user matching will fail. For example, if the email attribute is chosen and different AD users have the same email address, attribute matching between IdP account and AD User account will not be successful.

Attributes configuration tips

- When possible, use automation for user synchronization (such as Microsoft Azure AD Connect for Azure IdP configuration) between your Active Directory and the IdP to minimize user identity management overhead.
- Choose a user identification attribute that is unique to your environment, such as the User Principal Name (UPN) or Immutable ID (ObjectGuid) when possible. Alternatively, you can use other unique identifiers such as email address. In this case make sure that the **Email address** field in the user object in the AD is configured. If you use Microsoft Exchange Server, use the **Exchange Addresses** tab and Exchange policies.
- If using UPN as an attribute, you can also configure alternative UPN suffixes. This can be done from Active Directory Domains and Trusts (select root > right-click to open the **Properties** dialog).Once a new alternative UPN suffix is created, you can change the UPN on the user object properties from Active Directory Users and Computers.

Active Directory User Account Configuration

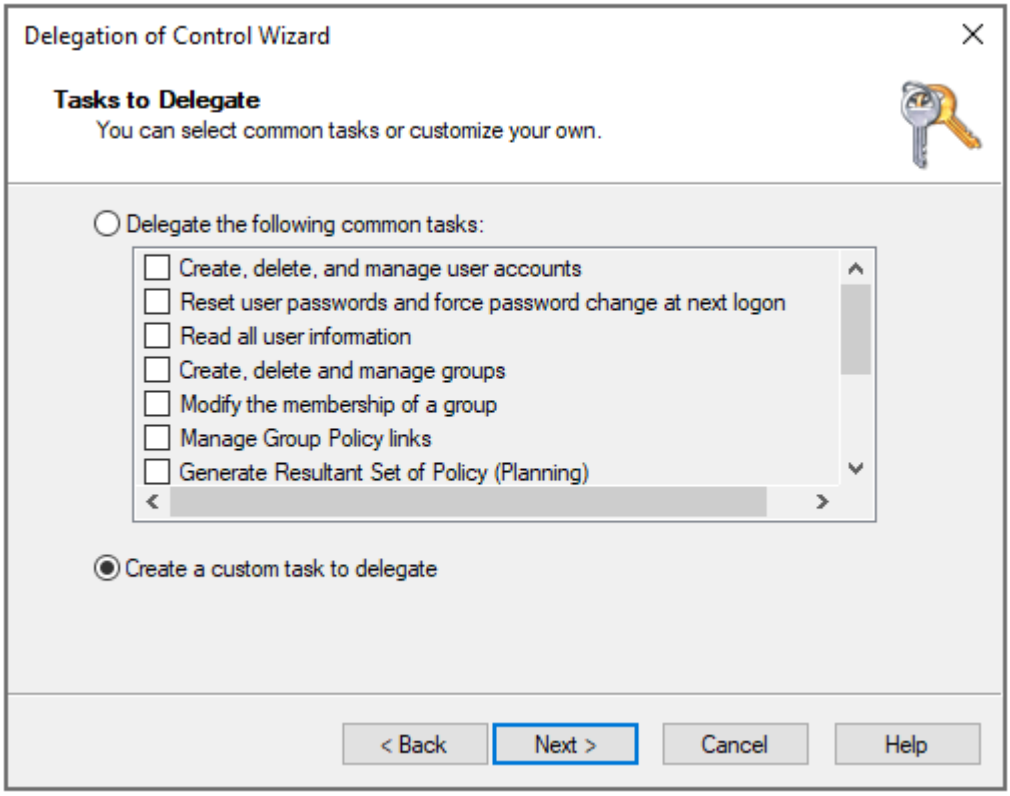
The enrollment agent user and NLA user must be created in Microsoft Active Directory. The following describes how to create these users.

Enrollment agent user account configuration

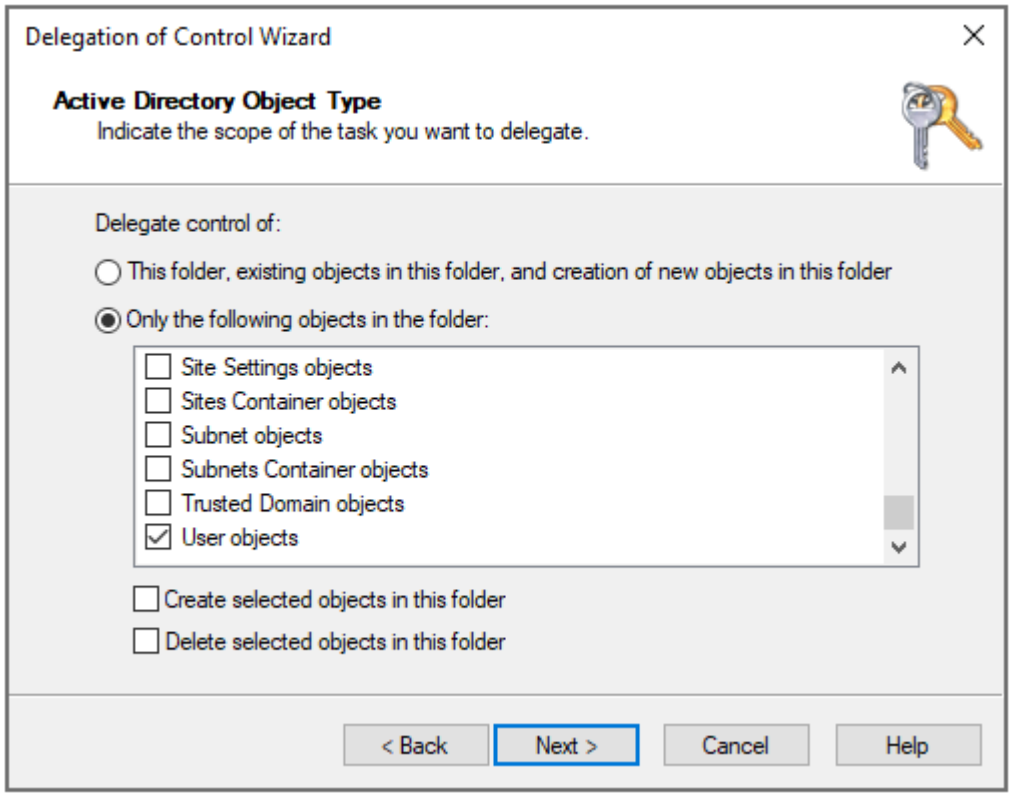
The enrollment agent user account is required in order to be used to enroll certificates through RAS Enrollment Server on behalf of the authenticated user.

To create the enrollment agent user and delegate permissions on AD container or OU, do the following:

1. Open Active Directory Users and Computers.
2. Create an enrollment agent user in AD.
3. Right click on the container or OU where the user accounts logging in to the RAS environment reside and select **Delegate Control**.
4. On the **Welcome** page of the wizard, click **Next**. On **Users and Groups**, click **Add** and enter the name of the enrollment agent account, then click **OK** and click **Next**.
5. On the **Tasks to Delegate** page, click **Create a custom task to delegate** and then click **Next**.

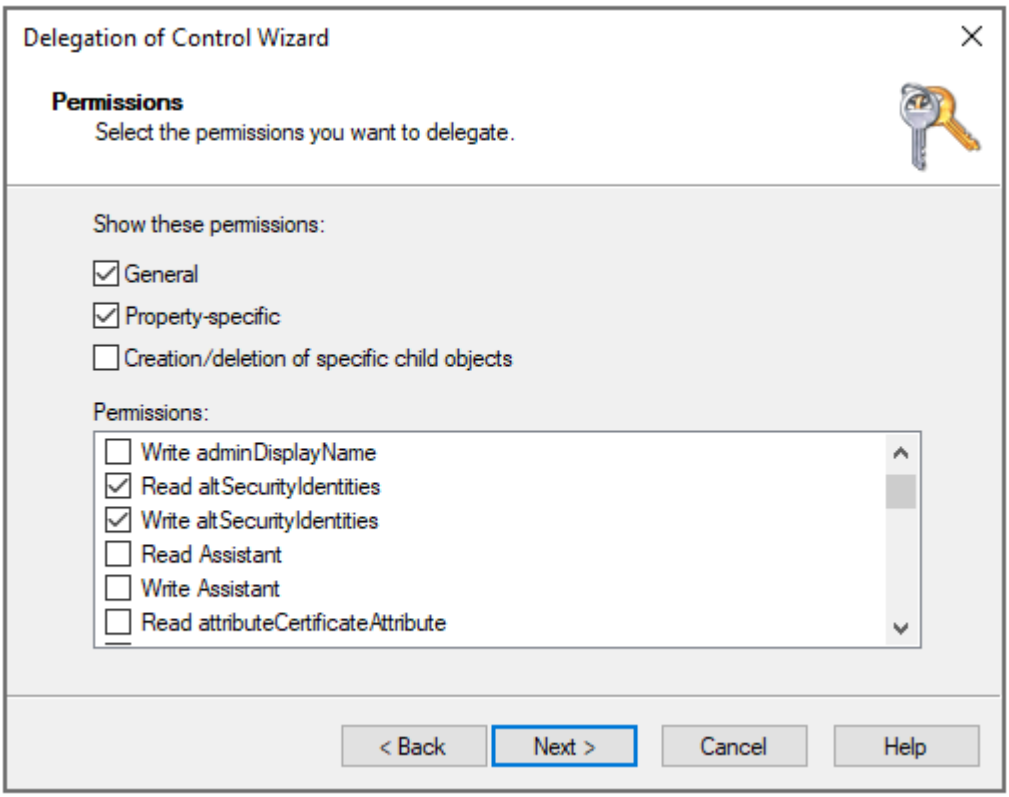


6 On the **Active Directory Object Type** page, click **Only the following objects in the folder**, select the **User objects** option, and then click **Next**.



7 On the **Permissions** page, select the **Property-specific** option, then select the **Read altSecurityIdentities** and **Write altSecurityIdentities** options and click **Next**.

Note: The Alt-Security-Identities attribute either at domain (CN=USERS) or OU level where user accounts logging in to the RAS environment using SAML authentication reside. The Alt-Security-Identities attribute contains mappings for X.509 certificates or external Kerberos user accounts to this user for the purpose of authentication.



8 On the **Completing the Delegation** page, click **Finish**.

NLA user account

The NLA User is needed to initiate the NLA connection with RD Session Hosts and/or VDI guests.

The NLA User must be a member of the Remote Desktop Users group and be granted the **Allow log on through Remote Desktop Services** permission. At the same time the NLA User must be prohibited to logon via Remote Desktop Services.

To exclude the NLA User account, it must be assigned the **Deny log on through Remote Desktop Services** user right.

To achieve both goals, you can use local or domain GPOs (linked to OU or domain wide).

A restart of the device is not required for this policy setting to be effective. Any change to the user rights assignment for an account becomes effective the next time the owner of the account logs on.

Group Policy settings are applied through GPOs in the following order, which will overwrite settings on the local computer at the next Group Policy update:

1 Local policy settings

2 Site policy settings

3 Domain policy settings

4 OU policy settings

Create a new GPO or use Default Domain Policy GPO as follows:

1 Open the Group Policy Management Console (GPMC).

2 Open or create a GPO linked with the OU where the RDSH or VDI objects reside.

3 Navigate to Computer Configuration > Windows Settings > Security Settings > Local Policies > User Rights Assignment and open “Allow log on through Remote Desktop Services” option.

4 Choose to add User or Group..., add the NLA user and click OK.

> **Note:** The option will override default settings (on workstation and servers: Administrators, Remote Desktop User; on domain controllers: Administrators) therefore do not forget to add the groups like local administrators group or domain admins group.

5 Navigate to **Computer Configuration** > **Windows Settings** > **Security Settings** > **Local Policies** > **User Rights Assignment** and open the **Deny log on through Remote Desktop Services** option.

6 Choose to add User or Group..., add the NLA user and click **OK**.

Configure Certificate Authority Templates

In this section:

- Create an Enrollment Agent Template (p. 257)
- Enroll the Enrollment Agent Certificate
- Enroll the Enrollment Agent Certificate

Create an Enrollment Agent Template

To create the Enrollment Agent template:

1 From the Certificate Authority server, launch the Certificate Authority management console (MMC) from Administrative Tools.

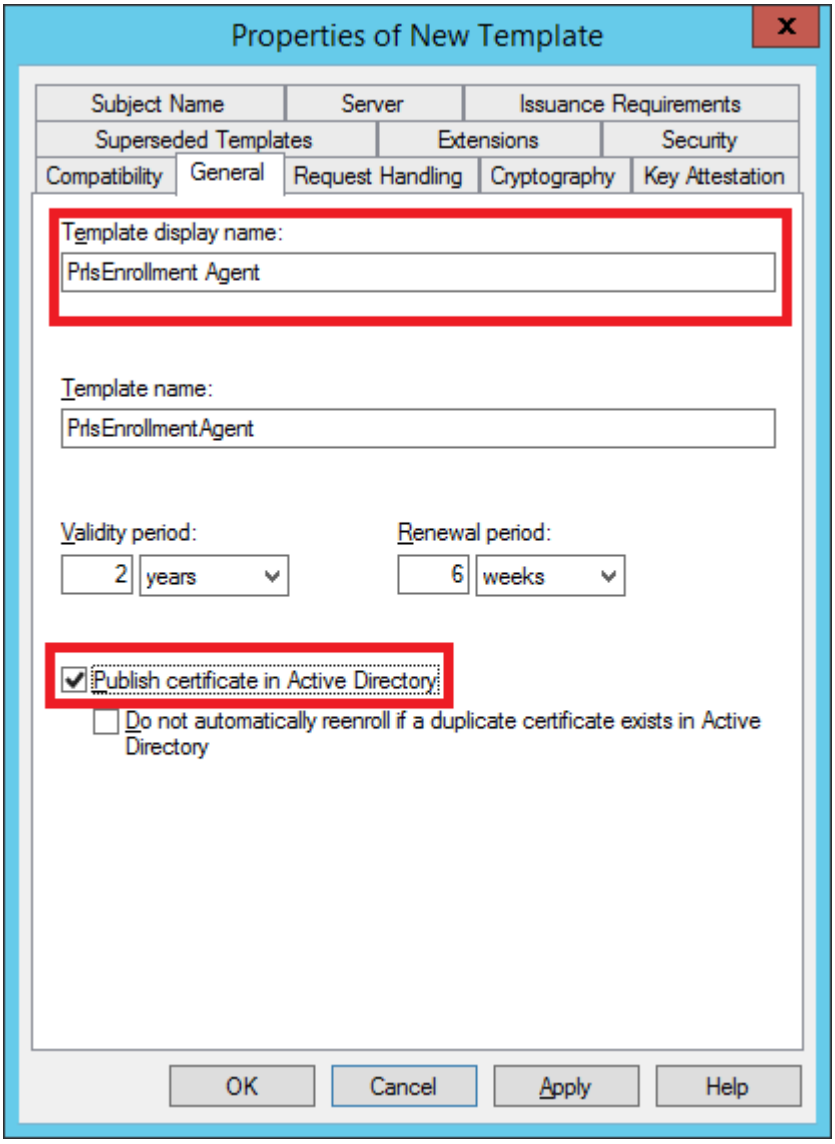
2 Expand the CA, right -click on the "Certificate Templates" folder and select **Manage**.

3 Right-click the Enrollment Agent template and choose **Duplicate Template**. The new template properties window opens. On the **General** tab, configure the following properties:

- **Template display name:** PrlsEnrollmentAgent

- **Template name:** PrlsEnrollmentAgent
- **Validity period:** 2 years
- **Renewal period:** 6 weeks
- **Publish certificate in Active Directory**: ON
- **Do not automatically re-enroll if a duplicate certificate exists in Active Directory:** OFF

Note: The display name can be any name you choose, however the template name must match the template name highlighted above.



4 Select the **Cryptography** tab and set the following values:

- **Provider category:** Legacy Cryptographic Service Provider (read-only).
- **Algorithm name:** Determined by CSP

- **Minimum key size:** 2048

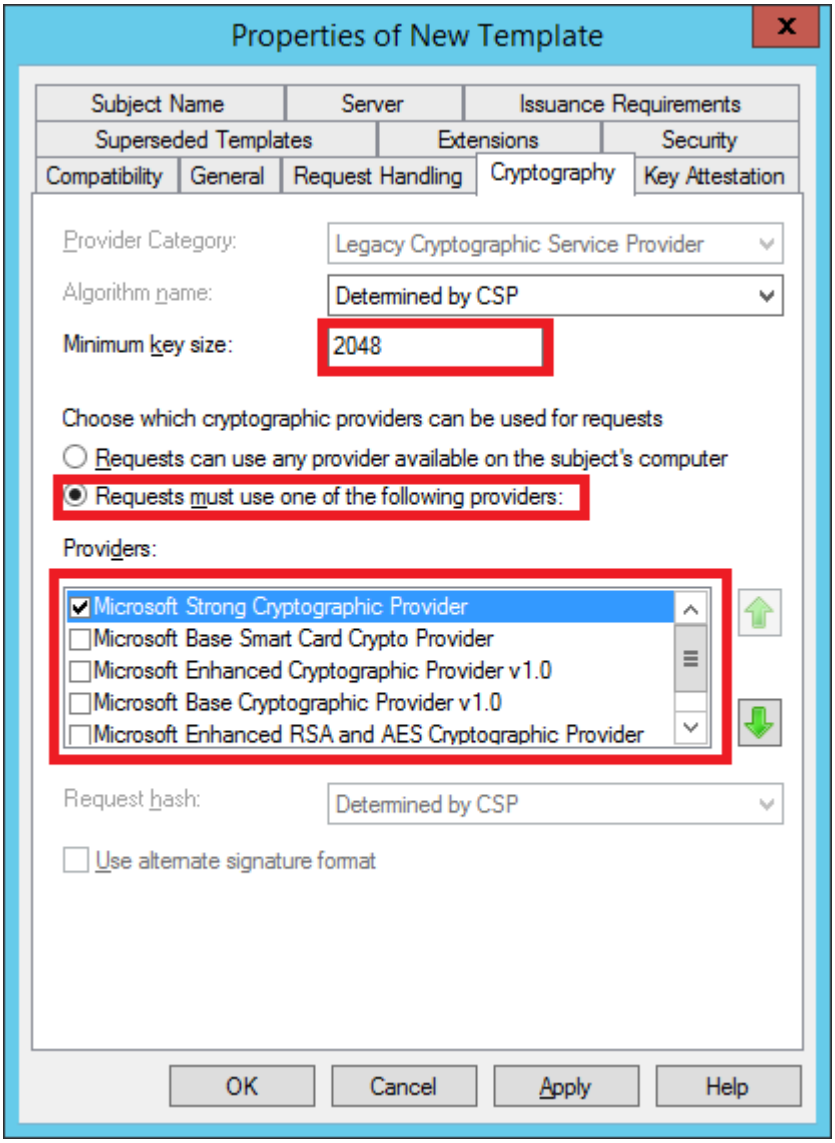
In the section **Choose which cryptographic providers can be used for requests**, choose **Requests must use one of the following providers**. In the following list of providers, clear all options except **Microsoft Strong Cryptographic Provider** and set priority as the preferred provider:

[X] Microsoft Strong Cryptographic Provider

[ ] Microsoft Enhanced Cryptographic Provider v 1.0

[ ] Microsoft Base Cryptographic Provider v 1.0

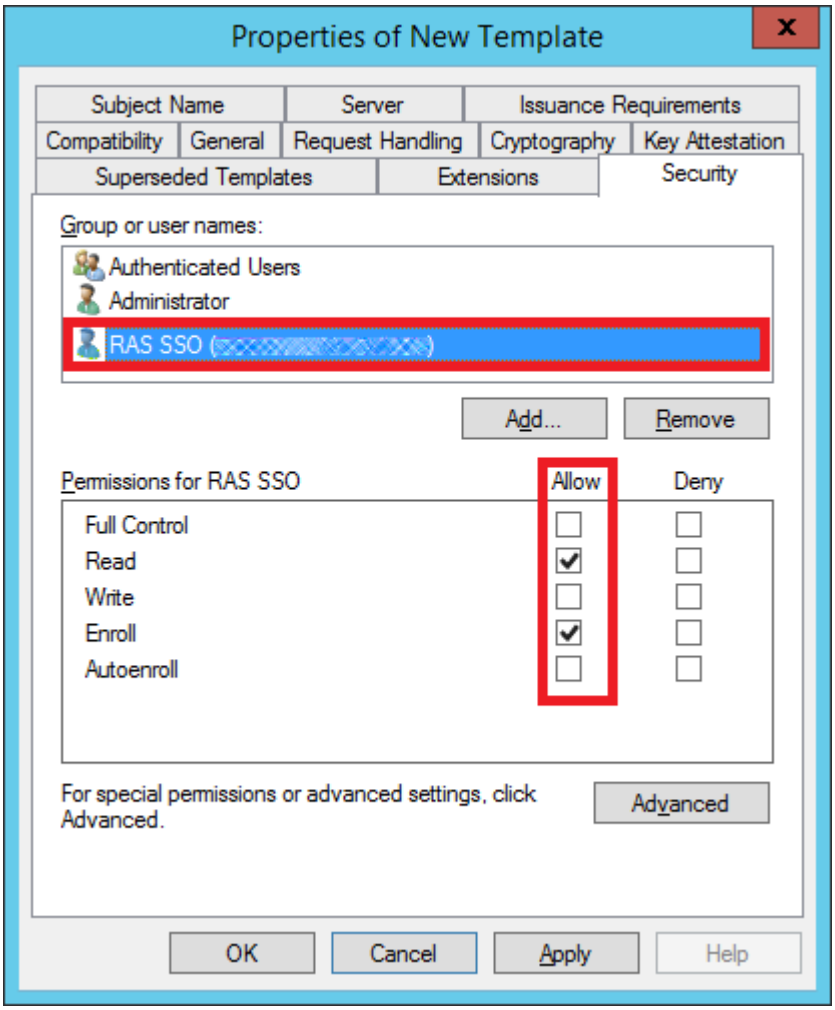
[ ] Microsoft Enhanced RSA and AES Cryptographic Provider



5 Select the **Security** tab and do the following:

- Click **Add.**

- Add the enrollment agent user account.
- Allow (select) the “Read” and “Enroll” permission. Click **Apply** and **OK**.



Issue the certificate template

To issue the certificate template that you've created:

1 Run Certificate Authority again and right click on **Certificate Templates,** select new and click on **Certificate Template to Issue**.

2 Select the certificate template you've created in the previous steps (i.e. Prls Enrollment Agent) and click **OK**.

3 The certificate template should appear in the **Certificate Templates** list.

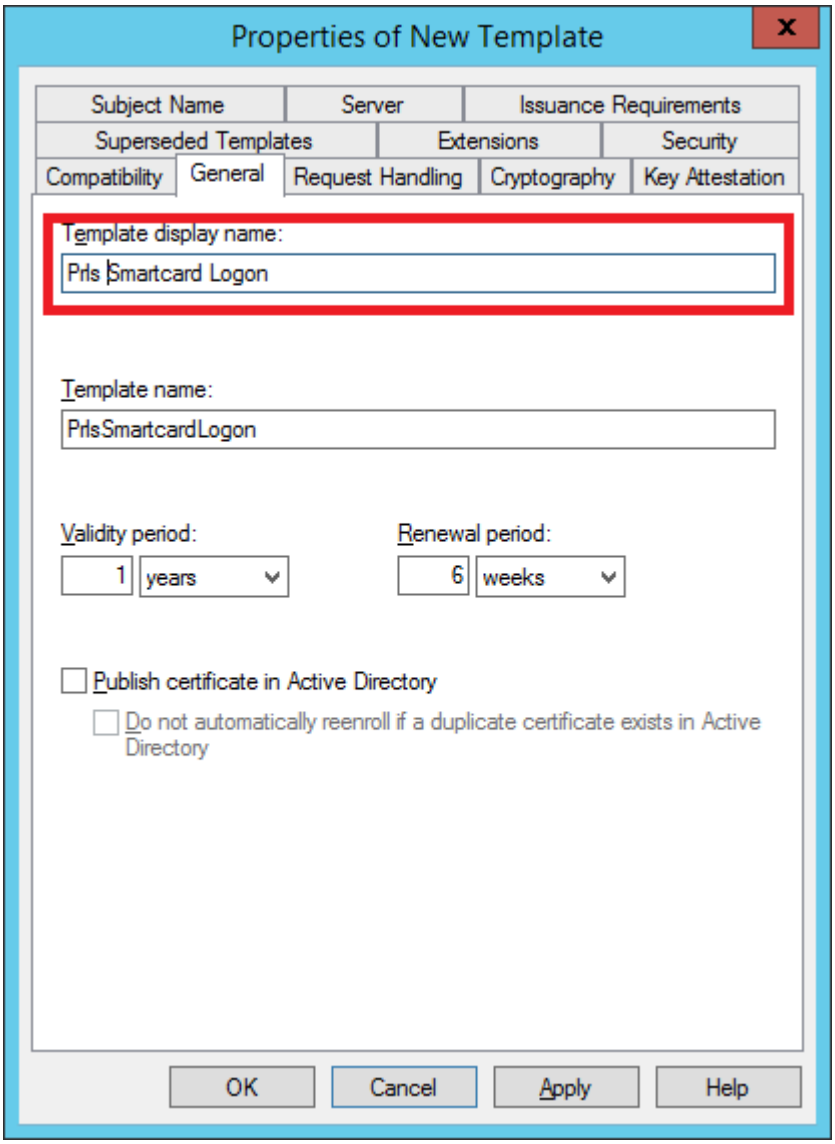
Note: After creating the Enrollment Agent template and the Smartcard Logon template (described later), you should restart the **Active Directory Certificate Services** service in Windows.

Create a Smartcard Logon Certificate Template

To create a smartcard logon certificate template:

1. From the Certificate Authority server, launch the Certificate Authority management console (MMC) from Administrative Tools.
2. Expand the CA, right -click on the "Certificate Templates" folder and select **Manage**.
3. Right click on the "Smartcard Logon" certificate template and then select **Duplicate**.
4. The new template properties open in the **General** tab. Type a template name in the text box. Note that the real name automatically appears in the second text box with no spaces. Remember this name. You will need it later to configure of SAML feature. The options on this tab should be configured as follows:
   - **Template display name:** PrlsSmartcardLogon
   - **Template name:** PrlsSmartcardLogon
   - **Validity period:** 1 years
   - **Renewal period:** 6 weeks
   - **Publish certificate in Active Directory:** OFF
   - **Do not automatically re-enroll if a duplicate certificate exists in Active Directory:** OFF

Note: The display name can be any name you choose, however the template name must match the template name highlighted above.



5 Select the **Cryptography** tab and set the following:

- **Provider category:** Legacy Cryptographic Service Provider (read-only).
- **Algorithm name:** Determined by CSP
- **Minimum key size:** 2048

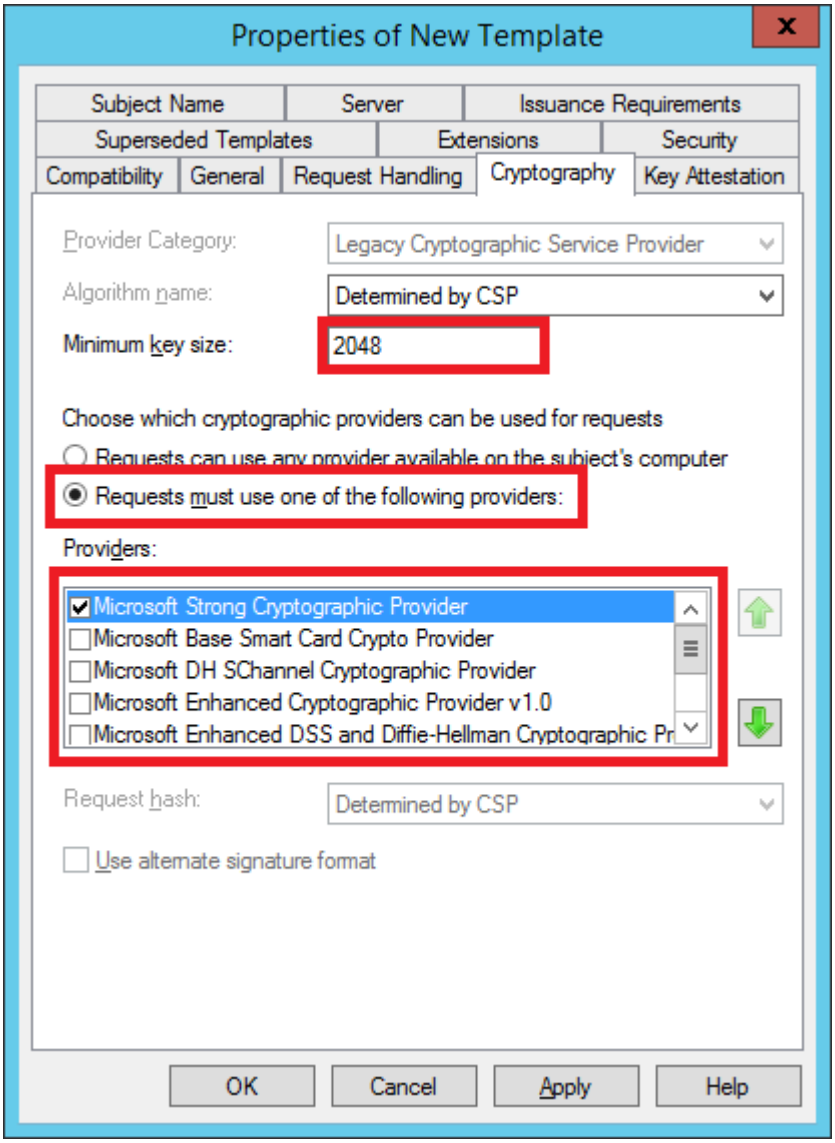
In the section **Choose which cryptographic providers can be used for requests**, choose **Requests must use one of the following providers**. In the following list of providers, clear all options except **Microsoft Strong Cryptographic Provider** and set priority as the preferred provider:

[X] Microsoft Strong Cryptographic Provider

[ ] Microsoft Enhanced Cryptographic Provider v 1.0

[ ] Microsoft Base Cryptographic Provider v 1.0

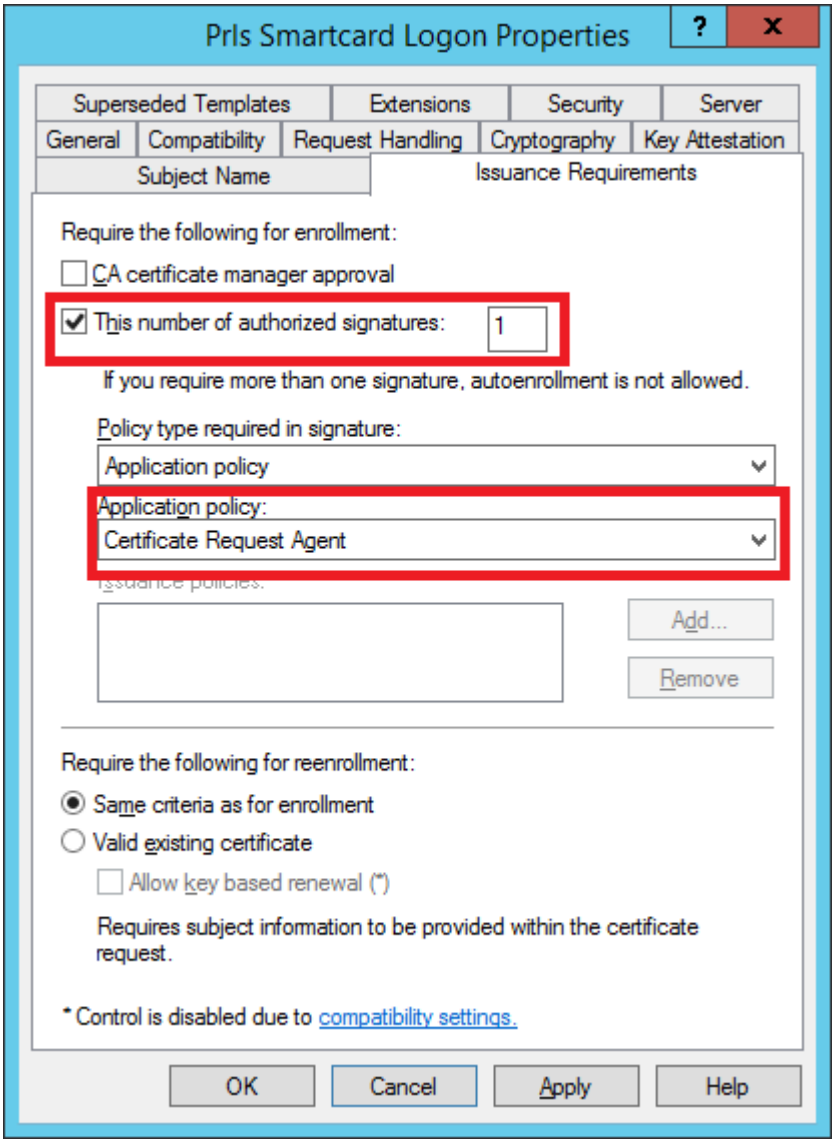
[ ] Microsoft Enhanced RSA and AES Cryptographic Provider



6 Select the **Issuance Requirements** tab and set the following:

- **CA certificate manager approval:** OFF
- **This number of authorized signatures:** 1
- **Policy type required in signature:** Application policy
- **Application policy:** Certificate Request Agent

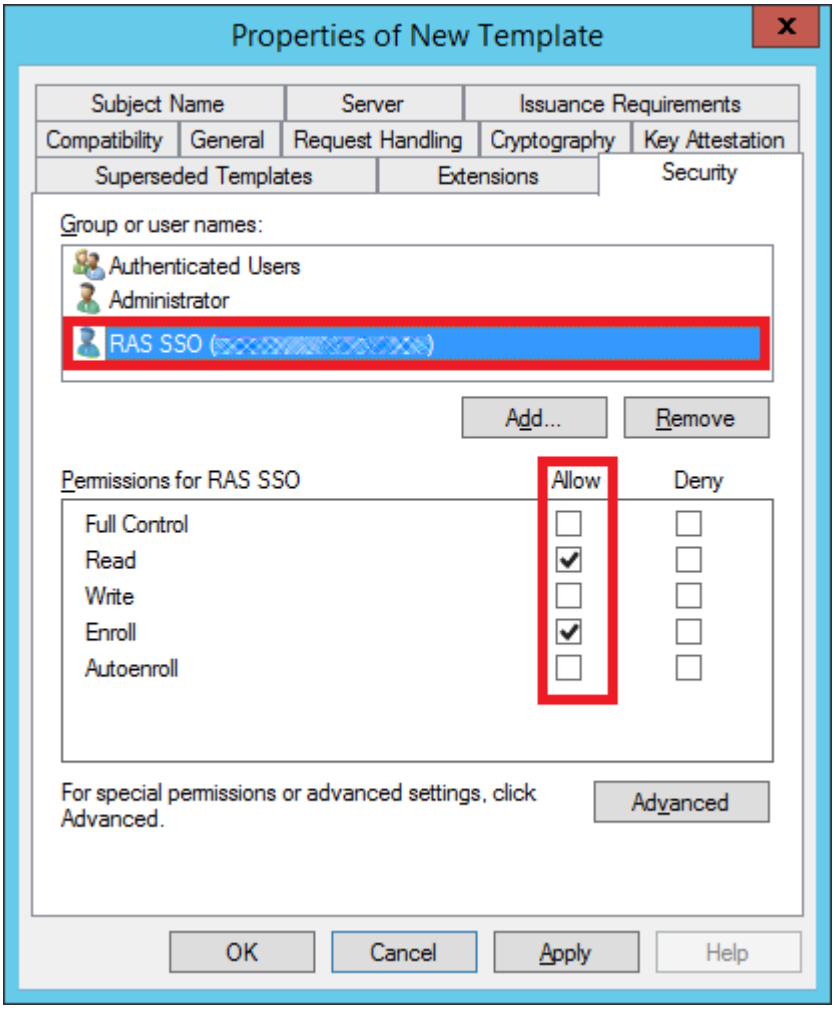
- **Same criteria as for enrollment:** ON



7 Select the **Security** tab and do the following:

- Click **Add.**
- Add the enrollment agent user account.

- Allow (select) the “Read” and “Enroll” permissions. Click **Apply** and **OK**.



Issue the certificate template

To issue the certificate template that you've created:

1 Run Certificate Authority again and right click on **Certifiifcate Templates,** select new and click on **Certificate Template to Issue**.

2 Select the certificate template you've created in the previous steps (i.e. Prls Smarcard Logon) and click **OK**.

3 The certificate template should appear in the **Certificate Templates** list.

Note: After creating the Smartcard Logon template and the Enrollment Agent template (described earlier), you should restart the **Active Directory Certificate Services** service in Windows.

RAS Enrollment Server Configuration

RAS Enrollment Server communicates with Microsoft Certificate Authority (CA) to request, enroll, and manage digital certificates on behalf of a user for SSO authentication in the Parallels RAS environment.

Note: For security reasons, RAS Enrollment Server should be installed on a secure, dedicated server similar to an Active Directory Domain Controller or Certificate Authority with no other Parallels RAS components installed.

Setup and configure RAS Enrollment Server

You can remotely install the RAS Enrollment Server Agent on a specified server from the RAS Console. You can also install the Agent by running the standard RAS installer on the desired server.

To remotely install the RAS Enrollment Server:

1. In the RAS Console, navigate to **Farm** / **Site** / **Enrollment servers**.
2. Click **Tasks** > **Add**.
3. Specify the FQDN or IP address of the server where you want the RAS Enrollment Server Agent to be installed.
4. Click **Next**.
5. In the **Enrollment Server Agent Information** dialog, click **Install** and follow the onscreen instructions.

To install the RAS Enrollment Server using the Parallels RAS installer:

1. Run the Parallels RAS installer on the server where you want the RAS Enrollment Server Agent installed.
2. On the **Select Installation Type** page, select **Custom** and click **Next.**
3. Clear all other components and select the Parallels RAS Enrollment Server component.
4. Click **Next** and follow the onscreen instructions.
5. Once the RAS Enrollment Server is installed, open the RAS Console and navigate to **Farm** / **Site** / **Enrollment servers**.
6. Click **Tasks** > **Add**.
7. Enter the Enrollment Server FQDN or IP address and click **Next**.
8. Follow the onscreen instructions to add the server to the Farm.

Obtain and copy the registration key

If you perform a manual installation using the RAS installer, it is necessary to place a registration key file on the Enrollment Server host. This step is not required if the RAS Enrollment Server Agent was remotely deployed from the RAS Console.

First, you need to obtain the registration key file as follows:

1. Open the RAS Console and navigate to **Farm** / **Site** / **Enrollment servers**.
2. Click **Tasks** > **Export registration key**.
3. Save the key to a file named *registration.crt*.

Once you have the registration.crt file, copy it to the following folder on the server where you have the RAS Enrollment Server installed, by default in the following path:

```
C:\Program Files (x86)\Parallels\ApplicationServer\x64
```

Note: It is mandatory for the registration key file to be named “registration.crt”.

Configure AD Integration

After you added the RAS Enrollment Server in the RAS Console, you need to configure AD integration for it as follows:

1. In the RAS Console, navigate to **Farm** / **Site** / **Enrollment Servers**.
2. Select the **AD Integration** tab.
3. In the **Certificate authority (CA)** section, specify the configuration string of your Enterprise CA where the new certificate templates, (Prls Enrollment Agent and Prls Smartcard Logon) were created. This should be done in the following format:

   ```
   CAhostname.domain\issuing CA name
   ```

   Alternatively, you can click the **[...]** button to select a CA. For configuration details, see **Configure Certificate Authority Templates** (p. 257).
4. In the **Enrollment Agent** section, specify the Enrollment Agent username and password. For configuration details, see **Active Directory User Account Configuration** (p. 254).
5. In the **NLA user** section, specify the NLA username and password. For configuration details, see **Active Directory User Account Configuration** (p. 254).
6. Click the **Validate AD integration settings** button to make sure that the information you've entered is valid.

RAS Enrollment Server High Availability

For high availability, multiple Enrollment Servers (ESs) can be added to each Site. All enabled and verified ESs will be used in an active/active fashion. Upon user login, requests from workload VMs such as RD Session Hosts or VDIs are equally distributed among the available ESs. In case of failures on a particular ES, the next available ES is selected and the SAML SSO authentication process continues. Specifically required for manual deployment of multiple ESs, it is important to note that all ESs in the same site share the same registration key which is required to be deployed in the specified path as mentioned in the **RAS Enrollment Server Configuration** (p. 266) section.

Note: Multiple ESs do not share a common certificate repository store and all certificates are segregated on each ES. This means that in case of multiple ESs, same user might have different certificates available on different ESs.

SAML Integration Examples and Tips

For examples of how to integrate various Identity Providers with Parallels RAS, please read the **SAML SSO Authentication Examples** guide, which is available on the Parallels website at https://www.parallels.com/products/ras/resources/

User Account Attributes

When user authentication is performed by the IdP, user account attributes in Active Directory and the IdP are compared with each other for a match. Attributes to be compared are configured on the IdP and in the RAS Console. For details, see **SP Side Configuration (RAS side)** (p. 251).

Security Tip

For security reasons, it is advisable to configure enrollment agent restrictions for a CA to allow only the newly created Enrollment Agent User permissions to enroll certificates on behalf of the users. To do so, follow the steps below.

1. Open the Certification Authority snap-in, right-click the name of the CA, and then click **Properties**.
2. Click the **Enrollment Agents** tab, click **Restrict enrollment agents**, and click **OK** on the message that appears.
3. Under **Enrollment agents**, click **Add**, type the name of the Enrollment agent user created in the previous steps and then click **OK**. Click **Everyone**, and then click **Remove**.
4. Under **Certificate Templates**, click **Add**, select the templates that were created (Prls Enrollment Agent and Prls Smartcard Logon) and then click **OK**. When you have finished adding the names of certificate templates, click **<All>**, and then click **Remove**.
5. Under **Permissions**, click **Add**, type the names or groups, which are the users or group expected to login to the RAS environment using SAML, and then click **OK**. Click **Everyone**, and then click **Remove**.

6 If you want to block the enrollment agent from managing certificates for other users, computers, or groups, under **Permissions**, select this user, computer, or group, and then click **Deny**.

7 When you are finished configuring enrollment agent restrictions, click **OK** or **Apply**.

Note: The user or group that you applied enrollment agent restrictions to must have a valid enrollment agent certificate for the CA before they can act as an enrollment agent, whether restricted enrollment agent permissions have or have not been configured.

Test the SAML SSO Deployment

When you have the SAML SSO authentication configured, you can test it as described below.

Service provider initiated authentication

1 Use a web browser to open the RAS HTML5 Client, specifying the Theme to which you assigned the identity provider.

2 Start a published application. Check that the application session was started successfully.

3 Create one more Theme, add one more IdP providers and then connect specifying the new Theme. Launch another application.

Identity provider initiated authentication

1 Use the web browser to connect to the identity provider portal.

2 Start a published application. Check that the application session was started successfully.

Error Messages

Error messages appear in the web browser when something goes wrong with SAML SSO authentication.

Pre HTML5 loading

Error message	Notes
Unable to parse SAML Assertion	There was an error while parsing and validating the SAML Assertion. Further details can be found in HTML5 Logs. Most common causes: **SAML Response is not valid for this audience:** The most probable cause for this issue is having wrong configuration on the IDP, especially the Entity ID URL. The entity ID URL in the assertion will not match with the Entity ID provided in the SP SAML settings. **Expected 1 Assertion or 1 EncryptedAssertion; found 0:** The

	Assertion / EncryptedAssertion tag was not found in the response. The HTML5 Client will be expecting an encrypted assertion while the IDP is sending a non encrypted one. This can either be fixed by changing the IDP settings to send an encrypted assertion or tick the checkbox found in 'RAS Console > Connection > SAML > IDP Settings > Allow unencrypted assertion' **SAML Response is not yet valid:** This might happen if the time of the server where RAS Gateway is installed is incorrect, for instance 4 seconds behind. In this case the assert will be created before actually trying to parse it. **SAML Response is no longer valid:** This might happen if the time of the server where RAS Gateway is installed is incorrect. In case it's manually set in the future, assert might be seen as not valid anymore while trying to validate it.
SAML Assertion body is empty	SAML Assertion was not found in the response. Further details can be found in HTML5 Logs
Unable to create SAML logout request	There was an error while creating SAML logout request. Further details can be found in HTML5 Logs.
Unable to create SAML logout response	There was an error while creating logout response. Further details can be found in HTML5 Logs.

Post HTML5 loading

Error code	Error message	Notes
0x00000029	SAML IdP settings not found. IdP Id:'xxx'	Check the Identity Provider settings. Check if the IdP metadata are correctly imported.
0x0000002A	SAML IdP info keys loading failed. IdP Id:'xxx'	Check if the IdP certificate is present in the IdP settings.
0x0000002B	SAML Theme mismatch	Check if the theme is correctly set in the IdP settings.
0x0000002C	Logon using SAML failed. Error: 0x00001	See errors below
0x00000029	No Enrollment Sever available	Check Enrollment server(s) status
0x0000002A	Missing NLA User Configuration	Enter NLA User details
0x00000003	Logon using SAML failed. Error: Failed to match AD User. 0x00000006	Check if the Attributes settings are correct in the IdP properties.
0x00000003	Logon using SAML failed. Error: Failed to validate and decrypt the response. 0x00000009	Check if the IdP certificate is present in the IdP settings.
0x00000003	Logon using SAML failed. Error: Assertion not encrypted. 0x0000001C	Check if the IdP settings for the logon request are correct.
0x00000003	Logon using SAML failed. Error: Failed to decrypt the assertion. 0x0000001D	Check the SP certificate is correctly set in the IdP settings.
0x00000003	Logon using SAML failed. Error: Failed to verify assertion. 0x0000001F	Check if the IdP certificate is present in the IdP settings.

Once an application or desktop is launched

Error message	Description and reference
Invalid username or password	The user certificate is valid, but the domain controller did not accept it. Check the Kerberos logs on the domain controller.
The system could not log you on. Your credentials could not be verified.	Check connectivity with the domain controller and check that the appropriate certificates installed.
The request is not supported	The “Domain Controller” and “Domain Controller Authentication” certificates on Domain Controller require enrolling, even if they are already available.
The system could not log you on. The smartcard certificate used for authentication was not trusted.	The intermediate and root certificates are not installed on the machine where the error is shown. The CA root certificate and any intermediate certificates must be added to the "Trusted root certificates"in the local computer account.
You cannot logon because smart card logon is not supported for your account.	The user account has not been fully configured for smart card logon.
No valid smart card certificate could be found.	Check the configuration of the PrIsSmartcardCertificate. The extensions might not be set correctly, or the RSA key is less than 2048 bits.
Bad Request	Check the configuration of the PrIsSmartcardCertificate. The extensions might not be set correctly, or the RSA key is less than 2048 bits.

CHAPTER 15

Parallels HTML5 Client

Parallels HTML5 Client is a RAS client application that runs in a web browser. Users can use Parallels HTML5 Client to view and launch remote applications and desktop from a web browser.

Compared to platform-specific Parallels Clients (Parallels Client for Windows, Parallels Client for iOS, etc.), Parallels HTML5 Client does not require end users to install additional software on their computers or mobile devices. Feature-wise, platform-specific Parallels Clients give users more options than Parallels HTML5 Client. Nonetheless, Parallels HTML5 Client is a fully-featured platform-independent client providing end users with an alternative method of working with remote resources published via Parallels RAS.

Please note that the RAS HTML5 Gateway (the server side) requires Windows Server 2008 R2 or higher (it will not work on Windows Server 2008). The only requirement for the client side is an HTML5-enabled web browser.

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Configure HTML5 Client

The HTML5 Client is a part of RAS Secure Client Gateway. To be used by end users, the HTML5 Gateway must be enabled and configured in the RAS Console as described in **Configure HTML5 Gateway** (p. 70).

Session persistence based on a cookie

RAS HTML5 Client session persistence is normally set by user's IP address (source addressing). If you can't use source addressing in your environment (e.g. your security policy doesn't allow it), you can use the Session Cookie to maintain persistence between a user and a server. To do so, you'll need to set up a load balancer that can use a session cookie for persistence. The cookie that you should use is ASP.NET_SessionId. If you are using a load balancer that doesn't use ASP.NET, you can specify a different cookie on the Web Requests tab of the RAS Secure Client Gateway Properties dialog. For more information, see **Web Request Load Balancing** (p. 74).

Configure Themes

Themes in Parallels RAS is a functionality that allows you to do the following:

- Allow access to a Theme to specified groups of users while configuring certain Theme properties that will apply to these groups. This functionality is supported by Parallels Client on all available platforms.
- Customize the appearance of Parallels Client, which enables you to implement custom branding of Parallels Client for different groups of users. Note that this functionality is only available for RAS HTML5 Client and Parallels Client for Windows.

To manage Themes, in the Parallels RAS Console, navigate to **Farm** / <Site> / **Themes**. The **Themes** view in the right pane displays the available Themes. The list contains at least one default Theme. This Theme cannot be removed but you can customize it as needed. In addition to the default Theme, you can create your own Themes.

To create a new or modify an existing Theme:

- Click **Tasks** > **New Theme** (or click the **[+]** icon) to create a new Theme.
- Double-click an existing Theme (or right-click it and choose **Properties**).

The **Theme Properties** dialog opens. Use the dialog to create a new or modify an existing Theme. The instructions in the subsequent sections apply to both scenarios.

General Theme Settings

The Theme settings described below apply to Parallels Client for all available platforms.

General

Select **General** in the left pane and specify the following Theme properties:

- **Enable Theme:** Enable or disable the Theme (the default Theme cannot be disabled).
- **Name:** Specify a Theme name.

- **Description:** Specify an optional Theme description.
- **Limit access to this Theme to members of these Active Directory groups:** If this option is cleared, any Parallels RAS user can access the Theme if they know its URL. To limit access to a particular group (or groups), select this option and then click **Tasks** > **Add** (or click the **[+]** icon) and select the desired group(s).

Message

Select **Messages** in the left pane and specify a post-logon message (up to 500 characters). The post-logon message appears as a message box immediately after the user successfully logs in. The message can be overridden for HTML5 client and Windows client individually (see **Messages** for each client in the subsequent sections).

HTML5 Client Theme Settings

The **HTML5 client** category allows you to configure Theme settings for Parallels HTML5 client. These settings affect how the HTML5 client looks and behaves in a web browser.

Note: To see how your HTML5 client Theme looks, click the **Preview HTML5 Theme** button in the lower left-hand corner of the dialog at any time.

URLs

The **URLs** category is used to specify the Theme login page URL and add additional URLs to the HTML5 Client page:

- **Theme login page:** Specifies a postfix for the Theme login page URL. This field is populated automatically with the Theme name when you save it, but you can specify a name of your choice. The complete URL of the Theme login page is comprised of "https://<host-name>/" followed by the name specified in this field. For the explanation of what the <host-name> should be, please see **Web Request Load Balancing** (p. 74).

  For example, if you name the Theme "Theme-S1", the complete URL is https://<host-name>/Theme-S1. When you save the Theme, the URL is displayed on the **Themes** tab in the RAS Console (the **HTML5 URL** column).

  Please note that the URL described above is the short version, which is easier to remember and use. The full version is:

  https://<host-name>/RASHTML5Gateway/?theme=<team-name>

  Both the short and the long versions are equally valid.
- **Show Parallels Client download URL**. If selected, users will see the **Download Client** link on the HTML5 client page, which can be used to download, install, and configure Parallels Client on users' computers.

- **Override download URL for branded Parallels Client (Windows):** Specifies a location from which your Windows users will download Parallels Client for Windows. By default, Parallels Client is downloaded from the Parallels web site. If you use a branded version of Parallels Client, you can specify its location in this field.
- **Footer URLs**. This option allows you to specify custom URLs that will be placed in the HTML5 client footer. To add a URL, click **Tasks** > **Add** and specify a URL, a text that will appear on the page footer, and a tooltip text. When entering similar URLs, you can duplicate an existing one by right-clicking it and choosing **Duplicate** (or select an entry and click the "duplicate" icon next to the **[-]** icon). If you've added multiple URLs, you can reorder them by clicking the up or down arrow icons or selecting **Up** or **Down** items in the **Tasks** menu. The URLs will appear in the footer in the order listed (you can click the **Preview HTML4 Theme** button to see how it looks).

Branding

The **Branding** category allows you to customize the appearance of HTML5 Client pages.

The following properties can be customized:

- **Webpage title:** Specifies the title that appears on the webpage. You can type any title you like.
- **Login to:** Specifies a name that will appear in the HTML5 Client login dialog. For example, if you type "ABC" here, the login page will say, "Log in to ABC". There are two predefined variables that you can use here: %FARM% (the actual Farm name; this is the default value) and %SITE% (the Licensing Site name).
- **Company logo:** Displays the image which is displayed on the HTML5 client page header. To change the image, select browse and then specify the image file. Note that changing the logo image also removes the default **Remote Application Server** part from the page header.
- **Favicon icon:** Displays the currently set favicon icon. To change the icon, click **Browse** and select an icon file.

Colors

Specify the desired colors for various HTML5 Client elements, such as header, footer, work area, buttons, etc.

Gateway

The **Gateway** category can be used to override the default HTML5 Client settings, which are configured in the RAS Secure Client Gateway. The settings are described in detail in the **Configure HTML5 Client** section (p. 70).

Normally, you shouldn't override the gateway settings if you are running a traditional Parallels RAS Farm and using a single Theme in a Site. Scenarios when this functionality may come handy include the following:

- You have multiple Themes for different groups of users and would like different Themes to behave differently in terms of application launching methods and restrictions.

- You are using RAS multi-tenant architecture where RAS Secure Client Gateways are running in Tenant Broker and are shared by Tenants, which are separate Farms. Themes in this kind of deployment are defined on the Tenant level, so each Tenant can have its own HTML5 Client look and feel. Since gateways are shared by Tenants, it is logical to configure these settings on a Theme level, which is exactly what the **Gateway** category allows you to do. For the complete description of what Tenant Broker and Tenants are, please read the **RAS Multi-Tenant Architecture** chapter (p. 228).

To override the RAS Secure Client Gateway settings, select the **Override gateway settings for the Theme** option and then specify your own settings. For the description on how to configure these settings, see **Configure HTML5 Client (p. 70).**

Parallels Client for Windows Theme Settings

Panes under the **Windows client** heading allow you to configure Theme settings for Parallels Client for Windows. By configuring a Windows client Theme, you can make the client appear to end users as your organization requires.

Branding

On the **Branding** pane, specify the following:

- **Company name:** Used to create the Start menu hierarchy: Start \ Company Name \ App Name.
- **Application name:** Displayed in the app caption and the Start menu entry name.
- **Connection banner:** Displayed when a connection is being established.
- **Application icon:** The application icon used for the Start menu and by the main app window.

Messages

To override the default post-logon message, select the **Override post-logon message** option and enter a message.

Custom Menu

The **Custom Menu** pane allows you add a menu item to the **Help** menu in white-labeled Parallels Client for Windows. For example, if you enter "&Notepad" in the **Menu item** field and "notepad.exe" in the **Command** field, a new menu item will appear under the **Help** menu in every white-labeled Parallels Client for Windows connecting to this Farm. The item will be named **Notepad** (with the "N" being the shortcut) and it will open the Notepad.exe application when clicked. The **Command** field can contain an executable name, a URL, or any other command that can be properly executed on a Windows machine. For instance, you can add a menu item specifying a URL of your Helpdesk solution, so your users can easily reach it when needed.

After defining a Windows client Theme, you can also create a client package for mass distribution. For more information, see **Create Branded Windows Client for Mass Distribution (p. 277).**

General Theme Tasks

When you are done customizing a Theme, click **OK** to save it and return to the Parallels RAS console.

You can also perform the following actions on the **Themes** tab in the Parallels RAS Console:

- **Duplicate a Theme** — right-click a Theme and choose **Duplicate** (or select a Theme and click **Tasks** > **Duplicate**).
- **Preview HTML5 Theme** — right-click a Theme and choose **Preview HTML5 Theme** (or **Tasks** > **Preview...**).
- **Delete a Theme** — right-click a Theme and choose **Delete** (or **Tasks** > **Delete**).

When done creating or modifying Themes, click **Apply** in the Parallels RAS Console to commit the changes to Parallels RAS. You can now test the Theme by opening its URL in am HTML5-enabled web browser.

Create Branded Windows Client for Mass Distribution

To allow IT administrator to deploy a branded Parallels Client for Windows to end user PCs, Parallels RAS includes the functionality that simplifies the process.

First, you need to create a Theme that includes the necessary branding features. See **Parallels Client for Windows Theme Settings** (p. 276). After that, you need to create a Parallels Client for Windows installation package that will use the Theme. To do so:

1. On the **Themes** tab, click **Tasks** > **Generate Windows Client Package**.
2. In the dialog that opens, specify the following options:
   - Select a Theme to use to create the package. The Theme must have the **Parallels client** settings configured.
   - Specify the target folder on your local computer (e.g. "c:\temp").
   - Select or clear the "Open the folder in Windows Explorer .... " option as needed.
3. Click **Generate**. This will create the ClientDownloader.exe file. When you run the file, it will download the latest version of Parallels Client for Windows installer (MSI) and will apply the custom Theme to it.

You can now distribute this installer to end users. When they run the installer, it will install the Parallels Client for Windows with all the customizations (start menu shortcuts, desktop shortcut, images and icons) as specified in the Windows client Theme.

In the future, if you need to upgrade an installed copy of Parallels Client for Windows to a newer version, you don't need to repeat the instructions described above. Simply upgrade the older version and the branding features will remain intact.

Delegating Session Management Permissions

If your organization has multiple user groups, all sharing centralized Parallels RAS resources, you have the ability to delegate session management permissions to an administrator of a particular group. When you do, the administrator can see and manage Parallels RAS sessions only for users who belong to that group.

Here's how this functionality works:

1. A separate Theme is created for each group. Session management permissions for the Theme are delegated to a custom administrator (see **Managing Administrator Accounts** (p. 47)).
2. When a custom administrator logs in to the Parallels RAS Console, they are presented with a limited user interface displaying sessions that belong to the Theme (or multiple Themes) that the administrator is allowed to manage.

The rest of this section describes how to configure and use this functionality.

Create a Theme and delegate session management permissions

If you don't have a Theme for a user group, you need to create it. Follow the instructions provided earlier in this chapter (p. 273). To delegate session management permissions, you specifically need to do the following:

1. When specifying settings on the **General** page, select the **Limit access to this Theme to members of these Active Directory groups** option and add one or more groups.
2. After creating or configuring the Theme, close the **Theme Properties** dialog, then right-click anywhere in the list and choose **Delegate Permissions**.
3. If you already have a custom administrator account that you would like to use, it will appear in the list. If you don't have an account, create one as follows:
   a. Click **Tasks** > **Add**.
   b. In the **Account Properties** dialog, click the **[...]** button next to **Name** and select an account.
   c. The **Permissions** field is read-only and set to **Custom administrator** (the type that must be used here).
   d. Populate the rest of the fields (email, mobile, etc.) as needed.
   e. Click **OK**.
4. Back in the **Delegate Permission** dialog, select the administrator in the left pane.

5 In the lower portion of the right pane, select permissions (view, modify, manage sessions) for the desired Theme. You can also set permissions in the upper portion of the right pane, but they will apply to all existing Themes, and this is probably not what we are trying to do here.

6 Click **OK**.

Manage sessions

Once the above is complete, the custom administrator can manage sessions that belong to the specified Theme(s). To manage sessions:

1 Run the Parallels RAS Console and log in using the credentials of a custom administrator.

2 The right pane will contain sessions that belong to the members of the group(s) assigned to the Theme.

3 To manage a session, select it, then click the **Tasks** drop-down menu and choose a desired option (Disconnect, Log off, Send message, etc.).

Settings audit

Any changes to administrator permissions are recorded in the settings audit. Possible actions are create, update, and delete. You can view the changes by going to **Administration** / **Settings Audit** or **Farm** / **Themes** / **Settings Audit**.

Using Themes in Parallels Client for Windows

In order for a user to use a corresponding Theme, the connection properties must be properly set. To do so:

1 In Parallels Client for Windows, right-click a connection and choose **Connection Properties**.

2 On the **Connection** tab, the server name must be followed by the Theme name after a forward slash, as in `Server-name/Theme-name`.

When the administrator views sessions in the RAS Console, a client using a Theme can be identified by the Theme name in the **Theme** column.

Open Parallels HTML5 Client

To open Parallels HTML5 Client in a web browser, enter one of the following in a web browser, depending on your setup:

- The DNS name of an HALB device or HALB Virtual Server (if in use). For example, https://ras.msp.com.
- The FQDN or IP address of a specific RAS Secure Client Gateway. For example, https://ras-gw1.company.dom.

For more information about the HTML5 Client URL, please see **Web Request Load Balancing** (p. 74).

When you open the HTML5 Client in a web browser, the login page is displayed.

Note: By default, when a user opens HTML5 Client in a web browser for the first time, the cookie consent message is displayed at the top of the page in accordance with the GDPR regulation. To read the Parallels cookie policy, the user clicks the provided link. To agree with the policy, the user clicks **Got it** to close the message and continue. The RAS administrator can disable the cooke consent message in the Theme settings dialog.

To log in to Parallels RAS, specify your user name in the UPN format (username@domain.com) and password and click **Log in**.

Note: If Parallels RAS is configured to use Google Authenticator as a second-level authentication provider, an additional dialog opens where the user can either scan a QR code or use a secret key to generate a one time password (OTP). For details, please see **Using Google Authenticator** (p. 224).

Once the user is logged in, one of the scenarios described below takes place depending on how the HTML5 Client is configured on the server side. For details, please see **Configure HTML5 Client** (p. 70).

Launch apps in Parallels Client and fallback to HTML5

With this option configured on the server side, you will see a dialog box in the web browser with the following options:

- **Install Parallels Client**. Opens the Parallels Client download and installation page. Follow the instructions and install Parallels Client.

  Note: If you don't have administrative permissions on this computer, a dialog will open saying so. The dialog has two buttons: **Install Full Client** and **Install Basic Client**. If you know credentials of an administrative account on this computer, click **Install Full Client** and enter the credentials when asked. The installation will continue using these credentials and the full version of Parallels Client will be installed. If you don't know the credentials, click **Install Basic Client**. The basic version of Parallels Client will still work but some of the functionality will be missing.

  After the installation, you should see Parallels HTML5 Client displaying published resources that you can use. Please also note a link in the lower left corner of the screen displaying the Parallels Client version and build number.

  You can now run remote applications and desktop in Parallels Client or in a browser (HTML5). The default method for running applications and desktops is Parallels Client. To run a remote application or desktop in a browser, right-click it (or tap and hold on a mobile device) and then choose Parallels HTML5 Client.

- **Open in Parallels HTML5 Client**. Closes this dialog box and opens the main Parallels HTML5 Client screen. Remote applications or desktops will be launched in the web browser. When you open Parallels HTML5 Client the next time, you will again see the same dialog box with the same options.

- **Always open in Parallels HTML5 Client**. This option works similarly to the option above but your selection is remembered the next time you open Parallels HTML5 Client.

Launch apps in Parallels Client

When this option is configured on the server side, you will see a dialog box prompting you to install Parallels Client. Click the link provided to open the Parallels Client download and installation page and follow the instructions. After you install Parallels Client, the main Parallels HTML5 Client screen opens displaying published resources that you can use. If you now double-click or tap a resource, it will be launched in Parallels Client.

Launch apps in browser only (HTML5 only)

With this option configured, the main Parallels HTML5 Client screen opens with no additional prompts. Remote applications and desktops will be launched in the web browser.

Main Menu Options

To open the Parallels HTML5 Client main menu, click or tap the "person" icon in the upper-right. You can select from the menu options described below.

Settings

Allows you to configure the following settings:

- **Sound**: To play the sound on the local computer, select the **Bring to this computer** option. If sound is not supported by your browser, the menu will be disabled and you'll see a corresponding text message below it.
- **Remote audio recording**: Enables or disable the sound input redirection from the local computer to the remote application. For example, if you would like to use a microphone in Skype or a similar app for teleconferencing, you need to enable audio recording in Parallels HTML5 client. Select **Record from this computer** to enable recording or select **Do not record** to disable it.

  Note: Audio input is supported in Chrome, Firefox, Edge and Safari 11. If your browser doesn't support audio input, this setting will be disabled and you will see a text message instead.

- **Redirect Links**: Select a desired redirection option from the following: **Do no redirect**, **Redirect URLs**, **Redirect email**, **Redirect all**. When redirection is enabled, a link will be opened on the local computer.
- **Redirect Printers**: Select a printer redirection option: **RAS Universal Printer** (uses the RAS Universal Printing technology) or **Do not redirect** (printers will not be redirected).
- **Keyboard Mode**: Select **Universal Keyboard** or **PC Keyboard**. If you have problems typing certain characters, try selecting **PC Keyboard** and then selecting a proper layout in the **Keyboard Layout** drop-down list (see below).

- **Keyboard Layout**: Select a keyboard layout (e.g. English (US), English (UK), Japanese). To enable this drop-down list, the Keyboard Mode option must be set to PC Keyboard.
- **Auto login**: Enable or disable auto login in HTML5 Client. If this option is on, and the user credentials have been saved before, the user will not have to enter them again. This option may not be available if a Client Policy was applied where this option is turned off. Note that the auto login option is supported on the latest Chromium-based browsers, such as Google Chrome and Microsoft Edge. For more information, please see **Auto Login**.
- **Connection Timeout**: Specify the connection timeout.
- **MFA: Remember last method used**: If using multi-factor authentication, enable this option so the last method used is remembered and used by default.

Change Password

Allows the user to remotely change their domain password. When the password is being changed, the password requirements are displayed on the screen, so the user can follow them for the new password to be accepted. This option can be disabled through Client Policies (**Control settings** > **Password** > **Prohibit changing password**).

Detect Client

Determines if Parallels Client is installed on the local computer. If Parallels Client is not installed, gives user an option to install it or skip the automatic Parallels Client detection on subsequent logons.

Download Client

Opens a web page with instruction on how to download and install Parallels Client.

Logout

Ends user session with Parallels RAS and logs the user out.

Launching Remote Applications and Desktops

Launching applications and desktops

To launch a remote application or desktop in Parallels HTML5 Client, do one of the following:

- Double-click (or tap on a mobile device) an application or a desktop icon. The resource will open inside a web browser or in Parallels Client depending on the server-side HTML5 configuration (RAS Secure Client Gateway Properties > HTML5 > Launch sessions using option).

- Right-click (or tap and hold on a mobile device) an application or a desktop to display a context menu. The menu will appear if the **Allow user to select launch method** or **Allow opening applications in a new tab** (or both) options are selected on the **RAS Secure Client Gateway Properties** > **HTML5** tab in the RAS console. The menu allows you to choose whether to open the resource in Parallels Client or Parallels HTML5 Client (depending on the setting mentioned above) and it also allows you to choose whether to open an application in the same or new tab in the web browser.
- If a resource cannot be opened in Parallels Client due to an error, a message will be displayed with an option to open it in the web browser instead.

Please note that to open a resource in Parallels Client from the HTML5 page, a URL with a custom scheme is used. When you double-click on a resource on the HTML5 page, the URL is executed and is then passed to Parallels Client which uses the instructions that it contains to open the resource. For more information see **RAS HTML5 Gateway API and Parallels Client URL Scheme** (p. 399).

Using drag and drop functionality

Parallels HTML5 Client supports drag and drop functionality when running remote applications and desktops.

Note: The **Allow file transfer command** option must be enabled on the Gateway for the drag and drop functionality to work. See **Configure HTML5 Client** (p. 70).

Here's how to use drag and drop when working with a remote application:

1. Select a file on your local computer.
2. Drag and drop the selected file to an app. The 'Save as' window will pop up.
3. Enter a name for the file and save it. The file will be saved on the server hosting the app.

You can also drag and drop files between two remote apps running on different hosts.

Here's how to use drag and drop with a remote desktop:

1. Select a file on your local computer.
2. Drag and drop the selected file to a remote desktop. The 'save as' window will pop up.
3. Enter a name for the file and save it. The file will be saved on the desktop on the server that hosts it.

Other useful features

Other useful functionality on the main Parallels HTML5 Client screen includes the following:

- **Favorites list**. You can add a remote application or a desktop to the Favorites list, so you can easily find them. To do so, point to or tap an application or a desktop and then click or tap the "star" icon. To view the list, click or tap the "star" icon on the footer toolbar (in the lower let). To remove a resource from the list, point to it and click the "X" icon (or point to or tap the resource icon and then click or tap the start icon).
- **Search**. To search for a resource, begin typing its name in the **Search** box (upper right). The list will be filtered as you type to contain only the resources with matching names.
- **View a description**. To view a resource description, position the mouse pointer over it. The description will appear as a tooltip. This could be helpful if one or more resources are published using the same name. By reading the description, you can distinguish between them.
- **Taskbar**. When you launch a remote application or a desktop, its icon is added to the taskbar at the bottom of the screen. When the taskbar is full, items of the same type are grouped to save space. You can click or tap on a group to see the list of all running instances and to switch to or close a particular instance.

Using the Toolbar

Parallels HTML5 Client includes a special toolbar that becomes available when you launch a remote application or desktop. The toolbar appears differently for remote desktops and remote applications. The toolbar has also slightly different functions for desktop computers and mobile devices. The differences are explained in the subsequent topics.

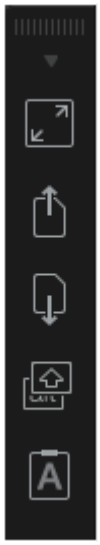
In this section:

- Using the Toolbar on Desktop Computers (p. 285)
- Using the Toolbar on Mobile Devices (p. 287)
- Using the Remote Clipboard (p. 288)
- Hiding Toolbar Items (p. 289)

Using the Toolbar on Desktop Computers

Remote Desktop Toolbar

When you launch a remote desktop in a web browser on a desktop or laptop computer, the toolbar appears as follows:



The top area of the toolbar is used to drag the toolbar up or down. Click and hold it and then drag the toolbar to the desired position. The arrow icon is used to show or hide the toolbar items.

The main toolbar items are (from top to bottom):

- **Full screen**. Display the remote desktop in full screen on the local computer.
- **Upload a file**. Upload a file from the local computer to the remote server. After clicking this item, you are presented with two dialogs, one after another. In the first dialog, select a file on the local computer you wish to upload. In the second dialog, select a location on the remote server where you want to save the file.
- **Download a file**. Download a file from the remote server to the local computer. After clicking this item, select a file on the remote server you wish to download. Depending on your web browser configuration, the download will start automatically or you will be asked to select a destination folder on your local computer.
- **Shortcuts**. Display the **Shortcuts** menu (see below for the menu description).
- **Clipboard**. Display the remote clipboard. Please see **Using the Remote Clipboard** (p. 288) for more information.

The **Shortcuts** menu allows you to send keystrokes and key sequences to the remote desktop:

- **Escape**. Sends the "Escape" keystroke to the remote desktop.
- **Tab**. Sends the "Tab" keystroke.

- **Backspace**. Sends the "Backspace" keystroke.
- **Print screen**. Sends the "Print Screen" keystroke. The screen will be printed to the clipboard of the remote desktop from where you can paste it into an application (e.g. Paint) running on the same remote computer.
- **Windows Key**. Sends the "Windows logo key" keystroke.
- **Control+Alt+Delete**. Sends the "Ctrl+Alt+Delete" key sequence.

Remote Application Toolbar

When you launch a remote application, the toolbar is embedded into the page footer and it's collapsed by default. To expand the toolbar, click the "arrow-up" icon in the lower right-hand corner.

The toolbar items are (from top to bottom):

- **Download**. Download a file from the remote server to the local computer. After clicking this item, select a file on the remote server you wish to download. Depending on your web browser configuration, the download will start automatically or you will be asked to select a destination folder on your local computer.
- **Upload**. Upload a file from the local computer to the remote server. After clicking this item, you are presented with two dialogs, one after another. In the first dialog, select a file on the local computer you wish to upload. In the second dialog, select a location on the remote server where you want to save the file.
- **Clipboard**. Display the remote clipboard. Please see **Using the Remote Clipboard** (p. 288) for more information.

Using the Toolbar on Mobile Devices

Remote Desktop Toolbar

When you launch a remote desktop in a web browser on a mobile device, the toolbar appears as follows:

The small arrow icon at the top is used to show or hide the toolbar items.

The main toolbar items are (from top to bottom):

- **Upload a file**. Upload a file from the local device to the remote server. Note that in iOS, you can upload from the Photos folder only.
- **Download a file**. Download a file from the remote server to the local device (not available in iOS).
- **Shortcuts**. Display the **Shortcuts** menu (see below for the menu description).
- **Clipboard**. Display the remote clipboard. Please see **Using the Remote Clipboard** (p. 288) for more information.
- **Keyboard**. Display the native keyboard. This opens your mobile device native keyboard so you can type in an application on the remote desktop.
- **Arrow**. The arrow icon is used to switch between the two available mouse input modes:

  Mode 1: The first mode (the arrow icon is white) follows the movement of your finger on the screen and performs a click on a remote desktop where you tap.

  Mode 2: The second mode (the arrow icon is red) displays a virtual mouse pointer on the remote desktop and allows you to move that pointer to a precise position with your finger. When you tap anywhere on the screen, the click on the remote desktop is performed at the precise position of the virtual mouse pointer.

The **Shortcuts** menu allows you to send keystrokes and key sequences to the remote desktop:

- **Escape**. Sends the "Escape" keystroke to the remote desktop.
- **Tab**. Sends the "Tab" keystroke.
- **Backspace**. Sends the "Backspace" keystroke.
- **Print screen**. Sends the "Print Screen" keystroke. The screen will be printed to the clipboard of the remote desktop from where you can paste it into an application (e.g. Paint) running on the same remote computer.
- **Windows Key**. Sends the "Windows logo key" keystroke.
- **Control+Alt+Delete**. Sends the "Ctrl+Alt+Delete" key sequence.

Remote Application Toolbar

When you launch a remote application, the toolbar is embedded into the page footer and it's collapsed by default. To expand the toolbar, click the "arrow-up" icon in the lower right-hand corner.

The toolbar items are (from top to bottom):

- **Download**. Download a file from the remote server to the local device (not available in iOS).
- **Upload**. Upload a file from the local device to the remote server. Note that in iOS, you can upload from the Photos folder only.
- **Clipboard**. Display the remote clipboard. Please see **Using the Remote Clipboard** (p. 288) for more information.
- **Keyboard**. Display the native keyboard. This opens your mobile device native keyboard so you can type in an application on the remote desktop.

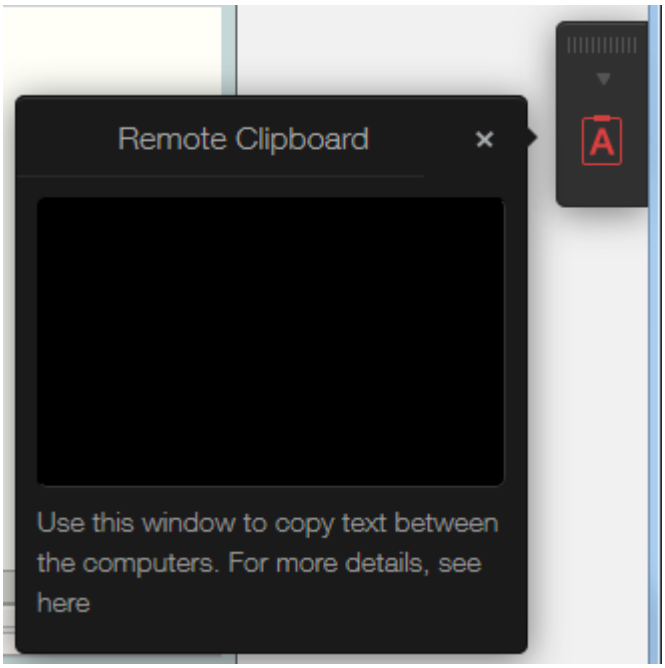
Using the Remote Clipboard

The Remote Clipboard allows you to copy and paste text between a remote application and the local device. The clipboard is accessed from the toolbar.

To use the clipboard:

1 Expand the toolbar click the **[A]** icon.

2 This opens the **Remote Clipboard** window. On the screenshot below, a remote desktop toolbar is shown. A remote application toolbar looks differently, but it functions exactly the same.



3 To copy text from the local computer to a remote application, type (or paste) it in the **Remote Clipboard** window. The text is automatically saved on the remote computer clipboard, so you can use a standard paste command (e.g. Ctrl+V) to paste it into a remote application.

4 To copy text from a remote application to the **Remote Clipboard** window, highlight it and use the standard copy command (e,g, Ctrl+C). The text will appear in the **Remote Clipboard** window from where you can copy it to a local application.

Hiding Toolbar Items

You can hide the clipboard and file transfer items on the toolbar if you believe that it's a security risk. The clipboard can be disabled on a RAS Secure Client Gateway or Client Policy level.

To disable the clipboard for a Gateway:

1 In the Parallels RAS Console, navigate to **Farms** / <Site> / **Gateways**.

2 Right-click a desired RAS Secure Client Gateway and choose **Properties**.

3 Select the **HTML5** tab and clear the **Allow clipboard command** option in the **Restrictions** section.

You can also disable the clipboard on the Client Policy level, which will disable it for a given user or user group on any Gateway they connect to:

1 In the Parallels RAS Console, select the **Policies** category.

2 Right-click a policy and choose **Properties**.

3 Select the **Connection Properties** item in the left pane and then select the **Local Resources** tab in the right pane.

4 In the **Local devices and resources** section, clear the **Clipboard** option.

Note: Please note that when enabling or disabling the clipboard on a client policy level, this will also affect the clipboard functionality on desktop and mobile versions of Parallels Client. This means that if you disable the clipboard, the desktop and mobile device users will not be able to use their local clipboard when working with a remote application.

You can also disable the file upload and file download items on the toolbar. For instructions, please read the **Enabling or Disabling Remote File Transfer** section (p. 335).

CHAPTER 16

Load Balancing and HALB

This chapter describes load balancing options that you can use in Parallels RAS.

In This Chapter

Resource Based & Round Robin Load Balancing 291
Load Balancing Advanced Settings 292
High Availability Load Balancing 293

Resource Based & Round Robin Load Balancing

Load Balancer in Parallels RAS is designed to balance RDS and VDI provider connections from Parallels Clients.

The following types of load balancing are available:

- **Resource-based.** Distributes sessions to servers depending on how busy the servers are. A new incoming session is always redirected to the least busy server.
- **Round robin**. Redirects sessions in sequential order. For example, let's say there are two RD Session Hosts in the Farm. The first session is redirected to server 1, the second session is redirected to server 2, and the third session is redirected to server 1 again.

Both methods are explained in this and the following subsections. Load Balancing options can be configured from the **Load Balancing** category in the RAS Console.

Selecting load balancing method

Load balancing is enabled by default when more than one server is available in a Site. The resource-based load balancing is the default method. Load balancing method can be selected from the **Method** drop-down list.

Configuring resource counters

Resource-based load balancing uses the following counters to determine if a given server is busier than other servers and vice versa:

- **User sessions:** Redirect users to a server with the least number of sessions.
- **Memory:** Redirect users to the server with the best free/used RAM ratio.

- **CPU:** Redirect users to the server with the best free/used CPU time ratio.

When all of the counters are enabled, the Load Balancer adds the counter ratios together and redirects the session to the server with the most favorable combined ratio.

To remove a counter from the equation, clear the checkbox next to the counter name in the **Counters** section.

Session options

Reconnect to disconnected sessions. Enable this option to redirect incoming user sessions to a previously disconnected session owned by the same user.

Reconnect sessions using client's IP address only. When reconnecting to a disconnected session, the Parallels RAS will match the username requesting reconnection with the username of the disconnected session to match the sessions. With this option enabled, Parallels RAS will determine to which disconnected session to reconnect the session by matching the source IP address.

Limit user to one session per desktop. Enable this option to ensure that the same user does not open multiple sessions. Please note that for this option to work, your RD Session Hosts must also be configured to restrict each user to a single session. In Windows Server 2008, you need to enable the "Restrict each user to a single session" option in Remote Desktop Session Host Configuration. In Windows Server 2012(R2), it's the "Restrict Remote Desktop Services users to a single Remote Desktop Services session" option in Local Group Policy \ Remote Desktop Services \ Remote Desktop Session Host \ Connections.

Disable Microsoft RD Connection Broker. If this option is enabled, the Microsoft RD Connection Broker will not interfere with the RAS brokering done by the RAS Publishing Agent if it is installed. Please note that this option will only work with Windows Server 2012 and above.

Load Balancing Advanced Settings

Excluding a Process from the CPU Counter

To exclude a process so it does not affect the free/used CPU time ratio on a server, follow the procedure below:

- Click the **Configure** button at the bottom of the **Load Balancing** options.
- Select the **Enable CPU Load Balancer** option and click **Exclude List**.
- Click **Add** to select a process in the list of running processes. Alternatively you can specify a process name in the **Please Enter Process Name** input field at the bottom of the dialog.
- Click **OK** to close the **Processes Exclude List** dialog or **Add** to add other processes.

To remove a process from the processes excluded list highlight the process and click **Remove**.

High Availability Load Balancing

High Availability Load Balancing (HALB) is an appliance that provides load balancing for RAS Secure Client Gateways. A Parallels HALB appliance is a preconfigured virtual machine with the operating system installed and all relevant settings configured.

Parallels HALB appliance is available for the following hypervisors:

- Microsoft Hyper-V
- VMware
- Citrix Hypervisor

HALB deployment in Parallels RAS is per Site, which means that a Site must have at least one Parallels HALB appliance deployed. Since HALB is a single point of contact for the client software, it is recommended to have at least two HALB appliances per Site for redundancy.

Multiple HALB deployments can run simultaneously, one acting as the primary and others as secondary. The more HALB deployments a Site has, the lower the probability that end users will experience downtime. Primary and secondary HALB deployments share a common or virtual IP address (VIP). Should the primary HALB deployment fail, a secondary is promoted to primary and takes its place.

Note: Please note that when a secondary HALB deployment is promoted to primary, a user will experience two disconnects: one when the primary HALB deployment goes down and one more time when it goes back up since VIP moves from one deployment to the other.

Setting up High Availability Load Balancing consists of the following steps:

1. Deploying a Parallels HALB appliance.
2. Configuring HALB in the RAS console.

Read on to learn how to download and deploy a Parallels HALB appliance.

Deploying a Parallels HALB Appliance

To download a Parallels HALB appliance, visit
`https://www.parallels.com/products/ras/download/links/`

On the **Download Parallels Remote Application Server** web page, scroll down to the **Download Optional Server Components** table and find the **Parallels Remote Application Server HALB Appliances** row. The row contains the following download links:

- HALB Appliance OVA
- HALB Appliance VHD

- HALB Appliance VMDK

The appliance type that you need to download depends on the hypervisor that you are using. Please follow the instructions below for your hypervisor type.

VMware

For VMware, the appliance can be imported with either the OVA or zipped VMDK appliance file. If deployed via the OVA file, the VM is created already configured.

Alternatively, deployment via the VMDK file deploys the VM without preconfigured specifications. The minimum specifications for this VM are outlined below:

- One CPU
- 256 mb RAM
- One network card

Microsoft Hyper-V

For Microsoft Hyper-V, the appliance is imported with the VHD file.

Citrix Hypervisor

For Citrix Hypervisor, the appliance can be imported with either OVA, VMDK, or VHD file.

Deploying a Parallels HALB appliance

After you download a Parallels HALB appliance, you need to import it to a hypervisor running on a separate machine connected to the same local network as Parallels RAS. For the information on how to import a virtual appliance, please consult your hypervisor documentation.

Once the appliance is deployed, you can add it to a Parallels RAS Farm. Read on to learn how to do it.

Configuring HALB in the RAS Console

To configure High Availability Load Balancing In the RAS console, navigate to **Farm** / <Site> / **HALB**. On the **HALB** tab in the right pane, select the **Enable HALB** option. This will enable the remaining options and will also show the **Devices** tab. Configure the options on each tab as described below.

HALB tab options

Specify the following options in the **Virtual IP** section:

- Select the IP version (IPV4, IPV6, or both) that you would like to use.
- Specify the IP address (or addresses if both version are selected) and their corresponding property (subnet mask, prefix). This is the IP address that clients will connect to. This will also be a floating IP address used by this and other HALB appliances.

To load-balance normal gateway connections, select the **LB Gateway Payload** option and then click **Configure**. In the **HALB Configuration** dialog that opens, specify the following:

1. The port number that will be used by HALB appliances to forward traffic to gateways (the port configured on the gateway).
2. Select the gateways that the HALB appliance will load-balance.
3. Click **OK**.

To load-balance SSL connections, select the **LB SSL Payload** option and then click **Configure.** In the the **HALB Configuration** dialog, specify the following:

1. The port number that will be used by HALB appliances to forward traffic to gateways (443 by default).
2. In the **Mode** drop-down list, select **Passthrough** or **SSL Offloading** to specify where the SSL decryption process is performed. By default, the SSL connections are tunneled directly to gateways (referred to as passthrough) where the SSL decryption process is performed.

   If you select the **SSL Offloading** mode, click **Configure**. The **SSL** dialog opens.The SSL Offloading mode requires an SSL certificate to be assigned to HALB. Specify the following options in the **SSL** dialog to configure SSL:

   - **Accepted SSL Versions.** Select an SSL version.
   - **Cipher Strength**. Select the cipher strength of your choice. To specify a custom cipher, select **Custom** and then specify the cipher in the **Cipher** field.
   - In the **Certificates** drop-down list, select a desired certificate. For the information on how to create a new certificate and make it appear in this list, see the **SSL Certificate Management** (p. 195) chapter.

     The **<All matching usage>** option will use any certificate configured to be used by HALB. When you create a certificate, you specify the "Usage" property where you can select "Gateway", "HALB", or both. If this property has the "HALB" option selected, it can be used with HALB. Please note that if you select this option, but not a single certificate matching it exists, you will see a warning and will have to create a certificate first.

   Click **OK** to close the **SSL** dialog.
3. Back in the **HALB Configuration** dialog, select the gateways that the HALB appliance will load-balance and click **OK** to save your changes and close the dialog.

Configure the remaining properties on the **HALB** tab:

1. Select the **Client Management** option to enable management of Windows devices connected through HALB. Click **Configure** and select gateways that will mange the devices.

2 Select the **Enable RDP UDP Data Tunneling** option to enable UDP tunneling on Windows devices.

3 The **Maximum sessions per device** property specifies the maximum number of simultaneous connections allowed. Use the default value or specify your own.

Devices tab options

Click the **Devices** tab to add HALB appliances that will be managed by this Farm. To add appliances:

1 Click **Tasks** > **Add** (or click the **+** icon) to bring up the **Add HALB Devices** dialog.

Parallels RAS is capable of detecting HALB appliances over the network and display them as a list. Selecting detected HALB appliances from this list is the preferred method for adding new appliances. If an appliance cannot be detected, you can add it manually by specifying the appliance IP address in the **IP Address** field.

2 Click **OK** to close the **Add HALB Devices** dialog. The appliance is initialized and added to the list on the **Devices** tab.

3 Finally, click **Apply** for the new HALB configuration to be applied to all added HALB appliances.

For additional information, please see the following KB article: https://kb.parallels.com/123607

HALB Device Status and Version Number

HALB device status and version information can be verified in two places in the RAS Console, which are described below.

Site tab

You can view HALB devices and related information on the **Site** tab in the RAS Console. To see it, navigate to **Farm** / **Site**. Note the **Agent** and **Agent Version** columns. The two columns are described below.

The **Agent column** can have the following values:

- **Not verified** (red) - The agent is not verified and cannot communicate. If you see this, verify the agent.
- **Needs update** (yellow) - The agent is functioning normally but is an older version. If you see this, you should update the agent to the latest version.
- **Agent OK** (green) - The agent is OK. No actions are necessary.

The **Agent Version** column displays the actual agent version, including the Parallels RAS version and build numbers.

Devices tab

The HALB devices agent status and version can also be viewed in the main HALB subcategory. To see it, navigate to **Farm** / **Site** / **HALB** and select the **Devices** tab. The agent information displayed here is the same as on the **Site** tab described above.

Changing the HALB Appliance Password

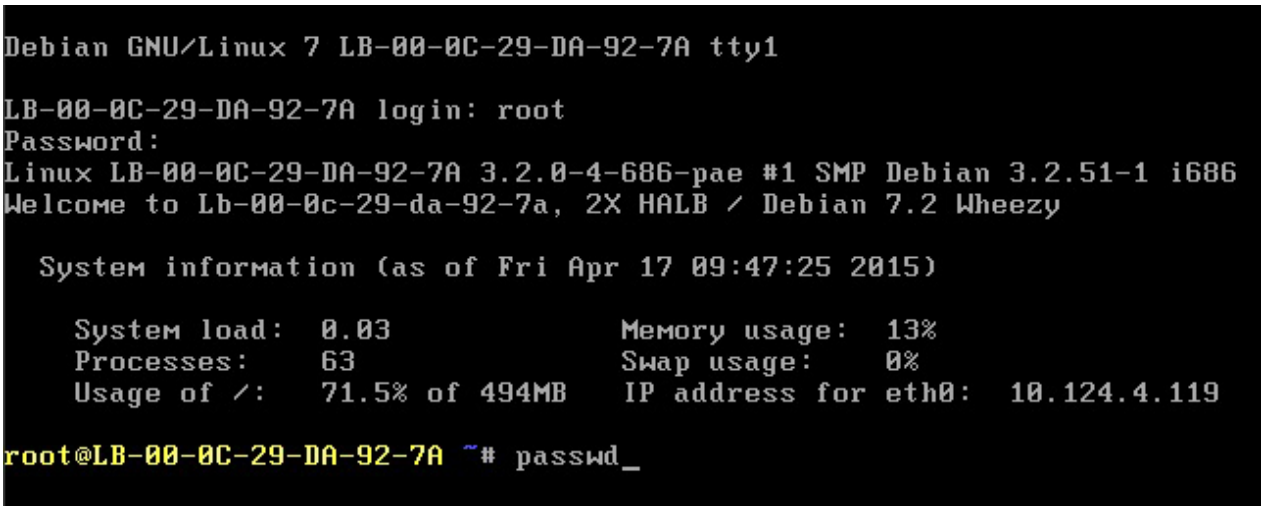
To change the HALB appliance password:

1 Boot the appliance (virtual machine).

2 Press the <ALT> – <F1> key combination. A login prompt should be displayed.

3 Type in the following credentials:

- **login:** `root`
- **password:** `Pa$$w0rd` (note that "0" is zero, not the letter "O").



4 Once logged in, execute the password changing command and type a new password.

Upon completion, you may log in to the HALB device with the new password.

CHAPTER 17

Universal Printing

Printer redirection enables users to redirect a print job from a remote application or desktop to their local printer, which can be connected to the user's computer or be a local network printer attached via an IP address. RAS Universal Printing simplifies the printing process and solves most printer driver issues by eliminating the need for a remote server to have a printer driver for a specific local printer on the client side. Therefore, a user can print regardless of which printer they have installed locally, and the RAS administrator doesn't have to install a printer driver for each printer connected to the local network.

In This Chapter

Managing Universal Printing Settings 298
Universal Printing Drivers 299
Font Management 300

Managing Universal Printing Settings

To configure RAS Universal Printing, select the **Universal Printing** category in the RAS Console.

By default, the Universal Printing driver is automatically installed together with an RD Session Host Agent, VDI Guest VM Agent, or a Remote PC Agent. Therefore, upon adding a server to the Farm, the Universal Printing is already enabled. The Universal Printing driver is available as a 32 bit and 64 bit version.

Enabling and Disabling Universal Printing Support

To enable or disable the Universal Printing support for a server, right-click the server in the **Servers in Site** list and click **Enable** or **Disable** in the context menu.

Configuring a Printer Renaming Pattern

By default, Parallels RAS renames printers using the following pattern: `%PRINTERNAME% for %USERNAME% by Parallels`. For example, let's say a user named Alice has a local printer named Printer1. When Alice launches a remote application or desktop, her printer is named `Printer1 for Alice by Parallels`.

To change the default printer renaming pattern, select the Universal printing category. On the Universal printing tab, specify a pattern in the **Printer rename pattern** field. To see the predefined variables that you can use, click the **[...]** button next to the input field. The variables are:

- `%CLIENTNAME%` – the name of the client computer.
- `%PRINTERNAME%` — the name of a printer on the client side.
- `%SESSIONID%` — RAS session ID.
- `%USERNAME%` — the name of the user connected to RAS.
- `<2X Universal Printer>` — This is a legacy mode where only one printer object will be created in the RDP session.

You can also use certain other characters in a printer renaming pattern. For example, you can define the following commonly used pattern: `Client/%CLIENTNAME%#/%PRINTERNAME%`. Using this pattern (and the user named Alice from the example above), a local printer will be named `Client/Alice's Computer#/Printer1`

You can specify a different printer renaming pattern for each server in the **Servers in Site** list.

Note: Redirected printers are only accessible by the administrator and the user who redirected the printer.

Printer retention

When client-defined printers are redirected to a remote session, it takes time and impacts overall session establishing time. To improve user experience, you can reuse previously created user's printers. To do so, on the **Universal printing** tab, set the **Printer retention** option to **On**.

Universal Printing Drivers

A system administrator can control the list of client-side printer drivers which should be allowed or denied the Universal Printing redirection privileges.

Using this functionality you can:

- Avoid server resource overloading by non-useful printer redirection. Since the majority of users choose to redirect all local printers (this is default setting), a large number of redirected devices is created on the server which are not really used. It's mostly related to various paperless printers like PDFCreator, Microsoft XPS Writer, or various FAX devices.
- Avoid server instability with certain printers. There are some printers that might create server instability (spooler service component) and as the result deny printing services as a whole for all connected users. It is very important that the administrator has the ability to include such drivers to the "deny" list to continue running printing services.

To specify printer drivers:

1. In the Parallels RAS Console, navigate to **Universal Printing** / **Printer Drivers**.
2. In the **Mode** drop-down list, select which printers should be allowed redirection from the following options:
   - **Allow redirection of printers using any driver** — (default) This option places no limitation on the type of driver a printer is using to use redirection privileges.
   - **Allow redirection of printers using one of the following drivers** — Only the printers using the drivers listed in the box below the **Mode** field are allowed redirection. To add a printer driver to the list, click the **Tasks** > **Add** (or click the **+** icon) and type the printer driver name in the edit field provided.
   - **Don't allow redirection of printers that use one of the following drivers** — This is probably the most useful option in the context of this feature. The printers that use the drivers specified in the list will be denied redirection privileges. All other printers will be allowed to use redirection. To add a printer driver to the list, click the **Tasks** > **Add** (or click the **+** icon) and type the printer driver name in the edit field provided.
3. To delete a printer driver from the list, click **Tasks** > **Delete** or click the minus-sign icon.
4. When done making changes, click the **Apply** button to save the changes.

Please make a note of the following:

- When adding a printer driver to the list, type the printer *driver* name, not the printer name.
- The driver names comparison is case insensitive and requires full match (no partial names, no wildcards).
- The settings that you specify on this tab affect the entire Site (not an individual server).

Font Management

Fonts need to be embedded so that when printing a document using Universal Printing the document is copied to the local spooler of the client machine to be printed. If the fonts are not present on the client machine the print out would not be correct.

To control the embedding of fonts within a print job use the **Fonts Management** tab page and check/uncheck the option **Embed Fonts**.

Excluding Fonts from Embedding

To exclude a specific font type from being embedded, click **Tasks** > **Add** in the **Exclude the following Fonts from embedding** section and select a font from the list.

Automatically Install Fonts on Servers and Clients

To automatically install a specific font type on servers and clients, click **Tasks** > **Add** in the **Auto install fonts** section and select the fonts from the list.

Note: By default, fonts added to the auto install list will be excluded from the embedding list because the fonts would be installed on the Windows clients, therefore there is no need for them to be embedded. Clear the option **Automatically exclude font from embedding** in the select font dialog so the font is not excluded from the embedding list.

Resetting List of Excluded Fonts to Default

To reset the list of excluded fonts to default, click **Tasks** > **Reset to Default**.

You can also specify a universal printing compression policy. For more info see **Client Policies** / **Experience** (p. 327).

CHAPTER 18

Universal Scanning

Scanner redirection enables users who are connected to a remote desktop or accessing a published application to make a scan using the scanner that is connected to the client machine. This chapter describes how to configure and use RAS Universal Scanning services.

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Managing Universal Scanning

Universal Scanning uses TWAIN and WIA redirection to let any application using either technology hardware connected to the client device for scanning. With Universal Scanning there is no need to install a specific scanner driver on the server.

Note: The server feature **Desktop Experience** is required in order to enable both WIA and TWAIN scanning on RD Session Hosts.

To configure Universal Scanning, select the **Universal Scanning** category in the RAS Console.

By default, the Universal Scanning driver is automatically installed with RD Session Host, Guest VM, and Remote PC agents. Therefore, upon adding a server to the Farm the Universal Scanning is installed.

Configuring a Scanning Rename Pattern

By default, Parallels RAS renames scanners using the following pattern: `%SCANNERNAME% for %USERNAME% by RAS`. For example, if a user named Lois, who has SCANNER1 installed locally, connects to a remote desktop or published application, her scanner is renamed to "SCANNER1 for Lois by RAS".

To change the pattern used to rename scanners, specify a new pattern in the **Scanner rename pattern** input field. The variables that you can use for renaming are:

- `%SCANNERNAME%` — client side scanner name.
- `%USERNAME%` — username of the user connected to the server.

- `%SESSIONID%` — ID of the active session.

You can configure a different renaming pattern specifically for each server in the list.

Note: Redirected scanners are only accessible by administrator and the user who redirected the scanner.

Enabling and Disabling Universal Scanning Support

To enable or disable the WIA or Twain Universal Scanning support for a particular server, click the **WIA** tab or the **TWAIN** tab, then right-click a server and click **Enable** or **Disable** in the context menu.

Managing Scanning Applications

Adding a Scanning Application

TWAIN applications that will use the Universal Scanning feature have to be added in the TWAIN tab by selecting the **TWAIN Applications** button so they can use the Twain driver, hence making it easier for the administrator to set them up.

To add an application to the list of scanning applications:

1. With the **Universal Scanning** category selected in the RAS Console, click the **TWAIN** tab.
2. Click the **Twain Applications** button (below the **Servers in Site** list) and then click **Add**.
3. In the **TWAIN Applications** dialog, click **Tasks** > **Add** and browse for the application executable. Select the executable and click **Open**.

Note: Some applications might use different or multiple executables. Make sure that all required executables are added to the list of scanning applications.

Deleting a Scanning Application

To delete a scanning application from the list, highlight it and click **Tasks** > **Delete**.

Note: If you delete an application from the list, the installation of the application will not be affected.

You can also specify a universal scanning compression policy. For more info see **Client Policies** > **Experience** (p. 327).

CHAPTER 19

User Device Management

This chapter describes tasks that a Parallels RAS administrator can perform to manage user devices, such as desktop computers, phones, or tablets.

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Inviting Users to Connect to Parallels RAS

Parallels RAS supports multiple platforms ranging from desktop PCs and Mac computers to mobile devices and ChromeApps. The Invitation Email feature is designed to reduce the complexities involved in the installation and client rollout process. This feature allows the administrator to send client installation and automatic configuration instructions to end users right from the Parallels RAS Console.

Before proceeding, please confirm that you've configured the mailbox as described in **Configuring SMTP Server Connection for Notifications via Email** (p. 368). To send an invitation email to users, use the **Start** category in the RAS Console. For more information see **Invite Users** (p. 34).

Mass Configuring User Devices

If you need to configure Parallels Client that is already installed on multiple devices in your organization, you can simplify the procedure by using one of the following mass configuration options:

- By exporting Parallels Client settings to a file and then importing them into all other Parallels Client installations.
- Using the Parallels Client URL scheme.

Exporting and Importing Parallels Client Settings

Parallels Client includes the Export/Import functionality that lets you export RAS or RDP connection settings to a file and then import them into Parallels Client running on another device. This functionality is available on all platforms, including desktop and mobile versions of Parallels Client (except Parallels Client for Chrome App). The Export/Import functionality is accessed in Parallels Client as follows:

- **Windows, Mac, Linux**:On the main menu, click **File** > **Export Settings** or **File** > **Import Settings**.
- **iOS/iPadOS**: To export connection settings, tap the [...] icon in the top right corner and choose **Share Connection**. To import, select the file that you exported earlier and choose to open it with Parallels Client.
- **Android**: To export connection settings, tap the menu icon (three vertical dots) in the top right corner and choose **Share connections**. To import, select the file that you exported earlier and choose to open it with Parallels Client.

For more information about exporting and importing connection settings, see the Parallels Client Guide for a desired platform.

Using Parallels Client URL Scheme

Parallels RAS uses a URL scheme to perform actions in Parallels Client installed on user devices. Specifically, the URL scheme can be used to configure RAS and RDP connections using predefined settings. For the information about the URL scheme please see **RAS HTML5 Gateway API and Parallels Client URL Scheme** (p. 399).

The URL scheme is used in invitation emails when you send an email to your users to install Parallels Client on their devices. An invitation email includes a link, which is a complete URL that uses the Parallels Client URL scheme. When you mass install Parallels Client on user devices, you simply send an invitation email to your users (p. 34). If you need to reconfigure existing Parallels Client installations (and don't want to do it by sending an invitation email), you can do the following:

1. Create an invitation email containing configuration profiles for all required platforms and send it to yourself.
2. Open the email and copy Parallels Client configuration URLs to a local intranet portal.
3. Let your users know where the URLs are.
4. To configure Parallels Client, your users will need to simply click a URL for their platform. This will automatically configure Parallels Client on their devices.

Enabling Help Desk Support

autParallels Client provides users with the ability to send a support request, together with a problem report, to your organization help desk.

Note: At the time of this writing, this functionality is only available in Parallels Client for iOS and Parallels Client for Android. Support for other clients will be added in future releases.

To enable Help Desk support, do the following:

1. In the RAS Console, select the **Features** category.
2. Select the **Enable Helpdesk functionality in Parallels Client** option and specify your help desk email address in the field provided. This email address will be updated in Parallels Client every time a user connects to Parallels RAS from it.

Help desk can be accessed in Parallels Client from the Help section (or menu). When the user selects the **Request support from helpdesk** item, a local email client will open. The following information will be prefilled in the email:

- Help desk email address (the one you set in the RAS Console).
- Application name.
- A screenshot.
- User name.
- Application version.
- Operating system version.

The user can provide their own description of the request.

Monitoring Devices

Device monitoring allows you to view devices which are connected to the Farm or have established a connection at least once in the past. To monitor devices, select the **Device manager** category in the Parallels RAS Console and click the **Devices manager** tab in the right pane. The information for a device includes:

- Device name
- IP address
- State (see below for the list of states)
- Last user (who used a device)
- MAC address
- OS version
- Parallels Client version
- Group (if a device is a member of a device group)
- Gateway name (the RAS Secure Client Gateway a device is connected to)
- Gateway IP address

To see the additional device information, right-click a device and choose **Get Device Information** in the context menu. In the dialog that opens, review the following properties:

- **Name:** Device name.
- **IPs:** Device IP address (or multiple addresses if applicable).
- **MAC Address:** MAC address.
- **State:** State (see below for the list of states).
- **Last User:** The user who logged in from this device the last time.
- **Last Logon Time:** The time of last logon.
- **OS Version:** The operating system version running on the device. Windows portable and U3 clients are marked as "Portable".
- **Client Version:** Parallels Client version installed on the device.
- **Gateway IP:** The RAS Secure Client Gateway IP address (the gateway the client is using).
- **Gateway:** The RAS Secure Client Gateway name.
- **Last Activity:** The date and time when any activity was detected from this device.

Device States

Devices that connect to Parallels RAS can have any of the following states:

- **Off**: Device is switched off.
- **Connected**: Device is connected.
- **Logged On**: Devices is logged on to the system.
- **Standalone**: Device has previously connected to the Parallels RAS but is not using Parallels Client, therefore it cannot be managed.
- **Not Support**: Device is not supported by the Parallels RAS.
- **Foreign Managed**: Connecting to the Farm but managed by a different Farm.
- **Not Manageable**: Client not manageable due to incompatible client version or uninstalled component.
- **Locked**. Device has an active session in locked status.
- **Pair Pending**. Connection should be refreshed on the client side; port UDP 20009 is blocked from the client to gateway; client management port is disabled on the gateway.

Windows Device Groups

The **Windows device groups** tab (**Device manager** category) allows you to group managed Windows devices and administer them together.

Creating a Windows Device Group

To create a Windows Device Group:

1. Navigate to the **Windows device groups** tab in the **Device manager** category and click **Tasks** > **Add**.
2. On the **Main** tab page, specify a group name and an optional description.
3. On the **OS Settings** tab, set the following options:
   - **Disable removable drives**. Disable mounting of removable drives on managed Windows device.
   - **Disable Print Screen**. Disable the **Print Screen** key.
   - **Replace desktop.** This feature makes a Windows computer behave like a thin client. It limits users from changing system settings or installing new applications. The administrator can add local apps (which are already installed on a computer) to the app list in addition to published resources from Parallels RAS. If you select this option, specify an administrator password in the **Admin Mode Password** field (below) to be used to switch a computer between user and admin modes.
   - **Kiosk mode**. Enable the kiosk mode.This will disable power cycling functions (reboot, shutdown) on computers in the group. Note that power functions will still be available when the computer is switched to the Admin mode.
   - **Use client as desktop**. If this option is selected, Parallels Client will run in full screen mode. A user will not be able to minimize it. Select this option to overcome an issue with Parallels Client breaking out of the kiosk mode on Windows 8.x. The issue may manifest itself in the tile-based UI or while using the "drag to close" feature.
   - **Admin Mode Password**. Specify a password to switch between user and admin modes when a Windows desktop is replaced (see **Replace desktop** above).
4. On the **Firewall Settings** tab, enable or disable the firewall and add the inbound ports if necessary.
5. On the **Shadowing** tab, select the **Request Authorization** option to prompt a Windows device user before remotely controlling their desktop. If enabled, the user can choose to decline the connection. For more information, see **Managing Windows Devices** (p. 309).

Adding a Windows Device to a Group

To add a Windows device to a group:

1. Navigate to the **Device manager** / **Device manager** tab.
2. Select one or more devices, then click Tasks (or right-click) and choose **Move to Group**.
3. Select a group and click **OK** to save the settings**.**

The administrator can now perform standard Windows power operations (Power On, Power Off, Reboot, Logoff, Lock) on groups of devices.

Managing Windows Devices

The Client Manager feature allows the administrator to convert Windows devices running Windows 7 up to Windows 10 into a thin-client-like OS. In order to be managed, Windows devices must be running the latest version of Parallels Client for Windows.

Read the instructions below to learn how to set up Parallels Client on a Windows computer and how to enroll and manage it in Parallels RAS.

Install Parallels Client on a Windows computer

To install and configure Parallels Client for Windows, follow the steps below. You can also read the **Parallels Client for Windows User's Guide** for the complete instructions on how to install and configure Parallels Client.

1. Download the Parallels Client for Windows from `https://www.parallels.com/products/ras/download/client/`
2. Double click the `RASClient.msi` or `RASClient-x64.msi` and follow the on-screen instructions to complete the installation wizard.
3. Create a new Parallels RAS connection by clicking **File** > **Add New Connection**.
4. Select **Parallels Remote Application Server** and click **OK**.
5. Next, configure the following connection properties:
   - **Primary Connection** — Specify the Parallels RAS FQDN or IP address.
   - **User Credentials** — Enter username, password, and domain.
6. Click **OK** to create the connection and then double-click it to connect to Parallels RAS.

Upon completion, the Windows device will appear in the Parallels RAS Console in **Client Manager** / **Devices**.

Windows device enrollment

You can configure Parallels RAS to enroll a Windows device automatically or you can opt to do it manually.

To manually enroll a Windows device in Parallels RAS:

1. In the RAS Console, navigate to **Client Manager** / **Devices**.
2. Select a device on the **Devices** tab.
3. Click **Tasks** > **Manage Device**.

The device state will change to **Pair pending** until the device reconnects. Ensure the **Client Manager Port** option is enabled for a gateway. To verify this:

1 Navigate to **Farm** / <Site> / **Gateways**.

2 Select a gateway and click **Tasks** > **Properties**.

3 Click the **Network** tab and make sure that the **Client Manager Port** option is selected

Once the device reconnects, the enrollment process is complete and the device state is updated to **Logged On**, which indicates that it's now managed by Parallels RAS. The user running Parallels Client on their Windows PC can also verify that the PC is managed by clicking **Help** > **About** on the main Parallels Client menu. The information includes the RAS Secure Client Gateway information that the Parallels Client uses to communicate with Parallels RAS.

You can also set Parallels RAS to automatically manage Windows devices. To do so:

1 In the RAS Console, select the **Client Manager** category.

2 Click the **Options** tab.

3 Enable the **Automatically manage Windows devices** option.

The administrator can now check the state of the device and perform power operations, such as Power On, Power Off, Reboot, and Logoff.

Note: Devices running some older versions of Parallels Client cannot be managed and are marked as **Not Supported**.

Lock a Windows device

To lock a Windows device that has an active session, select it in the list and then click the **Lock** item in the toolbar at the bottom. Note that the **Lock** icon is only enabled when the selected device is in the **Logged On** state.

You can also lock a device (or a device group) using the scheduler, which is described in the **Scheduling Windows Devices & Group Power Cycles** section (p. 315).

Shadow a Windows device

By shadowing a Windows device, you gain full access to the Windows desktop on the device and can control local and remote applications.

To shadow a Windows device:

1 In the RAS Console, navigate to **Client Manager** / **Devices**.

2 Select a device and click the **Shadow** item in the toolbar at the bottom.

The Windows user will be prompted to allow the administrator to take control over the device and can choose to deny access. The **Request Authorization** prompt can be deactivated by the administrator. To do so:

1. In the Parallels RAS Console, select the **Client Manager** category and click the **Windows Device Groups** tab in the right pane.
2. Right-click a group and choose **Properties**.
3. In the **Windows Device Group** dialog, select the **Shadowing** tab and clear the **Request Authorization** option.

Desktop replacement

The **Replace desktop** feature limits users from changing system settings or installing new applications. When this feature is enabled, the Windows desktop is replaced by Parallels Client, which converts it into a thin-client-like OS without actually replacing the operating system. This way the user can only deploy applications from Parallels Client, which gives the administrator a higher level of control over connected devices.

Additionally, the Kiosk mode allows you to limit the user from power cycling a device (power actions are still available in the Admin mode; see below for details.).

To enable the **Replace desktop** feature:

1. In the **Client Manager** category, select the **Windows Device Groups** tab.
2. Right-click a group and choose **Properties**.
3. Click the **OS Settings** tab.
4. Enable the **Replace desktop** option and optionally the **Kiosk mode** option.
5. Click **OK**.

Note: This feature requires an administrative password set to switch between User and Admin mode on the Windows device.

Switching to Admin mode

In User mode, the user is restricted to use only the applications provided by the administrator. In order to change system settings, switch the device to the Admin mode.

To switch to the Admin mode, right-click on the system tray icon and select **Switch to admin mode**. Type the password when prompted.

The following table outlines features that are available in Admin and User modes.

Feature	User Mode	Admin Mode
Parallels Client Global Options		x
Parallels Client Farm Connection Properties		x

Configuration of Local Applications		x
Add a new RAS Connection		x
Add a new RDP Connection		x
Manage Standard RDP Connections and Folders		x
Display Settings	x	x
Mouse Settings	x	x
Printer Settings		x
Task Manager		x
Control Panel		x
Command Prompt		x
Windows Explorer		x
Import / Export Settings		x

Configuring local applications when using Parallels Client desktop replacement

With the **Replace Desktop** option enabled, the administrator's goal should be to deploy remote applications or remote desktops and use the native OS to simply deploy the software needed to connect remotely. However, in some instances, local applications may be required. The administrator still has the ability to configure local applications to be shown within the Parallels Client Desktop Replacement, however it is necessary to switch to the Admin mode prior to it.

Publish a local application according to the following steps:

1. Shadow the user's session or use the user device station directly.
2. Switch the Parallels Client Desktop Replacement to admin mode.
3. Click **File** > **Add New Application**
4. Fill in the application information
5. Applications added will be visible in the Application Launcher.
6. Switch back to user mode once all the applications needed are configured.

Windows Desktop Replacement

This section explains what happens when the **Replace Desktop** option is enabled, and why it is useful to administrators.

When enabled, the Replace Desktop feature allows the administrator to convert a standard desktop into a limited device similar to a Thin Client, without replacing the operating system.

The end user will not have access to Windows Explorer, Taskbar or any other Windows components that usually allow them to install new applications or change system settings. The user can now only deploy applications configured within the Parallels Client, including remote applications, remote desktops, and locally configured applications. Local applications are allowed, so if a specific application is needed, but is not available remotely (e.g. a software which communicates with specific peripherals), the user can still deploy it.

When the **Replace Desktop** option is enabled, the following features take effect on the corresponding versions of Windows (7, 8, 8.1, 10):

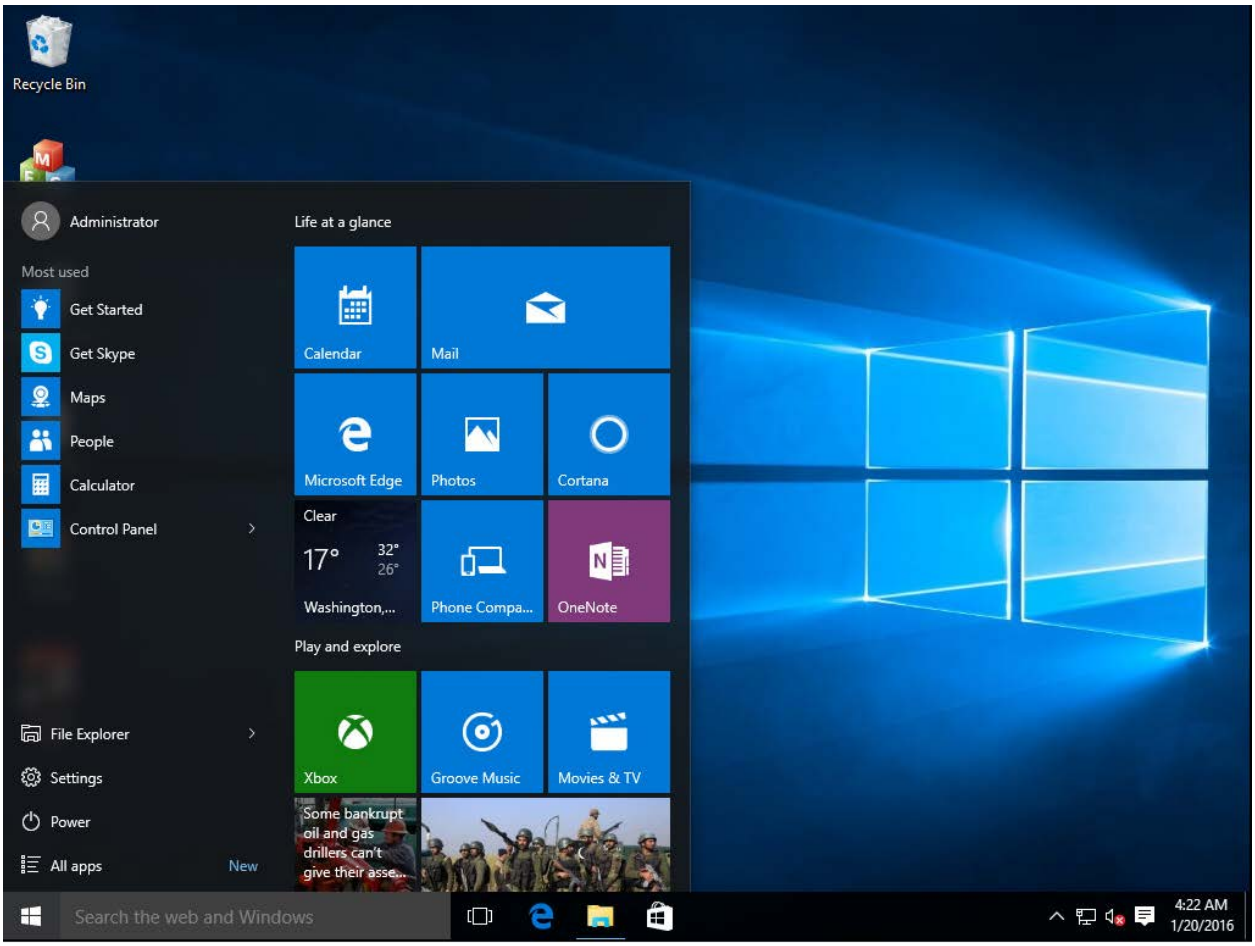
Feature	7	8	8.1	10
Replace Desktop with Parallels Client	x	x	x	x
Disable Start Button	x	x	x	x
Restrict Control Panel Access	x	x	x	x
Disable Windows Key	x	x	x	x
Disable the Task Manager	x	x	x	x
Disable Quick Access Toolbar	n/a	n/a	n/a	n/a
Disable Security Manager/Action Center Notifications	x	x	x	x
Lock the Taskbar	x	x	x	x
Remove Pinned Applications	x	x	x	x
Disable Metro Screen (user logs directly to desktop)	n/a	x	x	x
Disable Hot Corners	n/a	x	x	x
Disable Charm Hints	n/a	x	x	x
Disable Help Aids	n/a	x	x	x
Disable Windows Sidebar	x	n/a	n/a	n/a

In this mode, the user also has access to the Mouse and Display Control Panel applets. The user cannot change the Parallels Client Global Options and the Client Farm Connection Options. Advanced management features can be enabled if the device is switched into administration mode.

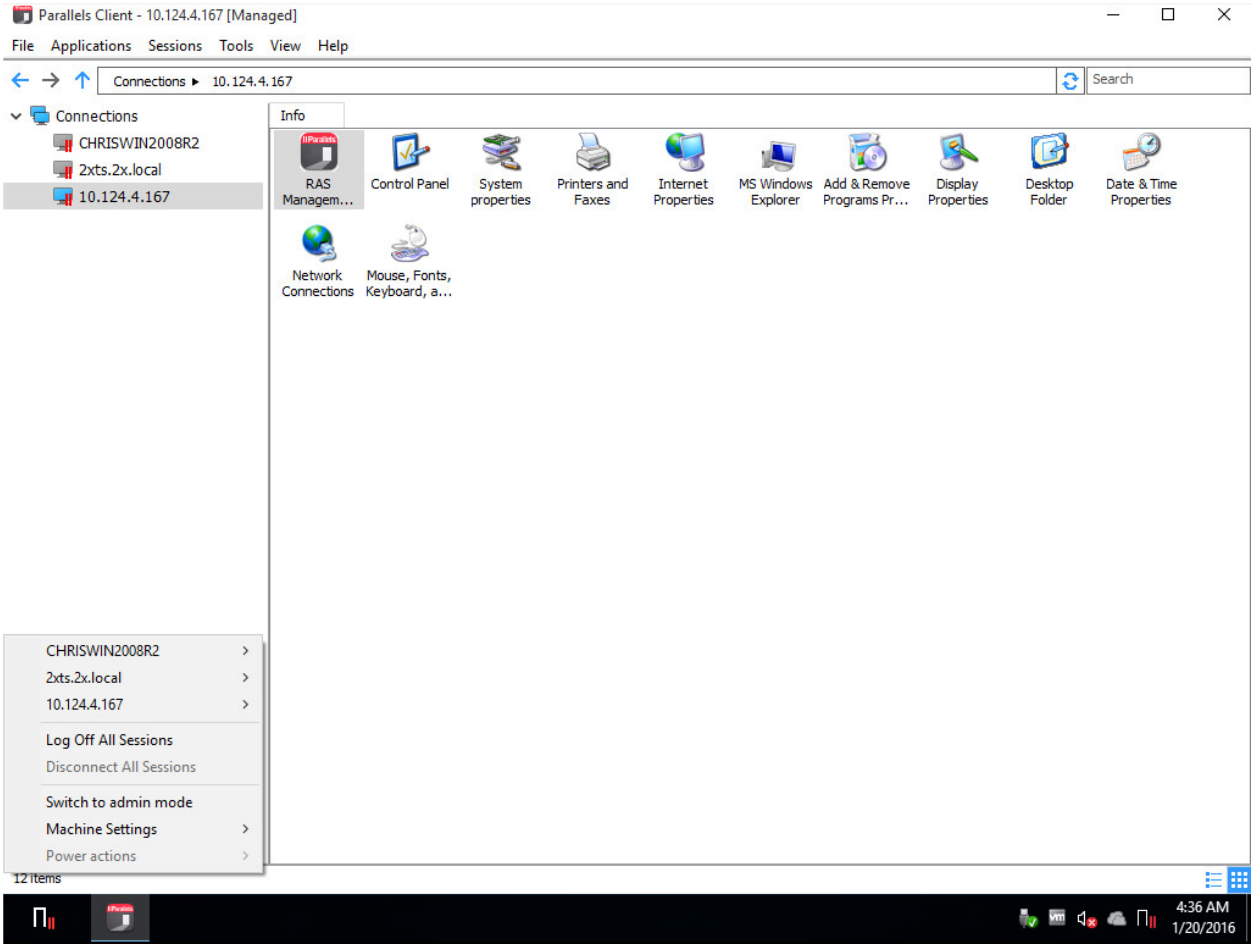
If the Windows Desktop Replacement feature is switched off, all the restrictions are removed and the standard desktop is made available to the user.

The following are the screenshots of a Windows 10 desktop before and after the **Replace Desktop** option is enabled.

Before



After



Scheduling Windows Devices & Groups Power Cycles

The **Scheduler** tab of the **Client Manager** category can be used to schedule automatic power operations on devices.

Adding a New Scheduler Task

To schedule a task:

1. On the **Scheduler** tab, click **Tasks** > **Add** to open the **Device Scheduler Properties** dialog.
2. Select the **Enable this scheduled entry** option.
3. Select an action in the **Action** drop-down list:

- **Device Group Switch On**
- **Device Group Log Off**
- **Device Group Switch Off**
- **Device Group Reboot**
- **Device Group Lock**

4 Select a device group in the **Target** drop-down list.

5 Specify the task start date and time.

6 Select the **Repeat** option from the following choices:

- **Never** (a task will run only once, as specified in the **Start** and **Time** fields)
- **Every day**
- **Every week**
- **Every 2 weeks**
- **Every month**
- **Every year**

7 Enter a task description in the **Description** field.

8 Click **OK** to create the task.

Managing Scheduled Tasks

To modify an existing task, right-click it in the **Schedule List** and click **Properties** in the context menu.

To enable or disable an event, right-click it, click **Properties**, and then select or clear the **Enable this scheduled entry** option.

To execute a scheduled task immediately, right-click it and click **Execute Now** in the context menu.

To delete a task, right-click it and then click **Delete**.

Client Policies

The **Policies** category allows you to manage Parallels Client policies for users connecting to a Farm. By adding client policies, you can group users and push different Parallels Client settings to user devices forcing them to function as your organization requires.

Settings that can be enforced on user devices include RAS connection properties, display, printing, scanning, audio, keyboard, device, and others. Once you create a policy and push it to a client device, the user of the device cannot modify the settings that the policy enforces. In Parallels Client this will manifest itself as hidden or disabled connection properties and global preferences.

Supported Parallels Client versions

Parallels Clients for all platforms are supported.

Note: Starting with Parallels RAS v16.5, a new approach is used to manage client policies. In the previous versions, a client policy would apply the full set of parameters and replace the client settings completely hiding an enforced category. In RAS v16.5 and newer, client policy settings are split into smaller groups with the ability to configure and enforce each group on the client side individually. For the information on how this affects existing client policies that were created in earlier version of Parallels RAS, please read **Client Policy Backward Compatibility** (p. 334).

In this section:

- Add a new client policy (p. 317)
- Configure session settings (p. 318)
- Configure client policy options (p. 330)
- Configure control settings (p. 332)
- Configure gateway redirection (p. 333)
- Client policy backward compatibility (p. 334)

Add a New Client Policy

To add a new client policy:

1. Select the **Policies** category and then click **Tasks** > **Add** in the right pane. The **Policy Properties** dialog opens.
2. The left pane contains a navigation tree allowing you to select a group of options to configure.
3. Make sure the **Policy** node is selected and then specify a policy name and an optional description.
4. In the **Browse Mode** drop-down list, select how you want to browse for users and groups. The preferred mode is **Secure Identifier** (default). Other options exist for backward compatibility.
5. In the **Apply policy to** section, click **Tasks** > **Add** (or click the plus sign icon) and specify the target users, computers, or groups. Note that in addition to users, user groups and security principles, you can search for and specify Active Directory computer accounts and computer security groups.

Configure criteria for the client policy

By default, a client policy applies to configured users, computers, and groups in all situations. You can optionally define criteria when the policy should be applied. This functionality allows you to create different policies for the same user or computer, which will be applied depending on where the user is connecting from and from which device.

To create new criteria:

1. Select **Criteria** (under the **Policy** node) in the left pane.
2. In the "gateway criteria" section, select the criteria type in the first drop-down list and then specify the values (if applicable) in the second drop-down list.
3. In the "MAC address criteria" section, select the criteria type in the first drop-down list and then specify the values (if applicable) in the second drop-down list.
4. In the "Parallels Clients" section, select the version of Parallels Client to which this policy should apply.

Configure Session Settings

Items under the **Session** node in the **Policy Properties** dialog include connection, display, printing, network, and other settings that will be enforced on a client if defined and enabled.

For a particular group of settings to be enforced on a client device, it must be selected (checked). Unselected groups will not be enforced, so end users will be able to configure them themselves. For example, you can check the **Connection** node, but only check the **Primary connection** and **Secondary connections** groups under it. This will enforce only the two selected groups of settings on client devices.

In this section:

- Connection (p. 319)
- Display (p. 321)
- Printing (p. 322)
- Scanning (p. 324)
- Audio playback (p. 324)
- Keyboard (p. 325)
- Local devices and resources (p. 325)
- Experience (p. 327)
- Network (p. 328)
- Server authentication (p. 328)
- Advanced settings (p. 328)

Connection

To configure connection properties, select the **Connection** node and then go through each child node configuring their respective properties.

Primary connection

The primary connection always defaults to the primary RAS Secure Client Gateway, but you can modify the following connection properties:

1. Specify a friendly name for the connection.
2. Select the **Auto start** option to enable Parallels Client to connect automatically to a remote server.
3. In the **Authentication type** drop-down list, select the desired method of authentication:
   - **Credentials**. The user will have to enter credentials to log on.
   - **Single Sign-On**. This option will be included in the list only if the Single Sign-On module is installed during Parallels Client installation. The credentials that the user used to log on will be used to connect to the remote server.
   - **Smart Card**. Select this option to authenticate using a smart card. When connecting to the remote server, a user will need to insert a smart card into the card reader and then enter a PIN when prompted.

   Note: The allowed authentication type(s) must be specified in the RAS Console in **Connection** / **Authentication**.
4. Select or clear **Save password** as needed (if credentials are used for authentication). This means forcing a client to save the password for this connection.
5. Specify the domain name (if credentials are used for authentication).

Secondary Connection

If you have more than one RAS Secure Client Gateway, you can define a secondary connection, which will be used as a backup connection in case the primary gateway connection fails.

To add a secondary connection:

1. Select the **Secondary connections** item.
2. In the **Secondary connections** pane, click **Tasks** > **Add** and specify a server name or IP address.
3. Select the connection mode and modify the default port number if necessary.

If you have multiple secondary connections, you can move them up or down in the list. If the primary connection cannot be established, Parallels Client will use secondary connections in the order listed.

Reconnection

In this pane, specify what to do if the connection is dropped:

- **Reconnect if connection is dropped**. if this option is selected, Parallels Client will try to reconnect if the connection is dropped. The **Connection retries** property specifies the number of retries.
- **Show connection banner if reconnection is not established within**. Specifies the number of seconds after which the connection banner will be displayed in Parallels Client. This will inform the user that the connection was dropped and will allow them to take actions on their own.

Computer name

Specify the name that a computer will use during a remote desktop session. If set, this will override the default computer name. Any filtering set by the administrator on the server side will make use of the **Override computer name** setting.

Advanced settings

- **Connection timeout**. The Parallels Client connection timeout value.
- **Show connection banner if connection is not established within.** Specifies the number of seconds after which the connection banner will be displayed. This will inform the user that the connection cannot be established and will allow them to take actions on their own.
- **Show desktop if published application does not start within**. If a published application is not launched within the time period specified in this field, the host server desktop will be shown instead. This is helpful if an error occurs on the server side while launching an application. By showing the server desktop, the user can see the error message.

Session Prelaunch

When a user opens a remote application, a session must first be launched. Launching a session can take some time, which will result in the user waiting for the application to start. To improve user experience, a session can be launched ahead of time, before the user actually opens an application.

To enable session pre-launch, choose one of the following in the **Mode** drop-down list:

- **Basic**. A session is pre-launched as soon as the user gets the application listing. The assumption is, the user will open an application within the next few minutes. The session will stay active for 10 minutes. If the user doesn't open an application during that time, the client will disconnect from the session.
- **Machine Learning**. When the application listing is acquired, a session is pre-launched based on user habits. With this option enabled, Parallels Client will record and analyze the user habits of launching applications on a given day of the week. A session is started a few minutes before the user usually opens an application.

When a session is pre-launched, it will all happen in the background, so the user will not see any windows or message boxes on the screen. When the user starts an application, it will open as usual in its own window.

The **Exclude sessions pre-launch** list allows you to specify dates on which the pre-launch must not be used. Click on the plus-sign icon and select a date. The list can contain multiple entries.

Display

To configure display settings, select the **Display** node and then configure the groups of settings described below.

Settings

Select the desired video acceleration mode and color depth.

Multi-monitor

Specify whether all monitors should be used for a desktop session if more than one monitor is connected to the user's computer.

Published applications

Select the **Use primary monitor only** option to start published applications on the primary monitor. Other monitors connected to a user's computer will not be used.

Desktop options

Specify the desktop options as follows:

- **Smart-sizing**. Desktop smart sizing will scale a remote desktop to fit the connection window.
- **Embed desktop in launcher**. Enable this option to access a published desktop inside Parallels Client.
- **Span desktop across all monitors**. Enable this option to span published desktops across all connected monitors.
- **Connection bar in full screen**. Specify whether the connection bar should be pinned, unpinned, or hidden when connecting in full screen mode.

Browser

This section applies to Parallels HTML5 client only. Specify whether a remote application should open in the same or a new tab in a web browser by default.

Printing

The **Printing** pane allows you to configure printing options.

In the **Technology** section, select the technology to use when redirecting printers to a remote computer:

- **None**. No printer redirection will be used.
- **RAS Universal Printing technology**. Select this option if you want to use RAS Universal Printing technology.
- **Microsoft Basic Printing Redirection technology**. Select this option if you want to use Microsoft Basic printing technology.
- **RAS Universal Printing and Microsoft Basic redirection technologies.** Select this option to use both Parallels RAS and Microsoft technologies.

RAS Universal Printing

If you selected **RAS Universal Printing technology**, use the **Redirect Printers** drop-down list to specify whether to redirect all printer on the client side, default printer only, or specific printers.

If you select **Specific only** in the step above, click **Tasks** > **Add**. Type a printer name and then click the **Options** button. In the dialog that opens, specify settings described below.

In the **Choose Format** drop-down list, select a data format for printing:

- **Print Portable Document Format (PDF).** Adobe PDF. This option does not require you to install any local applications capable of printing a PDF document. All the necessary libraries are already installed together with Parallels Client.
- **View PDF with external application**. To use this option you must have a local application installed which is capable of viewing a PDF document. Note that not all applications are supported. For example, the built-in PDF viewer in Windows is not supported, so you must have Adobe Acrobat Reader (or a similar application) installed.
- **Print PDF with external application**. This option works similar to the View PDF option above. It also requires an application capable of printing a PDF document installed locally.
- **Enhanced Meta File (EMF).** Use vector format and embedded fonts.
- **Bitmap (BMP).** Bitmap images.

In the **Client printer preferences** section, select one of the following:

- **Use server preferences for all printers**. If this option is selected, a generic printer preferences dialog will be shown when a user clicks **Print** in a remote application. The dialog has only a minimal set of options that they can choose.

- **Use client preferences for all printers**. With this option selected, a local printer preferences dialog will open when a user clicks **Print** in an application. The dialog will contain a full set of options for a particular printer that the user has installed on their local computer. If they have more than one printer installed, a native preferences dialog will open for any particular printer that they choose to print to.
- **Use client preferences for the following printers**. This option works similar to the **Use client preferences for all printers option** (above), but allows users to select which printers should use it. Select this option and then select one or more printer in the list below. If a printer is not selected, it will use the generic printer preferences dialog, similar to the first option in this list.

Default printer settings

To configure default printer settings, click the **Change Default Printer settings** button.

The default printer list shows printers that can be redirected by the client to the remote computer:

- To disable the default printer, select **<none>**.
- To redirect the default local printer, select **<defaultlocalprinter>**.
- When **<custom printer>** is selected, you can specify a custom printer. The first local printer that matches the printer name inserted in the **Custom** field will be set as the default printer on the remote computer.

Select **Match exact printer name** to match the name exactly as inserted in the **Custom** field. Please note that the remote printer name may not match the original printer name. Also note that local printers may not redirect due to server settings or policies.

The **Force Default printer for** option specifies the time period, during which a printer will be forced as default. If the default printer is changed during this time after the connection is established, the printer is reset as default.

Select the **Update the remote default printer if the local default printer is changed** option to change the remote default printer automatically when the local default printer is changed. Please note that the new printer must have been previously redirected.

A Windows 10 note

Windows 10 has a feature that automatically sets the default printer to the one used most recently or more often. This can break the default printer control on RD Sessions Hosts, guest VMs, and Remote PCs. To resolve this issue, the default printer management in Windows 10 should be disabled. To disable this feature using the Group Policy, do the following:

1. Open the group policy editor.
2. Navigate to **User Configuration** > **Administrative Templates** > **Control Panel** > **Printers**.
3. Find the **Turn off Windows default printer management** policy and enable it.
4. Force the group policy to all computers attached to the domain.

You can also disable the default printer management in Windows 10 locally by using the GUI or the registry editor:

1 On a Windows 10 computer, click **Start**, then click the "gear" icon which will open the **Settings** page.

2 On the **Printers and Scanners** tab, set the **Let Windows manage my default printer** option to **OFF**.

Using the registry editor:

1 Open the registry editor (regedit).

2 Navigate to HKEY_CURRENT_USER\Software\Microsoft\Windows NT\CurrentVersion\Windows.

3 Create a new DWORD item and name it **LegacyDefaultPrinterMode**.

4 Change the item's Value data to hexadecimal and set the value data to **1**.

In addition to disabling the default printer management, the **Download over metered connections** option should be enabled in **Settings** > **Devices** > **Printers & Scanners**.

Scanning

On the **Scanning** pane, you can specify a scanner that should be used when one is required by a published application:

- **Use**. Allows you to select a scanning technology. RAS Universal Scanning uses TWAIN and WIA redirection allowing an application to use either technology depending on the hardware type connected to the local computer. If you select **None**, scanning will disabled.
- **Redirect Scanners**. Select scanners attached to your computer for redirection. You can select **All** (all attached scanners will be redirected) or **Specific only** (only the scanners you select in the provided list will be redirected).

Audio

This pane allows you to configure remote audio playback and recording settings.

In the **Remote audio playback** section, Use the **Where** drop-down list to select one of the following remote audio playback options:

- **Bring to this computer**. Audio from the remote computer will play on your local computer.
- **Do not play**. Audio from the remote computer will not play on your local computer and will be muted on the remote computer as well.
- **Leave at remote computer**. Audio will not play on your local computer but will play normally on the remote computer.

Use the **Quality** drop-down list to adjust the audio quality:

- **Dynamically adjust based on available bandwidth**. This option will increase or decrease the audio quality based on your connection speed. The faster the connection, the higher audio quality setting will be used.
- **Always use medium audio quality**. The audio quality is fixed at the medium level. You can use this option when you don't require the best possible audio quality and would rather use the available bandwidth for graphics.
- **Always use uncompressed audio quality**. The audio quality is fixed at the highest level. Select this option if you have a very fast connection and require the best possible audio quality.

The **Enable recording (if applicable)** option allows you to enable audio recording on the remote computer. For example, you can speak into a microphone on the local computer and use a sound recording application on the remote computer to record yourself.

Keyboard

On the **Keyboard** pane, select how you want to apply key combinations (e.g. Alt+Tab) that you press on the keyboard:

- **On the local computer**. Key combinations will be applied to Windows running on the local computer.
- **On the remote computer**. Key combinations will be applied to Windows running on the remote computer.
- **In full screen mode only**. Key combinations will be applied to the remote computer only when in the full-screen mode.

Select or clear the **Send unicode characters** as needed.

Local Devices and Resources

Use the **Local devices and resources** pane to configure how local resources are used in a remote session.

Clipboard

Select the **Allow clipboard redirection** option to enable the local clipboard in a remote session.

Note: When you clear this option, it will also disable the Remote Clipboard functionality for affected users in Parallels HTML5 client. For more information, please see **Using the Remote Clipboard** (p. 288).

Disk drives

Select the **Allow disk drives redirection** option and select local drives you want to redirect, or select **Use all disk drives available**.

If you select the **Use also disk drives that I plug in later** option, disk drives that you connect to a local computer later will be automatically available in a remote session. Note that this option applies to Parallels Client for Windows only.

Devices

On this pane, specify whether to redirect local devices in general, use all devices available, and also devices that will be plugged in later.

Local devices that can be redirected include supported Plug and Play devices, media players based on the Media Transfer Protocol (MTP), and digital cameras based on the Picture Transfer Protocol (PTP).

Please note that disk drives and smart cards are redirected using dedicated **Disk drives** and **Smart cards** options.

Video capture devices

Specifies video capture devices to redirect from a user device to the remote session. This is a high-level redirection that allows to redirect a composite USB device, such as a webcam with a microphone.

- **Allow devices redirection**: Allows to choose which video capture devices to redirect.
- **Use all devices available**: Redirect all available devices.

Ports

Select whether to redirect LPT and COM ports.

Smart cards

Select whether to redirect smart cards. Note that if smart card is selected as the authentication type in the **Primary connection** pane, the smart card redirection is automatically enabled and this option is grayed out.

Windows touch input

Enables or disables Windows touch input redirection. Windows touch input redirection allows users to use Windows native touch gestures from touch-enabled devices, including touch, hold, and release actions. The actions are redirected to remote applications and desktops as corresponding mouse clicks. This option allows you to disable touch input redirection in case of app compatibility issues.

File transfer

Select whether to allow remote file transfer. For additional information, see **Enabling or Disabling Remote File Transfer** (p. 335).

Experience

The **Experience** pane allows you to tweak connection speed and compression.

Performance

Choose your connection speed to optimize performance: Choose a connection type according to your situation and then select experience options you want enabled. If you are connecting to a remote server on a local network that runs at 100 Mbps or higher, it is usually safe to have all of the experience options enabled. If you choose **Detect connection quality automatically**, the experience options will be enabled by default, but some may be dynamically disabled depending on the actual connection speed.

Enhance windows move/size: Enable this option if your users experience graphics artifacts (dark squares) while moving or resizing a remote application window on their desktops. The issue may manifest itself when a remote application is hosted on a Windows Server 2016 or 2019 and when the **Show contents of window while dragging** option is enabled. The issue does not appear with any other versions of Windows.

Compression

It is recommended to enable compression to have a more efficient connection. The available compression options are described below.

Enable RDP Compression: Enables compression for RDP connections.

Universal printing compression policy: The compression type should be selected based on your environment specifics. You can choose from the following options:

- **Compression disabled**. No compression is used.
- **Best speed (uses less CPU)**. Compression is optimized for best speed.
- **Best size (uses less network traffic)**. Compression is optimized to save network traffic.
- **Based on connection speed**. The faster the connection speed, the lower compression level and the minimum data size to compress are used.

Universal scanning compression policy: This drop-down list has the same options as the universal printing compression above. Select the compression type based on your environment specifics.

Network

Use the **Network** pane to configure a proxy server if you have one.

Select the **Use proxy server** option and then select the protocol from the following list:

- **SOCKS4**. Enable this option to transparently use the service of a network firewall.
- **SOCKS4A**. Enable this option to allow a client that cannot connect to resolve the destination host's name to specify it.
- **SOCKS5**. Enable this option to be able to connect using authentication.
- **HTTP 1.1**. Enable this option to connect using a standard HTTP 1.1 protocol connection.

Specify the proxy host's domain name or IP address and the port number.

For SOCKS5 and HTTP 1.1 protocols, select the **Proxy requires authentication** option. For authentication, select the **Use user logon credentials** option or specify a user name and password in the fields provided.

Server Authentication

Use the **Server authentication** pane to specify what should happen if authentication of an RD Session Host, Remote PC, or Guest VM fails.

In the **If authentication fails** drop-down list, select one of the following options:

- **Connect**. The user can ignore the certificate of the server and still connect.
- **Warn**. The user is alerted about the certificate and still has the ability to choose whether to connect or not.
- **Do not connect**. The user is not allowed to connect.

Advanced Settings

The **Advanced Settings** pane allows you to customize the default behavior or Parallels Client.

You can specify the following properties:

- **Use client system colors**. Enable this option to use the client system colors instead of those specified on the remote desktop.
- **Use client system settings**. Enable this option to use the client system settings instead of those specified on the RD Session Host.
- **Create shortcuts configured on server**. For each published application, the administrator can configure shortcuts that can be created on the client's desktop and the Start menu. Select this option to create the shortcuts, or clear the option if you don't want to create them.

- **Register file extensions associated from the server**. For each published application, the administrator can create file extension associations. Use this option to either register the associated file extensions or not.
- **Redirect URLs to the client device**. Enable this option to use the local web browser when opening 'http:" links.
- **Redirect MAILTO to the client device**. Enable this option to use the local mail client when opening ‘mailto:’ links.
- **Always ask for credentials when starting applications**. If this option is enabled, the user will be prompted to enter their credentials when starting applications.
- **Allow Server to send commands to be executed by client**. Enable this option to allow commands being received from the server to be executed by the client.
- **Confirm Server commands before executing them**. If this option is enabled, a message is displayed on the client to confirm any commands before they are executed from the server.
- **Network Level Authentication**. Check this option to enable network level authentication, which will require the client to authenticate before connecting to the server.
- **Redirect POS devices**. Enables the Point of Service (POS) devices such as bar code scanners or magnetic readers that are attached to the local computer to be used in the remote connection.
- **Use Pre Windows 2000 login format**. If this option is selected, it allows you to use legacy (pre-Windows 2000) login format.
- **Disable RDP-UDP for gateway connections**. Disables RDP UDP data tunneling on the client side. You can use this option when some clients experience random disconnects when RDP UDP data tunneling is enabled on the RAS Secure Client Gateway (the **Network** tab in the gateway **Properties** dialog), while other clients are not.
- **Do not show drive redirection dialog**. This option affects Parallels Client for Mac. By default, the **Grant access to Home folder** (drive redirection) dialog opens automatically when a Mac user connects to Parallels RAS. This happens when this option is disabled or when there's no client policy at all. The dialog allows the user to configure which folders on the local disk drive should be available to remote applications. If you enable this option, the dialog will not be shown a user. Read below for more explanation.

  Drive redirection cannot be configured via client policies, so Mac users have to do this themselves. By automatically showing the dialog, you can invite the user to go through the local folder configuration procedure. On the other hand, if there's no need for your users to redirect their local drives, you can disable the automatic opening of the dialog. Note that the dialog can still be run manually in Parallels Client for Mac at any time by opening **Connection Properties** > **Local Resources**, selecting the **Disk drives** option and clicking **Configure**.

  When the option is disabled (or when there's no client policy defined), the dialog opens at least once when the user connects to Parallels RAS for the first time. At that time, the user can either configure local folders or select the **Never ask me** again option. In both cases, the dialog will not be shown to the user anymore. The Mac user can reset the **Never ask me** selection by going to **Connection Properties** > **Advanced** and clearing the **Do not show drive redirection dialog** option.

Configure Client Policy Options

The **Client options** node allows you configure client policy options. Select the node and then select and configure individual items under it as described below.

Connection

On the **Connection** pane, specify the following options:

- **Connection Banner**. Select a banner to display while establishing a connection.
- **Automatically refresh connected RAS connections every [ ] minutes**. Select this option and specify the time interval to automatically refresh a connection. This will refresh the published resources list in Parallels Client.

Update

Select **Check for updates on startup** and specify an update URL if you want Parallels Client to check for updates when it starts. The URL can point to the Parallels website or you can store updates on your local network and use this local URL. For the information on how to configure a local update server, please read https://kb.parallels.com/123658.

Note: This option works with Parallels Client for Windows only. Parallels Client for Mac can be updated only from the App Store. Parallels Client for Linux does not support this feature.

PC keyboard

To force a particular keyboard to be used, select the Force use PC keyboard and select a keyboard layout from the drop-down list. Note that the selected layout can and will only be used in a Parallels Client version that supports this particular layout.

Single Sign-On

Parallels Client for Windows comes with its own SSO component that you can install and use to sign in to Parallels RAS. If you already use a third-party credential provider component on your Windows computers, you first need to try if the single sign-on works right out of the box. If it doesn't, you need to configure Parallels RAS and Parallels Client to use the Parallels RAS SSO component to function as a wrapper for the third-party credential provider component.

To use Parallels RAS SSO as a wrapper, specify a third-party component, select the **Force to wrap third party credential provider componen**t option and specify the component's GUID in the field provided. You can obtain the GUID in Parallels Client as follows:

1. Install Parallels Client on a computer that has the third-party component installed.
2. In Parallels Client, navigating to **Tools** > **Options** > **Single Sign-On** (tab page).

3 Select the "Force to wrap..." option and then select your provider in the drop-down list.

4 Click the **Copy GUID to Clipboard** button to obtain the component's GUID.

You will also need to specify the component's GUID when setting up an invitation email in the RAS Console. If you haven't set up an invitation email yet, you can do it as follows:

1 In the RAS Console, select the **Start** category and then click the **Invite Users** item in the right pane.

2 On the second page of the wizard (target platform and connection options), click the **Advanced** button.

3 In the dialog that opens, select the **Force to wrap third party SSO component** option and specify the GUID of the component.

For more information, see the **Invite Users** section (p. 34).

After the policies are applied on Windows computers, Parallels Client will be automatically configured to use the specified third-party credentials provider.

Advanced

Use this pane to specify advanced client options, as described below.

Global

- **Always on Top.** With this feature enabled, other applications will no longer mask the launcher.
- **Show connection tree**. Displays the connection tree.
- **Minimize to tray on close or escape.** Enable this feature to place the Parallels Client into the System Tray when you click on the **Close** button or hit escape.
- **Enable graphic acceleration (Chrome client)**.
- **Do not warn if server certificate is not verified.** When connected to a RAS Secure Client Gateway over SSL, and the certificate is not verified, a warning message will be displayed. You can disable this warning message by enabling this option.
- **Swap mouse buttons.** When enabling this setting, the mouse buttons will be swapped on the remote computer.
- **DPI aware**. This will force a published application to be DPI-aware depending on the client's DPI settings. This feature works on Windows 8.1 or higher.
- **Add RAS Connection automatically when starting web or shortcuts items**. This option will add the connection preferences in the Parallels Client when starting an item contained in a connection that is not yet listed.
- **Do not show prompt message for auto add RAS connection**. Enable this option to disable prompt messages when adding auto connections.
- **Close error messages automatically.** When a session disconnects because of an error, the error is automatically dismissed after 15 seconds.

- **Clear session cookies on exit.** When a user logs on, a Parallels RAS logon cookie is kept on the client side. This will allow the user to connect again with Parallels RAS without re-authenticating. Check this option to delete any cookies when the user closes the Parallels Client.
- **Enable extended logging**. Enables extended logging.

Language

Specify a language that Parallels Client should use. The **Default** option uses the main language used by the client's operating system.

Printing

- **Install missing fonts automatically.** If automatic fonts are installed on the server, they will be available when a session connects.
- **Redirect vendor paper sizes for RAS Universal Printing.** When enabling this setting, non-standard paper sizes which are not included in the standard options will be redirected to the client. Sizes may vary depending on the vendor.
- **Raw printing support.** When enabling this setting, printing will still work for applications sending data in RAW format.
- **Convert non distributable fonts data to images**. During RAS Universal Printing, if a document includes non-distributable fonts, each page is converted to an image.
- **Cache printers hardware information**. Caching of printer hardware information locally to speed-up RAS universal printer redirection.
- **Refresh printer hardware information every 30 days**. Forces the printer hardware information cache update even if nothing has changed in 30 days. When this option is off, the cache will only be refreshed if there were known changes.
- **Cache RAS Universal Printing embedded fonts**. Caching of embedded fonts locally to speed-up RAS universal printing process time.

Windows client

- **Hide Launcher when application is launched**. If this option is enabled, the launcher will be minimized in the system tray after an application is launched.
- **Launch automatically at Windows startup.** This option will place a shortcut in the start menu folder of the client and the Parallels Client will launch automatically on Windows startup.

Configure Control Settings

Control settings options allow you to control various actions on the client side. These options affect the following Parallels Clients:

- Windows

- Linux
- Mac
- Android
- iOS

Connections

On the **Connections** pane, select (or clear) the following options:

- **Prohibit adding of RAS connections**. When a user presses the **Add Connection** button, an RDP connection is always created.
- **Prohibit adding standard RDP connections**. When a user presses the **Add Connection** button, a RAS connection is always created

Password

On the **Password** pane, specify the following options:

- **Prohibit saving password**. The option to save the password will not be shown to the user for that particular connection. A password is never saved on a disk, but kept in memory until the user closes the application.
- **Prohibit changing password**. The option to change the password will not be shown in the context menu for that particular connection.

Import and export

On the **Import and Export** pane:

- **Prohibit import/export connection setting**. If this option is selected, the **Import** and **Export** buttons will not be shown to the user.

Configure Gateway Redirection

Redirection options allow you to move your existing users from one RAS Secure Client Gateway to another gateway within the same Farm, or you can even redirect users to a gateway in a different Farm.

Note: When setting gateway redirection, make sure that the gateway criteria (the **Criteria** node) does not conflict with it. Read the **Gateway criteria** subsection at the end of this section for the explanation.

To configure redirection options:

1 Select the **Redirection** node in the left pane of the **Policy Properties** dialog.

2 In the right pane, specify the new connection properties, including:

- **Gateway address**

- **Connection mode**
- **Port number**
- **Alternative address**

When this policy is applied to user devices, the following will happen:

- Parallels Client connection settings are automatically updated on each device.
- Parallels Client tests the new connection. If succeeded, the current connection policies are removed and new policies are added.
- If Parallels Client cannot connect to Parallels RAS using new settings, the application list will not be shown and an error message will be displayed saying that the redirection policy has failed to apply. The user will be advised to contact the system administrator.

Gateway criteria

If a policy has both **Redirection** and **Criteria** settings enabled and configured, a situation may occur when the policy is applied in an infinite loop on the client side, which will result in an error. Consider the following possible scenarios when this may happen:

- Parallels Client connects to gateway "A" and applies a policy, which redirects it back to gateway "A". This will continue to loop until Parallels Client gives up and displays an error to the user, which will say, "Failed to apply redirection policy....".
- Parallels Client connects to gateway "A" and applies policy "P1", which redirects it to gateway "B". As expected, Parallels Client connects to gateway "B" and applies policy "P2", which redirects it back to gateway "A" where it all began. This will will also continue to loop until Parallels Client gives up and displays the same error message as described above.

Once again, this may only happen if the **Criteria** node is enabled and specified gateways conflict with each other. To avoid it, make sure that the **Gateway criteria** option on the **Criteria** pane is set to **if Client is connected to one of the following gateways** and that the same policy is not applied again when Parallels Client is redirected to a new gateway.

Client Policy Backward Compatibility

Starting with Parallels RAS v16.5, a new approach is used to manage client policies. In the previous versions, a client policy would apply the full set of parameters and replace the client settings completely hiding an enforced category. In RAS v16.5 (or newer), client policy settings are split into smaller groups with the ability to configure and enforce each group on the client side individually. For example, the administrator wants to re-design the policies to disable clipboard redirection only, leaving the rest of the local devices and resources settings available for the end users to control. In the previous version, this would not be possible. The new design allows an administrator to easily achieve this goal.

This section explains how the backward compatibility is achieved with older clients and how new clients retain compatibility with older server-side installations.

The new client policies implementation handles compatibility issues as follows:

- All settings found in older policies are sent to the client as if being sent from an older Parallels RAS server. When a client receives the policy, the **Connection properties** and **Options/Preferences** settings are set correctly from the old design point of view. If, however, the policy is configured in such a way that the user cannot change anything, the entire tab will be hidden (no need to display the options if all of them are disabled).
- The Parallels RAS Console handles old-style policy settings as if they are new and displays them using the updated graphical user interface.
- In terms of policies, when a Parallels RAS v16.5 client connects to a previous version of Parallels RAS, the client keeps working normally and all of the policy settings are functioning as expected.

Enabling or Disabling Remote File Transfer

Parallels RAS provides end users with the ability to transfer files remotely to and from a remote server.

Note: At the time of this writing, file transfer is supported in Parallels HTML5 Client and Parallels Client for Chrome only.

As a Parallels RAS administrator, you have the ability to enable or disable file transfer capabilities if you believe that it presents a security risk. To make this functionality as flexible as possible, Parallels RAS allows you to enable/disable file transfer on the following three levels:

- RD Session Host, VDI provider, or Remote PC
- Parallels HTML5 gateway
- Client policy

Whatever file transfer settings you configure on each level, they take precedence in the order listed above. For example, if you enable it on a Parallels HTML5 gateway but disable it on an RD Session Host, file transfer will be disabled for all users who connect to the given RD Session Host through the given HTML5 gateway. As another example, you can enable file transfer on an RD Session Host and then disable it for a particular Client policy (or an HTML5 gateway). This way you can control which clients can use file transfer and which cannot.

Read the subsequent sections to learn how to enable or disable file transfer on each level.

Server Level

To enable or disable remote file transfer capabilities on an RD Session Host, VDI provider, or Remote PC, do the following:

1. In the Parallels RAS Console, select the **Farm** category and then select a desired server type (RD Session Host, VDI provider, Remote PCs) in the middle pane.
2. Right-click a desired server in the right pane and choose **Properties**.
3. Select the **Agent Settings** tab.
4. Select or clear the **Allow file transfer command** option (at the bottom). If the server is using default settings, click the **Edit Defaults** link in the top-right corner and then select or clear the same option in the **Default Server Properties** dialog.

HTML5 Gateway Level

To enable or disable remote file transfer capabilities on an HTML5 gateway, do the following:

1. In the Parallels RAS Console, navigate to **Farm** / <Site> / **Gateways**.
2. Right-click a desired RAS Secure Client Gateway in the right pane and choose **Properties**.
3. Select the HTML5 tab and select or clear the **Allow file transfer command** option (at the bottom).

Client Policy Level

To enable or disable remote file transfer capabilities on a Client policy, do the following:

1. In the RAS Console, select the **Policies** category.
2. Right-click a desired policy in the right pane and choose **Properties**.
3. Select the **Connection Properties** item in the left pane.
4. Select the **Local Resources** tab in the right pane.
5. Select or clear the **Allow file transfer command** (at the bottom).

CHAPTER 20

Parallels RAS Reporting

Parallels RAS Reporting is an optional RAS component that allows Parallels RAS administrator to run and view predefined and custom Parallels RAS reports. Predefined reports include user and group activity, device information, session information, and application usage. You can also create custom reports using your own criteria. Read this chapter to learn how to install and configure Parallels RAS Reporting and how to use it.

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Requirements and Configuration

To use Parallels RAS Reporting, you need to install and configure Microsoft SQL Server, SQL Server Reporting Services (SSRS), and the RAS Reporting component. This section describes installation and configuration requirements.

Note: RAS Reporting is described in greater detail in the **Parallels RAS Reporting Service Guide**, which is available on the Parallels website: https://www.parallels.com/products/ras/resources/

Operating System requirements

Parallels RAS Reporting can be installed on a server running one of the following Windows Server versions:

- Windows Server 2019
- Windows Server 2016
- Windows Server 2012 R2
- Windows Server 2012
- Windows Server 2008 R2
- Windows Server 2008

.NET Framework 3.5 and .NET Framework 4.5 or higher must be installed.

User Account requirements

To view RAS reports, a default AD user account will be created by the RAS Reporting installer. The account name is `RASREPORTINGVIEW`. If the account is not created automatically, you need to create it yourself. You can specify a different user during the RAS Reporting setup if you wish.

Microsoft SQL Server requirements

The following Microsoft SQL Server versions are supported:

- Microsoft SQL Server 2019
- Microsoft SQL Server 2017
- Microsoft SQL Server 2016
- Microsoft SQL Server 2014
- Microsoft SQL Server 2012
- Microsoft SQL Server 2008 R2 SP1
- Microsoft SQL Server 2008 SP1

Beginning with RAS 17.1, SQL Server Reporting Services (SSRS) and the SQL Server database engine can be deployed on separate hosts.

Using Microsoft SQL Server 2017 and 2019

Microsoft SQL Server 2017 and 2019 allow you to install the database engine and SQL Server Reporting Services (SSRS) on different hosts. Parallels RAS 17.1 (and newer) supports this deployment scenario and gives you the ability to use SQL Server Reporting Services and the SQL Server database engine installed on separate hosts.

Installation locations

RAS Reporting must be installed on the same server where SQL Server Reporting Services are running. Please note that if you have SSRS and the database engine installed on different hosts, RAS Reporting must be installed where the SSRS are installed.

The following table contains RAS and SQL Server version compatibility information and locations where components necessary to use RAS Reporting can be installed:

RAS Reporting versions	SSRS version	SQL Server version	Installation locations
17.1, 18.0	2019	2019	SSRS - same host as RAS Reporting SQL Server - can be a different host

17.1, 18.0	2017	2019	SSRS - same host as RAS Reporting SQL Server - can be a different host
17.1, 18.0	2017	2019	SSRS - same host as RAS Reporting SQL Server - can be a different host
17.1, 18.0	2017	2017	SSRS - same host as RAS Reporting SQL Server - can be a different host
17.1, 18.0	2017	2016	SSRS - same host as RAS Reporting SQL Server - can be a different host
17.0, 18.0	2008 R2 - 2016	2008 R2 - 2016	SSRS and SQL Server on the same host

Microsoft SQL Server and SQL Server Reporting Services configuration

The Microsoft SQL Server instance must have the following features installed:

- Database Engine Services
- Reporting Services - Native
- Management Tools

The SQL Server instance must be configured as follows:

- Must be a named instance. The default instance name and instance ID used by Parallels RAS Reporting is RASREPORTING. You can specify a different name, but you have to make sure that you use the same name when configuring Parallels RAS Reporting in the RAS Console.
- The SQL Server administrators must include system administrator, AD administrator, and the "System" user.

When configuring SQL Server Reporting Services using Report Server Configuration Manager, select **Web Service URL** in the left pane and make sure of the following:

- **Virtual Directory:** Must be set to "ReportServer_RASREPORTING".
- **TCP Port:** Must be set to 8085.

Note: For Parallels RAS installations running on multiple servers, it is recommended that Microsoft SQL Server is installed on a dedicated server.

For step-by-step instructions on how to install and configure Microsoft SQL Server and SQL Server Reporting Services, please read the following Parallels KB articles:

- **Microsoft SQL Server 2016 and earlier**: https://kb.parallels.com/en/124445
- **Microsoft SQL Server 2017 and 2019 single server installation**: https://kb.parallels.com/125164
- **Microsoft SQL Server 2017 and 2019 multi-server installation**: https://kb.parallels.com/125156

Installing RAS Reporting

To install RAS Reporting:

1. Log in to the server where you have Microsoft SQL Server Reporting Services installed. Make sure you use the account with administrative privileges (AD).

   Note: SQL Server 2017 and SQL Server 2019 allow you to install SQL Server database engine and SQL Server Reporting Services (SSRS) on different servers. You need to be logged in to the server where you have SSRS installed.

2. Download the latest version of Parallels RAS Reporting from `https://www.parallels.com/products/ras/download/links/`
3. Once downloaded, double-click the `RASReporting-xxx.msi` file to run the installation wizard.
4. Click **Next** when prompted. Review and approve the end-user license agreement and click **Next**.
5. On the **Database connection** page, specify the SQL Server database engine location:
   - **Location:** If the SQL Server database engine is installed on the local server (together with SSRS), select **Localhost**. If the SQL Server is installed on a different server, select **Remote** and then specify the server connection properties (see below).
   - **Server:** If you selected **Remote**, specify the FQDN or IP address of the server where you have SQL Server installed.
   - **Username:** Specify the username to log in to SQL Server.
   - **Password:** Specify the password.
6. On the same page, specify the SQL Server instance name. The default instance name is RASREPORTING. If you would like to use a different instance, you can specify it on this page. If the instance doesn't exist, you need to create it first.
7. Click **Next**.
8. On the **Viewing Reports User** page, specify the user account that will be used to view reports. The default preconfigured user in Parallels RAS is RASREPORTINGVIEW. If you would like to use a different user, you can specify it here. If the user doesn't exist, you need to create it first. Please note that if you specify a different user, you will need to change the reporting settings in the RAS Console later.
9. Click **Next**.
10. On the **Destination Folder** page, specify the target folder for the installation and click **Next**.
11. Click **Install** to begin the installation.
12. Click **Finish** when done.

Configuring RAS Reporting

After you install RAS Reporting, you need to configure it as follows:

1. Select the **Administration** category in the RAS Console and then click the **Reporting** tab in the right pane.
2. On the **Reporting** tab, specify the following options:
   - **Enable RAS Reporting:** Select this option to enable the RAS reporting functionality.
   - **Server:** Specify the FQDN or IP address of the server where RAS Reporting is installed.
   - **Port:** The port specified here is used by the service which receives data from the RAS Publishing Agent. The default port is 30008.
   - **Prompt user for login details**. Will prompt the user for AD credentials when generating reports.
   - **Use following credentials**. Specify AD username and password to be used each time a report is generated. The default user name is `RASREPORTINGVIEW`. If you specified a different user when you installed RAS Reporting, you can use it here.
3. When done, click the **Test connection** button to test the configuration.

Configuring Advanced Settings

Advanced settings allow the administrator to fine-tune the data collected by RAS Reporting and define for how long this data is retained before it is purged.

In the RAS Console, navigate to **Administration** / **Reporting.** On the **Reporting** tab, click the **Tracking Settings** button. The **Advanced Setting** dialog opens.

In the **Session Information** section, configure the following options:

- **Enable Tracking**. Records sessions data (affects all reports except Server Reports).
- **Retain information for**. Specify the period session information is retained for before purged.

In the **Server Counters** Information section, configure the following:

- **Enable Tracking**. Records server counter data (affects Server Reports only).
- **Retain information for**. Specify the period server counters information is retained for before purged.
- **Track CPU / Memory counter when change is more than**. Set the minimum CPU/Memory resource usage required to record data.

- The **Custom reports** section is used to enable custom reports in the Parallels RAS Console. Select the **Enable custom reports** option and specify a folder name where custom reports will be stored (or use the default "Custom reports" name). Note that this is a virtual folder located on the SQL Server Reporting Services side, so you need to specify just a name (not a traditional path). You will see the folder in the Parallels RAS Console in the **Reporting** category together with other (predefined) folders that contain reports. For more information about custom reports, please see the **Parallels RAS Reporting Guide**, which can be downloaded from the Parallels website: https://www.parallels.com/products/ras/resources/

Viewing Reports

To view Parallels RAS reports, select the **Reporting** category in the RAS Console. The report viewing interface consists of the following elements:

- The middle pane displays the available reports. See the **Predefined reports** subsection below for the complete list. The "blue folders" icon (at the top of the list) groups reports by type or displays all of them as a single list. The "refresh" icon refreshes the report list by retrieving it from the database (this can be useful when you enable/disable the reporting functionality or when you add custom reports, which may not appear in the list automatically).
- When you initially open the **Reporting** category, the right pane contains just the **Information** tab, which informs you whether Parallels RAS Reporting is active.
- The "blue square" icon in front of the **Tasks** drop-down menu (upper right-hand side of the RAS Console) expands the reporting interface into full screen. The **Tasks** drop-down menu allows you to perform the following actions: **Duplicate** (duplicates a report tab), **Full screen** (on/off), various **Close Report** options, **Delegate Permissions** (allows you to grant permissions to view reports to other users).

To run a report, double-click it in the middle pane. The report opens in a tab in the right pane:

- Most reports include controls that you can interact with, such as **From**/**To** dates, **Sort By**, **Sort Order**, **Chart Type**, **Server Name**, and others depending on the report type. When you change a value in any of these controls, click the **View Report** button to apply the new criteria and re-run the report.
- The main report area (lower portion where the data is represented as a graph, text, or numbers) includes a menu bar with icons that allow you to change the view magnification, list through report pages (if more than one is included), search for text, save a report to a file, print a report, and export it to data feed.

Note: The first time the reports are viewed, you may be requested to add http://<server domain/ IP> as a trusted website. This will appear depending on the Parallels RAS machine's "Internet Explorer Enhanced Security Configuration".

Predefined reports

Parallels RAS Reporting includes a number of predefined reports in the following groups:

1. **User Reports**. This group includes reports about how end users are interacting with Parallels RAS:
   - **User Activity** — shows all sessions produced by all users in the system. The report shows information about each session and includes active time, idle time, and disconnected time.
   - **User Session Activity** — shows all sessions produced by a single user. The report shows information about each session and includes active time, idle time, and disconnected time.
   - **Application Usage by User** — shows applications used by a specified user, including number of times used and total time.
   - **Devices Used by User** — shows information about devices used by a user. The report includes information such as device vendor, device model, and total time used.
   - **Client Operating System Used by User** — shows the operating system being used by a specified user.
   - **Full User Information** — shows detailed information about a specified user.
2. **Group Reports.** These reports obtain information about how groups of users are interacting with Parallels RAS:
   - **Groups Activity** — shows all sessions produced by all groups in the system. The report includes active, idle, and disconnected time.
   - **Group Sessions Activity** — shows all sessions produced by a group in the system. The report shows information about each session produced by each user in the group and includes start, end, active, idle, disconnect and total time.
   - **Applications Used by Group** — shows applications used by a specified group, including number of times used and total time.
   - **Devices Used by Group** — shows information about devices used by users as members of a specified group. The report includes device vendor, model and total time used.
   - **Client Operating System Used by Group** — shows the operating system used by members of a particular group.
3. **Devices Reports**. This group includes reports about the devices that are connecting to Parallels RAS:
   - **Devices Used** — shows all devices using the system. The report includes a device manufacturer, model, and the number of sessions opened by the device.
   - **Client Operating System Used** — shows devices and corresponding operating systems that are using the system.
   - **Parallels Client Version Used** — shows information about a device model, Parallels Client version used, and session information.
4. **Server Reports**. This group includes reports about the activity of Parallels RAS server components:
   - **Sessions Activity on Server** — shows the session activity of users on a particular server. Report includes start, end, active, idle and disconnect time.

- **Farm Health by Server** — shows server CPU and RAM usage for a specified server in the Farm.
- **Farm Health by Machine** — shows server CPU and RAM usage for a specified computer.
- **Gateway Tunneled Sessions** — shows tunneled session information for a specified Gateway.

5 **Application Reports**. Reports related to applications.

- **Applications Usage** — shows information about applications used in the system. Report includes information such as application name, number of times used and the total usage time. When viewing this report, select "All applications" or "RAS published applications" depending on your needs. When the second option is selected, the report will not include non-published applications and duplicates.

Note that if you have enabled the "custom reports" functionality (Administration > Reporting > Tracking settings > Enable custom reports), you will also see the custom reports group with a single demo report in it. As you add more custom reports, they will all appear in this folder. When the "custom reports" functionality is disabled, this group is not shown in the report list.

Custom reports are described in detail in the **Parallels RAS Reporting Guide**, which can be downloaded from the Parallels website. For quick how-to instructions, see the following KB article: https://kb.parallels.com/en/124648

GDPR Compliance

The Parallels RAS reporting database contains information about users, which may possibly include personal user information. To conform to GDPR, Parallels RAS gives you the ability to clear user data from the database at any time. **Parallels RAS Reporting Tools** is a simple application that you can use to perform this task. The tool is installed automatically when you install Parallels RAS.

To clear user data:

1 On the computer where you have Parallels RAS installed, navigate to `C:\Program Files (x86)\Parallels\RAS Reporting`.

2 In the folder specified above, locate and run the **RASReportingTools** application.

3 When the application starts, enter a user name in the **User data** field and click **Find user**. If the user is found, the user information is displayed. If the user is not found, it means that the RAS reporting database doesn't have any information about that user.

4 To see the user information contained in the RAS reporting database, click the **Show full user information** button. This will open the **Full User Information** report in a web browser (note that this report is also available in the **Reporting** category in the RAS Console). Examine the report to determine if any of the user information is subject to GDPR requirements.

5 To clear the user data, go back to the **Parallels RAS Reporting Tool** app and click the **Clear user data** button. When asked, confirm that you want to clear the data.

CHAPTER 21

Parallels RAS Performance Monitor

Parallels RAS Performance Monitor is a browser-based dashboard designed to help administrators analyze Parallels RAS deployment bottlenecks and resource usage. The dashboard provides a visual display of performance metrics, which can be viewed in the Parallels RAS Console or in a web browser.

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Overview

Components

Parallels RAS Performance Monitor consists of the following components:

- **InfluxDB database** — a database for storage of system performance data.
- **Grafana dashboard** — a browser-based dashboard providing a visual display of performance metrics.
- **Telegraf service** — a service that collects performance data on a server where it is installed. The service is installed automatically when you add a server to a Parallels RAS Farm and install a corresponding RAS Agent on it (e.g. RAS Secure Client Gateway Agent, RD Session Host Agent, Remote PC Agent, etc.).

How it works

The Telegraf service is stopped by default, so it doesn't collect any data. To start the service on each server in the Farm, the performance monitoring functionality must be configured and enabled in the Parallels RAS Console. Once enabled, the Telegraf service begins collecting a predefined set of performance counters at a fixed time interval (10 seconds). It then sends the collected data to the InfluxDB database for storage. To view performance metrics, the Parallels RAS administrator uses the dashboard (Grafana), which displays the visual representation of performance counters in real time.

The performance metrics are grouped in the dashboard by type (Session, CPU, Memory, Disk, etc.), so the administrator can view each group of metrics separately. The administrator can also select whether to view performance metrics for one or more specific servers or for all servers in the Farm or Site. In addition, the administrator can select a specific Site for which the data should be displayed.

Installing Parallels RAS Performance Monitor

Requirements

Parallels RAS Performance Monitor can be installed on a dedicated server or on a server hosting any of the Parallels RAS components. The installation comes down to installing the InfluxDB database and the Grafana dashboard service, which is done automatically using the installation wizard as described in the **Installation** subsection below.

The server on which you'll be installing Parallels RAS Performance Monitor must have the following communication ports open:

- TCP port 8086 (used by the InfluxDB database).
- TCP port 3000 (used by the Grafana performance dashboard).

Installation

To install Parallels RAS Performance Monitor:

1. Download the Parallels RAS Performance Monitor installer from `https://www.parallels.com/products/ras/download/links/`
2. Run the installation wizard (the RASPerformanceMonitor.msi file) and follow the onscreen instructions.
3. Close the wizard when finished.

The next step is to configure access to Parallels RAS Performance Monitor in the RAS Console.

Using Parallels RAS Performance Monitor

Configure access to Parallels RAS Performance Monitor

To enable data collection and view the dashboard:

1. In the RAS Console, navigate to **Administration** > **Reporting**.
2. Select the **Enable RAS Performance Monitor** option (the **RAS Performance Monitor configuration** section).

3 Enter the FQDN or IP address of the server where you have the InfluxDB database and Grafana dashboard installed.

4 Click **Apply** to commit the changes.

Once you perform the steps above, the Telegraf service is started on each server in the Site and the data collection begins.

Open the dashboard

Note: You should give Parallels RAS Performance Monitor some time to collect performance data before you can view it (about 1 hour on initial installation).

To view the dashboard, do the following:

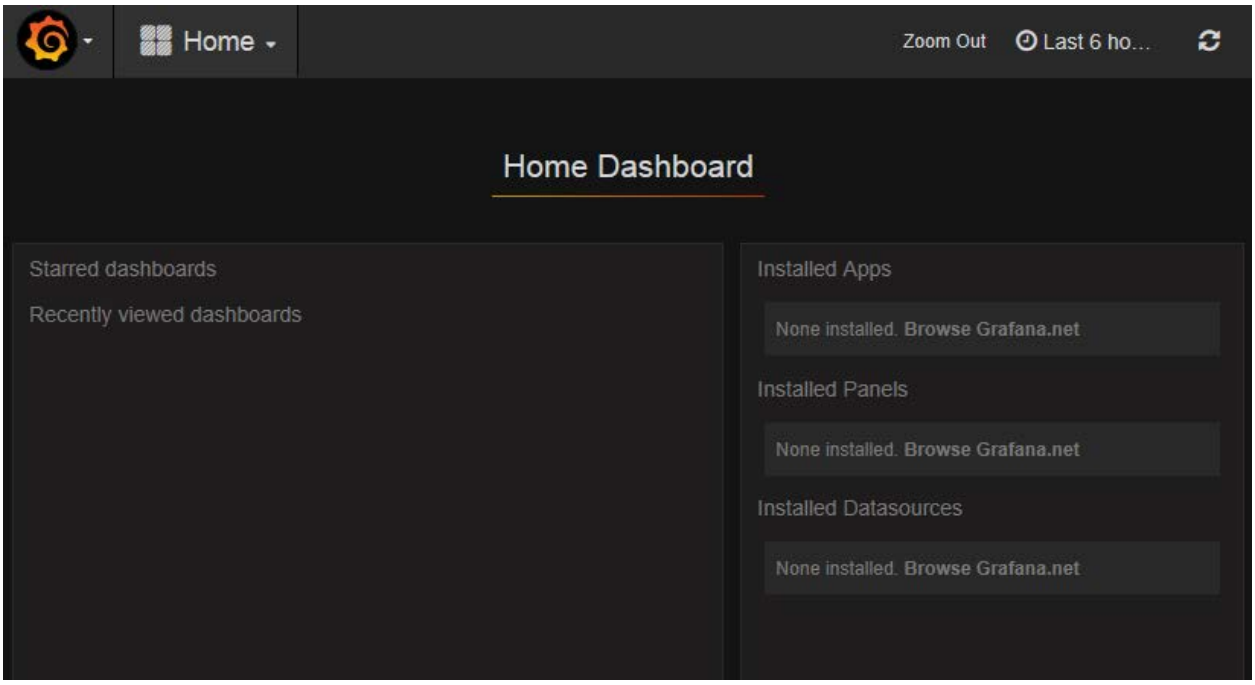
1 In the RAS Console, select the **Monitoring** category.

2 The dashboard is displayed in the right pane of the console. The logon to the dashboard is performed automatically, so no logon credentials are required.

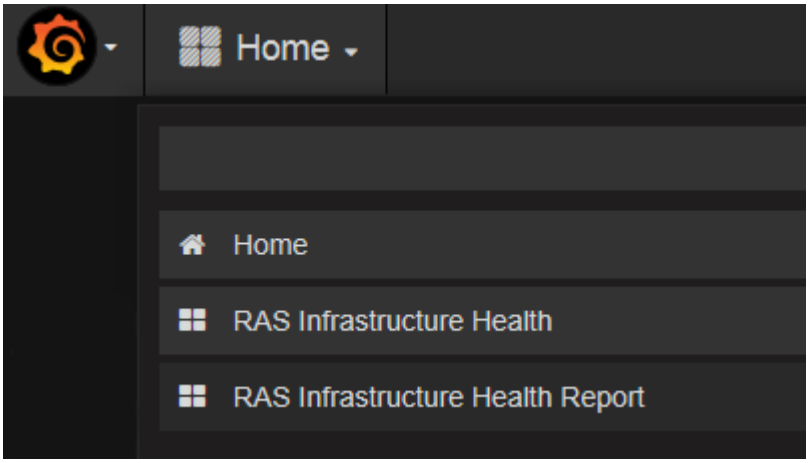
The buttons on the **Performance Monitoring Dashboard** tab (below the dashboard area) are as follows:

- **Home**. Displays the **Home Dashboard** page. The button is useful when you click on an external link in the dashboard, which may take you to an external web page.
- **Refresh**. Reloads the current page.
- **Open in browser**. Opens the performance dashboard in a web browser.

When you open the dashboard for the first time, the **Home Dashboard** page is displayed.



To view performance metrics, click the **Home** drop-down menu at the top of the dashboard and then click **RAS Infrastructure Health**.



This will open the page displaying performance metrics (please note that the other menu item, RAS Infrastructure Health Report, is for internal use only and should be ignored).

The menu bar on the **RAS Infrastructure Health** page includes the following items:

- **Hosts**. Allows you to select one or multiple servers for which the performance metrics should be displayed. To display the data for all servers in the Site, select **All**. Please note that if you don't see any servers in the list, you need to wait for Parallels RAS Performance Monitor to collect the initial set of statistics. This only happens on initial installation.

- **Instance**. This item allows you to select a specific counter instance (if there's more than one). For Network counters it is usually the name of a network interface. For Disk counters it is a disk name. Other types of counters don't usually have multiple instances.
- **Site**. Select a Site for which to display the data. Selecting **All** displays the data for all sites in the Farm. If you have another RAS Farm, and the RAS Performance Monitor is configured and enabled in it, you can also select a Site from that Farm.
- **Agent Type**. Select a RAS agent type.
- **Groups**. Select an RDS group.

To view metrics of a specific type, expand the desired category in the main area of the dashboard. The categories include:

- **Session Information**. Displays the information about active sessions (act_sess) and disconnected sessions (disc_sess).
- **CPU usage**. CPU counters.
- **Free memory**. Physical memory counters.
- **Disk usage**. Disk I/O counters.
- **Network usage**. Network interface I/O counters.
- **System information**. System information counters.

Performance metrics are displayed in the dashboard as a graph. Different counters are displayed using different colors. The legend is displayed below the graph.

To zoom in on a particular area of a graph, select a rectangular block with a mouse. You can also use the **Zoom** controls at the top of the dashboard for time range zoom out, shift time forward, or shift time backwards.

To select a specific time range, click the "clock icon" item at the top and then specify a time range or select one from the **Quick ranges** list.

To go the **Home Dashboard** page, click the **Home** drop-down menu and choose **Home**. If you are viewing the dashboard in the Parallels RAS Console, you can also click the **Home** button in the console itself.

For more information about performance metrics and their meaning, please refer to the following articles from Microsoft:

- https://technet.microsoft.com/en-us/library/cc976785.aspx
- https://technet.microsoft.com/en-us/library/2008.08.pulse.aspx

See also **RAS Performance Counters** (p. 409).

Configuring Performance Monitor Security

By default, any user can access the Performance Monitor page and view performance metrics. To increase security, you can set up the RAS Performance Monitor to use credentials, so that only authorized users can view it.

First, remove anonymous authentication from the Grafana configuration file as follows:

1. Open file C:\Program Files (x86)\Parallels\RAS Performance Monitor\conf\defaults.ini.
2. In the file, look for the following:

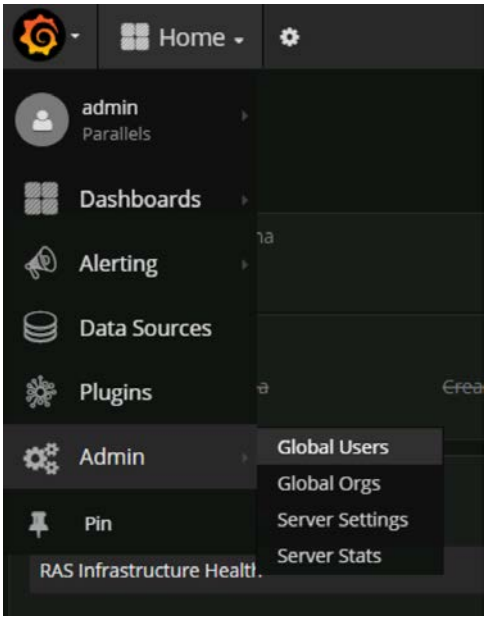
```
################################### Anonymous Auth
######################
[auth.anonymous]
# enable anonymous access
enabled = true
```

3. Change `"enabled = true"` to `"enabled = false"`.

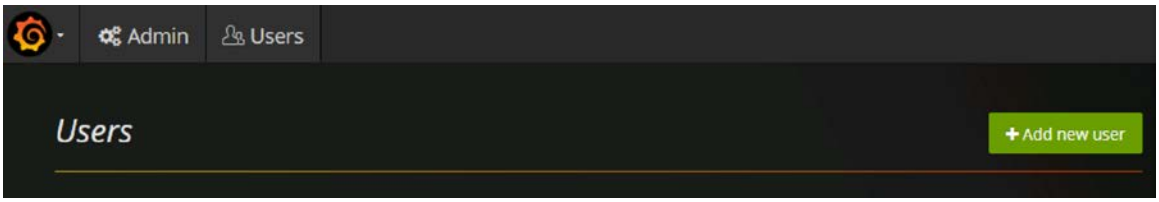
Restart the Grafana service and log in to Grafana console as follows:

- **URL:** http://yourserver:3000/login?redirect=%2Fdashboard%2Fdb%2Fras-infrastructure-health
- **User:** admin
- **Password:** admin

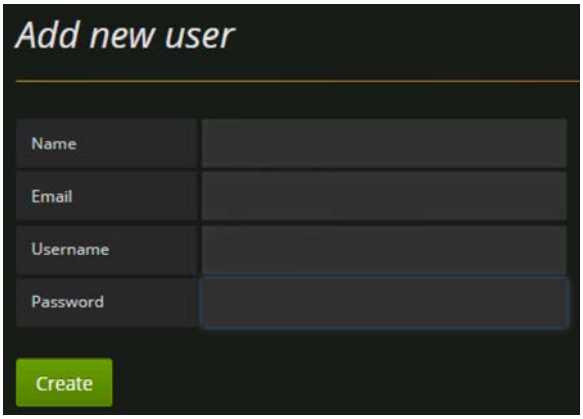
Once logged in, go to the Users admin page:



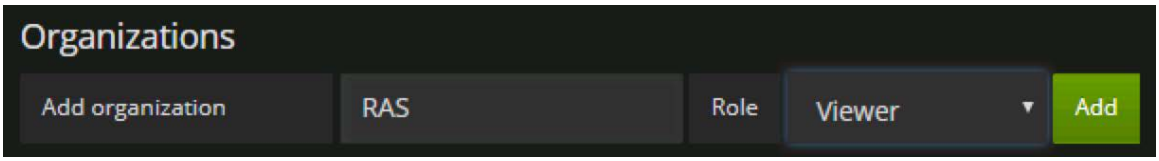
Click on **Add new user**:



Add a users by specifying the account name, email address, username and password, and click **Create**:



You know need to add the user to your organization's list. To do so, in the **Users** list, click **Edit** to edit the user and then set the organization and make the user a **Viewer**:



Click **Add** to add the user to your organization's list. The user can now view the RAS Performance Monitor statistics.

CHAPTER 22

Common Management Tasks

This chapter describes common Parallels RAS management tasks, including Farm status monitoring, license management, backup management, and others.

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Recovery - Add a Root Administrator

This topic addresses a possible issue when the root administrator is not available or the domain is changed. In such events, the system becomes inaccessible. If you encounter this issue, you can quickly add a root administrator by executing the following command on the server hosting the primary RAS Publishing Agent:

`2XRedundancy -c -AddRootAccount` *user* [*domain*]

Please note that an open Parallels RAS console will not be notified about the new account since this is an emergency recovery. You need to log out and then log in again to see the new account in the **Administration** area.

Host Name Resolution

When you add a server component (Publishing Agent, Gateway, RD Session Host, VDI provider, etc.) to a RAS Farm you have to specify its FQDN or IP address. It is normally up to you whether to use FQDN or IP address. On the other hand, the server IP address can change in the future. If that happens, you will have to reconfigure the corresponding component in the RAS Farm. On the other hand, the server FQDN usually stays the same, so if you used it instead of the IP address, no RAS configuration changes will be necessary. For this reason, Parallels RAS gives you an option to always resolve IP addresses to FQDNs for all server components in a Farm.

To always use name resolution, do the following:

1. In the RAS Console, click **Tools** > **Options** on the main menu (that's the menu at the top of the RAS Console window).
2. In the **Options** dialog, select the **Always attempt to resolve to fully qualified domain name (FQDN) when adding hosts** option.
3. Click **OK**.

When you now try to add a component to a Farm and enter its IP address instead of a name, it will be automatically resolved to FQDN. If the FQDN cannot be determined, you will see an error message and will be asked if you would like to use the IP address instead.

The examples below demonstrate how the automatic name resolution works for different components.

Adding a RAS Publishing Agent

1. On the **Publishing Agents** tab, click **Tasks** > **Add**.
2. In the **Server** field, enter the server IP address.
3. Click **Next**.
4. In the dialog that opens, observe that the IP address has been resolved to FQDN and the **Server** field contains the FQDN.

Adding a RAS Secure Client Gateway

1. On the **Gateways** tab, click **Tasks** > **Add**.
2. In the **Server** field, enter the server IP address.
3. Click **Resolve**. This will copy the IP address to the **IP(s)** field and will enable the **Next** button.
4. Click **Next**.
5. In the **Installing RAS Secure Client Gateway** dialog, observer that the server IP address is replaced with the FQDN.

Adding an RD Session Host

1. On the **RD Session Hosts** tab, click **Tasks** > **Add**.
2. On the first page of the wizard, enter the server IP address and click the plus-sign icon.
3. Observe that the server is added to the list, but the IP address is substituted with the FQDN that was automatically resolved.

Add a VDI Provider

1. On the **VDI** > **Providers** tab, click **Tasks** > **Add**.
2. Select **Virtualization** and click **Next.**
3. In the **Address** field, enter the IP address of a VDI provider.
4. Enter the remaining properties and click **Next**.
5. Observe that the VDI provider address is replaced with the FQDN.

Computer Management Tools

When you need to perform standard Windows computer management tasks, you can do it without leaving the RAS Console. The tasks include Remote Desktop Connection, Computer Management, Service Management, Event Viewer, PowerShell, Reboot, and others. To access the **Tools** menu, select a server in the RAS Console and then click **Tasks** (or right-click) > **Tools**.

The **Tools** menu is available in the following views in the RAS Console:

- **Site info**
- **RD Sessions hosts**
- **Virtual Desktop hosts**
- **Windows Virtual Desktop hosts**
- **Remote PCs**
- **Gateways**
- **Publishing Agents**

Requirements for using computer management tools

Some of the tools require an appropriate target host configuration before you can use them in the RAS Console. Please read the following requirements and make sure they are met.

To use Remote Desktop, remote connections must be enabled on a target host. You can verify that by using the standard Windows Remote Desktop Connection application and see if you can connect to a remote server.

PowerShell related tools require PowerShell remoting enabled on a target server. To enable PowerShell remoting, run the `Enable-PSRemoting` cmdlet on a target computer in PowerShell window with administrator privileges. Please note the following:

- The cmdlet configures a computer to receive PowerShell remote commands.
- The cmdlet starts the WinRM (Windows Remote Management) service, among other tasks. To see if the WinRM service is running, use the `Test-WSMan` cmdlet.
- When you execute the cmdlet, it will ask you to confirm every task that it wants to perform. To execute the command silently, use the `-Force` option.
- If you receive an error saying that "WinRM firewall exception will not work since one of the network connection types on this machine is set to Public", you can try to execute the cmdlet with the `-SkipNetworkProfileCheck` option, or you can change the network connection type on this host to Domain or Private.

To use PowerShell to manage a remote host, you also need to add the host to the TrustedHosts list on the computer where you have the RAS Console installed. To view the current TrustedHosts list, execute the following command in PowerShell window:

```
Get-Item WSMan:\localhost\Client\TrustedHosts
```

To add a host to the TrustedHosts list, use one of the options described below. Please note that all examples below, except the last one, always overwrite an existing TrustedHosts list. To add a specific computer to an existing list, use the last example (the one with the `-Concatenate` parameter).

Add all computers to the list:

```
Set-Item WSMan:\localhost\Client\TrustedHosts *
```

Add all domain computers:

```
Set-Item WSMan:\localhost\Client\TrustedHosts *.domain-name.dom
```

Add specific computers:

```
Set-Item WSMan:\localhost\Client\TrustedHosts <computer-name>,[<computer-name>]
```

Add a computer to an existing list (this is the only example that will not overwrite an existing TrustedHosts list):

```
Set-Item WSMan:\localhost\Client\TrustedHosts -Concatenate <ComputerName>
```

Available tools

The table below describes the tools available in the **Tasks** > **Tools** menu and their execution strings.

Tool	Execution string	Description
Remote Desktop	mstsc.exe /v:<selectedRDShostName>:<port> /admin	Launch a standard RDP connection to the selected RDS host.
Computer	compmgmt.msc /computer:<selectedRDShostName>	Launch Computer

Management		Management locally with connection to the selected host.
Service Management	services.msc /computer:<selectedRDShostName>	Launch Services Management locally with connection to the selected host.
Event Viewer	eventvwr.msc /computer:<selectedRDShostName>	Launch Event Viewer locally with connection to the selected host.
Shared Folders	smgmt.msc /computer:<selectedRDShostName>	Launch Shared Folders locally with connection to the selected host.
Powershell	Enter-PSSession –ComputerName <selectedRDShostName> [-Credential username]	Launch Powershell locally with connection to the selected host.
IPconfig	- Powershell remote connection to selected host - Get-NetIPConfiguration	Provides network configuration for the selected host.
Ping	- Powershell remote connection to selected host - Test-NetConnection -ComputerName www.microsoft.com | Select -ExpandProperty PingReplyDetails | FT Address, Status, RoundTripTime	Provides ICMP reply with status and RTT for the selected host.
Netstat	- Powershell remote connection to selected host - Get-NetTCPConnection	Displays network connections for Transmission Control Protocol on the selected host.
Reboot	shutdown /m \\<selectedRDShostName> /f /r /t 0	Reboot the selected host.
Shutdown	shutdown /m \\<selectedRDShostName> /f /s /t 0	Shutdown the selected host.

Site Information

To view the Site information, select the **Information** category in the RAS Console.

The **Site Information** tab displays information about available servers, Publishing Agents, Secure Client Gateways (see **Viewing Gateway Summary and Metrics** (p. 78)), and sessions on the local computer. To view information about running applications, select the **Show application information** option (at the bottom of the page).

The **Local Information** tab shows the status of RAS components running on the local server.

Site Settings

To view and configure common Site settings in the RAS Console, navigate to **Farm** / <Site> / **Settings**.

Auditing

The **Auditing** tab allows you to configure application auditing. When enabled, application auditing monitors processes running in the Site and records this information in the audit file. To view the information, click the **View Audit** button (at the bottom of the page). The information is also displayed on the **Information** / **Site information** page and in RAS Reports.

To enable or disable application auditing, use the **Auditing** drop-down list (at the bottom of the page). The **Clear Audit File** button clears the current audit.

The **Filtering the following processes** list allows you to specify processes that will be excluded from the audit. Use the **Tasks** drop-down menu to add or delete a process. You can also use the **Task** menu to import and export a process list from/to a CSV file. The **Task** > **Properties** menu item allows you to edit a process name. The **Default** menu item resets the list to contain the default set of standard processes.

Global logging

The **Global logging** tab allows you to specify the log level for Parallels RAS components. Logs are used by Parallels RAS support engineers to analyze possible issues with a Parallels RAS installation. To specify the log level, select one or more servers in the list and click the **Configure Logging** item. In the dialog that opens, select one of the following:

- **Standard** — This is the standard log level that records only the most important events. Unless you are asked by Parallels RAS support to use one of the log levels described below, you should always use this one.
- **Extended** — This logging involves more information than the standard logging, but it slows down the system because of the additional information that it needs to collect.
- **Verbose** — Verbose logging involves even more information than the extended logging and can slow down your system significantly.

Please note that to avoid degraded performance, extended and verbose logging should only be enabled for a limited time period (enough to collect the necessary information for analysis). You can set this time period using **Reset to the standard level after** option. The default value is 12 hours. In specific cases, a Parallels support engineer will advise you whether this time period should be set to a different value. Once this time period is over, the log level will be reset back to standard.

To retrieve a ZIP archive containing the collected log files, click the **Retrieve** item and then specify a location where you want the file to be saved. The **Clear** item clears all logs.

You can also set the log level for an individual server by navigating to the page where servers of that type are listed (e.g. RD Session hosts, Gateways, etc) and clicking **Tasks** (or right-click) > **Troubleshooting** > **Logging**. The context menu that opens has the same **Configure**, **Retrieve**, and **Clear** options as described above. The **Log Level** column in the server list indicates the currently set level.

URL redirection

The **URL redirection** tab allows you to specify URLs that will not be redirected when the **Allow Client URL/Mail redirection** option is enabled for an RD Session Host, VDI provider, or Remote PC (**Agent Settings** tab in the corresponding server properties).

To add one or more URLs that should not be redirected, click **Tasks** > **Add** and type a URL in the **Do not redirect the following URLs** list box.

Client settings

See **Specifying Client Settings** (p. 192)

Settings Audit

Parallels RAS gives you the ability to audit the modifications that were done to a Parallels RAS Farm, including changes to any of the components, objects, resources, and users. This information is stored in a database, so it can be reviewed and possibly reverted, if needed. The information is stored in the primary database but is replicated in a local database on the computer where Parallels RAS Console is running.

You can view the list of modifications using one of the following options:

- By navigating to **Administration** / **Settings audit**. The tab displays the main list of all changes to any components/objects in the Farm. If a modification can be reverted, you can do it here.
- By clicking **Tasks** > **Settings audit** on any pane in the RAS Console that supports this functionality. Compared to the main list (described above), you will only see modifications to the same types of components or objects that are managed on a given pane. You can also revert a modification here if it can be reverted. If the **Settings audit** menu option is not available on a particular pane, it means that the functionality is not available for the types of components or objects that this pane manages.

The following describes in detail how to view and revert Farm modifications.

View the main settings audit list

To view the main list of all modifications for a Farm, do the following:

1. In the Parallels RAS Console, select the **Administration** category and then click the **Settings audit** tab.
2. The sync process will check that the local audit database is in sync with the primary database and will do an update if necessary (you may see a progress indicator while the syncing is in progress).
3. Once the syncing is complete, the **Settings audit** tab will be populated with data. Each entry in the list corresponds to a modification that was done either by a RAS administrator or a system service.

The information for each entry in the list includes the following:

- **Date:** Date and time of the modification.
- **Session:** Session ID.
- **Username:** The name of the administrator or RAS service that was responsible for the modification. RAS services may include System (redundancy service) and Publishing Agent (controller service).
- **Action:** The action that was performed, such as Connect, Disconnect, Create, Update, Switch site, and others.
- **ID:** The affected object's ID.
- **Site:** The number and name of the affected Site. "Global" means the change affected all sites.
- **Type:** The modification type. This usually makes sense when viewed together with the **Action** value.
- **Name:** The value in this column is displayed for some entries and can provide additional information, such as the name of the changed object.

You can perform the following actions on the list:

- To refresh the list, click the "recycle" icon (top right).
- To view details for an entry, double-click it (or select an entry and click **Tasks** > **View entry**).
- To search for a specific entry (or entries), click the magnifying glass icon (top right). An extra row is added at the top of the list allowing you to enter the search criteria. You can type a string to search for in one or multiple columns. The search is performed as you type and the list is filtered to include only the matching entries. To cancel filtering and display the complete list, click the magnifying glass icon again.

Reverting a modification

To revert a modification in the main list:

1. Double-click a desired entry on the **Settings Audit** tab.
2. The **Audit Entry** dialog opens. While here, you can click **Next** and **Previous** buttons to go to the next or previous item as they are displayed in the main list.

3 To revert the change, click the **Revert** button. If the button is disabled, it means that the change cannot be reverted.

Changes that can never be reverted include the following:

- Any changes done by System or Publishing Agent (as displayed in the **Username** column).
- Changes that were done in previous versions of Parallels RAS where this feature did not exist.
- Changes related to administrator accounts.

View a local settings audit list

You can also view and revert configuration changes for a specific type of RAS components or objects. When you are on a particular pane (or tab) in the RAS Console, look for the **Tasks** > **Settings audit** menu option (or right-click > **Settings audit**). If it's there, then you can view the changes and revert them if needed. Consider the example below.

Let's say you want to see changes that were done to RD Session Hosts. To do so:

1 In the RAS Console, navigate to **Farm** / <Site> / **RD Session Hosts**.

2 Click **Tasks** > **Settings audit**.

3 The **Settings Audit** dialog opens listing all known modifications that were done to RD Session Hosts. The modifications may include creating, moving, deleting, or updating an RD Session Host. The type of the modification is displayed in the **Action** column in the list.

4 To revert a modification, select it and click the **Revert** button (in the lower right of the dialog). If the button is disabled when you select a particular entry, it means that the modification cannot be reverted.

The local settings audit functionality is available for most of the major components and objects in the Parallels RAS Console. This includes RD Session Hosts (including Groups and Scheduler), VDI, Remote PCs, Gateways, Publishing Agents, Themes, Publishing, Quick Keypad, and many others. Once again, when you view a particular pane, look for the **Tasks** > **Settings audit** menu option (or right-click > **Settings audit**). If it's there, then you can view the changes and revert them if needed.

Upgrading RAS Agents

When you add Parallels RAS components to a Farm, you install a corresponding RAS Agent on them. This includes RAS Publishing Agent, RD Session Host Agent, VDI Agent, Guest Agent, Remote PC Agent. In addition to the functionality that allows you to check agent status, and update it if necessary, you can do a bulk agent update or upgrade.

There are two ways you can find out if agents need to be updated. You can be notified by Parallels RAS or you can check the status and initiate the update procedure manually.

When the Parallels RAS Console starts, you may see a message box saying that Agents need to be installed or updated. You can start the update procedure by clicking **Yes** in this dialog. You will then see a list of all servers on which an Agent needs to be updated where you can decide whether to included a server in the bulk update procedure or exclude it. Once you've made your selection, follow the onscreen instructions and update the Agents.

To initiate the procedure manually, click the **Task** > **Upgrade all Agents** in the RAS Console where this menu is available (most of the views where it makes sense). You can also right-click inside the view and choose **Upgrade all Agents**. Follow the onscreen instructions and select the servers on which an Agent requires an update or upgrade. Please note that if all Agents on all servers displayed on a given pane are up to date, the menu option will be disabled.

For example, to upgrade all primary Publishing Agents in all sites, select **Farm** / **Farm** and then click **Tasks** > **Upgrade all Agents** (or right-click inside the pane and choose **Upgrade all Agents**). To upgrade all Agents on all servers in a Site, select **Farm** / <Site> and click **Tasks** > **Upgrade all Agents**. Similarly, to upgrade Agents on all RAS Secure Client Gateways, select **Farm** / <Site> / **Gateways** and use the same **Tasks** > **Upgrade all Agents** menu item. For other components, do exactly the same. Note that if you use the same credentials on all servers, you will have to enter them only once. The update procedure will remember the last entered credentials and will try to use them on all servers. If the credentials don't work on a server, you'll be asked to enter them again.

Please note that after you click the **Tasks** > **Upgrade all Agents** menu, the dialog that opens will contain the hosts on which an Agent needs updating or upgrading. The **Status** column in the list will indicate that and the host will be preselected for the upgrade. Unverified Agents will also be included in the list but will not be preselected. You can select them if you believe that an Agent has to be upgraded on them too.

Note: When updating an agent in a template (VDI), full and linked clone templates are updated differently. For important information, please read the **Template Maintenance** section (p. 145).

Licensing

The **Licensing** category allows you to manage your Parallels RAS license. When you click on the **Licensing** category, the **License Details** tab displays the following information:

- **License Type:** The type of your Parallels RAS license (e.g. subscription, trial, etc.).
- **Expiration Date:** Your license expiration date (or the number of days remaining).
- **Maximum allowed concurrent users:** The maximum number of concurrent users that your license allows. For example, if your own a Parallels RAS subscription and need more concurrent connections, you need to upgrade your subscription.
- **Peak Users:** Your peak concurrent users to date. You can use this value to evaluate whether you might need to upgrade your subscription to include more concurrent users.
- **Current Users:** The number of users currently connected to your Parallels RAS Farm.

Please note that you can also see these values (and more) in your Parallels Account. For more information, please read the **Parallels RAS Licensing Guide**, which is available on the Parallels website.

The **View Active Users** button opens a dialog where you can view currently active users and license usage. Use the toolbar buttons to refresh the list and to copy the information to the clipboard.

The **Manage license** button allows you to switch to a different Parallels account and to activate Parallels RAS using a different license key. Click the button to open the **Sign in to Parallels My Account** dialog. Use the dialog to sign in using an existing account or click **Register** to create a new account. If you are creating a new account, you'll also have to register a Parallels RAS license key in it and activate your Parallels RAS Farm using that key (see below).

To activate Parallels RAS using a different license key:

1. In the **Sign In to Parallels My Account** dialog, type the email address and password you used to register your account and click **Sign In**. You'll see the **Activate Product** dialog.
2. Select the **Activate using license key** option and enter the key in the field provided. You can click the button next to the field to see the list of subscriptions and/or permanent license keys you have registered with Parallels My Account. If the list is empty, it means that you don't have a subscription yet and need to purchase one first.
3. To purchase a subscription online, click the **Purchase a license** link.
4. After entering a license key, click **Activate**. You should see the confirmation message that your Parallels RAS was activated successfully.

Configure HTTP Proxy Settings

If you use an HTTP proxy server on your network, you need to configure it in the RAS Console. The proxy server settings will be used during Parallels RAS license updates and by other features that communicate with the Parallels cloud.

To configure a proxy server:

1. In the RAS Console, navigate to **Administration** > **Settings**.
2. In the **HTTP Proxy settings** section, click the **Configure Proxy** button.
3. In the dialog that opens, select one of the following options:
   - **No Proxy server** — if you don't use a proxy server.
   - **Manual HTTP proxy configuration** — select this option to specify the settings manually. The **Detect Settings** button will attempt to detect the proxy settings automatically.

     The **Proxy requires authentication** option allows you to specify or omit credentials for the proxy server. If your proxy server uses an IP address to authenticate clients, you can omit the credentials. Otherwise, select this option and specify a user name and password.

4 Click **OK** to save the settings.

System Event Notifications

You can configure system event notifications on the **Farm** / **Site** / **Settings / Notifications** tab. Notifications are used to alert the administrator about system events via email. When you configure notifications, the settings apply to all servers in the Farm.

To configure notifications, you first need to configure notification handlers where you can specify threshold values (where available) and whether an administrator should be notified via email. You can also configure notification scripts, which will be automatically executed when an event occurs.

Configuring Notification Handlers

To configure notification handlers:

1 In the RAS Console, navigate to **Farm** / **Site** / **Settings**.

2 Select the **Notifications** tab.

3 Click **Tasks** > **New** (or click the plus-sign icon) and choose an event for which to create a handler. For the list of events and their descriptions, please see the **System Events** subsection below.

4 A dialog opens where you can specify the event handler setting.

On the **General** tab, specify the following options:

- The threshold value (a number or percentage). Not available for some events (such as Licensing, Agent, and some other events).
- The direction (whether the event should trigger when the value rises above or drops below the specified value). Not available for some event (same as above).
- Whether to notify the administrator via email.
- Additional emails (separated by commas or semi-colons) to which to send event messages.
- Whether to execute a script when the event triggers. Here you need to select the **Execute a notification script** option and then choose a script from the drop-down list. Before you can use this option, you need to create one or more scripts as described in **Configuring Notification Scripts** (p. 365).

On the **Settings** tab, specify the following:

- **Use default settings:** Select this option to use default settings. To edit defaults, click the **Edit Defaults** link. To use custom settings, clear this option and specify the options as described below.

- **Notification handler grace period:** Specify a time period (in minutes) to wait from the event occurrence until the notification is triggered. Some events may trigger but last for a very short period of time. For example, a CPU usage can sharply jump above the specified threshold but quickly return to normal. For such events, it would probably make sense not to trigger the notification right away. This option allows you to specify the delay.
- **Notification interval:** Specify the minimum time interval (in minutes) between the last and the next notification. Allows to prevent multiple notifications to be emailed to administrators in rapid succession (i.e. prevents spamming).
- **Send one notification and suspend further notifications until recovered:** When this setting is enabled, a notification will be raised only once, and after that it will be suspended until the values monitored by the notification have recovered. For example, if the CPU usage is above the threshold for the whole day, instead of executing the notification handler multiple times, RAS would execute it only once.

5 When done, click **OK** to save the notification handler.

Please note that the mailbox should be configured in the RAS Console for the outgoing email functionality to work. This mailbox is usually set up when you run the RAS Console for the first time and then use the **Start** category to set up your RAS environment. You can also set up a mailbox as described in **Configuring SMTP Server Connection for Event Notifications** (p. 368).

To enable or disable an event handler, select or clear the checkbox in the first column, or right-click an event and choose **Enable** or **Disable**. To modify a handler, right-click it and choose **Properties**. To delete a handler right-click and choose **Delete**.

System Events

You can create notification handlers for the following system events:

- **CPU utilization**. Triggers when CPU utilization rises above or drops below a specified value.
- **Memory utilization**. Triggers when memory utilization rises above or drops below a specified value.
- **Number of RDSH sessions**. Triggers when the number of active sessions rises above or drops below a specified value.
- **Number of disconnected RDSH sessions**. Triggers when the number of disconnected sessions rises above or drops below a specified value.
- **RDSH session utilization**. Triggers when the number of RDSH sessions rises above or drops below a specified percentage of the maximum number of sessions.
- **RDSH disconnected sessions utilization**. Triggers when the number of RDSH disconnected sessions rises above or drops below a specified percentage of the maximum number of sessions.
- **Number of gateway tunneled sessions**. Triggers when the number of gateway tunneled sessions rises above or drops below a specified value.

- **Failed gateway tunneled sessions**. Triggers when a connection between a gateway and a resource object cannot be established.
- **RAS Agents events**. Triggers when an agent event occurs (e.g. agent disconnects or reconnects).
- **Licensing events**. Triggers when a licensing event occurs. One notable event here is the license usage reaching a predefined threshold. Specifically, when the license usage reaches 90% of all available licenses, you will receive an email, so you have time to decide whether you have enough licenses or need to add more. Other events include license activation/deactivation, license expiration, grace period starting/ending, license information changes, problem communicating with the licensing server.
- **Authentication server events**. Triggers when a connection issues occurs with an authentication server.
- **Published items events**. Triggers when a published item event occurs (e.g. the concurrent instance limit for an application is reached).
- **VDI events**. Triggers when a VDI event occurs (e.g. a template is not found).
- **Tenant events**. Triggers when a Tenant event occurs. For more info, see **RAS Multi-Tenant Architecture** > **Configuring Notifications** (p. 245).

Please also see the **Notification Types** table in the **Configuring Notification Scripts** section (p. 365).

Configuring Notification Scripts

To configure notification scripts:

1. On the **Administration** / **Notifications** tab, click **Tasks** > **New** (or click the plus-sign icon) in the **Notifications scripts** section.
2. In the dialog that open, specify the following options:
   - **Script name:** Enter a friendly name for the script.
   - **Command:** The command to execute.
   - **Arguments:** Command line arguments to pass to the command. An argument can be one of the predefined variables, which Parallels RAS will automatically replace with an actual value. See the **Command Line Variables** table below (the ID column contains the values that can be used here).
   - **Initial directory:** The full path to the current directory for the process. The string can also specify a UNC path.
   - **User name, Password:** These are optional fields that you can specify if you would like to execute the command under a specific user account.
3. When done, click **OK** to save the notification script item.

To modify a notification script, right-click it and choose **Properties**.

To delete a script, right-click and choose **Delete**. Please note that if a script is used by a notification handler, you will see a warning message. If you choose to delete it anyway, the script association will be removed from all notification handlers where it is used and all affected handlers will be automatically configured to send an email alert.

Command Line Variables

The following table lists command line variables that you can use as arguments when executing a script (see the **Arguments** option description above):

Variable	Description
($FARM-NAME)	Name of the RAS Farm which has raised the notification.
($SITE-NAME)	Name of the RAS Site which has raised the notification.
($SERVER-ADDRESS)	IP address or FQDN of the server which has raised the notification. It could be an RDSH server, the server hosting a RAS Publishing Agent, RAS Secure Client Gateway, etc.
($TRIGGER-ADDRESS)	IP address or FQDN of the Publishing Agent that has raised the notification.
($THRESHOLD-VALUE)	The threshold value that is assigned to the notification handler. If a notification type doesn't support thresholds, the argument should be replaced with an empty string.
($NOTIFICATION-TIME)	GMT time and date of when the event has occurred. String format shall use the "R" or "r" format specifier. Please see the following article from Microsoft for details: https://docs.microsoft.com/en-us/dotnet/standard/base-types/standard-date-and-time-format-strings **Note:** The time should represent the time when the notification has occurred, and not when the notification handler has been executed. The notification handler may be executed with a delay if a grace period is enabled.
($NOTIFICATION-TYPE)	A numeric value that is assigned to each particular notification type. Notification type values are listed in the **Notification Types** table below.

Notification Types

The following table lists supported notification types (the ID column represents values that are passed to the ($NOTIFICATION-TYPE) command line variable):

Type	Priority	ID	Notes
CPU utilization	L	1	
Memory utilization	L	2	
Number of active session	M	3	
Number of disconnected sessions	M	4	
RAS Agent connect	H	5	
RAS Agent disconnect	H	6	

VDI template is missing	H	7	
Published application limit exceeded	M	8	
Multi PA communication error	H	9	
Authentication provider not reachable	H	10	
% of RDSH session out of the maximum specified value	H	11	
Gateway is tunneling X number of sessions	H	12	
Reserved		13	Used internally.
Licensing events	M	14	All licensing notifications are controlled through this item.
Session degradation	H	18	Parallels Client determines abnormal round trip time.
Application startup time	M	19	Time to start an application. The measurement is done on the client side.
Publishing Agent auto promotion		20	
Publishing Agent auto promotion failed		21	
Publishing Agent auto promotion failback		22	
License activated		100	Controlled through "Licensing events"
License deactivated		101	Controlled through "Licensing events"
License max usage		102	Controlled through "Licensing events"
License about to expire		103	Controlled through "Licensing events"
License expired		104	Controlled through "Licensing events"
License trial expired		105	Controlled through "Licensing events"
License grace period start		106	Controlled through "Licensing events"
License grace period end		107	Controlled through "Licensing events"
License disabled		108	Controlled through "Licensing events"
License information changed		109	Controlled through "Licensing events"
License failed to communicate with server		110	Controlled through "Licensing events"
License no file		111	Controlled through "Licensing events"
License invalid version		112	Controlled through "Licensing events"
License invalid signature		113	Controlled through "Licensing events"
License invalid license		114	Controlled through "Licensing events"
License invalid MAC address		115	Controlled through "Licensing events"

Configuring SMTP Server Connection for Event Notifications

The **Mailbox** tab in the **Administration** category allows you to configure an SMTP server for outgoing emails. The SMTP server is required for the administrator to receive system event alerts (as described in the previous sections) and to send invitation emails to users.

To configure an SMTP server:

1. In the RAS Console, select the **Administration** category and then click the **Mailbox** tab.
2. In the **Mail Server** field, type your mail server FDQN or IP address.
3. In the **TLS / SSL** drop-down list, select whether to use it the protocol.
4. Select the **SMTP server requires authentication** option if required and then type the SMTP server username and password in the fields provided.
5. In the **Sender information** section, type the sender email address (e.g. your email).
6. The **Test mailbox settings** section can be used to test your SMTP server configuration. Enter one or more email addresses separated by a semicolon. Click **Send Test Email** to test the settings.

RAS Session Variables

When a remote user starts a published application or desktop, a set of session variables is created by Parallels RAS on the host server. The variables contain information about the client machine, which you can examine if needed. The variables are always updated, so on connect/reconnect they always contain the latest values.

The following RAS session variables are available:

Variable Name	Description
TUX_REMOTECLIENT_PLATFORM	Name and version of the operating system running on the client machine. For example, "Windows 8.1 Enterprise Edition (WOW 64)", "iPhone OS 9.2.1", "Android 6.0", etc.
TUX_REMOTECLIENT_MAC	MAC address of the client machine.
TUX_REMOTECLIENT_IP	IP address of the client machine as seen by the client.
TUX_REMOTECLIENT_LANG	Language used by the GUI on the client machine: EN, FR, RU, DE, ES, IT, PT, NL, JP, CS (Chinese Simplified), CT (Chinese Traditional), KR (Korean). Note that on macOS, iOS, and Android devices, the language is reported as the one used in the OS but only if it's a supported language. If it's not supported, it will default to EN.
TUX_REMOTECLIENT_MACHINE	Client's computer name. For example, "Bob's iPad mini 1st generation", "BobPC", "Bob's iMac", etc.
TUX_REMOTECLIENT_LOGIN	The username (including domain) that was used to log in to

	Parallels RAS. For example, myuser@somedomain.
TUX_REMOTECLIENT_VERSION	Parallels Client version.
TUX_REMOTECLIENT_VENDOR	Device vendor name. For example, "Asus", "Apple", "Google", etc.
TUX_REMOTECLIENT_MODEL	Device model name. For example, "Nexus 5", "iPad2.6", etc.

You can view RAS session variables and their values using one of the following two methods:

- By examining the Windows registry on the host server.
- By executing the GetRASVariable.exe utility (provided by Parallels RAS).

Each method is described below.

Examine the registry

To see the variables, run `regedit` and navigate to `HKEY_CURRENT_USER\Software\Parallels\Shell\<Session-ID>`, where <Session-ID> is the ID of a session as displayed in the RAS Console (e.g. 2, 3, 4, etc.) The variables for a particular session are listed under the session ID node. On user connect/reconnect they are updated to reflect the actual client configuration. The variables exist for the duration of a session and are removed from the registry once the session is terminated.

Please note that in addition to the variables listed in the table above you may see other (undocumented) variables under a session ID. Those are for internal Parallels RAS use only and should be ignored.

Using GetRASVariable.exe utility

The GetRASVariable.exe utility is located in the Parallels RAS installation folder (e.g. C:\Program Files (x86)\Parallels\ApplicationServer). To obtain a value of a variable, execute the utility from the command line passing the variable name as parameter (see the table above). The utility will output the value to the screen.

The following example displays the value of the TUX_REMOTECLIENT_MACHINE variable:

```
GetRASVariable.exe TUX_REMOTECLIENT_MACHINE
```

Maintenance and Backup

Keeping Parallels RAS up to date

By default, Parallels RAS checks for updates each time the RAS Console is started. If you wish to change this behavior:

1 Select the **Administration** category and click the **Settings** tab.

2 Select or clear the **Check for updates when launching Parallels RAS Console** option according to your needs.

3 To check for updates manually, click the **Check Now** button.

Backing up the Parallels RAS Farm configuration

To backup the Parallels RAS Farm configuration:

1 Select the **Administration** category and then click the **Settings** tab.

2 Click the **Export Settings** button.

3 You'll see a message box saying that all sites will be synchronized. Click **Yes** to continue with export or click **No** to abort it.

4 Specify the file name and target folder and click **Save**.

Note: The export procedure only exports the Parallels RAS Farm configuration data. Unrelated objects, such as downloaded OS, etc. are not included in the exported file.

To restore a Parallels RAS Farm configuration from a backup file, click the **Import Settings** button and select a backup file (the default file extension is `.dat2`). When you import a configuration from a file, your existing Farm configuration will be completely replaced with it.

You can also export and import a Parallels RAS Farm configuration from the command line. For complete instructions, please read on.

Exporting and Importing Farm Settings via Command Line

Parallels RAS PowerShell allows you to perform the majority of Parallels RAS administration tasks from the command line.

This section contains information about using PowerShell to export and import Farm settings. To learn more about Parallels RAS PowerShell, please visit https://www.parallels.com/products/ras/resources/ and download (or view online) the **Parallels RAS PowerShell Guide**.

One of the uses of exporting and importing Farm settings is running automated tests. Specific configurations can be created, exported, and then imported for specific test scenarios. You can also use this functionality with Windows task scheduler for regular backups of Farm settings.

Installing Parallels RAS PowerShell

RAS PowerShell is installed by default when you run the default Parallels RAS installation. If you haven't installed it (or to install it on a different computer), do the following:

1 Run the Parallels RAS installer.

2 Select **Custom** and then select the **Parallels RAS PowerShell** component.

3 Complete the wizard and install Parallels RAS PowerShell.

Using Parallels RAS PowerShell

The complete up-to-date information about Parallels RAS PowerShell can be found in the **Parallels RAS PowerShell Guide**. The guide includes the **Getting Started** chapter to help you quickly get started with Parallels RAS PowerShell, as well as the complete reference and code samples. Please visit https://www.parallels.com/products/ras/resources/ to view or download the guide.

Use the instructions below to export and import Parallels RAS Farm settings.

To import the Parallels RAS PowerShell module, open the PowerShell console and execute the following command:

```
Import-Module PSAdmin
```

Create a Parallels RAS session (use the name or IP address of the server where you have Parallels RAS installed):

```
New-RASSession -Server "server.company.dom"
```

To export Farm settings, execute the following command (substitute the path and filename of the backup file with your own):

```
Invoke-ExportSettings "C:\Backup\RAS-backup.dat2"
```

To import Farm settings:

```
Invoke-ImportSettings "C:\Backup\RAS-backup.dat2"
```

Problem Reporting and Troubleshooting

If you are experiencing an issue with Parallels RAS, you can search for a solution right from the RAS Console. If you can't find a solution, you can send a support request to Parallels. This section describes how to accomplish these tasks.

Search for a solution

To search for a solution from the RAS Console:

1 In the console, click **Help** on the main menu and choose **Troubleshooting and Request Support**.

2 The **Troubleshooting** dialog opens.

3 In the **Select Category** drop-down list, select a category you are having a problem with. The area in the middle of the dialog will be populated with a list of existing KB articles related to that category.

4 Click an article of interest to read in a web browser.

5 You can also click **Knowledge Base Index** or **Forums** links to go to the Parallels knowledge base or Parallels forums.

Request support

If you can't find a solution for your problem using the options described above, you can send a support request to Parallels. When you do, the collected logging information is retrieved and attached to the email, so that Parallels Support can analyze it. See **Logging** (p. 373) for more information.

Note: A support request creates a support ticket, which is then sent to Parallels Support. If you already have a request support ticket, you can send just the system report to Parallels without creating an additional (and identical) ticket. See the **Send a report** subsection below. Please note that if you don't have a valid RAS subscription or a support contract, the ticket will not be created. In order to receive support, you will need to purchase a subscription or support contract.

Before you request support, please make sure that you have a mailbox setup in the RAS Console. If you haven't set up a mailbox yet, do it as follows:

1 In the RAS Console, navigate to **Administration** / **Mailbox Setup**.

2 Enter your outgoing email server information, your email address, and the security/authentication information if needed.

3 You can send a test email by entering an email address in the field provided and clicking the **Send Test Email** button.

To send a support request to Parallels:

1 In the **Troubleshooting** dialog, click the **Send Support Request** button.

2 The **Contact Support** dialog opens.

3 Enter your full name and your company name.

4 Enter the subject. This will be used as a subject in the email that will be sent to Parallels Support.

5 In the **Enter your query** box, describe the issue the best you can.

6 Use the **Attachment** field to attach a file to the email. Click the **[...]** button to browse for a file. You can attach a picture or any other file that you think might help the Parallels Support to find a solution. Please note that the log files and the Parallels RAS settings are collected and attached to the email automatically, so you don't have to do it yourself.

7 In the drop-down list at the bottom of the dialog, select whether you want to send the email or save it (including the automatically collected information) as a zip file.

8 Depending on the action selected in the previous step, click **Send** to send the email or **Save** to save it as a zip file on your local drive or a network folder.

Send a report

If you already have a support request ticket, you can send just a system report to Parallels without creating a new ticket.

To send a report:

1. In the console, click **Help** on the main menu and choose **Upload System Report to Parallels**.
2. A dialog opens displaying the progress bar.
3. Once the system report data is collected and sent to Parallels, a message box is displayed containing the report number.
4. Click **OK** to finish.

Logging

Parallels RAS components are monitored and logs are created containing relevant information. Logs are used by Parallels RAS support engineers to analyze possible issues with a Parallels RAS installation. As a Parallels RAS administrator you have the ability to set the log level for a specific component or multiple components. By default, the standard log level is used, which collects and saves only the essential information. A Parallels RAS support engineer can ask you to enable the extended or verbose log level when an additional information is required to analyze an issue.

To set the log level for a specific component/server, navigate to the page in the RAS Console where the components of that type are listed (e.g. RD Session hosts, VDI, Gateways, Publishing Agents), select a component and then click **Tasks** (or right-click) > **Troubleshooting** > **Logging** > **Configure**. This opens the **Set Log Level** dialog where you can choose a log level from the following:

- **Standard** — This is the standard log level that records only the most important events. Unless you are asked by Parallels RAS support to use one of the log levels described below, you should always use this one.
- **Extended** — This logging involves more information than the standard logging, but it slows down the system because of the additional information that it needs to collect.
- **Verbose** — Verbose logging involves even more information than the extended logging and can slow down your system significantly.

Please note that to avoid degraded performance, extended and verbose logging should only be enabled for a limited time period (enough to collect the necessary information for analysis). You can set this time period using **Reset to the standard level after** option. The default value is 12 hours. In specific cases, a Parallels support engineer will advise you whether this time period should be set to a different value. Once this time period is over, the log level will be reset back to standard.

To retrieve a ZIP archive containing the log files, click **Tasks** (or right-click) > **Troubleshooting** > **Logging** > **Retrieve** and then specify a location where you want the file to be saved. The **Clear** item in the same context menu clears all logs.

Note that you can also set the log level on the **Farm** / <Site> / **Settings** / **Global logging** tab, where you can see RAS components of all types in one list. For more information, see **Site Settings** (p. 357).

Log rotation

Parallels RAS log rotation works as follows:

1. When the total size of all log files reaches a predefined size (200 MB by default), the logs are archived. This is done log by log by appending the current timestamp to the filename and starting a new empty log file.
2. A new ZIP file is created for each old log named %logname%_%DATE%.zip . (e.g. console_10.06.2018.zip, controller_10.06.2018.zip).
3. Renamed old logs are moved to the ZIP file. Parallels RAS keeps five ZIP files by default.
4. When the maximum number of archived files is exceeded, the oldest file is deleted.
5. This log rotation mechanism guarantees that the total log file size never exceeds X * Y * Z MB, where X is the total size of all log files (200 MB by default), Y is the maximum number of ZIP files (5 by default) and Z is the number of RAS components.
6. The X and Y values from the example above are pre-configured in Windows registry on a computer hosting a given RAS component. The default values are the same for every RAS component. To modify the values, navigate to HKEY_LOCAL_MACHINE > SOFTWARE > Wow6432Node > Parallels and set the LogMaxSize and LogMaxBackups values for a RAS component.

Suggest a Feature

If you have an idea of a new feature for Parallels RAS, we would like to hear from you! To suggest a feature, in the RAS Console, click **Help** on the main menu and choose **Suggest a Feature**. This will take you to the **Parallels RAS Feature Suggestion** web page where you can communicate your ideas to us. Please note that you must be signed in using your Parallels account email address and password to post in the feature suggestion forum.

CHAPTER 23

Parallels RAS Management Portal

This chapter gives you an overview of Parallels RAS Management Portal. For the complete information, please refer to **Parallels RAS Management Portal Guide**, which is available on the Parallels website at https://www.parallels.com/products/ras/resources/.

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Overview

Parallels RAS Management Portal is a modern web-based configuration and administration console designed for Parallels RAS administrators using a desktop/laptop computer or a mobile device to carry out configurations and day-to-day activities.

Parallels RAS Management Portal provides administrators with ability to:

- Centrally deploy, manage, and configure essential Parallels RAS components such as RD Session Hosts, Publishing Agents and Secure Client Gateways.
- Publish various resources from RD Session Hosts.
- Configure FSLogix Profile Container settings.
- Configure printing and scanning settings.
- Manage SSL certificates.
- Configure connection settings and MFA (Google Authenticator or other TOTP such as Microsoft Authenticator).

- Monitor and manage user sessions.
- Manage administrative accounts and sessions
- Configure mailbox.
- Manage your license.
- Contact support and provide necessary system reports.

Note: More features and capabilities that are currently available in the desktop-based Parallels RAS Console will be included in Parallels RAS Management Portal in future releases until it becomes the main management tool for Parallels RAS.

Prerequisites

RAS Management Portal can run in any modern web browser supporting HTML5 such as Microsoft Edge (Chromium-based), Google Chrome, Mozilla Firefox, Safari, etc.

Before installing the web service, make sure that your Windows server has the following updates installed (RAS Management Portal depends on them):

- Windows Server 2008 R2: — KB2999226 and KB2533623
- Windows Server 2012 R2 — KB2999226

If you don't have the updates installed and run the installer, it will ask you to install them. Newer versions of Windows Server do not require any specific updates.

The web service listens to web requests on the following ports by default:

- HTTPS: 20443
- HTTP: 20080

Installation

Prerequisites

RAS Management Portal can run in any modern web browser supporting HTML5 such as Microsoft Edge (Chromium-based), Google Chrome, Mozilla Firefox, Safari, etc.

Before installing the web service, make sure that your Windows server has the following updates installed (RAS Management Portal depends on them):

- Windows Server 2008 R2: — KB2999226 and KB2533623
- Windows Server 2012 R2 — KB2999226

If you don't have the updates installed and run the installer, it will ask you to install them. Newer versions of Windows Server do not require any specific updates.

The web service listens to web requests on the following ports by default:

- HTTPS: 20443
- HTTP: 20080

Installation

To enable RAS Management Portal in a RAS Farm, you need to install RAS Web Administration Service. It can be installed on the RAS Publishing Agent server or any other server.

To install RAS Web Administration Service:

1. Run the Parallels RAS installer on the RAS Publishing Agent or any other server.
2. On the **Select Installation Type** page, select **Custom**.
3. On the next page, select to install the **Parallels RAS Web Administration Service** component.
4. Click **Next** and follow the onscreen instructions.

Configuration

If the RAS Web Administration Service was installed on a separate server (not the RAS Publishing Agent server), you need to modify the service configuration and specify the RAS Publishing Agent server address. You may also want to change the port number and certificate information in the same configuration file.

The configuration of the RAS Web Administration service is saved as a JSON file at the following location:

- C:\Program Files (x86)\Parallels\ApplicationServer\WebAdminService\appsettings.json

To edit the file, open it in an advanced text editor like Wordpad or Notepad++. The file contains configuration parameters for the RAS Management Portal and the RAS REST API (p. 395), some of which are shared between the two. The following describes the parameters that apply to the RAS Web Administration service:

Key	Description
`WebAdminService{`	
`  WebConsole{`	
`    Enable`	Enable or disable the RAS Management Portal (true / false).
`  }`	
`  Session{`	
`    Expire`	The number of minutes that a session can remain idle before it is terminated.

} }	
AllowedHosts{	
EndPoints{	
HttpsDefaultCert{	
Url	HTTPS URL pattern and port number. The default port is 20443. You can specify a different port if needed.
Certificate{	This section is commented out by default. If you would like to specify a custom SSL certificate in PFX format, uncomment this section and specify values for the following two keys.
Path	A path to the PFX file.
Password	A file password.
}	
}	
Http{	
Url	HTTP URL pattern and port number. The default port is 20080. You can specify a different port if needed.
}	
}	
}	

Permissions

To allow access to RAS Management Portal features, a user (e.g. a helpdesk representative) must have sufficient rights. When creating a new user in Parallels RAS, use the Power Administrator or Custom Administrator role and grant the user the following permissions:

- Allow viewing of site information
- Allow session management
- Allow connection changes
- Allow viewing of RAS Reporting

For more information about setting up an administrator account, see **Managing Administrator Accounts** (p. 47).

Opening RAS Management Portal

To open the RAS Management Portal on the server where you've installed the RAS Web Administration Service, navigate to **Apps** > **Parallels** and click **Parallels Remote Application Server Management Portal**.

To open the console on a remote computer, enter the following URL in a web browser:

```
https://<IP-address>:20443
```

where `<IP-address>` is the address of the server where you have the RAS Web Administration Service installed. If you've changed the port number in the configuration file, specify the correct port.

The first page that opens is the **Sign In** page. Enter your RAS administrator username and password and click **Sign in**.

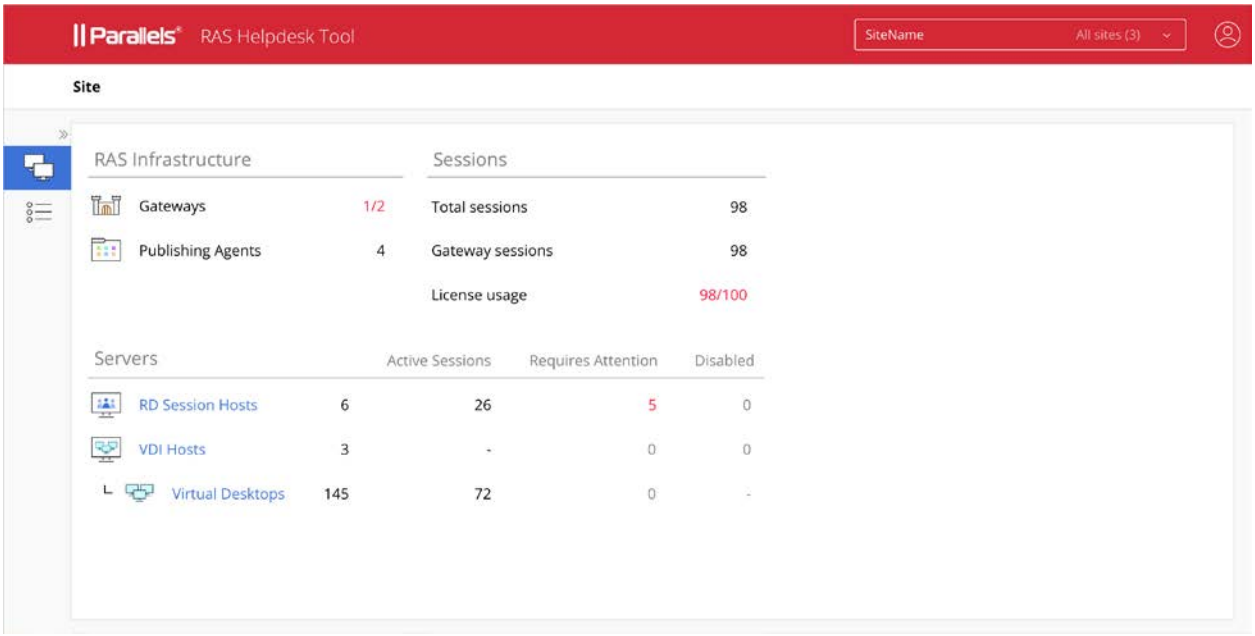
The User Menu

The user menu opens when you click on the "person" icon on the RAS Management Portal page header (in the upper right). The menu has the following info and options:

- *User name* — the name of the current user.
- **Give feedback** — allows you to give a feedback about the Console (p. 392).
- Log Off — logs the current user off.

The Site Page

When you open the console for the first time, the **Site** page is displayed with the information about the Licensing Site infrastructure. If you have more than one Site in the Farm, you can switch between them using the **Sitename** drop-down menu on the page header.



RAS Infrastructure

The **RAS Infrastructure** section contains the following information:

- Status of RAS Secure Client Gateway(s) in the following format: Number of OK Gateways / Total number of Gateways in the Site. For example, 1/2 means out of two Gateways, only one is working.
- Status of RAS Publishing Agent(s). Same display format is used as for Gateways above.

Session

The **Sessions** section contains the following:

- **Total sessions**. Total number of sessions on VDI providers and RD Session Hosts.
- **Gateway sessions**. Total number of sessions connected through all RAS Secure Client Gateways.
- **License usage**. Number of licenses used / License limit.

Servers

The **Servers** section displays an overview of the available servers of each type. The table columns are as follows:

- **Active Sessions**. The number of sessions in active state for a particular type of servers.
- **Requires Attention**. The number of servers that require attention. The servers are filtered by agent state and performance thresholds, such as agent state, CPU, RAM, Sessions, etc. You can click on this number to get full list of such servers.
- **Disabled**. The number of disabled servers for a particular type of servers.

Viewing server and session lists

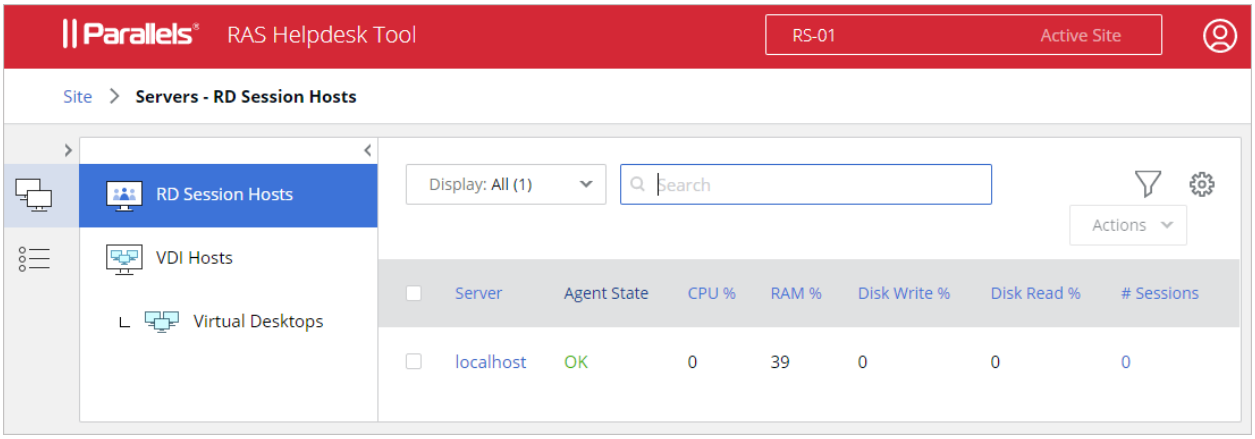
From the **Site** page, you can open the following pages:

- Click a server type (RD Sessions Hosts, VDI providers / Virtual Desktops) to view the list of individual servers of a particular type.
- Click the **Sessions** category in the sidebar to view the list of sessions. You can expand the sidebar to see the category descriptions (Site, Sessions) by clicking on the ">" icon.

Server and session management is described in detail in subsequent sections of this chapter.

Managing RD Session Hosts

To view the list of RD Session Hosts, on the **Site** page, click the **RD Session Hosts** link in the **Servers** section. The **Servers - RD Session Hosts** page opens:



The RD Session Host information includes the following (table columns):

- **Server**. Server name or IP address.
- **Agent State**. State of the server agent.

- **CPU %**. CPU load. Green/red comparing to predefined threshold (80%).
- **RAM %**. RAM. Green/red comparing to predefined threshold (80%).
- **Disk Write**. Disk Write time.
- **Disk Read**. Disk Read time.
- **# Sessions**. Number of sessions running on a server. Green/red comparing to threshold specified in server configuration.
- **Logon Status**. Whether logons are enabled on a server.
- **Group**. Server type.
- **Agent Version**. RAS agent version number.
- **Log Level**. Currently set log level.
- **Description**. Serve description.
- **Server ID**. Server ID.

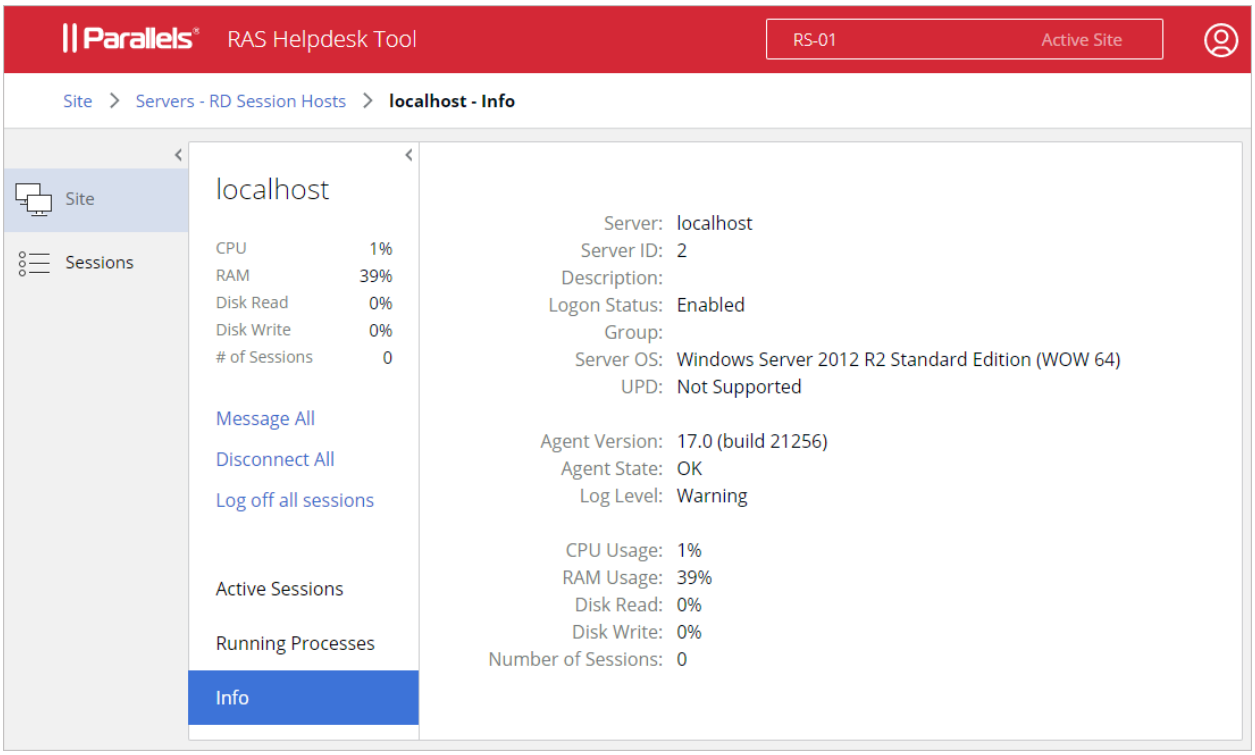
Note that some of the columns could be hidden. To show or hide columns, click the "gear" icon in the upper right-hand corner above the list and select or clear the desired columns.

The actions that you can perform here include the following:

- View server info (p. 383)
- View active sessions (p. 384)
- View running processes (p. 385)

Server Info

To view the RD Session Host info, on the **Site** > **Servers - RD Session Hosts** page, locate a server of interest and click its name/IP address in the **Server** column. The following page opens:



Note the selected **Info** item in the sidebar (you can also select **Active Sessions** and **Running Processes**, which are described in the subsequent sections). The server information is displayed in the right pane. The information is similar to what is displayed on the **Site** page with some additional info added, such as the currently set log level, who and when created the server and when it was last modified.

The other action items in the sidebar are:

- **Active Sessions** — displays a page with a list of active sessions for this particular RD Session Host.
- **Running Processes** — displays a page with a list of running processes for this particular RD Session Host.

Active sessions and processes are described in the sections that follow this one.

Active Sessions

To view active session for an RD Session Host, on the **Site** > **Servers - RD Session Hosts** page, click the server name and then click **Active Sessions** in the sidebar. The **Sessions** page opens with a filter applied to display sessions for the selected RDS host.

The session information includes the following:

- **User**. User name.
- **Session ID**. Session ID.
- **Server**. Remote server name or IP address.
- **Theme**. Theme name.
- **Protocol**. Protocol used.
- **State**. Whether the session is active.
- **Logon Time**. The time the user logged on.
- **Duration**. Session duration (called "Session Length" in the RAS Console).
- **Idle Time**. Session idle time.
- **Type**. Session type (e.g. Admin).
- **Resolution**. Screen resolution used.
- **Color Depth**. Color depth used.
- **Device Name**. Client device name.
- **IP Address**. Client IP address.
- **Group**. Group name.

Note that some of the columns could be hidden. To show or hide columns, click the "gear" icon in the upper right-hand corner above the list and select or clear the desired columns.

You can filter the list by any of the available column. To do so, select a checkbox in front of the server name and then click the "funnel" icon at the top. In the dialog that opens, select a desired column and specify criteria. You can add more columns if needed.

The drop-down menu to the left of the **Search** field allows you to apply a predefined filter based on the value of the **State** column. The available options are:

- **All sessions** — displays all sessions (no filter).
- **Active** — displays only the active sessions.
- **Idle** — displays only the idle sessions.
- **Disconnected** — displays only the disconnected sessions.

The **Actions** menu allows you to perform the following tasks (you can also right-click on a session to access the same menu):

- **Disconnect**. Disconnects the user from the server.
- **Log off**. Logs the user off.
- **Message**. Allows you to send a text message to the user.
- **Show running processes**. Shows the running processes (see the section that follows this one for details).

Running Processes

To view running processes for an RD Session Host, on the **Site** > **Servers - RD Session Hosts** page, click the server name and then click **Running Processes** in the sidebar. The page that opens displays the information about processes running in active user sessions on the selected RD Session Host.

The process information includes the following:

- **Name**. Process name.
- **Process Name**. The name of the binary behind the process.
- **PID**. Process ID.
- **User**. User name.
- **Session ID**. Session ID to which the process belong.
- **Server**. Remote server name or IP address.
- **Server ID**. Remote server ID.

Note that some of the columns could be hidden. To show or hide columns, click the "gear" icon in the upper right-hand corner above the list and select or clear the desired columns.

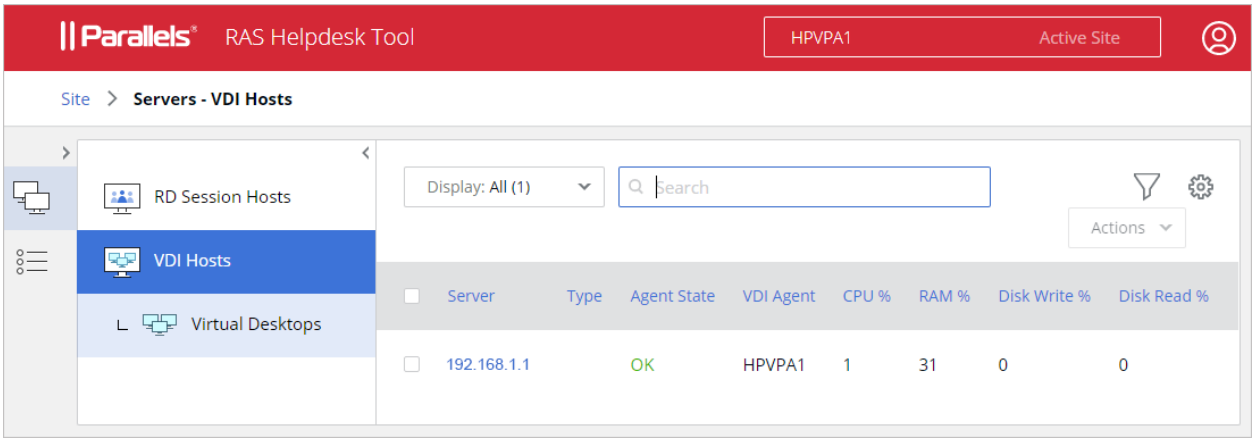
You can filter the list by any of the available column. To do so, select a checkbox in front of the process name and then click the "funnel" icon at the top. In the dialog that opens, select a desired column and specify criteria. You can add more columns if needed.

The **Actions** menu (or right-clicking on a process) allows you to perform the following task:

- **Kill process**. Kills the selected process. You can select more than one process if needed.

Managing VDI Providers

To view the list of VDI providers, on the **Site** page, click the **VDI Providers** link in the **Servers** section. The **Servers - VDI Providers** page opens:



The VDI provider information includes the following (table columns):

- **Server**. Server name or IP address.
- **Type**. VDI type.
- **Agent State**. State of the server agent.
- **VDI Agent**. Address of the agent that manages this server.
- **CPU %**. CPU load. Green/red comparing to predefined threshold (80%).
- **RAM %**. RAM. Green/red comparing to predefined threshold (80%).
- **Disk Write**. Disk Write time.
- **Disk Read**. Disk Read time.
- **Log Level**. Currently set log level.
- **Description**. VDI provider description.
- **ID**. VDI provider ID.
- **Agent Version**. RAS agent version number
- **VDI Port**. Port number.
- **VDI Username**. User name.
- **Active Connections**. The number of active connections.

Note that some of the columns could be hidden. To show or hide columns, click the "gear" icon in the upper right-hand corner above the list and select or clear the desired columns.

You can filter the list by any of the available column. To do so, select a checkbox in front of the server name and then click the "funnel" icon at the top. In the dialog that opens, select a desired column and specify criteria. You can add more columns if needed.

The drop-down menu to the left of the **Search** field allows you to apply a predefined filter to the list. The available options are:

- **All** — displays all VDI providers (no filter).
- **Requires attention** — the list is filtered by agent state and performance thresholds, such as agent state, CPU, RAM, Sessions, etc.
- **Enabled from settings** — only the servers that are enabled in the server settings are displayed (based on the **Agent State** column value).
- **Disabled from settings** — only the servers that are disabled in the server settings are displayed (based on the **Agent State** column value).

To perform actions on a VDI provider, select the checkbox in the first column and click the **Actions** drop-down menu (or right-click on a host). The following actions are available:

- **Show hosted VDI Desktops** — opens the page with the list of VDI desktops. Note that the page has a filter applied to include only the desktops hosted by the selected server (click the "funnel" icon to view the filter). The page is described in the **Virtual Desktops** section (p. 388).
- **Show Active Sessions** — opens the **Sessions** page displaying the list of active sessions on the selected VDI provider. The page is also filtered out to include only the sessions for the selected VDI provider.

VDI Provider Info and Actions

To view the VDI provider info, on the **Site** > **Servers - RD Session Hosts** page, locate a server of interest and click its name/IP address in the **Server** column. A page displaying the VDI provider info appears. Note that the **Host Info** item is selected in the sidebar on the left.

The server information is displayed in the right pane. The information is similar to what is displayed on the **Site** page with some additional info added, such as Server OS and Max Guests.

Show VDI Desktops

To show the VDI Desktops (guest VMs) that run on the given VDI provider, click the **Show VDI Desktops** link in the sidebar. See **Virtual Desktops** (p. 388) for more information.

Sending a message to sessions

To send a text message to sessions running on the given host, click the **Message All** link in the sidebar. In the dialog that opens, enter the message title and text and click **Send**.

Stopping all desktops

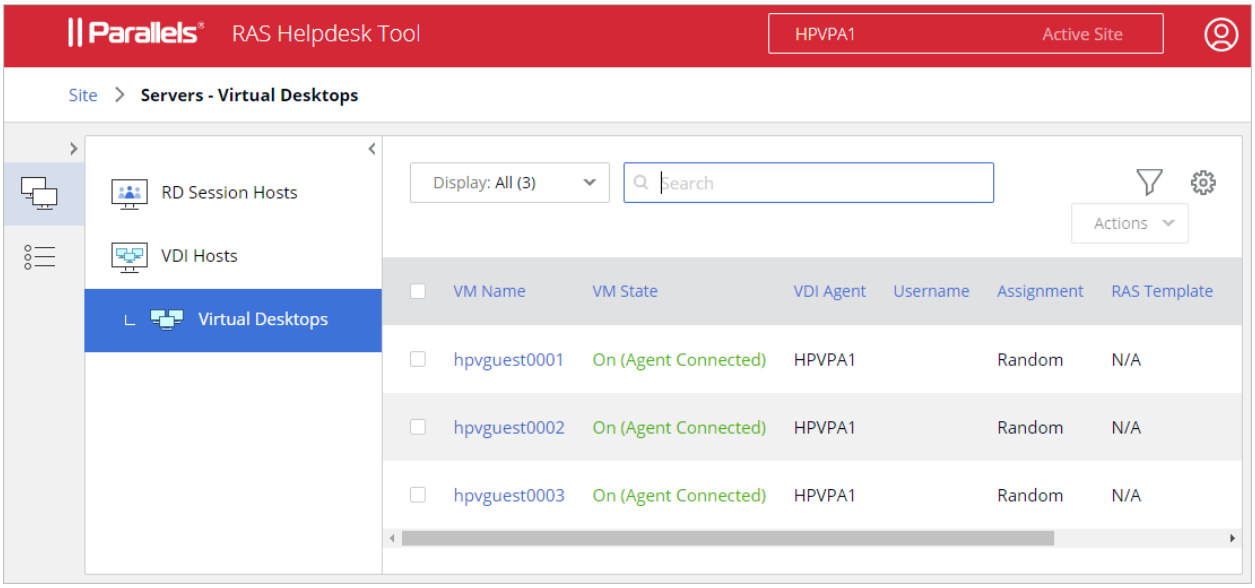
To stop all virtual desktops running on the given VDI provider, click the **Stop all Desktops** link.

Virtual Desktops

The **Virtual Desktops** page lists the available VDI desktops (guest VMs). It can be opened from a number of locations in the RAS Management Portal. To view the page, do one of the following:

- On the **Site** page, click the **Virtual Desktops** link.
- On the **Site > Servers - VDI Providers** page, click the **Virtual Desktops** link.
- On the VDI provider information page, click the **Show VDI Desktops** link.

All of the above open the same **Server - Virtual Desktops** page:



The **Virtual Desktops** page contains the following information (table columns):

- **VM Name**. Guest VM name.
- **VM State**. Guest VM state.
- **VDI Agent**. VDI Agent information.
- **Username**. User name.
- **Assignment**. Guest VM assignment information.
- **Template**. The name of the template used.
- **IP Address**. Guest VM IP address.
- **Provider**. The name or IP address of the VDI provider.

- **Type**. VDI type.
- **Agent State**. Agent status.
- **Host OS**. The VDI provider operating system.
- **Log Level**. Currently set log level.
- **ID**. Guest VM ID.

Some of the columns could be hidden. To show or hide columns, click the "gear" icon in the upper right-hand corner above the list and select or clear the desired columns.

You can filter the list by any of the available column. To do so, select a checkbox in front of the server name and then click the "funnel" icon at the top. In the dialog that opens, select a desired column and specify criteria. You can add more columns if needed.

The drop-down menu to the left of the **Search** field allows you to apply a predefined filter to the list. The available options are:

- **All** — displays all VDI providers (no filter).
- **Requires attention** — the list is filtered by agent state and performance thresholds, such as agent state, CPU, RAM, Sessions, etc.
- **Powered OFF** — only the powered off virtual desktops are displayed.
- **Powered ON** — only the powered on desktops are displayed.
- **Persistent** — only the virtual desktops that are marked as persistent are displayed.
- **Non-persistent** — only the non-persistent virtual desktops.

The **Actions** drop-down menu (or right-clicking on a VM) allows you to perform the following actions on a virtual desktop:

- **Start**
- **Stop**
- **Restart**
- **Suspend**

Virtual desktop information

To view the information about a particular virtual desktop, click its name in the **Server** column. The page that opens displays the virtual desktop information similar to what is displayed in the Virtual Desktops list with some additional items added.

Active sessions and running processes

To view active sessions and running processes for the virtual desktop, click the corresponding link in the sidebar on the left.

When managing sessions, the **Actions** menu (or right-clicking on a VM) allows you to perform the following tasks:

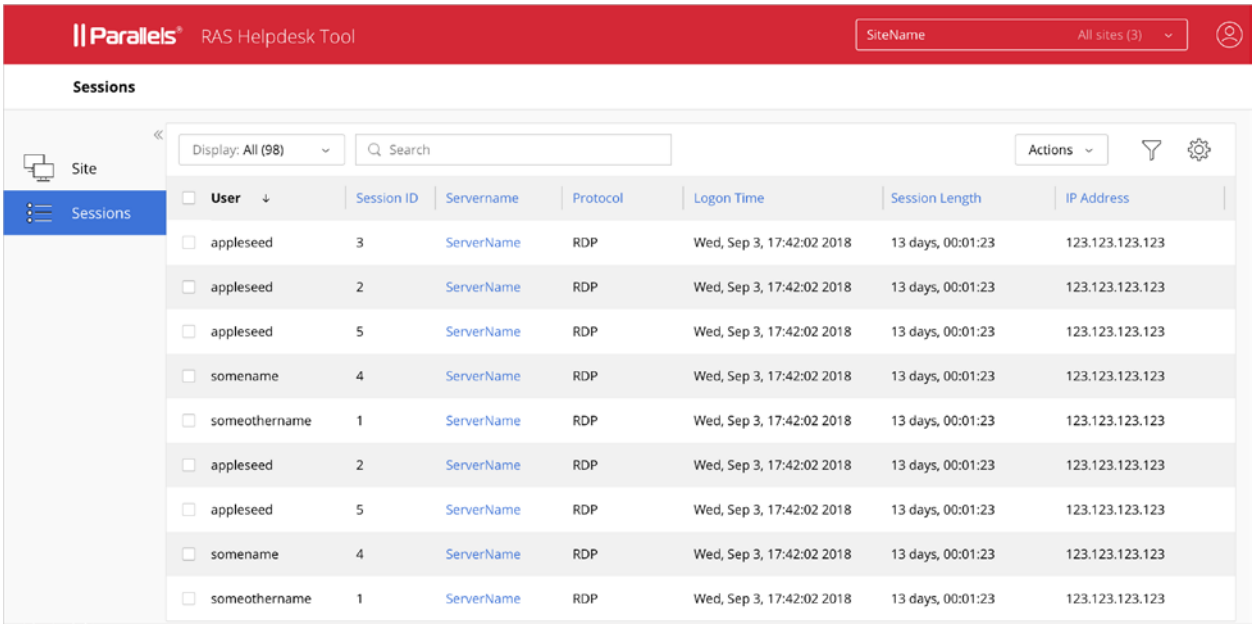
- **Disconnect**. Disconnects the user from the server.
- **Log off**. Logs the user off.
- **Message**. Allows you to send a text message to the user.

When managing running processes, the list contains processes running in active user sessions on the selected virtual desktop. The following information is displayed for a process:

- **Name**. Process name.
- **Process Name**. The name of the binary behind the process.
- **PID**. Process ID.
- **User**. User name.
- **CPU %**. CPU consumption by this user.
- **Session ID**. Session ID to which the process belong.
- **Server**. Remote server name or IP address.
- **Server ID**. Remote server ID.

Managing Sessions

To view all sessions from all RD Sessions Hosts and VDI desktops, click the **Sessions** item in the main sidebar on the left side of the screen.



The session information includes the following (table columns):

- **User**. User name.
- **Session ID**. Session ID.
- **Server**. Server name or IP address.
- **Theme**. Theme name.
- **Protocol**. Protocol used.
- **State**. Session state.
- **Logon Time**. The time the user logged on
- **Duration**. Session duration (called "Session Length" in the RAS Console).
- **Idle Time**. Session idle time.
- **Type**. Session type (e.g. Admin).
- **Resolution**. Screen resolution used
- **Color Depth**. Screen color depth.
- **Device Name**. Client device name.
- **IP Address**. Client IP address.
- **Group**. Group name.
- **VDI Provider**. Name of the VDI provider on which this session is running.

To perform actions on a session, select the checkbox in the first column and click the **Actions** drop-down menu (or right-click on a user). The actions include the following:

- **Disconnect**. Disconnects the user.
- **Log off**. Logs off the user.
- **Message**. Open a dialog where you can type and send a text message to the user.
- **Show Running Processes**. Opens the server page with the session list filtered to display only the processes for the selected session.

Configuring RAS Web Administration Service

The configuration of the RAS Web Administration service is saved as a JSON file at the following location:

C:\Program Files (x86)\Parallels\ApplicationServer\WebAdminService\appsettings.json

To edit the file, open it in an advanced text editor like Wordpad or Notepad++. The file contains configuration parameters for the RAS Management Portal and the RAS REST API (p. 395), some of which are shared between the two. The following describes the parameters that apply to the RAS Web Administration service:

Key	Description
WebAdminService{	
WebConsole{	
Enable	Enable or disable the RAS Management Portal (true / false).
}	
Session{	
Expire	The number of minutes that a session can remain idle before it is terminated.
}	
}	
AllowedHosts{	
EndPoints{	
HttpsDefaultCert{	
Url	HTTPS URL pattern and port number. The default port is 20443. You can specify a different port if needed.
Certificate{	This section is commented out by default. If you would like to specify a custom SSL certificate in PFX format, uncomment this section and specify values for the following two keys.
Path	A path to the PFX file.
Password	A file password.
}	
}	
Http{	
Url	HTTP URL pattern and port number. The default port is 20080. You can specify a different port if needed.
}	
}	
}	

Give Us a Feedback

We would like to hear from you! To give us a feedback about Parallels RAS Management Portal, click the "person" icon on the console header and then click **Give feedback**. This will open the Parallels RAS forums page where you can share your experience and thoughts with us. Thank you!

CHAPTER 24

Parallels RAS APIs

Parallels RAS comes with APIs to help you develop custom applications that integrate with it. This includes RAS PowerShell API and RAS REST API.

In addition, the RAS HTML5 Gateway API and Parallels Client URL scheme allow you to integrate with Parallels Client for Windows/macOS/Linux/iOS/Android and the RAS HTML5 Client.

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RAS PowerShell API

RAS PowerShell API is intended for RAS administrators who would like to automate their RAS administration. The API includes commands to perform most of the RAS management tasks.

Parallels RAS requirements

The Parallels RAS PowerShell API version must match the version of the RAS Publishing Agent with which it communicates. Since the two components can be installed separately, you need to make sure that their versions match.

Microsoft Windows component requirements

The following components must be installed on the computer where you'll be executing Parallels RAS PowerShell cmdlets:

- Windows PowerShell 3.0 or higher
- Microsoft .NET Framework 4.5.2 or higher

Installation

To install Parallels RAS PowerShell, run the standard Parallels RAS installer, choose **Custom** installation, and then select to install the **Parallels RAS PowerShell** component. Follow the onscreen instructions to install the component.

Basic concepts

To quickly get started with RAS PowerShell, do the following:

1. Open the Windows PowerShell console.
2. In the console, type the following command to import the Parallels RAS PowerShell module:

   ```
   Import-Module PSAdmin
   ```

3. Create a Parallels RAS session by executing the `New-RASSession` cmdlet (see example below). Substitute the server name (in quotes) with the name or IP address of your Parallels RAS Licensing Server. Type your RAS administrator username and password when prompted:

   ```
   New-RASSession -Server "server.company.dom"
   ```

4. Execute the following cmdlet to see the list of cmdlets included in the Parallels RAS PowerShell module:

   ```
   Get-Command -Module PSAdmin
   ```

5. Execute other cmdlets. For example, try executing the `Get-GW` cmdlet to retrieve information about RAS Secure Client Gateway(s). The example below returns information about all RAS Secure Client Gateways available in the RAS Licensing Server Site:

   ```
   Get-GW
   ```

6. To see help for a cmdlet, execute `Get-Help` passing a cmdlet name:

   ```
   Get-Help Get-GW
   ```

7. To apply changes you've made to the Farm configuration, use the `Invoke-Apply` cmdlet (this performs the same action as the **Apply** button in the RAS Console):

   ```
   Invoke-Apply
   ```

8. To activate a Parallels RAS license, use the `Invoke-LicenseActivate` cmdlet:

   ```
   Invoke-LicenseActivate
   ```

   When executing the cmdlet above, you'll be prompted to enter your Parallels account email address and password. You can include an optional `-Key` parameter and specify a Parallels RAS license key. If omitted (as in the example above), Parallels RAS is activated as a trial.

Parallels RAS PowerShell Guide

The complete **Parallels RAS PowerShell Guide** (online HTML and downloadable ZIP versions) is available on the Parallels website at the following location:
https://www.parallels.com/products/ras/resources

RAS REST API

This section gives you an introduction to the RAS REST API. Read it to learn about system requirements, installation, configuration, and basic usage.

Installation

To enable RAS REST API in a RAS Farm, you need to install the RAS Web Administration Service. It can be installed on the RAS Publishing Agent server or any other server. If you install the service on a separate server, you will need to change its configuration (after the installation) to point to RAS Publishing Agent. By default, the configuration points to "localhost".

Note: If you've already configured and are using Parallels RAS Management Portal, you may skip this step because you should already have the RAS Web Administration Service installed.

To install RAS Web Administration Service:

1. Run the Parallels RAS installer on the RAS Publishing Agent or any other server.
2. On the **Select Installation Type** page, select **Custom**.
3. On the next page, select to install the **Parallels RAS Web Administration Service** component.
4. Click **Next** and follow the onscreen instructions.

Configure RAS Web Administration Service

If the RAS Web Administration Service was installed on a separate server, you need to modify its configuration and specify the RAS Publishing Agent server address. You may also want to change the port number and certificate information in the same configuration file. For details about configuring RAS Web Administration Service, please refer to KB article https://kb.parallels.com/en/124701.

When modifying the service configuration, please note the following:

- In the configuration JSON file, the RAS Publishing Agent address is specified using the "LicenseServer" parameter.
- The default HTTPS port number is set to 20443. This number is chosen not to conflict with RAS Secure Client Gateway ports. You can change it to 443 (if possible), so when opening the portal, you don't have to include the port in the URL.

Permissions

To access any of the RAS REST resources, the user executing a request must have sufficient rights to access a particular resource. These are basically the same rights a RAS administrator has in the Parallels RAS Console. For example, a root administrator can access any of the RAS REST resources. On the other hand, a power administrator who doesn't have rights to modify Site settings (as an example) will not be able to access a corresponding REST resource. Similarly, a custom administrator who, for instance, only has rights to view and modify RD Session Hosts will be able to access just that particular REST resource and no other.

Getting started

Applications communicate with Parallels RAS by sending HTTP or HTTPS requests. Parallels RAS answers with a JSON file in a response to every HTTP request.

All HTTP requests that you will use to retrieve and manage Parallels RAS resources have the following base structure:

```
https://<API-host>/api/<URI>
```

The parameters in the above URL are:

- `<API-host>` is the IP address or FQDN of the server on which the RAS Web Administration Service is installed.
- `<URI>` is a path to a REST resource that you would like to work with.

Logging in and sending requests

This section contains an example of RAS REST API usage that can help you quickly get started. The example demonstrates how to:

1. Login to Parallels RAS and obtain a session token.
2. Retrieve the information about all available RD Session Hosts.
3. Retrieve the information about a specific RD Session Host.
4. Modify RD Session Host properties.

Log in to Parallels RAS and obtain a session token

Before you can access any of the resources, you need to log in to Parallels RAS using administrator credentials and obtain a session token. This is accomplished by sending the following request:

```
POST https://<API-host>/api/session/logon
```

Request headers: The logon request must contain just the Content-Type request header. Subsequent requests must additionally contain the auth_token header, as you'll see in the examples that follow this one.

Content-Type: application/json; api-version=1.0

Request body: The request body must contain the RAS administrator user name and password.

```
{
 "username": "USER",
 "password": "PASSWORD"
}
```

Response: After sending the logon request, you will receive a reply containing the session token, which you will use in all subsequent requests:

```
{
 "authToke    n": "Lj+KddoJkANhzvbDRvB=K=DFCroRjXJHeeWGbGlIRKaz-EXplbmhVWvWTiDVqtOq"
}
```

Retrieve information about RD Session Hosts

Now that we have the session token, we can send requests to access various resources. In this example we'll first obtain the information about all available RD Session Hosts. In the example that follows, we'll obtain the information about a specific RD Session Host.

To retrieve the RD Session Host info, send the following request:

```
GET https://<API-host>/api/RDS
```

Request headers: This time the auth_token request header must also be included and must contain the session token that we've obtained earlier.

Content-Type: application/json; api-version=1.0

auth_token: Lj+KddoJkANhzvbDRvB=K=DFCroRjXJHeeWGbGlIRKaz-EXplbmhVWvWTiDVqtOq

Response: The response will look similar to the following (with multiple RD Session Hosts in the Farm each block of the result set will contain the information about an individual server).

```
[
    {
        "directAddress": "IP_ADDR",
        "rasTemplateId": 0,
        "inheritDefaultAgentSettings": true,
        "inheritDefaultPrinterSettings": true,
        "inheritDefaultUPDSettings": true,
        "inheritDefaultDesktopAccessSettings": true,
        "port": 3389,
        …
        "restrictDesktopAccess": false,
        "restrictedUsers": [],
        "server": "IP_ADDR",
        "enabled": true,
        "description": "",
```

```
        "siteId": 1,
        "id": 2
    }
]
```

Retrieve information about a specific RD Session Host

To retrieve the information about a specific server, we'll use the same request as above but will add the server ID at the end:

```
GET https://<API-host>/api/RDS/2/
```

The response will also be similar to the example above and will contain the information just for the specified server.

Modify RD Session Host properties

In this example we'll modify a property of the RD Session Host that we retrieved earlier. For simplicity let's modify the "description" field.

The request to modify properties of an RD Session Host has the following syntax:

```
PUT https://<API-host>/api/RDS/2/
```

Note the "2" at the end of the request, which specifies the ID of the RD Session Host that we want to modify.

Request headers:

- Content-Type: application/json; api-version=1.0
- auth_token: Lj+KddoJkANhzvbDRvB=K=DFCroRjXJHeeWGbGIlRKaz-EXplbmhVWvWTiDVqtOq

Request body:

```
{
    "description": "description was updated!"
}
```

Response: If the PUT request succeeds, you will get an empty response with code "204: No Content". To verify that the "description" field was in fact modified, let's use the same GET request that we used earlier: GET https://<API-host>/api/RDS/2/

As we can see, the result now contains the updated "description" field:

```
[
    {
        "directAddress": "IP_ADDR",
        "rasTemplateId": 0,
        "inheritDefaultAgentSettings": true,
        …
        "server": "IP_ADDR",
        "enabled": true,
        "description": "description was updated!",
```

```
        "siteId": 1,
        "id": 2
    }
]
```

Configuring RAS Web Administration Service

If the RAS Web Administration Service was installed on a separate server, you need to modify its configuration and specify the RAS Publishing Agent server address. You may also want to change the port number and certificate information in the same configuration file. For details about configuring RAS Web Administration Service, please refer to KB article https://kb.parallels.com/en/124701.

When modifying the service configuration, please note the following:

- In the configuration JSON file, the RAS Publishing Agent address is specified using the "LicenseServer" parameter.
- The default HTTPS port number is set to 20443. This number is chosen not to conflict with RAS Secure Client Gateway ports. You can change it to 443 (if possible), so when opening the portal, you don't have to include the port in the URL.

More information

Parallels RAS REST API comes with the **Parallels RAS REST API Guide**. The guide contains more examples and the complete resource and schema reference. To view and download the guide, visit https://www.parallels.com/products/ras/resources/

RAS HTML5 Gateway API and Parallels Client URL Scheme

RAS HTML5 Gateway API and Parallels Client URL scheme allow you to integrate with Parallels clients.

Using the RAS HTML5 Gateway API or the URL scheme, you can implement an in-house solution, such as an application hub or web portal, for authenticating users and launching remote applications, desktops, and other published resources. Such an implementation is possible by integrating a custom solution with Parallels RAS clients, including Parallels clients for supported platforms (Windows, macOS, Linux, iOS, Android) and RAS HTML5 Client.

The following is a quick summary of the API and the URL scheme:

- **RAS HTML5 Gateway API** — provides connection, user authentication, and resource launching methods called from a web browser via the RAS HTML5 Gateway.

- **Parallels Client URL Scheme** — a custom URL scheme that allows you to perform actions in a Parallels Client installed on a user device. Actions include configuring a connection, authenticating a user, and launching published resources.

RAS HTML5 Gateway API and Parallels Client URL scheme are described in detail in the **Integrating with Parallels RAS Clients** guide, which is available for download on the Parallels website at the following location: https://www.parallels.com/products/ras/resources/

CHAPTER 25

Appendix

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Port Reference

Parallels Client

Source	Destination	Protocols	Ports	Description
Parallels Client	HALB	TCP, UDP TCP, UDP TCP, UDP	80, 443 3389 20009	Management and user session connections. Optional - Used for user session if RDP Load Balancing is enabled. Client Manager shadowing via Firewall (indirect network connection).
	RAS Secure Client Gateway (Normal and Forwarding modes)	TCP, UDP TCP, UDP TCP, UDP UDP	80, 443 3389 20009 20000	Management and user session connections. Optional - Used for user session if RDP Load Balancing is enabled. Client Manager shadowing via Firewall (indirect network connection). **Note:** Since RAS v16, Secure Client Gateways (in Forwarding mode) do not support client management. Secure Client Gateway lookup broadcast.
	RDP Session	TCP, UDP	3389	Used for user session connections in Direct Mode only. RDP connection is always encrypted.

Web Browsers

Source	Destination	Protocols	Ports	Description
Web browser (HTML5)	HALB	TCP	443	End-user access to Parallels RAS HTML5 Client (on Secure Client Gateway in Normal mode) through the HALB.
	RAS Secure Client Gateway	TCP	443	End-user access to Parallels RAS HTML5 Client (on Secure Client Gateway in Normal mode).
	RAS Management Portal	TCP	443	Admin access to HTML5 based Management Console of RAS environment.

HALB

Source	Destination	Protocols	Ports	Description
HALB	HALB	VRRP	112	HALB to HALB communication used for automatic assignment of VIP to active HALB.
	RAS Secure Client Gateway in Forwarding Mode	TCP, UDP TCP, UDP	80, 443 3389	Management and user session connections. Optional - Used for user session if RDP Load Balancing is enabled.
	RAS Secure Client Gateway in Normal Mode	TCP, UDP TCP, UDP TCP, UDP	80, 443 3389 20009	Management and user session connections. Optional - Used for user session if RDP Load Balancing is enabled. Client Manager shadowing via Firewall (indirect network connection).

RAS Secure Client Gateway

Source	Destination	Protocols	Ports	Description
RAS Secure Client Gateway in Forwarding mode	RAS Secure Client Gateway in Normal mode	TCP, UDP TCP, UDP	80, 443 3389	Management and user session connections. Optional - Used for user session if RDP Load Balancing is enabled.
	RAS Performance Monitor	TCP	8086	Agent (Telegraf service) sends collected performance data to InfluxDB.
RAS Secure Client Gateway in Normal mode	Remote Desktop Services	TCP, UDP	3389	RDP Connections.
	RAS Publishing Agent	TCP	20002	RAS Publishing Agent service port - communications with RAS Secure Client Gateways and the RAS Console (in Normal mode only).
	RAS Performance Monitor	TCP	8086	Agent (Telegraf service) sends collected performance data to InfluxDB.
	Localhost	TCP	20020	Communication with HTML5 Gateway web server (NodeJS).

RAS Publishing Agent

Source	Destination	Protocols	Ports	Description
RAS Publishing Agent	RAS Publishing Agent	TCP	20001 20030	Redundancy service. Communication between RAS Publishing Agents running in the same site.
	Parallels Licensing Server	TCP	443	RAS Publishing Agent (primary Publishing Agent in Licensing Site) communicates with Parallels Licensing Server (https://ras.parallels.com). **Note:** Not required for Tenant Broker RAS Publishing Agent (see the **Tenant Broker** section).
	RAS Performance Monitor	TCP	8086	Agent (Telegraf service) sends collected performance data to InfluxDB.
	RAS RD Session Host Agent	TCP, UDP	30004	Server for Publishing Agent requests.
	RAS VDI Agent	TCP, UDP	30006	VDI Agent communication port.
	RAS Guest Agent	TCP UDP	30010 30009	Used by RAS Console during RAS Template creation. Used by components on the destination RDS/guest/Remote PC for internal communication. Client does not use it.
	RAS Remote PC Agent	TCP, UDP	30004	RAS Remote PC Agent communication port (Agent status, counters and session information).
	MFA Server(s)	TCP, UDP	8080, 80, 1812, 1813	Deepnet / Safenet / Radius
	RAS Enrollment Server	TCP	30030	RAS Publishing Agent Sends RAS Enrollment Server connection request.

RAS Console

Source	Destination	Protocols	Ports	Description
RAS Console	RAS Reporting	TCP	30008	RAS Console is connected to primary RAS Publishing Agent which communicates with RAS Reporting (installed on the same host as SSRS). SSRS talks to SQL via TCP 1433 (or dynamic if 1433 is not established in the settings).
	HALB	TCP, UDP	31006	Used for configuration.
	Parallels Client	TCP	50005	Shadowing from the RAS Console in case of direct network connection.

	RAS RD Session Host Agent RAS Guest Agent RAS Remote PC Agent RAS Publishing Agent RAS Secure Client Gateway RAS Enrollment Server	TCP	135, 445, 49179	Remote install push/takeover of software.
	RAS RD Session Host Agent	UDP, TCP	30004	Used for the "Check Agent" task. Used to manage components.
	RAS Guest Agent	TCP UDP	30010 30009	Used for the "Check Agent" task. Used to manage components.
	RAS Remote PC Agent	UDP, TCP	30004	Used for the "Check Agent" task. Used to manage components.
	RAS VDI Agent	UDP, TCP	30006	Used for the "Check Agent" task. Used to manage component.
	MFA Server(s)	TCP, UDP	8080, 80, 1812, 1813	Deepnet / Safenet / Radius
	www.turbo.net	TCP	80, 443	**Note:** Turbo.net public repository integration with the RAS console has been deprecated in Parallels RAS 18, but existing Turbo.net applications already configured on the RD Session Hosts will remain available. The ports are used to obtain app categories and available app metadata for Turbo public repository.
	RAS Performance Monitor	TCP	3000	Performance Dashboard in the Monitoring category (Grafana connection).
	RAS Publishing Agent	TCP	20002, 20001 30020	Communication with Publishing Agent and redundancy. 30020 - remote agent pushing.
	RAS Enrollment Server	TCP, UDP	30030	Used for the "Check Agent" task. Used to manage components and for troubleshooting.
	Wyse Broker	UDP	1234 (outbound only) 68 (inbound only)	Wyse broker discovery request broadcast packet (V_WYSEBCAST). Wyse broker discovery reply packet (V_WYSETEST).

RAS VDI Agent

Source	Destination	Protocols	Ports	Description
RAS VDI Agent	RAS Publishing Agent	TCP	20003	Publishing Agent communication port.
	RAS Guest Agent	TCP	135, 49152-65535	WMI ports. Port 135 is a standard RPC port. WMI also uses a randomly assigned port from the 49152-65535 range in Windows Vista, 2008 and above.
	RAS Performance Monitor	TCP	8086	Agent (Telegraf service) sends collected performance data to InfluxDB - applicable to Hyper-V only.
	Hyper-V	TCP	135, 49152-65535	WMI ports. Port 135 is a standard RPC port. WMI also uses a randomly assigned port from the 49152-65535 range in Windows Vista, 2008 and above.
	Nutanix	TCP	9440	Nutanix REST port
	VMWare	TCP	443	Taken from Required Ports for vCenter Server . This port is also used for the following services: - WS-Management (also requires port 80 to be open) - Third-party network management client connections to vCenter Server - Third-party network management clients access to hosts

RAS Enrollment Server

Source	Destination	Protocols	Ports	Description
RAS Enrollment Server	RAS Publishing Agent	TCP UDP	20003 20003	Settings synchronization and performance counters. Deny connection request.
	Certificate Authority (CA)	TCP TCP	135 dynamic range: 49152 - 65535	DCOM/RPC ports.

RAS Agents: RD Session Host, Guest, Remote PC

Source	Destination	Protocols	Ports	Description
RAS RD Session Host Agent	RAS Publishing Agent	TCP, UDP	20003	Used for communications with RAS Publishing Agents.
	Localhost	TCP	30005*	For internal commands (memshell, printer redirector).
	www.turbo.net	TCP	80, 443	**Note:** Turbo.net public repository integration with the RAS console has been deprecated in Parallels RAS 18 and newer, but existing Turbo.net applications already configured on the RD Session Hosts will remain available. The ports are used for downloading the Turbo installation package and to download and install/update application containers.
	RAS Performance Monitor	TCP	8086	Agent (Telegraf service) sends collected performance data to InfluxDB.
	RAS Enrollment Server	TCP	30030	RAS RD Session Host Agent (PrlsSCDriver) connects to get logon credentials.
RAS Guest Agent	RAS Publishing Agent	TCP, UDP	20003	Used for communications with RAS Publishing Agents.
	VDI Agent	TCP, UDP	30006	Communication with VDI Agent. Subnet broadcast is sent to find VDI agent.
	Localhost	TCP	30005*	For internal commands (memshell, printer redirector).
	RAS Performance Monitor	TCP	8086	Agent (Telegraf service) sends collected performance data to InfluxDB.
	RAS Enrollment Server	TCP	30030	RAS Guest Agent (PrlsSCDriver) connects to get logon credentials.
RAS Remote PC Agent	RAS Publishing Agent	TCP, UDP	20003	Used for communications with RAS Publishing Agents.
	Localhost	TCP	30005*	For internal commands (memshell, printer redirector).
	RAS Performance Monitor	TCP	8086	Agent (Telegraf service) sends collected performance data to InfluxDB.
	RAS Enrollment Server	TCP, UDP	30030	RAS Remote PC (PrlsSCDriver) connects to get logon credentials.

***** By default, port 30005 is used for communications between RAS Shell and RAS Agents. A registry key may be added and an alternative port may be specified. In case the newly assigned port or 30005 are not available, a dynamic port between 31005 and 31015 range will be used. The registry key can be added as follows:

- HKLM\SOFTWARE\Parallels\AgentIPC
- Value: Port
- Type: REG_DWORD

Tenant Broker

Source	Destination	Protocols	Ports	Description
Parallels Client	Tenant Broker - HALB	TCP, UDP TCP, UDP TCP, UDP	80, 443 3389 20009	Management and user session connections. Optional - Used for user session if RDP Load Balancing is enabled. Client Manager shadowing via Firewall (indirect network connection).
	Tenant Broker - RAS Secure Client Gateway (Normal and Forwarding modes)	TCP, UDP TCP, UDP TCP, UDP UDP	80, 443 3389 20009 20000	Management and user session connections. Optional - Used for user session if RDP Load Balancing is enabled. Client Manager shadowing via Firewall (indirect network connection). **Note:** Since RAS v16, Secure Client Gateways (in Forwarding mode) do not support client management. Secure Client Gateway lookup broadcast.
	Tenant - RDP session	TCP, UDP	3389	Used for user session connections in Direct Mode only. RDP connection is always encrypted.
Web browser (HTML5)	Tenant Broker - HALB	TCP	443	User access to Parallels RAS HTML5 Client (on Secure Client Gateway in Normal mode) through HALB.
	Tenant Broker - RAS Secure Client Gateway	TCP	443	User access to Parallels RAS HTML5 Client (on Secure Client Gateway in Normal mode).
Tenant Broker - RAS Secure Client Gateway in Forwarding Mode	Tenant Broker - RAS Secure Client Gateway in Normal Mode	TCP, UDP TCP, UDP	80, 443 3389	Management and user session connections. Optional - Used for user session if RDP Load Balancing is enabled.
	RAS Performance Monitor	TCP	8086	Agent (Telegraf service) sends collected performance data to InfluxDB.
Tenant Broker - RAS Secure Client Gateway in Normal Mode	Tenant - RAS RD Session Host Agent Tenant - RAS Guest Agent Tenant - RAS Remote PC Agent	TCP, UDP	3389	User session connections to Tenant's hosts.
	Tenant - RAS Publishing Agent	TCP	20002	Communications with RAS Secure Client Gateways and the RAS Console.
	Tenant Broker - RAS Publishing Agent	TCP	20002	Communications with Tenant Broker RAS Publishing Agent related to configuration synchronization and status reporting.
	RAS Performance Monitor	TCP	8086	Agent (Telegraf service) sends collected performance data to InfluxDB.

	Localhost	TCP	20020	Communication with RAS HTML5 Gateway web server (NodeJS).
Tenant Broker - RAS Console	RAS Reporting	TCP	30008	RAS Console is connected to primary RAS Publishing Agent which communicates with RAS Reporting (installed on the same host as SSRS). SSRS talks to SQL via TCP 1433 (or dynamic if 1433 is not established in the settings).
	Tenant Broker - HALB	TCP, UDP	31006	Used for configuration.
	Tenant Broker - Secure Client Gateways	TCP	135, 445, 49179	Remote install push/takeover of software.
	Tenant Broker - RAS Publishing Agent	TCP TCP	20002, 20001 135, 445, 49179	Communication with RAS Publishing Agent and redundancy. Remote install push/takeover of software.
	RAS Performance Monitor	TCP	3000	Performance Dashboard in the Monitoring category (Grafana connection).
Tenant Broker - HALB	Tenant Broker - HALB	VRRP	112	HALB to HALB communication used for automatic assignment of VIP to active HALB.
	Tenant Broker - RAS Secure Client Gateway in Forwarding mode	TCP, UDP TCP, UDP	80, 443 3389	Management and user session connections. Optional - Used for user session if RDP Load Balancing is enabled.
	Tenant Broker - RAS Secure Client Gateway in Normal mode	TCP, UDP TCP, UDP TCP, UDP	80, 443 3389 20009	Management and user session connections. Optional - Used for user session if RDP Load Balancing is enabled. Client Manager shadowing via Firewall (indirect network connection).
Tenant - RAS Publishing Agent	Tenant Broker - RAS Publishing Agent	TCP	20003	RAS Publishing Agent communicates with Tenant Broker to join Tenant Broker, synchronize configuration and statuses.
	RAS Performance Monitor	TCP	8086	Agent (Telegraf service) sends collected performance data to InfluxDB.

Common Communication Ports

Source	Destination	Protocols	Ports	Description
RAS Console	Any host to which Agents are pushed	TCP	135, 445, 49179	Remote install push/takeover of software.
Primary RAS Publishing Agent	AD DS controllers	TCP TCP TCP,UDP UDP	389, 3268 636, 3269 88 53	LDAP LDAPS Kerberos DNS
	MFA Server/s	TCP, UDP	8080, 80, 1812, 1813	Deepnet / Safenet / Radius.

Active Directory and Domain Services Ports

For Active Directory and Active Directory Domain Services port requirements, please see the following article: https://technet.microsoft.com/en-us/library/dd772723%28v=ws.10%29.aspx

RAS Performance Counters

The following table lists performance counters available in Parallels RAS per component:

Parallels RAS Gateway (2XProxyGateway.exe)

ID	Name	Description
ras_gw_tot_conn	Total connections	The total number of Connections with the Gateway.
ras_gw_tot_threads	Total threads	The total number of threads running on the Gateway.
ras_gw_rpd_sess	RDP tunneled sessions	The number of tunneled RDP sessions.
ras_gw_rpd_sess_s	RDP SSL tunneled sessions	The number of tunneled RDP sessions over SSL.
ras_gw_html	HTTP connections	The number of tunneled HTTP sockets
ras_gw_html_s	HTTPS connections	The number of tunneled HTTPS sockets
ras_gw_html5	HTML5 connections	The number of tunneled HTTP5 sockets
ras_gw_html5_s	HTML5 SSL connections	The number of tunneled HTTP5 sockets over SSL
ras_gw_cm	Client Manager connections	The number of RAS Client Manager connections
ras_gw_cm_s	Client Manager SSL connections	The number of RAS Client Manager connections over SSL
ras_gw_wyse	Wyse connections	The number of Wyse connections
ras_gw_wyse_s	Wyse SSL connections	The number of Wyse connections over SSL
ras_gw_rdpudp	RDP UDP tunneled sessions	The number of RDP UDP connections
ras_gw_rdpudp_s	RDP UDP DTLS tunneled sessions	The number of RDP UDP connections over DTLS
ras_gw_cache_sock	Cached sockets	The number of cached sockets between Gateway and Publishing Agent
ras_gw_idle_threads	Idle threads	The number of idle threads on the Gateway
ras_gw_client	Client connections	The number of Parallels Client connections
ras_gw_client_s	Client SSL connections	The number of Parallels Client connections over SSL

Parallels RAS Publishing Agent (2XController.exe)

ID	Name	Description
ras_pa_avg_client_connection_time	Average time for client connection	The average client connection time.
ras_pa_avg_client_auth_time	Average time for user authentication	The average time taken to authenticate a user.
ras_pa_avg_client_policy_time	Average time to retrieve user policy	The average time taken to retrieve the user's policy.
ras_pa_avg_client_rep_time	Average time to send client telemetry	The average time taken to send client telemetry. Used by CEP.
ras_pa_avg_client_applist_time	Average time to retrieve user's published items	The average time taken to retrieve user's published items list.
ras_pa_avg_client_appicons_time	Average time to retrieve icons	The average time taken to retrieve published items icons.
ras_pa_avg_client_getidle_time	Average time to start up a request	The average time taken for the start up request.

Parallels RAS RDS Agent (2XAgent.exe)

ID	Name	Description
act_sess	Active RDS sessions	The number of active RDS Sessions.
disc_sess	Disconnected RDS sessions	The number of disconnected RDS Sessions.

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