



# Virtuozzo Hybrid Workspace

## Infrastructure Deployment Guide

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## CHAPTER 1

# Introduction

## 1.1 About This Guide

This guide explains how to deploy an infrastructure for Parallels Remote Application Server (RAS) in a Virtuozzo Hybrid Infrastructure cluster to create a ready Virtuozzo Hybrid Workspace setup. Deployment is performed via templates that automate provisioning of required virtual machines (VMs) as well as networks, load balancers, and virtual routers. Each Parallels RAS component can then be installed into a dedicated VM. Having completed this guide, you can proceed to set up Parallels RAS according to its [documentation](#).

## 1.2 About Virtuozzo Hybrid Workspace

Virtuozzo Hybrid Workspace allows you to seamlessly deliver applications and desktops to any device from a secure datacenter with a guaranteed SLA. Virtuozzo Hybrid Workspace supports the following ways of delivery:

- Virtual desktop infrastructure (VDI), the complete Windows-based desktop experience.
- Remote desktop session (RDS), a session to a remote desktop with multiple installed applications. Most suited for call centers and operators.
- Application publishing, a single application, e.g., a web browser or text editor. Most suited for delivering legacy applications.

## 1.3 About Virtuozzo Hybrid Infrastructure

Virtuozzo Hybrid Infrastructure represents a new generation of hyper-converged infrastructures targeted at both service providers and end customers. It is a scale-out, cost-efficient, and multi-purpose solution that combines universal storage and high-performance virtualization.

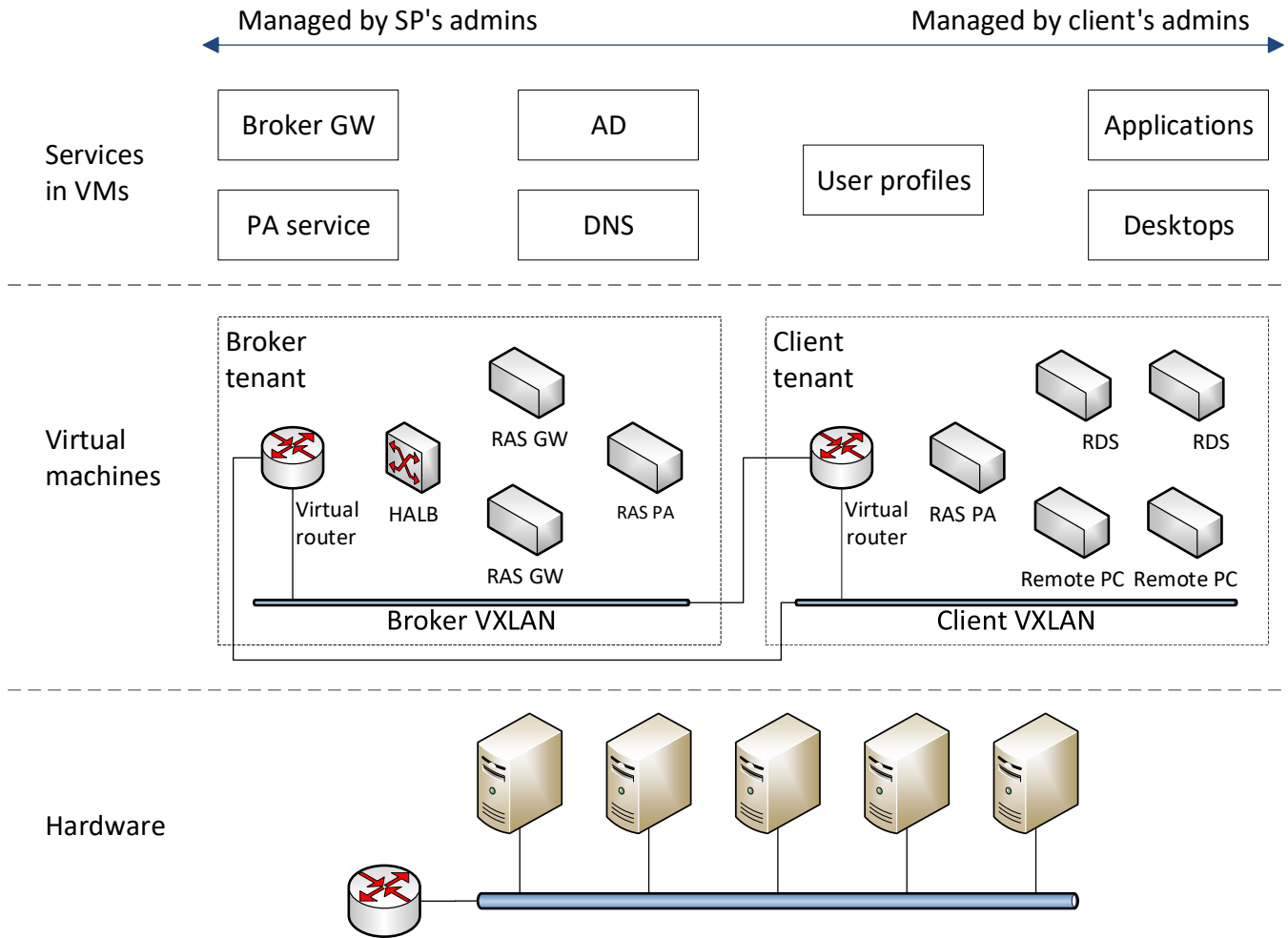
## 1.4 About Parallels Remote Application Server

Parallels RAS enables end users to access their remote desktops and applications from any device running virtually any operating system, including Windows, Linux, macOS, iOS, Android, or Chrome. Additionally, web access is available via Parallels Web Portal, as well as clientless access via HTML5.

## 1.5 Infrastructure Overview

The infrastructure presented in this guide is tailored for the [multi-tenant architecture](#) of Parallels RAS. If you prefer other deployment scenarios, consult the [Parallels documentation](#).

To create a Virtuozzo Hybrid Workspace environment, each component of Parallels RAS is installed into a dedicated VM in a Virtuozzo Hybrid Infrastructure cluster. The complete setup looks like this:



The infrastructure is deployed in two Virtuozzo Hybrid Infrastructure projects (tenants) as follows:

Table 1.5.1: Managed Service Provider (MSP) Broker Project

Component	Quantity	Flavor	Network	Role
Private network (VXLAN)	1	n/a	msp-net	n/a
Router	1	n/a	Public\msp-net	n/a
Load balancer	1	n/a	Public\msp-net	TCP:443,80
PA VM	2	large	msp-net	RAS PA, AD, DNS
SCG VM	2	medium	msp-net	RAS GW

Table 1.5.2: Client project (e.g., "abc")

Component	Quantity	Flavor	Network	Role
Private network (VXLAN)	1	n\ a	abc-net	n\ a
Router	1	n\ a	Public\ abc-net	n\ a
VDI provider*	1	small	abc-net	Remote PC VDI provider
RDSH VM	2 if needed	large+	Public\ abc-net	RDSH

\* For a small setup, you can use the PA VM as a VDI provider as it contains this role by default.

The following roles are used:

#### **RAS PA**

Parallels RAS Publishing Agent (Microsoft Windows Server). The main Parallels RAS component that manages other Parallels RAS components and handles user authorization.

#### **RAS GW**

Parallels Secure Client Gateway (Microsoft Windows Server). A gateway server that receives user connections and redirects them to application hosts.

#### **RDSH**

Remote Desktop Session Host (Microsoft Windows Server with the RDS role). Hosts remote desktop applications and serves remote desktop sessions.

**AD** Microsoft Windows Active Directory domain. Provides user authentication data.

**DNS** Microsoft Windows Names Server. Provides the domain name resolution service.

#### **Remote PC VDI Provider**

Enables RAS PA to manage Virtuozzo Hybrid Infrastructure virtual machines using Remote PC Pool capabilities.

#### **HALB**

Virtuozzo Load Balancer for RAS GW machines. Provides the endpoint for external clients to connect.

---

**Note:** The RDSH, AD, and DNS roles can be reused from an existing Windows Domain if such an environment exists and msp-net can be routed to it.

---

## 1.6 High Availability Considerations

Virtuozzo Hybrid Infrastructure provides high availability for all running VMs to protect against hardware node failures. Parallels RAS can provide an additional level of redundancy by deploying multiple publishing agents. This may be needed to achieve service continuity during VM restart on hardware node failures or during PA VM maintenance or VM guest OS issues.

This guide explains how to set up two publishing agents in the MSP broker tenant. This is done mainly for the continuity of the DNS service as it is the most critical on the broker for gateway connectivity to applications in the client tenant. If you have two external DNSes, you can install only one PA in the MSP broker tenant.

The guide also instructs to set up two publishing agents in the client tenant. This is done for the continuity of both the DNS and PA services. For more details Parallels RAS PA high availability, consult the [Parallels RAS Administrator's guide](#).

## 1.7 Required Images and Scripts

Even though you could create the required VMs from the Virtuozzo Hybrid Infrastructure self-service panel manually, the easiest way is to use the supplied automation scripts:

### **Tenant-Deploy.yaml**

The master template that deploys a set of Microsoft Windows Server VMs for the MSP broker tenant or client tenant. It relies on a set of nested templates listed further.

### **init-stack.yaml**

Deploys the network and router.

### **ad-create.yaml**

Deploys a Microsoft Windows Server VM with a new AD domain controller.

### **server-deploy.yaml**

Deploys a Microsoft Windows Server VM and joins it to the given domain.

### **lb-create.yaml**

Creates a load balancer for port 443.

### **server-gw-deploy.yaml**

Deploys multiple VMs connected to the load balancer.



**pause.yaml**

Inserts a configurable delay into the provisioning sequence.

**last-pa-deploy.yaml**

Deploys the second AD DNS controller.

**ActiveDirectoryDomainController.ps1**

A PowerShell script that runs on the first boot to install Active Directory Domain Services (ADDS).

**AD.psm1**

A PowerShell module required for the script.

**Add-Computer.ps1**

A PowerShell script that joins a computer to a domain.

**Add-Controller.ps1**

A PowerShell script that installs the secondary AD and DNS controller.

In addition, you will need a cloudbase QCOW2 image that all VMs will be created from. You can create one as described in the Virtuozzo Hybrid Infrastructure [Administrator's Guide](#). This guide uses a Microsoft Windows Server 2019 image **Windows-2k19-clb-RAS.qcow2** as an example.

## CHAPTER 2

# Preparing Windows Images

Before you can provide remote desktops, you may want to prepare an image to quickly deploy multiple identical remote desktops from it. In general, you can prepare Microsoft Windows cloudbase QCOW2 images (“templates” in Virtuozzo Hybrid Infrastructure terminology) as described in the Virtuozzo Hybrid Infrastructure [Administrator’s Guide](#).

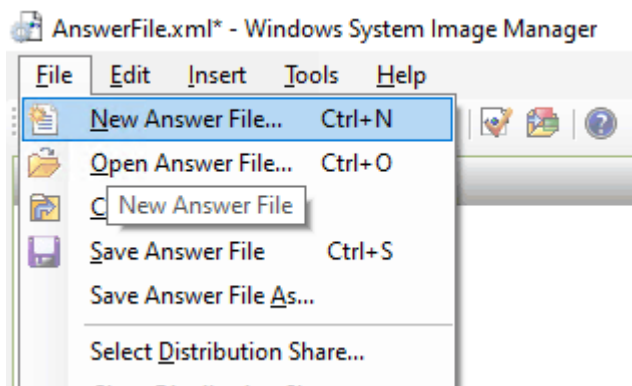
The next section describes in more detail how to prepare a Microsoft Windows 10 image.

## 2.1 Preparing Windows 10 Images

To prepare a Microsoft Windows 10 image, do the following:

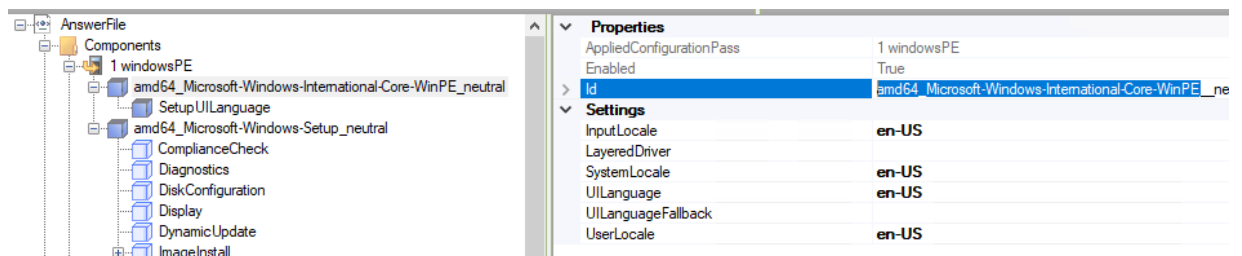
1. Obtain a distribution image of Microsoft Windows 10 v1909 or newer and upload it to Virtuozzo Hybrid Infrastructure. For details, see the Virtuozzo Hybrid Infrastructure [Administrator’s Guide](#).
2. Create a reference VM based on the uploaded image. For details, see the Virtuozzo Hybrid Infrastructure [Administrator’s Guide](#).
3. Start the reference VM and open its console from the VM details pane or the context menu. Perform the next steps from inside the VM.
4. Complete Windows installation.
5. Install the updates.
6. Install Cloudbase-Init in the VM. Perform steps 1 to 5 from the Virtuozzo Hybrid Infrastructure [Administrator’s Guide](#). Do not stop the VM at this point.
7. Optimize the system for better performance. For example, with [this optimization tool](#).

8. Install Virtuozzo guest tools. See the Virtuozzo Hybrid Infrastructure Administrator's Guide.
9. Optionally, if you need to use random desktops, install FSLogix Agent and configure Profile Container as described in the [official documentation](#).
10. Install user applications: messengers, office programs, and such.
11. Create an answer file for the Sysprep tool. One of the ways to do it is provided further. Perform these steps on a machine with the same version of Windows as the reference VM. For example, if you are preparing a Windows 10 v1909 image, perform these steps on machine running Windows 10 v1909 as well.
  - 11.1. Mount the distribution image of Microsoft Windows 10 and copy its contents to a writable folder, e.g., on disk C:.
  - 11.2. Download the [Windows Assessment and Deployment Kit](#). Install only the Deployment Tools from it.
  - 11.3. Launch the Windows System Image Manager installed with the Deployment Tools.
  - 11.4. Click **File > New Answer File**. You will be asked to provide a Windows image. Choose the `sources\install.wim` file from the folder with the distribution image contents.



- 11.5. If you do not have a catalog file, create one as offered.
- 11.6. Once a new answer file is loaded, configure its keys:

Set `amd64_Microsoft-Windows-International-Core-WinPE:`



Set amd64\_Microsoft-Windows-Setup > UserData > AcceptEUDA to True.

Set amd64\_Microsoft-Windows-Shell-Setup > CopyPofile to True.

Set amd64\_Microsoft-Windows-Shell-Setup > OOBE:

OOBE Properties		
<b>Properties</b>		
AppliedConfigurationPass		7 oobeSystem
Component		Microsoft-Windows-Shell-Setup
Path		OOBE
<b>Settings</b>		
HideEULAPage		<b>true</b>
HideLocalAccountScreen		<b>true</b>
HideOEMRegistrationScreen		<b>true</b>
HideOnlineAccountScreens		<b>true</b>
HideWirelessSetupInOOBE		<b>true</b>
NetworkLocation		<b>Work</b>
OEMAppId		
ProtectYourPC		<b>3</b>
SkipMachineOOBE		<b>true</b>
SkipUserOOBE		<b>true</b>
UnattendEnableRetailDemo		<b>false</b>

Create a new account in amd64\_Microsoft-Windows-Shell-Setup > UserAccounts > LocalAccounts:

LocalAccount[Name="admin"] Properties		
<b>Properties</b>		
AppliedConfigurationPass		7 oobeSystem
Component		Microsoft-Windows-Shell-Setup
KeyName		Name
Path		UserAccounts/LocalAccounts/LocalAccount[Name="adr
<b>Settings</b>		
Action		<b>AddList Item</b>
Description		
DisplayName		<b>admin</b>
Group		<b>administrators</b>
Name		<b>admin</b>

And set a password for it:

The screenshot shows the 'Answer File' tree on the left and the 'Password Properties' table on the right. The tree structure is as follows:

- 7 oobeSystem
  - amd64\_Microsoft-Windows-Shell-Setup\_neutral
    - OOBE
      - VMModeOptimizations
      - UserAccounts
        - AdministratorPassword
        - DomainAccounts
        - LocalAccounts
          - LocalAccount[Name="admin"]
            - Password

The 'Password Properties' table is:

Password Properties		
<b>Properties</b>		
AppliedConfigurationPass		7 oobeSystem
Component		Microsoft-Windows-Shell-Setup
Path		UserAccounts/LocalAccounts/LocalAccount[Name="adr
PlainText		true
<b>Settings</b>		
Value		<b>Virtuozzo 1@</b>

11.7. Save the answer file. It may resemble [this sample](#).

11.8. Copy the answer file to the reference VM.

12. Prepare Windows with Sysprep, using the answer file. For more details, see [its documentation](#). Inside the reference VM, from the console, run:

```
> C:\Windows\System32\Sysprep\sysprep.exe /mode:vm /oobe /generalize /unattend:C:\answerfile.xml
```

Where C:\answerfile.xml is the path to your answer file.

13. After the process completes, the reference VM will shut down.

14. Now you can create the image that you will deploy remote desktops from. Click the reference VM to open its details. Click the bootable volume to open its details. In the volume details, Click **Create image**. The volume will be converted to an image and show up in **Virtual machines > Images**.

You can now create VMs from the prepared image.

## CHAPTER 3

# Preparing for Deployment

Virtuozzo Hybrid Workspace works only on top of Virtuozzo Hybrid Infrastructure. This guide assumes that you already have a Virtuozzo Hybrid Infrastructure compute cluster set up. For instructions on how to install Virtuozzo Hybrid Infrastructure, consult its [Installation Guide](#).

Complete these steps to prepare to deploy the Virtuozzo Hybrid Workspace infrastructure in a Virtuozzo Hybrid Infrastructure cluster:

1. As a Virtuozzo Hybrid Infrastructure administrator, upload a cloudbase QCOW2 image to Virtuozzo Hybrid Infrastructure. Share the image and give it a name. You will need the name later during the installation. For the purposes of this guide, the image name will be **Windows-2k19-clb-RAS**.

---

**Note:** You can prepare cloudbase QCOW2 images as described *Preparing Windows Images* on page 7.

---

2. Create the user, project, and domain (if needed) for the MSP broker tenant. For example:
  - Domain: **provider**
  - Project: **ras-broker**
  - User: **admin**
  - Password: **Providerpassw0rd**

For more details on how to create these entities, see the Virtuozzo Hybrid Infrastructure [Administrator's Guide](#)

3. Create the user, project, and domain for the client tenant. For example:
  - Domain: **abc**

- Project: **ras**
- User: **admin**
- Password: **Clientpassw0rd**

4. This guide implies you are running the deployment from the Virtuozzo Hybrid Infrastructure management node directly. You can, however, do it from a Linux machine that has `python2-openstackclient` and `python2-heatclient` packages installed and access to the Compute API endpoint of your Virtuozzo Hybrid Infrastructure cluster.

Log in via SSH to the Virtuozzo Hybrid Infrastructure management node. It is usually on the same IP address with the Virtuozzo Hybrid Infrastructure admin panel.

5. Download and unpack the required scripts:

```
# wget https://docs.virtuozzo.com/files/vhw-deploy-scripts.tar
# tar -x -f vhw-deploy-scripts.tar
```

6. Install `python2-heatclient`:

```
# yum install python2-heatclient
```

7. Prepare OpenStack credentials files for both tenants. Replace `<compute_API_endpoint>` with the IP address of the Compute API endpoint of your Virtuozzo Hybrid Infrastructure cluster. For example:

```
# cat provider-openrc.sh
export OS_PROJECT_DOMAIN_NAME=provider
export OS_USER_DOMAIN_NAME=provider
export OS_PROJECT_NAME=ras-broker
export OS_USERNAME=admin
export OS_PASSWORD=Providerpassw0rd
export OS_AUTH_URL=https://<compute_API_endpoint>:5000/v3
export OS_IDENTITY_API_VERSION=3
export OS_AUTH_TYPE=password
export OS_INSECURE=true
export NOVACLIENT_INSECURE=true
export NEUTRONCLIENT_INSECURE=true
export CINDERCLIENT_INSECURE=true
export OS_PLACEMENT_API_VERSION=1.22
```

```
# cat client-openrc.sh
export OS_PROJECT_DOMAIN_NAME=abc
export OS_USER_DOMAIN_NAME=abc
export OS_PROJECT_NAME=ras-abc
export OS_USERNAME=admin
export OS_PASSWORD= Clientpassw0rd
export OS_AUTH_URL=https://<compute_API_endpoint>:5000/v3
export OS_IDENTITY_API_VERSION=3
```

```

export OS_AUTH_TYPE=password
export OS_INSECURE=true
export NOVACLIENT_INSECURE=true
export NEUTRONCLIENT_INSECURE=true
export CINDERCLIENT_INSECURE=true
export OS_PLACEMENT_API_VERSION=1.22

```

8. Customize the master template `Tenant-Deploy.yaml` according to your needs:

Table 3.1: Master template parameters

Parameter	Default value	Description
key_name	n/a (provide one)	The SSH key.
gw_count	2	The number of RAS GW virtual machines to deploy.
rds_count	1	The number RDS virtual machines to deploy
flavor_pa	large	The VM flavor for PA servers.
flavor_gw	medium	The VM flavor for GW servers.
flavor_rds	large	The VM flavor for RDS servers.
image	Windows-2k19-clb-RAS	The ID or name of the Microsoft Windows Server image with cloudbase.
volume_size	64	The size of virtual machine boot volumes.
boot_volume_type	default	The storage policy for virtual machine boot volumes.
cidr	192.168.100.0/24	The subnet CIDR for the private network.
router	192.168.100.1	The IP address of the GW router to create in the private network.
public_dns	8.8.8.8	The IP address of your domain name server or a public DNS.
public_network	Public	The name of the public network to connect the project (tenant) to.
delay	900	The number of seconds to wait until the first AD server installs ADDS.
domain_name	vdiprotider.lab	The domain name to use.
domain_netbios_name	vdiprotider	The Netbios version of the domain name to use.

Continued on next page



Table 3.1 -- continued from previous page

Parameter	Default value	Description
password	n/a (provide one)	The AD administrator password.
mode	broker	The installation mode to use.
ad	create	Whether to create an AD domain or join one.

In the parameters above:

- `mode` can be `broker` or `client`. `broker` is intended for the MSP broker tenant and deploys the set number of RAS GW virtual machines and a load balancer. `client` is intended for the client tenant and deploys the set number of RDS virtual machines.
- `ad` can be `create` or `join`. `create` deploys a tenant with two AD servers and creates a domain. `join` deploys a tenant with one PA virtual machine joined to the specified domain.

The values of both `mode` and `ad` parameters are mutually exclusive. Changing them, you can use variants of the master template to provision both the MSP broker and client tenants. To join an AD domain, connect Virtuozzo Hybrid Infrastructure to it on the physical network level. That is, set up your edge router to route traffic from Virtuozzo Hybrid Infrastructure VMs to the AD subnet. In addition, point `public_dns` to your AD DNS.

## CHAPTER 4

# Deploying the MSP Broker Tenant

This guide describes how to deploy the MSP broker tenant with new AD services. The default tenant configuration is:

- mode: broker
- ad: create
- key-name: heat-key
- cidr: 192.168.100.0/24
- domain\_name: vdiprovider.lab
- password: Providerpassw0rd
- Stack name: provider

Other options are as described in *Master template parameters* on page 13.

The templates used require a public SSH key. You can use a key previously uploaded to the Virtuozzo Hybrid Infrastructure self-service panel or generate a new one, as done in this guide.

---

**Note:** In case of issues during the deployment, you can delete the stack with `openstack --insecure stack delete provider` and try again.

---

Perform these steps to deploy the MSP broker:

1. Load provider's OpenStack credentials:

```
# source provider-openrc.sh
```

2. Generate a new SSH key:

```
# openstack --insecure keypair create heat_key > heat_key.priv
```

3. Start tenant provisioning:

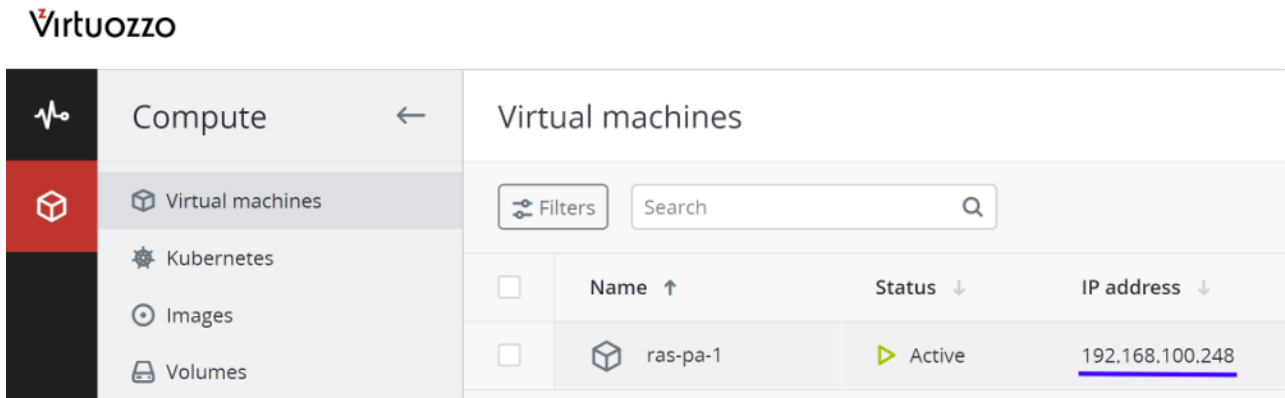
```
# openstack --insecure stack create -t Tenant-Deploy.yaml provider --wait\
--fit-width --parameter password=Providerpassw0rd --parameter key_name=heat_key
2020-04-19 18:57:30Z [provider]: CREATE_IN_PROGRESS Stack CREATE started
2020-04-19 18:57:30Z [provider.init-stack]: CREATE_IN_PROGRESS state changed
2020-04-19 18:57:50Z [provider.init-stack]: CREATE_COMPLETE state changed
2020-04-19 18:57:50Z [provider.ad-create]: CREATE_IN_PROGRESS state changed
2020-04-19 18:58:15Z [provider.ad-create]: CREATE_COMPLETE state changed
2020-04-19 18:58:15Z [provider.lb-create]: CREATE_IN_PROGRESS state changed
2020-04-19 18:59:33Z [provider.lb-create]: CREATE_COMPLETE state changed
2020-04-19 18:59:33Z [provider.pause]: CREATE_IN_PROGRESS state changed
```

Now stack provisioning pauses for the value of `delay` (15 minutes by default). This is needed to complete the provisioning of the Active Directory Domain Controller.

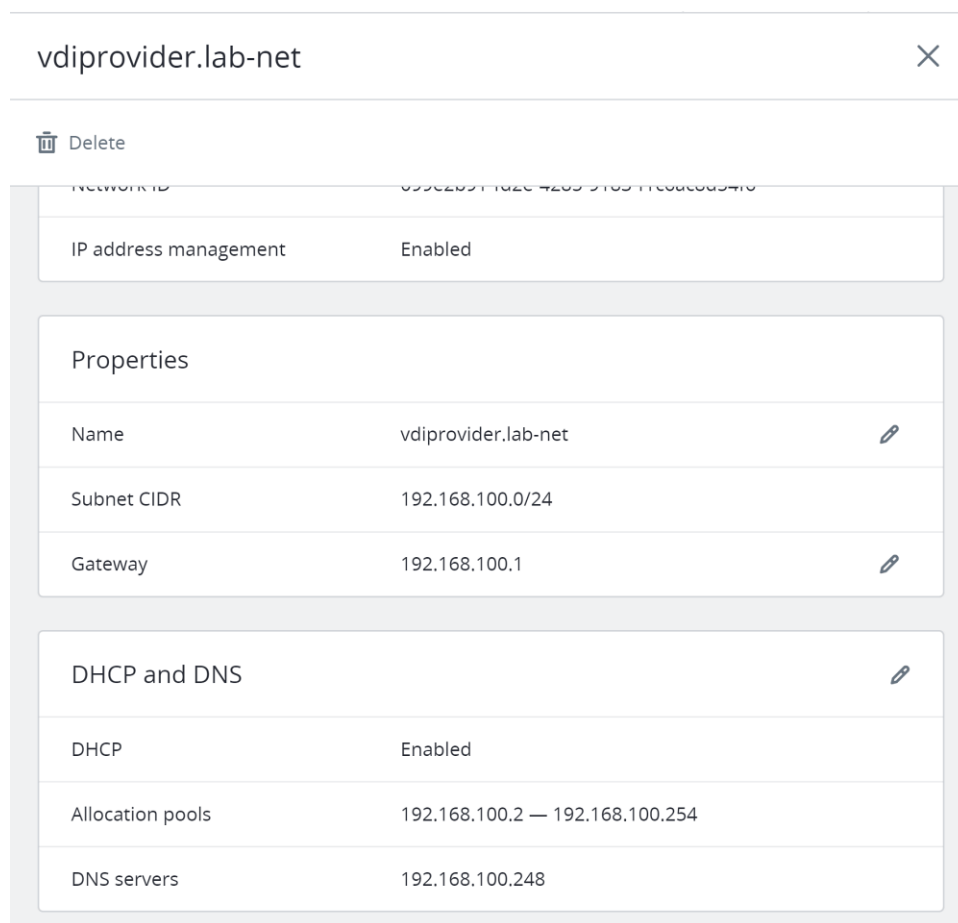
During this stage, the Microsoft Windows Server VM **ras-pa-1** boots from the image, SysPrep actions are performed, and the VM restarts. On VM's second boot, the Cloudbase-Init service in the guest OS starts and invokes PowerShell scripts that deploy ADDS. After that, the VM restarts again. After this, the VM **ras-pa-1** is ready to serve as an Active Directory Domain Controller and accept connection from the VMs created next. The 15 minutes set by default should be enough for this operation to complete. You can, however, increase this timeout up to 1 hour by changing the `delay` parameter in the template.

4. During the pause stage, change the DNS server of the created private network to the IP address of the newly created **ras-pa-1** VM. This needs to be done before any other VMs are deployed, so they can find the AD DNS server and join the domain.

In the self-service panel of your Virtuozzo Hybrid Infrastructure cluster, find out the IP address of the **ras-pa-1** VM on the **Virtual machines** screen. For example:



In the **Networks** section, change the DNS server parameter of the new private network. For example:



5. Wait for the tenant provisioning to complete:

```

...
2020-04-19 19:15:15Z [provider.pause]: CREATE_COMPLETE state changed
2020-04-19 19:15:16Z [provider.server_group_gw]: CREATE_IN_PROGRESS state changed
2020-04-19 19:15:16Z [provider.last_pa]: CREATE_IN_PROGRESS state changed
2020-04-19 19:15:45Z [provider.last_pa]: CREATE_COMPLETE state changed

```

```

2020-04-19 19:15:50Z [provider.server_group_gw]: CREATE_COMPLETE state changed
2020-04-19 19:15:50Z [provider]: CREATE_COMPLETE Stack CREATE completed successfully
+-----+-----+
| Field          | Value                                     |
+-----+-----+
| id             | 266fc393-a332-4ed0-924e-3f8115fdf9c7 |
| stack_name     | de1123                                   |
| creation_time  | 2020-04-19T18:57:29Z                   |
| updated_time   | None                                     |
| stack_status   | CREATE_COMPLETE                         |
| stack_status_reason | Stack CREATE completed successfully |
+-----+-----+

```

After the tenant is ready, you can assign floating IPs to the VMs to be able to log in to them via RDP.

Now you can log in to the **ras-pa-1** VM and deploy the first Parallels RAS Publishing Agent in the MSP broker tenant. Next, deploy RAS Secure Gateways in **ras-gw-0** and **ras-gw-1** VMs. After this, you can deploy and configure the Parallels RAS tenant according to the Parallels RAS [Administrator's Guide](#).

---

**Note:** To make the DNS service more reliable, you can manually deploy the second AD controller and DNS server in the **ras-pa-2** VM. Then you can add the IP Address of the **ras-pa-2** VM to the list of DNS servers of your tenant network.

---

## CHAPTER 5

# Deploying the Client Tenant

You can deploy client tenants using a variant of the master template. This guide uses the following parameters as an example:

- mode: client
- key-name: heat-key
- cidr: 192.168.200.0/24
- router: 192.168.200.1
- domain: abc.local
- domain\_netbios\_name: abc
- password: Clientpassw0rd
- Stack name: client

Other options are as described in *Master template parameters* on page 13.

The templates used require a public SSH key. You can use a key previously uploaded to the Virtuozzo Hybrid Infrastructure self-service panel or generate a new one, as done in this guide.

---

**Note:** In case of issues during the deployment, you can delete the stack with `openstack --insecure stack delete provider` and try again.

---

1. Load client's OpenStack credentials:

```
# source client-openrc.sh
```

2. Adjust parameters in **Tenant-Deploy.yaml**. Make sure to change mode to client and cidr to a new subnet, so you can route two private networks.
3. Repeat steps 2-5 from *Deploying the MSP Broker Tenant* on page 15.

After the tenant is ready, you can assign floating IPs to the VMs to be able to log in to them via RDP.

Now you can log in to the **ras-pa-1** VM and deploy the first Parallels RAS Publishing Agent in the client tenant. After this, you can deploy and configure the Parallels RAS tenant according to the Parallels RAS [Administrator's Guide](#).

---

**Note:** To make the DNS service more reliable, you can manually deploy the second AD controller and DNS server in the **ras-pa-2** VM. Then you can add the IP Address of the **ras-pa-2** VM to the list of DNS servers of your tenant network.

---

## CHAPTER 6

# Finalizing Network Configuration

For the entire setup to work, routes need to be created between the MSP broker's and client's private networks. For this, the MSP broker's router needs to have a port in the client's network and client's router needs to have a port in the broker's network. In this guide's example, the values are:

- router: router-vdiprotider.lab
  - network: 192.168.100.0/24
  - port: 192.168.100.1
  - network: 192.168.200.0/24
  - port: 192.168.200.254
  - route: 192.168.200.0/24 via 192.168.100.254
- router: router-abc.local
  - network: 192.168.200.0/24
  - port: 192.168.200.1
  - network: 192.168.100.0/24
  - port: 192.168.100.254
  - route: 192.168.100.0/24 via 192.168.200.254

If tenants are deployed in different Virtuozzo Hybrid Infrastructure domains and projects, only the Virtuozzo Hybrid Infrastructure administrator can create ports for their routers.



To set up the routers, do the following:

1. Load Virtuozzo Hybrid Infrastructure administrator OpenStack credentials:

```
# source /etc/kolla/admin-openrc.sh
```

2. Find out the network IDs:

```
# openstack --insecure network list --fit-width
+-----+-----+-----+
| ID                | Name                | Subnets          |
+-----+-----+-----+
| ef35a550-7c6e-4675-8653-cff10ee4a637 | abc.local-net      | 119b2d20-<...> |
| 099e2b91-fd2e-4285-9183-f1c6ac8d54f6 | vdiprotider.lab-net | fc4be57a-<...> |
+-----+-----+-----+
```

3. Find out the router IDs:

```
# openstack --insecure router list --fit-width
+-----+-----+-----+-----+
| ID                | Name                | Status | State |
+-----+-----+-----+-----+
| 8558fe74-ebe0-43bc-a66f-9054561e7a77 | router-abc.local   | ACTIVE | UP    |
| e11d6b76-4972-4cb0-a04b-9687f6e03542 | router-vdiprotider.lab | ACTIVE | UP    |
+-----+-----+-----+-----+
```

4. Create the port 192.168.100.254 in vdiprotider.lab-net for router-abc.local:

```
# openstack --insecure port create port-router-abc.local \
--network 099e2b91-fd2e-4285-9183-f1c6ac8d54f6 --fixed-ip \
subnet=fc4be57a-a288-46ea-95a5-25873b195b41,ip-address=192.168.100.254
```

Then add it to the router:

```
# openstack --insecure router add port router-abc.local port-router-abc.local
```

5. Create the port 192.168.200.254 in abc.local-net for router-vdiprotider.lab-net:

```
# openstack --insecure port create port-router-vdiprotider.lab-net \
--network ef35a550-7c6e-4675-8653-cff10ee4a637 --fixed-ip \
subnet=119b2d20-51b3-4574-a24f-c79d00fdcb85,ip-address=192.168.200.254
```

Then add it to the router:

```
# openstack --insecure router add port router-vdiprotider.lab \
port-router-vdiprotider.lab-net
```

6. Add a static route from vdiprotider.lab to 192.168.200.0/24:

```
# openstack --insecure router set --route destination=192.168.200.0/24,\
gateway=192.168.100.254 router-vdiprotider.lab
```

And add a static route from abc.local-net to 192.168.100.0/24:

```
# openstack --insecure router set --route destination=192.168.100.0/24,\  
gateway=192.168.200.254 router-abc.local
```

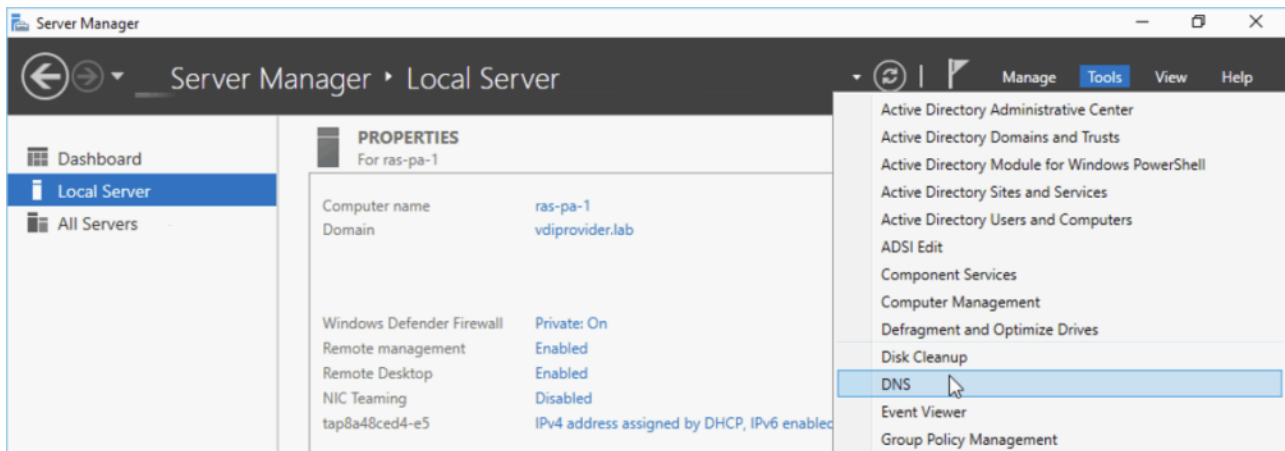
## CHAPTER 7

# Configuring DNS Delegation

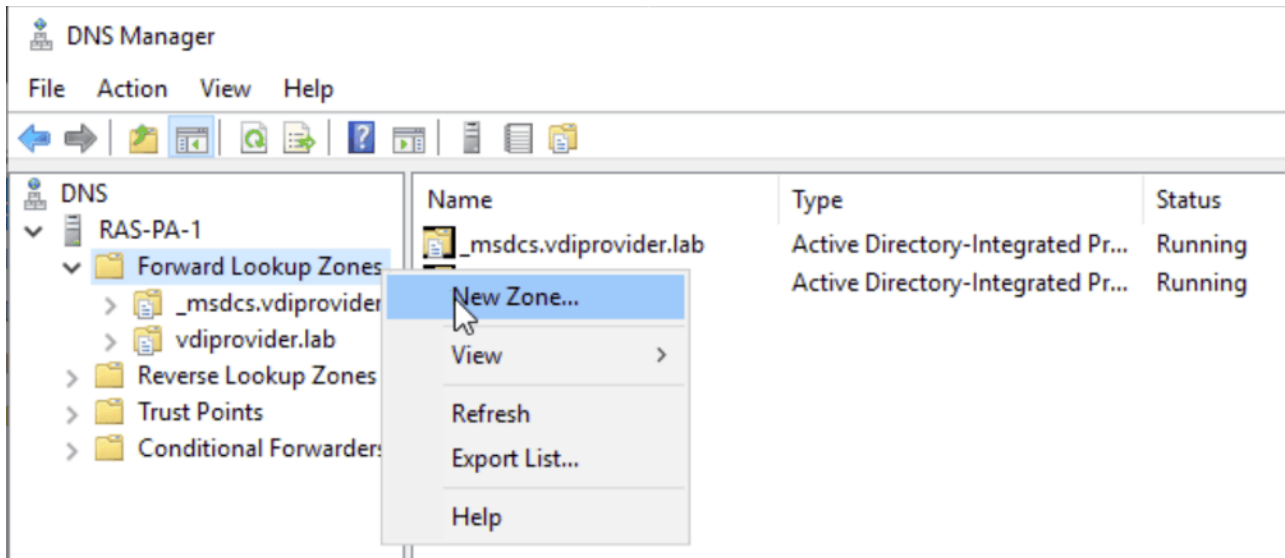
Parallels RAS Secure Gateway routes client sessions to client VDI and RDS by names received the PA server in the client tenant. In order to operate properly, the DNS server in the MSP broker tenant needs to be able to resolve names of client domains.

Do the following:

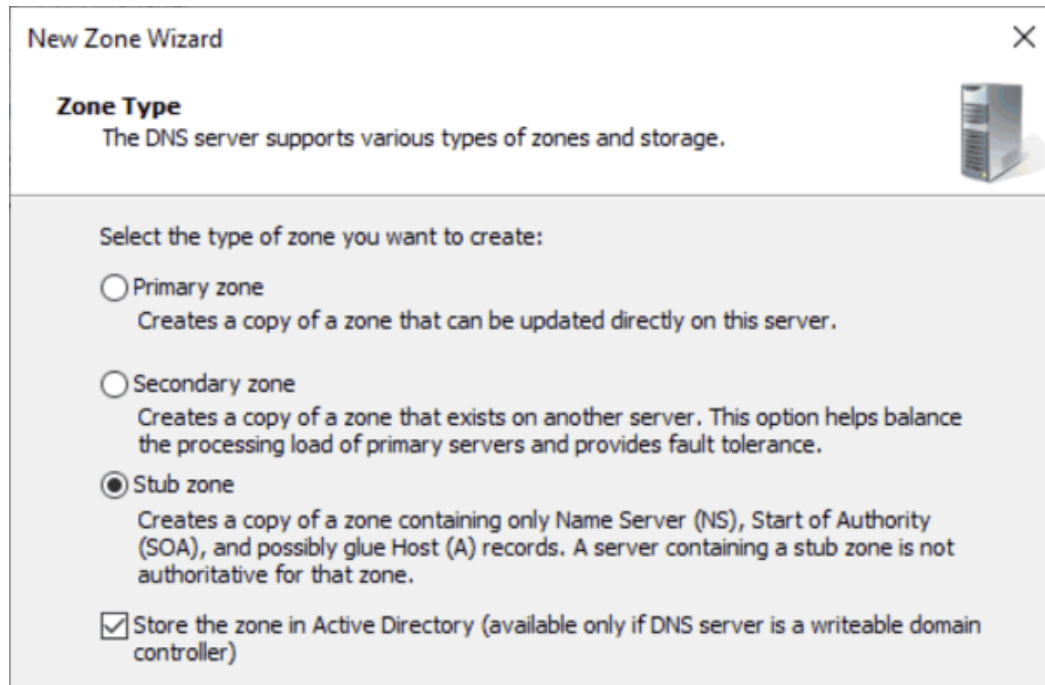
1. Log in to your AD/DNS server (the **ras-pa-1** VM in this guide's example) and open the DNS console:



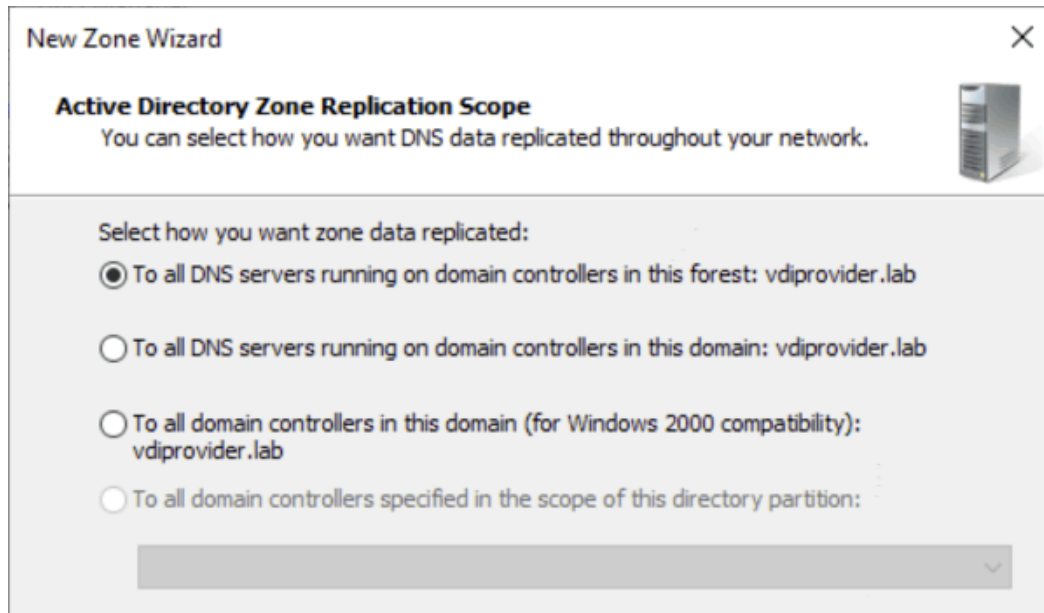
2. Create a new stub zone for **abc.local**:



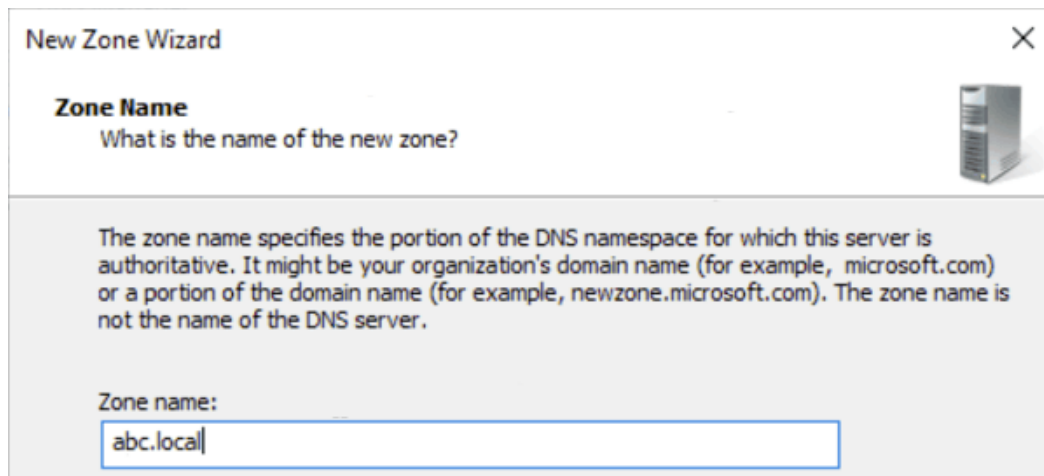
Select **Stub zone**:



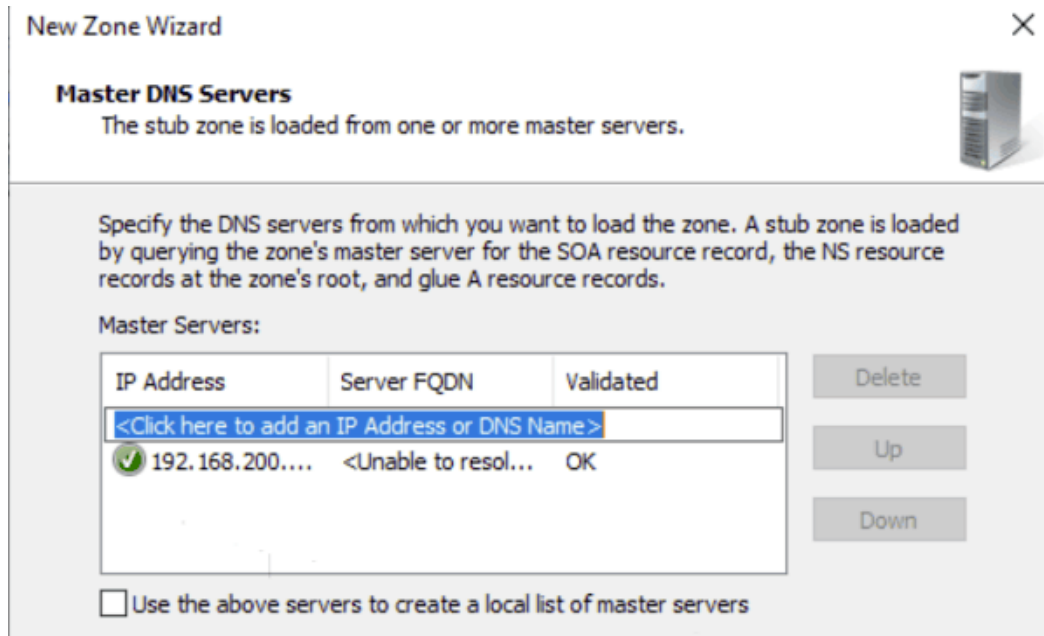
Choose to replicate zone data to all DNS servers in this forest:



Name the new zone, e.g., after the client tenant:



Provide the IP address of client's DNS server (the **ras-pa-1** VM from the tenant **abc** in this guide's example):



3. Complete the wizard and check connectivity:

```

Administrator: Command Prompt
C:\Users\administrator>ping ras-pa-1.abc.local

Pinging ras-pa-1.abc.local [192.168.200.212] with 32 bytes of data:
Reply from 192.168.200.212: bytes=32 time=2ms TTL=126
Reply from 192.168.200.212: bytes=32 time<1ms TTL=126
Reply from 192.168.200.212: bytes=32 time<1ms TTL=126
Reply from 192.168.200.212: bytes=32 time<1ms TTL=126

Ping statistics for 192.168.200.212:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 2ms, Average = 0ms

C:\Users\administrator>ping ras-pa-2.abc.local

Pinging ras-pa-2.abc.local [192.168.200.103] with 32 bytes of data:
Reply from 192.168.200.103: bytes=32 time=1ms TTL=126
Reply from 192.168.200.103: bytes=32 time<1ms TTL=126
Reply from 192.168.200.103: bytes=32 time<1ms TTL=126
Reply from 192.168.200.103: bytes=32 time<1ms TTL=126

Ping statistics for 192.168.200.103:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

```

## CHAPTER 8

# Creating and Populating Remote PC Pools

After setting up Parallels RAS, you can proceed to create remote PC pools as described in the [Parallels documentation](#).

Having created the pools, you will need to populate them with virtual machines. For this you will need need a cloudbase image tailored for your VDI scenario. You can create it as described in the [Virtuozzo Hybrid Infrastructure Administrator's Guide](#). You will need to:

1. Optimize the system for better performance. For example, with [this optimization tool](#).
2. Install Virtuozzo guest tools. See the [Virtuozzo Hybrid Infrastructure Administrator's Guide](#).
3. Install user applications.
4. Optimize security settings.
5. Optionally install FSlogix tools to enable random desktops.

While you can create the VMs manually, it is simpler to populate a remote PC pool using the following scripts. Run them inside the Windows VM where you have installed Parallels RAS.

Download the scripts:

```
# wget https://docs.virtuozzo.com/files/vhw-remote-pc-pool-scripts.tar.gz
# tar -xzf vhw-remote-pc-pool-scripts.tar.gz
```

The scripts are:

### **New-VDIGuestFromVHI.ps1**

A PowerShell script that creates virtual machines in Virtuozzo Hybrid Infrastructure and adds them to

the specified Parallels RAS remote PC pool.

### Remove-VDIGuestFromVHI.ps1

A PowerShell script that removes virtual machines from the specified Parallels RAS remote PC pool and deletes them in Virtuozzo Hybrid Infrastructure.

Other scripts in the downloaded archive are used by these two.

Before you can use the scripts, prepare the system as follows:

1. Download and install the latest Python 2 release from the [Python website](#). Add the installation directory to the PATH variable.
2. Verify that PATH contains C:\Python27;C:\Python27\Scripts:

```
> echo %PATH%
```

3. Install python-openstackclient. From the command prompt, run:

```
> easy_install pip
> pip install python-openstackclient
```

If you get an error that Microsoft Visual C++ Compiler for Python 2.7 is missing, [download](#) and install it. If you get an error “The system administrator has set policies to prevent this installation”, run the command prompt as administrator and install the compiler as follows:

```
> msixexec /i VCForPython27.msi
```

4. Install python-heatclient:

```
> pip install python-heatclient
```

5. Replace the line `import queue` with `import Queue as queue` in

```
C:\Python27\Lib\site-packages\openstack\cloud\openstackcloud.py:import queue
C:\Python27\Lib\site-packages\openstack\utils.py:import queue
```

6. On the Virtuozzo Hybrid Infrastructure node with the Parallels RAS VM, create a `provider-openrc.sh` script for the Virtuozzo Hybrid Infrastructure domain and project where you will create remote desktop VMs. For more details, see the Virtuozzo Hybrid Infrastructure [Administrator’s Command Line Guide](#).

To populate a remote PC pool with VMs, use **New-VDIGuestFromVHI.ps1**:



Table 8.1: New-VDIGuestFromVHI.ps1 parameters

Parameter	Description
OpenRC	The tenant's OpenRC file.
Insecure	Skip certificate verification.
ImageName	The name of the image to create VMs from.
VmNameTemplate	VM naming template.
Count	The amount of Virtual Machines to create.
Flavor	VM flavor.
StoragePolicy	The storage policy to use for VMs. If not specified, the "default" storage policy is used.
Network	The network to connect VMs to.
PoolName	The name of the remote PC pool to add VMs to.
ADDomain	The Active Directory Domain to add VMs to.
ADUsername	The Active Directory Domain Administrator username.
ADPassword	The Active Directory Domain Administrator password.
OUPath	The path to the Organizational Unit.
ProviderName	The name of the VDI provider in Parallels RAS.

For example:

```
> New-VDIGuestFromVHI.ps1 -OpenRC admin-openrc.sh -ImageName `
Windows-2k19-clb-RAS -VmNameTemplate 'new-w2019-v1' -Count 2 `
-Flavor medium -Network VDINetwork -ADDomain abc.local -ADUsername Administrator `
-PoolName TestPool -Insecure -StoragePolicy Premium-SSD-3R `
-OUPath 'OU=RemotePC,OU=RAS,DC=abc,DC=local' -ProviderName abc-farm-pa-dc0.abc.local
```

To remove VMs from a remote PC pool and delete them from Virtuozzo Hybrid Infrastructure, use

### **Remove-VDIGuestFromVHI.ps1:**

Table 8.2: New-VDIGuestFromVHI.ps1 parameters

Parameter	Description
OpenRC	The tenant's OpenRC file.
Insecure	Skip certificate verification.
VmNameTemplate	VM naming template.
PoolName	The name of the remote PC pool to remove VMs from.
ADUsername	The Active Directory Domain Administrator username.

Continued on next page

Table 8.2 -- continued from previous page

Parameter	Description
ADPassword	The Active Directory Domain Administrator password.

For example:

```
> Remove-VDIGuestFromVHI.ps1 -OpenRC admin-openrc.sh -VmNameTemplate `
'new-w2019-v1' -ADUsername Administrator -PoolName TestPool -Insecure `
-ProviderName abc-farm-pa-dc0.abc.local
```