Oracle® Virtual Desktop Infrastructure

Administrator's Guide for Release 3.4.1

E35769-03
September 2012
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Preface

The *Oracle VDI Administrator's Guide* is a comprehensive guide to how to install, configure, and administer Oracle Virtual Desktop Infrastructure (VDI). Troubleshooting information is also included.

Audience

This document is written for system administrators who want to install and configure Oracle VDI in order to deploy desktops to users. It is assumed that readers are familiar with web and virtualization technologies and have a general understanding of operating systems such as UNIX (including Linux) and Windows.

Document Organization

The document is organized as follows:

- **Chapter 1, System Overview of Oracle Virtual Desktop Infrastructure** provides an overview of the Oracle VDI system and its components.
- **Chapter 2, Installing Oracle VDI and Configuring Oracle VDI Centers** describes how to install Oracle VDI software and configure hosts to form Oracle VDI Centers.
- **Chapter 3, Configuring Companies and User Directories** describes how to integrate Oracle VDI with the user directories used in your organization. Oracle VDI uses the information in a directory to assign desktops to users.
- **Chapter 4, Configuring Desktop Providers and Virtualization Platforms** describes how to configure the virtualization platforms that run the desktops provided by Oracle VDI.
- **Chapter 5, Preparing Desktops** describes how to prepare the desktops that are deployed though Oracle VDI and how to assign them to users.
- **Chapter 6, Desktop Access** describes how to provide access to the desktops deployed through Oracle VDI.
- **Chapter 7, Performance and Tuning** contains guidelines for sizing Oracle VDI systems and configuration tips for obtaining the best performance.
- **Chapter 8, Monitoring and Maintaining Oracle VDI** contains common tasks for day-to-day administration of Oracle VDI systems.
- **Chapter 9, Troubleshooting and FAQs** contains answers to common questions and problems when using Oracle VDI.
- The appendices and Glossary contain reference material.

Documentation Accessibility


Access to Oracle Support

Related Documents

The documentation for this product and related products is available at:


Conventions

The following text conventions are used in this document:

<table>
<thead>
<tr>
<th>Convention</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>boldface</strong></td>
<td>Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.</td>
</tr>
<tr>
<td><em>italic</em></td>
<td>Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.</td>
</tr>
<tr>
<td><em>monospace</em></td>
<td>Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.</td>
</tr>
</tbody>
</table>

Document Revision

Document generated on: 2012-09-28 (revision: 1385)
1.1. Introduction to Oracle Virtual Desktop Infrastructure

Oracle Virtual Desktop Infrastructure (VDI) provides access to virtualized desktops hosted in a data center. Oracle VDI can provide a complete desktop provisioning and delivery service by:

- Creating, running, and storing virtual machines.
- Authenticating users and connecting them to their virtualized desktops.
- Enabling client devices to display virtualized desktops.

The four elements of an Oracle VDI system are virtualization, storage, management and desktop access, as shown in Figure 1.1.

Figure 1.1. Oracle VDI Architecture

The following sections describe these elements.
1.2. About Virtualization

Virtualization is the basis of Oracle VDI because it provides the functionality for creating and managing desktops. A desktop is an instance of an operating system running on a virtualization platform. In Oracle VDI, a virtualization platform is configured as a desktop provider. When you configure a desktop provider, you specify the following:

- The provider type: This is the platform used to virtualize desktops.
- The provider hosts: The servers that actually run the desktops, and their associated storage.

Oracle VDI supports several types of desktop provider and the types can be divided into the following categories:

- Hypervisor-based providers: These provide access to desktops that are virtual machines hosted by a bare metal hypervisor such as a VMware ESX server, or a hosted hypervisor such as Oracle VM VirtualBox.
- Session-based providers: These provide access to desktop sessions that are hosted by remote computers, such as Microsoft Remote Desktop Services (RDS).

The provider hosts configured for a desktop provider are installed separately from Oracle VDI and run on their own platforms. The provider hosts provide the physical resources for running desktops, such as CPU and memory, as well as the means for managing desktops. The storage used by the provider hosts is discussed in Section 1.3, “About Storage”.

Oracle VDI does not restrict you to a single virtualization platform. You can use a mixture of desktop provider types and create as many desktop providers as you need. How Oracle VDI interacts with a desktop provider depends on the provider type, and is described in more detail in the following sections.

Hypervisor-Based Desktop Providers

The following are the available hypervisor-based desktop providers:

- Oracle VM VirtualBox
- Microsoft Hyper-V
- VMware vCenter

The Oracle VM VirtualBox software is distributed with Oracle VDI. Unlike the other desktop providers, VirtualBox enables you to run UNIX and Linux platform desktops as well Windows desktops. VirtualBox also has its own integrated server for the Remote Desktop Protocol (RDP) that enables you to connect to, and control, a remote virtual machine as though it was running locally.

With the Oracle VM VirtualBox and Microsoft Hyper-V desktop providers, Oracle VDI directly manages the provider hosts. Oracle VDI sends requests to register desktops with a provider host, including the configuration information for the virtual machines, and sends requests to manage those desktops, for example to start, stop, and preserve the state of desktops. For Oracle VDI providers, Oracle VDI uses the VirtualBox web service application programming interface (API) to communicate with the provider hosts. For Microsoft Hyper-V providers, Windows Remote Management (WinRM) is used. The communication between Oracle VDI and a provider host takes place over secure Hypertext Transfer Protocol (HTTPS) connections. There is no limit on the number of hosts these desktop providers can have, and to ensure best performance, Oracle VDI balances the desktop load across the available hosts.

When you configure a VMware vCenter desktop provider, you specify a VMware vCenter server rather than individual provider hosts because the provider hosts are managed by the VMware infrastructure.
Oracle VDI sends requests for desktops to the vCenter server, and the vCenter server sends the request to a vSphere server in the group. Oracle VDI uses the VMware Infrastructure SDK web services API to communicate with the vCenter server and the communication takes place over HTTPS. Although the VMware infrastructure is responsible for all desktop operations, Oracle VDI is able to monitor the load and choose a particular datastore to use when creating a desktop.

**Session-Based Desktop Providers**

The following are the available session-based desktop providers:

- Microsoft Remote Desktop
- Sun Ray Kiosk
- Generic

The Microsoft Remote Desktop provider does not provide individual desktops, instead Oracle VDI connects users to desktop sessions created on RDS servers. The provider host can be a single stand-alone RDS server or a group of servers in an RDS farm. The RDS server or farm is responsible for creating new RDS desktop sessions for users, or for reconnecting users to their existing desktop sessions (if Session Broker is configured), and for load balancing the sessions. Optionally, you can configure the RDS servers so that Oracle VDI can display session, CPU, and memory load information, in the Oracle VDI administration tools.

The Sun Ray Kiosk desktop provider provides access to types of sessions that are not available with Oracle VDI itself, for example to connect to a remote desktop using a different broker such as the Sun Ray VMware View connector, or to provide access to a web-based application in a locked-down web browser.

Generic desktop providers run RDS desktop sessions on physical computers or virtual machines. Typically the Generic provider is used by Oracle VDI to connect users to existing Windows PCs, and is used as part of a strategy for migrating desktops to the Oracle VDI solution.

### 1.3. About Storage

Storage is closely related to virtualization because usually a desktop provider requires somewhere to create and store the virtual disks used for desktops. The storage requirements depend on the desktop provider type.

The Oracle VM VirtualBox and Microsoft Hyper-V desktop providers require storage. Oracle VDI supports local disks, network file system shares, iSCSI storage devices, and Zettabyte File System (ZFS) storage pools. The storage that can be used depends on the desktop provider type and operating system of the virtualization hosts.

VMware vCenter desktop providers also require storage but the storage is managed by the VMware infrastructure. However, Oracle VDI is able to query vCenter for the available storage, and can select the data store to use when creating virtual disks.

For all other desktop providers, storage is managed independently of Oracle VDI.

For the desktop providers that require storage, Oracle VDI is able to monitor the available free space and current workload. If multiple storage servers are configured, Oracle VDI uses this information to balance the load.

### 1.4. About Management

The management element is the main part of Oracle VDI. This element provides all the functionality needed to build large-scale virtual machine deployments, and to provide users with access to their desktops. It contains the following components:
The RDP Broker, and Sun Ray Software components provide the means for users to access their
desktops, and these are discussed in Section 1.5, “About Desktop Access”. The following sections
describe the purpose of the other components.

**VDI Service**

The VDI Service is the most important component of the Oracle VDI. It is used to create and manage
desktop providers and desktops, and to authenticate users and assign desktops to them. The VDI Service
is deployed as the vda module in the Common Agent Container (Cacao), which is a system daemon for
running Java management applications. Sometimes the VDI Service is referred to as the VDA Service.

With Oracle VDI, desktops are organized into **pools**. A pool is a group of desktops hosted by a particular
desktop provider type. Individual desktops can be imported into a pool, or a desktop can be imported as a **template** which is then cloned to create the required number of desktops. Pools are also used to apply a
group of configuration settings to all the desktops in the pool, for example to specify the subnet on which
the desktops are placed, or to control the resources used by the virtual machines.

The desktops in a pool are one of the following types:

- **Personal**: These desktops are assigned to individual users and are owned by them until the desktop is
  either deleted or assigned to another user by an Administrator.

- **Flexible**: These desktops are temporarily assigned to individual users. Once a user logouts out, or the
desktop is no longer in use, the desktop is either recycled so that it can be assigned to another user or
  deleted.

The VDI Service can be configured to manage the complete lifecycle of a desktop by:

- Creating the virtual machine
- Starting the virtual machine
- Assigning the desktop to a user
- Monitoring the usage of the desktop and the state of the virtual machine
- Recycling the desktop
- Shutting down the virtual machine
- Deleting the virtual machine

Oracle VDI can make use of data held in external user directories to authenticate users and assign
desktops to them. This enables you to assign individual desktops or pools to the existing users and groups
within your organization. The VDI Service supports Active Directory and LDAP-type directories. Multiple
directories can be configured and this enables you to provide desktops to multiple companies from a single
Oracle VDI deployment, or to integrate with companies that have complex Active Directory structures such
as multiple tree forests with multiple domains. It is also possible to assign desktops to users using smart
cards (Oracle VDI calls these tokens). Tokens and user directories can be used together, or independently.

Oracle VDI has two tools for configuring and managing the VDI Service:

- **Oracle VDI Manager**: This is a web-based graphical application.
- The **vda** command: This a command-line tool with a family of sub-commands for managing the
  individual areas such as desktop providers and pools.

The VDI Service itself can only be started and stopped from the command line, using the `vda-service`
command.

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### Oracle VDI Center Agent

The Oracle VDI Center Agent is deployed as the `vda.center.agent` module in the Common Agent Container
(Cacao). It enables Oracle VDI to scale up to support more users, and to provide a reliable and highly
available service.

Oracle VDI hosts can be joined together to form an Oracle VDI Center. The first host that is configured
forms the Oracle VDI Center and this host is known as the primary host. Additional hosts are configured
and added to the Oracle VDI Center as secondary hosts. The Oracle VDI Center Agent provides secure
communication between the hosts in the Oracle VDI Center and is responsible for co-ordinating the
information about the Oracle VDI Center among the hosts.

An Oracle VDI Center that has more than one host is able to provide a reliable service because the
desktop sessions can be distributed between the hosts. If one host fails another one continues to host
desktop sessions with only a minimal interruption to the user. If the primary host becomes unavailable, the
Oracle VDI Center Agent automatically promotes a secondary host to become the new primary host, and
communicates these changes to the other hosts in the Oracle VDI Center. This is known as failover.

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### MySQL Database

Oracle VDI requires a MySQL database to store configuration and run-time information. When you
configure an Oracle VDI Center, you can choose to use the embedded MySQL Server database that is
included with the Oracle VDI software, or you can use your own MySQL database.

If you use the embedded MySQL Server database, the primary host in the Oracle VDI Center runs the
Oracle VDI master database. To provide for high availability, a secondary host in the Oracle VDI Center
runs a slave database that receives replication updates from the primary host. If the primary host becomes
unavailable, the Oracle VDI Center Agent automatically promotes the secondary host to become the
primary host, and its database becomes the master database. If you use your own MySQL database, you
must make your own provision for high availability.

The configuration data stored in the database includes the information about user directories and tokens,
desktop information such as desktop providers, pools, templates, and storage. The run-time information
includes information about the users that are logged in, the desktops they are using, the state of the
desktops, and details of cloning jobs that are running.

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### Oracle VDI Web Server

The Oracle VDI Web Server is an Apache Tomcat server that is used to run the graphical administration
tools used with Oracle VDI. In addition to Oracle VDI Manager, there is also the Sun Ray Administration
tool. Each administration tool uses its own Tomcat instance and is accessed using a different port number.

The Oracle VDI Web Server also runs the Oracle VDI web services, which are described in Section 1.5,
"About Desktop Access".
1.5. About Desktop Access

With Oracle VDI, desktop sessions always run on the virtualization host and never on the client devices. Users can access their desktops using any of the following clients:

- Oracle Sun Ray Clients, including Oracle Virtual Desktop Clients
- Remote Desktop Protocol (RDP) clients, including secure web access using Oracle Secure Global Desktop
- Web services clients, typically web applications

All requests for access to a desktop are handled by the VDI Service. Once a user has a desktop, the RDP protocol is used to connect to, and display, the desktop session. How users access their desktops depends on the client used to access a desktop, and is described in the following sections.

Oracle Sun Ray Clients

Users can access a desktop using an Oracle Sun Ray Client, or an Oracle Virtual Desktop Client. A Sun Ray Client is a secure, low-power, hardware thin client device for displaying desktops hosted on a server. The Oracle Virtual Desktop Client is an application that installs on common client operating systems, and is a software version of a Sun Ray Client. Both of these clients use the Appliance Link Protocol (ALP) to connect to the Sun Ray Software which runs on an Oracle VDI host.

The Sun Ray Software provides the infrastructure for displaying desktops to Sun Ray Clients. The Sun Ray Software runs the Oracle VDI Kiosk Session, which in turn runs a Desktop Selector program and a Sun Ray Windows connector program. The Desktop Selector submits the user's credentials to the VDI Service and requests the desktops assigned to the user. The Sun Ray Windows connector is an RDP client for the Sun Ray environment and this connects the user to the virtual machine running the desktop. Users access their desktops by authenticating themselves with a user name, password, and optionally a Windows domain, or by inserting a smart card. If the authentication succeeds, the user is connected to their desktop. If a user is assigned more than one desktop, a screen is displayed that enables them to select the desktop to connect to. The user's credentials can also be passed to a Windows operating system so that the user can be automatically logged into their desktop.

RDP Clients

Oracle VDI includes an RDP Broker that enables RDP clients to connect to a desktop using the Remote Desktop Protocol. Supported RDP clients include the Remote Desktop Client included with Oracle Secure Global Desktop, or Microsoft Remote Desktop Connection.

Users access their desktop by running an RDP client and specifying an Oracle VDI host to connect to. The RDP Broker accepts the incoming request, which includes a user name, password, and optionally a domain name, and runs the VDI Client command line tool, which authenticates the user and requests a desktop. The VDI Service returns the IP address and port of the desktop to the VDI Client tool, which passes this information to the RDP Broker. The RDP Broker redirects the RDP Client to connect to the desktop at the specified IP address and port.

Oracle Secure Global Desktop extends the reach of traditional RDP clients by providing users with secure access to a remote desktop using a browser.

Web Services Clients

The VDI Client command line tool has a web services application programming interface (API). Application developers and system integrators can use the HTTP and SOAP protocols to develop their own solutions for requesting a desktop from Oracle VDI. The web service is hosted by the Oracle VDI Web Server.
Chapter 2. Installing Oracle VDI and Configuring Oracle VDI Centers

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2.1. About Oracle VDI Centers and Hosts

An Oracle VDI Center consists of one or more hosts on which the Oracle VDI software is installed.

After the software is installed on a host, it must be configured. The first host that is configured forms the Oracle VDI Center and this host is known as the primary host. Additional hosts are configured and added to the Oracle VDI Center as secondary hosts. Having more than one host in an Oracle VDI Center automatically configures the Center for high availability. High availability offers reliability so that if one host fails, another one continues to host desktop sessions with only a minimal interruption to the user. An Oracle VDI Center containing a single host is also a supported configuration.

Apart from high availability, the other main configuration choice is whether to use the embedded Oracle VDI MySQL Server database, or to connect to your own remote database.

There are several possible configurations for Oracle VDI. The following sections describe the main configuration models.
2.1.1. Single Oracle VDI Host Configuration

The single Oracle VDI host configuration is a configuration for deployments that prioritize low cost above high availability. With a single Oracle VDI host there is no failover and all the required components are installed on a single host. This configuration is possible only if you use the bundled Oracle VM VirtualBox. On Oracle Solaris platforms, you must use either a local ZFS pool, a local disk, or a network file system share for the storage. On Oracle Linux platforms, you must use either a local disk or a network file system share for the storage.

![Figure 2.1. Single Oracle VDI Host Configuration](image)

It is possible to use separate hosts for the database, virtualization platform, and storage, but this increases the cost of the deployment without increasing availability.

2.1.2. High Availability Configuration Using the Embedded MySQL Server Database

The high availability configuration using the embedded MySQL Server database requires a minimum of two hosts. The primary host forms the Oracle VDI Center and high availability is automatically configured as soon as a secondary host is added. Additional secondary hosts can be added to the Oracle VDI Center to increase capacity.

![Figure 2.2. High Availability Configuration Using the Embedded MySQL Server Database](image)

This configuration provides high availability at both the database level and the desktop access level.

At the database level, the primary host runs the master database for the entire Oracle VDI Center. The first secondary host that is added to the Oracle VDI Center runs the slave database. The slave database is not active, it simply receives asynchronous replications from the master. If the primary host becomes unavailable, the secondary host with the slave database is automatically promoted to become the new primary. Additional secondary hosts have no database role.
At the desktop access level, the primary host is configured as the Sun Ray primary server and the secondary hosts are configured as Sun Ray secondary servers. Together they form a failover group. If one host fails, another host continues to host desktop sessions with only a minimal interruption to the user. If the primary host becomes unavailable, the secondary host is automatically promoted to become the new primary.

High availability of the virtualization platform, storage and user directory must be configured separately.

### 2.1.3. High Availability Configuration Using a Remote MySQL Database

The high availability configuration using a remote MySQL database requires a minimum of two hosts. The primary host forms the Oracle VDI Center and high availability is automatically configured as soon as a secondary host is added. Additional secondary hosts can be added to the Oracle VDI Center to increase capacity.

**Figure 2.3. High Availability Configuration Using a Remote MySQL Database**

This configuration provides high availability at the desktop access level. The primary host is configured as the Sun Ray primary server and the secondary hosts are configured as Sun Ray secondary servers. Together they form a failover group. If one host fails, another host continues to host desktop sessions with only a minimal interruption to the user. If the primary host becomes unavailable, the secondary host is automatically promoted to become the new primary.

High availability at the database level can be configured for the remote database, but this is configured outside of Oracle VDI.

High availability of the virtualization platform, storage and user directory must be configured separately.

### 2.2. Oracle VDI System Requirements

#### 2.2.1. Oracle VDI Hardware Requirements

The basic hardware requirements for Oracle VDI are:

- At least one 2.0GHz x86-64 (x64) CPU
- At least 4GB RAM
- At least 32GB disk space

These requirements assume the host is used only for Oracle VDI.

Hardware sizing is a very important part of planning an Oracle VDI deployment. Some basic sizing guidelines can be found at Chapter 7, *Performance and Tuning*. For more detailed assistance with sizing, contact an Oracle Sales or Support representative.
2.2.2. Supported Installation Platforms for Oracle VDI

The following are the supported installation platforms for Oracle VDI:

<table>
<thead>
<tr>
<th>Operating System</th>
<th>Supported Releases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oracle Linux (64-bit) on x86 platforms</td>
<td>5.6, 5.7</td>
</tr>
<tr>
<td>Oracle Solaris (64-bit) on x86 platforms</td>
<td>Solaris 10 release 09/10 (update 9) or later</td>
</tr>
</tbody>
</table>

**Note:** Solaris 11 is not supported.

Oracle products certified on Oracle Linux are also certified and supported on Red Hat Enterprise Linux due to implicit compatibility between both distributions. Oracle does not run any additional testing on Red Hat Enterprise Linux products.

For the best performance on Oracle Linux platforms, use Oracle's Unbreakable Enterprise Kernel.

All the hosts in the same Oracle VDI Center must use the same operating system. The use of mixed operating systems in the same Oracle VDI Center is not supported.

The supported installation platforms for Oracle VDI can be virtualized, see Section 2.2.7, “Oracle VDI Centers in Virtualized Environments”.

If you use technologies for automating the installation of the operating system or for replicating hosts, such as Kickstart on Oracle Linux platforms or Jumpstart or Flash Archives on Oracle Solaris platforms, you must ensure that each host has a unique iSCSI initiator name. See your system documentation for details on how to configure the iSCSI initiator.

If the firewall is enabled on Oracle VDI hosts, see Section 2.5, “Firewall Ports and Protocols” for details of the ports that might need to be opened.

2.2.3. Requirements for Oracle Linux Platforms

On Oracle Linux platforms, Oracle VDI requires specific packages to be installed. The Oracle VDI installation script checks for these packages before installing the software. If any required packages are missing, the installation script uses the `yum` command to check whether the packages are available. If the missing required packages are available, you are prompted to continue and the packages are downloaded and installed. If the required packages are not available, the installation fails and a list of required packages that must be installed is displayed. You must resolve these dependencies before you can install Oracle VDI. The check for the required packages is performed only for fresh installations of Oracle VDI.

Before you install the software, it is best to ensure that yum is configured correctly and that it is working.

Automatic software update tools, such as the `yum` command, can be configured to update a host to a new release of Oracle Linux when it becomes available. Updates performed in this way can result in the host being updated to a release of Oracle Linux that is not supported. Ensure that your Oracle VDI hosts are configured to receive updates only for the supported releases of Oracle Linux, for example by disabling the Oracle Linux 5 Latest (x86_64) channel (ol5_x86_64_latest).

Oracle VDI requires that an Oracle Linux system is running in runlevel 5 (full multi-user mode with an X-based login screen).

**Checking the Status of the iSCSI daemon**

The iSCSI daemon must be running on the Oracle VDI host. Use the following command to check:
Requirements for Oracle Solaris Platforms

If the daemon is not running, start it with the following command:

```
/etc/init.d/iscsi start
```

SELinux Configuration

If the SELinux setting is enforcing, Oracle VDI installs correctly but configuration fails. Change the SELinux setting to permissive or disabled, by using the SELinux Administration Tool (`system-config-selinux`), or the `/usr/sbin/setenforce 0` command (this command changes the setting to permissive).

2.2.4. Requirements for Oracle Solaris Platforms

On Oracle Solaris platforms, you must install the Entire distribution to get the libraries required by Oracle VDI. If you use Solaris zones, Oracle VDI must be installed in the global zone. Installation in a non-global zone is not supported.

Oracle VDI requires that an Oracle Solaris system is running in runlevel 3 (multi-user level with NFS resources shared).

2.2.5. Time Synchronization

It is important to synchronize the time on Oracle VDI hosts. Use Network Time Protocol (NTP) software to ensure the time on all hosts is synchronized.

When you configure Oracle VDI, a check is made as to whether NTP is configured on the host. If NTP is not configured, the first host (the primary) added to the Oracle VDI Center is automatically configured as an NTP server, and the secondary hosts in the Oracle VDI Center automatically synchronize their times with the primary. If NTP is configured but the time on a host is not synchronized, a warning displays when you configure Oracle VDI.

2.2.6. Requirements for Using a Remote MySQL Database

You specify that you want to use a remote MySQL database when you configure the primary host in an Oracle VDI Center. The remote MySQL database must already be installed and configured.

The following are the supported remote databases:

- MySQL server, at least release 5.0, with the InnoDB storage engine.
- MySQL Cluster, at least release 6.2.15, with the NDB storage engine.

To use the remote database, you must provide the following information when you configure Oracle VDI on a primary host:

- The DNS name of the MySQL host.
- The user name and password of a privileged administrator in the MySQL database.
- The port number to use for connections to the database and whether you want to use Socket Secure Layer (SSL) to secure the connections.

The privileged database administrator is used only to create and configure an Oracle VDI database on the remote MySQL database. When the Oracle VDI database is created, a database user is also created. All access to the remote Oracle VDI database is performed through this user. By default, the name of the
remote Oracle VDI database is \texttt{vda} and the name of the database user is \texttt{vdadb}. When you configure the Oracle VDI primary, you can choose different names, and choose a password to use for the database user.

To use SSL connections to the remote database, you must copy the certificate and key files needed for the SSL connection to the primary host so that they can be specified when you configure Oracle VDI. The certificates and key must be in Privacy Enhanced Mail (PEM) format. Depending on the SSL configuration of the remote database, you might need the following:

- The Certificate Authority (CA) certificate
- The client certificate
- The client certificate private key

For more information about MySQL SSL configuration, refer to the \textit{MySQL Server Administration} chapter of the \textit{MySQL Reference Manual}.

### 2.2.7. Oracle VDI Centers in Virtualized Environments

Oracle VDI can be installed in a virtualized environment. If you plan to create an Oracle VDI Center by cloning an Oracle VDI host template, note the following.

- **Only clone an unconfigured host.**

  A fully configured Oracle VDI host template cannot be cloned. You can install the Oracle VDI software in the template, but you can only configure the host and add it to an Oracle VDI Center after it has been cloned.

- **iSCSI initiator node names must be unique for each host.**

  After cloning the template, you might have to reconfigure the iSCSI initiator name on the host, so that it is a unique name. See your system documentation for details on how to configure the iSCSI initiator.

- **High availability requires two separate hosts.**

  The primary host (with the master database) and the first secondary host (with the slave database) can be installed in a virtualized environment. However, to provide for high availability, they must be hosted on separate physical machines.

For information on multiple Oracle VDI Centers, see Section 3.12, “About Global Oracle VDI Centers”

### 2.3. Installing and Configuring Oracle VDI

#### 2.3.1. Installing Oracle VDI

Before you begin, check that the host meets the requirements for installing Oracle VDI, as described in Section 2.2, “Oracle VDI System Requirements”.

1. Download the Oracle VDI software archive to a temporary location on the host.
2. Log in as root on the host.
3. Unzip the Oracle VDI software archive and change working directory to the extracted directory.

   - On Oracle Solaris hosts:

```
# unzip vda_3.4.1_solaris_amd64.zip
# cd vda_3.4.1_solaris_amd64
```
4. Install the software.

```bash
# ./vda-install
```

The software is installed in `/opt/SUNWvda`.

On Oracle Linux hosts, the installation script checks whether the required packages for Oracle VDI are installed. If any required packages are missing and yum is configured correctly, the installation script prompts you to continue and installs the missing packages. If the required packages are not installed, the installation fails.

At the end of the installation, you are prompted to configure Oracle VDI.

```
Do you want to configure Oracle VDI 3.4.1 now? ([y]/n)
```

- To configure Oracle VDI later, type `n` and press the Return key.
- To configure Oracle VDI now, press the Return key.

For details of how to configure Oracle VDI, see:

- Section 2.3.2, “Configuring Oracle VDI on a Primary Host”
- Section 2.3.3, “Configuring Oracle VDI on a Secondary Host”

### 2.3.2. Configuring Oracle VDI on a Primary Host

You can configure Oracle VDI on a host in the following circumstances:

- As part of the software installation, immediately after installing or updating the Oracle VDI software on a host.
- As a separate step, after installing or updating the Oracle VDI software on a host.
- As a separate step, after unconfiguring Oracle VDI on a host.

To use a remote MySQL database instead of the embedded Oracle VDI MySQL Server database, ensure you have all the required information as described in Section 2.2.6, “Requirements for Using a Remote MySQL Database”.

1. (Optional) Start the configuration script.

   This step is not necessary if you configure the software at the same time as installing the software.

   Run the following command as root:

   ```bash
   # /opt/SUNWvda/sbin/vda-config
   ```

   A list of configuration types is displayed:

   ```bash
   1 New Oracle VDI Center
   2 Join Oracle VDI Center
   Select (1/2):
   ```
2. To configure the host as the primary host in an Oracle VDI Center, type 1 and press the Return key.

If you are configuring an Oracle VDI Center that contains **only one host**, type 1.

A list of configuration settings is displayed.

```
Review the settings for a new Oracle VDI Center:
Name: VDI Center
Administrator Password: ********
DNS name of this host: primary.example.com
Maximum number of sessions on this host: 100
User ID range start: 150000
Database: Embedded Oracle VDI
```

Do you want to create the Oracle VDI Center now? Enter 'c' to customize the settings. ([y]/c):

The default is to use the embedded Oracle VDI MySQL Server database. To use a remote MySQL database, you **must** customize the configuration settings.

- To accept the defaults and create the Oracle VDI Center, press the Return key.
- To change the settings before creating the Oracle VDI Center, type c and press the Return key.

If you change the settings, you can review the changes before they are applied.

The host is configured using the supplied settings.

The following are the configuration settings for a primary host:

- **Name**: The name of the Oracle VDI Center. The name can contain alphanumeric characters as well as spaces.

- **Administrator Password**: The password used to secure the embedded Oracle VDI MySQL Server database and the Sun Ray datastore.

  Normally you do not need to know this password and an automatically-generated password is used. To use the automatically-generated password, press the Return key. Otherwise you can provide a password, which you have to enter twice to confirm. The password must contain at least five characters.

- **DNS name of this host**: The fully-qualified DNS name of the host, for example `primary.example.com`. There must be a valid DNS entry for the host, otherwise the configuration fails.

- **Maximum number of sessions on this host**: This is the maximum number of user sessions that can run on each Oracle VDI host in the Oracle VDI Center.

- **User ID range start**: Oracle VDI creates a local user for each user session on the Oracle VDI host. This option enables you to specify the starting number of the user ID.

- **Database**: Choose whether to use the embedded Oracle VDI MySQL Server database, or connect to a remote MySQL database. For more information about using remote databases, see Section 2.2.6, “Requirements for Using a Remote MySQL Database”.

### 2.3.3. Configuring Oracle VDI on a Secondary Host

You can configure Oracle VDI on a host in the following circumstances:
• As part of the software installation, immediately after installing or updating the Oracle VDI software on a host.

• As a separate step, after installing or updating the Oracle VDI software on a host.

• As a separate step, after unconfiguring Oracle VDI on a host.

1. (Optional) Start the configuration script.

   This step is not necessary if you configure the software at the same time as installing the software.

   Run the following command as root:

   ```bash
   # /opt/SUNWvda/sbin/vda-config
   ```

   A list of configuration types is displayed.

   1 New Oracle VDI Center
   2 Join Oracle VDI Center

   Select (1/2):

2. To configure the host as a secondary host in an Oracle VDI Center, type 2 and press the Return key.

   You are prompted to enter the DNS name of the primary host in the Oracle VDI Center.

   Enter the primary Oracle VDI Host:

3. Enter the fully-qualified DNS name of the primary host in the Oracle VDI Center and press the Return key.

   For example, `primary.example.com`.

   The MD5 fingerprint of the primary's SSL certificate is displayed and you are prompted to enter the password of the root user on the primary host.

   ```text
   Retrieving certificate from primary.example.com...
   ```

   Enter the root password for primary.example.com:

4. Check that the MD5 fingerprint matches the fingerprint of the primary host.

   This is an important security step that ensures you are adding the secondary to a genuine Oracle VDI Center. To check the fingerprint:

   a. Log in as root on the primary host.

   b. Use the `vda-center agent-status` command to display the MD5 fingerprint of the primary host.

   ```bash
   # /opt/SUNWvda/sbin/vda-center agent-status
   Agent is up for 0 day(s), 0:6.
   ```

5. On the secondary host, enter root's password and press the Return key.

   You are prompted to enter the DNS name of the secondary host.

   ```text
   Enter the DNS name of this host [secondary.example.com]:
   ```
6. To accept the detected DNS name of the secondary, press the Return key. Otherwise, enter the fully-qualified DNS name of the secondary and press the Return key.

There must be a valid DNS entry for the host, otherwise the configuration fails.

The host is configured using the supplied settings.

2.3.4. Reconfiguring Oracle VDI on a Host

You might want to reconfigure an Oracle VDI Host to remove it from an Oracle VDI Center or if there is a problem with the host's configuration.

1. Unconfigure Oracle VDI.
   
   # /opt/SUNWvda/sbin/vda-config -u

2. Reconfigure Oracle VDI.

   See Section 2.3.2, “Configuring Oracle VDI on a Primary Host”.
   
   See Section 2.3.3, “Configuring Oracle VDI on a Secondary Host”.

2.3.5. Reinstalling Oracle VDI

If you want to reinstall Oracle VDI on a host and preserve your configuration, you must first back up the following:

- **Database**: You must back up the database before reinstalling. This enables you to restore the current system. For more information about backing up the Oracle VDI database, refer to Section 8.4, “Backing Up and Restoring the Oracle VDI Database”.

- **Customized {my.conf} files**: The database configuration file. The reinstall creates a new /etc/opt/SUNWvda/my.cnf file. Add the customizations from the backup to the new file.

- **Customized {pam.conf} files**: The Sun Ray Server Software access configuration file. The reinstall creates a new /etc/pam.conf file. Add the customizations from the backup to the new file.

To reinstall Oracle VDI, you must first uninstall it, see Section 2.3.6, “Uninstalling Oracle VDI”. After reinstalling the software, restore the data from the backups.

2.3.6. Uninstalling Oracle VDI

- Unconfigure and uninstall the Oracle VDI.

  # /opt/SUNWvda/sbin/vda-install -u

2.4. Updating Oracle VDI to Release 3.4.1

2.4.1. Oracle VDI Update Requirements

Updates to Oracle VDI release 3.4.1 are supported only from the following releases of Oracle VDI:

- 3.4
- 3.3.2

To update from any other release of Oracle VDI, contact Oracle Support.
To update Oracle VDI, follow the instructions for your specific Oracle VDI configuration:

- Updating an Oracle VDI Center (Single Host)
- Updating an Oracle VDI Center (High Availability)

After you update Oracle VDI, it is best to clear your browser's cache before logging in to Oracle VDI Manager. This prevents any display problems after the update.

**Updating Sun Ray Client Operating Software (Client Firmware)**

When you update Oracle VDI, you also update the included Sun Ray Software component. You should also update the firmware on your Sun Ray Clients in order to take full advantage of the enhancements in the updated Sun Ray Software component. Also new Sun Ray Clients might not contain the latest firmware and might need to be updated.

Starting with Sun Ray Software release 5.3, the Sun Ray Operating Software (formerly known as Sun Ray Client firmware) is no longer included with Sun Ray Software and must be downloaded separately from My Oracle Support.

See the Sun Ray Software 5.3 Administration Guide for details of how to update the Sun Ray Operating Software on Sun Ray Clients.

For support-related questions about Sun Ray Operating Software, see knowledge document ID 1448410.1 on My Oracle Support.

**Updating Virtualization Platforms**

In addition to updating Oracle VDI, you might also have to update your virtualization platform. See the following for details of what is supported in this release:

- Oracle VM VirtualBox requirements
- Microsoft Hyper-V requirements
- Microsoft Remote Desktop Services requirements
- VMware vCenter requirements
- Supported storage platforms
- Supported desktop operating systems

**2.4.2. Updating an Oracle VDI Center (Single Host)**

Before you begin:

- Ensure that no users are logged in to Oracle VDI on the host. The update stops all Oracle VDI services.
- Check that the host meets the requirements for installing Oracle VDI, see Section 2.2, “Oracle VDI System Requirements”.
- Check that the host meets the requirements for updating Oracle VDI, see Section 2.4.1, “Oracle VDI Update Requirements”.

1. Download the Oracle VDI software archive to a temporary location on the host.
2. Log in as root on the host.

3. Make a backup of the Oracle VDI database.
   While the backup job is running, all other jobs are stopped or held in the queue.
   • From the CLI, run the `vda-backup` command.

     ```
     # /opt/SUNWvda/sbin/vda-backup -p <path-to-directory> -o <output-file-name>
     ```
   Use the `vda-backup -h` to see all the options for this command.
   • In Oracle VDI Manager:
     a. Go to **Settings → VDI Center**.
     b. Select the **Database** tab.
     c. In the **VDI Database Backup** section, click **Backup**.

4. Unzip the Oracle VDI software archive and change working directory to the extracted directory.

   ```
   # unzip vda_3.4.1_solaris_amd64.zip
   # cd vda_3.4.1_solaris_amd64
   ```

5. Preserve the Oracle VDI configuration on the host.

   ```
   # ./vda-preserve
   ```
   This step preserves the Oracle VDI configuration settings and stops Oracle VDI services on the host.

6. Install the software.

   ```
   # ./vda-install
   ```
   An existing installation is detected and you are prompted to update the installation.

   Oracle Virtual Desktop Infrastructure 3.4.1 Installation
   Found preserved data from 3.4.
   Do you want to update to Oracle VDI 3.4.1 now? ([y]/n)

7. To update, press the Return key.
   The Oracle VDI components are updated.
   At the end of the update, you are prompted to configure Oracle VDI.

   Do you want to configure Oracle VDI 3.4.1 now? ([y]/n)

   To configure the host, press the Return key.
   To configure the host later, type `n` and press the Return key. Use the `vda-config` command to configure the host.

   The host is configured using the details from the preserved configuration.

### 2.4.3. Updating an Oracle VDI Center (High Availability)

Before you begin:
• Ensure that no users are logged in to the Oracle VDI Center. The update stops all Oracle VDI services in the Center.

• Check that the hosts meet the requirements for installing Oracle VDI, see Section 2.2, “Oracle VDI System Requirements”.

• Check that the hosts meet the requirements for updating Oracle VDI, see Section 2.4.1, “Oracle VDI Update Requirements”.

• If you are using a remote database, ensure that you have the administrator password of the remote database.

1. Make a backup of the Oracle VDI database.

   The backup can be made on any host in the Oracle VDI Center.

   While the backup job is running, all other jobs in the Oracle VDI Center are stopped or held in the queue.

   • From the CLI, run the `vda-backup` command.

     ```
     # /opt/SUNWvda/sbin/vda-backup -p <path-to-directory> -o <output-file-name>
     ```

     Use the `vda-backup -h` to see all the options for this command.

   • In Oracle VDI Manager:

     a. Go to Settings → VDI Center.

     b. Select the Database tab.

     c. In the VDI Database Backup section, click Backup.

2. Preserve the Oracle VDI configuration on all hosts in the Oracle VDI Center.

   Start with the primary, followed by the secondaries.

   Repeat the following steps on each Oracle VDI host.

   a. Download the Oracle VDI software archive to a temporary location on the host.

   b. Log in as root on the host.

   c. Unzip the Oracle VDI software archive and change working directory to the extracted directory.

     ```
     # unzip vda_3.4.1_solaris_amd64.zip
     # cd vda_3.4.1_solaris_amd64
     ```

   d. Run the preservation script.

     ```
     # ./vda-preserve
     ```

     This step preserves the Oracle VDI configuration settings and stops Oracle VDI services on the host.

3. Install and configure the software on the primary host.

   a. Install the software.

     ```
     # ./vda-install
     ```
An existing installation is detected and you are prompted to update the installation.

Oracle Virtual Desktop Infrastructure 3.4.1 Installation
Found preserved data from 3.4.
Do you want to update to Oracle VDI 3.4.1 now? ([y]/n)

b. To update, press the Return key.

If you are using a remote database, you are prompted for the administrator password for the remote database.

Oracle VDI 3.4.1 Installation
Updating from Oracle VDI 3.4 to Oracle VDI 3.4.1
MySQL VDA Database Update.
Enter remote database administrator privileged user name: mydbadmin
Enter remote database administrator privileged password:

Enter the administrator password and press the Return key.

At the end of the update, you are prompted to configure Oracle VDI.

Do you want to configure Oracle VDI 3.4.1 now? ([y]/n)

c. To configure the host, press the Return key.

To configure the primary host later, type `n` and press the Return key. Use the `vda-config` command to configure the host. If you do this, you must configure the primary **before** you configure any secondary hosts.

The primary host is configured using the details from the preserved configuration.

4. Install and configure the software on all the **secondary hosts**.

Only configure one secondary host at a time. Wait for the configuration to complete before adding additional secondary hosts.

Repeat the following steps on each Oracle VDI secondary host.

a. Install the software.

```
# ./vda-install
```

An existing installation is detected and you are prompted to update the installation.

Oracle Virtual Desktop Infrastructure 3.4.1 Installation
Found preserved data from 3.4.
Do you want to update to Oracle VDI 3.4.1 now? ([y]/n)

b. To update, press the Return key.

At the end of the update, you are prompted to configure Oracle VDI.

Do you want to configure Oracle VDI 3.4.1 now? ([y]/n)

c. To configure the secondary host, press the Return key.
To configure the secondary host later, type `n` and press the Return key. Use the `vda-config` command to configure the host. If you do this, you must configure the primary before you configure any secondary hosts.

The host is configured using the details from the preserved configuration.

## 2.5. Firewall Ports and Protocols

Firewalls can be used to protect various parts of a network and must be configured to permit the connections required by Oracle VDI.

### 2.5.1. Firewalls Between Clients and Oracle VDI

Clients must be able to connect to any host in an Oracle VDI Center.

The following table lists the ports you might need to open to permit these connections.

<table>
<thead>
<tr>
<th>Source</th>
<th>Destination</th>
<th>Port</th>
<th>Protocol</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client</td>
<td>Oracle VDI web server</td>
<td>1800</td>
<td>TCP</td>
<td>HTTP connections to Oracle VDI Manager.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>These connections are redirected to port 1801.</td>
</tr>
<tr>
<td>Client</td>
<td>Oracle VDI web server</td>
<td>1801</td>
<td>TCP</td>
<td>HTTPS connections to Oracle VDI Manager.</td>
</tr>
<tr>
<td>Client</td>
<td>Oracle VDI web server</td>
<td>1802</td>
<td>TCP</td>
<td>HTTPS connections to the VDI Client web services API.</td>
</tr>
<tr>
<td>Client</td>
<td>Oracle VDI host</td>
<td>3389</td>
<td>TCP</td>
<td>RDP connections to the Oracle VDI RDP Broker.</td>
</tr>
</tbody>
</table>

### 2.5.2. Firewalls Between Oracle VDI and User Directories

All hosts in an Oracle VDI Center need to be able to make connections to any of the configured user directories.

The following table lists the ports you might need to open to permit these connections.

<table>
<thead>
<tr>
<th>Source</th>
<th>Destination</th>
<th>Port</th>
<th>Protocol</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oracle VDI host</td>
<td>Windows server</td>
<td>53</td>
<td>UDP</td>
<td>DNS lookups on Active Directory.</td>
</tr>
<tr>
<td>Oracle VDI host</td>
<td>Windows server</td>
<td>88</td>
<td>TCP or UDP</td>
<td>Authenticate users in Active Directory.</td>
</tr>
<tr>
<td>Oracle VDI host</td>
<td>LDAP directory</td>
<td>389</td>
<td>TCP</td>
<td>Authenticate users in an LDAP directory.</td>
</tr>
<tr>
<td>Oracle VDI host</td>
<td>Windows server</td>
<td>464</td>
<td>TCP or UDP</td>
<td>Enable users to change their password if it has expired.</td>
</tr>
</tbody>
</table>
Ports Required for Active Directory Type Directories

Each Oracle VDI host must be able to make connections to Active Directory on the following ports:

- Port 53 for DNS lookups on Active Directory
- Ports 88 and 464 for Kerberos authentication to a Key Distribution Center (KDC)
- Port 389 for the secure LDAP connection to a domain controller
- Port 3268 for the secure LDAP connection to a global catalog server

Oracle VDI performs several DNS lookups to discover LDAP information. For these lookups to work, it is essential that your DNS is configured correctly to enable the required information to be returned from Active Directory.

Ports 88 and 464 are the standard ports used for Kerberos authentication to a Key Distribution Center (KDC). These ports are configurable. Connections to these ports can use either the TCP or UDP protocol depending on the packet size and your Kerberos configuration. Port 464 is only required for password change operations.

Ports Required for LDAP Type Directories

The standard ports used for connections to LDAP directories are port 389 for standard connections (simple authentication) and port 636 for secure connections (secure authentication). These ports are configurable.

2.5.3. Firewalls Between Oracle VDI and Desktop Providers

In order to run desktops, all hosts in an Oracle VDI Center must be able to connect to any of the configured desktop provider hosts, and their associated storage hosts.

The ports used for connections depends on the desktop provider type and whether the storage is managed by Oracle VDI.

The following table lists the ports you might need to open to permit these connections.
### Ports You Might Need to Open

<table>
<thead>
<tr>
<th>Source</th>
<th>Destination</th>
<th>Port</th>
<th>Protocol</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oracle VDI host</td>
<td>Storage host</td>
<td>3260</td>
<td>TCP</td>
<td>iSCSI connections when virtual disks are copied for management reasons, for example when desktops are imported or copied to a storage host for cloning. Required only for Oracle VM VirtualBox and Hyper-V desktop providers.</td>
</tr>
<tr>
<td>VirtualBox or Microsoft Hyper-V host</td>
<td>Storage host</td>
<td>3260</td>
<td>TCP</td>
<td>iSCSI connections to connect virtual machines to their virtual disks. Required only for Oracle VM VirtualBox and Hyper-V desktop providers.</td>
</tr>
<tr>
<td>Oracle VDI host</td>
<td>Virtualization host</td>
<td>3389</td>
<td>TCP</td>
<td>Microsoft RDP connections to virtual desktops.</td>
</tr>
<tr>
<td>VirtualBox host</td>
<td>VirtualBox host</td>
<td>7777</td>
<td>TCP</td>
<td>Required for Oracle Cluster File System version 2 (OCFS2) for VirtualBox hosts on Oracle Linux platforms and the hosts use an iSCSI or a Sun ZFS storage.</td>
</tr>
<tr>
<td>Oracle VDI host</td>
<td>VirtualBox host</td>
<td>18083</td>
<td>TCP</td>
<td>HTTPS connections to web services for provisioning and managing virtual desktops. Required only for Oracle VM VirtualBox desktop providers when a non-root user is selected to run VirtualBox.</td>
</tr>
<tr>
<td>Oracle VDI host</td>
<td>VirtualBox host</td>
<td>49152 to 65534</td>
<td>TCP</td>
<td>VirtualBox RDP (VRDP) connections to virtual desktops. Required only for the Oracle VM VirtualBox desktop provider if VRDP is selected as the desktop protocol.</td>
</tr>
</tbody>
</table>

Ports 22, 443, 3389, 18083, and 49152-65534 are configurable.

On VirtualBox hosts, the HTTPS port is configured when you install VirtualBox. The VRDP ports are only required if the VRDP protocol is used to connect to desktops. See Choosing Between VRDP and MS-RDP for details. The range of ports used is configurable, see Configuring the VRDP Port Range for details.

### 2.5.4. Firewalls Between the Hosts in an Oracle VDI Center

A network might contain firewalls between the hosts in an Oracle VDI Center, for example if you have multiple offices each containing an Oracle VDI host. The Oracle VDI hosts must be able to connect to any other member of the Oracle VDI Center.

The following table lists the ports you might need to open to permit these connections.
<table>
<thead>
<tr>
<th>Source</th>
<th>Destination</th>
<th>Port</th>
<th>Protocol</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oracle VDI secondary host</td>
<td>Oracle VDI primary host</td>
<td>123</td>
<td>UDP</td>
<td>Network time connection (NTP) connections to the primary host. Required only if NTP is not enabled on the secondary host.</td>
</tr>
<tr>
<td>Oracle VDI host</td>
<td>Another Oracle VDI host</td>
<td>3307</td>
<td>TCP</td>
<td>Connections to the embedded MySQL Server database.</td>
</tr>
<tr>
<td>Oracle VDI host</td>
<td>Remote MySQL database host</td>
<td>Configurable</td>
<td>Configurable</td>
<td>Connection to a remote MySQL database. Required only if a remote MySQL database is selected when you configure an Oracle VDI Center.</td>
</tr>
<tr>
<td>Oracle VDI host</td>
<td>Another Oracle VDI host</td>
<td>11172</td>
<td>TCP</td>
<td>Used for the JMX-MP connector to Cacao. Used by the <code>cacaoadm</code> command.</td>
</tr>
<tr>
<td>Oracle VDI host</td>
<td>Another Oracle VDI host</td>
<td>11173</td>
<td>TCP</td>
<td>Used for the command stream connector to Cacao. Used by <code>vda</code> and <code>vda-center</code> commands.</td>
</tr>
<tr>
<td>Oracle VDI host</td>
<td>Another Oracle VDI host</td>
<td>11174</td>
<td>TCP</td>
<td>Used for the JMX RMI connector to Cacao. Used by the Oracle VDI Manager and for the communication between Oracle VDI Center Agents.</td>
</tr>
<tr>
<td>Sun Ray Software</td>
<td>Sun Ray Software</td>
<td>Various</td>
<td>Various</td>
<td>See <code>Ports and Protocols</code> in the Sun Ray Software 5.3 Administration Guide for details.</td>
</tr>
</tbody>
</table>

On Oracle VDI hosts, port 3303 is also used for the connection between the `vda client` command and the Oracle VDI host. This port is bound to localhost and is configurable.
Chapter 3. Configuring Companies and User Directories

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3.1. About User Directory Integration

Typically user information is already stored in an Active Directory or LDAP server. Before you can create pools and assign users to desktops, you must configure the desired Active Directory/LDAP server and the Oracle VDI. The following information describes the user directory types supported by Oracle VDI.

3.1.1. Active Directory Types

Active Directory integration is the recommended choice for production platforms integrating with Microsoft Active Directory. Active Directory integration requires additional configuration (Kerberos configuration and time synchronization) on the Oracle VDI hosts. To set up Active Directory integration quickly, for example for testing purposes, you can use LDAP Types, see Section 3.1.2, “LDAP Types”.

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See Section 3.2, “Supported User Directories” for details of the supported versions of Active Directory.

The users from the Active Directory can be used for desktop and pool assignments and will be able to access desktops provided by Oracle VDI. On top of this basic feature, Active Directory integration offers the following functionalities:

1. Active Directory integration enables access to all the users from a forest and makes those users available for desktop and pool assignments. This means that the users from the different sub-domains of the forest will be able to access desktops from Oracle VDI.

For more details on supported forest configurations, see Section 3.10, “About Complex Forest Configurations”.

2. Active Directory integration allows computer entries to be removed from the Active Directory when cloned desktops are deleted by the Oracle VDI.

When a Windows desktop (cloned in Oracle VDI) joins a domain through Sysprep, this will typically create a new computer entry in the Active Directory. Configuring Oracle VDI with Kerberos Authentication will allow the Oracle VDI to remove the computer entries from the Active Directory, when deleting unused desktops. This avoids having computer entries piling up in the Active Directory while the matching desktops have long been destroyed.

3. Active Directory integration allows users to update their password (Section 6.2.4, “How to Change a User Password”) in the Active Directory server either before this password has expired (optional action) or after the password has expired (mandatory action).

You can choose from the following supported Active Directory types:

- **Kerberos Authentication** - The typical choice when integrating with Microsoft Active Directory.

  See Section 3.5, “How to Set Up Kerberos Authentication” for more information.

- **Public Key Authentication** - To be used to integrate with Microsoft Active Directory when the domain controller requires LDAP signing, see: http://support.microsoft.com/kb/935834.

  See Section 3.6, “How to Set Up Public Key Authentication” for more information.

### 3.1.2. LDAP Types

LDAP integration is the recommended choice for integrating with other types of LDAP directories or to set up Active Directory integration quickly. The setup is straightforward, without the need for extra configuration.

See Section 3.2, “Supported User Directories” for details of the supported LDAP directories.

LDAP integration allows users to update their password (Section 6.2.4, “How to Change a User Password”) in the directory server only before this password has expired (optional action). If the user password expires, the user will be required to update it using a customer-provided process external to Oracle VDI.

LDAP Integration offers three security types for authentication: anonymous, simple, and secure:

- **Anonymous Authentication** - Useful for a quick integration with an LDAP server but not recommended for production environments. Anonymous Authentication may only be chosen if the LDAP server supports anonymous authentication. Active Directory does not support Anonymous Authentication.

  See Section 3.7, “How to Set Up Anonymous Authentication” for more information.

- **Simple Authentication** - The recommended choice for production platforms integrating with LDAP directories other than Active Directory. If integrating with Active Directory, use Kerberos Authentication,
see Section 3.5, “How to Set Up Kerberos Authentication”. A default restriction in Active Directory prevents password updates from an LDAP Simple Authentication.

See Section 3.8, “How to Set Up Simple Authentication” for more information.

- **Secure Authentication** - Useful to secure connections over SSL, when the directory supports it.
  
  See Section 3.9, “How to Set Up Secure Authentication” for more information.

When a user gets a desktop from Oracle VDI (via the Desktop Selector), Oracle VDI passes the user credentials to the desktop so the user does not have to re-enter their credentials at the desktop login. One way Oracle VDI enables users to authenticate is through their email address, however, an email address is not a valid username on the desktop side.

### 3.1.3. User Directory Customization

If you have an expert understanding of user directory integration and would like to optimize Oracle VDI for your user directory, refer to the following sections:

- Appendix C, *User Directory LDAP Filters and Attributes*
- Section C.1, “How to Edit LDAP Filters and Attributes”
- Section 3.11, “How to Reconfigure the User Directory Settings”

### 3.2. Supported User Directories

The following versions of Active Directory are supported as Active Directory type user directories:

- Windows Server 2008 R2
- Windows Server 2008
- Windows Server 2003 R2
- Windows Server 2003

The following directories are supported as LDAP type user directories:

- Oracle Directory Server Enterprise Edition 11.1.1.5
- Oracle Directory Server Enterprise Edition 7.0
- Oracle Directory Server Enterprise Edition 6.3.1
- Microsoft Active Directory on Windows Server 2008 R2
- Microsoft Active Directory on Windows Server 2008
- Microsoft Active Directory on Windows Server 2003 R2
- Microsoft Active Directory on Windows Server 2003
- Novell eDirectory 8.8
- OpenLDAP 2.4.23

### 3.3. About Companies

The Company feature enables several user directories to be configured for one Oracle VDI environment. For example, this is useful for a business that provides “Desktop as a Service” for separate customers.
To take advantage of the Company feature, you can create a company for each user directory. Virtualization resources (hosts and storage) are shared by all companies. Pools, desktops, users, groups, and tokens are separated for each company.

Templates are automatically separated for each company that use Oracle VM VirtualBox or Microsoft Hyper-V desktop providers. For VMware vCenter desktop providers, all templates are visible to all pools. For security reasons, be sure that templates are only be used among pools of the same company.

For more information about how to create a Company, refer to Section 3.4, “How to Create a Company”. For more information about user directory integration, refer to Section 3.1, “About User Directory Integration”.

3.3.1. Changes to Desktop Selector

When you configure multiple companies, the user's interaction with the Desktop Selector changes. The privacy between the various companies involved is enforced, so the domain list menu is not shown in the Desktop Selector and users must input a username that identifies which company they belong to. The user can enter one of the following usernames based on the type of authentication configured:

- `userid@domainname` type syntax for Active Directory integration.
- `userid@companyname` type syntax for user directories that do not support domains.
- User's email address. This requires that you must set the E-Mail Domain Name property for the company. Multiple domain names can be configured.

Note

When a user gets a desktop from Oracle VDI (via the Desktop Selector), Oracle VDI passes the user credentials to the desktop so the user does not have to re-enter their credentials at the desktop login. One way Oracle VDI enables users to authenticate is through their email address, however, an email address is not a valid username on the desktop side.

3.3.2. Corporation Setting

The Company feature also provides a Corporation setting. This setting is needed when you have a large number of users spread across multiple user directories (LDAP servers or Active Directory domains), but they are all part of the same “Corporation.” For example, a company may have separate user directories per geographical location, such as Company-US and Company-Germany.

In this scenario, the privacy of company data is not required, so the domain list menu is shown in the Desktop Selector and it is populated with all the available domains from all the available companies.

You can enable the Corporation option from the Settings, Company page in .

3.4. How to Create a Company

Most production environments keep user information stored in an Active Directory or LDAP server. Oracle VDI can be configured to recognize existing user directories. Multiple user directories can be configured for one Oracle VDI instance with the Company feature. For more information about the Company feature, refer to Section 3.3, “About Companies”.

Oracle VDI Manager Steps

1. In the Oracle VDI Manager, go to Settings → Company.
2. In the Companies table, click New to activate the New Company wizard.

3. Choose between Active Directory and LDAP user directory types. You can also choose ‘none’ if you only require token assignments.
   - If Active Directory type is chosen, some extra configuration on Oracle VDI hosts is required before setting up Kerberos or Public Key certificates on Oracle VDI.
   - LDAP type is more straightforward and may work with your Active Directory server depending on its configuration. LDAP integration offers three types of authentication: anonymous, simple, and secure.

### 3.5. How to Set Up Kerberos Authentication

Follow the steps below to configure Kerberos Authentication for your Active Directory.

To get the full functionality offered by Kerberos Authentication, it is necessary to provide the credentials of a user that has ‘write’ access to Active Directory. This user is used to read users and delete computer entries from the directory.

#### Steps

Kerberos Authentication requires some specific configuration on the Active Directory server and Oracle VDI hosts prior to setting up the user directory in the Oracle VDI Manager.

1. Kerberos authentication must be enabled in Active Directory.
   - It should already be enabled as the default.

2. Ensure that each Active Directory forest has a global catalog server.
   - Configure a domain controller in each forest as a global catalog server.

3. Set the Forest Functional Level.
   - If the Domain Controller is running on Microsoft Windows Server 2008 R2, the Forest Functional Level must be set to Windows Server 2008 or Windows Server 2008 R2 (instead of the value used by default, Windows Server 2003). Refer to Microsoft documentation for more information about the Forest Functional Level.

4. Synchronize the time between the Oracle VDI hosts and Active Directory server.
   - Use Network Time Protocol (NTP) software or the `rdate` command to ensure the clocks on all hosts are synchronized.
     - For example, use `ntupdate my.windows.host`
   - In a production environment, it is best to use an NTP time server.

5. Edit the system default Kerberos configuration file on the Oracle VDI hosts.
   - The system default Kerberos configuration file is:
     • `/etc/krb5/krb5.conf` on Oracle Solaris OS platforms.
     • `/etc/krb5.conf` on Oracle Linux platforms.
Caution

The capitalization of the realm names in the Kerberos configuration file is very important so make sure you respect the capitalization as indicated in the example.

At a minimum, the Kerberos configuration file must contain the following sections:

- **[libdefaults]** - this sets defaults for Kerberos authentication. You must set the `default_realm`.

- **[realms]** - this sets the KDCs for each Kerberos realm. A realm can have more than one `kdc`, the port can be omitted if the default port 88 is used.

To allow end-users to update their password (Section 6.2.4, “How to Change a User Password”), the details of the server that handles the password change for each Kerberos realm must be specified. The `kpasswd_server` and `admin_server` entries identify the Kerberos administration server that handles the password change. If `kpasswd_server` is omitted, the `admin_server` is used instead. The port can be omitted if the default port 464 is used.

Format of a realm definition:

```
REALM_NAME = {
    kdc = host:port
    kdc = host:port
    ... 
    kpasswd_server = host:port
    admin_server = host:port
    kpasswd_protocol = SET_CHANGE
}
```

- **[domain_realm]** - this maps Active Directory domains to Kerberos realms.

The following is an example Kerberos configuration file for a forest with a single domain:

```
[libdefaults]
default_realm = MY.COMPANY.COM

[realms]
MY.COMPANY.COM = {
    kdc = my.windows.host
    admin_server = my.windows.host
    kpasswd_protocol = SET_CHANGE
}

[domain_realm]
.my.company.com = MY.COMPANY.COM
my.company.com = MY.COMPANY.COM
```

6. You can check that Kerberos and its name resolution requirements are configured properly by using `getent`, `nslookup`, and `kinit`

For example:

- `# getent hosts <my.windows.host>` must return the IP address and the hostname
- `# getent hosts <IP_of_my.windows.host>` must return the IP address and the hostname
- `# nslookup -query=any _gc._tcp.<my.company.com>` must resolve the domain
More Information on Kerberos Authentication

7. Restart the VDA Service.

    # /opt/SUNWvda/sbin/vda-service restart

8. Configure the user directory in Oracle VDI Manager.
   a. In Oracle VDI Manager, go to Settings and then Company.
   b. In the Companies table, click New.
      The New Company wizard is displayed.
   d. On the Specify Connection step, configure Kerberos authentication.
      i. Select Kerberos Authentication.
      ii. In the Domain field, enter the Active Directory domain name.
          For example, my.company.com.
      iii. In the User Name and Password boxes, enter the user principal name of a user that has sufficient privileges to write to the Active Directory.
          For example, super-user or super-user@my.company.com.
   e. On the Define Company step, enter the company details.
      i. In the Name field, enter the name of the company.
      ii. (Optional) In the E-Mail Domain Name field, enter one or more email domain names.
          Enter multiple domain names as a comma-separated list.
          If you enter an email domain, users can log in using their email address.
      iii. (Optional) In the Comments field, enter any notes about the company.
   f. On the Review step, check the configuration of the company and click Finish.
      The new company is added to the Companies table.

More Information on Kerberos Authentication

For more information about Kerberos authentication:

• krb5.conf(4) man page - http://docs.oracle.com/docs/cd/E19253-01/816-5174/6mbb98ufn/index.html
3.5.1. Whitelist and Blacklist Support

Oracle VDI supports the Whitelist and Blacklist feature for Kerberos authentication. The feature is an optional set of hostname lists that can be specified for a Company, giving more fine-grained control over which Active Directory servers are queried by Oracle VDI.

The directory whitelist is a list of comma-separated Active Directory global catalog servers that are always used for LDAP queries. The order of the servers in the White List is important. If Oracle VDI cannot contact the first server in the list, it tries the next one. The directory blacklist is a list of comma-separated Active Directory servers that are never used for LDAP queries. The blacklist settings override the whitelist settings.

This feature can be enabled in the CLI only.

3.6. How to Set Up Public Key Authentication

Public Key Authentication requires some specific configuration on the Active Directory server and the Oracle VDI hosts prior to setting up the user directory in Oracle VDI Manager.

Steps

1. Follow the configuration steps 1 to 5 described for Kerberos Authentication. See Section 3.5, “How to Set Up Kerberos Authentication”.

2. Create a client certificate for each of the Oracle VDI hosts.

   The Oracle VDI keystore for the client certificate is located at `/etc/opt/SUNWvda/sslkeystore` and the password is `changeit`.

   a. Generate a key pair (private/public key) for the client certificate.

      On the Oracle VDI host, log in as superuser (root) and use the Java `keytool` utility to generate the key pair in the Oracle VDI keystore.

      ```
      keytool -genkey -keyalg rsa \
      -keystore /etc/opt/SUNWvda/sslkeystore \
      -storepass changeit -keypass changeit \
      -alias your_alias
      ```

   b. Generate a Certificate Signing Request (CSR) for client certificate.

      On the Oracle VDI host, use `keytool` to generate the certificate request.

      ```
      keytool -certreq \
      -keystore /etc/opt/SUNWvda/sslkeystore \
      -storepass changeit -keypass changeit \
      -alias your_alias \
      -file certreq_file
      ```

      The alias must be the same as the alias used when generating the key pair. Aliases are case-insensitive.

   c. Create the certificate.

      i. Copy the CSR file to the server hosting the Active Directory.

      ii. Using Internet Explorer, go to "http://localhost/certsrv".

      iii. Log in.
iv. On the Microsoft Certificate Services page, click **Request a Certificate**.

v. On the **Request a Certificate** page, click **Advanced Certificate Request**.

vi. On the **Advanced Certificate Request** page, click **Submit a Certificate Request** by using a base-64-encoded CMC or PKCS #10 file, or submit a renewal request by using a base-64-encoded PKCS #7 file.

vii. On the **Submit a Certificate Request or Renewal Request** page, paste the contents of the CSR into the **Saved Request** text box or browse to the CSR file.

viii. Select an appropriate template from the **Certificate Templates** list.

Administrator is recommended.

ix. Click **Submit**.

x. On the **Certificate Issued** page, ensure **Base 64 Encoded** is selected and click **Download Certificate Chain**.

xi. Save the certificate file.

d. Import the certificate on the Oracle VDI host.

i. Copy the certificate file to the Oracle VDI host.

ii. Import the certificate into the Oracle VDI keystore.

```
keytool -import \
-keystore /etc/opt/SUNWvda/sslkeystore \n-storepass changeit -keypass changeit \
-trustcacerts -file certificate_file \n-alias your_alias
```

3. Restart the VDA Service.

```
# /opt/SUNWvda/sbin/vda-service restart
```

4. Configure the user directory in Oracle VDI Manager.

   a. In Oracle VDI Manager, go to **Settings** and then **Company**.

   b. In the Companies table, click **New**.

      The New Company wizard is displayed.

   c. On the Choose User Directory step, select **Active Directory**.

   d. On the Specify Connection step, configure public key authentication.

      i. Select **Public Key Authentication**.

      ii. In the **Domain** field, enter the Active Directory domain name.

         For example, `my.company.com`.

   e. On the Verify Certificate step, check that the SSL certificate details are correct.
f. On the Define Company step, enter the company details.
   i. In the Name field, enter the name of the company.
   ii. (Optional) In the E-Mail Domain Name field, enter one or more email domain names.
       Enter multiple domain names as a comma-separated list.
       If you enter an email domain, users can log in with their email address.
   iii. (Optional) In the Comments field, enter any notes about the company.

g. On the Review step, check the configuration of the company and click Finish.
   The new company is added to the Companies table.

3.7. How to Set Up Anonymous Authentication

Use the steps below to set up anonymous authentication.

**Oracle VDI Manager Steps**

1. In Oracle VDI Manager, go to Settings and then Company.
2. In the Companies table, click New.
   The New Company wizard is displayed.
3. On the Choose User Directory step, select LDAP.
   a. Select Anonymous Authentication.
   b. In the Host field, enter the fully-qualified DNS name or IP address of the LDAP server.
   c. In the Port field, enter the port number used for connections to the LDAP server.
      The default port number is 389.
   d. (Optional) In the Base DN field, enter the distinguished name (DN) of an LDAP object to use as the search base.
      For example: cn=Users,dc=example,dc=com.
      The base DN is used to restrict the part of the LDAP directory used to search for users.
5. On the Define Company step, enter the company details.
   a. In the Name field, enter the name of the company.
   b. (Optional) In the E-Mail Domain Name field, enter one or more email domain names.
      Enter multiple domain names as a comma-separated list.
      If you enter an email domain, users can log in with their email address.
   c. (Optional) In the Comments field, enter any notes about the company.
6. On the Review step, check the configuration of the company and click **Finish**.

   The new company is added to the Companies table.

7. (Optional) If you want users to authenticate only once when logging in using their email address, set the default domain for the user directory.

```
/opt/SUNWvda/sbin/vda directory-setprops [-u CompanyName] \
   -p directory.default.domain=domainname
```

### 3.8. How to Set Up Simple Authentication

Use the steps below to set up simple authentication.

**Note**

It is necessary to provide the credentials of a user that has 'read' access to the user directory. This user will be used to read user information from the directory.

**Oracle VDI Manager Steps**

1. In Oracle VDI Manager, go to **Settings** and then **Company**.

2. In the Companies table, click **New**.

   The New Company wizard is displayed.

3. On the Choose User Directory step, select **LDAP**.


   a. Select **Simple Authentication**.

   b. In the **Host** field, enter the fully-qualified DNS name or IP address of the LDAP server.

   c. In the **Port** field, enter the port number used for connections to the LDAP server.

      The default port number is 389.

   d. (Optional) In the **Base DN** field, enter the distinguished name (DN) of an LDAP object to use as the search base.

      For example: `cn=Users,dc=example,dc=com`.

      The base DN is used to restrict the part of the LDAP directory used to search for users.

   e. In the **User Name** and **Password** boxes, enter the DN and password of a user that has sufficient privileges to search the LDAP directory.

      For example, `cn=super-user,cn=Users,dc=example,dc=com`.

5. On the Define Company step, enter the company details.

   a. In the **Name** field, enter the name of the company.

   b. (Optional) In the **E-Mail Domain Name** field, enter one or more email domain names.

      Enter multiple domain names as a comma-separated list.
If you enter an email domain, users can log in with their email address.

c. (Optional) In the **Comments** field, enter any notes about the company.

6. On the Review step, check the configuration of the company and click **Finish**.

   The new company is added to the Companies table.

7. (Optional) If you want users to authenticate only once when logging in using their email address, set the default domain in the user directory.

   ```bash
   /opt/SUNWvda/sbin/vda directory-setprops [-u CompanyName] \[-p directory.default.domain=domainname]
   ```

### 3.9. How to Set Up Secure Authentication

Use the steps below to set up secure authentication.

---

**Note**

It is necessary to provide the credentials of a user that has 'read' access to the user directory. This user will be used to read user information from the directory.

---

**Oracle VDI Manager Steps**

1. In Oracle VDI Manager, go to **Settings** and then **Company**.

2. In the Companies table, click **New**.

   The New Company wizard is displayed.

3. On the Choose User Directory step, select **LDAP**.


   a. Select **Secure Authentication**.

   b. In the **Host** field, enter the fully-qualified DNS name or IP address of the LDAP server.

   c. In the **Port** field, enter the port number used for secure connections to the LDAP server.

      The default port number is 636.

   d. (Optional) In the **Base DN** field, enter the distinguished name (DN) of an LDAP object to use as the search base.

      For example: `cn=Users,dc=example,dc=com`.

      The base DN is used to restrict the part of the LDAP directory used to search for users.

   e. In the **User Name** and **Password** boxes, enter the DN and password of a user that has sufficient privileges to search the LDAP directory.

      For example, `cn=super-user,cn=Users,dc=example,dc=com`.

5. On the Verify Certificate step, check that the SSL certificate details are correct.

6. On the Define Company step, enter the company details.
3.10. About Complex Forest Configurations

The following types of Active Directory forest configurations are supported by Oracle VDI.

- Single domain forests
- Single tree forests with multiple domains
- Multiple tree forests with multiple domains with or without child domains

Example of a Single Tree Forest

The Active Directory is a forest containing:

- A root domain named example.com. The Global Catalogs are located in the root domain.
- A child domain named users.example.com where all the users are located, including the user used to set up authentication in the Oracle VDI Manager.

The krb5.conf file should look similar to the following.

```conf
[libdefaults]
default_realm = USERS.EXAMPLE.COM

[realms]
USERS.EXAMPLE.COM = {
kdc = users.host
admin_server = users.host
kpasswd_protocol = SET_CHANGE
}
EXAMPLE.COM = {
kdc = example.windows.host
admin_server = example.windows.host
kpasswd_protocol = SET_CHANGE
}

[domain_realm]
.users.example.com = USERS.EXAMPLE.COM
users.example.com = USERS.EXAMPLE.COM
.example.com = EXAMPLE.COM
example.com = EXAMPLE.COM
```
And the settings to be used in the Oracle VDI Manager:

- **Domain:** example.com
- **Username:** super-user@users.example.com

### Example of Multiple Tree Forests

For example, the following multiple tree configuration with multiple domains is supported.

- One tree containing the domain `central.vdi.example.com` (Forest Root) and a child domain `child.central.vdi.example.com`
- A second tree containing the domain `east.vdi.example.com`
- Both trees are part of the same forest (central.vdi.example.com)

In order to add this tree configuration as a Company in Oracle VDI Manager, first make sure that Kerberos has been configured correctly on the Oracle VDI hosts.

The `krb5.conf` file should look similar to the following.

```plaintext
[libdefaults]
default_realm = CENTRAL.VDI.EXAMPLE.COM

[realms]
CENTRAL.VDI.EXAMPLE.COM ={
kdc = centralroot.vdi.example.com
}
CHILD.CENTRAL.VDI.EXAMPLE.COM = {
kdc = centralchild.vdi.example.com
}
EAST.VDI.EXAMPLE.COM = {
kdc = eastroot.vdi.example.com
}

[domain_realm]
.central.vdi.example.com = CENTRAL.VDI.EXAMPLE.COM
central.vdi.example.com = CENTRAL.VDI.EXAMPLE.COM
.child.central.vdi.example.com = CHILD.CENTRAL.VDI.EXAMPLE.COM
central.child.central.vdi.example.com = CHILD.CENTRAL.VDI.EXAMPLE.COM
central.east.vdi.example.com = EAST.VDI.EXAMPLE.COM
central.vdi.example.com = EAST.VDI.EXAMPLE.COM

east.vdi.example.com = EAST.VDI.EXAMPLE.COM
```

In the Oracle VDI Manager **New Company** wizard, be sure to enter the domain name of the Forest Root in the **Specify Connection** step.

### 3.11. How to Reconfigure the User Directory Settings

User directory settings are configured in the Oracle VDI Manager in the Settings category and Company subcategory.

#### 3.11.1. Defining the User Directory

The instructions to define the user directory are described in Section 3.1, “About User Directory Integration”.

#### 3.11.2. Changing the Security Level

It is possible to change the security level for the connections to a user directory:

1. In the Oracle VDI Manager, go to **Settings → Company**.
2. Select a company and go to the LDAP or Active Directory tab (depending on the user directory type).
3. Click Edit for the Security Level to launch the wizard.
4. Switch to another security level and modify the other settings if necessary, such as the port, the username, and the password.
5. Click Next to review your choices before completing the configuration update.

It is only possible to switch to a security level within the same type of user directory, LDAP or Active Directory. To switch between LDAP and Active Directory types, use the `vda directory-setprops` command.

In the case of LDAP connection type, it is not possible to change the security level if additional hosts have been defined (see Section 3.11.5, “Adding Fallback Hosts”).

### 3.11.3. Changing the Credentials

When using Kerberos, Simple or Secure authentication, it is possible to update the credentials used for opening the connection to a user directory:

1. In the Oracle VDI Manager, go to **Settings → Company**.
2. Select a company and go to the LDAP or Active Directory tab (depending on the user directory type).
3. Click Edit for the Security Level to launch the wizard.
4. Edit the username and the password as necessary.
5. Click Next to review your choices before completing the configuration update.

### 3.11.4. Updating the Server SSL Certificates

When using Public Key or Secure authentication, if the SSL certificate for the server has been changed, you need Oracle VDI to use the new certificate:

1. In the Oracle VDI Manager, go to **Settings → Company**.
2. Select a company and go to the LDAP or Active Directory tab (depending on the user directory type).
3. Click Edit for the Security Level to launch the wizard.
   
   Do not change any of the existing settings if you only want to update the server certificates. One of the wizard steps shows the SSL certificates of the servers. Click Next to permanently accept the certificates.
4. Click Next to review your choices before completing the configuration update.

### 3.11.5. Adding Fallback Hosts

When using the LDAP type of connection, it is possible to have additional LDAP hosts that would be used as a fallback in the case the connection to the main host is failing.

The additional LDAP hosts must be the replica of the main host. The connection to the fallback hosts will be open using the same security level, same port, same base DN and same credentials as for the main host.

The list of LDAP hosts can be found in the LDAP tab. Hosts can be added, removed and their order can be changed.
3.12. About Global Oracle VDI Centers

The Global Oracle VDI Centers feature is useful for companies whose users travel from one site to another. It extends the basic hotdesking experience to multiple Oracle VDI environments so that, when they travel, users can access desktops in their home Oracle VDI Center or locally hosted desktops.

Global Oracle VDI Centers assume the existence of a global user directory infrastructure. Global Oracle VDI Centers are always enabled, but you cannot take advantage of this feature unless your user directory is properly prepared. For more information about how to prepare the user directory, refer to Section 3.13, “How to Prepare a User Directory for Global Oracle VDI Centers”.

When considering the user experience, you should decide whether to implement manual or automatic redirection for hotdesking and whether to make guest pools available.

Guest pools are described in Section 3.12.2, “Guest Pools”. For more information on hotdesking, see Hotdesking in the Sun Ray Software 5.3 Administration Guide. Manual and automatic redirection are described below in Section 3.12.3.1, “Manual Redirection” and Section 3.12.3.2, “Automatic Redirection”.

3.12.1. Home and Foreign Oracle VDI Centers

An Oracle VDI Center is an individual Oracle VDI environment consisting of one or more Oracle VDI hosts. The Oracle VDI Center where a user normally works is that person's home Oracle VDI Center. Working in one's home Oracle VDI Center is no different, from the user point-of-view, than working in a standalone Oracle VDI Center. With Global Oracle VDI Centers, once the user directory has been properly prepared, a user can continue to access an existing desktop in the home Oracle VDI Center while traveling or use a desktop from a guest pool at the foreign Oracle VDI Centers.

3.12.2. Guest Pools

A Guest pool -- a pool with the Guest flag turned on -- provides desktops for users who have no assignments to desktops or other non-Guest pools in the Oracle VDI Center to which they are currently connecting. A Guest pool is displayed in the Desktop Selector dialog only when a user meets this condition.

You can set a pool as a Guest pool with the Oracle VDI Manager or the CLI. Although they are not mandatory, the following settings for Guest pools are recommended:

- Flexible desktop assignment
- Small Preferred Size, to conserve resources
- Small number of Free Desktops, to conserve resources
- Large Maximum Size, depending on how many guest users are expected to work at the same time in a worst-case scenario

3.12.3. Oracle VDI Login and Desktop Selector Dialog

Initially, the Oracle VDI Login Dialog looks the same as in previous releases, which did not include Global Oracle VDI Centers. When the user provides a username and password, the system determines, based on the Global Oracle VDI Center-related data in the user directory, whether to connect to the user's current home Oracle VDI Center or to a foreign Oracle VDI Center. If no such data can be found for the current user, the current Oracle VDI Center is considered to be the user's home Oracle VDI Center.

So, there is no difference in the user experience when users connect to their home Oracle VDI Center. However, when a user connects to a foreign Oracle VDI Center, the Desktop Selector dialog contains new entries, such as:
1. One or more Guest pool entries. If you have configured the Guest pools correctly, the user can get a local desktop from a Guest pool in the foreign Oracle VDI Center, after which the Desktop Selector displays that desktop instead of the Guest pools.

2. An entry to switch to the user's home Oracle VDI Center. This option redirects the current session to the user's home Oracle VDI Center. The Login Dialog is displayed with the username pre-populated, and the user has to enter a password again. After successful authentication, the Desktop Selector dialog displays the user's assigned desktops and pools.

3.12.3.1. Manual Redirection

Normally, the Oracle VDI Login Dialog prompts for username, domain, and password. If authentication succeeds, the Oracle VDI system determines the user's home Oracle VDI Center. If the Sun Ray Client is connected to the user's home Oracle VDI Center, then nothing changes in the dialog's behavior, and the user is presented with the Desktop Selector screen. However, if the Sun Ray Client is not connected to the user's home Oracle VDI Center, then the Desktop Selector screen displays an Oracle VDI Center entry in addition to any other guest desktops that may be available for a visitor to that Oracle VDI Center. The user now has the choice of being redirected to the home Oracle VDI Center or of using one of the guest desktops available at the foreign Oracle VDI Center.

If the user selects the home Oracle VDI Center entry, the Sun Ray Client is redirected to one of the Sun Ray servers in the user's home Oracle VDI Center, and the Login Dialog displays the username and current domain. Upon re-entering the correct password, the user is presented with the normal Desktop Selector screen. Since the Sun Ray Client is now connected to the user's home Oracle VDI Center, the assigned desktops in the home Oracle VDI Center are now accessible. At this point, the user cannot revert to the new local Center.

If you want to enable redirection back to the previous home Oracle VDI Center, see Section 3.12.3.3, “Automatic Redirection to Initial Server”.

3.12.3.2. Automatic Redirection

The default redirection logic requires the user to enter a password twice, first on the initial login screen and then after redirection. To avoid this inconvenience, you can configure the Login Dialog to perform multi-step authentication. Setting the client.autoredirection.homeserver=Enabled property instructs the dialog to ask only for username and domain information (see Section 9.7.7, “How Do I Control Client Redirection with client.autoredirect Properties?”). This information is sufficient to determine the user's home Oracle VDI Center.

Users already connected to their home Oracle VDI Center get a password prompt in a second step. For users not already connected, the Sun Ray Client is automatically redirected to any server in the user's home Oracle VDI Center. After redirection, the password prompt is presented (username and domain are preset). After successful authentication, the user gets the Desktop Selector screen.

Automatic redirection does not offer the capability to stay at the foreign Oracle VDI Center and to use or select a guest desktop. Instead, the user must work with desktops hosted in the user's home Oracle VDI Center.

3.12.3.3. Automatic Redirection to Initial Server

After a Sun Ray Client has been redirected to a different server, it usually remains there when the user disconnects. This can cause some confusion for the next user, who might be surprised to be offered an Oracle VDI Center link and a list of guest desktops instead of the expected list of assigned desktops. Under automatic redirection, however, the client is automatically redirected to the current user's home Oracle VDI Center during the login sequence.
You can use the `client.autoredirect.firstserver` setting to configure the Oracle VDI kiosk session to redirect the Sun Ray Client to return to its initial server automatically when the user logs off, disconnects, or quits the session. It is enabled by default (see Section 9.7.7, “How Do I Control Client Redirection with client.autoredirect Properties?”).

### 3.13. How to Prepare a User Directory for Global Oracle VDI Centers

Global Oracle VDI Centers have been designed to work out-of-the-box on the Oracle VDI side. However, the Oracle VDI Center data needs to be populated in your user directory according to the schema used by Oracle VDI, see Section 3.13.1, “Oracle VDI Center Data Schema”.

If you want to use different attribute names and object types than the defaults, you may do so. You will then need to customize the LDAP filters and attributes used for Global Oracle VDI Centers to reflect the attributes and objects used in your schema.

See Section C.1, “How to Edit LDAP Filters and Attributes” for the necessary steps and the default LDAP filters and attributes for Global Oracle VDI Centers.

### 3.13.1. Oracle VDI Center Data Schema

Oracle VDI is configured to use the following schema for storing Oracle VDI Center data. This schema uses classes and attributes that already exist in LDAP v3 directories.

- **Oracle VDI Center**: an Oracle VDI Center is an Organization Unit (ou) object. It may be located in any place in the user directory. The name used to represent an Oracle VDI Center in the Oracle VDI Desktop Selector dialog is taken from the `displayName` attribute if this attribute is specified. Otherwise, the value of the `ou` attribute is used. An Oracle VDI Center `ou` contains (directly or through a hierarchy) several Oracle VDI Host objects, which are the Oracle VDI hosts composing the Oracle VDI Center.

- **Oracle VDI Host**: an Oracle VDI Host is a `computer` object (on Active Directory) or a `device` object (on other LDAP directories). The hostname/IP address of the Oracle VDI Host is taken from the `dNSHostName` attribute (on Active Directory) or the `ipHostNumber` attribute (on other LDAP directories). If none of these attributes are defined, the value of the `cn` attribute of the host object is used.

- **Associating an Oracle VDI Center with a User**: the Oracle VDI Center to which a user belongs is defined on the user object, in the `seeAlso` attribute. This value of this attribute needs to be the full DN of the Oracle VDI Center object for that user.

*Figure 3.1* shows an example global Oracle VDI Center in Active Directory.
3.14. About LDAP Filters and Attributes

Oracle VDI uses various LDAP filters and attribute lists to look up and interpret the data stored in a user directory.

This section explains how the LDAP filters and attributes are used by Oracle VDI to perform the different searches in the user directory necessary for each task.

See Section C.1, “How to Edit LDAP Filters and Attributes” for details about how to edit those filters.


You can use the administration tools (Oracle VDI Manager or CLI) to search for users and groups, in order to assign them to desktops or pools.

The search logic works as follows:
• Users are searched first:
  • The filter used to search for users is: \( (&\text{ldap.user.object.filter} \&\text{ldap.user.search.filter}) \).
  • The \$SEARCH_STRING placeholder is replaced by \*criteria\* where criteria is the string typed in the Oracle VDI Manager search field. If the criteria string already contains a wild-card \*\*, then the \$SEARCH_STRING placeholder is simply replaced by criteria.

• Groups are then searched as follow:
  • The filter used to search for groups is: \( (&\text{ldap.group.object.filter} \&\text{ldap.group.search.filter}) \).
  • The \$SEARCH_STRING placeholder is replaced by \*criteria\* where criteria is the string typed in the Oracle VDI Manager search field. If the criteria string already contains a wild-card \*\*, then the \$SEARCH_STRING placeholder is simply replaced by criteria.

If the global setting \text{ldap.search.wildcard} is set to disabled, the \$SEARCH_STRING placeholder is replaced by criteria (without being surrounded by the wildcards). This restricts the returned results to strictly match the typed string but it is useful with very large and distributed user directories where the search using the wildcards takes too long to return.

Wildcards are added by default as the default value for \text{ldap.search.wildcard} is enabled.

3.14.2. Requesting a Desktop for a User

When requesting a desktop for a user, Oracle VDI first needs to find the user DN that matches the user ID before resolving the pool and desktop assignments for the user DN. If client authentication is enabled, then the user ID attribute is also used for authentication.

The attributes used to match the user ID are defined in \text{ldap.userid.attributes}.

3.14.3. Resolving Group Membership

Group membership is resolved using the attributes defined in \text{ldap.user.member.attributes} and \text{ldap.group.member.attributes}.

Nested group depth is limited to 3.

Oracle VDI also resolves Primary Group membership which is Active Directory specific. The attributes used for resolving primary group membership are defined in \text{ldap.group.short.attributes} and \text{ldap.user.member.attributes}.

3.14.4. LDAP Cache

In order to improve the performance and reduce the load on the user directory, the user and group entries retrieved by Oracle VDI are cached. Entries in the LDAP cache time out after 10 minutes.

It is not possible, at the moment, to change the LDAP cache timeout, nor to flush the cache.

3.15. Removing a Company

You can remove a company through the All Companies page in Oracle VDI Manager. You cannot remove a company that has pools. you must delete all pools for a company before you can remove it.
Chapter 4. Configuring Desktop Providers and Virtualization Platforms

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4.1. Oracle VM VirtualBox

4.1.1. About Oracle VM VirtualBox

Oracle VDI bundles and supports a specific Oracle VM VirtualBox release. See Section 4.1.2, “System Requirements for Oracle VM VirtualBox”.

The VirtualBox provides the following features.
Shared Memory

Shared Memory (also known as memory ballooning) is a feature that enables more desktops to run on VirtualBox hosts. By specifying an amount of memory to be shared between desktops, the VirtualBox host's memory can be automatically redistributed between desktops as required. The Shared Memory feature can be activated on a per-pool basis on the Pool category, Settings tab by specifying a value greater than 0% (up to 75%).

The memory sharing percentage is the amount of memory that can be used for other desktops if a desktop does not require the full amount of memory for itself. For instance, if the desktop memory size is 1 GB and memory sharing is set to 40%, the desktop will initially have around 600 MB of real memory. The other 400 MB will be made available to the desktop on demand.

Oracle VDI constantly monitors desktops with memory sharing enabled to ensure they don't run out of memory. If a desktop's free memory drops below 64 MB more usable memory will be provided. If a desktop has excessive amounts of free memory, some memory will be gradually taken away until the memory sharing percentage is reached. The changes to desktop memory will not be apparent to the guest OS.

Memory Paging

Memory Paging (also known as de-duplication of memory) is a feature that enables more desktops to run on VirtualBox hosts. If several desktops have identical content in memory, pages will be used to consume real memory on the hypervisor only once. The desktops will reference the page and do not need physical memory for identical pages any more.

The Memory Paging feature can be activated on a per-pool basis on the Pool category, Settings tab.

4.1.2. System Requirements for Oracle VM VirtualBox

Oracle VDI includes release 4.1.18 of Oracle VM VirtualBox. For reasons of backward compatibility, you can continue to use some releases of VirtualBox that were included in previous releases of Oracle VDI. In this release, the following are the only supported releases of VirtualBox:

- 4.1.18
- 4.1.14
- 4.0.16

On Oracle Linux platforms, due to the changes to storage in this release, you must use at least release 4.1.14 of VirtualBox.

To obtain the best performance, it is best to use the bundled release of VirtualBox.

The following are the supported installation platforms for the bundled release of VirtualBox:

<table>
<thead>
<tr>
<th>Operating System</th>
<th>Supported Releases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oracle Linux (64-bit) on x86 platforms</td>
<td>5.6 and 5.7</td>
</tr>
<tr>
<td>Oracle Solaris (64-bit) on x86 platforms</td>
<td>Solaris 10 release 09/10 (update 9) or later</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Solaris 11 is not supported.</td>
</tr>
</tbody>
</table>

Oracle products certified on Oracle Linux are also certified and supported on Red Hat Enterprise Linux due to implicit compatibility between both distributions. Oracle does not run any additional testing on Red
Hat Enterprise Linux products. However, due to Bug ID 13974640, you must use Oracle’s Unbreakable Enterprise Kernel if you use Oracle Linux as the platform for your VirtualBox hosts. The Red Hat kernel is not supported.

Due to the differences in the availability of the storage types and the way they are used, the virtualization hosts for an Oracle VM VirtualBox desktop provider must use the same operating system. You cannot mix Oracle Solaris and Oracle Linux virtualization hosts.

All VirtualBox hosts must have the virtualization extensions from AMD (AMD-V) and Intel (VT-x) enabled. Some basic hardware sizing guidelines can be found at Chapter 7, Performance and Tuning. For more detailed assistance with sizing, contact an Oracle Sales or Support representative.

If the firewall is enabled on VirtualBox hosts, see Section 2.5.3, “Firewalls Between Oracle VDI and Desktop Providers” for details of the ports that might need to be opened.

Storage Requirements

Oracle VM VirtualBox requires storage for the virtual disks used by Oracle VDI. See Section 4.6, “Storage” for details of what is supported.

User Requirements

When you install VirtualBox, you provide the user name and password of the user that runs VirtualBox on the host. Oracle VDI uses the credentials to access the VirtualBox host using SSH and to access the VirtualBox web service. By default, the root user is used. It is best to use the root user, as this ensures that the VirtualBox functionality for suspending and resuming virtual machines works in all situations. On Oracle Linux platforms, you must use the root user if you want to use iSCSI storage or Sun ZFS storage. If you use a different user, the user must have a home directory and the home directory must not be shared between several systems that run VirtualBox.

System Requirements for VirtualBox Hosts on Oracle Solaris Platforms

On Solaris platforms, you must install the Entire distribution to get the libraries required by Oracle VDI. The VirtualBox installation script warns you if the zfs_arc_min parameter is not set. If this is not set, the ZFS ARC cache does not shrink below approximately 12% of the available memory. The recommended setting for a dedicated VirtualBox host is 512 MB.

If you intend to use local storage on the VirtualBox host and the local storage is a ZFS file system, you might need to increase the zfs_arc_min setting. The recommended 512 MB setting maximizes the available memory for running virtual machines but reduces ZFS performance by limiting the ARC cache.

You should also set the zfs_arc_max parameter to be the same value as zfs_arc_min.

To set the zfs_arc_min and zfs_arc_max values, log in as root and edit the /etc/system file. You set the parameter values in bytes. For example, to set the values to 512 MB, add the following:

```
set zfs:zfs_arc_min = 536870912
set zfs:zfs_arc_max = 536870912
```

System Requirements for VirtualBox Hosts on Oracle Linux Platforms

On Oracle Linux platforms, VirtualBox requires specific packages to be installed in order to function correctly. The VirtualBox installation script checks for these packages before installing the software. If any required packages are missing, the installation script uses the yum command to check whether the
packages are available. If the missing required packages are available, you are prompted to continue and the packages are downloaded and installed. If the required packages are not available, the installation fails and a list of required packages that must be installed is displayed. You must resolve these dependencies before you can install VirtualBox. The check for the required packages is only performed for fresh installations of VirtualBox.

Before you install the software, it is best to ensure that yum is configured correctly and that it is working.

Automatic software update tools, such as the `yum` command, can be configured to update a host to a new release of Oracle Linux when it becomes available. Updates performed in this way can result in the host being updated to a release of Oracle Linux that is not supported. Ensure that your virtualization hosts are configured to receive updates only for the supported releases of Oracle Linux, for example by disabling the Oracle Linux 5 Latest (x86_64) channel (ol5_x86_64_latest).

### 4.1.3. Installing Oracle VM VirtualBox

This section describes how to install the release of Oracle VM VirtualBox that is bundled with Oracle VDI.

Before you begin, check that the host meets the installation requirements, see Section 4.1.2, “System Requirements for Oracle VM VirtualBox”.

If you are updating VirtualBox, see Section 4.1.4, “Updating Oracle VM VirtualBox”.

**About the VirtualBox Installation Script**

Oracle VM VirtualBox is installed and uninstalled with the `vb-install` script. VirtualBox is delivered as two packages, an open source package (the Base Pack) and an Oracle proprietary package (the Extension Pack).

The Oracle VDI software archive only includes the Extension Pack. When you run the `vb-install` script, the script automatically downloads the Base Pack using the `wget` program. If this fails, for example due to network connectivity problems, the script exits and you must manually download the Base Pack. You can download the Base Pack and the Extension Pack from the VirtualBox download page.

The following table lists the options that can be used with `vb-install` script to automate the installation on several servers with a script.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-f</td>
<td>Forces existing virtual machines to be deleted.</td>
</tr>
<tr>
<td>-n &lt;user&gt;</td>
<td>Specifies the user name of the VirtualBox user. The default is root.</td>
</tr>
<tr>
<td>-o &lt;port&gt;</td>
<td>Specifies the SSL port to use to connect to VirtualBox. The default is port 443 if the user is root, otherwise port 18083.</td>
</tr>
<tr>
<td>-p</td>
<td>Requires input from standard input (<code>stdin</code>) to enter the password in a secure way.</td>
</tr>
<tr>
<td>-u</td>
<td>Uninstalls the currently installed release of VirtualBox.</td>
</tr>
</tbody>
</table>

**Steps**

1. Log in as root on the virtualization host.
2. Download the main Oracle VDI software archive.
3. Unzip the main Oracle VDI software archive and change working directory to the extracted directory.
   - On Oracle Solaris hosts:
     
     ```
     # unzip vda_3.4.1_solaris_amd64.zip
     # cd vda_3.4.1_solaris_amd64
     ```
   - On Oracle Linux hosts:
     
     ```
     # unzip vda_3.4.1_linux.zip
     # cd vda_3.4.1_linux
     ```

4. Unzip the VirtualBox archive and change working directory to the extracted directory.

   ```
   # unzip vbox_4.1.zip
   # cd vbox_4.1
   ```

5. Install VirtualBox.

   ```
   # ./vb-install
   ```

   The installation script downloads the VirtualBox Base Pack, and then installs both the Base Pack and the Extension Pack. You complete the installation by providing a user name, a password, and a port number to use for SSL connections.

   If the Base Pack download fails, you must manually download it from the [VirtualBox download page](#). Make sure you download the release that is bundled and supported with this release of Oracle VDI. Copy the Base Pack to the same folder as the `vb-install` script, and then run the script again.

### 4.1.4. Updating Oracle VM VirtualBox

You update Oracle VM VirtualBox by installing the new release bundled with an Oracle VDI release. When you update, the existing version of VirtualBox must first be uninstalled. When you install the new release, the installation script prompts you to uninstall existing release. Alternatively, you can uninstall the existing release manually with the `vb-install --u` command.

When you uninstall VirtualBox, you are prompted to shut down any virtual machines that are running. You must shut down all running virtual machines before uninstalling. You are also prompted to unregister and delete the virtual machines. If you choose to unregister and delete, you cannot register the virtual machines again after the update.

After updating VirtualBox, you must update the guest additions in all templates and desktops.

### 4.1.5. Configuring the VRDP Port Range

When VirtualBox RDP (VRDP) protocol is selected as the desktop protocol, Oracle VDI makes connections to Oracle VM VirtualBox hosts on a range of ports between 49152 to 65534. Use the `vda settings-setprops` command to configure the VRDP port range.

- Run the following command as root.

   ```
   # /opt/SUNWvda/sbin/vda settings-setprops -p \n   vbox.rdp.port.range="<StartPort>-<EndPort>"
   ```

   For example:

   ```
   # /opt/SUNWvda/sbin/vda settings-setprops -p \n   vbox.rdp.port.range="50000-60000"
   ```
4.2. Microsoft Hyper-V and Remote Desktop Services

4.2.1. Microsoft Hyper-V

Oracle VDI provides users access to virtual machines hosted by Microsoft Hyper-V. Microsoft Hyper-V can be installed either as a free stand-alone product, or it can be enabled as the Hyper-V role in Windows Server.

Oracle VDI remotely manages the virtualization hosts for a Microsoft Hyper-V desktop provider. To enable communication between Oracle VDI and the Windows Server hosting Microsoft Hyper-V, the Windows Server needs to be prepared. See Section 4.2.7, “Preparing a Windows Server” for more details.

Oracle VDI does not include Microsoft software. You must purchase this separately. Oracle Support contracts do not cover third-party software-related issues.

4.2.2. System Requirements for Microsoft Hyper-V

The following are the supported virtualization platforms for the Microsoft Hyper-V desktop provider:

- Microsoft Hyper-V Server 2008 R2
- Microsoft Windows Server 2008 R2 (including SP1)

System requirements for the Hyper-V server:

- Hyper-V Server 2008 R2
- Windows Server 2008 R2

To install the Hyper-V role, see the Microsoft Hyper-V Getting Started Guide.

To install the standalone product, see the Microsoft Hyper-V Server 2008 R2 site.

Storage Requirements for Microsoft Hyper-V

Microsoft Hyper-V requires a storage server to store the virtual disks used by Oracle VDI. This server is in addition to the Hyper-V host itself. See Section 4.6, “Storage” for details of what is supported.

4.2.3. Microsoft Remote Desktop Services

Oracle VDI provides users access to Windows Terminal Services or Remote Desktop Services (Terminal Services) sessions provided by Microsoft Windows servers by either individual Windows servers or a cluster of servers belonging to a Remote Desktop Session Host farm or Network Load Balancing cluster.

If you want to display session and load information about a Windows server in Oracle VDI Manager and on the command line, you must prepare Windows Remote Management (WinRM) on your Windows servers over HTTPS to communicate with Oracle VDI. See Section 4.2.7, “Preparing a Windows Server” for more details.

Oracle VDI relies on some Microsoft tools being implemented along with Remote Desktop Services to provide advanced features such as farm or cluster of RDS hosts with load balancing and session reconnection.

Oracle VDI does not include Microsoft software or licenses for Microsoft Remote Desktop Services. You must purchase these separately. Oracle Support contracts do not cover third-party software-related issues.
4.2.4. System Requirements for Microsoft Remote Desktop Services

The following are the supported virtualization platforms for the Microsoft Remote Desktop desktop provider:

- Microsoft Windows Server 2008 R2 (including SP1)
- Microsoft Windows Server 2003 Enterprise Edition (including SP1 and SP2)

System requirements for Remote Desktop Services hosts:

- Windows Server 2008 R2
- Windows Server 2003

To install the Remote Desktop Services role on Windows Server:

- Windows Server 2008 R2
- Windows Server 2003

4.2.5. Microsoft RDS Farm (NLB Cluster) Management

If you have RDS hosts belonging to a Remote Desktop Session Host farm or a NLB cluster, how you configure a Microsoft Remote Desktop provider depends on whether or not you want to be able to view session information or CPU and memory load information in Oracle VDI Manager or on the command line.

If you want to view session and load information in Oracle VDI, configure the Microsoft Remote Desktop provider as follows:

- Prepare each RDS host, as described in Section 4.2.7, “Preparing a Windows Server”.
- In the New Provider Wizard, add all the RDS hosts in the farm using the Specify New Host option.

With this configuration, Oracle VDI detects the information about the farm by querying the first RDS host of the provider. The detected farm name is returned to the remote client when users try to access a session. The session can be started on any host participating in the farm.

If you do not want to view session and load information in Oracle VDI, configure the Microsoft Remote Desktop provider as follows:

1. In the New Provider Wizard, select the Specify Remote Desktop Server Farm option.
2. Enter the DNS name or IP address of the RDS farm or NLB cluster.

With this configuration, the configured farm name is returned to the remote client when users try to access a session.

Microsoft Terminal Services on Windows Server 2003

Oracle VDI provides access to Terminal Services sessions delivered by either a single server running Windows Server 2003 or a cluster of servers running Windows Server 2003, any edition.

The cluster is a Microsoft Network Load Balancing (NLB) cluster, which provides load balancing among servers.

Microsoft Session Directory can be used to enable users to reconnect to existing sessions.
Microsoft reference documentation:

- Session Directory and Load Balancing Using Terminal Server
- Network Load Balancing Clusters

**Microsoft Remote Desktop Services on Windows Server 2008 R2**

Oracle VDI provides access to Remote Desktop Services sessions delivered by:

- A single server running Windows Server 2008 R2
- A farm of servers with the following characteristics:
  - All servers running Windows Server 2008 R2
    - Microsoft Remote Desktop Connection Broker (formerly Terminal Services Session Broker) is used to enable load balancing and enable users to reconnect to existing sessions.

As described in Microsoft documentation, preliminary load balancing may be provided using DNS round robin or Microsoft Network Load Balancing (NLB) or a hardware load balancer.

Microsoft reference documentation:

- TS Session Broker Load Balancing Step-by-Step Guide
- Network Load Balancing Step-by-Step Guide: Configuring Network Load Balancing with Terminal Services

### 4.2.6. Limitations of Microsoft Remote Desktop Providers and Pools

Due to the differences between Microsoft Remote Desktop Services (RDS) and other virtualization platforms, some restrictions apply to the configuration of desktop providers and pools, as follows:

- A desktop provider can contain multiple Windows servers if they are members of the same Network Load Balancing (NLB) cluster or Remote Desktop Session Host farm. In this situation, the NLB cluster or Remote Desktop Connection Broker is responsible for load balancing sessions across the hosts and not Oracle VDI.

- A desktop provider can contain one or more stand-alone Windows servers. If Windows Remote Management (WinRM) is not configured on the first Windows server that is added to the desktop provider, the provider can only contain one Windows server. If WinRM is configured, a provider can contain multiple Windows servers and Oracle VDI load balances the sessions across the hosts.

- A Windows server can be contained in only one desktop provider.

- Each Microsoft Remote Desktop provider can have only one pool.

- The pool does not use cloning because the Windows server or farm is responsible for opening new RDS sessions when users connect.

- The desktop assignment type of the pool is always flexible. Users can be reconnected to their existing RDS sessions, if the RDS hosts are configured for session reconnection. The reconnection is not handled by Oracle VDI.

- The list of desktops displayed for a pool are the list of all RDS sessions from all RDS hosts associated with the provider. All RDS sessions, whether they come from Oracle VDI or not, are displayed.
• Groups or users can be assigned to RDS pools but you cannot assign a user manually to an RDS desktop.

4.2.7. Preparing a Windows Server

After installing Microsoft Hyper-V or Microsoft Remote Desktop Services you must prepare your Windows server to communicate with Oracle VDI. Oracle VDI does not require any agents to be installed on the Windows servers, instead Oracle VDI communicates with Windows servers using Windows Remote Management (WinRM) over HTTPS (a secure protocol). For HTTPS, WinRM requires a server certificate to operate properly. This certificate is used for encryption of the communication channel. For more details, see Windows Remote Management or Configuration and Security in the Microsoft documentation.

Preparing the Windows server for communication with Oracle VDI is a two-step process. First, you must generate the self-signed certificate using the Microsoft Internet Information Services (IIS) 6.0 Resource Kit Tools (Step 1, below). Then configure winrm to listen for HTTPS requests (Step 3, below).

Note

These steps are necessary for RDS (or Terminal Services) hosts so that critical information about the server (including CPU usage, memory usage, and number of user sessions) can be displayed in Oracle VDI Manager and on the command line. If you do not want to view session or load information in Oracle VDI, the following steps are not necessary, see Section 4.2.5, “Microsoft RDS Farm (NLB Cluster) Management” for more details. The delivery of desktop sessions from RDS pools is still provided by a regular RDP connection. For information about how to configure the RDP settings per desktop pool, see Section 5.1.3, “How to Configure RDP Options Per Pool”.

Caution

Run the following commands in Command shell and not PowerShell.

1. Generate a self-signed certificate on the Windows server.

   Use the selfssl.exe tool which is part of the IIS 6.0 Resource Kit and can be downloaded from the Microsoft Support web site.

   a. Copy selfssl.exe to your Windows Server.

   b. Create a self-signed certificate:

      C:\Program Files\IIS Resources\SelfSSL\selfssl /T /V:<days>

      The parameter /V: dictates the number of days the certificate will be valid. There is no maximum value.

   c. Run the certutil command, and make note of the Cert Hash of the new certificate:

      certutil -store MY

      Note

      If the Windows server and the Oracle VDI servers are not in time sync, you might not be able to connect Oracle VDI to the server because the certificate is not valid for the delta between both servers.

2. (Windows Server 2003 only) Install WS-Man (WinRM).
Note

Windows Server 2008 and Hyper-V Server 2008 come with WinRM pre-installed.

a. Download the WS-MAN v1.1. installation file from the Microsoft Download Center.
b. Install WS-Man.

3. Configure Windows Remote Management for HTTPS.

The `winrm` tool is used to configure remote management settings on the server. You must specify the certificate hash to be used, and the authentication settings to enable Oracle VDI to send requests.

a. Create a listener on the Windows Server.

In a command shell run:

```
winrm create winrm/config/listener?Address=<HYPER_IP>+Transport=HTTPS @{Hostname="<HOST>",CertificateThumbprint="<CERTHASH>",Port="443"}
```

• Replace `<HYPER_IP>` with the IP address of the Windows Server.
• Replace `<HOST>` with the Computer Name of the Windows Server.
• Replace `<CERTHASH>` with the Cert Hash value, with no spaces, noted from the self-signed certificate created with `selfssl`.

b. Open that port so that the Windows Server can receive requests from Oracle VDI:

```
netsh firewall add portopening TCP 443 "Oracle VDI Remote Management"
```

Port 443 is the port Oracle VDI listens on by default.

c. Enable Basic authentication on the server by running the command:

```
winrm set winrm/config/service/auth @{Basic="true"}
```

Note

If you use a port other than 443 for Oracle VDI communication with Microsoft Hyper-V or RDS, you must remember to specify this port when adding the host in the Oracle VDI Manager.

4.3. VMware vCenter

4.3.1. System Requirements for VMware vCenter

The following are the supported virtualization platforms for the VMware vCenter desktop provider:

• VMware vCenter server 5.0
• VMware vCenter server 4.1 (including update 1)
• VMware vCenter server 4.0 (including all updates)
• VMware VirtualCenter server 2.5 (including all updates)
Storage Requirements

VMware vCenter desktop providers require storage for storing the virtual disks used for desktops. The storage is managed by the VMware infrastructure and not by Oracle VDI. However, Oracle VDI is able to query vCenter for the available storage, and can select the data store to use when creating virtual disks.

Any storage qualified by VMware can be used, see the VMware Compatibility Guide for details.

4.3.2. Setting Up a VMware ESX Server

VMware ESX Server is a Linux-based appliance that provides a virtualization platform by abstracting CPU resources, storage, and memory of a physical host into multiple virtual machines.

Steps

1. Power on the host machine with the VMware ESX Server CD in the CD drive.

   If available, you can also use remote management applications such as the Integrated Lights Out Manager (ILOM) to drive the installation.

2. During installation, you can safely rely on the suggested default settings.

   Refer to the VMware Documentation for more details about installing VMware ESX Server.

3. After installation, install the VMware Virtual Infrastructure Client so that you can access the VMware ESX server.

   Refer to the VMware Documentation for more details about installing the VMware Virtual Infrastructure Client.

4.3.3. Setting Up a VMware vCenter Server

VMware vCenter provides central management of several VMware ESX servers, and can be installed on a physical or virtual host. Refer to the VMware Documentation.

Steps

Once VMware vCenter is installed, complete the following configuration steps:

1. Add the VMware ESX server as a managed host.

   In VMware vCenter select the data center where the host will be added. In the menu bar go to Inventory, Datacenter, then Add Host, and follow the instructions.

2. Install the Windows System Preparation Tools for Windows XP.

   These tools can be downloaded from the following Microsoft web sites:

   • Windows XP Service Pack 2 Deployment Tools
   • Windows XP Service Pack 3 Deployment Tools

3. Extract the Sysprep tools from the CAB into the following directory:

   C:\Documents and Settings\All Users\Application Data\VMware\VMware VirtualCenter\sysprep\xp

   For more information about installing the Microsoft Sysprep Tools, see the VMware Documentation.
4. Verify that the server is configured for access to the web services API.

Oracle VDI takes advantage of the web services API provided by the VMware Infrastructure SDK to communicate through HTTPS with VMware vCenter.

a. Verify that the VMware vCenter Webaccess component is installed and configured.

b. Verify that Port 443 (HTTPS) is enabled in any firewall that may be active on the system.

c. As a simple test, go to http://<vCenter Host>/mob. If everything works correctly, you will have access to the VMware Infrastructure SDK browser (after providing the VMware administrator user name and password).

4.3.4. Testing the Platform Setup

It is highly recommended to test the virtualization platform configuration, before setting up the Oracle VDI components. A quick manual test consists of cloning a virtual machine using the desired template and customization specification followed by a remote access to the cloned virtual machine via RDP.

Before You Begin

In order to test the platform setup, you must first create a virtual machine. See Section 5.5.2, “How to Create Virtual Machines (VMware vCenter)” for more details.

Steps

1. Open the Virtual Infrastructure Client.

2. Right-click on the desired template and select Deploy Virtual Machine from this Template.

a. The wizard will ask you to specify a name for the new virtual machine. Select the desired host/cluster and datastore with sufficient free space.

b. On the Guest Customization step, select the Customize Using an Existing Customization Specification option, then choose the customization specification you just created from the list.

c. Review your selections, and click Finish to begin cloning.

3. After the cloning has finished, select the new virtual machine and power it on.

After some time you should see its IP address and host name appear in the Virtual Infrastructure Client. Make sure that it has a unique IP address and that the host name corresponds to the virtual machine name.

4. On the VMware vCenter server, open a Remote Desktop Connection by clicking Start, All Programs, Accessories, Communications, then Remote Desktop Connection.

a. In the Remote Desktop Connection window, enter the IP address of the newly cloned virtual machine, and click Connect.

b. If everything is configured correctly, a full-screen remote desktop session to your virtual machine should be displayed.

4.4. Sun Ray Kiosk Desktop Providers

Oracle VDI Sun Ray Kiosk desktop providers enable you to use an existing Sun Ray Kiosk Mode session type instead of a regular Oracle VDI desktop. A pool for a Sun Ray Kiosk desktop provider enables you
to specify arguments for the kiosk session. If a user, group or token is assigned to a kiosk pool, the kiosk session is listed on users' Desktop Selector screen as well as their regular Oracle VDI desktops. When the kiosk session ends, users are returned to the login screen.

Sun Ray Kiosk desktop providers enable you to provide access to types of sessions that are not available with Oracle VDI itself, for example to connect to a remote desktop using a different broker such as the Sun Ray VMware View connector, or to provide access to a web-based application in a locked-down web browser.

Each Sun Ray Kiosk desktop provider corresponds to one kiosk session type that is available in the Oracle VDI Center. Each pool connected to a Sun Ray Kiosk Session provider can have its own specific settings for the kiosk session, see Section 5.1.6, “How to Configure Kiosk Settings (Sun Ray Kiosk Provider)”.

Kiosk Session Environment

The Sun Ray Kiosk desktop provider makes some information available that can be used in kiosk session scripts to detect whether the kiosk session is being run by Oracle VDI. This is useful for integrating different kiosk sessions with Oracle VDI, for example to provide a single sign-on capability, or to make the different sessions operate as an integrated desktop where users have multiple desktops. The following information is available:

- The **user name** of the logged in Oracle VDI user is available in the `VDA_USER` environment variable.
- The **password** of the Oracle VDI user can be read from standard input by the kiosk session process only if the `VDA_SSO_AWARE` environment variable is set to `true`. This environment variable must be set in the kiosk session descriptor. By default, passwords are not read from standard input.
- The **domain** of the logged in Oracle VDI user is available in the `VDA_DOMAIN` environment variable.
- The **X11 display** to use for the kiosk session is available in the `VDA_DISPLAY` environment variable.
  
  If this is not set, a full screen display on the current display is assumed.
- The **screen location** in which the kiosk session is displayed, in X11 geometry format, is available in the `VDA_GEOMETRY` environment variable.
  
  If this is set, the session runs in a window on the display specified by `VDA_DISPLAY`. If no geometry is set, the session runs full-screen on the specified display.

The following is a simple example of how this information might be used in a kiosk session script.

```bash
theUser="$VDA_USER"
thePassword=
theDomain="$VDA_DOMAIN"
theDisplay="$VDA_DISPLAY"
theGeometry="$VDA_GEOMETRY"
read thePassword
```

Restrictions on Kiosk Session Types

There are restrictions on the kiosk session types that can be used with Sun Ray Kiosk desktop providers. Most of these are because Oracle VDI itself runs under Sun Ray Kiosk Mode. A kiosk session run by a Sun Ray Kiosk desktop provider is a sub-process of the main Oracle VDI kiosk session. Note the following:

- The Sun Java Desktop System 3 and the Common Desktop Environment kiosk types (available on Oracle Solaris platforms only) cannot be used with Oracle VDI, even though they can be selected for use with a Sun Ray Kiosk desktop provider.
• Kiosk session types that do not use the \texttt{VDA\_DISPLAY} or \texttt{VDA\_GEOMETRY} environment variables to detect the Oracle VDI session might not function correctly if users can access multiple desktops.

• Kiosk pre-session or post-session scripts that must be run by root are not supported.

  Kiosk session types that have the \texttt{KIOSK\_SESSION\_PRE} or \texttt{KIOSK\_SESSION\_POST} keys set cannot be used with Oracle VDI.

• When the kiosk session exits, temporary files and folders in the kiosk user's home directory are not cleaned up. Do not use kiosk session types that create temporary files and folders, as these might affect other kiosk sessions of the same or different types.

• Processes started as background processes by the kiosk session continue to run until the Oracle VDI session ends.

• Kiosk commands and functions that operate on the kiosk session, operate on the containing Oracle VDI session, as follows:
  
  The \texttt{kioskrestart(1)} command cannot be used to end a kiosk session. This command ends the entire Oracle VDI session.

  Commands such as \texttt{kioskparam(1)} or \texttt{kioskstatus(1)} cannot be used to query the configuration or status of the kiosk session. These commands only report the parameters of the Oracle VDI kiosk session.

  If the kiosk session starts any process as a critical process, the entire Oracle VDI session ends when the critical process exits. The kiosk sessions themselves are not run as critical processes.

  Kiosk application lists do not work correctly with a kiosk session run by the Sun Ray Kiosk desktop provider. Do not use "desktop-style" session types that support configurable application lists.

4.5. Generic Desktop Providers

One of the benefits of desktop virtualization solution like Oracle VDI is that companies can slowly make a transition from their traditional infrastructure to a virtualized one. In some cases, it may make sense to build an Oracle VDI setup top-down instead of bottom-up. The Generic Desktop Provider feature was created for just this purpose.

The Generic desktop provider can act as a desktop provider to any virtual or physical machine with an RDP connection. This enables you import and manage individual Windows PCs with Oracle VDI Manager.

See Section 5.6.4, “How to Import Individual Windows PCs” for detailed instructions.

Refer to the Section 5.6.4, “How to Import Individual Windows PCs” for information about importing individual Windows PCs.

4.6. Storage

4.6.1. Introduction to Storage

Storage is closely related to virtualization because the virtualization platforms require a location for creating and storing the virtual disks used for desktops.

Whether you have limited hardware or dedicated storage appliances, Oracle VDI is designed to enable you to use a variety of storage types to meet your requirements. Oracle VDI supports four types of storage:
Local Storage

- Local Storage
- Network File System Storage
- iSCSI Storage
- Sun ZFS Storage

The storage types that can be used for a desktop provider type depend on the virtualization platform and the operating system, as shown in the following table.

<table>
<thead>
<tr>
<th>Storage Type</th>
<th>VirtualBox (Linux)</th>
<th>VirtualBox (Solaris)</th>
<th>Microsoft Hyper-V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Network file system</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>iSCSI</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sun ZFS</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

VMware vCenter desktop providers also require storage but the storage is managed by the VMware infrastructure and not Oracle VDI. However, Oracle VDI is able to query vCenter for the available storage, and can select the data store to use when creating virtual disks.

For all other desktop providers, storage is managed independently of Oracle VDI.

All the supported storage types require preparation before they can be used. The level of preparation required depends on how directly Oracle VDI manages the storage.

For high availability, a desktop provider can be configured to use more than one storage. To achieve the best performance and to balance the load, Oracle VDI selects a storage to clone and host virtual disks based on the available free space and current workload. Once a virtual disk is created, it remains on the storage until it is deleted. With some storage platforms, such as Sun Unified Storage Systems, you can also create storage clusters to provide redundancy for the hardware components of a storage server.

An Administrator can enable maintenance mode for a storage. In maintenance mode, the storage is disabled and all running desktops are either shut down or suspended. Once this mode is enabled, maintenance can take place on the storage. This mode is also useful for replicating and replacing a storage server, for example to replace hardware.

4.6.2. Local Storage

Local storage enables you to use any local directory on the virtualization host.

Local storage can be inexpensive to set up and performs reasonably, but it is not suitable for high availability deployments. Because the storage is not shared between virtualization hosts, personal desktops cannot be load-balanced between hypervisors and there is also no redundancy in the event of failure.

Local storage is different from all the other storage types because it is not a central storage that is accessed by all virtualization hosts. Instead each virtualization host accesses its own local disk to store the virtual disks. With local storage, the virtualization hosts and the storage hosts are the same. When local storage is used, Oracle VDI automatically creates a local storage for each virtualization host that is added to the desktop provider so that the free space and number of desktops can be monitored on each host.

You can only have one local storage for a Oracle VM VirtualBox desktop provider and you cannot mix local storage with any other storage type.
Storage Preparation

To use local storage with Oracle VDI, you must configure a directory at the same location on each virtualization host. The directory must reside in a local file system and it must not be provided by a shared storage location. For performance reasons, it is better to use a server with at least two disks, so that the storage can be separated from the operating system. When you add the storage for a desktop provider, you simply provide the path to the directory.

How the Storage is Used

The virtual disks are created in the local file system using the VirtualBox command line. When a user requests a desktop, Oracle VDI registers a virtual machine with a virtualization host and this includes the file path to the virtual disk in the local file system.

4.6.3. Network File System Storage

Network file system storage enables you to use any distributed file system that can be mounted or shared on the virtualization host.

A network file system storage can be a Network File System (NFS) share. In a production environment, it is best to use a file system that is designed for clustering such as the Oracle Cluster File System version 2 (OCFS2).

Compared to local storage, network file system storage provides shared access for the virtualization hosts. High availability and redundancy can be achieved through the use of multiple shares and multiple network paths. However the performance for virtual disk I/O can be slower than a local disk. There is also the management overhead in setting up, monitoring, and maintaining this type of storage.

For Oracle VM VirtualBox desktop providers on Oracle Solaris platforms, you cannot mix network file system storage with the Sun ZFS storage type.

Storage Preparation

To use network file system storage with Oracle VDI, you must configure the network file system on a storage host and mount it at the same mount point on all the virtualization hosts for a desktop provider. When you add the storage for a desktop provider, you simply provide the path to mount point of the storage.

It is best to permit root access to the network file system from the virtualization hosts, as this enables virtual disks to be cloned with secure file permissions.

How the Storage is Used

The virtual disks are created in the shared file system using the VirtualBox command line. When a user requests a desktop, Oracle VDI registers a virtual machine with a virtualization host and this includes the file path to the virtual disk in the shared file system.

4.6.4. iSCSI Storage

iSCSI storage enables you to connect virtualization hosts to any storage device that supports the Internet SCSI (iSCSI) protocol.

iSCSI storage is only available for Oracle VM VirtualBox desktop providers on Oracle Linux platforms.

With iSCSI storage, existing IP networks are used to connect a virtualization host to a LUN on a storage area network (SAN) device so that the LUN appears to the host as a locally attached disk. The virtualization host acts as the iSCSI initiator (the client) and the storage is the iSCSI target.
The following are requirements for using an iSCSI storage with Oracle VDI:

- The storage must be compatible with the Oracle Linux iSCSI stack.
- The storage must be able to publish an iSCSI target and a Logical Unit Number (LUN).
- The storage must provide unauthenticated access to the LUN.

**Storage Preparation**

To use an iSCSI storage with Oracle VDI, you must configure an iSCSI target and LUN on the storage host. Setting Up an iSCSI Target on Sun ZFS Systems provides some example instructions for preparing an iSCSI target.

When you add the storage for a desktop provider, you provide the following details:

- The IP address or fully-qualified DNS name of the storage host.
- The iSCSI Qualified Name (IQN) of the iSCSI target.
- The LUN number.

**How the Storage is Used**

Oracle VDI uses iSCSI to connect to the LUN on the storage host. Oracle VDI then automatically formats the LUN using Oracle Cluster File System version 2 (OCFS2) and mounts the file system at /vdi on all the virtualization hosts. The virtual disks are created in the shared file system using the VirtualBox command line.

When a user requests a desktop, Oracle VDI registers a virtual machine with a virtualization host and this includes the path to the virtual disk in the mounted OCFS2 file system as shown in Figure 4.1.

Figure 4.1. iSCSI Storage and VirtualBox
4.6.5. Sun ZFS Storage

Sun ZFS storage enables you to use Zettabyte File System (ZFS) storage pools on Sun Storage 7000 Unified Storage Systems or Oracle Solaris hosts. The following are the supported Sun ZFS storage platforms:

- Oracle Solaris 10 10/09 x86 (64-bit) and later

  **Note**

  Oracle Solaris 11 and Oracle Solaris on SPARC platforms are not supported.

- Sun Storage 7000 series Unified Storage Systems 2009.Q2.5.1 and later

For Sun Storage 7000 Unified Storage Systems, note the following:

- For performance reasons, do not disable the write cache if you do not have write solid-state drives (SSDs), also known as Logzilla. If the write cache is enabled and you have write SSDs, the write SSDs are not used. See Section 7.4.2, “About ZFS Storage Caches” for more information on write caching.

- Oracle VDI supports only the default pool.

  Use projects to separate your areas of concern.

For Oracle VM VirtualBox desktop providers on Oracle Solaris platforms, you cannot mix Sun ZFS storage with any other storage type.

For more information about supported storage, see the following:

- Oracle Technology Network article on using a Sun ZFS Storage Appliance with Oracle VDI
- Oracle Solaris 10 documentation
- Sun Unified Storage 7000 Series whitepapers and documentation

**Storage Preparation**

To use a ZFS storage, Oracle VDI requires SSH root access to the storage host and a ZFS pool on that host. The following provides some example instructions:

- **Setting Up a Sun Storage 7000 Unified Storage System**
- **Setting Up an Oracle Solaris Storage**

With Sun Storage 7000 Unified Storage Systems, you can create storage clusters to provide redundancy for the hardware components of a storage host. *Storage Clustering for Sun Storage 7000 Unified Storage Systems* provides information about configuring clusters for use with Oracle VDI.

After configuring the storage, it is best practice to prepare the storage host for backup and recovery in the event of a failure. The following provides some example instructions:

- **Replicating and Replacing a Sun Storage 7000 Unified Storage System**
- **Replicating and Replacing an Oracle Solaris Storage System**

When you add the storage for a desktop provider, you provide the following details:
• The IP address or fully-qualified DNS name of the storage host.
• The SSH port used on the host.
• The user name and password of a user with root access to the host.

How the Storage is Used With VirtualBox (Solaris) and Hyper-V Desktop Providers

Each virtual disk is created as a thin-provisioned (sparse) ZFS volume in the ZFS pool and each ZFS volume is configured as an iSCSI target on the storage host. Oracle VDI uses either the Sun Unified Storage command line (Sun Storage 7000 Unified Storage Systems) or ZFS commands (Oracle Solaris hosts) to perform this configuration.

When a user requests a desktop, Oracle VDI registers a virtual machine with a virtualization host and this includes the iSCSI target address of the ZFS volume. When the desktop is started, iSCSI is used to connect the desktop to its virtual disk, as shown in Figure 4.2.

Figure 4.2. Sun ZFS Storage and VirtualBox on Oracle Solaris Platforms

How the Storage is Used With VirtualBox (Linux) Desktop Providers

A single thin-provisioned (sparse) ZFS volume is configured in the ZFS pool and the ZFS volume is configured as an iSCSI target on the storage host. Oracle VDI uses either the Sun Unified Storage command line (Sun Storage 7000 Unified Storage Systems) or ZFS commands (Oracle Solaris hosts) to perform this configuration. On the virtualization hosts, Oracle VDI uses iSCSI to connect to the ZFS volume on the storage host. The volume is formatted using the Oracle Cluster File System version 2 (OCFS2) file system and mounted at /vdi on all the virtualization hosts. The virtual disks are then created in the shared file system using the VirtualBox command line.

When a user requests a desktop, Oracle VDI registers a virtual machine with a virtualization host and this includes the path to the virtual disk in the mounted OCFS2 file system as shown in Figure 4.3.
4.6.6. Preparing iSCSI and Sun ZFS Storage

4.6.6.1. Setting Up an iSCSI Target on Sun ZFS Systems

The following instructions are provided as an example of how to configure an iSCSI target on a Sun Storage 7000 Unified Storage System and on an Oracle Solaris System. Adapt the principles for your own iSCSI storage device.

Setting Up an iSCSI Target on a Sun Storage 7000 Unified Storage System

1. Log in to the browser user interface (BUI) of your Sun Storage 7000 Unified Storage System.
2. In the navigation area, click Configuration and then click SAN.
3. Create the iSCSI target.
   a. Click iSCSI Targets and then click the Add button (+).
      The New iSCSI Target window is displayed.
   b. For the Target IQN, ensure Auto-assign is selected.
   c. In the Alias box, enter an alias for the iSCSI target.
      The alias is not actually used by Oracle VDI.
   d. For the Initiator Authentication Mode, ensure None is selected.
   e. Click OK.
      The new iSCSI target is added to the list of targets.
Preparing iSCSI and Sun ZFS Storage

Make a note of the iSCSI Qualified Name (IQN) of the iSCSI target, you need the IQN when you configure the storage for a desktop provider.

4. Add the iSCSI target to an iSCSI target group.
   a. Drag and drop the new iSCSI target to the iSCSI Target Groups list. You can create a new group for the target or add it to an existing group.
   b. Click the **Apply** button.

5. In the navigation area, click **Shares**, and then click **Shares** if this page is not already selected.

6. Create a logical unit number (LUN).
   a. Click **LUNs** and then click the **Add** button (+). The Create LUN window is displayed.
   b. From the **Project** list, select your project.
   c. In the **Name** box, enter an name for the LUN.
   d. In the **Volume Size** box, enter the size of the volume. The volume must be big enough to contain all the virtual disks for all desktop providers that use the storage.
   e. Select **Thin Provisioned**.
   f. From the **Target Group** list, select the iSCSI target group to which the iSCSI volume belongs.
   g. From the **Operational Status** list, ensure Online is selected.
   h. Click the **Apply** button. The new LUN is added to the list of LUNs.

7. Edit the settings for the new LUN.
   a. Double-click the name of the LUN or click the Pencil icon to the right of the LUN name.
   b. Click **Protocols** and select **Write Cache Enabled**.
   c. Click the **Apply** button.

8. Make a note of the Assigned LU Number displayed. You need the LUN number when you configure the storage for a desktop provider.

### Setting Up an iSCSI Target on an Oracle Solaris System

1. Log in as superuser on the Oracle Solaris host.

2. Create a ZFS sparse volume.
   
   ```
   # zfs create -sV<size> <poolname>/<volumename>
   ```
   
   For example:
Preparing iSCSI and Sun ZFS Storage

# zfs create -sV 100G vdipool/vdi-disks

3. Share the ZFS volume over iSCSI.

# zfs set shareiscsi=on <poolname>/<volumename>

For example:

# zfs set shareiscsi=on vdipool/vdi-disks

4. Use the `iscsitadm list target` command to obtain the details of the iSCSI target.

```
# iscsitadm list target
Target: vdipool/vdi-disks
  iSCSI Name: iqn.1986-03.com.sun:02:f3510986-6ed5-ca3e-bc25-a25e2056e5a7
  Connections: 0
```

Make a note of the details. When you configure the storage in Oracle VDI, use the iSCSI Name for the Target and use 0 as the LU Number.

### 4.6.6.2. Setting Up a Sun Storage 7000 Unified Storage System

For a list of supported Sun Storage 7000 Unified Storage Systems, see Section 4.6.5, “Sun ZFS Storage”.

**Steps**

1. Set up the system.
   
   Follow the instructions in the Sun Storage 7000 Unified Storage System Quick Setup manual.

2. (Optional) Update the Sun Storage 7000 Unified Storage System software.
   
   Update the Sun Storage 7000 Unified Storage System software to get important performance enhancements. See Section 4.6.5, “Sun ZFS Storage” for the supported software releases.

3. Create a project.
   
   You do not need to create a separate ZFS pool for use with Oracle VDI because only the default pool is supported. Instead you use a project to separate the data.
   
   Project names must be unique. If you are using a storage cluster, using a project name that exists on both heads causes Oracle VDI to fail in the event of failover.

### 4.6.6.3. Setting Up an Oracle Solaris Storage

For a list of supported Oracle Solaris storage systems, see Section 4.6.5, “Sun ZFS Storage”.

**Steps**

1. Install the Oracle Solaris operating system.
   
   The Oracle Solaris installer gives you the choice of using UFS or ZFS for the root file system. If the host has only one disk, choose ZFS. If host has multiple disks and the other disks are exclusively used for the Oracle VDI ZFS pools, either of the two choices is fine.

2. Enable root access.
   
   a. Edit the file `/etc/ssh/sshd_config` and change the line `PermitRootLogin no` to `PermitRootLogin yes`
Preparing iSCSI and Sun ZFS Storage

b. Restart the SSHD service to implement the changes you made to the `sshd_config` file.

```
# svcadm restart ssh
```

3. (Optional) Create a ZFS pool.

If ZFS was selected during installation, the Oracle Solaris OS installer created a pool named `rpool`. This pool contains the root file systems and can also be used by Oracle VDI. Create a dedicated pool to separate the Oracle VDI data from the Oracle Solaris file systems.

```
# zpool create <pool name> <disk1> <disk2> <disk3> ...
```

4. Enable iSCSI access.

Type the following CLI command as root on the Oracle Solaris OS storage server.

```
# svcadm enable svc:/system/iscsitgt:default
```

4.6.6.4. Storage Clustering for Sun Storage 7000 Unified Storage Systems

For Sun Storage 7000 Unified Storage Systems using firmware 2010.Q1.0.0 and later, Oracle VDI supports active-passive as well as active-active storage clusters. Clustered storage is managed by Oracle VDI the same way as individual storages.

A storage cluster introduces redundancy for the server components of a storage including CPU, memory, main board, network cards, but does not increase the redundancy of the disks or their controllers. That is taken care of by the JBODS and the RAID levels used.

The two storage servers in the cluster (called 'heads') are connected over a special card, the Clustron, which allows the heads to exchange state and configuration information and to detect a failed head.

A `resource` is a core concept of clustering, and is typically either a network interface or a storage pool. To ensure availability, the resource is taken over by a head if the other head fails.

The main configuration steps when setting up a cluster are to define the resources, which is performed the same way as in a single setup (`Configuration, Storage` or `Configuration, Network`), and to assign a head as the resource owner (`Configuration, Cluster`).

A cluster is called "active/passive" if only one head owns all resources. A cluster is called "active/active" if both heads own resources. While the performance of an active/passive cluster does not degrade if one head fails, both heads of an active/active cluster are actively processing requests during normal operation resulting in a better utilization of the available hardware.

Identical hardware available on both storages can only be used to create one resource owned by one head. For example, if you configure a 192.168.100.100 interface using the nge0 device and assign head1 as its owner, head2 will use its nge0 device to take over the 192.168.100.100 interface in case head1 fails. To be able to do so the nge0 device must be unused on head2.

Another constraint about clustered interfaces is that they must be statically configured. You cannot use DHCP.

A typical setup for two storages with four network devices each and array:

<table>
<thead>
<tr>
<th></th>
<th>Head1</th>
<th>Head2</th>
</tr>
</thead>
<tbody>
<tr>
<td>nge0</td>
<td>owner</td>
<td>-</td>
</tr>
<tr>
<td>nge1</td>
<td>owner</td>
<td>-</td>
</tr>
<tr>
<td>nge2</td>
<td>-</td>
<td>owner</td>
</tr>
</tbody>
</table>
For more information about Sun Storage 7000 series Unified Storage Systems and clustering, refer to the Administration Guide:

- PDF Format - Sun Storage 7000 series Unified Storage Systems

4.6.6.5. Replicating and Replacing a Sun Storage 7000 Unified Storage System

Storage replication is a useful technique to increase storage server availability for lower budget Oracle VDI installations. After replicating a Sun Storage 7000 Unified Storage System, the Oracle VDI storage replace feature allows you to easily enable the replicated storage server from Oracle VDI Manager if, for some reason, the storage server fails.

Preparation

Configure the Sun Storage 7000 Unified Storage System for replication and replicate it. Replication is a built-in feature, and can be configured from the Sun Unified Storage System browser user interface (BUI). The following steps are valid for 2010.Q1 firmware and above.

1. Add the target storage for the replication to the Remote Replication service. Go to Configuration, then Services.

2. Add a replication action to the project. Go to Shares, Projects, <project>, then Replication. The Include Snapshots option must be selected.

   The ZFS structures are now replicated to the target storage as replication package.

Disaster Recovery

If a storage server fails, use the procedure below to replace and re-enable the storage server.

1. Disable the failed storage server.
   a. In Oracle VDI Manager, go to Desktop Providers.
   b. Select a desktop provider that uses the failed storage server.
   c. Go to the Storage tab, select the storage server, and click Maintenance.
   d. Choose a time for the server to begin entering maintenance, or click Now to select the current time.
   e. Click OK to submit the maintenance mode job.

2. In the Unified Storage System UI, convert the replication package to a local project.
   a. Sever the replication connection of the replication target. Go to Shares, Projects, Replica, <replication package>, then Replication.

3. Enable the new storage server.
Preparing iSCSI and Sun ZFS Storage

a. In Oracle VDI Manager, go to Desktop Providers.
b. Select a desktop provider that uses the failed storage server.
c. Go to the Storage tab.
d. Select the storage server to be replaced and click Replace to activate the Replace Storage wizard. Enter information about the new storage (replication target).
e. Select the new storage and click Edit to activate the Edit Storage wizard.
f. Enter additional information about the new storage.
g. Select the new storage and click Enable.

4.6.6.6. Replicating and Replacing an Oracle Solaris Storage System

Storage replication is a useful technique to increase storage server availability for lower budget Oracle VDI installations. After replicating an Oracle Solaris storage system, Oracle VDI Manager enables you to replace a failed storage server with the replicated storage.

Preparation

Replicate the Oracle Solaris storage on another host.

1. Take a ZFS snapshot of the whole storage pool.

   # zfs snapshot <pool>@rep

2. Take a ZFS snapshot of each volume in the storage pool.

   Use the following command for each volume.

   # zfs snapshot <pool>/<volume>@rep

3. Export the ZFS file system to the new storage host.

   # zfs send -R <pool>@rep | ssh root@<host> zfs receive -dF <newpool>

4. Delete all ZFS snapshots on the original and new storage servers.

   Use the following command for the whole storage pool.

   # zfs destroy <pool>@rep

   Use the following command for each volume.

   # zfs destroy <pool>/<volume>@rep

Disaster Recovery

If a storage server fails, use this procedure to replace the storage server.

1. Disable the failed storage server.

   a. In Oracle VDI Manager, go to Desktop Providers.
   b. Select a desktop provider that uses the failed storage server.
   c. Go to the Storage tab.
Creating Desktop Providers

d. Select the storage server, and click Maintenance.
e. Choose a time for the server to begin entering maintenance, or click Now to select the current time.
f. Click OK to submit the maintenance mode job.

2. Enable the new storage server.
   
a. Go to the Storage tab.
b. Select the storage server to be replaced and click Replace to activate the Replace Storage wizard.
c. Enter the information about the new storage.
d. Select the new storage and click Edit to activate the Edit Storage wizard.
e. Enter additional information about the new storage.
f. Select the new storage and click Enable.

4.7. Creating Desktop Providers

Desktop providers encapsulate the details of the underlying virtualization platform. At a minimum, you must configure one desktop provider before you can create desktop pools. There is no limitation to the number of providers the system can manage. At any time, you can configure additional providers.

Desktop providers can also be configured to run a specified number of synchronous desktop cloning and recycling jobs during and outside of specified peak hours. See Section 5.7.10.2, “Setting Peak Times for Desktop Providers” for details.

4.7.1. Creating an Oracle VM VirtualBox Desktop Provider

Due to the differences in the availability of the storage types and the way they are used, the virtualization hosts for an Oracle VM VirtualBox desktop provider must use the same operating system. You cannot mix Oracle Solaris and Oracle Linux virtualization hosts.

Oracle VM VirtualBox desktop providers require storage as well virtualization hosts. See Section 4.6.1, “Introduction to Storage” for details of the supported storage types and the preparation required for use with Oracle VDI.

Oracle VDI Manager Steps

1. In Oracle VDI Manager, select Desktop Providers from the navigation tree.
2. In the Desktop Providers table, click New.
   
   The New Desktop Provider wizard is displayed.
3. On the Select Desktop Provider Type step, select Oracle VM VirtualBox.
5. On the Specify New Host step, enter the host details.
   
a. In the Host field, enter the fully-qualified DNS name or IP address of the VirtualBox host.
b. In the SSL Port field, enter the port number to use for SSL communication with the VirtualBox host.
Creating an Oracle VM VirtualBox Desktop Provider

This is the port that was specified when VirtualBox was installed. The default SSL port is port 443.

If SSL is not used, deselect **Use SSL Encryption**.

c. In the **SSH Port** field, enter the port number used for SSH connections to the VirtualBox host.

d. In the **User Name** and **Password** fields, enter the credentials of a user with root access to the VirtualBox host.

e. On the Verify Certificate step, check that the SSH and SSL certificate details are correct.

   This is an important security step that ensures you are adding a genuine VirtualBox host to the desktop provider.

   The Specify Hosts step is displayed again.

6. To add more VirtualBox hosts, select **Specify New Host** and enter the host details as shown in step 5. Otherwise, select **Select Existing Hosts**.

7. On the Specify Storage step, select **Specify New Storage**.

   The following are the restrictions on how the supported storage types can be used:

   • The iSCSI storage type can only be used with Oracle Linux virtualization hosts.

   • With Oracle Solaris virtualization hosts, you cannot mix Sun ZFS storage with any other storage type.

   • You cannot mix local storage with any other storage type.

   • You can only add one local storage.

**Sun ZFS storage:**

a. From the **Storage Type** list, select **Sun ZFS Storage**.

b. In the **Storage** field, enter the fully-qualified DNS name or IP address of the storage.

c. In the **SSH Port** field, enter the port number used for SSH connections to the storage.

d. In the **User Name** and **Password** fields, enter the credentials of a user with root access to the storage.

e. On the Verify Certificate step, check that the SSH certificate details are correct.

   This is an important security step that ensures you are adding a genuine storage host to the desktop provider.

   f. On the Select ZFS Pool step, from the **ZFS Pool** list, click the name of a ZFS pool.

**iSCSI storage:**

a. From the Storage Type list, select **iSCSI Storage**.

b. In the **Storage** field, enter the fully-qualified DNS name or IP address of the storage.

c. In the **Target** field, enter the iSCSI Qualified Name (IQN) of the iSCSI volume.
d. In the **LU Number** field, enter the logical unit number of the iSCSI volume.

**Network File System storage:**

a. From the Storage Type list, select **Network File System**.

b. In the **Name** field, enter a name for the storage.

c. In the **Path** field, enter the mount point of the storage on the virtualization hosts.

**Local storage:**

a. From the Storage Type list, select **Local Storage**.

b. In the **Path** field, enter the path to the storage on the virtualization hosts.

Once you add the storage, the Specify Hosts step is displayed again.

8. To add more storage, select **Specify New Storage** and enter the storage details as shown in step 7. Otherwise, select **Select Existing Hosts**.


a. In the **Name** field, enter the name of the desktop provider.

b. (Optional) In the **Comments** field, enter any notes about the desktop provider.

10. On the Review step, check the configuration of the desktop provider and click **Finish**.

The new desktop provider is added to the Desktop Provider table.

If you add local storage and the desktop provider contains multiple virtualization hosts, Oracle VDI automatically creates a local storage for each virtualization host so that the free space and number of desktops can be monitored.

---

**Caution**

When you first add a storage for a desktop provider that has **Oracle Linux** virtualization hosts, a critical alert might be displayed in Oracle VDI Manager and the alert might take some time to clear. This is because Oracle VDI formats the configured storage using Oracle Cluster File System version 2 (OCFS2) and this might take a while, depending on the size of the volume.

---

**Command Line Steps**

1. Create a new Oracle VM VirtualBox desktop provider.

   ```
   vda provider-vb-create -p name=<name>
   ```

2. Add at least one VirtualBox host to the desktop provider.

   ```
   vda provider-add-host -p host=<host>,username=<username> <provider>
   ```

3. Add at least one storage host to the desktop provider.

   You must add at least one VirtualBox host to the desktop provider before you can add storage.

   The following are the restrictions on how the supported storage types can be used:
The iSCSI storage type can only be used with Oracle Linux virtualization hosts.

With Oracle Solaris virtualization hosts, you cannot mix Sun ZFS storage with any other storage type.

You cannot mix local storage with any other storage type.

You can only add one local storage.

**Sun ZFS storage:**

```
vda provider-add-storage-zfs \ 
-p host=<host>,username=<username>,zfspool=<zfspool> <provider>
```

**iSCSI storage:**

```
vda provider-add-storage-iscsi \ 
-p host=<host>,target=<target>,lu-number=<lu-number> <provider>
```

**Network File System storage:**

```
vda provider-add-storage-networkfs \ 
-p host=<host>,path=<path> <provider>
```

**Local storage:**

```
vda provider-add-storage-local \ 
-p path=<path> <provider>
```

If you add local storage and the desktop provider contains multiple virtualization hosts, Oracle VDI automatically creates a local storage for each virtualization host so that the free space and number of desktops can be monitored on each host.

---

**Caution**

When you first add a storage for a desktop provider that has Oracle Linux virtualization hosts, the status of the provider might be displayed as critical and it might take some time for the critical status to clear. This is because Oracle VDI formats the configured storage using Oracle Cluster File System version 2 (OCFS2) and this might take a while, depending on the size of the volume.

The following example creates an Oracle VM VirtualBox desktop provider with two hosts and one iSCSI storage.

```
vda provider-vb-create -p name="VB provider"
vda provider-add-host \ 
-p host=vb1.example.com,username=root "VB provider"
vda provider-add-host \ 
-p host=vb2.example.com,port=444,username=root "VB provider"
vda provider-add-storage-iscsi \ 
-p host=192.168.0.1,\ 
target=ign.1986-03.com.sun:02:a5e94e8d-03b8-e50e-9b67,lu-number=12 "VB provider"
```

---

### 4.7.2. Creating a Microsoft Hyper-V Desktop Provider

**Oracle VDI Manager Steps**

1. In Oracle VDI Manager, select **Desktop Providers** from the navigation tree.
2. In the Desktop Providers table, click **New**.

   The New Desktop Provider wizard is displayed.

3. On the Select Desktop Provider Type step, select **Microsoft Hyper-V**.

4. On the Specify Hosts step, select **Specify New Host**.

5. On the Specify New Host step, enter the host details.
   a. In the **Host** field, enter the fully-qualified DNS name or IP address of the Hyper-V host.
   b. In the **SSL Port** field, enter the port number to use for SSL communication with the Hyper-V host.
      This is the port configured on the host for Windows Remote Management (WinRM). The default SSL port is port 443.
   c. In the **User Name** and **Password** boxes, enter the credentials of a user with administrative privileges on the Hyper-V host.
   d. On the Verify Certificate step, check that the SSL certificate details are correct.
      This is an important security step that ensures you are adding a genuine Hyper-V host to the desktop provider.

   The Specify Hosts step is displayed again.

6. To add more Microsoft Hyper-V hosts, select **Specify New Host** and enter the host details as shown in step 5. Otherwise, select **Select Existing Hosts**.

7. On the Specify Storage step, select **Specify New Storage**.
   a. In the **Storage** field, enter the fully-qualified DNS name or IP address of the storage.
   b. In the **SSH Port** field, enter the port number used for SSH connections to the storage.
   c. In the **User Name** and **Password** boxes, enter the credentials of a user with root access to the storage.
   d. On the Verify Certificate step, check that the SSH certificate details are correct.
      This is an important security step that ensures you are adding a genuine storage host to the desktop provider.
   e. On the Select ZFS Pool step, from the **ZFS Pool** list, click the name of a ZFS pool.

   Once you add the storage, the Specify Hosts step is displayed again.

8. To add more storage, select **Specify New Storage** and enter the storage details as shown in step 7. Otherwise, select **Select Existing Hosts**.

   a. In the **Name** field, enter the name of the desktop provider.
   b. (Optional) In the **Comments** field, enter any notes about the desktop provider.

10. On the Review step, check the configuration of the desktop provider and click **Finish**.
Creating a Microsoft Remote Desktop Provider

The new desktop provider is added to the Desktop Provider table.

Command Line Steps

1. Create a new Microsoft Hyper-V desktop provider.
   
   ```
   vda provider-hv-create -p name=<name>
   ```

2. Add at least one Microsoft Hyper-V host to the desktop provider.
   
   ```
   vda provider-add-host \\
   -p host=<host>,username=<username> <provider>
   ```

3. Add at least one storage host to the desktop provider.
   
   ```
   vda provider-add-storage-zfs \\
   -p host=<host>,username=<username>,zfspool=<zfspool> <provider>
   ```

   The following example creates a Microsoft Hyper-V desktop provider with two hosts and one storage.

   ```
   vda provider-hv-create -p name="HyV provider"
   vda provider-add-host \\
   -p host=my.first.hyv.com,port=443,username=root "HyV provider"
   vda provider-add-host \\
   -p host=my.second.hyv.com,port=443,username=root "HyV provider"
   vda provider-add-storage \\
   -p host=my.zfs.com,username=root,zfspool=vda_zfspool "HyV provider"
   ```

4.7.3. Creating a Microsoft Remote Desktop Provider

How you configure a Microsoft Remote Desktop provider depends on whether or not Windows Remote Management (WinRM) is configured on the Remote Desktop Services (RDS) hosts, and whether or not there is an RDS farm. Oracle VDI uses WinRM to obtain session and load information from the RDS hosts. If WinRM is not configured and there is no RDS farm, a desktop provider can only contain a single RDS host because Oracle VDI cannot load balance the sessions between hosts.

Oracle VDI Manager Steps (WinRM Configured)

Follow these steps to configure a desktop provider that contains either of the following:

- Individual RDS hosts with WinRM configured and there is no RDS farm.
- A farm of RDS hosts and WinRM is configured on each RDS host in the farm.

1. In Oracle VDI Manager, select Desktop Providers from the navigation tree.
2. In the Desktop Providers table, click New.
   
   The New Desktop Provider wizard is displayed.

3. On the Select Desktop Provider Type step, select Microsoft Remote Desktop.
5. On the Specify New Host step, enter the host details.
a. In the **Host** field, enter the fully-qualified DNS name or IP address of the RDS host.
b. In the **SSL Port** field, enter the port number to use for SSL communication with the RDS host.
   The default SSL port is port 443.
c. In the **User Name** and **Password** boxes, enter the credentials of an Administrator on the RDS host.
d. On the Verify Certificate step, check that the MD5 fingerprint matches the fingerprint of the SSL certificate for the RDS host.
   This is an important security step that ensures you are adding a genuine RDS host to the desktop provider.
   The Specify Hosts step is displayed again.

6. To add more RDS hosts, select **Specify New Host** and repeat step 5. Otherwise, select **Select Existing Hosts**.

7. On the Define Desktop Provider step, enter the desktop provider details.
   a. In the **Name** field, enter the name of the desktop provider.
   b. (Optional) In the **Comments** field, enter any notes about the desktop provider.

8. On the Review step, check the configuration of the desktop provider and click **Finish**.
   The new desktop provider is added to the Desktop Provider table.

9. Specify the host name or IP address, SSL port, and administrator credentials for each RDS host.

**Command Line Steps (WinRM Configured)**

Follow these steps to configure a desktop provider that contains either of the following:

• Individual RDS hosts with WinRM configured and there is no RDS farm.

• A farm of RDS hosts and WinRM is configured on each RDS host in the farm.

1. Create a Microsoft Remote Desktop desktop provider.

   ```
   $ vda provider-ts-create -p name=<name>
   ```

2. Add at least one RDS host to the desktop provider.

   ```
   $ vda provider-add-host \
   -p host=<host>,username=<username> <provider>
   ```

   The **username** property is the user name of an Administrator on the RDS host. You are prompted for the password. If a non-standard port is used for SSL communication with the RDS host, you must specify the port number using the **port=<port>** property.

   The following example creates a Microsoft Remote Desktop provider named "RDS Sessions and adds a single RDS host.

   ```
   vda provider-ts-create -p name="RDS Sessions"
   vda provider-add-host -p host=rds1.example.com,username=Administrator "RDS Sessions"
   ```
Oracle VDI Manager Steps (WinRM Not Configured)

Follow these steps to configure a desktop provider that contains either of the following:

- A single RDS host without WinRM configured and there is no RDS farm.
- A farm of RDS hosts and WinRM is not configured on each RDS host in the farm.

1. In Oracle VDI Manager, select Desktop Providers from the navigation tree.
2. In the Desktop Providers table, click New.
   
   The New Desktop Provider wizard is displayed.
3. On the Select Desktop Provider Type step, select Microsoft Remote Desktop.
5. On the Specify Remote Desktop Server Farm step, enter the fully-qualified DNS name or IP address of the RDS farm in the Farm Name field.
6. On the Define Desktop Provider step, enter the desktop provider details.
   
   a. In the Name field, enter the name of the desktop provider.
   
   b. (Optional) In the Comments field, enter any notes about the desktop provider.
7. On the Review step, check the configuration of the desktop provider and click Finish.
   
   The new desktop provider is added to the Desktop Provider table.

Command Line Steps (WinRM Not Configured)

Follow these steps to configure a desktop provider that contains either of the following:

- A single RDS host without WinRM configured and there is no RDS farm.
- A farm of RDS hosts and WinRM is not configured on each RDS host in the farm.

1. Create a Microsoft Remote Desktop desktop provider.
   
   vda provider-ts-create -p name=<name>
2. Specify the RDS farm.
   
   vda provider-add-host \
   -p host=<host>,farm=true <provider>

The following example creates a desktop provider named “RDS farm” for the farm rdsfarm.example.com.

   vda provider-ts-create -p name="RDS farm"
   vda provider-add-host -p host=rdsfarm.example.com,farm=true "RDS farm"

4.7.4. Creating a VMware vCenter Desktop Provider

Oracle VDI Manager Steps

1. In Oracle VDI Manager, go to Desktop Providers.
2. In the **Desktop Providers** table, and click **New** to activate the **New Desktop Provider** wizard.

   The wizard enables you to add multiple hosts and multiple storages in a loop.

   Once you click **Finish**, the new desktop provider appears in the Oracle VDI Manager.

   The **New Desktop Provider** wizard requires different information depending on the virtualization platform in use. For example, most desktop providers require a host IP address and administrator credentials. Oracle VDI or Microsoft Hyper-V desktop providers require a host and a storage.

   You can view the VMware vCenter resource details, including data centers, VMware clusters, and datastores.

### Command Line Steps

- Create a new VMware vCenter desktop provider.

  ```bash
  vda provider-vc-create \
  -p name=<name>,host=<host>,username=<username>
  ```

  The following example creates a VMware vCenter desktop provider.

  ```bash
  vda provider-vc-create \
  -p name="VC provider",host=my.vc.com,username=Administrator
  ```

4.7.5. Creating a Sun Ray Kiosk Desktop Provider

Before you begin, see **Section 4.4, “Sun Ray Kiosk Desktop Providers”** for information about using kiosk session types with Oracle VDI.

### Oracle VDI Manager Steps

1. In Oracle VDI Manager, select **Desktop Providers** from the navigation tree.

2. In the Desktop Providers table, click **New**.

   The New Desktop Provider wizard is displayed.

3. On the Select Desktop Provider Type step, select **Sun Ray Kiosk**.

4. On the Select Kiosk Session Type step, select a Sun Ray kiosk session type in the **Session Type** list.

5. On the Define Desktop Provider step, enter the desktop provider details.

   a. In the **Name** field, enter the name of the desktop provider.

   b. (Optional) In the **Comments** field, enter any notes about the desktop provider.

6. On the Review step, check the configuration of the desktop provider and click **Finish**.

   The new desktop provider is added to the Desktop Provider table.

### Command Line Steps

1. (Optional) List the available kiosk session types.

   ```bash
   # /opt/SUNWkio/bin/kioskdesc list -s
   ```

2. Create a Sun Ray Kiosk desktop provider.
Creating a Generic Desktop Provider

Oracle VDI Manager Steps

1. In Oracle VDI Manager, select Desktop Providers from the navigation tree.

2. In the Desktop Providers table, click New.

   The New Desktop Provider wizard is displayed.

3. On the Select Desktop Provider Type step, select Generic.

4. On the Define Desktop Provider step, enter the desktop provider details.
   a. In the Name field, enter the name of the desktop provider.
   b. (Optional) In the Comments field, enter any notes about the desktop provider.

5. On the Review step, check the configuration of the desktop provider and click Finish.

   The new desktop provider is added to the Desktop Provider table.

Command Line Steps

• Create a generic desktop provider.

   vda provider-pc-create -p name=<name>

   The following example creates a generic desktop provider named "windows-pcs".

   vda provider-pc-create -p name=windows-pcs
# Chapter 5. Preparing Desktops

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5.1. About Pools

5.1.1. How to Create Desktop Pools

Oracle VDI organizes desktops in pools. A pool is a collection (or container) of desktops. Typically you will create different pools for different types of users. For example, the engineering team in your company might have different desktop requirements than the marketing department.

**Caution**

When you change pool settings from NAT networking to Host Networking + Windows RDP, existing desktops that are running must be stopped and restarted or else subsequent user requests for these desktops will fail.

This issue occurs because existing, running desktops will be using NAT and will not have a public IP address. After the pools settings have been changed, subsequent requests for that desktop will attempt to access the desktop via the private (and inaccessible) NAT IP.

**Note**

Only one pool can be created per Microsoft Remote Desktop provider.

**Oracle VDI Manager Steps**

1. In Oracle VDI Manager, go to **Pools**.
2. Select a company.
3. In the **Pools** table, click **New**.

A **New Pool** wizard is displayed.

a. For Oracle VM VirtualBox and Microsoft Hyper-V desktop providers, choose one of the following pool types:

   - **Dynamic** pools are filled with cloned flexible desktops. If you choose the Dynamic Pool type, the desktops in the pool will be temporarily assigned to users. They will be recycled each time the user logs out. This pool type is considered dynamic because the user-desktop assignments are often changing.

   - **Growing** pools are filled with cloned personal desktops. If you choose the Growing Pool type, the desktops in the pool will be permanently assigned to users. Users can log in and out without losing their desktop settings. The desktops are not recycled.

   - **Manual** pools are initially empty. They are filled manually by importing personal desktops. The Manual Pool type should be used if cloned desktop assignment is not an option.

**Note**

For Microsoft Remote Desktop providers, pool types do not apply.

**CLI Steps**

- Create a pool.
How to Configure Networks Per Pool

```
# /opt/SUNWvda/sbin/vda pool-create -p name=pool name,provider=desktop provider name
```

- Example - Creates a pool for an Oracle VM VirtualBox desktop provider.

```
example% /opt/SUNWvda/sbin/vda pool-create
  -p name="Templates",provider="VB provider",assignment-type=personal
```

- Example - Creates a pool for a VMware vCenter desktop provider and specifies a template to fill the pool from.

```
example% /opt/SUNWvda/sbin/vda provider-list-templates "VC provider"
NAME ID PATH
XP-Template vm-134 [Datacenters, ADatacenter, vm]
XPClone vm-629 [Datacenters, ADatacenter, vm]
example% /opt/SUNWvda/sbin/vda pool-create
  -p name="VC pool",provider="VC provider",template=vm-134,preferred-size=30,
  free-size=5,max-size=35,power-state=on,assignment-type=flexible,
  recycle-policy=reuse,idle-timeout=2
```

5.1.2. How to Configure Networks Per Pool

The Per Pool Network Configuration feature enables an administrator to specify the subnet in which desktops will be placed. For Oracle VM VirtualBox, Microsoft Hyper-V, and VMware vCenter desktop providers, Oracle VDI will detect the networks that are configured on the provider's hosts, and the administrator can select which of these networks should be used in specific pools.

Configuration of networks is done at two levels in Oracle VDI:

- **Desktop Provider** (Oracle VM VirtualBox and Microsoft Hyper-V only) - Each subnet available on either an VirtualBox or Microsoft Hyper-V host is identified by a unique label. By default this label is the subnet address, but it can be changed in the Network tab for the desktop provider. When a host is added to a desktop provider, Oracle VDI will detect the subnets available on that host and will update the Network table accordingly. If a subnet is not available on any of the hosts in a provider, Oracle VDI will display a warning. You can view the list of subnets available for a specific host by selecting that host in the Host tab for the desktop provider. If you make changes to the networking on a host, click the Refresh button in the Network tab so that Oracle VDI can rescan the subnets available on the host.

- **Desktop Pool**

  - **Oracle VM VirtualBox and Microsoft Hyper-V desktop providers only** - A pool can have one or more networks assigned to it. When a pool is created, Oracle VDI will check whether any networks are available on all hosts for the desktop provider of the pool, and it will assign one of these networks to the pool. If no networks are available on all hosts for the provider, the administrator must explicitly specify a network to be used by the pool through the Settings tab for the pool. When desktops are imported or cloned in a pool, Oracle VDI will create a network device on the desktop and configure that device to be in the networks that have been enabled for the pool. If more than one network has been configured for the pool, Oracle VDI will use the network that has been configured as the primary network when trying to establish an RDP connection to the desktop. The primary network for a pool can be configured in the Settings tab.

  - **VMware vCenter desktop provider only** - The default behavior for VMware vCenter pools is to use the network configuration stored with your VMware vCenter templates and virtual machines. You can override this behavior for a given pool by enabling the use customized network settings in the pool's Settings tab.
How to Configure RDP Options Per Pool

Note
The Per Pool Network Configuration feature is only available for Oracle VM VirtualBox desktop provider pools if Host Networking is being used.

Oracle VDI Manager Steps

1. In Oracle VDI Manager, go to Pools.
2. Select a pool.
3. Go to the Settings tab to specify which networks are configured on the desktops in the pool.

For each network selected, a network adapter will be created on new desktops created in that pool.

Note
Oracle VM VirtualBox and Hyper-V desktop provider notes:
• Rename or refresh the desktop provider network list - Select the Desktop Providers category, and select the Oracle VM VirtualBox or Microsoft Hyper-V desktop provider of interest. Select the Network tab to see the network(s) configured on the desktop provider. After making changes to the networking on an VirtualBox or Microsoft Hyper-V host, click the Refresh button to rescan the network list for the provider.

• View a read-only list of the networks on a specific host - Go to the Desktop Providers category, and select a desktop provider. Then select the host in the Host tab.

Note
VMware vCenter desktop provider notes:
• VMware vCenter networks are not accessible in the Desktop Providers category. You can create and manage networks using VMware vCenter management tools instead.

5.1.3. How to Configure RDP Options Per Pool

You can configure the RDP options to be used by Sun Ray sessions when users connect to their desktops.

The options used by default for the Sun Ray Windows connector (uttsc) are:

• USB redirection: enabled (-r usb:on)
• Desktop Background: enabled (-E wallpaper)
• Theming: enabled (-E theming)
• Fullscreen mode: enabled (-m)

Use the following steps to configure additional RDP options for the pool.

Oracle VDI Manager Steps

1. In Oracle VDI Manager, go to Pools and select a pool.
2. Go to the Settings tab.
3. In the Sun Ray section, click **Edit Sun Ray RDP Settings**.
4. Change the RDP settings and click **Save**.
   
   See **Pool Sun Ray RDP Settings** for an explanation of the settings.
5. Click **Back**.
6. In the Sun Ray section, select **Use Customized Settings**.
7. Click **Save**.

### 5.1.3.1. Pool Sun Ray RDP Settings

The Sun Ray Windows connector (uttsc) supports a wide range of options for configuring RDP connections to users' desktops.

Oracle VDI enables you to configure a subset of these options for a pool. The following tables list the supported options. For a full list of Sun Ray Windows connector settings, see the man page for the uttsc command (\texttt{man -M /opt/SUNWuttsc/man uttsc}). For details of how other options can be used, see [Section 6.2.1, “About the Oracle VDI Sun Ray Kiosk Session”](#).

The options that can actually be used for a virtual desktop depend on the RDP protocol selected for the pool, the desktop operating system, and the configuration of the virtual desktop itself. For more information, see:

- [Section 5.1.7, “Choosing Between VRDP and MS-RDP”](#)
- [Section 6.1, “About Desktop Access”](#)
- [Section 5.2.1, “Supported Desktop Operating Systems”](#)

#### General Settings

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<th>Name</th>
<th>Description</th>
<th>Default Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session Language</td>
<td>Use this setting to identify the language used for users’ desktop sessions.</td>
<td>en-US</td>
</tr>
<tr>
<td></td>
<td>The options for this setting are:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• An RFC1766 language tag in the format \texttt{&lt;language&gt;-&lt;COUNTRY&gt;}, for example fr-CH for Swiss French.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• The decimal value of a Microsoft language ID, for example 2057 (0x0809) for UK English.</td>
<td></td>
</tr>
<tr>
<td>Keyboard Layout</td>
<td>Use this setting to identify the keyboard layout used to process keyboard input by the Remote Desktop Server.</td>
<td>en-US</td>
</tr>
<tr>
<td></td>
<td>The options for this setting are:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• An extended RFC1766 language tag in the format \texttt{&lt;language&gt;-&lt;COUNTRY&gt;[;&lt;layout&gt;]}, for example en-US:INT for a US International keyboard.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• The decimal value of a Microsoft keyboard layout ID, for example 66569 (0x10409) for the US English Dvorak layout.</td>
<td></td>
</tr>
</tbody>
</table>
# How to Configure RDP Options Per Pool

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<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Default Value</th>
</tr>
</thead>
</table>
| Keyboard Type         | Use this setting to identify the keyboard type used for users' desktop sessions.  
                          | Valid values for this setting include All Sun and PC USB Keyboards, Sun Type6 Japanese Keyboard, and Sun Korean Keyboard. | All Sun and PC USB Keyboards                                                  |
| Hotdesking            | Use this setting to configure the disconnection and reconnection behavior for RDP sessions when hotdesking occurs. | If Device Client Access License Mode is configured, RDP sessions are disconnected and reconnected.  
                          |                                                                                   | If Device Client Access License Mode is not configured, RDP sessions are not disconnected. |
| Windows Pulldown      | Use this setting to enable or disable the Windows pulldown header.           | Enabled                                                                       |
| Header                |                                                                             |                                                                               |
| RDP Packet Data       | Use this setting to enable or disable the compression of RDP packet data.     | Enabled                                                                       |
| Compression           |                                                                             |                                                                               |

## Appearance Settings

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Default Value</th>
</tr>
</thead>
</table>
| Color Depth           | Use this setting to specify the preferred color depth for users' desktop sessions.  
                          | Valid values for this setting are 8, 15, 16, 24 and 32.  
                          | Note: Color depth may be limited by configuration of the desktop to which a user connects. In such cases, the available color depths of the desktop take priority over the color depth configured for the pool.  
                          | Note: Oracle Secure Global Desktop does not support 15-bit color depths. If this color depth is specified for a virtual desktop, 8-bit color is used instead.  
                          | Note: 32-bit color is available on Windows Vista or Windows Server 2008 and later platforms; however, the client device must be capable of displaying 32-bit color. | 32             |
| Theming               | Use this setting to enable or disable theming for users' desktop sessions.  
                          | Note: Disabling this setting can improve display performance.               | Disabled       |
| Desktop Background    | Use this setting to enable or disable the desktop background for users' desktop sessions.  
<pre><code>                      | Note: Disabling this setting can improve display performance.               | Disabled       |
</code></pre>
<p>| Show Window Contents  | Use this setting to enable or disable the ability to show complete window contents while dragging windows in users' desktop sessions. | Disabled       |
| While Dragging        |                                                                             |                                                                               |</p>
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Default Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transition Effects for Menus</td>
<td>Use this setting to enable or disable visual effects during the use of menus in users' desktop sessions. Note: Disabling this setting can improve display performance.</td>
<td>Disabled</td>
</tr>
<tr>
<td>Pointer Shadow</td>
<td>Use this setting to enable or disable the use of pointer shadow in users' desktop sessions. Note: Disabling this setting can improve display performance.</td>
<td>Disabled</td>
</tr>
<tr>
<td>Pointer Scheme</td>
<td>Use this setting to enable or disable the use of pointer schemes in users' desktop sessions. Note: Disabling this setting can improve display performance.</td>
<td>Disabled</td>
</tr>
<tr>
<td>Font Smoothing</td>
<td>Use this setting to enable or disable font smoothing for text on the desktop.</td>
<td>Disabled</td>
</tr>
<tr>
<td>Sound Input</td>
<td>Use this setting to enable sound input redirection from the client to the desktop and to select the quality of transmitted sound. The options for this setting are: • High: transmit sound at the highest available sample rate. • Medium: transmit sound at up to 22.05kHz. • Low: transmit sound at a maximum of 8kHz. • Off: disable sound input.</td>
<td>Off</td>
</tr>
<tr>
<td>Sound Output</td>
<td>Use this setting to disable sound output redirection from the desktop to the client or to select the quality of transmitted sound. The options for this setting are: • High: transmit sound at 22.05 kHz or higher. By default, High quality sound output is enabled and plays locally. • Low: transmit sound at 8kHz. • Mute: play the sound on the desktop and not on the client. • Off: disable sound output.</td>
<td>High</td>
</tr>
</tbody>
</table>
How to Enable USB Redirection

Redirection Settings

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Default Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smart Cards</td>
<td>Use this setting to enable or disable smart card redirection from an Sun Ray Client to users' desktop sessions.</td>
<td>Disabled</td>
</tr>
<tr>
<td>USB</td>
<td>Use this setting to enable or disable USB redirection from an Sun Ray Client to users' desktop sessions.</td>
<td>Enabled</td>
</tr>
<tr>
<td>Serial Devices</td>
<td>Use this setting to identify serial devices which should be redirected to users' desktop sessions.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Valid values for this setting are specified using the format <code>comport=device</code> where <code>device</code> identifies the serial device to be redirected and <code>comport</code> identifies the port (on the users' desktops) that <code>device</code> should be redirected to.</td>
<td>No serial devices are redirected by default.</td>
</tr>
<tr>
<td>Paths</td>
<td>Use this setting to identify paths (available on an Oracle VDI host) which should be redirected to drives on users' desktop sessions.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Valid values for this setting are specified using the format <code>drive name=path</code> where <code>path</code> identifies the path to be redirected and <code>drive name</code> identifies the drive (on the users' desktops) that <code>path</code> should be redirected to.</td>
<td>No paths are redirected by default.</td>
</tr>
<tr>
<td>Printers</td>
<td>Use this setting to identify printer queues which should be redirected to users' desktop sessions.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Valid values for this setting are specified using the format <code>printer=[driver]</code> where <code>printer</code> identifies the printer queue to be redirected and <code>driver</code> identifies a printer driver to be used for the printer on users' desktop sessions. If <code>driver</code> is omitted, a simple PostScript driver is used by default.</td>
<td>No printer queues are redirected by default.</td>
</tr>
</tbody>
</table>

5.1.4. How to Enable USB Redirection

Steps

1. Prepare the virtual machine template.
   a. In order to use USB 2.0 devices, ensure that a USB 2.0 (EHCI) controller is enabled in the virtual machine template.
   b. Add additional USB drivers for virtual machine templates created in VMware vCenter or Microsoft Hyper-V.
      This step is not necessary for Oracle VM VirtualBox virtual machines.
      See How to Add USB Drivers to a Virtual Machine in the Sun Ray Software 5.3 Administration Guide for details of how to do this.
   c. Installing the USB redirection component of the Sun Ray Windows connector.
This step is only required if the MS-RDP protocol is used to connect to virtual machines.

See *How to Install the Windows Connector Components on a Windows System* in the *Sun Ray Software 5.3 Administration Guide* for details of how to do this.

2. Import the prepared virtual machine as a template into the Oracle VDI host.

   Refer to the following:

   - Section 5.6.1, “How to Import Desktops (Oracle VM VirtualBox)"
   - Section 5.6.3, “How to Import Desktops (Microsoft Hyper-V)"
   - Section 5.6.2, “How to Import Desktops (VMware vCenter)"

3. (Optional) Check that the USB 2.0 (EHCI) controller is enabled in the template.
   a. In Oracle VDI Manager, go to **Pools**.
   b. Select a pool.
   c. Go to the Template tab.
   d. In the Templates table, click the name of the template.
      
      The Template Summary page is displayed.
   e. Click the Virtual Machine link.
      
      The Machine Configuration page is displayed.
   f. Ensure that the USB 2.0 (EHCI) Controller option is selected.

4. Enable USB support.
   a. In Oracle VDI Manager, go to **Pools**.
   b. Select a pool.
   c. Go to the Settings tab.
   d. In the Sun Ray Client section, click Edit Sun Ray RDP Settings.
      
      The Sun Ray RDP Settings are displayed.
   e. In the Redirection section, ensure Enable USB is selected.
   f. Click Save and then click Back.
      
      The Settings tab is displayed.
   g. In the Sun Ray Client section, select Use Customized Settings.
   h. Click Save.

5. Check that the USB controllers are present in the template.
   a. (Optional) Clone a virtual machine from the template.
b. Log in to the virtual machine.

c. Choose Computer → Properties → Hardware → Device manager to see whether the device is listed under USB Serial Bus Controllers.

5.1.5. How to Configure Smart Card Removal

You can control what should happen to a user's desktop after a smartcard is removed from a Sun Ray Client. Using the Smart Card Removal Policy, you can indicate that a user's desktop should be shut down, suspended, or recycled when the smart card has been out of a Sun Ray Client for a specific length of time. If the user reinserts a smart card before the specified time has elapsed, the associated action on the desktop will be canceled. The Smart Card Removal Policy is configurable per pool and is available for all Oracle VM VirtualBox, Microsoft Hyper-V, and VMware vCenter pools. This policy may be configured using Oracle VDI Manager or the CLI.

Recycling is applied only to desktops that have flexible assignments. Choosing the recycle option for your Smart Card Removal Policy will have no effect on personally assigned desktops.

Oracle VDI Manager Steps

1. In Oracle VDI Manager, go to Pools.

2. Select a pool.

3. Go to the Settings tab.

4. In the Sun Ray section, indicate the action you want to be associated with removal of smart cards from thin clients using the Action on Card Removal menu.
   - No Action - Select if you want Oracle VDI to ignore smart card removals.
   - Recycle Desktop - Select if you want flexibly assigned desktops to be recycled.
   - Shutdown Desktop - Select if you want desktops to be shut down.
   - Suspend - Select if you want desktops to be suspended.

5. Specify the number of seconds a smart card must be removed from a thin client before any action should be taken in the Delay Action field.

6. Click Save.

CLI Steps

1. Configure the desktop action associated with smart card removal.

   ```bash
   # /opt/SUNWvda/sbin/vda pool-setprops \
   -p card-removed=desktop action pool name
   ```

2. Specify the length of time (in seconds) that a smart card must be out of a thin client before the action is performed.

   ```bash
   # /opt/SUNWvda/sbin/vda pool-setprops \
   -p card-removed-timeout=time in seconds pool name
   ```

   In the following example, the desktop action that should be performed after a smart card has been out of a thin client for 30 seconds is configured.

   ```bash
   # /opt/SUNWvda/sbin/vda pool-setprops \
   -p card-removed-timeout=30 pool name
   ```
5.1.6. How to Configure Kiosk Settings (Sun Ray Kiosk Provider)

You can configure kiosk settings by defining the arguments to be passed to a Sun Ray Kiosk Mode session. Kiosk settings are configurable per pool and are available only for Sun Ray Kiosk pools. Kiosk session arguments are provided as text using a command line syntax. The settings can be configured using Oracle VDI Manager or the CLI.

Each kiosk session type defines what options and arguments it supports. The specified arguments override any default arguments defined by the kiosk session type. For more information, see Kiosk Mode in the Sun Ray Software 5.3 Administration Guide and the documentation for the specific kiosk session type.

See Section 4.4, “Sun Ray Kiosk Desktop Providers” for more details about Sun Ray kiosk sessions.

Oracle VDI Manager Steps

1. In Oracle VDI Manager, go to Pools.
2. Select a pool.
3. Go to the Settings tab.
4. In the Kiosk Settings field, type the arguments to pass to the kiosk session.
5. Click Save.

CLI Steps

- Configure the kiosk settings for the pool.

```
# /opt/SUNWvda/sbin/vda pool-setprops -p kiosk-settings="kiosk session arguments" "pool name"
```

In the following example, settings are configured for a Sun Ray VMware View connector kiosk session.

```
# /opt/SUNWvda/sbin/vda pool-setprops \
-p kiosk-settings="-s myvdmserver.domain -https -- -E theming" "VDM-Pool"
```

5.1.7. Choosing Between VRDP and MS-RDP

Oracle VDI uses the Remote Desktop Protocol (RDP) for transmitting data to and from virtual desktops. Oracle VDI supports two different types of RDP, VirtualBox RDP (VRDP) and Microsoft RDP (MS-RDP).

VRDP enables Oracle VDI to connect to virtual desktops at the machine level. This characteristic enables users to watch a virtual machine boot in the same way as a real computer, and desktop sessions appear to start faster. With VRDP, you can also choose between network address translation (NAT) networking or host networking (bridged networking). NAT networking is the simplest way of accessing an external network from a virtual machine, and usually it does not require any configuration on the host network or virtual machine.

With MS-RDP, Oracle VDI connects at the operating system level. Users are not able to watch the virtual machine boot, and the desktop sessions appear to start slower because you have to wait for the virtual machine to boot and be ready to accept RDP connections.

For virtual desktops hosted by Oracle VM VirtualBox desktop providers, you can use either VRDP or MS-RDP. You select the required protocol and networking method in the network settings for the pool, see Section 5.1.2, “How to Configure Networks Per Pool”. By default, pools are configured to use VRDP and NAT networking. To use MS-RDP, you must select host networking.

For all other desktop providers, MS-RDP is used.
The following table shows Oracle VDI features by protocol. The choice of client and virtual machine configuration also influence which features can be used for a virtual desktop. For more information, see Section 6.1, “About Desktop Access”.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
<th>VRDP</th>
<th>MS-RDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio recording (input audio)</td>
<td>Enables recording from client devices to virtual desktops.</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Audio redirection</td>
<td>Enables audio content on virtual desktops to be played on client devices.</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Auto-logon</td>
<td>Enables users to be logged in automatically to remote desktops.</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Clipboard redirection</td>
<td>Enables copy and paste functionality for text between client devices and virtual desktops.</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>COM port mapping</td>
<td>Enable access to serial devices connected to client devices.</td>
<td>x</td>
<td>✓</td>
</tr>
<tr>
<td>Compression</td>
<td>Enables the bulk compression of data sent to and from the virtual desktops.</td>
<td>x</td>
<td>✓</td>
</tr>
<tr>
<td>Drive redirection (client drive mapping)</td>
<td>Enables access to drives on the client devices.</td>
<td>x</td>
<td>✓</td>
</tr>
<tr>
<td>Multi-desktop</td>
<td>Enables multiple virtual desktops to be displayed if multiple monitors are attached to client devices.</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Multi-monitor</td>
<td>Enables the use of multiple monitors attached to client devices. One desktop session can be displayed on multiple monitors, or multiple desktop sessions on multiple monitors.</td>
<td>✓</td>
<td>✓ (RDP 7 only)</td>
</tr>
<tr>
<td>Network security (encryption level)</td>
<td>Enables the encrypted transmission of data to and from virtual desktops, optionally with host verification.</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Session directory</td>
<td>Enables automatic reconnection to existing virtual desktop sessions.</td>
<td>x</td>
<td>✓</td>
</tr>
<tr>
<td>Smart card device redirection</td>
<td>Enables access to smart card devices connected to client devices.</td>
<td>x</td>
<td>✓</td>
</tr>
<tr>
<td>Time zone redirection</td>
<td>Enables the time in the virtual desktop to be adjusted to match the time zone of the client device.</td>
<td>x</td>
<td>✓</td>
</tr>
<tr>
<td>USB device redirection</td>
<td>Enables access to USB devices connected to client devices.</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Video acceleration</td>
<td>Enables enhancement to improve the performance of video streams and Adobe Flash content.</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Windows printer mapping (client printing)</td>
<td>Enables printing to printers attached to client devices, or printing to local or network printers attached to the virtual desktop or Sun Ray Software server.</td>
<td>x</td>
<td>✓</td>
</tr>
</tbody>
</table>

* Access to client USB storage devices is supported.
b Access to client USB smart card devices is supported.
c Access to client USB printers is supported.

For detailed information of the features listed in the above table, and information on using MS-RDP and the Sun Ray Windows connector, see Windows Connector in the Sun Ray Software 5.3 Administration Guide.

For detailed information on VRDP, see Remote Virtual Machines in the Oracle VM VirtualBox documentation.

Desktop Performance Settings and VRDP

Most RDP client programs have settings that can be used to enhance the performance of remote desktops. For example, for Sun Ray Clients, these settings can be configured for a pool, see Section 5.1.3, “How to Configure RDP Options Per Pool”. The performance settings control things such as the color depth, the mouse shadow, and window and menu animations. However, if the VRDP protocol is used to connect to desktops, these settings have no effect, because VRDP connects at the machine level rather than the operating system level.

Auto-Logon

To use automated logons for Windows desktops using the VRDP protocol, the VirtualBox Windows Guest Addition module must be installed in the template or desktop. The Guest Additions must be installed from the command line with the /with_autologon switch.

Auto-Logon is supported for Windows desktops only.

Audio Recording (Input Audio) and MS-RDP

To configure support for audio recording (input audio) from a Sun Ray Client when the MS-RDP protocol is used to connect to a virtual desktop, you must install the audio input component of the Sun Ray Windows connector in the template or desktop. This component is supported on Windows XP and Windows Server 2003 only.

See How to Install the Windows Connector Components on a Windows System in the Sun Ray Software 5.3 Administration Guide for details.

Audio input is disabled by default. You enable it in the RDP options for a pool, see Section 5.1.3, “How to Configure RDP Options Per Pool” for details.

Multi-Monitor

For multi-monitor support with VRDP, Oracle VDI runs a separate instance of the Sun Ray Windows connector for each monitor connection.

For multi-monitor support with MS-RDP, Oracle VDI runs one instance of the Sun Ray Windows connector for each Oracle VDI session.

Oracle VDI provides additional security for VRDP connections by setting a one-time password. Without the correct user name and one-time password, an RDP client fails to connect.

Not all editions of Windows 7 include multi-monitor support, see the Microsoft Remote Desktop Connection FAQ for details.

USB Redirection and MS-RDP

To configure support for USB redirection from a Sun Ray Client when the MS-RDP protocol is used to connect to a virtual desktop, you must install the USB redirection component of the Sun Ray Windows connector in the template or desktop. See Section 5.1.4, “How to Enable USB Redirection” for details.
Video Acceleration and VRDP

VirtualBox has a Video Redirection feature for VRDP. Video streams in a virtual machine are detected by the VRDP server automatically as frequently updated rectangular areas. Video frames are compressed using the Motion JPEG (M-JPEG) format, allowing a higher compression rate than standard RDP bitmap compression methods. The Video Redirection feature works without having to install additional software in the guest. It is not possible to turn off this feature or to change the compression rate.

The Video Redirection feature is supported for any supported desktop that uses VRDP and accessed from a Sun Ray Client, or a client that supports RDP version 7. On Sun Ray Clients, the M-JPEG video streams are delivered through the SunFlash channel.

Video Acceleration and MS-RDP

Video Acceleration is supported for connections that use RDP version 7.

To configure support for video acceleration from a Sun Ray Client when the MS-RDP protocol is used to connect to a virtual desktop, you must install the following components of the Sun Ray Windows connector in the template or desktop:

- Multimedia redirection: This component provides enhanced performance for Windows Media Player.
- Adobe Flash acceleration: This component provides enhanced playback capabilities for Adobe Flash content.
- Audio/video synchronization: This component provides enhanced audio and video synchronization for multimedia content

The multimedia redirection and audio/video synchronization components are supported on Windows XP and Windows Server 2003 only.

For detailed information on how to install the components, see How to Install the Windows Connector Components on a Windows System in the Sun Ray Software 5.3 Administration Guide.

For detailed information about the Sun Ray Windows connector components, see Windows Connector in the Sun Ray Software 5.3 Administration Guide.

5.2. About Desktops

The term desktop refers to an instance of an operating system running on a virtualization host. It is delivered to a user and accessed via a desktop access client. Oracle VDI manages desktops on any of the following virtualization platforms:

- Oracle VM VirtualBox
- VMware Infrastructure
- Microsoft Hyper-V
- Microsoft Remote Desktop

Desktops may be created one-by-one for each user, but in most situations there will be groups of users that require the same applications. Oracle VDI allows you to prepare and use a desktop template, and clone as many desktops as needed from the template. For more on templates, refer to the Section 5.3, “About Templates and Revisions” section.
### 5.2.1. Supported Desktop Operating Systems

The following table shows the desktop operating systems that are supported for each desktop provider type. Pay particular attention to the notes that follow this table.

<table>
<thead>
<tr>
<th>Desktop Operating System</th>
<th>Oracle VM VirtualBox</th>
<th>VMware vCenter</th>
<th>Microsoft Hyper-V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows 7 (32-bit and 64-bit)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Windows Vista Enterprise</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Windows XP SP2 and SP3 (32-bit and 64-bit)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Windows 2000 SP4</td>
<td>✓ (VRDP only)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oracle Linux 5.6</td>
<td>✓ (VRDP only)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oracle Solaris 10, at least release 10/09</td>
<td>✓ (VRDP only)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUSE Linux Enterprise Desktop 11</td>
<td>✓ (VRDP only)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ubuntu 12.04 (Precise Pangolin)</td>
<td>✓ (VRDP only)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ubuntu 11.04 (Natty Narwhal)</td>
<td>✓ (VRDP only)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ubuntu 10.04 (Lucid Lynx)</td>
<td>✓ (VRDP only)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Not all editions of Windows 7 include support for remote desktop connections, see the Microsoft Remote Desktop Connection FAQ for details.

The supported desktops for Microsoft Remote Desktop provider are described in Section 4.2.4, “System Requirements for Microsoft Remote Desktop Services”.

The features that can be used with a virtual desktop depend on the RDP protocol selected for the pool and the method used to access Oracle VDI. For more information, see the following:

- Section 5.1.7, “Choosing Between VRDP and MS-RDP”
- Section 6.1, “About Desktop Access”

### 5.2.2. Available Actions for Desktops

Not all actions are available for all platforms. VMware has its own management tool, VMware vCenter, and Oracle VDI simply accesses the data. Microsoft Remote Desktop is not a virtualization platform like the others, therefore desktops cannot be imported and assigned personally.

<table>
<thead>
<tr>
<th>Action</th>
<th>Details</th>
<th>Location in Oracle VDI Manager</th>
<th>vda Subcommand</th>
<th>Desktop Provider</th>
</tr>
</thead>
<tbody>
<tr>
<td>Import Desktop</td>
<td>Imports a virtual machine into Oracle VDI. After that the desktop can be assigned to any user. Oracle VM VirtualBox and Microsoft Hyper-V hosted machines can be imported from a shared folder. In addition, virtual machines can be</td>
<td>Desktop Tab → Import (button)</td>
<td>pool-vb-import</td>
<td>• Oracle VM VirtualBox</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>pool-vb-import-unmanaged</td>
<td>• Hyper-V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>pool-vc-import</td>
<td>• VMware</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>pool-hv-import</td>
<td>• Generic</td>
</tr>
<tr>
<td>Action</td>
<td>Details</td>
<td>Location in Oracle VDI Manager</td>
<td>vda Subcommand</td>
<td>Desktop Provider</td>
</tr>
<tr>
<td>---------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------------------------------</td>
<td>----------------</td>
<td>------------------</td>
</tr>
<tr>
<td></td>
<td>directly imported from a VirtualBox host. For VMware vCenter, the virtual machines remain under the control of VMware vCenter, but the user assignment and runtime management is done by Oracle VDI. For more details see: • Section 5.6.1, “How to Import Desktops (Oracle VM VirtualBox)” • Section 5.6.3, “How to Import Desktops (Microsoft Hyper-V)” • Section 5.6.2, “How to Import Desktops (VMware vCenter)”</td>
<td>Desktop Tab → Duplicate (in Menu)</td>
<td>desktop-duplicate</td>
<td>• Oracle VM VirtualBox • Hyper-V</td>
</tr>
<tr>
<td>Duplicate Desktops</td>
<td>Creates an identical clone of any desktop.</td>
<td>Desktop Tab → Rename (in Menu)</td>
<td>desktop-setprops</td>
<td>• Oracle VM VirtualBox • Hyper-V • Generic</td>
</tr>
<tr>
<td>Rename Desktop</td>
<td>Renames the desktop. The name is also visible if more than one desktop is assigned to the user.</td>
<td>Desktop Tab → Export (in Menu)</td>
<td>desktop-export</td>
<td>• Oracle VM VirtualBox</td>
</tr>
<tr>
<td>Export Desktop</td>
<td>Exports the selected desktop to disk, consisting of an XML file for the properties of the virtual machine and a .vdi file for the content of the desktop's hard drive. The exported desktop can then be stored and used outside Oracle VDI.</td>
<td>Desktop Tab → Delete Desktop (in Menu)</td>
<td>desktop-delete</td>
<td>• Oracle VM VirtualBox</td>
</tr>
<tr>
<td>Delete Desktop</td>
<td>If necessary, the desktop is stopped.</td>
<td>Desktop Tab → Delete Desktop (in Menu)</td>
<td>desktop-delete</td>
<td>• Oracle VM VirtualBox</td>
</tr>
</tbody>
</table>
### Available Actions for Desktops

<table>
<thead>
<tr>
<th>Action</th>
<th>Details</th>
<th>Location in Oracle VDI Manager</th>
<th>vda Subcommand</th>
<th>Desktop Provider</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convert Desktop to Template</td>
<td>Then for VirtualBox and Microsoft Hyper-V hosted desktops, the iSCSI disk is deleted from the storage. For VMware vCenter desktops, you have the option to keep the virtual machine available on VMware vCenter. All references to the desktop are removed from the Oracle VDI database.</td>
<td>Desktop Tab → Convert to Template (in Menu)</td>
<td>desktop-template</td>
<td>• Hyper-V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• VMware</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Generic</td>
</tr>
<tr>
<td>Reset Cloning</td>
<td>Regardless of the recycle policy all cloned desktops (that are not currently in use or personally assigned) are deleted and new desktops are cloned. You can use this action to make sure that all desktops are cloned from the same template or the latest master revision, and use the latest settings from the Pools-Cloning tab, like naming conventions or Windows system preparation.</td>
<td>Desktop Tab → Reset Cloning (in Menu)</td>
<td></td>
<td>• Oracle VM VirtualBox</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Hyper-V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• VMware</td>
</tr>
<tr>
<td>Assign Desktop</td>
<td>Creates a persistent relation between a user and the desktop. This desktop will be reserved for the user as their personal desktop.</td>
<td>Desktop Tab → Assign (button)</td>
<td>user-personaldesktop</td>
<td>• Oracle VM VirtualBox</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Hyper-V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• VMware</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Generic</td>
</tr>
<tr>
<td>Remove User</td>
<td>Breaks the persistent relation between user and desktop.</td>
<td>Desktop Tab → Remove User (in Menu)</td>
<td>user-unassign</td>
<td>• Oracle VM VirtualBox</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Hyper-V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• VMware</td>
</tr>
<tr>
<td>Action</td>
<td>Details</td>
<td>Location in Oracle VDI Manager</td>
<td>vda Subcommand</td>
<td>Desktop Provider</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------------------------------------------------------------</td>
<td>-------------------------------------------------------</td>
<td>----------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Log Out User</td>
<td>Logs the user out of their RDS session, and the session no longer exists.</td>
<td>Desktop Tab → Log Out User (button)</td>
<td>desktop-logoff</td>
<td>• Hyper-V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• VMware</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Generic</td>
</tr>
<tr>
<td>Disconnect</td>
<td>Disconnects the user from their RDS session, but the session remains on</td>
<td>Desktop Tab → Disconnect (button)</td>
<td>desktop-disconnect</td>
<td>• MS Remote</td>
</tr>
<tr>
<td></td>
<td>the RDS Session Host and the user can reconnect to it later.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Start Desktop</td>
<td>Starts the desktop on the host. If the desktop is not registered on the</td>
<td>Desktop Tab → Start (button)</td>
<td>desktop-start</td>
<td>• Oracle VM</td>
</tr>
<tr>
<td></td>
<td>host, one is selected based on free memory. The desktop is then</td>
<td></td>
<td></td>
<td>VirtualBox</td>
</tr>
<tr>
<td></td>
<td>registered and started.</td>
<td></td>
<td></td>
<td>• Hyper-V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• VMware</td>
</tr>
<tr>
<td>Shut Down Desktop</td>
<td>Sends an ACPI shutdown signal to the desktop.</td>
<td>Desktop Tab → Shut Down (in Menu)</td>
<td>desktop-stop</td>
<td>• Oracle VM</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>VirtualBox</td>
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<td>• Hyper-V</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• VMware</td>
</tr>
<tr>
<td>Restart Desktop</td>
<td>Restarts the desktop on the same host. Equivalent to pressing the reset</td>
<td>Desktop Tab → Restart (button)</td>
<td>desktop-restart</td>
<td>• Oracle VM</td>
</tr>
<tr>
<td></td>
<td>button on your PC and can cause data loss if files are open.</td>
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<td></td>
<td>VirtualBox</td>
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<td></td>
<td></td>
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<td></td>
<td>• Hyper-V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• VMware</td>
</tr>
<tr>
<td>Power Off Desktop</td>
<td>Immediately powers-off the desktop and unregisters it from the</td>
<td>Desktop Tab → Power Off (in Menu)</td>
<td>desktop-stop -p</td>
<td>• Oracle VM</td>
</tr>
<tr>
<td></td>
<td>VirtualBox or Microsoft Hyper-V host. On a VMware vCenter</td>
<td></td>
<td></td>
<td>VirtualBox</td>
</tr>
<tr>
<td></td>
<td>virtualization host, the desktop is only powered off.</td>
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<td></td>
<td>• Hyper-V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• VMware</td>
</tr>
<tr>
<td>Suspend Desktop</td>
<td>Saves the desktop's state to disk. When</td>
<td>Desktop Tab → Suspend (in Menu)</td>
<td>desktop-suspend</td>
<td>• Oracle VM</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>VirtualBox</td>
</tr>
</tbody>
</table>
## 5.3. About Templates and Revisions

Desktops that are designed to be used as master copies from which clones can be propagated are called **templates**. A template consists of a guest operating system profile, a hardware profile, and one or more virtual hard disks. The use of templates makes it easier to perform and control administrative tasks such as filling a pool with available desktops and propagating updates to them. For more about desktops, refer to Section 5.2, “About Desktops”.

Each platform has slightly different requirements for selecting and managing templates. Oracle VDI offers template management for Oracle VM VirtualBox and Microsoft Hyper-V desktop pools. VMware Infrastructure, however, has its own template management conventions, so for this purpose, Oracle VDI offers access to the list of available templates in VMware vCenter.

For Oracle VM VirtualBox and Microsoft Hyper-V desktop pools, Oracle VDI also offers **template revisions**. Template revisions facilitate the proliferation of software updates and other changes to pools of cloned desktops. Oracle VDI saves a revision history of your templates. You can use template revisions to add software applications, to correct errors, and to provide fresh instances of a given desktop. You can also test revisions before cloning on a large scale and revert to earlier revisions if needed.

It is always a good idea to perform virus scanning on templates and/or storage rather than on individual virtual desktops, whose performance can be adversely affected by local scanning, which can consume both CPU and memory resources.

When a template is upgraded and declared as the new master revision, Oracle VDI deletes and replaces desktops that are not assigned to a user and those desktops that are in an idle state (see Section 5.4.2, “Desktop States” with a new version based on the new master template.

### Action | Details | Location in Oracle VDI Manager | vda Subcommand | Desktop Provider
---|---|---|---|---
**Open Desktop Console** | Opens a new window to access the desktop directly from the browser. | Desktop Tab → Console Tab → Open in Window (button) | | • Hyper-V  
| | | | • VMware  

**Mount or Unmount ISO** | Mounts or unmounts an ISO image on the virtual machine. | Desktop Tab → Mount ISO Image, or Unmount ISO Image (in Menu) | | • Oracle VM VirtualBox  
| | | | • Hyper-V  

**Activate Desktop** | In some error situations, Oracle VDI will mark a desktop "unresponsive" rendering the desktop unusable. Select Activate to return the desktop to the previous state. | Desktop Tab → Activate (in Menu) | | • Oracle VM VirtualBox  
| | | | • Hyper-V  

---

**Note**

It is always a good idea to perform virus scanning on templates and/or storage rather than on individual virtual desktops, whose performance can be adversely affected by local scanning, which can consume both CPU and memory resources.
However, desktops that are in use at the time are not affected by the template revision mechanism until the user logs out. When the user logs out, the desktop reverts to an idle state. At that point, the desktop is deleted and replaced with a new version.

**Figure 5.1. Templates and Revisions**

5.3.1. Available Actions for Templates

There are a number of available actions for templates and revisions.

<table>
<thead>
<tr>
<th>Action</th>
<th>Details</th>
<th>Location in Oracle VDI Manager</th>
<th>vda Subcommand</th>
<th>Desktop Provider</th>
</tr>
</thead>
<tbody>
<tr>
<td>Import Template</td>
<td>Imports a virtual machine into Oracle VDI, and creates a first revision. The revision can be used for cloning in any pool that uses the same desktop provider.</td>
<td>Template Tab → Import Template (button)</td>
<td>pool-vb-import</td>
<td>• Oracle VM VirtualBox</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>pool-vb-import-unmanaged</td>
<td>• Hyper-V</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>pool-vc-import</td>
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<td></td>
<td></td>
<td></td>
<td>pool-hv-import</td>
<td></td>
</tr>
<tr>
<td>Open Console</td>
<td>Opens a new window to access the template directly from the browser.</td>
<td>Template Tab → Open Console (button)</td>
<td></td>
<td>• Oracle VM VirtualBox</td>
</tr>
<tr>
<td>Create Revision</td>
<td>Saves the current state of the template as a new revision.</td>
<td>Template Tab → Create Revision (button)</td>
<td>revision-create</td>
<td>• Oracle VM VirtualBox</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Hyper-V</td>
</tr>
<tr>
<td>Rename</td>
<td>Renames the template or revision.</td>
<td>Template Tab → Rename (in Menu)</td>
<td>template-setprops</td>
<td>• Oracle VM VirtualBox</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Hyper-V</td>
</tr>
<tr>
<td>Action</td>
<td>Details</td>
<td>Location in Oracle VDI Manager</td>
<td>vda Subcommand</td>
<td>Desktop Provider</td>
</tr>
<tr>
<td>-----------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------</td>
<td>------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Copy Template to Desktop</td>
<td>Copies the template to a usable desktop. Formerly called &quot;Convert to Desktop&quot;.</td>
<td>Template Tab → Copy to Desktop (in Menu)</td>
<td>template-desktop</td>
<td>Oracle VM VirtualBox, Hyper-V</td>
</tr>
<tr>
<td>Export Template</td>
<td>Exports the selected template to disk, consisting of an XML file for the properties of the virtual machine and a <code>.vdi</code> file for the content of the template's hard drive. The exported desktop can then be stored and used outside Oracle VDI.</td>
<td>Template Tab → Export (in Menu)</td>
<td>template-export</td>
<td>Oracle VM VirtualBox</td>
</tr>
<tr>
<td>Start Template</td>
<td>Starts the desktop in order to apply changes to the template.</td>
<td>Template Tab → Start (in Menu)</td>
<td>template-start</td>
<td>Oracle VM VirtualBox, Hyper-V</td>
</tr>
<tr>
<td>Restart Template</td>
<td>Restarts the template on the same host. Equivalent to pressing the reset button on your PC and can cause data loss if files are open.</td>
<td>Template Tab → Restart (in Menu)</td>
<td>template-restart</td>
<td>Oracle VM VirtualBox, Hyper-V</td>
</tr>
<tr>
<td>Shut Down Template</td>
<td>Sends an ACPI shutdown signal to the template.</td>
<td>Template Tab → Shut Down (in Menu)</td>
<td>template-stop</td>
<td></td>
</tr>
<tr>
<td>Power Off Template</td>
<td>Immediately powers-off the template and unregisters it from the virtualization host.</td>
<td>Template Tab → Power Off (in Menu)</td>
<td>template-stop -p</td>
<td>Oracle VM VirtualBox, Hyper-V</td>
</tr>
<tr>
<td>Mount or Unmount ISO</td>
<td>Mounts or unmounts an ISO image on the virtual machine.</td>
<td>Template Tab → Mount ISO Image, or Unmount ISO Image (in Menu)</td>
<td>template-mount-iso, template-unmount-iso</td>
<td>Oracle VM VirtualBox, Hyper-V</td>
</tr>
<tr>
<td>Apply for Cloning</td>
<td>If automatic cloning is selected as a pool setting, any fresh desktops for the pool will be cloned from the template that has been applied for cloning.</td>
<td>Template Tab → Apply for Cloning in Pool (in Menu)</td>
<td>pool-setprops</td>
<td>Oracle VM VirtualBox, Hyper-V</td>
</tr>
</tbody>
</table>
### Available Actions for Revisions

<table>
<thead>
<tr>
<th>Action</th>
<th>Details</th>
<th>Location in Oracle VDI Manager</th>
<th>vda Subcommand</th>
<th>Desktop Provider</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Revert Template</strong></td>
<td>Reverts the template to the most recent revision.</td>
<td>Template Tab → Revert (in Menu)</td>
<td><code>template-revert</code></td>
<td>• Oracle VM</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>VirtualBox</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Hyper-V</td>
</tr>
<tr>
<td><strong>Delete Template</strong></td>
<td>Delete the template and all the corresponding revisions of the template.</td>
<td>Template Tab → Delete (in Menu)</td>
<td><code>template-delete</code></td>
<td>• Oracle VM</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>VirtualBox</td>
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<td>• Hyper-V</td>
</tr>
</tbody>
</table>

#### 5.3.2. Available Actions for Revisions

<table>
<thead>
<tr>
<th>Action</th>
<th>Details</th>
<th>Location in Oracle VDI Manager</th>
<th>vda Subcommand</th>
<th>Virtualization Platform</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Make Revision Master</strong></td>
<td>Marks the revision for cloning in pools that have selected the template for cloning.</td>
<td>Template Tab → Make Master (button)</td>
<td><code>revision-setprops</code></td>
<td>• Oracle VM VirtualBox</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Hyper-V</td>
</tr>
<tr>
<td><strong>Rename Revision</strong></td>
<td>Renames the revision.</td>
<td>Template Tab → Rename (in Menu)</td>
<td><code>revision-setprops</code></td>
<td>• Oracle VM VirtualBox</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Hyper-V</td>
</tr>
<tr>
<td><strong>Copy Revision to Template</strong></td>
<td>Creates a new template based on this revision. Use this action to create an independent branch of any existing revision.</td>
<td>Template Tab → Copy to Template (in Menu)</td>
<td><code>template-create</code></td>
<td>• Oracle VM VirtualBox</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Hyper-V</td>
</tr>
<tr>
<td><strong>Copy Revision to Desktop</strong></td>
<td>Creates a new independent desktop in the same pool.</td>
<td>Template Tab → Copy to Desktop (in Menu)</td>
<td><code>revision-desktop</code></td>
<td>• Oracle VM VirtualBox</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Hyper-V</td>
</tr>
<tr>
<td><strong>Clone Revision</strong></td>
<td>Creates a desktop based on the selected revision in the same pool.</td>
<td>Template Tab → Clone Desktop (in Menu)</td>
<td><code>revision-clone</code></td>
<td>• Oracle VM VirtualBox</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Hyper-V</td>
</tr>
<tr>
<td><strong>Export Revision</strong></td>
<td>Exports the selected revision to disk, consisting of an XML file for the properties of the virtual machine and a <code>.vdi</code> file for the content of the desktop’s hard drive. The exported desktop can then be stored and used outside Oracle VDI.</td>
<td>Template Tab → Export (in Menu)</td>
<td><code>revision-export</code></td>
<td>• Oracle VM VirtualBox</td>
</tr>
</tbody>
</table>
### 5.4. About Desktop and Virtual Machine States

In Oracle VDI, a user is assigned to one or several virtual desktops and can use these desktops from everywhere as if they were running on a traditional personal computer. Oracle VDI provides advanced management and lifecycle features which allow the effective management of thousands of desktops. Desktops transition through states defined by settings in Oracle VDI.

Virtual machines are used to run the operating systems which render the desktops. They are controlled by a hypervisor, such as Oracle VM VirtualBox, Microsoft Hyper-V, and VMware Infrastructure. They cycle through traditional machine states such as powered off and running.

#### 5.4.1. Virtual Machine States

Virtual machine states are defined by the virtualization platform.

- **Running**

  Running desktops are registered and started on a single hypervisor host. The host that a virtual machine is running on can be determined using the Desktop Summary page in Oracle VDI Manager. A running virtual machine is connected directly to the storage.

- **Powered Off**

---

### Table: About Desktop and Virtual Machine States

<table>
<thead>
<tr>
<th>Action</th>
<th>Details</th>
<th>Location in Oracle VDI Manager</th>
<th>vda Subcommand</th>
<th>Virtualization Platform</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Apply System Preparation to Revision</strong></td>
<td>Internally a clone is created and started to call the Windows Sysprep command. After that a new snapshot is taken that will be used for cloning the desktops in the pools.</td>
<td>Template Tab → System Preparation (in Menu)</td>
<td>revision-sysprep</td>
<td>• Oracle VM VirtualBox</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Hyper-V</td>
</tr>
<tr>
<td><strong>Apply for Cloning</strong></td>
<td>Selects a pool that should use a specific revision for cloning. Otherwise the master revision will be used.</td>
<td>Template Tab → Apply for Cloning (in Menu)</td>
<td>pool-setprops</td>
<td>• Oracle VM VirtualBox</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Hyper-V</td>
</tr>
<tr>
<td><strong>Delete Revision</strong></td>
<td>For Oracle VDI and Hyper-V the iSCSI disk is deleted from the storage. For VMware you have the option to keep the virtual machine available on vCenter. All references to the revision are removed from the Oracle VDI database.</td>
<td>Template Tab → Delete (in Menu)</td>
<td>revision-delete</td>
<td>• Oracle VM VirtualBox</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Hyper-V</td>
</tr>
</tbody>
</table>
Powered off virtual machines reside in two places in the Oracle VDI environment, the database and the storage. The Oracle VDI database contains the desktop configuration information to register the desktop on a hypervisor. The storage server contains the desktop's hard disk data.

Powered off virtual machines are typically not associated or registered on any hypervisor host. This strategy enables Oracle VDI to select the best suited host on every start of a virtual machine. This setup helps ensure a distribution of virtual machines across the available VirtualBox or Microsoft Hyper-V hosts minimizing resource usage on each.

- **Suspended**
  Suspended virtual machines have been suspended by the hypervisor.

- **Paused, Aborted, or Stuck**
  These machine states are specific to VirtualBox.

- **Unknown**
  This state typically indicates that either a VMware vCenter server cannot be contacted to retrieve the state information, or a VirtualBox host returns null.

- **Active or Disconnected**
  These machine states apply to Microsoft Remote Desktops only. Oracle VDI does not control the machine state, just the connection to the desktop.

### 5.4.2. Desktop States

The desktop states are used to accomplish the following:

- Implement the desktop lifecycle.
- Synchronize Oracle VDI hosts and virtualization platform.
- Serve as a tool for monitoring and analyzing the system state.

The following figure depicts a simplified version of the lifecycle of a flexibly assigned desktop.

**Figure 5.2. Lifecycle of a Flexibly-Assigned Desktop**

![Lifecycle of a Flexibly-Assigned Desktop Diagram]
Possible desktop states are:

- **Available** - The first state

  A desktop is added to the database and then set to the *Available* state after being cloned from a template. After becoming *Available*, the desktop is ready to be assigned to users. If the recycle policy is set to Reuse Desktop or Reset to Snapshot, the desktop will return to this state.

- **Idle** - The intermediate state

  The desktop is in this state whenever the desktop is assigned and the user is not using it, for example, when the desktop is assigned and the user has not logged in yet or when the desktop is assigned and the user just logged out. A desktop is recycled after it remains in that state for a configurable amount of time.

  The VMware vCenter desktop provider has two additional *Idle* states: when the desktop is assigned and either the virtual machine is suspended or the guest OS goes into standby through the vCenter option Keep VM Running on Guest OS Standby.

- **Used** - The active state

  A desktop enters the *Used* state as soon as the user has logged in to the desktop. The desktop stays in this state while the user logs in, uses the desktop, and logs out.

- **Reserved** - The maintenance state

  A desktop is *Reserved* when it is being worked on by Oracle VDI. This desktop state usually occurs when the desktop is the source of a manual copy operation or the desktop is recycled. The desktop will become *Available* after leaving the *Reserved* state.

- **Unresponsive** - The quarantine state

  The desktop enters the *Unresponsive* state whenever Oracle VDI determines a severe problem with the desktop. An unresponsive desktop is outside the desktop life cycle and needs the attention of the administrator. The administrator may either fix the problem and apply the Activate action to the desktop, which puts the desktop back in the lifecycle, or the administrator may choose to delete the desktop.

### 5.5. Creating Desktop Images

This section describes how to create the virtual machines that are to be used as desktop images.

After creating the virtual machine and installing the desktop operating system, it is best to optimize the desktop operating system for performance in a virtual machine. The guidelines in this section outline the desktop image settings that maximize desktop performance in Oracle VDI. These are not requirements, they are suggestions for better performance.

### 5.5.1. How to Create Virtual Machines (Oracle VM VirtualBox)

Oracle VDI presents users with easy access to their virtual desktops, instances of any desktop operating system executed in a virtual machine. You can manually create virtual machines, or you can configure Oracle VDI to create or clone additional virtual machines automatically from a template.

**Before You Begin**

After installing Oracle VM VirtualBox, you can create your first virtual machine. It is possible to create virtual machines on the server, or on a local installation of VirtualBox. If you choose to use a local
installation of VirtualBox to create virtual machines, be sure to use the same release as the version supplied with Oracle VDI.

Steps

1. Start Oracle VM VirtualBox Manager.
   On Oracle Solaris platforms, run the following command:
   
   ```bash
   # /opt/VirtualBox/VirtualBox
   ```
   
   On Oracle Linux platforms, run the following command:
   
   ```bash
   # /usr/bin/virtualbox
   ```
   
   a. Click **New** to launch the **New Virtual Machine** wizard.
   
   b. The wizard will guide you through virtual machine creation.
      
      Be sure to choose the appropriate hard-disk and RAM space for the desired configuration.
      
      - For Windows Vista and Windows 7, a minimum of 1024 MB RAM and 5723 MB hard disk are recommended.
      
      - For Windows 2000 and Windows XP, a minimum of 384 MB RAM and 4 GB hard disk are recommended.

   For more information about virtual machine system requirements, refer to the Oracle VM VirtualBox documentation.

2. Install the operating system.
   At this point you have an empty virtual machine, equivalent to a PC without an OS installed. The next step is to choose the boot medium for the OS and install it.
   
   a. Select the newly created virtual machine and click **Settings**.
   
   b. Open the **Advanced** tab in the **Settings** GUI.
   
   c. Ensure that CD/DVD-ROM is set as the first boot device.
   
   d. Select the **CD/DVD-ROM** option in the left panel of the **Settings** dialog.
   
   e. Select the **Mount CD/DVD Drive** option.
   
   f. Click **OK** to save the changes and close the **Settings** GUI.

   At this point the new virtual machine must be started to trigger the OS installation.

   g. Select the new virtual machine and click **Start**.
   
   h. Follow the installation prompts, or seek further installation details from the OS manufacturer.

3. Install the VirtualBox Guest Additions.
   VirtualBox provides a Windows Guest Addition module for automated logons on Windows XP, Windows Vista, and Windows 7 guests. The Auto-Logon feature can only be enabled during Guest Additions installation. You have the optional to install the traditional Guest Additions or Guest Additions with Auto-Logon.
• Install Guest Additions without Auto-Logon:
  a. With the virtual machine running and fully booted, select Devices in the virtual machine console.
  b. Select Install Guest Additions. This will launch the Oracle VM VirtualBox Guest Additions installer inside the virtual machine.

• Install Guest Additions with Auto-Logon:
  a. In the virtual machine console, load the Guest Additions by selecting Devices, CD/DVD Devices, then VBoxGuestAdditions.iso.
  b. With the virtual machine running and fully booted, go to the Windows Run console.
     • (Windows XP) In the Start menu, choose Run.
     • (Windows Vista and Windows 7) Search for ‘run’ in the Start search bar, and select it from the search results.
  c. Type the following and click OK to launch the Oracle VM VirtualBox Guest Additions installer inside the virtual machine.

D:\VBoxWindowsAdditions.exe /with_autologon

4. Install additional software, and optimize the desktop image.

For more information, see:
• Section 7.6.2, “Optimizing Windows 7 Desktop Images”
• Section 7.6.3, “Optimizing Windows Vista Desktop Images”
• Section 7.6.4, “Optimizing Windows XP Desktop Images”
• Section 7.6.5, “Optimizing Desktop Images for Other Operating Systems”

5.5.2. How to Create Virtual Machines (VMware vCenter)

Oracle VDI presents users with easy access to their desktops, typically instances of Microsoft Windows XP executed in a virtual machine. You can manually create virtual machines, or you can configure Oracle VDI to create or clone additional virtual machines automatically from a template.

For more detailed information about creating virtual machines, creating templates, custom specifications, and installing the VMware Tools, see the VMware Documentation.

Steps

1. Create a virtual machine with Microsoft Windows.

   Use your standard process for creating virtual machines.

   Follow these recommendations:
   • Use Microsoft Windows XP SP3 as the baseline. The license must be a volume license.
   • Define one disk. It should be as small as possible. The size impacts system performance and overall storage consumption. RAM also should be as small as possible.
• For Windows Vista and Windows 7, a minimum of 1024 MB RAM and 5723 MB hard disk are recommended.

• For Windows 2000 and Windows XP, a minimum of 384 MB RAM and 4 GB hard disk are recommended.

• A single CPU should be enough.

• One network interface is needed. It should be configured for DHCP. Ensure that the virtual machine obtains a valid IP after powering on.

2. Install the VMware Tools.

Once you have created a virtual machine with Microsoft Windows XP installed on it, install VMware Tools. VMware Tools is a suite of utilities that enhances the performance of the virtual machine’s guest operating system and improves management of the virtual machine. Installing VMware Tools in the guest operating system is vital.

The installation can be easily triggered from within the VMware Virtual Infrastructure Client (VIC): Right-click the virtual machine and choose Install VMware Tools.

3. Enable remote desktop access.

RDP is the main access method to the Microsoft Windows XP desktop. By default, this access method is disabled and rejected through the firewall. To enable remote desktop access, launch VMware’s Virtual Infrastructure Client, with your virtual machine still powered on and logged in, then follow these steps:

a. Open a console for the virtual machine, and click the virtual machine’s Start button.

b. Right-click on My Computer in the start menu, and select Properties.

c. In the System Properties window, select the Remote tab.

d. Under Remote Desktop, select the box marked Enable Remote Desktop on This Computer.

e. Make sure that the desired users have been granted remote access rights.

Before you try to connect to a virtual desktop remotely, ensure that no firewall blocks the remote access. Make sure that port 3389 is enabled in any firewall that may be active on the system.

4. Install the Oracle VDI Tools. Oracle VDI has a tools component that notifies the Oracle VDI service when a desktop is in use and handles RDP connections when the guest OS initiates standby. The Oracle VDI Tools must be installed on the guest operating system for recycling to work correctly and so that the RDP connection is correctly closed when the virtual machine goes into standby or suspend mode. There are two versions of the Oracle VDI Tools: vda-tools-x86.msi for 32-bit platforms and vda-tools-x64.msi for 64-bit platforms.

a. Locate the correct installer file in the directory where you unzipped Oracle VDI archive.

   The vda-tools-x86.msi and vda-tools-x64.msi are located in the ./image/vda_<Oracle-VDI-release>/Windows/Packages/ subdirectory. Copy the installer to the desired virtual machine.

b. Within the virtual machine’s console, double-click the installer and follow the prompts to complete installation.
The default target location for the Oracle VDI Tools on Windows is C:\Program Files\Oracle \Virtual Desktop Access\Tools.

c. The VM Services list should now contain a new service named Oracle VDI Tools, running and set to start automatically.

5. Install additional software, and optimize the desktop image.

For more information, see:

- Section 7.6.2, “Optimizing Windows 7 Desktop Images”
- Section 7.6.3, “Optimizing Windows Vista Desktop Images”
- Section 7.6.4, “Optimizing Windows XP Desktop Images”
- Section 7.6.5, “Optimizing Desktop Images for Other Operating Systems”

6. Convert a virtual machine into a template.

You can clone additional virtual machines manually, or Oracle VDI clone them automatically from a template. Any existing virtual machine can be converted into a template.

a. Open the Virtual Infrastructure Client.

b. Right-click the desired virtual machine and power down the machine.

c. From the commands area or the pop-up menu, click Convert to Template.

7. Create a Customization Specification.

It is necessary to customize the identity and network settings of Windows XP after a clone has been created from a template. This can be achieved using a Customization Specification.

a. Open the Virtual Infrastructure Client.

b. Click Edit from the menu above the tool bar and select Customization Specifications.

c. Click the New icon in the Customization Specification Manager to start the wizard.

d. On the first wizard step, choose Windows as the target virtual machine OS, and give the specification a name and description.

e. The following steps ask the standard Windows installation questions and should be completed to correspond with your requirements, with the exception of the following.

   - Computer Name: Make sure that the Use the Virtual Machine Name item is selected. If not, you may end up with duplicate hostnames.

   - Windows License: Enter your Windows XP serial number. The Include Server License Information item should be left unchecked.

   - Networking: Make sure the interface is configured for DHCP. If not, your cloned virtual machines will not have unique IP addresses and will not work with Oracle VDI.

f. After completing the wizard and saving your customization specification, close the Customization Specification Manager.
5.5.3. How to Create Virtual Machines (Microsoft Hyper-V)

Oracle VDI presents users with easy access to their virtual desktops, typically instances of Microsoft Windows XP executed in a virtual machine. You can manually create virtual machines, or you can configure Oracle VDI to create or clone additional virtual machines automatically from a template.

Steps

1. Create a virtual machine with Microsoft Windows.

   Use your standard process for creating virtual machines. For information on how to create a virtual machine in Microsoft Hyper-V, refer to the Microsoft documentation; see: http://www.windowsreference.com/hyper-v/hyper-v-how-to-create-a-new-virtual-machine/.

   Follow these recommendations:
   - The license must be a volume license.
   - Define one disk. It should be as small as possible. The size impacts system performance and overall storage consumption. RAM also should be as small as possible.
     a. For Windows Vista and Windows 7, a minimum of 1024 MB RAM and 5723 MB hard disk are recommended.
     b. For Windows 2000 and Windows XP, a minimum of 384 MB RAM and 4 GB hard disk are recommended.

2. Install the Microsoft Hyper-V Integration Components.

   Once you have created a virtual machine with Microsoft Windows XP installed on it, install the Hyper-V Integration Components. The Integration Components allow Microsoft Hyper-V and Oracle VDI to interoperate with the virtual machine. Installing the Integration Components in the guest operating system is vital.

   The installation can be easily triggered from within the Hyper-V Management Console: Connect to the virtual machine from the console and select the Insert Integration Services Setup Disk option from the Action menu.

3. Enable remote desktop access.

   RDP is the main access method to the Microsoft Windows XP desktop. By default, this access method is disabled and rejected through the firewall. To enable remote desktop access, connect to the virtual machine from the Hyper-V Management Console and follow these steps:
   a. In the console, click the virtual machine’s Start button.
   b. Right-click on My Computer in the start menu, and select Properties.
   c. In the System Properties window, select the Remote tab.
   d. Under Remote Desktop, check the box marked Enable Remote Desktop on this computer so that this item is selected.
   e. Make sure that the desired users have been granted remote access rights.
   f. Click OK to save the settings and close the dialog.
Before you try to connect to a virtual desktop remotely, ensure that no firewall blocks the remote access:

Make sure that port 3389 is enabled in any firewall that may be active on the system.

4. Install the Oracle VDI Tools. Oracle VDI has a tools component that notifies the Oracle VDI service when a desktop is in use and handles RDP connections when the guest OS initiates Standby. The Oracle VDI Tools must be installed on the guest operating system for recycling to work correctly and so that the RDP connection is correctly closed when the virtual machine goes into Standby or Suspend mode.

   a. Locate the installer file, `vda-tools-x86.msi` for 32bit platforms or `vda-tools-x64.msi` for 64bit platforms, in the directory where you unzipped the Oracle VDI archive. The installer is located in the `vda_<Oracle-VDI-release>/Windows/Packages` subdirectory. Copy the installer to the desired VM.

   b. Within the VM's console double-click the installer and follow the prompts to complete installation.

   The default target location for the Oracle VDI Tools on Windows is `C:\Program Files\Oracle\Virtual Desktop Access\Tools`.

   c. The VM services list should now contain a new service named Oracle VDI Tools, running and set to start automatically.

5. Install additional software, and optimize the desktop image.

   For more information, see:

   - Section 7.6.2, “Optimizing Windows 7 Desktop Images”
   - Section 7.6.3, “Optimizing Windows Vista Desktop Images”
   - Section 7.6.4, “Optimizing Windows XP Desktop Images”
   - Section 7.6.5, “Optimizing Desktop Images for Other Operating Systems”

### 5.6. Importing Desktops

**5.6.1. How to Import Desktops (Oracle VM VirtualBox)**

A pool is empty and has no desktops after initial creation. After you create virtual machines, you must import them into the Oracle VDI database.

Note

Importing snapshots of virtual machines is not supported.

**Before You Begin**

A virtual machine must be created in the Oracle VM VirtualBox interface or using the integrated Oracle VDI Manager Flash console before it can be imported into the Oracle VDI database. Refer to the Section 5.5.1, “How to Create Virtual Machines (Oracle VM VirtualBox)” section for detailed information.
Oracle VDI Manager Steps

1. In Oracle VDI Manager, go to **Pools**.

2. Select a pool.

3. Select the **Desktops** tab, and click **Import**.

   An import dialog will be displayed.

4. Select a desktop to be imported.
   - If the desktop you would like to import is on the VirtualBox host, select it from the **Hypervisor** tab, and click **OK**.
   - If the desktop you would like to import is available on the Oracle VDI host in `/var/tmp`, define the corresponding XML and Oracle VDI files under the **Folder** tab.

After the desktop has been imported successfully, it will be displayed in the **Desktop** tab of the pool's profile.

**Note**

You can move your virtual machine XML file and Oracle VDI image to `/var/tmp` using the following command:

```bash
# scp path to file root@Oracle VDI host:/var/tmp
```

If there is not enough space in `/var/tmp`, you can copy both files to another location on the host and create a symbolic link:

```bash
# ln -s path to file /var/tmp/
```

**CLI Steps**

- Import a desktop from the Oracle VDI host into the Oracle VDI database.

  ```bash
  # /opt/SUNWvda/sbin/vda pool-vb-import -p vdi-image=virtual machine name.vdi,\ xml-configuration=virtual machine name.xml pool name
  ```

  **Example - Importing a VirtualBox desktop**

  ```bash
  example$ /opt/SUNWvda/sbin/vda pool-vb-import \ -p vdi-image=UbuntuDE.vdi,xml-configuration=UbuntuDE.xml "Sales - EMEA"
  ```

- Import a desktop from the VirtualBox host into the Oracle VDI database.

  1. List all unmanaged desktops for a specified desktop provider.

     ```bash
     # /opt/SUNWvda/sbin/vda provider-list-unmanaged desktop provider name
     ```

     **Example - Listing and importing unmanaged VirtualBox desktops**

     ```bash
     example$ /opt/SUNWvda/sbin/vda provider-list-unmanaged "VB provider"
     HOST NAME ID
     my.vb.com UbuntuDE 35
     my.vb2.com UbuntuEN 36
     example$ /opt/SUNWvda/sbin/vda pool-vb-import-unmanaged -d 35 "Sales - EMEA"
     ```
2. Import a desktop into the Oracle VDI database.

```bash
# /opt/SUNWvda/sbin/vda pool-vb-import-unmanaged -d desktop ID pool name
```

### 5.6.2. How to Import Desktops (VMware vCenter)

A pool is empty and has no desktops after initial creation. After you create virtual machines, you must import them so that Oracle VDI can create a corresponding entry for the virtual machine in its database. The virtual machine will not be altered in any way.

#### Before You Begin

A virtual machine must be created in VMware vCenter before it can be imported into Oracle VDI. Refer to the Section 5.5.2, “How to Create Virtual Machines (VMware vCenter)” section for detailed information.

#### Oracle VDI Manager Steps

1. In Oracle VDI Manager, go to **Pools**.
2. Select a pool.
3. Go to the **Desktops** tab, and click **Import**.
   
   An import dialog is displayed showing the available virtual machines in the VMware vCenter hierarchy. You can select individual virtual machines or folders. If you select a folder, all the virtual machines in the folder will be selected for the import.

4. Click **OK** to import the desktops into the **Oracle VDI** database.

   **Note**

   Desktops that are already imported into Oracle VDI cannot be selected for import. You also cannot import templates.

   After the desktops have been imported successfully, they will show up in the **Desktops** tab of the pool's profile (a page refresh might be necessary).

#### CLI Steps

1. List all unmanaged desktops for a specified desktop provider.

   ```bash
   # /opt/SUNWvda/sbin/vda provider-list-unmanaged desktop provider name
   ```

2. Import a desktop into the Oracle VDI database.

   ```bash
   # /opt/SUNWvda/sbin/vda pool-vc-import -d desktop ID pool name
   ```

   **Example - Listing and importing unmanaged vCenter desktops**

   ```bash
   # /opt/SUNWvda/sbin/vda provider-list-unmanaged "VC provider"
   HOST NAME ID
   my.vc.com WindowsXPde vm-134
   my.vc2.com WindowsXPen vm-629
   # /opt/SUNWvda/sbin/vda pool-vc-import -d vm-134 "Support - EMEA"
   ```

### 5.6.3. How to Import Desktops (Microsoft Hyper-V)

A pool is empty and has no desktops after initial creation. After you create virtual machines, you must import them into the Oracle VDI database.
How to Import Individual Windows PCs

Note
Importing snapshots of virtual machines is not supported.

Before You Begin

A virtual machine must be created in Microsoft Hyper-V and exported, before it can be imported into the Oracle VDI database. Refer to the Section 5.5.3, “How to Create Virtual Machines (Microsoft Hyper-V)” section for detailed information. To export the virtual machine from the Hyper-V server:

1. In the Hyper-V management console, select the Hyper-V virtual machine.
2. Select Export from the Actions menu and choose a directory on the Hyper-V server to which you want to export the virtual machine.

After the export has completed, you will have a directory containing a number of files and subdirectories. Copy the entire directory from the Hyper-V server to a directory on your Oracle VDI host or to a shared directory on a remote server (the shared directory must be accessible to the Oracle VDI host).

Oracle VDI Manager Steps

1. In Oracle VDI Manager, go to Pools.
2. Select a pool.
3. Go to the Desktops tab, and click Import. An import dialog will be displayed.
4. In the Server property, select the server you copied the Microsoft Hyper-V desktop directories to (if you copied them to your Oracle VDI server then choose the Host 'servername' option otherwise if you copied them to a shared directory on a remote server then choose the Other Server option and enter the remote server name where the shared directory resides).
5. In the Path property, enter the path to the directory that contains the Microsoft Hyper-V desktop directories.
6. Select the correct desktop name from the Desktop dropdown, and click OK.

After the desktop has been imported successfully, it will display in the Desktops tab of the Pools page. A page refresh might be necessary.

CLI Steps

• Import a Hyper-V desktop into the Oracle VDI database.

```
# /opt/SUNWvda/sbin/vda pool-hv-import
-p export-directory=path to export directory pool name
```

Example - Importing a Hyper-V desktop into the Oracle VDI database

```
example% /opt/SUNWvda/sbin/vda pool-hv-import
-p export-directory=/data/virtual-machines/xp-template hvpool
```

5.6.4. How to Import Individual Windows PCs

Individual Windows PCs can be imported and managed with Oracle VDI Manager as long as they allow remote connections. Importing an individual Windows PC consists of creating a Generic desktop provider, creating a new pool for the Generic desktop provider, and importing the Windows PC into the pool.
### Before You Begin

Verify that the Windows PC is configured to allow remote connections by going to **System Properties**, then **Remote Desktop**.

### Oracle VDI Manager Steps

1. In Oracle VDI Manager, go to **Desktop Providers**.
2. In the **Desktop Providers** table, click **New**.
   - Create a Generic desktop provider.
3. Go to **Pools**.
4. In the **Pools** table, click **New**.
   - Choose the Generic desktop provider to host the pool.
5. Select the newly created pool from the **Pools** table.
6. Go to the **Desktop** tab and click **Import**.

### 5.6.5. About Template Management

Oracle VDI provides an Adobe Flash plug-in that enables you to easily access, test, and modify the desktop directly from within Oracle VDI Manager. This feature also includes changing desktop properties as well as mounting ISO images for setting up the operating system.

Any desktop can be used as template for cloning additional desktops. Testing desktop templates and keeping track of any changes before rollout is crucial for large enterprise deployments. Oracle VDI now includes support for managing several template revisions. You can create a new template revision at any time, test your changes and declare the new revision as the master used for the cloning process. You can also revert to a previous revision if you are not satisfied with your changes.

### 5.6.5.1. How to Modify a Template in Oracle VDI Manager

Template modification from Oracle VDI Manager is available for Oracle VM VirtualBox and Microsoft Hyper-V desktop pools. This functionality is especially useful for installation of additional software or operating system upgrades. For more about template and revision actions, refer to the **Section 5.3, “About Templates and Revisions”** section.

### Before You Begin

You will need to have created at least one virtual machine in the interface of your chosen desktop provider (Oracle VDI, or Microsoft Hyper-V) before you can import it and use the template modification tools in Oracle VDI Manager. Once you have created and imported the virtual machine, you can start it from Oracle VDI Manager and carry out all the necessary preparation steps from there. For more information, see **Section 5.5.1, “How to Create Virtual Machines (Oracle VM VirtualBox)”** or **Section 5.5.3, “How to Create Virtual Machines (Microsoft Hyper-V)”**.

### Oracle VDI Manager Steps

1. In Oracle VDI Manager, go to **Pools**.
2. Select a pool.
3. Go to the Template tab.
4. Click the Import Template button to import the virtual machine you just created in the hypervisor interface.

The virtual machine will be saved as Revision 1 as soon as it is imported.

5. Select the template you would like to modify, and click Start from the More Actions menu.

No modifications can be performed until the virtual machine is started from Oracle VDI Manager.

6. If necessary, make modifications to the template, such as installation of additional software or upgrades of the operating system.

• Virtual machines hosted by Oracle VM VirtualBox can be modified from an interactive Adobe Flash console.

Figure 5.3. Interactive Adobe Flash Console

• On Microsoft Hyper-V desktop providers, the modifications may take place on the desktop provider’s Hyper-V host.

7. When you are finished modifying the template, select Shut Down from the More Actions menu.

5.7. Cloning Desktops

5.7.1. How to Clone Desktops (Oracle VM VirtualBox)

Cloning is the fastest and most efficient way to populate a pool. Use the steps below to enable cloning in a pool.
Before You Begin

A desktop must be imported before a template can be cloned. Refer to the Section 5.6.1, “How to Import Desktops (Oracle VM VirtualBox)” section for detailed information.

Oracle VDI Manager Steps

To enable cloning for an existing pool:

1. In Oracle VDI Manager, go to Pools.
2. Select a pool.
3. Go to the Cloning tab.
5. In the Name Pattern field, enter the naming pattern to use for the cloned desktops.

The name pattern is used to generate the name for the virtual machine and, for Windows desktops that use either Sysprep or FastPrep, the name of the computer that is registered in the Windows domain.

The naming pattern consists of a prefix (the default prefix is the name of the pool) followed by a sequence of "0" characters which are placeholders for the sequential number of the cloned desktops. Ensure that you configure enough "0" character placeholders for the expected number of desktops in the pool, for example enter "000" if the pool contains up to 999 desktops. If the desktops will join a Windows domain, the naming pattern must only contain numbers (0-9), letters (A-Z) and hyphens (-) and must not exceed 15 characters in length.

6. From the Template list, select a template.

Desktops are cloned from the master revision of the selected template.

7. Click Save.

To enable cloning when you create a pool:

1. In the New Pool wizard, on the Select Template step, from the Template list, select a template.

Cloning can take up to a minute to start, after which you will see clone jobs begin to display in the Jobs window. To access the Jobs window, click the Jobs Running link in the top left of Oracle VDI Manager. After a clone job has been finished successfully, the new desktop will be displayed in the Desktops tab of the pool's profile. A page refresh might be necessary.

CLI Steps

- Start automatic cloning in a pool.

```
$ /opt/SUNWvda/sbin/vda pool-start pool name
```

Example - Starting automatic cloning in a pool

```
example$ /opt/SUNWvda/sbin/vda pool-start MyPool
```
5.7.2. **How to Clone Desktops (VMware vCenter)**

Cloning is the fastest and most efficient way to populate a pool. Use the steps below to enable cloning in a pool.

Oracle VDI includes support for VMware linked clones. For details of how to enable the use of linked clones in Oracle VDI, see Section 5.7.3, “How to Enable VMware Linked Cloning”.

**Before You Begin**

A virtual machine must be imported before a template can be cloned. Refer to the Section 5.6.2, “How to Import Desktops (VMware vCenter)” section for detailed information.

**Oracle VDI Manager Steps**

To enable cloning for an existing pool:

1. In Oracle VDI Manager, go to **Pools**.
2. Go to the **Resources** tab.
3. Select your preferred storage for newly cloned virtual machines.
   
   By default, all available storage may be used. For each clone, Oracle VDI selects the storage with the most available disk space.
4. Go to the **Cloning** tab.
5. Select **Enable Automatic Cloning**.
6. In the **Name Pattern** field, enter the naming pattern to use for the cloned desktops.
   
   The name pattern is used to generate the name for the virtual machine and, for Windows desktops that use either Sysprep or FastPrep, the name of the computer that is registered in the Windows domain.
   
   The naming pattern consists of a prefix (the default prefix is the name of the pool) followed by a sequence of "0" characters which are placeholders for the sequential number of the cloned desktops. Ensure that you configure enough "0" character placeholders for the expected number of desktops in the pool, for example enter "000" if the pool contains up to 999 desktops. If the desktops will join a Windows domain, the naming pattern must only contain numbers (0-9), letters (A-Z) and hyphens (-) and must not exceed 15 characters in length.
7. From the **Template** list, select a template.
   
   Desktops are cloned from the master revision of the selected template.
8. Select **Apply System Preparation** and select a customization specification from the list.
9. Click **Save**.

To enable cloning when you create a pool:

1. In the **New Pool** wizard on the Select Template step, from the **Template** list, select a template.
2. On the Select Pool Size step, select **Enable Automatic Cloning**.
3. On the Review step, click **Finish**.
Cloning can take up to a minute to start, after which you will see clone jobs begin to display in the Jobs window. To access the Jobs window, click the Jobs Running link in the top left of Oracle VDI Manager. After a clone job has been finished successfully, the new desktop will display in the Desktops tab of the pool's profile. A page refresh might be necessary.

**CLI Steps**

- Start automatic cloning in a pool.

```
/opt/SUNWvda/sbin/vda pool-start pool name
```

### 5.7.3. How to Enable VMware Linked Cloning

Oracle VDI includes support for VMware linked clones. VMware linked cloning enables multiple virtual machines to share virtual disks with a parent virtual machine and use the same software installation. Linked clones conserve disk space by storing the differences for each virtual machine in delta disks. Linked clones are also created more quickly than full clones. Detailed information on VMware linked cloning is available on the VMware web site.

VMware linked cloning is applied on a per pool basis.

**Before You Begin**

VMware linked cloning is available for use only if the following conditions are met:

- VMware ESX 4.0 or later must be used.
- A template must have at least one snapshot.

**Oracle VDI Manager Steps**

1. In Oracle VDI Manager, go to Pools.
2. Select a pool.
3. Go to the Cloning tab.
4. Select the Linked Cloning check box.
5. Click Save.

**CLI Steps**

- Enable linked cloning for a pool.

```
/opt/SUNWvda/sbin/vda pool-setprops -p linked-cloning=enable pool name
```

In the following example, linked cloning is enabled for a pool named MyPool.

```
/opt/SUNWvda/sbin/vda pool-setprops -p linked-cloning=enabled MyPool
```

In the following example, linked cloning is disabled for a pool named MyPool.

```
/opt/SUNWvda/sbin/vda pool-setprops -p linked-cloning=disabled MyPool
```

### 5.7.4. How to Clone Desktops (Microsoft Hyper-V)

Cloning is the fastest and most efficient way to populate a pool. Use the steps below to enable cloning in a pool.
Before You Begin

A virtual machine must be imported before a template can be cloned. Refer to the Section 5.6.3, “How to Import Desktops (Microsoft Hyper-V)” section for detailed information.

Oracle VDI Manager Steps

To enable cloning for an existing pool:

1. In Oracle VDI Manager, go to Pools.
2. Select a pool.
3. Go to the Cloning tab.
4. From the Template list, select a template.
   Desktops are cloned from the master revision of the selected template.
5. In the Name Pattern field, enter the naming pattern to use for the cloned desktops.
   The name pattern is used to generate the name for the virtual machine and, for Windows desktops that use either Sysprep or FastPrep, the name of the computer that is registered in the Windows domain.
   The naming pattern consists of a prefix (the default prefix is the name of the pool) followed by a sequence of "0" characters which are placeholders for the sequential number of the cloned desktops. Ensure that you configure enough "0" character placeholders for the expected number of desktops in the pool, for example enter "000" if the pool contains up to 999 desktops. If the desktops will join a Windows domain, the naming pattern must only contain numbers (0-9), letters (A-Z) and hyphens (-) and must not exceed 15 characters in length.
6. To start cloning, select Enable Automatic Cloning.
7. Click Save.

To enable cloning when you create a pool:

1. In the New Pool wizard, on the Select Template step, from the Template list, select a template.
3. Click Finish.

Cloning can take up to a minute to start, after which you will see clone jobs beginning to display in the Jobs window. To access the Jobs window, click the Jobs Running link in the top left of Oracle VDI Manager. After a clone job has been finished successfully, the new desktop will display in the Desktops tab of the Pool page. A page refresh might be necessary.

CLI Steps

- Start automatic cloning in a pool.

```bash
# /opt/SUNWvda/sbin/vda pool-start pool name
```

In the following example, automatic cloning is enabled for the pool MyPool.

```bash
# /opt/SUNWvda/sbin/vda pool-start MyPool
```
5.7.5. About Clone Customization

Oracle VDI offers two methods for customizing Windows desktops during the cloning process, Microsoft System Preparation (Sysprep), which is often used in Active Directory environments, and Oracle VDI Fast Preparation (FastPrep). Oracle VDI FastPrep is a replacement for Microsoft Sysprep. You can trigger Sysprep from within Oracle VDI Manager.

Sysprep ensures that each desktop clone is assigned its own unique security identifier (SID). The corresponding template revision is automatically marked as Sysprepped once the preparation has completed.

FastPrep is designed to reduce the clone time of each desktop. It leverages Sysprep and changes the computer name of each clone, joins it to a domain, and, optionally, can execute a post-customization script.

5.7.6. How to Debug Fast Preparation Problems

In the event that cloning fails with Fastprep, error codes are often returned. Typically, they are Microsoft Windows System Error Codes returned by the desktop or domain controller when a clone attempts to join the domain. The error codes are described in:


If further debugging is needed, you can disable the automatic cleanup of failed clones by running the following command:

```
# /opt/SUNWvda/sbin/vda settings-setprops -p cloning.cleanup.failures=disabled
```

With this setting disabled, Oracle VDI does not delete any failed clones, and you can examine a clone to find out why an error occurred.

If issues persist when trying to join a domain, inspect the Windows netsetup.log on the clone in C:\Windows\Debug\netsetup.log for debug output of the attempted join operation.

Once the issue is resolved, enable the automatic cleanup of failed clones by running the following command:

```
# /opt/SUNWvda/sbin/vda settings-setprops -p cloning.cleanup.failures=enabled
```

Failed clones that occur while automatic cleanup is disabled remain on the provider host. You must manually delete these clones using Oracle VDI Manager or the command line.

5.7.7. How to Enable Oracle VDI Fast Preparation for Windows Templates (Oracle VM VirtualBox and Microsoft Hyper-V)

Windows desktops require customization for successful cloning by Oracle VDI. Unlike Microsoft System Preparation, Fast Preparation (FastPrep) does not require any special preparation of the template prior to use.

Before You Begin

1. Prepare the template for Fast Preparation.
   a. If a post-customization script is required, the script should be copied to the template prior to cloning.
b. Ensure that the template is not a member of a domain, it must be a member of a workgroup.

2. Import a virtual machine template in Oracle VDI Manager.

For more information, see the following:

• Section 5.6.1, “How to Import Desktops (Oracle VM VirtualBox)”
• Section 5.6.3, “How to Import Desktops (Microsoft Hyper-V)”

Oracle VDI Manager Steps

1. In Oracle VDI Manager, go to Pools.

2. Select a pool.

3. Go to the Cloning tab (or the Select Template screen of the New Pool wizard).

4. Click Create next to System Preparation.

5. Select the appropriate Fast Preparation option from the drop down for your template OS.

6. The Create System Preparation File dialog will appear.

   • Windows Domain - The FQDN of the Windows domain. e.g. my.domain.com
   • Domain Administrator - A domain administrator with permission to create a computer account and join the domain. This can optionally be prefixed with the domain, e.g. my.domain.com\Administrator
   • Domain Administrator Password - The password the for the domain administrator
   • Computer Container DN - The DN to place the new computer account in (e.g. OU=Accounting,OU=VDI Center,DC=my,DC=domain,DC=com). If left blank the default Computers container is used (ou=Computers,DC=my,DC=domain,DC=com).
   • Read-only Domain Controller - From Windows 2008 Server, domain controllers (DC) can be configured as read-only for deployments in unsecured locations. For a computer to join a domain via a read-only DC the account must already exist and a special read-only flag is needed.
   • Desktop Administrator - An administrator account on the template that has permissions to change the computer name, join a domain and optionally execute the custom script. For Windows Vista/7 the ‘Administrator’ account must be enabled and used.
   • Desktop Administrator Password - The desktop administrator password
   • Custom Script - An optional script that will be executed after customization has completed. This script can be a batch file or executable and must be located in a drive or folder accessible by the template and clones.

You are now ready to clone customized Windows desktops. Refer to the Section 5.7.1, “How to Clone Desktops (Oracle VM VirtualBox)” and Section 5.7.4, “How to Clone Desktops (Microsoft Hyper-V)” sections.

CLI Steps

• Prepare a pool for sysprepped cloning.

```bash
# /opt/SUNWvda/sbin/vda pool-create-fastprep -p domain=<domain>,\
```
5.7.8. How to Enable System Preparation for Windows Templates (Oracle VM VirtualBox and Microsoft Hyper-V)

Windows desktops require System Preparation for successful cloning by Oracle VDI. After you create a Windows virtual machine, you should prepare it for Sysprep by downloading a Sysprep CAB (Windows XP only), and installing the Oracle VDI Tools (Hyper-V virtualization platforms only). Import the virtual machine into Oracle VDI as a template, and select System Preparation on one of the template revisions. Oracle VDI boots the revision, runs `Sysprep.exe`, and then shuts down the system. The revision now acts as a blank slate for cloning desktops in any pool with a valid System Preparation file.

A pool’s System Preparation file defines licensing and credentials. If a pool has a valid System Preparation file, System Preparation is enabled, and cloning from the sysprepped template is enabled, all cloned desktops in the pool will have the customization defined by the System Preparation file.

One sysprepped revision can be used for multiple pools, and the System Preparation files can be changed and saved at any time from within Oracle VDI Manager.

**Note**

Due to a bug in Windows 7, the Windows Media Player Network Sharing Service causes the Windows Sysprep tool to hang. If you do not need this service enabled in your Windows 7 desktops and you intend to run System Preparation from Oracle VDI Manager, stop and disable it. If you prefer to leave this service enabled, run `Sysprep` manually from within the template’s Run console before importing it.

```
sysprep.exe -generalize -oobe -shutdown -quiet
```

**Before You Begin**

1. (Hyper-V Only) Install the Oracle VDI Tools on the template.

   The System Preparation action in the **Template** tab will not work if you do not have the tools (`vda-tools-x86.msi` for 32-bit platforms or `vda-tools-x64.msi` for 64-bit platforms) installed on your template. For Windows XP templates, you also need to have the Sysprep tools in a `C:\Sysprep` directory.

2. Prepare the template for System Preparation.

   - Windows 2000 and Windows XP
     a. Log into the template and download the appropriate Sysprep CAB for your version of Windows XP.
     b. Create a directory on the template named `C:\Sysprep`. 

---

123
c. Unpack the contents of the Sysprep CAB into the \Sysprep directory.

- Windows Vista and Windows 7

No files need to be installed. Windows Vista and Windows 7 ship with all required system preparation files pre-installed.

3. Import a virtual machine template in Oracle VDI Manager.

For more information, see the following:

- Section 5.6.1, “How to Import Desktops (Oracle VM VirtualBox)”
- Section 5.6.3, “How to Import Desktops (Microsoft Hyper-V)”

**Oracle VDI Manager Steps**

1. In Oracle VDI Manager, go to **Pools**.

2. Select a pool.

3. Run System Preparation in a template revision.

   a. Go to the **Template** tab, and select a revision.

   b. Choose **System Preparation** from the **More Actions** menu.

      This action will start a job, start the revision, run **Sysprep.exe**, and wait for the system to shut down.

   c. Wait for the job to complete successfully via the **Job Summary** pop-up. If the job fails for any reason, details of the failure can viewed in the **Job Details** text area by clicking on the failed job.

   d. Select the sysprepped revision and click **Make Master**.

      All pools currently using this template will clone new desktops from the sysprepped revision.

4. Prepare a pool to clone customized desktops based on a System Preparation file.

   a. Go to the **Cloning** tab (or the **Select Template** screen of the **New Pool** wizard).

   b. Create a System Preparation file.

      The file requires a Windows administrator password, a Windows license key, and a Windows workgroup or a Windows domain, domain administrator, and administrator password.

   c. Select the sysprepped template, and select **Apply System Preparation**.

      You are now ready to clone customized Windows desktops. Refer to the Section 5.7.1, “How to Clone Desktops (Oracle VM VirtualBox)” and Section 5.7.4, “How to Clone Desktops (Microsoft Hyper-V)” sections.

**CLI Steps**

1. Run System Preparation in a template revision.

   a. Choose a template from the pool (template ID).
# About Personal Hard Drives

About Personal Hard Drives

2. Prepare a pool for sysprep cloning.

To create a System Preparation file for a pool.

```bash
# /opt/SUNWvda/sbin/vda pool-create-sysprep -p
key=<key>,workgroup=<workgroup>,windows-arch=32|64,
windows-release=winxp|win7 <pool-name>
```

To apply an existing System Preparation file to new or existing pools.

```bash
# /opt/SUNWvda/sbin/vda pool-create -p system-preparation=path to file pool name
# /opt/SUNWvda/sbin/vda pool-setprops -p system-preparation=path to file pool name
```

Example - Enabling System Preparation for a pool of Oracle VM VirtualBox desktops.

```bash
example% /opt/SUNWvda/sbin/vda pool-templates MyPool
example% /opt/SUNWvda/sbin/vda template-revisions 35
example% /opt/SUNWvda/sbin/vda revision-sysprep 55
example% /opt/SUNWvda/sbin/vda pool-create-sysprep -p
key=ABC12-DEF34-GHI56-JKL78-MNO90,domain=mydomain.mycompany.com,
domain-admin=Administrator,windows-arch=64,windows-release=win7 MyPool
```

5.7.9. About Personal Hard Drives

Each time a user’s desktop is updated to a new template revision, their local data is destroyed. One solution to this problem is to use personal hard drives. When personal hard drives are enabled, Oracle VDI automatically creates a second data disk for each desktop, a drive D:. The Windows user profile directory is stored on this drive and contains all the information normally stored in one of the following locations:

- **C:\Documents and Settings\<username>** (Windows XP platforms)
- **C:\Users\<username>** (Windows Vista and later platforms)

Whenever the desktop template is updated (a new revision), the desktop’s primary disk containing the operating system is replaced with a fresh clone. The user’s personal hard drive is preserved and reattached to the fresh clone.

Only use personal hard drives when users have a requirement to store personal information in their desktop and that information must be retained after template and revision updates.

To use personal hard drives the following must be true:

- The user directory for the company must be Active Directory. The user directory can be configured as either an LDAP directory type or as Active Directory type.
- The desktop provider type must be either Oracle VM VirtualBox or Microsoft Hyper-V.
- The assignment type for desktops in the pool must be personal.
- System preparation must be enabled for the pool. You can use either Oracle VDI Fast Preparation (FastPrep) or Microsoft Windows System Preparation (SysPrep).
- The desktop must be a Windows desktop.

5.7.9.1. Enabling Personal Hard Drives

Personal hard drives are only added to desktops that are cloned after the personal hard drive feature is enabled. Existing personal desktops are not affected.

Oracle VDI Manager Steps

1. In Oracle VDI Manager, go to Pools and select a pool.
2. Go to the Cloning tab.
3. Click Edit Personal Hard Drive Settings.
   - The Edit Personal Hard Drive Settings Windows is displayed.
4. Select Create Personal Hard Disk.
5. In the Size field, enter the size of the personal hard drive in gigabytes.
   - The size must be a whole number without a decimal point.
6. Click OK.
7. On the Cloning tab, check that the Personal Hard Drive setting shows Enabled.

Command Line

On the command line, you enable personal hard drives by editing the properties of the pool. You can do this when you create the pool, or by editing the pool, as follows:

```
/opt/SUNWvda/sbin/vda pool-setprops -p personal-hd-enabled=enabled,personal-hd-size=6 <pool name>
```

5.7.10. Clone and Recycle Job Management

The cloning and recycling of desktops can be a resource intensive processes. For this reason, Oracle VDI enables you to limit the number of clone and recycle jobs that can run in your Oracle VDI environment at any one time.

5.7.10.1. Setting Cloning Production Priorities for Pools

At the pool level, Oracle VDI Manager enables you to specify the cloning production priority for particular pools. This priority is assigned to the pool when clone jobs are being submitted. A pool with a high production priority is allowed to clone more quickly than a pool with medium priority, and a pool with medium priority is allowed to clone more quickly than a pool with low priority. The production priority setting does not apply to recycle jobs.

To set the cloning production priority for pools, select an existing pool in the Pool category and click on the Cloning tab.

5.7.10.2. Setting Peak Times for Desktop Providers

At the desktop provider level, Oracle VDI Manager enables you to specify the maximum number of cloning and recycling jobs that run at peak and off-peak times. You can also configure the times during each day.
Assigning Users to Desktops

that are considered peak times. Once set, Oracle VDI will control the combined total number of clone and recycle jobs that it runs according to the limits that are set.

To set peak times in Oracle VDI Manager, go to the Peak Times tab for the desktop provider. On the command line, use the vda provider-setpeaktimes command.

5.8. Assigning Users to Desktops

5.8.1. How to Assign Users to Pools or Desktops

You can either assign a user to a specific desktop, or you can assign a user (or user group) to a desktop pool. If a user is assigned to a pool and requests a desktop, Oracle VDI will automatically deliver any available desktop from the pool.

For Microsoft Remote Desktop providers, users cannot be directly assigned to desktops. Instead, users or groups are assigned to Remote Desktop Services pools.

Oracle VDI Manager Steps

1. In Oracle VDI Manager, go to Users.
2. Select a company.
3. To assign a user or a group, go to the Users and Groups tab.
   a. Search for users and groups in the user directory.
      You can specify user name or user ID.
   b. Click on the user name, and click the Assignment tab in their profile.
   c. Select Add in the Assigned Desktops or Assigned Pools table, depending on your preference.
4. To assign a custom group, go to the Custom Groups tab.
   a. Click the Assignment tab in the custom group's profile.
   b. In the Assigned Pools table, select Add.
5. Select the checkbox for the desktop or pool assignment, and click OK.

You can always see which pools and desktops are associated with a user by clicking the Summary tab of the user or group's profile.

CLI Steps

• Assign a user to a desktop.
1. List the available desktops.

   # /opt/SUNWvda/sbin/vda pool-desktops pool name

2. Assign a user to a desktop.

   # /opt/SUNWvda/sbin/vda user-assign --desktop=desktop ID user name

Example - Assigning a user to a desktop.
How to Create Custom Groups and Custom Group Filters

Oracle VDI user directory integration not only recognizes existing groups, but also allows you to make custom groups, and assign them to a pool. If you want to define a set of users that is not an existing group in the user directory, you can create a custom group, and specify the filter to search in the user directory. This functionality allows you to define Oracle VDI user groups locally without the need for any changes in your Active Directory or LDAP user directory.

Oracle VDI Manager Steps

To create a custom group:

1. Select the Users category, and the Custom Groups subcategory in the left sidebar.
2. Select New in the Custom Groups overview.
3. Give the Custom Group a descriptive name, and click OK.

To define a custom group filter:

1. Click the Filter tab, and choose a Filter Mode:
   
   The default filter mode is Composition. You can create a custom filter by choosing an Attribute, Relationship, and Value.

   You can also use the Advanced filter mode, which uses LDAP search syntax defined by RFC 2254 LDAP documentation.

   For more information, see RFC 2254.

2. Before saving, click Preview to see how the filter configuration will behave. If the filter defines the target group of users, click Save.

5.8.3. How to Assign Tokens to Users

In a Sun Ray environment, users may take advantage of smart cards (tokens) to initiate a session on a Sun Ray Client. With Oracle VDI, you can assign a token to a user. It is also possible to assign desktops directly to specific tokens. Once tokens have been created, they can be assigned to pools and desktops.
Oracle VDI Manager Steps

1. In Oracle VDI Manager, go to Users.
2. Select a company.
3. Go to the Users and Groups tab.
4. Search for a user in the user directory.
5. Click on the user name, and go the Token tab.
6. Assign the token.
   - If you are assigning a new token, click New in the Tokens table. Then Enter the ID of the new token (e.g. Payflex.500d9b8900130200).
   - If you are assigning an existing token, select Add in the Tokens table. Then search for the desired token.

Note
Token IDs can be copied directly from the Sun Ray Admin GUI (see the Tokens tab and display Currently Used Tokens).

CLI Steps

- Assign a new token to a user.

```bash
# /opt/SUNWvda/sbin/vda token-create -p token-id=token ID,user=user ID
```

Example - Creating a new token and assigning it to a user

```bash
# /opt/SUNWvda/sbin/vda token-create -p token-id=Payflex.600a7c560130200,user=jd123456
Token Payflex.600a7c560130200 created
```

- Assign an existing token to a user.

```bash
# /opt/SUNWvda/sbin/vda token-create -p token-id=token ID,user=user ID
```

Example - Assigning an existing token to a user

```bash
# /opt/SUNWvda/sbin/vda token-setprops -p user=jd123456 Payflex.600a7c560130200
Token properties updated
```

5.8.4. How to Assign Tokens to Desktops or Pools

You can assign tokens to desktops or desktop pools. This is similar to assigning desktops to users, however, a single user can potentially own multiple tokens (smart cards). By assigning tokens to desktops, users are able to easily switch between the assigned desktops by just inserting different smart cards into the Thin Client.

Assigning desktops or pools to each token individually can be cumbersome. To ease this process, Oracle VDI provides some predefined special tokens ("AnySmartCard.000" and "AnySunRayClient.000"), which can be used to make default pool assignments in a single company setup.

For example, if you assign a pool to the AnySmartCard.000 token, any user taking advantage of a smart card (regardless of the smart card ID) will get a desktop from this pool. Or, if you assign a pool to the
How to Assign Tokens to Desktops or Pools

AnySunRayClient.000 token, any user using a Sun Ray Client (Sun Ray hardware and Oracle Virtual Desktop Client) without a smart card will get a desktop from this pool.

Oracle VDI Manager Steps

1. In Oracle VDI Manager, go to Users.
2. Select a company.
3. Go to the Tokens tab.
4. Select a token from the Tokens table.
5. Assign the token.
   • If you are assigning a token to a desktop, click Add on the Assigned Desktops table. Then enter the ID of the token (e.g. Payflex.500d9b8900130200).
   • If you are assigning a token to a pool, click Add on the Assigned Pool table. Then enter the ID of the token (e.g. Payflex.500d9b8900130200).

Note
Token IDs can be copied directly from the Sun Ray Admin GUI (see the Tokens tab and display Currently Used Tokens).

CLI Steps

• Assign a token to a desktop.
1. List available desktops.

```
# /opt/SUNWvda/sbin/vda pool-desktops pool name
```
2. Assign the token to one of the listed desktops.

```
# /opt/SUNWvda/sbin/vda token-assign --desktop=desktop ID token ID
```

Example - Assigning an existing token to a desktop

```
# /opt/SUNWvda/sbin/vda pool-desktops "Sales - EMEA"
NAME          ID MACHINE_STATE STATUS   USER        DN
Ubuntu_02     4   Powered Off    Available   -           -
Ubuntu_01     6   Powered Off    Available   -           -
Ubuntu_05     8   Powered Off    Available   -           -
```

```
# /opt/SUNWvda/sbin/vda token-assign --desktop=4 Payflex.500d9b8900130200
Token Payflex.500d9b8900130200 assigned to desktop 4
```

• Assign a token to a pool.

```
# /opt/SUNWvda/sbin/vda token-assign --pool=pool name token ID
```

Example - Assigning an existing token to a pool

```
# /opt/SUNWvda/sbin/vda token-assign --pool="Sales - EMEA" Payflex.500d9b8900130200
```

Example - Assigning all smart cards to a pool

```
# /opt/SUNWvda/sbin/vda token-assign --pool="Sales - EMEA" AnySmartCard.000
```
5.8.5. How to Create Bulks of Tokens

It is possible to create a number of tokens at once using the token-create subcommand.

The token-create subcommand can take an input file containing the tokens to create and the user associated with the token if needed.

Usage

Options:
- **f** token-file, --file=token-file
  A CSV file containing the properties of the tokens to be created. Format of the file is: token-id,comment,userid
- **w**, --write
  Overwrite existing tokens, option to be used with the token-file option

The format of the token file is CSV with the following values:

- **token-id**: the id of the smart card, this value is mandatory.
- **comment**: a comment about the token that can be used as a user friendly description of the token. This value maybe empty.
- **userid**: the user id of a user from the user directory, to be associated with the token. This value maybe empty.

Example

The following example shows a valid csv file for token creation and uses the file to create the tokens and their association to users.

```
example% cat /tokens.csv
mo12.345,"token for Mary O'Leary",moleary
js46.23,"token for user John Smith",jsmith
x34.45,"token without any associated user",
```

```
example% /opt/SUNWvda/sbin/vda token-create -f /tokens.csv
example% /opt/SUNWvda/sbin/vda token-search
NAME USER DN
mo12.345 Mary O'Leary cn=Mary O'Leary,ou=people
js46.23 John Smith cn=John Smith,ou=people
x34.45 - -
```

5.8.6. How to Search for Desktops

This task describes how to search for any desktop managed by Oracle VDI Manager. The Desktop Search feature enables you to search for any desktop in any pool based on a set of predefined filters, or by using the search field.

Oracle VDI Manager Steps

1. In Oracle VDI Manager, go to Pools.
2. Select Desktop Search.
3. Click a predefined filter link to display the list of desktops:
   - All desktops - The complete set of desktops from all existing pools.
   - Assigned desktops - All the desktops currently assigned to a user.
• Running desktops - All the desktops currently up and running.

• Desktops with error - All the desktops currently with errors, which can be due to a Defective State, or when the Machine State is Stuck, Aborted, Unresponsive or Unknown.

4. (Optional) Search the list of desktops by assigned user.

Type a user name into the Desktop Search field and click Search to show only the currently listed desktops with the matching assigned user.

5.8.7. Obtaining the ID of a Desktop or Template

When you use the vda command to perform an action on a desktop or template, you must use the unique ID of the desktop or template rather than the name. Oracle VDI Manager only displays the name.

To obtain the ID of a desktop, use the vda pool-desktops command.

To obtain the ID of a template, use the vda pool-templates command.

In the following example, information about the desktops in the pool winxp-pool is displayed:

```
$ /opt/SUNWvda/sbin/vda pool-desktops winxp-pool
NAME            ID  MACHINE_STATE STATUS              USER                          DN
winxp-001       33   Powered Off   Idle   aberginuid=bergin,ou=People
winxp-002       34   Powered Off   Available   -                          -
```

There are two desktops in the pool with IDs of 33 and 34.
Chapter 6. Desktop Access

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6.1. About Desktop Access

Users can access their virtual desktops from two types of clients, Sun Ray Clients and Remote Desktop Protocol (RDP) clients.

Sun Ray Clients, whether traditional hardware clients or Oracle Virtual Desktop Clients, connect to Sun Ray Software over the Oracle Appliance Link Protocol (ALP). Under Oracle VDI, Sun Ray Software runs on the Oracle VDI host and includes the Oracle VDI kiosk session and the Sun Ray Windows connector (uttsc). The kiosk session connects Sun Ray users to Oracle VDI, and the Sun Ray Windows connector completes the connection to the virtual desktops.

The RDP protocol was developed by Microsoft as a way to establish secure connections between servers and remote clients. Oracle VDI includes a built-in RDP broker that enables RDP clients to access virtual desktops. These RDP clients include the Oracle Secure Global Desktop RDP client (ttatsc) and Microsoft Remote Desktop Connection (RDC).

The following table shows Oracle VDI features by client type. The choice of RDP protocol and virtual machine configuration also influence which features can be used for a virtual desktop. For more information, see Section 5.1.7, “Choosing Between VRDP and MS-RDP”.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Sun Ray Client (Hardware)</th>
<th>Oracle Virtual Desktop Client</th>
<th>Oracle Secure Global Desktop</th>
<th>Microsoft Remote Desktop Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio recording (input audio)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Audio redirection</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Auto-logon</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Clipboard redirection</td>
<td>x</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>COM port mapping</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>


### Feature Comparison Table

<table>
<thead>
<tr>
<th>Feature</th>
<th>Sun Ray Client (Hardware)</th>
<th>Oracle Virtual Desktop Client</th>
<th>Oracle Secure Global Desktop</th>
<th>Microsoft Remote Desktop Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compression</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Drive redirection (client drive mapping)</td>
<td>✓ a</td>
<td>✓ b</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Multi-desktop</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Multi-monitor</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Network security (encryption level)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Session directory</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Smart card device redirection</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Time zone redirection</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>USB device redirection</td>
<td>✓</td>
<td>x</td>
<td>x</td>
<td>✓</td>
</tr>
<tr>
<td>Video acceleration</td>
<td>✓</td>
<td>✓</td>
<td>x</td>
<td>✓</td>
</tr>
<tr>
<td>Windows printer mapping (client printing)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

a Access to client USB storage devices is supported. Paths on an Oracle VDI host can be mapped to remote desktops using pool RDP settings.
b Paths on an Oracle VDI host can be mapped to remote desktops using pool RDP settings.

For Sun Ray Clients, support for these features can vary by hardware version and the software release. Check the documentation for your products to see what is supported. For the latest list of peripherals tested to work with Sun Ray Software, see the Sun Ray Peripherals List.

For Oracle Secure Global Desktop, support for these features depends on the software release. Check the documentation for your product to see what is supported.

For Microsoft Remote Desktop Connection, support for these features depends on the which RDP version is used. Check the documentation for your version to see what is supported.

### Color Depth

Oracle Secure Global Desktop does not support 15-bit color depths. If this color depth is specified for a virtual desktop, 8-bit color is used instead.

32-bit color is available on Windows Vista or Windows Server 2008 and later platforms. To display 32-bit color, the client device must be capable of displaying 32-bit color.

### Encryption Level

You can only use the Low, Client-compatible, or High encryption levels with Oracle Secure Global Desktop and Sun Ray Clients. The Federal Information Processing Standards (FIPS) encryption level is not supported.

### Multi-Monitor and Windows 7

Not all editions of Windows 7 include multi-monitor support, see the Microsoft Remote Desktop Connection FAQ for details.
Transport Layer Security

Oracle Secure Global Desktop does not support the use of Transport Layer Security (TLS) for server authentication, and to encrypt Terminal Server communication.

USB Redirection

USB 1.0 and USB 2.0 are supported. In order to use USB 2.0, a USB 2.0 (EHCI) controller must be configured in the desktop or template. See Section 5.1.4, “How to Enable USB Redirection” for details. Sun Ray 2 Clients only support USB 1.0. If USB 2.0 is enabled, Sun Ray 2 Clients auto-negotiate down to USB 1.0. Sun Ray 3 Clients and later support USB 2.0.

6.2. Desktop Access Using Sun Ray Clients

Oracle VDI installation and configuration includes the installation of a bundled release of Sun Ray Software configured specifically for use with Oracle VDI (see About the Oracle VDI Software). This section describes the information needed to provide access to Oracle VDI desktops from Sun Ray Clients.

Administrators can modify this default configuration. Appendix B, Defaults for the Software Bundled With Oracle VDI has details of the default configuration. For detailed information about Sun Ray Software and Sun Ray Clients, see the Sun Ray Product Documentation page http://www.oracle.com/technetwork/documentation/sun-ray-193669.html.

6.2.1. About the Oracle VDI Sun Ray Kiosk Session

Sun Ray Software is designed to provide access to standard Oracle Solaris or Linux platform desktop sessions from Sun Ray Clients. You can also use Sun Ray kiosk mode to provide controlled access to other session types. Oracle VDI comes with a predefined kiosk session, called Oracle Virtual Desktop Infrastructure. This kiosk session uses the Sun Ray Windows connector (uttsc) to establish a Remote Desktop Protocol (RDP) connection to a virtual machine.

Typically, an Oracle VDI Sun Ray kiosk session starts when a user inserts a smart card into a Sun Ray Client. The user enters a user name, a password, and, optionally, a Windows domain in the Login Dialog. The Login Dialog always requires a fully qualified domain name (FQDN). However, you can control, on a per-pool basis, whether the kiosk session uses a FQDN or a NetBIOS name when it starts uttsc. Use the Fully Qualified Domain Name check box in the Login panel under Pool Settings > Login in the Oracle VDI Admin GUI to toggle between the FQDN (the default) and the NetBIOS name.

After successful authentication, the system contacts the Oracle VDI service to determine what desktops are assigned to that user. If multiple desktops are available, a Desktop Selector screen prompts the user to select a desktop, after which the Sun Ray Windows connector starts and connects to the virtual machine running the user's desktop. If the virtual machine is not already running, a wait screen (see Figure 6.4, “The Wait Screen”) is displayed while the machine starts.

The kiosk session is enabled for both smart card and non-smart card access, so users do not have to use smart cards to log in; however, by default, all users must authenticate to Oracle VDI before they can access a desktop. The Oracle VDI service contacts the User Directory to verify user credentials. If authentication succeeds, the connection to the selected desktop is established. The credentials can then be passed to a Windows guest operating system so that the user can be logged into that desktop automatically.

If you disable client authentication (see Section 6.2.5, “How to Disable Client Authentication”), users can either insert a smart card or provide a user name in the Login Dialog to access their desktops. Desktops are assigned via the smart card token or the user name, and the user is not required to enter a password. In this situation, which bypasses other authentication mechanisms, it is best to configure the desktop operating system to require authentication.
The login and Desktop Selector dialogs can also be disabled. When the Desktop Selector is disabled, users are always connected to their default desktop without having to authenticate to Oracle VDI. Because users cannot enter a user name or password before accessing their desktops, however, disabling these dialogs also requires Client Authentication to be disabled. When this is the case, users must insert a smart card, which is used to direct them to the proper pool or desktop assignments. This arrangement can be convenient for users, but it is not recommended for sites or administrators with security concerns.

Administrators can use session parameters to configure the appearance and behavior of the kiosk session. There are two sort of parameters:

- Desktop Selector options, which affect the login and Desktop Selector dialogs.
- Sun Ray Windows connector options, which affect the quality of the RDP connection.

The options are explained below. Section 6.2.2, “How to Modify the Bundled Sun Ray Kiosk Session”, describes how to configure and apply the options.

**Desktop Selector Options**

The following table shows the available Desktop Selector options.

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-n</td>
<td>Disables the login and Desktop Selector dialogs.</td>
</tr>
<tr>
<td>-d &lt;domain&gt;</td>
<td>Sets a default domain in the Domain field.</td>
</tr>
<tr>
<td>-l &lt;domain1&gt;,&lt;domain2&gt;,...</td>
<td>Populates the Domain dropdown list with the specified domains.</td>
</tr>
<tr>
<td>-t secs</td>
<td>Specifies the timeout in seconds applied after a user logs in.</td>
</tr>
<tr>
<td>-j path</td>
<td>Path to the Java Runtime Environment (JRE) used to display the login and Desktop Selector dialogs.</td>
</tr>
<tr>
<td>-a</td>
<td>Enables the User Name field. Normally the User Name field is read-only. Using this option enables users to log in with a different user name.</td>
</tr>
<tr>
<td>-h</td>
<td>Hides the User Name field.</td>
</tr>
<tr>
<td>-o</td>
<td>Hides the Domain field.</td>
</tr>
<tr>
<td>-w</td>
<td>Shows the Password field.</td>
</tr>
<tr>
<td>-r &lt;res1&gt;,&lt;res2&gt;,...</td>
<td>Populates the Screen Resolution menu (under More Options) with a list of resolutions.</td>
</tr>
<tr>
<td>-v &lt;log level&gt;</td>
<td>Enables verbose logging. The log levels are FINEST, INFO, WARNING, SEVERE, and ALL.</td>
</tr>
<tr>
<td>-N</td>
<td>Disables numlock and the navigation or direction keys are active. By default, numlock is enabled and the navigation or direction keys are not active.</td>
</tr>
</tbody>
</table>
Previous releases of Oracle VDI supported a long format for these options, for example `--no-desktop-selector` instead of `-n`. The long options are deprecated, do not use them.

If you disable the login and Desktop Selector dialogs with the `-n` option, users cannot enter a user name or password before accessing their desktops. If you use this option, you must also disable client authentication (see Section 6.2.5, “How to Disable Client Authentication”). Users must insert a smart card in order to access their default desktop.

If you enable verbose logging with the `-v` option, additional log messages are output to standard error (`stderr`). The log messages can be viewed in the following locations:

- **Oracle Solaris platforms:** `/var/dt/Xerrors`
- **Oracle Linux platforms:** `/var/opt/SUNWkio/home/utku<XX>/.xsession-errors`

By default, the Oracle VDI login and Desktop Selector dialogs use the JRE included with Oracle VDI. However, you can specify an alternative JRE with the `-j` option. For the best support for locales and the latest improvements to Java Swing, use Java 6.

### Desktop Selector Configuration

By default, when users disconnect from their desktops, they are returned to the Oracle VDI Login Dialog. To change this behavior so that users are returned to the Desktop Selector dialog, run the following command as root:

```bash
# /opt/SUNWvda/sbin/vda settings-setprops -p client.logout.always=Disabled
```

If you change this setting, users are returned to the Desktop Selector dialog only if they use either the X button on the Sun Ray Windows connector toolbar at the top of the screen or the Disconnect button in the Windows Start menu. If users disconnect in any other way, they are logged out.

By default, the Desktop Selector dialog has a Reset button that enables users to reboot a desktop. To hide the Reset button from all users, run the following command as root:

```bash
# /opt/SUNWvda/sbin/vda settings-setprops -p client.desktop.reset=Disabled
```

If you change this setting, the Desktop Selector dialog is displayed only if a user is assigned multiple desktops. If a user is assigned only one desktop, the Desktop Selector dialog is never displayed.

For additional settings to control which server is presented as the default after users disconnect from their sessions, see Section 9.7.7, “How Do I Control Client Redirection with client.autoredirect Properties?”. For a discussion of how login and Desktop Selector screens can be affected by Global Oracle VDI Centers, see Section 3.12.3, “Oracle VDI Login and Desktop Selector Dialog”.

### uttsc Options

The man page for the `uttsc` command (`man -M /opt/SUNWuttsc/man uttsc`) has the complete listing of the supported options.

### 6.2.2. How to Modify the Bundled Sun Ray Kiosk Session

1. Log in to the Sun Ray Administration GUI. See Section 6.2.3, “How to Access the Sun Ray Administration GUI”.
2. Go to the Advanced tab.
3. Click the Kiosk Mode link.
The Kiosk Mode page is displayed.

4. Click the Edit button.

The Edit Kiosk Mode page is displayed.

5. In the Arguments field, type the required kiosk session arguments.

The syntax for the kiosk session arguments is:

```
Desktop Selector options -- uttsc options
```

The available kiosk options for Oracle VDI are described in Section 6.2.1, “About the Oracle VDI Sun Ray Kiosk Session”.

For example:

```
-d vdatest -j /usr/java6 -- -E wallpaper -E theming
```

6. Click OK.

7. (Optional) Perform a cold restart of Sun Ray services.

The new settings only take effect for new kiosk sessions. To enforce the settings for existing sessions, you must perform a cold restart of Sun Ray services. This terminates all existing sessions and creates new kiosk sessions as necessary.

a. Go to the Servers tab.

b. Select all servers in your Oracle VDI environment.

   c. Click Cold Restart.

   This operation can take several minutes to complete.

### 6.2.3. How to Access the Sun Ray Administration GUI

The Sun Ray Administration GUI is configured and accessible on each Oracle VDI host. This allows easy modification of Sun Ray configuration settings, such as kiosk session parameters.

**Steps**


   If you enter an `http://` URL, you are redirected to an `https://` URL.

   The browser displays a security warning and prompts you to accept the security certificate.

2. Accept the security certificate.

   The login screen is displayed.

3. Log in as super user (root) with corresponding password.

   **Note**

   Oracle VDI does not use the default `admin` user account that is normally configured as part of the Sun Ray Software installation.
6.2.4. How to Change a User Password

Oracle VDI supports password change on the following directory servers:

- Active Directory (from Windows Server 2003 and 2008)
- Oracle Directory Server Enterprise Edition

If client authentication is not disabled, Sun Ray Client users can update their passwords in the User Directory from the desktop login/selector dialog (see Section 6.2.5, “How to Disable Client Authentication”.

The authentication type (see Section 3.1, “About User Directory Integration”) selected to integrate the User Directory with Oracle VDI affects the password change functionality in the following ways:

- Kerberos authentication (see Section 3.5, “How to Set up Kerberos Authentication”) and Public Key authentication (see Section 3.6, “How to Set up Public Key Authentication”) allow users to change their passwords both before and after expiration.
- LDAP Anonymous Authentication (Section 3.7, “How to Set Up Anonymous Authentication”), LDAP Simple Authentication (Section 3.8, “How to Set Up Simple Authentication”), and LDAP Secure Authentication (Section 3.9, “How to Set Up Secure Authentication”) allow users to change their passwords only before expiration. If the user password expires in such a configuration, the user must use a customer-provided process external to Oracle VDI to change the password.

**Note**

A default restriction in Active Directory prevents password update from an LDAP Simple Authentication.

6.2.4.1. If the Password has Expired

On an Active Directory server that uses Kerberos authentication (see Section 3.5, “How to Set Up Kerberos Authentication”) or Public Key authentication (see Section 3.6, “How to Set Up Public Key Authentication”):

1. The user enters login credentials in the Login Dialog.
2. The system detects that the user password has expired and directs the user to the password change dialog, where the user types old and new passwords (new password needs to be entered twice).
3. After a successful password update, the user is authenticated with the new password and the system will offer the same screen as after a regular successful authentication.

If an LDAP type of authentication (see Section 3.1, “About User Directory Integration”) is used:

1. The user enters login credentials in the Login Dialog.
2. The system detects that the user password has expired and displays an error message.
3. The user must use an alternate, customer-provided process to update the password before to be able to log in again.

6.2.4.2. If the Password Has Not Expired

This functionality is offered with all types of authentication for the User Directory (see Section 3.1, “About User Directory Integration”) so long as the directory server allow users to change their passwords and the user is assigned more than one desktop.
1. The Desktop Selector dialog offers a More Options menu at the bottom which contains a Change Password entry.

2. The user selects Change Password and is directed to the password change dialog and types old and new passwords (the new password needs to be entered twice).

3. The user may cancel the password change at this point, in which case, there is no password change, and the Desktop Selector screen is displayed.

4. When the user confirms the password change, the password gets updated in the directory server and the Desktop Selector screen displays a confirmation message.

6.2.4.3. Troubleshooting

The update of the password may fail for the following reasons:

- The user does not type the right old password.
- The new password does not comply to the password policy from the directory server (not allowed to reuse old password, password complexity not met).
- On an Active Directory server, the Kerberos configuration does not allow password change. See Section 3.5, “How to Set Up Kerberos Authentication” for help on setting up Kerberos authentication.
- The authentication type does not allow password change. See the restrictions described in Section 6.2.4, “How to Change a User Password”.

In case of problems, check the log files. See Section 8.3.2, “How to Check the Oracle VDI Log Files”, for further information.

6.2.5. How to Disable Client Authentication

All users must present authentication credentials before getting access to any desktop. Credentials usually consist of a user name, password, and optionally a Windows domain, The Oracle VDI service contacts the User Directory to verify the credentials. A connection to the desktop is only established if authentication succeeds. The user credentials are forwarded to the desktop operating system to provide an automatic login so that the user does not have to authenticate again.

The automatic login feature works for Windows desktops using either the RDP or VRDP protocols. Automatic logins do not work for non-Windows desktops.

It is possible to disable authentication at the Oracle VDI service level, but if you do so, it is a good idea to configure desktops to present their own login screen, so that users authenticate to the desktop operating system. Users may consider login screens inconvenient, but they do provide at least minimal protection for user data. Bypassing authentication at the Oracle VDI service level may also allow you to take advantage of more advanced authentication techniques that are not supported by the Oracle VDI service.

Steps

Authentication is enabled by default. You can use the vda command to enable or disable authentication by the Oracle VDI service.

To check the current authentication policy:

```
# /opt/SUNWvda/sbin/vda_settings-getprops -p clientauthentication
```

To enable authentication (the default):

```
# /opt/SUNWvda/sbin/vda_settings-setprops -p clientauthentication=Enabled
```
6.2.6. How to Enable Desktop Screen Locking on Sun Ray Clients

With the hotdesking feature, the user must authenticate to access an assigned desktop when inserting a smart card. Once logged into the desktop session, the user can move to other Sun Ray Clients by removing and reinserting the smart card without having to log in again. This is one of the advantages of hotdesking.

However, some groups may find this scenario to be a security issue. For example, a lost smart card could be used by a different person to get access to the desktop session without the need to enter a password.

Enabling desktop screen locking forces users to provide a password whenever they insert a smart card, even when currently logged into a desktop session. The domain field and the user field on the login screen are already provided.

By default, desktop screen locking is disabled.

- To check the current desktop screen locking policy:

  ```bash
  # /opt/SUNWvda/sbin/vda settings-getprops -p clientscreenlock
  ```

- To enable desktop screen locking:

  ```bash
  # /opt/SUNWvda/sbin/vda settings-setprops -p clientscreenlock=Enabled
  ```

- To disable desktop screen locking (default):

  ```bash
  # /opt/SUNWvda/sbin/vda settings-setprops -p clientscreenlock=Disabled
  ```

6.2.7. Sun Ray Client User Access Scenarios

This section provides examples of how users access their desktops from Sun Ray Clients (Sun Ray hardware or Oracle Virtual Desktop Client).

Depending on the configuration of the Sun Ray kiosk session, users might have to log in before they can access a desktop. Users assigned multiple desktops may also be able to select which desktop to access. See Section 6.2.1, “About the Oracle VDI Sun Ray Kiosk Session”, for more details.

What users see on the Login Dialog can also be affected by other factors, such as the configuration of multiple Oracle VDI Centers.

Example 1

In this example, a user logs in to Oracle VDI and then selects which desktop to access.

1. The user logs into Oracle VDI.

   The user inserts a smart card into a Sun Ray Client that is connected to an Oracle VDI host. The token on the user's smart card is assigned either to a pool or directly to a desktop.

   The Login Dialog is displayed.
Figure 6.1. Oracle VDI Login Dialog

The user must provide a user name, password, and, optionally, a Windows domain.

2. The user selects a desktop or pool.

After successful authentication, the system determines which desktops and pools are assigned to the user. If multiple desktops are assigned to the user, the Desktop Selector dialog is displayed. The dialog is not displayed if only one desktop is assigned.
3. The user works with the desktop.

Once the user selects a desktop, the Sun Ray Windows connector starts and displays the desktop.
The user can disconnect from the desktop at any time by moving the mouse to the top of the screen and clicking the X on the remote desktop pulldown menu. When the user is disconnected from the current desktop session, either the Desktop Selector dialog or the Login Dialog is displayed.

Desktops connected through Windows RPD also have a Disconnect button available in the Windows start menu. Desktops connected through VirtualBox RDP (VRDP) do not have this button.

**Example 2**

In this example, the user is not required to log in to Oracle VDI and accesses only the default desktop.

1. The user starts the desktop.

   The user inserts a smart card into a Sun Ray Client that is connected to an Oracle VDI host. The user's smart card token is assigned either to a pool or directly to a desktop.

   Oracle VDI determines the default desktop assigned to the user. In this example, the desktop is not already running, so a wait screen is displayed while the desktop is started.

   ![Figure 6.4. The Wait Screen](image)

2. The user logs in to the desktop.

   In this example, the standard Windows login screen is displayed because the configuration of the guest operating system requires a user name and password. (It could also require the Windows domain, but that case is not illustrated in the following figure.)
3. The user works with the desktop.

After successful authentication, the desktop is displayed. The behavior is the same as for a standard Windows PC.
6.2.8. Multiple Monitor Capability

Sun Ray Software enables the display of a single Sun Ray session across multiple monitors or of multiple Sun Ray sessions on separate monitors (see Multiple Monitor Configurations in the Sun Ray Software 5.3 Administration Guide.) Oracle VDI extends this capability to the display of virtual Windows XP or Windows 7 desktops.

6.2.8.1. Multiple Desktop Selection

The Desktop Selector enables the user to select and connect to multiple desktops, provided that user has a Sun Ray Client with two monitors and has been assigned two or more virtual desktops.

Figure 6.7. Connecting to Multiple Desktops with Multiple Monitors

Desktops are displayed in the order they are listed on the Desktop Selector, that is, the first desktop listed is displayed on the first monitor. To change the order in which the desktops are displayed, the user must return to the Desktop Selector by logging out or by closing the Sun Ray Windows connector session. The previously displayed desktops are then marked with monitor icons. When one of the desktops marked with a monitor icon is selected, arrows allowing each desktop to be promoted or demoted in position are displayed. When the desktops have been re-ordered, the user can reselect which ones to view and click Connect.

6.2.8.2. Multiple Monitors

The Multi-Monitor feature enables configuration of multiple monitors for an Oracle VDI desktop session. It is supported for Windows XP and Windows 7 guests that use either VRDP or MS-RDP. The feature is limited to a maximum of eight monitors for VRDP.

Note

Not all editions of Windows 7 include multi-monitor support, see the Microsoft Remote Desktop Connection FAQ for details.
6.2.8.3. Multi-Monitor Hotdesking

Hotdesking enables users to access their sessions when they move from one Sun Ray Client to another (see Hotdesking in the Sun Ray Software 5.3 Administration Guide). However, because some Sun Ray Clients support only one monitor while others can support either one or two (see Section 6.2.8.4, “Sun Ray Multihead Groups and Xinerama”), users may have to modify some settings in order to get or keep their desired display characteristics.

For example, moving from one Sun Ray Client to another may leave some open windows on non-existent monitors. In that case, the user must go to Control Panel, launch the Display Properties application, and modify the number of available monitors. This moves all windows from the invisible monitors to the existing monitors, allowing the user to see all windows again.

6.2.8.4. Sun Ray Multihead Groups and Xinerama

You can configure several Sun Ray Clients as a multihead group to create a large array of monitors and display a single desktop across several monitors or multiple desktops on separate monitors. Sun Ray 2FS and Sun Ray 3 Plus Clients can support two monitors each.

For multihead groups and VRDP, Oracle VDI runs an instance of the Sun Ray Windows Connector for each monitor connection. For this configuration, disable the Xinerama X Window System extension.

For multihead groups and MS-RDP, Oracle VDI runs an instance of the Sun Ray Windows Connector for each VDI session. For this configuration, enable the Xinerama X Window System extension.

For details on Xinerama usage, see How to Enable and Disable Xinerama in the Sun Ray Software 5.3 Administration Guide.

Note

The term head in this context refers to a Sun Ray Client, not a monitor.
6.2.8.5. How to Enable Support for Multiple Monitors

1. Edit the template or desktop and configure the display properties to extend the desktop to multiple monitors.

   If you are using Sysprep, do not perform this step, because the monitor configuration is removed during cloning. If you use FastPrep, the monitor configuration is preserved.
a. In the template or desktop, go to the Start menu and select Control Panel.

b. Go to Appearance and Personalization → Personalization → Display Settings.

c. Select Identify Monitors and position the monitors.

2. Configure the required number of monitors for the desktops in a pool.

a. In Oracle VDI Manager, go to Pools and select a pool.

b. Go to the Settings tab.

c. In the Sun Ray Client section, select the required number of monitors in the Monitors list.

The virtual machine is configured with one graphics card for each monitor.

3. Modify the virtual machine video memory setting for the template or the desktop.

Multiple monitors require more video memory. The amount of video memory depends on the screen resolution and the color depth configured in the desktop or template. The following calculations provide a good estimate of the amount of memory you should allocate but should not be used as a replacement for your own testing. The calculations also assume that you are not using special video effects such as 3D.

The video memory required for each monitor can be calculated using the following formula:

Video Memory (in bytes) = (display_width * display_height * 4) + 1048576 (1 megabyte)

For example, for a monitor with a resolution of 1920 x 1200, the memory required is:

\[(1920 \times 1200 \times 4) + 1048576 = 10264576 \text{ bytes (9.79 megabytes)}\]

The total video memory (in bytes) is the sum of the video memory required for each monitor + 1048576 (1 megabyte).

For example, for two 1920 * 1200 monitors, the total video memory required is:

\[(2 \times 10264576) + 1048576 = 21577728 \text{ bytes (20.58 megabytes)}\]

To access the video memory setting for a desktop or template in a pool, do either of the following:

• Go to the Templates tab, click the master revision in the Templates table, and then click Virtual Machine.

• Go to the Desktop tab, click a desktop in the Desktops table, and then click Virtual Machine.

4. Restart all running desktops in the pool.

You must restart all running desktops so that the graphics card changes in the virtual machine are detected. If you do not do this, users might experience connection problems when they connect to their desktops. Existing desktops that have been powered off detect the graphics card changes when they are next powered on.

a. Go to the Desktop tab.

b. Select all the running desktops in the pool.
Select all the desktops except those with a Machine State of powered off.

c. Click Restart.

The display properties in existing desktops must be configured individually to extend the desktop to multiple monitors.

6.3. Desktop Access Using RDP Clients

Oracle VDI includes a built-in RDP broker that enables access desktops using an RDP client.

Supported Clients

The following RDP clients have been tested with Oracle VDI:

- The Microsoft RDP client (also known as Remote Desktop Connection)
- The Sun Ray Windows connector (also known as uttsc)
- The Oracle Secure Global Desktop Remote Desktop Client (also known as ttatsc)

Other clients may also work, but have not been tested.

RDP Connection Settings

When users access a desktop from an RDP client, none of RDP settings configured for the pool apply (see Section 5.1.3.1, “Pool Sun Ray RDP Settings”). These settings include performance optimization settings, such as disabling menu animations, and device redirection settings, such as access to client drives and audio. Users have to specify any such connection settings in the RDP client, for example on the Experience tab of Microsoft Remote Desktop Connection.

RDP Broker Security

As a security precaution, Oracle VDI authenticates users each time they sign into a desktop. Users may find this inconvenient. If you prefer to disable this feature, refer to Section 6.2.5, “How to Disable Client Authentication”. For a more detailed treatment of security issues, see the Oracle Virtual Desktop Infrastructure Security Guide.

6.3.1. Accessing Desktops With an RDP Client

To access a desktop, users run the RDP client and specify the DNS name or IP address of an Oracle VDI host together with a user name, which can include a domain name. By default, users are connected to their default desktop, which can be defined in Oracle VDI Manager.

Alternatively, users can specify a particular desktop or pool by entering the user name, the pool name, and optionally a desktop ID, in the RDP client using the following syntax:

```
username::pool=poolname[,desktop=desktopId]
```

It is usually sufficient to specify just the user name and pool name. However, users with multiple desktops assigned from the same pool must specify both the pool name and the desktop ID.

To view a listing of desktop IDs, use the following command:

```
vda user-desktops username
```

In the following example, the Sun Ray Windows connector is used to connect to any machine from a pool:
About the Oracle VDI RDP Broker

```
/opt/SUNWuttsc/bin/uttsc -u jdoe::pool=win-xp -d example.com vdi-example.com
```

The following image shows a similar example using Microsoft Remote Desktop Connection.

In the following example, the Sun Ray Windows connector is used to connect to a specific desktop:

```
/opt/SUNWuttsc/bin/uttsc -u jdoe::pool=win-xp,desktop=33 -d example.com vdi-example.com
```

The following image shows a similar example using Microsoft Remote Desktop Connection.

If users frequently switch between desktops, it is best to save the connection settings for each desktop in the RDP client.

### 6.3.2. About the Oracle VDI RDP Broker

This section describes how the RDP broker mediates between several elements of Oracle VDI:

1. The RDP client contacts the Oracle VDI RDP broker and passes it any relevant information, such as user name and password.
2. The RDP broker then contacts the Oracle VDI service on behalf of the client and asks it to start the desired desktop.
3. Assuming that client authentication is enabled on the service side, which it is by default, the Oracle VDI service verifies the user name and password (see Section 6.2.5, “How to Disable Client Authentication”).
4. If authentication succeeds, the Oracle VDI service starts the corresponding desktop and returns the IP address and, optionally, RDP port of the virtual machine running the desktop.
5. The RDP broker uses this information to construct an **RDP Server Redirection Packet**.
   - For Windows RDP, the packet contains the VM host/IP address as the server to redirect to. This is the model that VMware Infrastructure 3 uses.
   - For VirtualBox RDP, the packet contains a **routing token**. The routing token consists of an encoded IP address and RDP port information, which are needed because VRDP does not use the standard Windows RDP port. For details of the routing token encoding, see the “Routing Token Format” section of *Session Directory and Load Balancing Using Terminal Server* on the Microsoft website.
6. The RDP broker sends the redirection packet to the RDP client, and the client is redirected accordingly.

### 6.4. Desktop Access Using Oracle Secure Global Desktop

Oracle VDI supports secure web access to desktops through Oracle Secure Global Desktop (SGD). You can use either the Oracle VDI Broker or a Windows application object to access desktops.
The Oracle VDI Broker is part of the SGD Dynamic Launch feature. The broker uses the web services application programming interface (API) of the Oracle VDI Client command line tool to authenticate the user, to obtain a list of desktops for the user, and to start and end the desktop. The SGD RDP client (ttatsc) is then used to display the desktop. For detailed information on configuring and using the broker, see Integrating SGD with Oracle VDI in the SGD Administration Guide for your SGD release.

**Note**

The Oracle VDI Broker replaces the Legacy Oracle VDI Broker that was available in SGD release 4.6. It is best to use the Oracle VDI Broker because it uses a public API and does not require SGD and Oracle VDI to be installed on the same host.

Use a Windows application object if you are unable to use the broker. With this access method, the SGD RDP client (ttatsc) is used to access a desktop in the same way as a regular RDP client, as described in Section 6.3.1, “Accessing Desktops With an RDP Client”. For detailed information on configuring Windows application objects, see Windows Applications in the SGD Administration Guide for your SGD release.

### 6.5. Logging Out of Desktop Sessions

How to end a desktop session varies slightly according which protocol, RDP or VRDP, is used to establish the session. With either protocol, a user can log out by clicking the X button on the Sun Ray Windows connector toolbar at the top of the screen. The toolbar is hidden until the mouse pointer is moved to the top of the screen.

**Figure 6.11. The Sun Ray Windows Desktop Connector Toolbar**

The Windows Start menu shows slightly different logout options depending on whether VRDP or MS-RDP is used, as shown in the following figure.

**Figure 6.12. Start Menus**

The user can also log out by clicking the Log Off button in the Start menu.

The VRDP Start menu has a Turn Off Computer button, which shuts the virtual desktop down. This option requires a full boot sequence the next time the user logs in.

The RDP Start menu has a Disconnect button instead. This option logs the user out of Windows and the Oracle VDI desktop session, but it does not shut down the virtual machine. This option does not require a full boot sequence the next time the user logs in.
Chapter 7. Performance and Tuning

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7.1. Introduction to Oracle VDI Performance and Tuning

The following diagram shows a typical hardware environment for an Oracle VDI deployment.
A production deployment consists of one primary Oracle VDI host and at least one secondary Oracle VDI host to provide redundancy. The Oracle VDI servers host the embedded MySQL Server database for the Oracle VDI data, route information between clients and desktops, and provide the broker functionality which delivers the desktops to the clients. Alternatively, remote databases are also supported. The Oracle VM VirtualBox servers run the virtual machines which provide the desktops. The storage servers provide the virtual disks which are interpreted as physical disks by the operating systems running within the virtual machines. The iSCSI protocol is used to transfer the disk data between the VirtualBox servers and the storage. That iSCSI data creates a major part of the total network traffic of an Oracle VDI system.

Other consumers of network bandwidth are the clients of Oracle VDI: Sun Ray Clients, Oracle Secure Global Desktop, and RDC clients. The clients connect to the VirtualBox servers through the Oracle VDI servers. In the case of a Sun Ray client, which uses the ALP protocol to transfer the desktop graphics, the Oracle VDI servers convert the RDP protocol received by the VirtualBox servers to the ALP protocol. So, there is one data stream for each client connection between the client, the Oracle VDI server, and the VirtualBox server. RDP clients such as the Sun Ray Windows connector (uttsc), connect to the Oracle VDI server which, in turn, uses the RDP Redirect feature to instruct the clients to connect to the VirtualBox servers directly as there is no need to translate the RDP protocol. In this case, there is a data stream between the client and the VirtualBox server.

This chapter provides sizing, performance, and tuning guidelines for Oracle VDI deployments. The sizing information is derived from a sizing test with 1000 desktops running a script to simulate an office workload of a "heavy worker", as defined in the VMware VDI Server Sizing and Scaling Guide.

The sizing guidelines are provided as a general starting point for sizing and should not be used as a replacement for your own testing. The workload is different for every installation and relatively small
changes in the usage patterns can have noticeable effects on the requirements. For assistance with sizing, contact Oracle Sales or Support.

7.2. Oracle VDI Hosts

7.2.1. Sizing Guidelines for Oracle VDI Servers

The primary Oracle VDI server requires a dual-core CPU and 2 GB of memory. As long as the Oracle VDI services are not configured on that server, these hardware requirements do not change with the number of running desktops.

The secondary Oracle VDI server requirements for the number of cores and memory size varies with the number of running desktops supported, as well as the required network bandwidth. The bandwidth also varies with the content displayed. The numbers given below are typical for office work. Displaying videos or web pages with Flash content can increase the required bandwidth.

- **Number of cores** = number of running desktops / 20
  
  Example: Two secondary Oracle VDI servers with 8 CPUs and 4 cores per CPU can serve 2 x 8 x 4 x 20 = 1280 running desktops

- **Memory size [MB]** = number of desktops x 32 MB + 2048 MB
  
  Example: Two secondary Oracle VDI servers with 64 GB of memory can serve (2 x 64 x 1024 MB - 2 x 2048 MB) / 32 MB = 3968 running desktops

- **Network bandwidth [Mb/s]** = number of running desktops x 0.15 [Mb/s]
  
  Example: Two secondary Oracle VDI servers with one 1 Gb Ethernet interface can serve 2 x 1024 / 0.15 Mb/s = 13653 running desktops

7.2.2. Controlling the Number of Sessions on an Oracle VDI Host

By default, an Oracle VDI host can host 100 sessions. The number of sessions is set when you configure Oracle VDI.

To change the number of sessions on a configured Oracle VDI host, run the following command as root:

```
# /opt/SUNWkio/bin/kioskuseradm extend -c <count>
```

7.3. Virtualization Hosts

7.3.1. Sizing Guidelines for Oracle VM VirtualBox Servers

We found that the ‘VMs/core’ unit, while being striking, is a fuzzy statement as the available CPUs today differ by at least a factor of 2 in performance and that even ignores older CPUs customers may want to reuse. Therefore we decided to also provide the ‘SPEC CINT2006 Rate (peak) / VM’ value. Statements made based on this unit are valid for a longer time as they abstract from a concrete CPU, while statements based on ‘VMs/core’ hold true for cores showing roughly the same performance only.

CINT values for a vast number of CPUs can be looked up from the database of the Standard Performance Evaluation Corporation (SPEC) at [http://www.spec.org/cpu2006/results/rint2006.html](http://www.spec.org/cpu2006/results/rint2006.html) or by running the provided test suite.

The numbers for this section have been updated based on a new test run. We were able to run 100 VMs on a X4170 with two E5520 CPUs having 4 cores each. The SPEC CINT2006 Rate (peak) for servers with two E5520 CPUs is ~200 which results in a cint / VM value of 2.
• **Number of cores** = number of running desktops / 12.5

  Example: A server roughly equivalent to a X4170 with two E5520 CPUs can support up to 2 x 4 x 12.5 = 100 running desktops

• **Memory size [MB]** = number of running desktops x memory size of a desktop x 1.2 + 1024 MB

  Example: A server with 64 GB of memory can support 64 x 1024 MB - 1024 MB / (512 MB x 1.2) = 105 running desktops of 512 MB in size

• **Network bandwidth [Mb/s]** = storage network bandwidth / number of VirtualBox servers

  Note

  At least 20% of the available CPU power, memory size and network bandwidth should be available as security margin.

### 7.4. Storage Performance and Tuning

#### 7.4.1. Sizing Guidelines for Sun ZFS Storage Servers

The recommended disk layout is RAID 10, mirrored sets in a striped set, with ZFS striping the data automatically between multiple sets. This layout is called "mirrored" by the 7000 series. While this disk layout uses 50% of the available disk capacity for redundancy, it is faster than RAID 5 for intense small random read/writes, which is the typical access characteristic for iSCSI.

The storage servers provide the virtual disks that are accessed by Oracle VM VirtualBox through iSCSI. Because iSCSI is a CPU-intensive protocol the number of cores of the storage server are a decisive factor for its performance. Other important factors are the memory size (cache), the number of disks, and the available network bandwidth.

The network bandwidth is very volatile and determined by the relation of desktops starting up (peak network bandwidth) and desktops that have cached the applications in use (average network bandwidth). Starting a virtual machine (XP guest) creates a network load of 150 MB which needs to be satisfied in around 30 seconds. If many desktops are started at the same time, the requested network bandwidth may exceed 1 Gb/s if the CPUs of the storage can handle the load created by the iSCSI traffic. This scenario is typical for shift-work companies. In such a case, set the Pool, Cloning, or Machine State option to Running, which always keeps the desktops running and therefore decouples the OS boot from the login of a user. Another option is to trunk several interfaces to provide more than 1 Gb/s bandwidth through one IP. You can also use Jumbo Frames to speed up iSCSI connections. Jumbo Frames need to be configured for all participants of the network: storage servers, VirtualBox servers, and switches. Note that Jumbo Frames are not standardized so there is a risk of incompatibilities.

Oracle VDI, in combination with VirtualBox, uses the Sparse Volume feature of ZFS, which enables it to allocate more disk space for volumes than is physically available as long as the actual data written does not exceed the capacity of the storage. This feature, in combination with the fact that cloned desktops reuse unchanged data of their templates, results in a very effective usage of the available disk space. Therefore, the calculation for disk space below is a worst-case scenario assuming that all volumes are completely used by data which differs from the template.

• **Number of disks** = number of users * user IOPS * (read ratio * read penalty + write ratio * write penalty) / disk IOPS

  See Calculating the Number of Disks for an explanation of this formula and an example.

• **Number of cores** = number of virtual disks in use / 200
Example: A x7210 storage with 2 CPUs and 4 cores per CPU can serve up to 2 * 4 * 200 = 1600 virtual disks

- **Memory size** - The more the better. The free memory can be used as a disk cache, which reduces the access time.

- **Average Network bandwidth [Mb/s] = number of virtual disks in use * 0.032 Mb/s**
  
  Example: An x7210 storage with one Gigabit Ethernet interface can serve up to 1000 / 0.032 = 31250 virtual disks

- **Peak Network bandwidth [Mb/s] = number of virtual disks in use * 40 Mb/s**
  
  Example: An x7210 storage with one Gigabit Ethernet interface can serve up to 1000 / 40 = 25 virtual disks

- **Disk space [GB] = number of desktops * size of the virtual disk [GB]**
  
  Example: An x7210 storage with a capacity of 46 TB can support 46 * 1024 GB / 2 / 8 GB = 2944 8 GB disks in a RAID 10 configuration

**Calculating the Number of Disks**

The calculation for the number of disks depends on several factors, as follows:

- **Disk IOPS**: The capability of the disks in terms of physical input/output operations per second (IOPS).

  The following table shows the typical disk IOPS for various disk speeds (in revolutions per minute or RPM) or disk types.

<table>
<thead>
<tr>
<th>Disk RPM or Type</th>
<th>Disk IOPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSD</td>
<td>10,000</td>
</tr>
<tr>
<td>15,000</td>
<td>175</td>
</tr>
<tr>
<td>10,000</td>
<td>125</td>
</tr>
<tr>
<td>7,200</td>
<td>75</td>
</tr>
<tr>
<td>5,400</td>
<td>50</td>
</tr>
</tbody>
</table>

- **User IOPS**: The input/output operations per second generated by users when they use applications in their desktops.

  The user IOPS value depends largely on the applications used and how they are used. The following table shows some sample IOPS based on long-time averages for different user types and Windows platforms.

<table>
<thead>
<tr>
<th>Windows User Type</th>
<th>User IOPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows 7 task worker</td>
<td>7</td>
</tr>
<tr>
<td>Windows 7 knowledge user</td>
<td>15</td>
</tr>
<tr>
<td>Windows 7 power user</td>
<td>25</td>
</tr>
</tbody>
</table>

**Note**

For details about how to improve desktop performance, see the sections on optimizing desktop images [Section 5.5, “Creating Desktop Images”](#).
About ZFS Storage Caches

### Windows User Type

<table>
<thead>
<tr>
<th>User IOPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows XP task worker</td>
</tr>
<tr>
<td>Windows XP knowledge user</td>
</tr>
<tr>
<td>Windows XP power user</td>
</tr>
</tbody>
</table>

- Disk read:write IOPS ratio: This depends on the cache available to both the operating system of the desktop and, most importantly, the storage.

For Sun ZFS storage, the more Adaptive Replacement Cache (ARC) and Second Level Adaptive Replacement Cache (L2ARC) that is available, the fewer read IOPS are performed, and this enables more write IOPS. You can optimize the storage head movements if you decrease the read IOPS. Write IOPS are cached and written in bursts to optimize the head movements, but read requests can disrupt this optimization. Typical read:write ratios range from 40:60 to 20:80, or even less.

- Read and Write Penalty: The selected RAID configuration of the storage has a read and write penalty, as shown in the following table.

<table>
<thead>
<tr>
<th>RAID Type</th>
<th>Read Penalty</th>
<th>Write Penalty</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAID0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>RAID1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>RAID10</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>RAID5</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>RAID6</td>
<td>1</td>
<td>6</td>
</tr>
</tbody>
</table>

#### Example 7.1. Example Calculation

The number of disks are needed for 1000 Windows XP task workers using 10,000 RPM disks with a 20:80 read:write ratio in a RAID10 array is:

\[
1000 \times 5 \times (0.2 \times 1 + 0.8 \times 2) / 125 = 72
\]

### 7.4.2. About ZFS Storage Caches

This section provides a brief overview of the cache structure and performance of ZFS, and how it maps to the hardware of the Sun Storage 7000 series Unified Storage Systems.

#### Background

The Zettabyte File System (ZFS) is the underlying file system on the supported Solaris and Sun Storage 7000 series Unified Storage Systems storage platforms.

The Adaptive Replacement Cache (ARC) is the ZFS read cache in the main memory (DRAM).

The Second Level Adaptive Replacement Cache (L2ARC) is used to store read cache data outside of the main memory. Sun Storage 7000 series Unified Storage Systems use read-optimized SSDs (known as Readzillas) for the L2ARC. SSDs are slower than DRAM but still much faster then hard disks. The L2ARC allows for a very large cache which improves the read performance.

The ZFS Intent Log (ZIL) satisfies the POSIX requirements for synchronous writes and crash recovery. It is not used for asynchronous writes. The ZFS system calls are logged by the ZIL and contain sufficient information to play them back in the event of a system crash. Sun Storage 7000 series Unified Storage Systems use write-optimized SSDs (known as Writezillas or Logzillas) for the ZIL. If Logzillas are not available the hard disks are used.
The write cache is used to store data in volatile (not battery-backed) DRAM for faster writes. There are no system calls logged in the ZIL if the Sun Storage 7000 series Unified Storage Systems write cache is enabled.

Performance Considerations

Size the read cache to store as much data in it to improve performance. Maximize the ARC first (DRAM), then add L2ARC (Readzillas).

Oracle VDI enables the write cache by default for every iSCSI volume used by Oracle VDI. This configuration is very fast and does not make use of Logzillas, as the ZIL is not used. Without ZIL, data might be at risk if the Sun Storage 7000 series Unified Storage System reboots or experiences a power loss while desktops are active. However, it does not cause corruption in ZFS itself.

Disable the write cache in Oracle VDI to minimize the risk of data loss. Without Logzillas the ZIL is backed by the available hard disks and performance suffers noticeably. Use Logzillas to speed up the ZIL. In case you have two or four Logzillas use the ‘striped’ profile to further improve performance.

To switch off the in-memory write cache, select a storage in Oracle VDI Manager, click Edit to open the Edit Storage wizard and unselect the Cache check box. The change will be applied to newly created desktops for Oracle VM VirtualBoxs and to newly started desktops for Microsoft Hyper-V virtualization platforms.

7.4.3. Managing the ZIL on Oracle Solaris Platforms

On Oracle Solaris 10 10/09 (and later) storage platforms, you can increase performance on the storage by disabling the ZFS Intent Log (ZIL). However, it is important to understand that the performance gains are at the expense of synchronous disk I/O and data integrity in the event of a storage failure.

Managing the ZIL - Oracle Solaris 10 9/10 (Update 9) and Earlier

On Oracle Solaris 10 9/10 (Update 9) platforms and earlier, you can disable the ZIL temporarily or permanently.

If you disable the ZIL temporarily, the ZIL is re-enabled when the system is rebooted. If you disable the ZIL permanently, it remains disabled after the system is rebooted. When you change the ZIL setting, the setting is only applied to a ZFS pool when it is mounted. If the ZIL is disabled, the ZFS pool must be created, or mounted, or imported, after the setting is changed.

If you disable the ZIL setting permanently, the ZIL is disabled for all ZFS pools following a reboot. This can cause undesirable behavior if the system's root volume is a ZFS volume because there is no synchronous disk I/O. In this situation, it is best practice to use a storage host with at least two disks. Format the first disk using the UFS file system, and use that disk for the operating system. Format the other disks using ZFS, and use those disks as the ZFS storage. In this way, ZIL can be disabled without affecting the performance of the operating system.

To disable the ZIL temporarily, run the following command as superuser (root):

```bash
# echo zil_disable/W0t1 | mdb -kw
```

To re-enable a temporarily-disabled ZIL, run the following command as superuser (root):

```bash
# echo zil_disable/W0t0 | mdb -kw
```

To disable the ZIL permanently, edit the /etc/system as superuser (root) and add the following line:

```bash
set zfs:zil_disable=1
```
Managing the ZIL - Oracle Solaris 10 8/11 (Update 10) and Later

Starting with Oracle Solaris 10 8/11 (Update 10), the steps for disabling the ZIL changed. The ZIL is configured as a ZFS property on a dataset. This means different ZFS datasets can have different ZIL settings and so you can disable the ZIL for a storage pool without affecting the ZFS volume of the operating system.

To disable the ZIL, run the following command as superuser (root):

```
# zfs set sync=disabled <dataset>
```

The change takes effect immediately and the ZIL remains disabled on reboot.

To re-enable the ZIL, run the following command as superuser (root):

```
# zfs set sync=standard <dataset>
```

7.4.4. Oracle VDI Global Settings for Storage

This section provides information about the Oracle VDI global settings that apply to storage. Use the `vda settings-getprops` and `vda settings-setprops` commands to list and edit these settings.

<table>
<thead>
<tr>
<th>Global Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>storage.max.commands</code></td>
<td>The number of commands executed on a storage in parallel. The default is 10. Changing this setting requires a restart of the Oracle VDI service.</td>
</tr>
<tr>
<td></td>
<td>The setting is global for an Oracle VDI installation and applies to a physical storage determined by its IP or DNS name.</td>
</tr>
<tr>
<td></td>
<td>The number of Oracle VDI hosts does not influence the maximum number of parallel storage actions executed by Oracle VDI on a physical storage. Reduce the number in case of intermittent &quot;unresponsive storage&quot; messages to reduce the storage load. Doing so impacts cloning and recycling performance.</td>
</tr>
<tr>
<td></td>
<td>This setting works even if the Oracle VDI Center Agent is no longer running on the host.</td>
</tr>
<tr>
<td></td>
<td>This setting applies only to Sun ZFS storage used with Oracle VM VirtualBox (on Solaris) and Microsoft Hyper-V desktop providers.</td>
</tr>
<tr>
<td><code>storage.query.size.interval</code></td>
<td>The time in seconds the Oracle VDI service queries the storage for its total and available disk space. The default is 180 seconds.</td>
</tr>
<tr>
<td></td>
<td>As there is only one Oracle VDI host which does this, there is typically no need to change this setting.</td>
</tr>
<tr>
<td></td>
<td>This setting applies to all storage types.</td>
</tr>
<tr>
<td>Global Setting</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>storage.watchdog.interval</td>
<td>The time in seconds the Oracle VDI service queries the storage for its availability.</td>
</tr>
<tr>
<td></td>
<td>The default is 30 seconds.</td>
</tr>
<tr>
<td></td>
<td>As there is only one Oracle VDI host which does this, there is typically no need to change this setting.</td>
</tr>
<tr>
<td></td>
<td>This setting applies to all storage types.</td>
</tr>
<tr>
<td>storage.fast.command.duration</td>
<td>The time in seconds after which the Oracle VDI service considers a fast storage command to have failed.</td>
</tr>
<tr>
<td></td>
<td>The default is 75 seconds.</td>
</tr>
<tr>
<td></td>
<td>Changing this setting requires a restart of the Oracle VDI service.</td>
</tr>
<tr>
<td></td>
<td>The only Oracle VDI functionality which uses this command duration is the storage watchdog which periodically pings the storage for its availability.</td>
</tr>
<tr>
<td></td>
<td>This setting applies only to Sun ZFS storage used with Oracle VM VirtualBox (on Solaris) and Microsoft Hyper-V desktop providers.</td>
</tr>
<tr>
<td>storage.medium.command.duration</td>
<td>The time in seconds after which the Oracle VDI service considers a medium storage command to have failed.</td>
</tr>
<tr>
<td></td>
<td>The default is 1800 seconds (30 minutes).</td>
</tr>
<tr>
<td></td>
<td>Changing this setting requires a restart of the Oracle VDI service.</td>
</tr>
<tr>
<td></td>
<td>The majority of the storage commands used by Oracle VDI use this command duration.</td>
</tr>
<tr>
<td></td>
<td>This setting applies only to Sun ZFS storage used with Oracle VM VirtualBox (on Solaris) and Microsoft Hyper-V desktop providers.</td>
</tr>
<tr>
<td>storage.slow.command.duration</td>
<td>The time in seconds after which the Oracle VDI service considers a slow storage command to have failed.</td>
</tr>
<tr>
<td></td>
<td>The default is 10800 seconds (3 hours).</td>
</tr>
<tr>
<td></td>
<td>Changing this setting requires a restart of the Oracle VDI service.</td>
</tr>
<tr>
<td></td>
<td>Only a few complex storage scripts used by Oracle VDI use this command duration. Such scripts are not run very often, typically once per day.</td>
</tr>
<tr>
<td></td>
<td>This setting applies only to Sun ZFS storage used with Oracle VM VirtualBox (on Solaris) and Microsoft Hyper-V desktop providers.</td>
</tr>
</tbody>
</table>
The `storage.max.commands` setting is the setting that is most often changed. By default, Sun Storage 7000 series Unified Storage Systems can only execute four commands in parallel, and the remaining commands are queued. To achieve better performance, Oracle VDI VDI intentionally overcommits the storage queue. If your storage becomes slow, for example because of a heavy load, it can take too long for queued commands to be executed, and if the commands take longer than the duration specified in the duration settings, the storage might be marked incorrectly as unresponsive. If this happens regularly, you can decrease the value of the `storage.max.commands` setting, but this might result in a decrease in performance when the storage is not so busy.

The interval settings rarely need to be changed because the commands are performed only by the primary host in an Oracle VDI Center. Decreasing the value of these settings results in more up-to-date information about the storage disk space and a quicker detection of unresponsive storage hosts, but also increases the load on the storage hosts. It is best to keep these settings at their defaults.

The duration settings include a good safety margin. Only change the duration settings if the storage is not able to execute the commands in the allotted time.

### 7.4.5. About Block Alignment

Classic hard disks have a block size of 512 bytes. Depending on the guest operating system of the virtual machine, one logical block of the guest file system can use two blocks on the storage. This is known as block misalignment. Figure 7.2 shows an example. It is best to avoid block misalignment because it doubles the IO on the storage to access a block of the guest OS file system (assuming a complete random access pattern and no caching).

![Figure 7.2. Examples of Misaligned and Aligned Blocks with Sun ZFS Storage](image)

By default, Windows XP does not correctly align partitions and the blocks are misaligned. Usually Windows Vista and Windows 7 do align partitions correctly and the blocks are aligned.

### Checking the Block Alignment

Typically a single partition on a disk starts at disk sector 63. To check the alignment of a Windows partition, use the following command:

```
wmic partition get StartingOffset, Name, Index
```

The following is an example of the output from this command:

```
Index Name StartingOffset
0 Disk #0, Partition #0 32256
```
To find the starting sector, divide the StartingOffset value by 512 (the block size of the hard disk):

\[32256 \div 512 = 63\]

An NTFS cluster is typically 4 kilobytes in size. So the first NTFS cluster starts at disk sector 63 and ends at disk sector 70.

Storage types that use the Zettabyte File System (ZFS) file system have a default block size of 8 kilobytes. So on the storage, the fourth ZFS block maps to disk sectors 48 to 63, and the fifth ZFS block sector maps to disk sectors 64 to 79.

Storage types that use that use the Oracle Cluster File System version 2 (OCFS2) have a default block size of 4 kilobytes. So on the storage, the eighth OCFS2 block maps to disk sectors 56 to 63, and the ninth OCFS2 block sector maps to disk sectors 64 to 73.

A misalignment occurs on both storage types because more than one block on the storage must be accessed to access the first NTFS cluster, as shown in Figure 7.2.

For a correct block alignment, the StartingOffset value must be exactly divisible by either 8192 or 4096, depending on the block size used by the file system on the storage.

In the following example, the blocks are misaligned:

```
wmic partition get StartingOffset, Name, Index
Index Name                   StartingOffset
0     Disk #0, Partition #0  32256
```

\[32556 \div 8192 = 3.97412109\]

\[32556 \div 4096 = 7.94824219\]

In the following example, the blocks are aligned:

```
wmic partition get StartingOffset, Name, Index
Index Name                   StartingOffset
0     Disk #0, Partition #0  32768
```

\[32768 \div 8192 = 4\]

\[32768 \div 4096 = 8\]

### Correcting Block Alignment

On Windows 2003 SP1 and later, the `diskpart.exe` utility has an Align option to specify the block alignment of partitions. For Windows XP, use a third-party disk partitioning tool such as `parted` to create partitions with a defined start sector, see the example that follows. For other operating systems, refer to your system documentation for details of how to align partitions.

### Example of How to Prepare a Disk for Windows XP with Correct Block Alignment

In this example, the disk utilities on a bootable live Linux system, such as Knoppix, are used to create a disk partition with the blocks aligned correctly.

1. Create a new virtual machine.
2. Assign the ISO image of the live Linux system to the CD/DVD-ROM drive of the virtual machine.
3. Boot the virtual machine.
4. Open a command shell and become root.
5. Obtain the total number of sectors of the disk.
About Block Alignment

Use the `fdisk -ul` command to obtain information about the disk.

In the following example, the disk has 20971520 sectors:

```
# fdisk -ul
Disk /dev/sda doesn't contain a valid partition table
Disk /dev/sda: 10.7 GB, 10737418240 bytes
255 heads, 63 sectors/track, 1305 cylinders, total 20971520 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x00000000
```

6. Create an MS-DOS partition table on the disk.

Use the `parted <disk> mklabel msdos` command to create the partition table.

In the following example, a partition table is created on the /dev/sda disk:

```
# parted /dev/sda mklabel msdos
```

7. Create a new partition, specifying the start and end sectors of the partition.

Use the `parted <disk> mkpartfs primary fat32 64s <end-sector>s` command to create the partition. The `<end-sector>` is the total number of sectors of the disk minus one. For example if the disk has 20971520 sectors, the `<end-sector>` is 20971519.

Depending on the version of `parted` used, you might see a warning that the partition is not properly aligned for best performance. You can safely ignore this warning.

In the following example, a partition is created on the /dev/sda disk:

```
# parted /dev/sda mkpartfs primary fat32 64s 20971519s
```

8. Check that the partition is created.

Use the `parted <disk> print` command to check the partition.

In the following example, the /dev/sda disk is checked for partitions:

```
# parted /dev/sda print
Model: ATA VBOX HARDDISK (scsi)
Disk /dev/sda: 10.7GB
Sector size (logical/physical): 512B/512B
Partition Table: msdos
```

```
<table>
<thead>
<tr>
<th>Number</th>
<th>Start</th>
<th>End</th>
<th>Size</th>
<th>Type</th>
<th>File system</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>32.8kB</td>
<td>10.7GB</td>
<td>10.7GB</td>
<td>primary</td>
<td>fat32</td>
<td>lba</td>
</tr>
</tbody>
</table>
```

9. Shut down the virtual machine and unassign the ISO image.

10. Assign the Windows XP installation ISO image to the CD/DVD-ROM drive of the virtual machine.

11. Boot the virtual machine and install Windows XP.

12. When prompted, select the newly created partition.

13. (Optional) When prompted, change the file system from FAT32 to NTFS.

14. Complete the installation.
Networking

15. Log in to the Windows XP guest as an administrator.

16. Check that the StartingOffset is 32768.

```
wmic partition get StartingOffset, Name, Index
Index Name                StartingOffset
0   Disk #0, Partition #0  32768
```

7.5. Networking

The following is a list of the types of network traffic created by Oracle VDI. The list is ordered by bandwidth requirements, with highest bandwidth requirement listed first:

1. iSCSI traffic between VirtualBox and Microsoft Hyper-V virtualization hosts and storage hosts
2. RDP traffic between Oracle VDI hosts and virtualization hosts
3. ALP traffic between Sun Ray Clients and Oracle VDI hosts
4. RDP traffic between the RDP clients and Oracle VDI hosts or virtualization hosts
5. Database replication traffic between the master and slave database hosts in an Oracle VDI Center, or between the primary Oracle VDI host and the external database, if an external database is used
6. SSH and HTTPS traffic between Oracle VDI hosts and storage hosts, or between Oracle VDI hosts and virtualization hosts

By default the SSH traffic used for storage management and the iSCSI traffic used for virtual disks use the same network interface. For reasons such as security considerations, routing requirements, or traffic shaping, you might want to configure the iSCSI traffic to use a separate network interface. See Section 7.5.1, “How to Configure a Dedicated iSCSI Network”.

It is best practice to use link aggregation (also known as trunking or link bonding) for virtualization hosts and storage hosts. This results in a balanced use of the physical network interfaces, a better network throughput, as well as in the ability to keep an aggregated interface active if a physical interface goes down. To use link aggregation, you need a switch that supports the Link Aggregation Control Protocol (LACP). See Section 7.5.2, “How to Configure Link Aggregation”.

VLANs provide a way to tag and isolate network traffic and can improve performance and security. See Section 7.5.3, “How to Configure a VLAN”.

Link aggregation and VLANs can be used independently or together by tagging an aggregated link with a VLAN ID.

For Sun Ray Clients, see the following sections in the Sun Ray Software 5.3 Administration Guide for details of how to improve network performance:

- Network Troubleshooting
- Performance Tuning

7.5.1. How to Configure a Dedicated iSCSI Network

You can use a dedicated iSCSI network to separate the storage management traffic from the iSCSI traffic used for virtual disks.

The dedicated iSCSI network interface must be configured before the first virtual disk is created on the storage host.
Oracle VDI Manager Steps

1. In Oracle VDI Manager, go to Desktop Providers.
2. Select a desktop provider.
3. Go to the Storage tab.
4. Select a storage host and click Edit.
   The Edit Storage wizard is displayed.
5. Complete the steps of the Edit Storage wizard until you reach the Select ZFS Pool step.
6. On the Select ZFS Pool step, select a different network from the iSCSI Interface list.
7. Click Finish.

CLI Steps

- Edit the network address interface to use for ISCSI.

```
/opt/SUNWvda/sbin/vda provider-storage-setprops --storage=<storage-host> \
-p iscsi-interface=<interface-ip-address> <provider-name>
```

For example:
```
/opt/SUNWvda/sbin/vda provider-storage-setprops --storage=storage1.example.com \
-p iscsi-interface=192.168.50.1 vbox1.example.com
```

7.5.2. How to Configure Link Aggregation

Link aggregation (also known as trunking or link bonding) is a mechanism for combining one or more network interfaces to provide better throughput and failover capabilities. To use link aggregation, you need a switch that supports the Link Aggregation Control Protocol (LACP). The following provides separate configuration examples for Oracle Solaris and Oracle Linux platforms.

Steps for Oracle Solaris Platforms

In the following steps, you aggregate devices e1000g0 and e1000g1. You can list the available devices on your system using the `dladm` command:
```
# dladm show-dev
e1000g0 link: up speed: 1000 Mbps duplex: full
e1000g1 link: up speed: 1000 Mbps duplex: full
e1000g2 link: down speed: 0 Mbps duplex: half
e1000g3 link: down speed: 0 Mbps duplex: half
```

Interfaces e1000g0 and e1000g1 are connected to ports 0 and 1 respectively on the switch.

For further information about link aggregation, refer to the documentation for your Oracle Solaris release.

1. Identify the switch ports that each network interface in the aggregation uses.
   In this example, ports 0 and 1 are used.
2. Configure the switch to use aggregation (LACP) on ports 0 and 1.
   Consult the switch's documentation for instructions on how to do this.
3. Create the aggregation.

Consult the `dladm` man page for more information on the parameters below. The policy `(-P L3)` must match the policy you configured for the switch ports. The last parameter, `'1'`, indicates the aggregation key.

```
# dladm create-aggr -P L3 -l active -T short -d e1000g0 -d e1000g1 1
```

You can view the aggregated device with `dladm show-link` and `dladm show-aggr`.

```
# dladm show-link
e1000g0 type: non-vlan mtu: 1500 device: e1000g0
e1000g1 type: non-vlan mtu: 1500 device: e1000g1
e1000g2 type: non-vlan mtu: 1500 device: e1000g2
e1000g3 type: non-vlan mtu: 1500 device: e1000g3
aggr1 type: non-vlan mtu: 1500 aggregation: key 1
```

```
# dladm show-aggr
key: 1 (0x0001) policy: L3 address: 0:14:4f:40:d2:4a (auto)
device address speed duplex link state
e1000g0 0:14:4f:40:d2:4a 0 Mbps half down standby
e1000g1 80:9c:4c:0:80:fe 0 Mbps half down standby
```

4. To make the device persistent, create a hostname file with the IP address assigned to the device, and reboot.

```
# echo "192.168.1.101" > /etc/hostname.aggr1
# reboot -- -r
```

5. After the system is rebooted, verify that the device is plumbed and available.

```
# ifconfig -a
```

6. If this is an existing Oracle VM VirtualBox host, refresh the networks in Oracle VDI Manager.

Navigate to the Oracle VM VirtualBox desktop provider’s Network tab and click Refresh.

If you have more than one network or subnet, ensure that the correct network is selected in the Settings tab for each pool.

**Steps for Oracle Linux Platforms**

In the following steps, you aggregate devices eth1 and eth2.

You can list the available devices on your system using the `ifconfig` command.

For further information about link aggregation, refer to the documentation for your Oracle Linux release.

Interfaces eth1 and eth2 are connected to ports 1 and 2 respectively on the switch.

1. Identify the switch ports that each network interface in the aggregation uses.

   In this example, ports 1 and 2 are used.

2. Configure the switch to use aggregation (LACP) on ports 1 and 2.

   Consult the switch’s documentation for instructions on how to do this.

3. Create the aggregation.

   Create a file `ifcfg-bond0` in `/etc/sysconfig/network-scripts` with the following content:
4. Configure the eth1 and eth2 interfaces to use the aggregation.

Edit the `ifcfg-eth1` configuration file so that it contains only the following lines:

```
DEVICE=eth1
BOOTPROTO=None
ONBOOT=yes
MASTER=bond0
SLAVE=yes
```

Edit the `ifcfg-eth2` configuration file so that it contains only the following lines:

```
DEVICE=eth2
BOOTPROTO=None
ONBOOT=yes
MASTER=bond0
SLAVE=yes
```

In the interface configuration file, you can just comment out lines that are not needed.

5. Set up the kernel module parameters for the aggregation.

Add the following lines to `/etc/modprobe.conf`:

```
alias bond0 bonding
options bond0 miimon=100 mode=balance-rr
```

This sets the balancing mode to round robin and checks the card every 100 milliseconds. For other options, refer to `/usr/share/doc/iputils-20020927/README.bonding`.

6. Restart the host.

7. Use the `ifconfig` command to check that the bond0 interface is listed.

8. Check the bonding status.

   `cat /proc/net/bonding/bond0`

9. If this is an existing Oracle VM VirtualBox host, refresh the networks in Oracle VDI Manager.

   Navigate to the Oracle VM VirtualBox provider's `Network` tab and click `Refresh`.

   If you have more than one network or subnet, ensure that the correct network is selected in the `Settings` tab for each pool.

### 7.5.3. How to Configure a VLAN

VLANs provide a way to tag and isolate network traffic and can improve performance and security. Either a physical network interface or a link aggregation can be tagged with a VLAN ID.

**Steps for Oracle Solaris Platforms**

Oracle Solaris currently supports the following interface types for VLANs: ce, bge, xge, e1000g.
How to Configure a VLAN

For further information, refer to the documentation for your Oracle Solaris release.

1. Configure the switch ports used by the interfaces in the machine for the corresponding VLAN IDs (VIDs).

   Consult your switch documentation for instructions on how to do this.

2. Calculate the physical point of attachment (PPA).

   Each VLAN interface has a physical point of attachment (PPA) which needs to be calculated using the following formula: driver-name + VID * 1000 + device-instance.

   To calculate the PPA for e1000g0:

   ```
   driver-name = e1000g
   VID = 123
   device-instance = 0
   e1000g + 123 * 1000 + 0 = e1000g123000
   ```

   To calculate the PPA for aggr1:

   ```
   driver-name = aggr
   VID = 123
   device-instance = 1
   aggr + 123 * 1000 + 1 = aggr123001
   ```

3. With the PPA at hand, plumb the interface.

   ```
   # ifconfig e1000g123000 plumb 192.168.1.101 up
   ```

4. Make the changes persistent.

   ```
   # echo "192.168.1.101" > /etc/hostname.e1000g123000
   # ifconfig -a
   ```

5. If this is an existing Oracle VM VirtualBox host, refresh the networks in Oracle VDI Manager.

   Navigate to the Oracle VM VirtualBox desktop provider's Network tab and click Refresh.

   If you have more than one network/subnet ensure that the correct network is selected in the Settings tab for each pool.

Steps for Oracle Linux Platforms

In the following example VLAN ID (VID) 3 is used with the physical interface eth0.

1. Configure the switch ports used by the interfaces in the machine for the corresponding VIDs.

   Consult your switch documentation for instructions on doing this.

2. Create the new VLAN interface.

   ```
   DEVICE=eth0.3
   BOOTPROTO=static
   ONBOOT=yes
   IPADDR=IP of the new VLAN interface
   NETMASK=netmask of the VLAN interface
   VLAN=yes
   ```

3. Bring up the new interface.
4. Use the `ifconfig` command to check that the eth0.3 interface is listed.

5. If this is an existing Oracle VM VirtualBox host, refresh the networks in Oracle VDI Manager. Navigate to the Oracle VM VirtualBox desktop provider's **Network** tab and click **Refresh**. If you have more than one network/subnet ensure that the correct network is selected in the **Settings** tab for each pool.

### 7.6. Virtual Machines

#### 7.6.1. How to Configure Desktop Resources Per Pool (Oracle VDI Provider)

With Oracle VDI, you can configure Desktop Resource settings for all desktops within a specific pool. The settings only apply to pools that use an Oracle VM VirtualBox desktop provider.

**Oracle VDI Manager Steps**

1. In Oracle VDI Manager, go to **Pools**.
2. Select a pool.
3. Go to the **Settings** tab.
4. In the Desktop Resources section, configure the resource settings.


5. Click Save.

**CLI Steps**


   ```bash
   # /opt/SUNWvda/sbin/vda pool-setprops -p prop1=value1, prop2=value2 pool name
   
   In the following example, the CPU usage is set to 70% for the pool named MyPool.
   
   # /opt/SUNWvda/sbin/vda pool-setprops -p cpu-cap=70 MyPool
   ```

2. Check the Desktop Resource settings.

   ```bash
   # /opt/SUNWvda/sbin/vda pool-getprops -p cpu-cap pool name
   
   CPU Execution Cap: 70
   ```

#### 7.6.1.1. Available Desktop Resource Settings

The following table lists the Desktop Resource settings available to pools that use an Oracle VM VirtualBox desktop provider. The settings apply to all desktops in the pool.

<table>
<thead>
<tr>
<th>Setting</th>
<th>CLI Property</th>
<th>Description</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Usage</td>
<td><code>cpu-cap</code></td>
<td>Controls how much CPU time a virtual CPU can use, expressed as a percentage.</td>
<td>100</td>
</tr>
</tbody>
</table>
### Optimizing Windows 7 Desktop Images

#### Block Alignment

The alignment of the blocks on the virtual disk can have a significant impact on the performance of the storage. See Section 7.4.5, “About Block Alignment” for details of how to correct the block alignment.

#### Cloning Preparation for Oracle VM VirtualBox and Microsoft Hyper-V

**Oracle VDI Fast Preparation (FastPrep)** and **Windows System Preparation (Sysprep)** enable cloning of Windows desktops by Oracle VDI. Oracle VDI FastPrep can be configured within a pool without any desktop preparation. Before enabling Windows System Preparation for a pool, the desktop must be prepared using the steps below.

1. **Disable the Windows Media Player Network Sharing Service.**

   Due to a bug in Windows 7, the Windows Media Player Network Sharing Service causes the Windows Sysprep tool to hang. If you do not need this service enabled in your Windows 7 desktops and you intend to run System Preparation from Oracle VDI Manager, stop and disable it. If you prefer to leave this service enabled, run Sysprep manually from within the template before importing it.

   - For details about disabling Windows services, see "Security and Services" in Section 7.6.2, “Optimizing Windows 7 Desktop Images”.
   - To run Sysprep manually:

   ```shell
   sysprep.exe -generalize -oobe -shutdown -quiet
   ```

2. **(Microsoft Hyper-V Only) Install the Oracle VDI Tools on the template.**

<table>
<thead>
<tr>
<th>Setting</th>
<th>CLI Property</th>
<th>Description</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memory Sharing</td>
<td>memory-sharing</td>
<td>Controls the amount of memory shared between desktops, expressed as a percentage between 0 and 75.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For more information, see Section 4.1.1, “About Oracle VM VirtualBox”.</td>
<td></td>
</tr>
<tr>
<td>Memory Paging</td>
<td>memory-paging</td>
<td>Controls whether or not memory paging is used for similar running virtual machines.</td>
<td>Disabled</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For more information, see Section 4.1.1, “About Oracle VM VirtualBox”.</td>
<td></td>
</tr>
<tr>
<td>Asynchronous Disk I/O</td>
<td>async-io</td>
<td>Enables or disables asynchronous disk I/O.</td>
<td>Enabled</td>
</tr>
<tr>
<td></td>
<td></td>
<td>This feature is not supported by IDE controllers.</td>
<td></td>
</tr>
<tr>
<td>Limited Data Rate</td>
<td>Enabled if Maximum Data Rate is set</td>
<td>Enable or disable the ability to limit bandwidth.</td>
<td>Disabled</td>
</tr>
<tr>
<td>Maximum Data Rate</td>
<td>bandwidth-ctl</td>
<td>Limit the maximum bandwidth used for asynchronous I/O, expressed as megabytes per second (MB/s).</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The Limited Data Rate setting must be enabled</td>
<td></td>
</tr>
</tbody>
</table>

---

7.6.2. Optimizing Windows 7 Desktop Images

**Block Alignment**

The alignment of the blocks on the virtual disk can have a significant impact on the performance of the storage. See Section 7.4.5, “About Block Alignment” for details of how to correct the block alignment.

**Cloning Preparation for Oracle VM VirtualBox and Microsoft Hyper-V**

*Oracle VDI Fast Preparation (FastPrep)* and *Windows System Preparation (Sysprep)* enable cloning of Windows desktops by Oracle VDI. Oracle VDI FastPrep can be configured within a pool without any desktop preparation. Before enabling Windows System Preparation for a pool, the desktop must be prepared using the steps below.

1. **Disable the Windows Media Player Network Sharing Service.**

   Due to a bug in Windows 7, the Windows Media Player Network Sharing Service causes the Windows Sysprep tool to hang. If you do not need this service enabled in your Windows 7 desktops and you intend to run System Preparation from Oracle VDI Manager, stop and disable it. If you prefer to leave this service enabled, run Sysprep manually from within the template before importing it.

   - For details about disabling Windows services, see "Security and Services" in Section 7.6.2, “Optimizing Windows 7 Desktop Images”.
   - To run Sysprep manually:

   ```shell
   sysprep.exe -generalize -oobe -shutdown -quiet
   ```

2. **(Microsoft Hyper-V Only) Install the Oracle VDI Tools on the template.**
The System Preparation action in the Template tab will not work if you do not have the tools (vda-tools-x86.msi for 32-bit platforms or vda-tools-x64.msi for 64-bit platforms) installed on your template.

**Appearance and Personalization**

1. Go to the Personalization menu.

   Right-click on the desktop and select Personalize.

   Or, select Start, Control Panel, Appearance and Personalization, then Personalization.

2. Set a plain desktop background.
   a. Select Desktop Background from the Personalization menu.
   b. Select Solid Colors in the Picture Location menu.

3. Configure the screen saver.

   If you want to use the Oracle VM VirtualBox Auto-Logon feature, disable the screen saver. Otherwise, set a blank screen saver with password protect on resume.
   a. Select Screen Saver from the Personalization menu.
   b. Either set the screen saver to [None] to disable it, or set the screen saver to Blank and select On resume, display logon screen.

   a. Select Sound from the Personalization menu.
   b. On the Sounds tab, select No Sounds under Sound Scheme.

5. (VRDP Only) Change mouse pointers.
   a. Select Change mouse pointers from the left sidebar of the Personalization menu.
   b. In the Scheme menu, select Windows Black (system scheme).

6. Save your settings as a Theme.
   a. Select Save theme from the Personalization menu.
   b. Choose a name for the theme.

7. Go to the Display menu.

   Select Start, Control Panel, Appearance and Personalization, then Display.

8. Ensure hardware acceleration is enabled.
   a. Select Change display settings in the left sidebar, then click Advanced Settings.
   b. Select the Troubleshoot tab, then Change settings, and ensure that the Hardware acceleration is set to Full.
System and Security

1. Go to the System and Maintenance menu.
   Select Start, Control Panel, then System and Security.

2. Optimize visual effects performance.
   a. Select System from the System and Security menu.
   b. Select Advanced system settings in the left sidebar. Then select Settings under the Performance heading on the Advanced tab.
      For a less drastic option, select Let Windows choose what's best for my computer.

3. Install Windows updates.
   a. Select Windows Update from the System and Security menu.
   b. Select Check for updates, then Install updates.

4. (VMware vCenter Only) Configure power management.
   a. Configure power management on the guest operating system.
      i. Select Power Options from the System and Security menu.
      ii. Click Change when the computer sleeps in the left sidebar, and set the desired value.
   b. Configure power management in the Virtual Infrastructure Client.
      i. Open the Virtual Infrastructure Client.
      ii. Right-click on the desired virtual machine and go to Edit Settings.
      iii. Go to Options, then Power Management, and select Suspend the Virtual Machine.

5. Run defragmentation and turn off scheduled defragmentation.
   a. Select Defragment your hard drive under the Administrative Tools heading, on the System and Security menu.
   b. If under Schedule you see Scheduled defragmentation is turned on, select Configure Schedule. Ensure the Run on a schedule box is not checked.
   c. Then choose a disk and select Defragment disk.

6. Disable unwanted services.
   a. Select Administrative Tools from the System and Security menu.
   b. Select Services.
      As a minimum, disable the Windows Search Service, the SuperFetch Service, and the Disk Defragmenter Service.
   c. Right click on the service name and select Properties.
d. Choose Disabled for the Startup type.
e. Stop service by right clicking on it and selecting Stop.

7. Disable scheduled virus scanners.
   a. Select Schedule tasks under the Administrative Tools heading, on the System and Security menu.
   b. In the left sidebar, open the Task Scheduler Library and navigate your virus scanner's folder.
   c. In the right sidebar, select Disable.
   d. Disable any other unwanted tasks.

Other Optimizations

• Choose which programs start when Windows starts.
  1. Select Start, All Programs, Accessories, then Run.
  2. Type ‘msconfig’ and click OK.
  3. Select the Startup tab.
  4. Uncheck any programs that you do not want Windows to run at startup.

• Reduce recycle bin drive space usage.
  1. By default, the Recycle Bin is located on the Desktop. Right-click on it, then select Properties.
  2. On the General tab, select Custom size, and enter the desired value.

• Run Disk Cleanup.
  1. Select Start, then Computer.
  2. Right click on Local Disk (C:) and select Properties.
  3. Click Disk Cleanup on the General tab.

7.6.3. Optimizing Windows Vista Desktop Images

Block Alignment

The alignment of the blocks on the virtual disk can have a significant impact on the performance of the storage. See Section 7.4.5, “About Block Alignment” for details of how to correct the block alignment.

Cloning Preparation for Oracle VM VirtualBox and Microsoft Hyper-V

Oracle VDI Fast Preparation (FastPrep) and Windows System Preparation (Sysprep) enable cloning of Windows desktops by Oracle VDI. Oracle VDI FastPrep can be configured within a pool without any desktop preparation.

Before enabling Windows System Preparation for a pool that uses Microsoft Hyper-V as the desktop provider, install the Oracle VDI Tools on the template. The System Preparation action in the Template tab will not work if you do not have the tools (vda-tools-x86.msi for 32-bit platforms or vda-tools-x64.msi for 64-bit platforms) installed in your template.
Appearance and Personalization

1. Go to the **Personalization** menu.
   
   Right-click on the desktop and select **Personalize**.
   
   Or, select **Start, Control Panel, Appearance and Personalization**, then **Personalization**.

2. Set a plain desktop background.
   
   a. Select **Desktop Background** from the **Personalization** menu.
   
   b. Select **Solid Colors** in the **Picture Location** menu.

3. Configure the screen saver.
   
   If you want to use the Oracle VM VirtualBox Auto-Logon feature, disable the screen saver. Otherwise, set a blank screen saver with password protect on resume.
   
   a. Select **Screen Saver** from the **Personalization** menu.
   
   b. Either set the screen saver to [None] to disable it, or set the screen saver to **Blank** and select **On resume, display logon screen**.

   
   a. Select **Sounds** from the **Personalization** menu.
   
   b. On the **Sounds** tab, select **No Sounds** under **Sound Scheme**.

5. (VRDP Only) Change mouse pointers.
   
   a. Select **Mouse Pointers** from the **Personalization** menu.
   
   b. In the **Scheme** menu, select **Windows Black (system scheme)**.

6. Save your settings as a Theme.
   
   a. Select **Theme** from the **Personalization** menu.
   
   b. On the **Themes** tab, under the **Theme** menu, **Modified Theme** should be highlighted because personalization settings have been changed. If it is not highlighted, it is possible your personalization changes were not saved.
   
   c. Select **Save As**, and choose a name for the theme.

7. Ensure hardware acceleration is enabled.
   
   a. Select **Display Settings** from the **Personalization** menu.
   
   b. Click **Advanced Settings** and then **Change settings** on the **Troubleshoot** tab.
   
   c. Ensure that the **Hardware acceleration** is set to **Full**.

System and Maintenance

1. Go to the **System and Maintenance** menu.
   
   Select **Start, Control Panel**, then **System and Maintenance**.
2. Optimize visual effects performance.
   a. Select **System** from the **System and Maintenance** menu.
   b. Click **Advanced system settings** in the left sidebar. Then click the **Settings** button under **Performance** on the **Advanced** tab.
   c. On the **Visual Effects** tab, choose **Adjust for best performance**.
      
      For a less drastic option, select **Let Windows choose what's best for my computer**.

3. (VMware vCenter Only) Configure power management.
   a. Configure power management on the guest operating system.
      
      i. Select **Change when the computer sleeps** under the **Power Options** heading, on the **System and Maintenance** menu.
      
      ii. Click **Change when the computer sleeps** in the left sidebar, and set the desired value.
   b. Configure power management in the Virtual Infrastructure Client.
      
      i. Open the Virtual Infrastructure Client.
      
      ii. Right-click on the desired virtual machine and go to **Edit Settings**.
      
      iii. Go to **Options**, then **Power Management**, and select **Suspend the Virtual Machine**.

4. Run defragmentation and turn off scheduled defragmentation.
   a. Select **Defragment your hard drive** under the **Administrative Tools** heading, on the **System and Maintenance** menu.
   b. Ensure the **Run on a schedule** box is not checked.
   c. Then select **Defragment now**.

5. Disable unwanted services.
   a. Select **Administrative Tools** from the **System and Maintenance** menu.
   b. Select **Services**.
      
      As a minimum, disable the Indexing Service, the SuperFetch Service, and the Disk Defragmenter Service.
   c. Right click on the service name and select **Properties**.
   d. Choose **Disabled** for the Startup type.
   e. Stop service by right clicking on it and selecting **Stop**.

6. Disable scheduled virus scanners.
   a. Select **Schedule tasks** under the **Administrative Tools** heading, on the **System and Maintenance** menu.
   b. In the left sidebar, open the **Task Scheduler Library** and navigate your virus scanner’s folder.
c. In the right sidebar, select Disable.
d. Disable any other unwanted tasks.

Other Optimizations

- Install Windows updates.
  1. Select Start, then Control Panel.
  2. Select Check for updates, then Install updates.
- Choose which programs start when Windows starts.
  1. Select Start, All Programs, Accessories, then Run.
  2. Type 'msconfig' and click OK.
  3. Select the Startup tab.
  4. Uncheck any programs that you do not want Windows to run at startup.
- Reduce recycle bin drive space usage.
  1. By default, the Recycle Bin is located on the Desktop. Right-click on it, then select Properties.
  2. On the General tab, select Custom size, and enter the desired value.
- Run Disk Cleanup.
  1. Select Start, then Computer.
  2. Right click on Local Disk (C:) and select Properties.
  3. Click Disk Cleanup on the General tab.

7.6.4. Optimizing Windows XP Desktop Images

Block Alignment

The alignment of the blocks on the virtual disk can have a significant impact on the performance of the storage. See Section 7.4.5, “About Block Alignment” for details of how to correct the block alignment.

Cloning Preparation for Oracle VM VirtualBox and Microsoft Hyper-V

Oracle VDI Fast Preparation (FastPrep) and Windows System Preparation (Sysprep) enable cloning of Windows desktops by Oracle VDI. Oracle VDI FastPrep can be configured within a pool without any desktop preparation. Before enabling Windows System Preparation for a pool, the desktop must be prepared using the steps below.

1. (Microsoft Hyper-V Only) Install the Oracle VDI Tools on the template.

   The System Preparation action in the Template tab will not work if you do not have the tools (vda-tools-x86.msi for 32-bit platforms or vda-tools-x64.msi for 64-bit platforms) installed on your template.

2. Install System Preparation.
a. Log in to the template and download the appropriate Windows XP Deployment Tools for your version of Windows XP.


b. Create a directory on the virtual machine named C:Sysprep.

c. Unpack the contents of the Windows XP Deployment Tools (deploy.cab) into the C:Sysprep directory.

Appearance and Themes

1. Go to the Display Properties menu.
   Right-click on the desktop and select Properties.
   Or, select Start, Control Panel, Appearance and Themes, then Change the computer's theme.

2. Set a plain desktop background.
   a. Select the Display tab from the Display Properties menu.
   b. Under Background, select None.
   c. Select Apply.

3. Configure the screen saver.
   If you want to use the Oracle VM VirtualBox Auto-Logon feature, disable the screen saver. Otherwise, set a blank screen saver with password protect on resume.
   a. Select Screen Saver from the Display Properties menu.
   b. Either set the screen saver to [None] to disable it, or set the screen saver to Blank and select On resume, display logon screen.
   c. Select Apply.

4. Ensure hardware acceleration is enabled.
   a. Select the Settings tab from the Display Properties menu.
   b. Then select Advanced.
   c. On the Troubleshooting tab, ensure that the Hardware acceleration is set to Full.
   d. Select Apply.

5. Save your settings as a Theme.
   a. Select Themes tab from the Display Properties menu.
   b. Under the Theme menu, Modified Theme should be highlighted because display properties have been changed. If it is not highlighted, it is possible your personalization changes were not saved.
c. Select **Save As**, and choose a name for the theme.

**Performance and Maintenance**

1. Go to the **Performance and Maintenance** menu.
   
   Select **Start**, **Control Panel**, then **Performance and Maintenance**.

2. Optimize visual effects performance.
   
   a. Select **Adjust visual effects** from the **Performance and Maintenance** menu.
   
   b. On the **Visual Effects** tab, choose **Adjust for best performance**.
      
      For a less drastic option, select **Let Windows choose what's best for my computer**.

3. (VMware vCenter Only) Configure power management.
   
   a. Configure power management on the guest operating system.
      
      i. Select **Power Options** from the **Performance and Maintenance** menu.
      
      ii. Set the **System standby** time to the desired value.
   
   b. Configure power management in the Virtual Infrastructure Client.
      
      i. Open the Virtual Infrastructure Client.
      
      ii. Right-click on the desired virtual machine and go to **Edit Settings**.
      
      iii. Go to **Options**, then **Power Management**, and select **Suspend the Virtual Machine**.

4. Disable scheduled virus scanners.
   
   a. Select **Scheduled tasks** from the **Performance and Maintenance** menu.
   
   b. Right-click the virus scanner, and select **Properties**.
   
   c. Uncheck the **Enabled (scheduled task runs at specified time)** box.
   
   d. Disable any other unwanted tasks.

5. Disable unwanted services.
   
   a. Select **Administrative Tools** from the **Performance and Maintenance** menu.
   
   b. Select **Services**.
      
      As a minimum, disable the Indexing Service.
   
   c. Right click on the service name and select **Properties**.
   
   d. Choose **Disabled** for the Startup type.
   
   e. Stop service by right clicking on it and selecting **Stop**.

6. Run defragmentation.
a. Select **Administrative Tools** from the **Performance and Maintenance** menu.
b. Select **Computer Management**, then **Disk Defragmenter** from the left sidebar.
c. Select a disk, then **Defragment**.

**Other Optimizations**

- Turn off automatic defragmentation.
  1. Select **Start**, then **Run**.
  2. Type 'regedit' and click **OK**.
  3. In the registry editor, go to `HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Dfrg`.
  4. Select **BootOptimizeFunction**.
  5. In the right side of the registry editor, check if **Enable** already exists. If it does not exist, create it.
     - Right click on the right side of the registry editor.
     - Select **New**, then **String Value**. Name it "Enable".
  6. Select **Enable**, and enter 'N' to turn off automatic disk defragmentation.

- Choose which programs start when Windows starts.
  1. Select **Start**, the **Run**.
  2. Type 'msconfig' and click **OK**.
  3. Select the **Startup** tab.
  4. Uncheck any programs that you do not want Windows to run at startup.

- Disable Windows sounds.
  1. Select **Start**, **Control Panel**, **Sounds, Speech, and Audio Devices**, then **Change the sound scheme**.
  2. On the **Sounds** tab, select **No Sounds** under **Sound scheme**.
  3. Select **Apply**.

- (VRDP Only) Change mouse pointers.
  1. Select **Start**, **Control Panel**, **Printers and Other Hardware**, then **Mouse**.
  2. On the **Pointers** tab, select **Windows Black (system scheme)** in the **Scheme** menu.
  3. Select **Apply**.

- Install Windows updates.
  1. Select **Start**, then **All Programs**.
  2. Select **Windows Update**.
• Reduce recycle bin drive space usage.
  1. By default, the Recycle Bin is located on the Desktop. Right-click on it, then select Properties.
  2. On the Global tab, select Use one setting for all drives.
  3. Move the slider to the desired value.
• Run Disk Cleanup.
  1. Go to Start, then My Computer.
  2. Right click on Local Disk (C:) and select Properties.
  3. On the General tab, click Disk Cleanup.

7.6.5. Optimizing Desktop Images for Other Operating Systems

The following are some basic guidelines for optimizing desktop performance for other operating systems:

• The alignment of the blocks on the virtual disk can have a significant impact on the performance of the storage. See Section 7.4.5, "About Block Alignment" for details of how to correct the block alignment.
• Do not use desktop wallpaper.
• Do not use scheduled virus scanners.
• Do not use scheduled defragmentation.
• (VRDP Only) Do not use a mouse pointer theme that uses alpha blending.
8.1. How to Log in to Oracle VDI Manager

The following are the supported client platforms and browsers for Oracle VDI Manager:

<table>
<thead>
<tr>
<th>Client Operating System</th>
<th>Supported Browsers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microsoft Windows</td>
<td>Firefox 3.6</td>
</tr>
<tr>
<td></td>
<td>Internet Explorer 8</td>
</tr>
<tr>
<td>Oracle Solaris</td>
<td>Firefox 3.6</td>
</tr>
<tr>
<td>Linux</td>
<td>Firefox 3.6</td>
</tr>
</tbody>
</table>

1. Using a browser, go to https://<server-name>:1800
   If you enter an http:// URL, you are redirected to the https:// URL.
   The browser displays a security warning and prompts you to accept the security certificate.

2. Accept the security certificate.
A login page is displayed.

3. Log in as an administrator.

By default, the root user on the host is an administrator.

Log in with the user name root and root's password.

For more information on administrators, see Section 8.2, “Oracle VDI Administrators”.

8.2. Oracle VDI Administrators

8.2.1. About Oracle VDI Role-Based Administration

Oracle VDI administrators can be any valid user on an Oracle VDI host. They are identified by their login name. To able to administer Oracle VDI from any host in an Oracle VDI Center, the user account must exist on all hosts. Otherwise a user can only administer Oracle VDI on the hosts on which they have a user account.

By default, the root user is the only administrator on an Oracle VDI host. Other users can be granted administrative privileges. Oracle VDI uses role-based access control to restrict system access to the two main administrative areas, Companies and Desktop Providers. There are predefined roles to which administrators can be assigned to perform a job function.

There are three types of role:

- Administrator: This type has full read and write access to an area.
- Operator: This type has limited access to an area.
- Monitor: This type has read-only access to an area.

There are six roles available in Oracle VDI:

- Primary Administrator
  This role has full access to Oracle VDI. It can create, edit, and remove companies. The role inherits the Company Administrator and Desktop Provider Administrator roles.

- Company Administrator
  This role can create and delete pools. It provides full access to the template management. The role inherits the Company Operator role.

- Company Operator
  This role can edit pool settings and assign users to pools. It provides full access to the desktops. The role inherits the Company Monitor role.

- Company Monitor
  This role can view all details in the Users and Pools area.

- Desktop Provider Administrator
  This role can create, edit and delete desktop providers, and edit all settings. The role inherits the Desktop Provider Monitor role.
• Desktop Provider Monitor

This role can view all details in the Desktop Provider area.

The root user is always a Primary Administrator. This user cannot change role or be deleted from the list of administrators.

An administrator can be assigned more than one role but there are restrictions on the combinations. An administrator can have only one of the following:

• Primary Administrator role
• One Company role
• One Desktop Provider role
• One Company role and one Desktop Provider role

Role-Based Administration in Oracle VDI Manager

The appearance of Oracle VDI Manager is restricted depending on the roles assigned to the administrator. The top-level categories are shown only if the administrator has the required viewing rights for that category, as follows:

• The Users and Pools areas are shown to Company roles and the Primary Administrator role.
• The Desktop Provider area is shown to Desktop Provider roles and the Primary Administrator role.
• The Settings area is shown to the Primary Administrator role.

Cross-area links are disabled, if the administrator does not have the required viewing rights for the target area of the link.

Within an area, the appearance of Oracle VDI Manager is not changed depending on the roles assigned to the administrator. All buttons or action items appear active. When an administrator attempts to perform the operation that is not permitted, the operation fails and the following message is displayed:

You do not have sufficient administration rights to perform this operation.

Role-Based Administration on the Command Line

The vda command can be run by root and non-root users. All other Oracle VDI commands must be run by root.

Every time a non-root user runs a vda command, they are prompted to provide a password.

To run a vda command with an identity other than the current user, set the VDA_USERNAME environment variable to the required user name. When you run a command in this way, you enter the password of the VDA_USERNAME user.

If the administrator does not have the permission to run a vda subcommand, the command fails and the following message is displayed:

You do not have sufficient administration rights to perform this operation.

Role-Based Administration and Oracle VDI Web Services

Role-Based administration applies to Oracle VDI web services. A com.sun.vda.service.api.ServiceException is thrown if the credentials provided do not have the permissions to perform the requested operation.
8.2.2. How to Create Administrators and Assign Roles

To assign an administrator to a role, the administrator must be a valid user on the Oracle VDI host.

For more information about administrators and roles, see Section 8.2.1, “About Oracle VDI Role-Based Administration”.

Using Oracle VDI Manager, a Primary Administrator cannot edit their own role assignment, or remove their own user name from the list of administrators. These tasks must be performed by another Primary Administrator.

Oracle VDI Manager Steps

1. Log in to Oracle VDI Manager as a Primary Administrator.

   Only a Primary Administrator can assign administration privileges. By default, the root user is a Primary Administrator.

2. Go to Settings → VDI Center.

3. Go to the Administrator tab.

   A list of configured administrators and their roles is displayed.

4. Add an administrator.

   a. Click the New button.
   
   b. Type the login name of the administrator.
   
   c. Click OK.

   The new administrator is added to the list and is assigned the Company Monitor role by default.

5. (Optional) Edit the role assignments for an administrator.

   a. In the list of administrators, click the administrator user name.

      The Role Assignment list is displayed.

   b. Select the check box for the role(s) you want to assign to the administrator and click the Save button.

   c. Click the Save button.

      A message is displayed that confirms the role assignments are updated.

CLI Steps

1. On an Oracle VDI host and log in as a Primary Administrator.

   Only a Primary Administrator can assign administration privileges. By default, the root user is a Primary Administrator.

2. Check whether the user is an administrator.

   # /opt/SUNWvda/sbin/vda admin-list

3. List the available roles.
4. Assign roles to an administrator.

    # /opt/SUNWvda/sbin/vda admin-assign -r <role>,<role>... <username>

For example:

    # /opt/SUNWvda/sbin/vda admin-assign -r company.monitor,provider.operator jsmith

8.3. Checking Oracle VDI Services and Logs

This section describes how to check the status of the various services provided by Oracle VDI and how to check the log files for troubleshooting purposes. On Oracle Solaris platforms, some services also run under the control of the Service Management Facility (SMF).

The Oracle VDI Service and Center Agent run as modules in the Common Agent Container (Cacao). If you encounter any issues, check the status of Cacao and the modules, as well as the status of the Oracle VDI services.

8.3.1. How to Check the Status of the Oracle VDI Center

Use the `vda-center status` command to check the status of an Oracle VDI Center. This command obtains information from the individual hosts in the Oracle VDI Center. For each host, the status of the host, the database role of the host (if the embedded MySQL Server database is used), and the status of the Oracle VDI Center service is shown.

- Run the following command as root:

    # /opt/SUNWvda/sbin/vda-center status

For example:

<table>
<thead>
<tr>
<th>HOST NAME</th>
<th>HOST STATUS</th>
<th>SERVICE</th>
<th>SERVICE STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>primary.example.com</td>
<td>Up</td>
<td>VDI Database Replication</td>
<td>Up</td>
</tr>
<tr>
<td>secondary.example.com</td>
<td>Up</td>
<td>VDI Database</td>
<td>Up</td>
</tr>
</tbody>
</table>

2 host(s) in center.

In case of problems, check the log files for messages beginning `com.sun.vda.cluster`, see Section 8.3.2, “How to Check the Oracle VDI Log Files”.

8.3.2. How to Check the Oracle VDI Log Files

Events for Oracle VDI events are logged in the Cacao log files in the following locations:

- Oracle Solaris platforms: `/var/cacao/instances/vda/logs/cacao.0`
- Oracle Linux platforms: `/var/opt/sun/cacao2/instances/vda/logs/cacao.0`

Log messages at SEVERE or WARNING level are also forwarded to the syslog daemon.

8.3.3. How to Change Logging for Oracle VDI

By default, all Oracle VDI events are logged in the Cacao log files. The default maximum log file size is 95 megabytes. When the limit is reached, the current log file is closed and a new one created. By default, Oracle VDI retains ten log files. You can change the logging level, the number of log files, and the log file size limit.
Changing the Logging Level

1. Display a list of the available log filter levels.
   Run the following command as root:
   ```
   # cacaoadm list-filters -l -i vda
   ```
   On Linux platforms, the `cacaoadm` command is in `/opt/sun/cacao2/bin`.
   The logging levels are from SEVERE (shows the least detail) to FINEST (shows the most detail).

2. Change the logging level.
   Run the following command as root:
   ```
   # cacaoadm set-filter -p com.sun.vda.service=<log-level> -i vda
   ```
   For example, to decrease the logging level to log informational messages:
   ```
   # cacaoadm set-filter -p com.sun.vda.service=INFO -i vda
   ```
   For example, to reset the logging level to the default for the Oracle VDI service:
   ```
   # cacaoadm set-filter -p com.sun.vda.service=ALL -i vda
   ```

3. Restart Cacao.
   After changing the logging level, you must restart Cacao for the change to take effect.
   Run the following command as root:
   ```
   # cacaoadm stop -f -i vda
   # cacaoadm start -i vda
   ```

Changing the Log History and Log File Size

1. Stop Cacao.
   Run the following command as root:
   ```
   # cacaoadm stop -f -i vda
   ```

2. Change the number of log files Oracle VDI retains.
   Run the following command as root:
   ```
   # cacaoadm set-param log-file-count=<num> -i vda
   ```
   where `<num>` is the number of log files to retain. The default is 10.

3. Change the log file size limit.
   Run the following command as root:
   ```
   # cacaoadm set-param log-file-limit=<size> -i vda
   ```
   where `<size>` is the maximum size of the log files in bytes. The default is 100000000. The maximum allowed is 2147483647.

4. Check that the configuration changes have taken effect.
Run the following command as root:

```
# cacaoadm list-params -i vda
```

5. Restart Cacao.

Run the following command as root:

```
# cacaoadm start -i vda
```

### 8.3.4. How to Check the Status of the Oracle VDI Database

With Oracle VDI, you can use the embedded MySQL Server database, or connect to your own remote MySQL database. Use the `vda-db-status` command to check the status of either database type.

- Run the following command as root.

```
# /opt/SUNWvda/sbin/vda-db-status
```

For example:

```
# /opt/SUNWvda/sbin/vda-db-status
Ip/Hostname Database host                               Role    Status
----------------------------------------------------------------------
primary.example.com                                     Master  up
secondary.example.com                                   Slave   up
```

On Oracle Solaris platforms, you can also check the status of the Oracle VDI database using the Service Management Facility. This only checks the status of the database on the local host and is only available if you are using the embedded MySQL Server database. The master database runs on the primary host. The slave database service runs in the first secondary host added to the Oracle VDI Center.

On the primary host or the first secondary host, run the following command as root.

```
# svcs svc:/application/database/vdadb:default
```

For example:

```
# svcs svc:/application/database/vdadb:default
STATE          STIME    FMRI
online         Sep_30   svc:/application/database/vdadb:default
```

In case of problems on Oracle Solaris platforms, check the log file at `/var/svc/log/application-database-vdadb:default.log`. There is no equivalent log file on Oracle Linux platforms.

### 8.3.5. How to Check the Status of the Oracle VDI Service

Use the `vda-service status` command to show whether the Cacao management daemon is enabled or disabled, its process numbers, and its uptime.

- Run the following command as root:

```
# /opt/SUNWvda/sbin/vda-service status
```

For example:

```
# /opt/SUNWvda/sbin/vda-service status
vda instance is ENABLED at system startup.
Smf monitoring process: 11761
```
How to Check the Status of the Oracle VDI RDP Broker

8.3.6. How to Check the Status of the Oracle VDI RDP Broker

Use the `brokeradm status` command to check if the Oracle VDI RDP broker and proxy services are running.

- Run the following command as root.

```bash
# /opt/SUNWvda-rdpb/bin/brokeradm status
```

For example:

```bash
# /opt/SUNWvda-rdpb/bin/brokeradm status
broker is running (PID 18204)
proxy is running (PID 18223)
```

On Oracle Solaris platforms, the RDP broker and proxy services also run under the Service Management Facility. Run the following commands as root.

```bash
# svcs svc:/application/rdpb-broker:default
# svcs svc:/application/rdpb-proxy:default
```

For example:

```bash
# svcs svc:/application/rdpb-broker:default svc:/application/rdpb-proxy:default
STATE       STIME            FMRI
online      Sep_30  svc:/application/rdpb-broker:default
online      Sep_30  svc:/application/rdpb-proxy:default
```

In case of problems, check the log files:

- On Oracle Solaris platforms:
  - `/var/svc/log/application-rdpb-broker:default.log`
  - `/var/svc/log/application-rdpb-proxy:default.log`

- On Oracle Linux platforms:
  - `/opt/SUNWvda-rdpb/var/log/broker<PID>.log`
  - `/opt/SUNWvda-rdpb/var/log/proxy<PID>.log`

8.3.7. How to Check the Status of the Oracle VDI Center Agent

Use the `vda-center agent-status` command to check whether the Oracle VDI Center Agent is running (and for how long) and to display the MD5 fingerprint of the host's SSL certificate.

- Run the following command as root:

```bash
# /opt/SUNWvda/sbin/vda-center agent-status
```

For example:

```bash
# /opt/SUNWvda/sbin/vda-center agent-status
Agent is up for 2 day(s), 23:32.
```
8.3.8. How to Check the Status of the Oracle VDI Manager

Use the `vda-webserver status` command to check whether the Oracle VDI Manager is running.

- Run the following command as root.

```bash
# /opt/SUNWvda/sbin/vda-webserver status
```

For example:

```bash
# /opt/SUNWvda/sbin/vda-webserver status
Oracle Virtual Desktop Infrastructure Manager is running (pid 18106).
```

In case of problems, check the log file at `/var/opt/SUNWvda/log/webserver0.log`.

8.3.9. How to Check the Status of Cacao and the Oracle VDI Modules

You use the `cacaoadm` command to check the status of Cacao and the individual Oracle VDI modules. On Oracle Solaris platforms, Cacao is included with the operating system. On Oracle Linux platforms, Cacao is installed as part of Oracle VDI. On Oracle Linux platforms, the `cacaoadm` command is in `/opt/sun/cacao2/bin`.

When you check the status of Cacao, the command shows whether the Cacao management daemon is enabled or disabled, its associated process numbers, and its uptime.

When you check the status of the individual modules, the commands report the following information about the module:

- **Operational State**: either **ENABLED** (the module is able to offer service) or **DISABLED** (the module is unable to offer service). The **DISABLED** state indicates that Cacao has detected an error for the module and the module is not operational.

- **Administrative State**: either **LOCKED** (the module must not offer service) or **UNLOCKED** (the module must offer service).

- **Availability Status**: the availability status is empty unless the operational state is set to **DISABLED**. If this is the case, the values are either **DEPENDENCY** (the module cannot operate because another resource on which it depends is unavailable), **OFF_LINE** (a routine operation is needed to bring the module back into use), or **FAILED** (the module has an internal fault that prevents it from operating).

In case of problems, check the log files, see Section 8.3.2, “How to Check the Oracle VDI Log Files”.

How to Check the Status of Cacao

- Run the following command as root.

```bash
# cacaoadm status -i vda
```

For example:

```bash
# cacaoadm status -i vda
vda instance is ENABLED at system startup.
Smf monitoring process:
```
How to Check the Status of the Oracle VDI Service Module

- Run the following command as root.

```bash
# cacaoadm status -i vda com.sun.vda.service
```

For example:

```bash
# cacaoadm status -i vda com.sun.vda.service
Operational State:ENABLED
Administrative State:UNLOCKED
Availability Status:[]
Module is in good health.
```

How to Check the Status of the Oracle VDI Service Center Agent Module

- Run the following command as root.

```bash
# cacaoadm status -i vda com.sun.vda.center
```

For example:

```bash
# cacaoadm status -i vda com.sun.vda.center
Operational State:ENABLED
Administrative State:UNLOCKED
Availability Status:[]
Module is in good health.
```

8.3.10. How to Restart Cacao

- Run the following command as root.

```bash
# cacaoadm stop -f -i vda
# cacaoadm start -i vda
```

On Linux platforms, the `cacaoadm` command is in `/opt/sun/cacao2/bin`.

The `cacaoadm` command also has a `restart` subcommand. However, the `restart` subcommand does not support the `-f` option, which is the only way to make sure that all Oracle VDI services are shut down.

8.4. Backing Up and Restoring the Oracle VDI Database

As with all user-level data, it is important to back up the Oracle VDI database periodically. This is also a crucial step if you plan to reinstall an Oracle VDI host.

The following information should be used when backing up data for both the embedded Oracle VDI MySQL Server database and a remote MySQL database. To learn more about Oracle VDI configurations and the corresponding databases, refer to Section 2.1, “About Oracle VDI Centers and Hosts”.
Before You Begin

This backup task archives only the content of the Oracle VDI database. The volumes of desktops and templates as well as configuration and settings values are not backed up.

Before You Begin

Here is a list of important notes when backing up and restoring the Oracle VDI database.

- For multi-host setups, the backup and restore process should only be done on one host. It does not need to be done on every host.
- You can perform the backup and restore tasks on different hosts as long as the archived backup is accessible.
- The backup job stops all other Oracle VDI jobs. Jobs are automatically started again after the backup finishes.
- The restore job stops the entire Oracle VDI system, but active sessions will continue to run. When a restore job finishes, you must restart the Oracle VDI system (through the Common Agent Container (cacao) on all hosts.

Steps

1. Make a backup of the database.
   - From the CLI, run the `vda-backup` command.
     
     ```
     # /opt/SUNWvda/sbin/vda-backup [-p <path-to-directory>] [-o <output-file-name>]
     ```

     While the backup job is running, all other jobs are stopped or put in queue in all hosts. A zip archive is created, that includes one file, with an `.db` extension and a timestamp-based name.

     For a detailed view of the `backup` command syntax use the following command.
     
     ```
     # /opt/SUNWvda/sbin/vda-backup -h
     ```

   - From Oracle VDI Manager:
     a. Select the Settings category, then the VDI Center subcategory.
     b. Select the Database tab, and click Backup in the VDI Database Backup section.

2. Restore the backed up database on the new Oracle VDI installation.
   - From the CLI, run the `vda-restore` command.
     
     ```
     # /opt/SUNWvda/sbin/vda-restore -i <path-to-backup.zip>
     ```

     For a detailed view of the `vda-restore` command syntax use the following command.
     
     ```
     # /opt/SUNWvda/sbin/vda-restore -h
     ```

3. After the restore job finishes, restart Oracle VDI system on all hosts.

   ```
   # cacaoadm stop -f -i vda
   # cacaoadm start -i vda
   ```

   On Linux platforms, the cacaoadm command is in `/opt/sun/cacao2/bin`. 
8.5. About Desktop Provider Alarms

The status of desktop provider alarms is displayed at the top of Oracle VDI Manager underneath the Log Out and Help buttons. If there are no current desktop provider alarms in the Oracle VDI environment, the Alarms heading does not display.

The icons next to the Alarms heading change depending on the status of the desktop providers in the Oracle VDI environment. For each alarm state displayed, a counter specifies how many desktop providers are currently in that state. The valid states include:

- **Major Alarm**: An alarm condition occurred that is currently impairing service but not seriously. The condition needs to be corrected before it becomes more severe. A major alarm is represented by a yellow icon.

- **Critical Alarm**: An alarm condition occurred that is seriously impairing service and requires immediate correction. The critical alarm is represented by a red icon.

Each alarm counter is also a link that displays the Desktop Providers page based on the following conditions:

- If you click on the Major alarms link, the Desktop Providers page is displayed and lists the desktop providers that currently have major or critical alarms.

- If you click on the Critical alarms link, the Desktop Providers page is displayed and lists the desktop providers that currently have critical alarms.

8.6. Maintenance Mode

On occasion, you might need to off-line a configured host or storage, including maintenance, upgrades, and decommissioning. The Maintenance Mode feature allows virtual machines to be cleared from a currently used host or storage and moved to a different host or storage so that normal operations may continue while the initial host or storage is unavailable. This process is also considered a "cold" migration because running virtual machines will be suspended to allow the maintenance process to proceed.

Maintenance mode is available for Oracle VM VirtualBox and Microsoft Hyper-V desktop providers only.

8.6.1. Oracle VM VirtualBox and Microsoft Hyper-V Host Maintenance

The two ways a host can be put in maintenance mode are:

**Migrate Desktops or Shutdown and Restart Desktops on Another Host**

- Requires > 1 Oracle VM VirtualBox host.

- Migrate Desktops - Offered only if the Oracle VDI thinks there are other compatible hosts. Otherwise, "Shutdown and Restart Desktops" is offered.

- Desktops are migrated one after the other. A desktop being migrated will be temporarily unavailable for up to a minute.

**Suspend Desktops on a Host**

- Always offered.

- Suspends all desktops on the current host.

- If a suspended desktop is requested it will be resumed on another VirtualBox host, if available.
A compatible VirtualBox host must have identical, or very similar, CPU models. Attempting to resume a desktop on a different CPU model will often result in a failure. The Oracle VDI verifies that hosts have the correct CPU manufacturer. The administrator is responsible for ensuring that the CPU models are compatible.

Desktop providers with a single VirtualBox or Microsoft Hyper-V host will be able to suspend all running desktops associated with the specified host.

Desktop providers with more than one VirtualBox host allow running desktops to be migrated to other enabled hosts. Depending on host compatibility one of two migration options will be available. If Oracle VDI detects other compatible hosts, it will attempt to migrate each desktop by suspending it and resuming it on another host. If no compatible hosts are detected, Oracle VDI will attempt to shutdown and restart the desktops on other hosts. A compatible VirtualBox host must have identical, or very similar, CPU models. Oracle VDI verifies that hosts have the correct CPU manufacturer. The administrator is responsible for ensuring that the CPU models are compatible. Oracle VDI also checks for valid VirtualBox releases.

With Microsoft Hyper-V, the desktops cannot be migrated to another host. They are suspended and will be restarted on the same host. In the event that the disk number associated with a desktop has changed during the host maintenance period (this may happen if the Hyper-V host is rebooted), Oracle VDI will power off the desktop before it can be restarted, causing any suspend data to be lost.

In Oracle VDI Manager:

1. Select the Desktop Providers category, and click the desktop provider containing the host you would like to suspend.

2. Select the Host tab, select the host to migrate and click the Maintenance button.
   
   A pop-up window will appear with two options depending on host compatibility.

   a. Choose maintenance type.
      
      • If you will be moving the desktops to a different host, select the Migrate Desktops option.
      
      • If you will be suspending all desktops on the host, select the Suspend Desktops option.

   b. Choose a time for the server to begin entering maintenance or click Now to select the current time.

   c. Click OK to submit the maintenance mode job.

### 8.6.2. Storage Maintenance

Oracle VDI provides a mechanism to put one or more storage servers in maintenance mode. Maintenance mode implies that the storage server is disabled and all running desktops are either shutdown or suspended. At this point, maintenance can take place on the storage server (reboot or upgrade). No data is moved or deleted from the specified storage server (including desktop hard disk data), but the associated OCFS2 file systems (iSCSI or Sun ZFS storage types) are unmounted from the virtualization hosts. When the storage server is re-enabled, the OCFS2 file systems are remounted on the virtualization hosts, and any desktops suspended as a result of entering maintenance mode are resumed.

When putting a Hyper-V host or storage into maintenance mode, all desktops must be powered off.

In Oracle VDI, you can clear or suspend running desktops on virtualization hosts and storage servers. Maintenance mode allows administrators to perform typical maintenance tasks on servers (rebooting, upgrading) with minimal impact to users.
Deleting Orphan Disks

Oracle VDI Manager Steps

1. In Oracle VDI Manager, go to Desktop Providers.
2. Select the desktop provider containing the storage server you would like to suspend.
3. Go to the Storage tab, select the storage server, and click the Maintenance button.
4. Choose a time for the server to begin entering maintenance, or click Now to select the current time.
5. Click OK to submit the maintenance mode job.

Note
All running desktops associated with a host or storage server can be manually shut down or suspended by navigating to the Storage or Host Desktop tab. This tab can be accessed by clicking the Host or Storage server hyperlink.

8.7. Deleting Orphan Disks

For the Oracle VM VirtualBox and Microsoft Hyper-V desktop providers, storage is provided by external storage volumes, and this storage is assigned to desktops and templates as you create them. Eventually, you may delete the desktop and templates, but the associated storage is not automatically released.

Orphan disks are those storage volumes that are not currently mapped to any desktop or template and can be deleted to free up space. Orphan disks that have descending clones cannot be deleted.

Note
Some orphan disks may still hold important data. Make sure the data on an orphan disk is no longer needed before you delete it.

Oracle VDI Manager Steps

1. In Oracle VDI Manager, go to Desktop Providers.
2. Select an Oracle VM VirtualBox or Microsoft Hyper-V desktop provider.
3. Go to the Storage tab.
4. Select a storage server.
   The Storage Summary page is displayed for the storage server.
5. Click the Orphan Disk link.
   The Orphan Disk page is displayed.
6. Select the orphan disks to delete and click Delete.

Note
The orphan disks without a checkbox cannot be deleted.

CLI Steps

1. List the current desktop providers.

   # /opt/SUNWvda/sbin/vda provider-list
2. List the storage servers for the specific desktop provider.

   # /opt/SUNWvda/sbin/vda provider-list-storage desktop-provider

3. List the orphan disks for a desktop provider's storage server.

   # /opt/SUNWvda/sbin/vda provider-storage-orphans -h storage-hostname -z storage-zfs-pool desktop-provider

4. Delete one or more orphan disks.

   # /opt/SUNWvda/sbin/vda provider-storage-orphan-delete -r desktop-provider -s storage-hostname -z storage-zfs-pool volumeId1[volumeId2...]

8.8. Oracle VDI Centers and Failover

Failover enables an Oracle VDI Center to recover automatically from the loss of the primary host. Failover is available only when an Oracle VDI Center is configured for high availability. High availability is enabled automatically when you add the first secondary host to the Oracle VDI Center. See Section 2.1, “About Oracle VDI Centers and Hosts” for details of Oracle VDI Center configuration and high availability.

You add and remove hosts from an Oracle VDI Center with the vda-config command. See the following for more information:

Section 2.3.2, “Configuring Oracle VDI on a Primary Host”
Section 2.3.3, “Configuring Oracle VDI on a Secondary Host”
Section 2.3.4, “Reconfiguring Oracle VDI on a Host”

Failover happens automatically and is triggered by a failure of the primary host in an Oracle VDI Center. During failover, the secondary host with the replication database is automatically promoted to become the new primary in the Oracle VDI Center. When connectivity to the original primary is restored, the original primary is reconfigured as a secondary host and it hosts the replication database.

An Oracle VDI Center can only have one replication database, all other secondary hosts have no database role. To change the replication host, see Section 8.8.1, “Changing the Replication Database Host”. If you are using a remote database instead of the embedded MySQL Server database, high availability for the database is configured outside of Oracle VDI.

To change the primary host in an Oracle VDI Center manually, see Section 8.8.2, “Changing the Primary Host in an Oracle VDI Center”.

The primary host in an Oracle VDI Center is also configured as the Sun Ray Software primary server in the Sun Ray failover group. During automatic failover, the host that is promoted to become the new primary in the Oracle VDI Center is also reconfigured to become the Sun Ray Software primary server. To change the Sun Ray primary server, or to disable the automatic reconfiguration of the Sun Ray primary, see Section 8.8.6, “Configuring the Sun Ray Primary Server in an Oracle VDI Center”.

The Oracle VDI Center Agent is the component that provides secure communication between Oracle VDI hosts and it handles automatic failover and other configuration changes to Oracle VDI Centers.

8.8.1. Changing the Replication Database Host

If you are using the embedded MySQL Server database, the primary host in the Oracle VDI Center runs the Oracle VDI database (the master database). The first secondary host that is added to the Oracle VDI Center is configured to host the replication database (the slave database). Follow these steps, to change the replication database host. To change the host that runs the master database, see Section 8.8.2, “Changing the Primary Host in an Oracle VDI Center”.
Oracle VDI Manager Steps

1. Go to Settings → VDI Center.
2. Go to the Database tab.
   A list of the Oracle VDI hosts in the VDI Center is displayed.
3. Select an Oracle VDI host and click Activate VDI Database Replication.
   A message is displayed that says the new replication host is activated.

CLI Steps

1. Change the replication host.
   Run the following command as root:
   
   ```bash
   # /opt/SUNWvda/sbin/vda-center setprops -p db.replication.host=<host>
   ```
   
   If you specify an empty `<host>`, you turn off replication and high availability.

2. Check that the change has taken effect.
   Run the following command as root:
   
   ```bash
   # /opt/SUNWvda/sbin/vda-center status
   ```

8.8.2. Changing the Primary Host in an Oracle VDI Center

The primary Oracle VDI host forms the Oracle VDI Center. When you change the primary host, the original primary is reconfigured as a secondary host and hosts the replication database (if you are using the embedded MySQL Server database). To change the replication database host, see Section 8.8.1, “Changing the Replication Database Host”. Follow these steps, to change the primary host.

Caution

By default, when you change the primary host, this causes an interruption to Sun Ray services and all Sun Ray Clients are disconnected.

Steps

1. Change the primary host.
   Run the following command as root:
   
   ```bash
   # /opt/SUNWvda/sbin/vda-center setprops -p vda.primary.host=<host>
   ```

2. Check that the change has taken effect.
   Run the following command as root:
   
   ```bash
   # /opt/SUNWvda/sbin/vda-center status
   ```

8.8.3. Triggering Failover Manually

In some circumstances you might want to trigger failover manually, for example if automatic failover is unsuccessful. To trigger failover manually, you change the secondary host that has the replication
Removing an Unresponsive Host from an Oracle VDI Center

Database to be the primary host in the Oracle VDI Center. See Section 8.8.2, “Changing the Primary Host in an Oracle VDI Center” for details.

8.8.4. Removing an Unresponsive Host from an Oracle VDI Center

Normally you use the vda-config command to add and remove hosts from an Oracle VDI Center. However if a host becomes unresponsive, you might not be able use this command. In this situation, you can force the removal of the host from the Oracle VDI Center.

Steps

1. Remove the host from the Oracle VDI Center.
   Run the following command as root on any of the remaining hosts in the Oracle VDI Center:
   
   ```
   # /opt/SUNWvda/sbin/vda-center purge <host>
   ```

2. Check that the change has taken effect.
   Run the following command as root:
   
   ```
   # /opt/SUNWvda/sbin/vda-center status
   ```

8.8.5. Tuning Automatic Failover

It is possible to adjust the properties for an Oracle VDI Center to tune the automatic failover behavior. The following table lists the available properties and what they control.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>db.connection.timeout</td>
<td>The connection timeout in milliseconds for database connections.</td>
</tr>
<tr>
<td></td>
<td>The Oracle VDI Service reports a database error to the Oracle VDI Center Agent, if an attempt to connect to the Oracle VDI database takes longer than this timeout.</td>
</tr>
<tr>
<td></td>
<td>The default is 1000 milliseconds.</td>
</tr>
<tr>
<td>db.failover.timeout</td>
<td>The period of time in seconds that the Oracle VDI Center Agent waits before starting failover.</td>
</tr>
<tr>
<td></td>
<td>The Oracle VDI Center Agent monitors the database error reports from the Oracle VDI Service. If database errors are reported continuously for this period of time, the database is considered as failed. If the embedded Oracle VDI MySQL Server database is used, failover is triggered.</td>
</tr>
<tr>
<td></td>
<td>The default is 15 seconds.</td>
</tr>
<tr>
<td>db.replication.config</td>
<td>Whether the Oracle VDI Center Agent automatically configures database replication. The permitted values are true or false.</td>
</tr>
<tr>
<td></td>
<td>If set to true, the automatic configuration of the replication database on a secondary host takes</td>
</tr>
</tbody>
</table>
Configuring the Sun Ray Primary Server in an Oracle VDI Center

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>place when the first secondary is added or a failover is performed.</td>
<td>If set to false, the automatic configuration of the replication database does not take place. High availability is disabled until an administrator manually configures a replication database host, see Section 8.8.1, “Changing the Replication Database Host”. This provides you with more control over the host that is used for the replication database but means that high availability has to be configured manually. The default is true.</td>
</tr>
</tbody>
</table>

Steps

1. Configure the required properties.
   
   Run the following command as root:
   
   ```
   # /opt/SUNWvda/sbin/vda-center setprops -p <key>=<value>
   ```
   
   For example:
   
   ```
   # /opt/SUNWvda/sbin/vda-center setprops -p db.failover.timeout=20
   ```

2. Check that the change has taken effect.
   
   Run the following command as root:
   
   ```
   # /opt/SUNWvda/sbin/vda-center listprops
   ```

8.8.6. Configuring the Sun Ray Primary Server in an Oracle VDI Center

By default, the primary host in an Oracle VDI Center is also configured as the Sun Ray primary server in the Sun Ray failover group. During automatic failover, the host that is promoted to become the new primary in the Oracle VDI Center is also reconfigured to become the Sun Ray Software primary server. Whenever the Sun Ray Software primary server is changed, this causes an interruption to Sun Ray services and all Sun Ray Clients are disconnected.

You can configure another host in the Oracle VDI Center to be the Sun Ray Software primary server and you can also disable the automatic reconfiguration of the Sun Ray primary server during failover.

If you change the Sun Ray primary server without disabling the automatic reconfiguration of the Sun Ray primary server, Oracle VDI still automatically reconfigures the Sun Ray primary server during failover.

If you disable the automatic reconfiguration of the Sun Ray primary server, Oracle VDI does not automatically reconfigure the Sun Ray primary server during failover. You must manually reconfigure the Sun Ray primary server.

Each Sun Ray server has its own local copy of the Sun Ray datastore, which is used to store information such as information about Sun Ray Clients and tokens. The Sun Ray primary server has read and write access to the datastore, while the Sun Ray secondary servers only have read access. Any changes to the datastore are first written on the primary server and the primary then replicates the changes to
the secondaries. If the primary server is unavailable, changes to the datastore cannot be stored. In this situation, the overall Sun Ray system continues to work because most Sun Ray operations only require read access to the datastore, but some things, such as token registration, are not available.

**Steps**

To display the current Sun Ray primary server in the Oracle VDI Center, run the following command as root:

```bash
# /opt/SUNWvda/sbin/vda-center getprops -p srs.primary.host
```

To change the current Sun Ray primary server in the Oracle VDI Center, run the following command as root:

```bash
# /opt/SUNWvda/sbin/vda-center setprops -p srs.primary.host=<host>
```

To disable the automatic reconfiguration of the Sun Ray primary server, run the following command as root:

```bash
# /opt/SUNWvda/sbin/vda-center setprops -p srs.primary.autoconfig=false
```

**8.8.7. Synchronizing the Sun Ray Group Signature and Data Store Password**

The Sun Ray servers in an Oracle VDI Center have a group signature and a data store password. When you configure the primary host in an Oracle VDI Center, the group signature and password are created and stored in both the Oracle VDI Center and in the Sun Ray server configuration. The Oracle VDI Center Agent uses these values whenever it adds and removes hosts from the Oracle VDI Center.

It is possible to use the Sun Ray administration tools to change either the group signature or the data store password, but these tools do not update the Oracle VDI Center. If the Oracle VDI Center and the Sun Ray servers are not synchronized, you cannot add hosts to a Oracle VDI Center.

**Caution**

The following commands display the password and group signature in plain text. For security reasons, ensure that no-one is overlooking you when you run the commands.

To synchronize the data store password for an Oracle VDI Center, use the following command:

```bash
# echo <Password> | /opt/SUNWvda/sbin/vda-center setprops -s srs.password
```

To synchronize the group signature for an Oracle VDI Center, use the following command:

```bash
# echo <GroupSignature> | /opt/SUNWvda/sbin/vda-center setprops -s srs.group.signature
```

To verify that the data store password change has taken effect, run the following command on each host in the Oracle VDI Center:

```bash
# /opt/SUNWut/sbin/utpw -p
```

To verify that the group signature change has taken effect, run the following command on each host in the Oracle VDI Center:

```bash
# cat /etc/opt/SUNWut/gmSignature
```

You might have to perform a warm restart or a cold restart of Sun Ray services on each host in the Oracle VDI Center for the change to take effect. A warm restart temporarily disconnects users and might require them to log in again or unlock their screens. A cold restart terminates all Sun Ray sessions.
For a warm restart, run the following command on each host in the Oracle VDI Center:

```
# /opt/SUNWut/sbin/utstart
```

For a cold restart, run the following command on each host in the Oracle VDI Center:

```
# /opt/SUNWut/sbin/utstart -c
```
Chapter 9. Troubleshooting and FAQs

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9.1. Installation and Configuration

9.1.1. Installation on Oracle Linux Platforms Fails Due Missing Packages

When you install Oracle VDI on Oracle Linux platforms, the installation script checks whether the required packages are installed on the system. If any packages are missing, Oracle VDI uses the `yum` command to download and install them. The installation fails if the missing packages cannot be installed, and a message is displayed that lists the missing packages, for example:

```
Checking for required libraries and packages...
13 packages are missing but cannot be installed because the software manager yum does not have access to the repositories or the repositories are invalid:
libaio-devel, sysstat, dhcp, compat-openldap, glib, libdb-4.2.so()(64bit), libXp.so.6, /usr/lib/libaio.so, /usr/lib64/libaio.so, /usr/lib/libXpm.so, /usr/lib/libXm.so.3, /usr/lib/libglib-1.2.so.0, /usr/lib/libcdda_paranoia.so
Error: The software manager yum cannot install the required packages.
See the log file '/var/log/vda-install.2011_09_26_06:03:26.log' for additional information.
```

The required packages might not be able to be downloaded because no repositories are configured for `yum`, or if there are other problems, for example incorrect proxy configuration or network connectivity issues.

To resolve the installation problem, ensure that `yum` is configured properly and is working. Then install Oracle VDI again.

If you want to install the missing required packages manually, the packages are listed in the log file for the failed installation in `/var/log`.

9.1.2. Configuration on Oracle Linux Platforms Fails Because the RDP Broker Cannot Be Enabled

When you configure Oracle VDI on Oracle Linux platforms, the configuration might fail because the RDP Broker cannot be enabled. A message is displayed that lists the log file for the failed configuration in `/var/log`, for example:

```
RDP Broker Configuration
   + Registering RDP broker...
   + Starting RDP broker...
RDP Broker cannot be enabled.
Error:
The configuration of Oracle VDI 3.4.1 has failed.
See the log file '/var/log/vda-config.2011_09_27_09:14:56.log' for additional information.
```

Messages might also be displayed in the SELinux alert browser, if is enabled.

If this error occurs, check the log files in `/opt/SUNWvda-rdpb/var/log` for the following error message:

```
2011/09/27 09:10:00.118 Broker start
2011/09/27 09:10:00.188 ERROR: Cannot open library VBoxRT.so: /opt/SUNWvda-rdpb/bin/../lib/VBoxRT.so: cannot restore segment prot after reloc: Permission denied.
2011/09/27 09:10:00.188 ERROR: RDP server init failed.
2011/09/27 09:10:00.188 Broker stop
```
The problem is caused by the SELinux setting for your system.

To resolve the problem:

1. Change the SELinux setting to permissive or disabled.

   Use the SELinux Administration Tool (`system-config-selinux`), or the `/usr/sbin/setenforce 0` command (this command changes the setting to permissive). Alternatively, edit `/etc/selinux/config` and change the entry `SELINUX=enforcing` to either `SELINUX=disabled` or `SELINUX=permissive`.

2. Unconfigure Oracle VDI.

   You must unconfigure before you can configure Oracle VDI again.

   ```
   /opt/SUNWvda/sbin/vda-config -u
   ```

3. Configure Oracle VDI.

   ```
   /opt/SUNWvda/sbin/vda-config
   ```

### 9.1.3. Oracle VDI Configuration Is Failing to Import svc_vdadb.xml

`vda-config` is failing to import `svc_vdadb.xml` because `TEMP/application/database/vdadb` does not get deleted. This is most commonly seen if a terminal is killed during uninstallation or configuration of Oracle VDI (`vda-config/install -u`), when the uninstallation/unconfiguration is run from the same Sun Ray session.

Workaround after getting the error:

1. To recover the SVC repository's snapshot, run the following.

   ```
   # /lib/svc/bin/restore_repository
   ```
   a. When prompted with `Enter Response [boot]`, select `manifest_import` instead of the default, `boot`.
   b. Choose the correct snapshot (`manifest_import-200904??_??` - the time of backup will be in DDMMYY format).
   c. After the system reboots, check to see that `svc:/TEMP/application/database/vdadb:default` has been removed.

2. Run the Oracle VDI configuration as usual.

### 9.1.4. Can I Try Out MySQL or Set up an Evaluation Oracle VDI Remote Database?

Yes! The MySQL Sandbox is a quick and easy way to setup MySQL or try out Oracle VDI remote database setup.

You can find it here: [https://launchpad.net/mysql-sandbox](https://launchpad.net/mysql-sandbox).

- Download and extract it to a temporary folder.

To install a simple MySQL server just execute:
Do I Need to Configure Sun Ray Software Separately?

A separate installation of Sun Ray Software is not necessary because Sun Ray Software is installed and automatically set up as part of the Oracle VDI installation and configuration.

Adding a Host to a Oracle VDI Center Fails With a Sun Ray Server Software Replication Error

When you add a Host to a Oracle VDI Center, it might fail with the following error message:

Sun Ray Server Software Configuration
  + Configuring Sun Ray Server Software...

Error: There was an error configuring Sun Ray Server Software replication

See the log file '/var/log/vda-config.2012_04_05_16:12:43.log' for additional information.

If the log file shown in the error message contains a Signature mismatch - check configuration message, it is possible that the Sun Ray group signature has been changed using the Sun Ray administration tools. These tools do not update Oracle VDI. See Section 8.8.7, “Synchronizing the Sun Ray Group Signature and Data Store Password” for details of how to synchronize the group signature.

Reconfiguring Oracle VDI Fails With "Error While Configuring Database"

When you reconfigure Oracle VDI on a host, the configuration can fail with an Error While Configuring Database message and a reference to a log file for additional information.

On an Oracle VDI primary host, the log file typically contains the following:

MySQL Database Server Configuration
  + Initializing database...
  ... /opt/SUNWvda/mysql/bin/mysqld: File './mysql-bin.index' not found (Errcode: 13)

110630 23:59:59 [Note] /opt/SUNWvda/mysql/bin/mysqld: Shutdown complete
... Error: Error while configuring database.

On an Oracle VDI secondary host, the log file typically contains the following:

MySQL Database Slave Configuration
  ... + Initializing database...
110630 23:59:59 [ERROR] Fatal error: Can't change to run as user 'vdadb'; Please check that the user exists!
110630 23:59:59 [Note] /opt/SUNWvda/mysql/bin/mysqld: Shutdown complete
... Error: Error while configuring database.

The problem is caused by the presence of a /var/opt/SUNWvda/mysql directory, which has data from a previous Oracle VDI configuration.
To resolve this problem:

1. Log in as root on the Oracle VDI host.
2. Unconfigure Oracle VDI on the host.
   
   ```
   # /opt/SUNWvda/sbin/vda-config -u
   ```
3. Remove the directory `/var/opt/SUNWvda/mysql`.
4. Configure Oracle VDI on the host.
   
   ```
   # /opt/SUNWvda/sbin/vda-config
   ```

### 9.1.8. Oracle VDI Configuration Fails to Create Database Tables With Remote Windows Databases That Use UTF-8

On Windows platforms, MySQL limits key sizes to 767 bytes. Due to this limit, the Oracle VDI configuration process fails when using a remote MySQL database on Windows platforms that have UTF-8 enabled.

There are two possible workarounds for this issue.

1. Modify the `/etc/opt/SUNWvda/vda-schema-create.sql` file on your primary Oracle VDI host and configure Oracle VDI software again.

   Change the line:

   ```sql
   UNIQUE INDEX distinguished_name (`distinguished_name` ASC, `ud_id` ASC) ,
   ```

   to:

   ```sql
   UNIQUE INDEX distinguished_name (`distinguished_name`(250) ASC, `ud_id` ASC) ,
   ```

   This workaround might cause problems assigning users to pools or desktops if the distinguished name (DN) of the user is longer than 250 characters.

2. Change the character set of the MySQL database to latin1 and configure Oracle VDI again.

   This workaround causes problems logging in users who have UTF-8 characters in their user name.

### 9.2. User Directory

#### 9.2.1. I Am Having Some Trouble With the User Directory. Can I Adjust the Log Level to Get More Information?

Yes, you can increase the detail that is shown in the logs.

By default, all Oracle VDI service messages are logged in the Cacao log files, see Section 8.3.2, “How to Check the Oracle VDI Log Files”. To increase the logging level for directory services, run the following command as root:

```bash
# cacaoadm set-filter -i vda -p com.sun.directoryservices=ALL
# cacaoadm set-filter -i vda -p com.sun.sgd=ALL
```

On Linux platforms, the `cacaoadm` command is in `/opt/sun/cacao2/bin`.

After changing the logging level, restart the Oracle VDI service:

```bash
# /opt/SUNWvda/sbin/vda-service restart
```
Kerberos Authentication to Active Directory Works for a While and Then Stops

After restarting the Oracle VDI service, recreate the problem and check the Cacao log file, see Section 8.3.2, “How to Check the Oracle VDI Log Files”.

To reset the logging level for directory services to their default, run the following command as root:

```bash
# cacaoadm set-filter -i vda -p com.sun.directoryservices=NULL
# cacaoadm set-filter -i vda -p com.sun.sgd=NULL
```

Then restart the Oracle VDI service:

```bash
# /opt/SUNWvda/sbin/vda-service restart
```

9.2.2. Kerberos Authentication to Active Directory Works for a While and Then Stops

A temporary solution for this issue is to run the following on each Oracle VDI host:

```bash
kinit -V administrator@MY.DOMAIN
```

This might be:

1. A time synchronization issue.

   Make sure the domain controllers and the Oracle VDI servers are connecting to the same NTP server.


   Make sure the Kerberos configuration file (`krb5.conf`) contains the `libdefaults` section and sets the `default_realm` as in the following example:

```plaintext
[libdefaults]
default_realm = MY.COMPANY.COM

[realms]
MY.COMPANY.COM = {
  kdc = my.windows.host
}

[domain_realm]
.my.company.com = MY.COMPANY.COM
my.company.com = MY.COMPANY.COM
```

9.2.3. Can I Use PKI Instead of Kerberos for Authentication to an Active Directory?

You can certainly use PKI authentication and it should offer the same features (including removing computers from the Active Directory) as Kerberos authentication.

9.2.4. What Type of Privileged Access to the User Directory Is Required?

For LDAP type of authentication:

- Read access to the entire users and groups base, so that Oracle VDI is able to look up for users and resolve the desktops assigned to the users that log in. (if using Active Directory with a single domain, this is typically under CN=Users,DC=my,DC=domain,DC=com).

- If using Active Directory, read access to the CN=Configuration,DC=my,DC=domain,DC=com location. This is used by Oracle VDI to pre-populate the domain field of the login dialog for end-users, with the domain or the list of subdomains. This is not mandatory, if no such access is given to Oracle VDI, the domain field of the login dialog will be left empty.
Can I Disable the Automatic Cleanup of Computer Objects in Active Directory?

For **Active Directory** type of authentication:

- Read access to the entire users and groups base, so that Oracle VDI is able to look up for users and resolve the desktops assigned to the users that log in. (If using Active Directory with a single domain, this is typically under `CN=Users,DC=my,DC=domain,DC=com`).

- Read access to the `CN=Configuration,DC=my,DC=domain,DC=com` location. This is used by Oracle VDI to pre-populate the domain field of the login dialog for end-users, with the domain or the list of subdomains. This is not mandatory, if no such access is given to Oracle VDI, the domain field of the login dialog will be left empty.

- Write access to the computers location. This is typically under `CN=Computers,DC=my,DC=domain,DC=com` when a Windows host joins to the `my.domain.com` domain. Write access to the computers location is used by Oracle VDI to delete the corresponding computer entry from the AD when a cloned desktop (VM) gets destroyed. The computer entry is automatically created by AD when the cloned Windows desktop joins the domain, which is generally instructed in the Sysprep. Write access is not mandatory, if you provide a user which has no such access, Oracle VDI won't be able to delete computers entries from the AD and you'll be left with a growing number of computer entries in your AD, this will only happen in the case you are using the cloning of Windows desktops.

### 9.2.5. Can I Disable the Automatic Cleanup of Computer Objects in Active Directory?

When you use Active Directory, and a Windows desktop joins a domain, a new computer object is created in Active Directory. If you use Kerberos authentication, Oracle VDI automatically removes the computer object from Active Directory whenever a desktop is deleted.

You can disable this behavior by configuring the `domain-cleanup` property for pool, as follows:

```
/opt/SUNWvda/sbin/vda pool-setprops -p domain-cleanup=disabled <pool>
```

### 9.3. Oracle VM VirtualBox Desktop Provider

#### 9.3.1. Why Are My Windows 7 Audio Drivers Not Automatically Installed?

32-bit Windows 7 does not ship with drivers for the Oracle VM VirtualBox emulated audio hardware (AC'97). However, running Windows Update should solve the problem by getting an appropriate driver for it automatically. After that update, followed by a reboot, you should have working audio.

For the 64-bit versions of Windows 7 you have to download the Realtek AC'97 drivers to enable audio.


#### 9.3.2. Oracle VM VirtualBox Install Is Failing With "Postinstall Script Did Not Complete Successfully" Errors

If you are installing Oracle VM VirtualBox, you may get the following error in the console:

```none
## Executing postinstall script.
Configuring VirtualBox kernel modules...
VirtualBox Host kernel module unloaded.
devfsadm: driver failed to attach: vboxdrv
Warning: Driver (vboxdrv) successfully added to system but failed to attach
can't load module: No such device or address
## Aborting due to attach failure.
## Configuration failed. Aborting installation.
```
pkga: ERROR: postinstall script did not complete successfully
Installation of <SUNWvbox> partially failed.

This error is typically seen when previous releases of VirtualBox are still installed. Try removing VirtualBox (./vb-install -u). Then verify that the following packages have been removed:

- SUNWvbox
- SUNWvboxkern

Reboot, then try the installation again.

9.3.3. There Is an Error When I Add an Oracle VM VirtualBox Host to a Desktop Provider

Errors can occur when you add an Oracle VM VirtualBox host to a desktop provider. In Oracle VDI Manager, error alerts might be displayed on either the Specify Host or Verify Certificate steps of the configuration wizard.

Specify Host Step

After you enter the host details, the following actions happen:

- The operating system of the host is verified.
- The DNS name of the host (if a DNS name is used) is resolved.
- The host's SSL and SSH certificates are retrieved.

If you see the message "The operating system does not match because all hosts should run the same operating system.", it means you cannot add the host to the desktop provider. Due to the differences in the availability of the storage types and the way they are used, the virtualization hosts for an Oracle VM VirtualBox desktop provider must use the same operating system. If you have a mixture of Oracle Solaris and Oracle Linux virtualization hosts, you must create separate desktop providers for them.

An error can be caused by DNS errors, either in resolving the host name or in contacting the host. If this happens, check the following:

- Check that all the information you entered is correct, including SSH and SSL ports.
  You specify the SSL port when you install VirtualBox.
- Check that the Oracle VDI host can resolve the host by using the nslookup <hostname> command on the Oracle VDI host.
- Check that the host is running and that the SSH service has started:

  # svc svc:/network/ssh:default

  The service should be online. If a service is marked as maintenance, try resetting it using:

  # svcadm clear <service_frmi>

Verify Certificate Step

An error at the Verify Certificate step, indicates that the VirtualBox web service cannot be contacted or might not be running.
Check that the VirtualBox web service is online, using the following command:

```
# svcs svc:/application/virtualbox/webservice:default
```

If the service is in maintenance mode, use the following command to clear the service and check the status again:

```
# svcadm clear svc:/application/virtualbox/webservice:default
```

If the service is off line, use the following command to enable:

```
# svcadm enable svc:/application/virtualbox/webservice:default
```

### 9.3.4. Are all Oracle VM VirtualBox Releases Compatible With Oracle VDI?

No. See Section 4.1.2, "System Requirements for Oracle VM VirtualBox" for details of what is supported.

If you want to create virtual machine templates locally, for example on a laptop, make sure to use the same release as you have installed on your Oracle VM VirtualBox desktop provider host. This ensures that you install the correct version of the guest additions, and avoids incompatibility problems with the XML configuration files for your virtual machines, which can prevent them from being imported into Oracle VDI.

### 9.3.5. I Can See My Oracle VM VirtualBox Hosted Desktop, But It Will Not Start

In some rare circumstances a desktop maybe left registered and powered off on an Oracle VM VirtualBox host. Desktops in this state for more than a couple of minutes can safely be deleted from the VirtualBox host if necessary as the configuration is stored in the Oracle VDI database and all data on a storage host. When manually unregistering a desktop from VirtualBox ensure that you also unregister the desktop's disk image.

Steps to resolve:

1. Log in as the user you specified during the installation of VirtualBox (typically 'root').
2. Determine the UUID of the virtual machine:
   - Execute `VBoxManage list vms`.
   - Or, use the Oracle VDI Manager to obtain the ZFS volume name listed in the Desktop Summary tab. The UUID is the string after the forward slash (example: f3ced2bb-d072-4efc-83c9-5a487872919d).
3. To unregister the virtual machine on the VirtualBox host (this action does not delete the Oracle VDI desktop), execute:
   ```
   VBoxManage unregistervm <uuid> -delete
   ```
4. To unregister the virtual disk on the VirtualBox host (this action does not delete the Oracle VDI desktop), execute:
   ```
   VBoxManage unregisterimage disk <uuid>
   ```

### 9.3.6. The Time in My Oracle VM VirtualBox Desktop Is Too Slow

Windows allows random applications to change the timer frequency from the default of 100Hz (which gives very good VM performance on Oracle Solaris hosts) to an arbitrary higher value, usually 1kHz.

In general, looking at `VBox.log (~/.VirtualBox/Machines/VDA/<VMNAME>/Logs/VBox.log)` reliably gives the current timer resolution if one searches for the last line containing `PIT: mode=... (ch=0)`. This works for any guest OS, as long as the number of CPUs assigned to a VM is left at the default (1). This should cover the majority of configurations used with Oracle VDI.
The typical lines are `PIT: mode=2 count=0x2ead (11949) - 99.85Hz (ch=0)` and `PIT: mode=2 count=0x4ad (1197) - 996.81Hz (ch=0)`.

Assuming there is only one application which requests the high timer resolution, it can be found by terminating all running applications one by one, and watching whether the log file shows the drop in timer resolution. This shows up instantaneously.

Also, looking at the output of `prstat` often allows to detect which VM processes use substantially more CPU time than others. This allows reducing the number of candidates if only some VMs use 1kHz timer resolution.

Performance issues caused by the timer resolution are often dormant until the number of VMs on a VirtualBox host exceeds the number of (true) CPU cores in the server. The reason is that VirtualBox tries its best to deal with the situation, which usually keeps a full CPU core busy. When there are more such VMs they block each other, triggering a symptom which is easy to observe - time in the VM runs much slower than it should.

**9.3.7. What Are the Requirements for High Availability for Oracle VM VirtualBox?**

High Availability for an Oracle VM VirtualBox virtualization platform would require at least two VirtualBox hosts. In the event that one VirtualBox server goes down, all existing desktop sessions would be terminated. Then the terminated sessions would be restarted on the remaining VirtualBox servers as they are requested by users, as long as there is sufficient memory available.

High Availability for Oracle VDI, Sun Ray Software, and MySQL requires two Oracle VDI hosts. See Section 2.1, “About Oracle VDI Centers and Hosts” for detailed information about the hardware configurations that support this type of redundancy.

**9.3.8. How Do I Change the Password of the VirtualBox User?**

When you add an Oracle VM VirtualBox host to a desktop provider, you provide the user name and password of the user that runs VirtualBox on the host. These credentials are the same credentials provided when VirtualBox was installed. Oracle VDI uses the credentials to access the VirtualBox host using SSH and to access the VirtualBox web service.

Before you change the password for the VirtualBox user, it is best to enable maintenance mode for the VirtualBox host to minimize disruption to users.

To change the password of the VirtualBox user, you must perform all of the following steps:

1. Change the password for the UNIX user.
   a. Log in as root or the VirtualBox user on the VirtualBox host.
   b. Change the VirtualBox user's password.

   Follow your organization's standard policy for changing passwords.

   For example, to use the `passwd` command:

   ```
   # /usr/bin/passwd
   passwd: Changing password for root
   New Password:
   Re-enter new Password:
   passwd: password successfully changed for root
   ```

2. Change the password for the VirtualBox web service user.
a. Log in as root on the VirtualBox host.

b. Generate the password hash of the new password.

You can use the VirtualBox command line to generate the hash.

```
$ VBoxManage internalcommands passwordhash <Password>
```

For example:

```
$ VBoxManage internalcommands passwordhash T0pSecr3t
Password hash: bfd5bde76fcee3c2e6fc583cd0541569a1d35d551c19d99b36a0ee7628b4b114
```

c. Change the password hash for the web service user.

The VirtualBox web service uses the VBoxAuthSimple library to authenticate web service users. The hashed password is stored in the VirtualBox global extra data items.

```
$ VBoxManage setextradata global VBoxAuthSimple/users/<User> <PasswordHash>
```

For example:

```
$ VBoxManage setextradata global VBoxAuthSimple/users/root \ 
bfd5bde76fcee3c2e6fc583cd0541569a1d35d551c19d99b36a0ee7628b4b114
```

d. Verify that the stored password hash for the VirtualBox web service user is correct.

```
$ VBoxManage getextradata global VBoxAuthSimple/users/<User>
```

For example:

```
$ VBoxManage getextradata global VBoxAuthSimple/users/root
Value: bfd5bde76fcee3c2e6fc583cd0541569a1d35d551c19d99b36a0ee7628b4b114
```

3. Change the password for the VirtualBox host in Oracle VDI.

a. In Oracle VDI Manager, go to Desktop Providers.

b. Select the desktop provider that contains the VirtualBox host.

c. Go to the Host tab, select the host and click Edit.

d. In the Password field, enter the new password and click Next to confirm the changed details.

Alternatively, use the vda provider-host-setprops command to change the password.

### 9.3.9. Users Experience Blurry Text in Internet Explorer

If users experience blurry text in Internet Explorer, this might be because the area is mistakenly interpreted by Oracle VM VirtualBox as near full-screen video. This is caused by the way Internet Explorer redraws the browser window.

You can work round this issue by limiting the areas which Oracle VM VirtualBox detects and sends as video. You do this by configuring a pool property with the following command:

```
/opt/SUNWvda/sbin/vda pool-setprops -p limited-rca-detection-enabled <PoolName>
```

When this property is enabled, screen areas greater than 800 x 600, but smaller than full screen, are not downscaled.
9.3.10. A Critical Alert is Displayed When Storage is Added to a Desktop Provider

A critical alert might be displayed in Oracle VDI Manager when you create an Oracle VM VirtualBox desktop provider or when you add storage to an existing provider and the VirtualBox hosts run on the Oracle Linux platform. On the command line, the status of provider is shown as critical. Because the alert takes a long time to clear, it might appear that an error has occurred.

The alert is displayed because the configured storage is not yet ready for use. When VirtualBox hosts run on the Oracle Linux platform, Oracle VDI formats the storage using Oracle Cluster File System version 2 (OCFS2). The critical alert is displayed for as long as it takes to format the storage. This affects Sun ZFS and iSCSI storage types only, local and network file system storage types are not affected.

9.3.11. A Storage Cannot Be Removed From a Desktop Provider

**Problem:** A storage cannot be removed from a desktop provider because the Remove button is disabled on the Storage tab in Oracle VDI Manager.

**Solution:** You must enable maintenance mode for the storage first. This enables Oracle VDI to migrate the desktops to another storage host and, if needed, to unmount the OCFS2 file systems. Once the storage is in maintenance mode, it can be removed.

If the storage is a local storage and there are multiple virtualization hosts, Oracle VDI automatically creates a local storage for each virtualization host so that the free space and number of desktops can be monitored on each host. You must enable maintenance mode for all the local storages before you can remove the local storage.

9.3.12. Adding a Storage Fails With an "Unable to Stop Cluster" Error

**Problem:** When you first add an iSCSI or Sun ZFS storage to an Oracle Linux VirtualBox desktop provider, it can fail with an **Unable to stop cluster as heartbeat region still active** error. The problem is caused by a failure to stop a running Oracle Cluster File System version 2 (OCFS2) cluster.

**Solution:** Stop OCFS2 services, disconnect the iSCSI target, and then add the storage again.

To stop OCFS2 services and disconnect the iSCSI target, perform the following steps on each virtualization host for the desktop provider:

1. Log in as root on the virtualization host.
2. Stop the OCFS2 service.
   ```bash
   # /etc/init.d/ocfs2 stop
   ```
   This command should unmount all OCFS2 file systems and stop all OCFS2 activity.
3. Verify that the OCFS2 file system is not mounted in /vd<mount>.
   Use the `mount` command to check if anything is mounted in that location.
   If the file system is not unmounted, try to unmount it using the following command:
   ```bash
   # umount /vd<mount>
   ```
   If it is not possible to unmount the OCFS2 file system because the device is busy. Use the following command to stop all processes running on the mount:
4. Stop the O2CB cluster service.

```bash
# /etc/init.d/o2cb offline
# /etc/init.d/o2cb unload
```

5. Disconnect the iSCSI target.

Use the `iscsiadm -m session` command to list the iSCSI targets on the host. For example:

```bash
# iscsiadm -m session
```

```
```

In this example, the session ID is shown in brackets [1], followed by the IP address and port of the iSCSI server (192.168.1.100:3260), followed by the iSCSI target name (iqn.1986-03.com.sun:vdi:j4c4iwosixizjpiicm9:y29q1vunmndes5jolyu).

Log out of the iSCSI target.

```bash
# iscsiadm -m node -T <targetname> -p <ip>:<port> --logout
```

For example:

```bash
# iscsiadm -m node -T iqn.1986-03.com.sun:vdi:j4c4iwosixizjpiicm9:y29q1vunmndes5jolyu \
-p 192.168.1.100:3260 --logout
```

Delete the iSCSI target.

```bash
# iscsiadm -m node -T <targetname> -p <ip>:<port> --delete
```

For example:

```bash
# iscsiadm -m node -T iqn.1986-03.com.sun:vdi:j4c4iwosixizjpiicm9:y29q1vunmndes5jolyu \
-p 192.168.1.100:3260 --delete
```

---

## 9.4. VMware vCenter Desktop Provider

### 9.4.1. I Cannot Log into My VMware Virtual Machine

This issue could be seen if the snapshot of the machine is older than 30 days. For more information, see [http://support.microsoft.com/kb/154501](http://support.microsoft.com/kb/154501)

### 9.4.2. Users Cannot Log Into Their VMware Provided Windows desktop

Verify that the users are configured for remote access and are allowed to perform a remote access.

### 9.4.3. Why Does My VMware Virtual Machine Have an Invalid IP Address Or Cannot Be Pinged?

1. Verify that your networking interface is properly configured for your ESX server in the Virtual Infrastructure Client.
2. If the network interface is properly configured for your ESX server:

   Verify that the network adapter is enabled in the template and is connected to the correct network.
Verify that there is a properly configured DHCP server with enough leases running on the subnet your virtual machine will run on.

See the VMware documentation, available online at http://www.vmware.com/support/pubs/vi_pubs.html

9.4.4. I Am Unable to Get a MS RDC Connection on My VMware Virtual Machine

1. Verify that it has been enabled in the Remote tab of the System Properties dialog.
   If this is enabled, the issue probably has to do with your network settings.

2. Verify that the virtual machine’s subnet can be reached from the Windows machine from which you run the Remote Desktop Connection client.
   If you have set up a private network for your virtual machines, it might not be accessible from a machine not on that network.

9.4.5. Creating a vCenter Desktop Provider Fails With "Unable to Contact VMware VirtualCenter - Host Not Reachable at Port 443" Errors

This error occurs when the VMware vCenter server has an expired certificate.

For more information about how to regenerate an expired certificate, refer to the VMware Knowledge Base article ID 1009092.

Once the certificate is regenerated, you should be able to successfully create a desktop provider.

9.4.6. In My VMware Desktop Pool, New Virtual Machines Are Created Automatically, But They Are Not Made Available

1. Verify that you still have enough disk space for your virtual machines.
   Depending on the recycle policy settings for your pool before a newly created virtual machine is made available for users, a snapshot is taken. This operation requires sufficient disk space.

2. Verify that the RDP port (typically 3389) of the Windows guest OS instance is open.
   Before a newly created virtual machine is made available, the Virtual Desktop Connector verifies whether RDP communication can be established to the virtual machine. The following issues might prevent a successful test:
   • The virtual machine is on a private network and cannot be accessed by the Virtual Desktop Connector. Verify your network configuration.
   • Remote access is disabled on the Windows guest OS.
   • Firewall settings of the Windows guest OS do not allow RDP connections.

9.4.7. The VMware Virtual Machine Cloning Process Is Not Operating As Expected

To determine whether a new virtual machine is ready for use, Oracle VDI tries to open an RDP connection to it. In certain cases, especially if you use a customized VM template for Vista, RDP can become available
before the build process has completed; however, a virtual machine made available before the build process has completed cannot be used.

The following procedure describes how to set up a customized virtual machine template VMware customization specs to correct this problem. It requires that RDP is disabled in the virtual machine template and that RDP is not blocked by a firewall when cloning is completed.

Preparations for manual Sysprep for Windows XP VMs (Step 3) and Windows Vista or Windows 7 VMs (Step 4) are also included.

1. Disable RDP by making sure the Remote Desktop checkbox on the Remote section of the System Preference dialog on the Windows Control Panel is unchecked.

   **Note**
   If you are using the Windows Firewall, make sure that the Remote Desktop item is checked under Firewall Exceptions.

1. Create a registry file called `enableRdp.reg` at C:\ with the following content:

   ```
   REGEDIT4
   [HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Terminal Server]
   "fDenyTSConnections"=dword:00000000
   ```

   The `enableRdp.reg` file is used at the end of the Sysprep process to enable RDP in the Windows registry.

2. For Windows XP manual Sysprep, include the following under Additional Commands in the Setup Manager tool:

   ```
   regedit /s C:\enableRdp.reg
   ```

   The Setup Manager tool is used to create answer files for Sysprep.

3. For Windows Vista or Windows 7 manual Sysprep and customization specs, create a batch file called `SetupComplete.cmd` in the `%WINDIR%\Setup\Scripts` directory with the following content:

   ```
   regedit /s C:\enableRdp.reg
   ```

   Windows Vista looks for `%WINDIR%\Setup\Scripts\SetupComplete.cmd` and executes it at the end of every setup process, including Sysprep. The default setting for `%WINDIR%` is `C:\Windows`.

### 9.4.8. The Window Displaying the VMware-Hosted Virtual Desktop Is Freezing

If you suspend or power down your virtual machine without first closing the RDP connection, the guest OS dies, but the RDP connection remains active. The result is a non-responsive window displaying the last known state of your Windows session. The following steps show how to set the Run VMware Tools Scripts panel on both the Virtual Infrastructure Client and the guest OS to avoid this problem.

1. Configure the Run VMware Tools Scripts panel on the Virtual Infrastructure Client.
   a. Select Edit Settings of a particular VM to bring up the Virtual Machine Properties page.
   b. Click the Options tab.
   c. Select VMware Tools.

   This is where you can modify the behavior of the Power Controls (Start, Stop, Suspend, and Reset).
d. Next to the Power Off switch (red rectangle), select Shut Down Guest.

This allows the guest OS to shut down gracefully when the Power Control button is pressed.

e. In the Run VMware Tools Scripts panel, check the Before Powering Off checkbox.

2. Repeat steps a. through e. above to configure the Run VMware Tools Scripts panel on the guest OS.

3. Modify the `poweroff-vm-default.bat` script on the guest OS.

   The install location on the guest OS, typically `C:\Program Files\VMware\VMware Tools`, contains the following default scripts:

   ```
   poweroff-vm-default.bat
   poweron-vm-default.bat
   resume-vm-default.bat
   suspend-vm-default.bat
   ```

4. Add `tsdiscon.exe` to the `poweroff-vm-default.bat` script.

   The `poweroff-vm-default.bat` script is the first to execute when the VM is powered off from the VMware Infrastructure Client. It now calls `tsdiscon.exe`, which closes all open RDP connections.

9.4.9. I Have Created a New Pool in My VMware Desktop provider and Virtual Machines Are Not Created Automatically

   • You have not defined a template for the pool. Make sure that your pool configuration points to a virtual machine or template.

   • There is not enough disk space available to create copies of the template.

9.4.10. How Do I Use VMware Virtual Machines With Multiple Network Adapters?

   Using virtual machines with more than one network interface can be problematic. Oracle VDI expects RDP to be available on the primary interface. If RDP is actually running on a different interface, then the machine may not be prepared successfully or assigned to users.

   The problem arises in determining which exactly is the primary interface. The VMware documentation would lead us to believe that it is the primary interface listed in Windows. But, this is not the case. In fact, the primary interface is determined by the order of the network adapters in VMware vCenter. The network adapter with the highest number, usually the one which was added most recently, is the primary network adapter.

   To change the network of the primary adapter:

   1. Edit the virtual machine settings in VMware vCenter.

   2. Select the network adapter with the highest number, for example Network Adapter 3.

   3. This is the primary network interface. Change the network label to the appropriate network for RDP.

   4. You may need to adjust the other network adapters so that the virtual machine is assigned to all the correct networks.
Figure 9.1. Virtual Machine Network Settings in VMware vCenter

9.4.11. Unused VMware Virtual Machines Are Not Being Recycled

1. Verify that the Power Options on the Windows guest OS have been configured to go into standby when it is idle.

2. Verify that the VMware Tools and the Virtual Desktop Connector Tools are installed and running on the Windows guest OS.

   Check the Windows Event Log for any problems with the tools.

   If you imported desktops from a previous release of Oracle VDI, verify that the desktop is using the latest version of the Oracle VDI tools. Open the desktop console, go to Control Panel > Add or Remove Programs. Open the support information for Oracle VDI Tools. The version number of the tools must match your Oracle VDI release number.

3. Verify that the virtual machine is configured to suspend when it is in standby.

   Check the virtual machine settings (Options/Power management), and make sure that the Suspend the Virtual Machine item is selected.

4. Verify that the Windows guest OS actually enters standby and the virtual machine suspends when the machine is not in use.

   **Note**

   If you experience problems with the standby feature in Windows XP, see [http://www.terranovum.com/projects/energystar/ez_gpo.html](http://www.terranovum.com/projects/energystar/ez_gpo.html). EZ GPO includes a group policy for power options.
9.5. Microsoft Hyper-V and RDS Desktop Providers

9.5.1. Sessions Are Started by Oracle VDI on RDS Hosts That Do Not Participate in the Microsoft Remote Desktop Provider. Why Is That Happening?

This will happen if you add to the provider some of the RDS hosts that participate in a farm, but not all of them. In case of RDS hosts participating in a farm, Oracle VDI detects the farm name which is returned to the Remote Client when a user tries to get a new session. Therefore, the session may be started on any RDS host participating in the farm, even on those that Oracle VDI does not know about.

This is why it is strongly recommended to add all RDS hosts of the farm to the Microsoft Remote Desktop provider. See Section 4.2.5, “Microsoft RDS Farm (NLB Cluster) Management” for details.

9.5.2. Hyper-V Desktop Cloning Fails With "Cannot Reload MSiSCSI Target List" Errors

The desktop cloning process relies on the iscsicli command-line interface on the Hyper-V server in order to assign a disk to the new clone. The iscsicli command may sometimes hang on the Hyper-V server, which in turn will cause the cloning process to fail with the error “Cannot reload MSiSCSI target list”.

Oracle VDI supports a number of settings which allow an administrator to configure how Oracle VDI runs the iscsicli command on the Hyper-V server. The properties can be modified using the vda command-line interface. The settings that can be modified are as follows:

- `msiscsi.timeout` - The amount of time that Oracle VDI should wait for MSiSCSI operations to complete on a Windows server.
- `msiscsi.retries` - The number of times Oracle VDI retry loading the iSCSI target list on a Windows server before returning an error.
- `msiscsi.retry.interval` - The amount of time that Oracle VDI should wait between iSCSI load retries.

To see the current values for the settings use the command:

```bash
# /opt/SUNWvda/sbin/vda settings-getprops
--property=msiscsi.timeout,msiscsi.retries,msiscsi.retry.interval
```

To set new values for the settings use a command like the following:

```bash
# /opt/SUNWvda/sbin/vda settings-setprops
--property=msiscsi.timeout=30,msiscsi.retries=10,msiscsi.retry.interval=15
```

In particular, increasing the value of the `msiscsi.retry.interval` property has been observed to reduce the number of cloning failures due to `iscsicli` failure.

9.5.3. Can I Enter the Farm Information for the Microsoft Remote Desktop Provider and let Oracle VDI Detect the Individual RDS Hosts Participating in the Farm?

No, it is not possible to do so. If you want Oracle VDI to collect information about the sessions and allow some control over them, you need to provide the administrator credentials of each individual RDS host participating in the farm so that Oracle VDI is able to query these hosts about the sessions.
Alternatively, you may choose to only specify the Remote Desktop Server Farm, in which case no session and load information is available in Oracle VDI.

See Section 4.2.5, “Microsoft RDS Farm (NLB Cluster) Management” for details.

9.5.4. Oracle VDI Is Not Able to Communicate With the Windows Server

Test that WinRM can communicate using HTTP between two Windows servers.

To configure WinRM to listen for HTTP requests run “winrm qc” on your windows platform.

On another windows machine execute the below command where <IP> is the IP address or host name of the windows server you want to test and <USER> is the local administrator on the windows server you want to test.

```bash
C:\Documents and Settings\Administrator>winrm id -r:<IP> -u:<USER>
```

If you get an error executing this command then WinRM has not been setup correctly on the windows server.

9.5.5. Connection Problems between Oracle VDI and Hyper-V

By default, Windows Server 2008 R2 installs with the Windows Remote Management (WinRM) limited to 15 concurrent operations per user. To check the number of concurrent operations per user, run the following command on Windows host:

```bash
> winrm get winrm/config
...
Service
MaxConcurrentOperationsPerUser = 15
...
```

For some Oracle VDI deployments, this limit is too low and can cause communication problems between Oracle VDI and Hyper-V. When there are communication problems, the cacao logs typically contain the following error message:

```
SOAP Fault: The WS-Management service cannot process the request. The maximum number of concurrent operations for this user has been exceeded. Close existing operations for this user, or raise the quota for this user.
  Actor:
    Code: s:Receiver
  Subcodes: w:InternalError
  Detail: The WS-Management service cannot process the request. This user is allowed a maximum number of 15 concurrent operations, which has been exceeded. Close existing operations for this user, or raise the quota for this user.
```

If you see this error message, the solution is to increase the MaxConcurrentOperationsPerUser property to a value that is appropriate for your Oracle VDI deployment. To change the property, run the following command on the Hyper-V host:

```bash
> winrm set winrm/config/service @(MaxConcurrentOperationsPerUser="num")
```

For example:

```bash
> winrm set winrm/config/service @(MaxConcurrentOperationsPerUser="200")
```
9.6. Desktops and Pools

9.6.1. How Do I Make a Desktop Available to a User at All Times?

Make sure the user’s desktop has a personal assignment instead of a flexible assignment. For more about desktop assignment types, see Section 9.6.3, “What Is the Difference Between Personal and Flexible Desktop Assignments?”.

9.6.2. Starting a Desktop Fails With "No suitable Hosts to Start a Desktop for Desktop Provider <Name>" Errors

The error 'No suitable hosts to start a desktop for Desktop Provider <ProviderName>.' indicates that there were no hosts with sufficient memory in your desktop provider.

Check the available memory on your hosts using Oracle VDI Manager under the Desktop Provider > Hosts tab.

9.6.3. What Is the Difference Between Personal and Flexible Desktop Assignments?

- **Personal Assignment**: Like physical computers assigned to users, desktops that are personally (or statically) assigned are owned by these users and are never recycled or available for other users unless an administrator explicitly removes the assignment and re-assigns a desktop to a different user.

- **Flexible Assignment**: Desktops that are flexibly (or dynamically) assigned are owned by users only temporarily. Once users log out of their desktops or their desktops are no longer in use, the desktops are recycled and become available for other users. As part of the recycle process, the desktop assignment is removed.

Personal assignments are created when you select a specific desktop in the Oracle VDI Admin GUI and assign it explicitly to a user.

If you assign a user (or a group of users) to a pool, the desktop assignments are created on demand the first time the user requests a desktop (or connects to a desktop). The type of assignment (personal or flexible) depends on the pool settings. You can configure this individually for each pool on the Pool - Settings subcategory (see the Desktop Assignment section).

In addition to the assignment type, you can also specify how each pool is filled with desktops. Here you have the choice to manually import desktops, or to clone desktops automatically from a specified template (see the Cloning subcategory).

When you create a new pool, we provide default settings for the assignment and cloning configurations. For convenience, the pool wizard offer "Manual", "Dynamic", and "Growing" pool types which only differ in their default settings. You can change the pool settings at any point. The pool type is not stored anywhere - it just defines the initial pool settings and is offered as a shortcut. The main differences in the pool types are as follows:

- **Dynamic pool**: Desktops are cloned from a template. Flexible desktop assignment is the default.

- **Growing pool**: Desktops are cloned from a template. Personal desktop assignment is the default.

- **Manual pool**: Cloning disabled (you have to manually fill this pool via importing desktops). Personal desktop assignment is the default.
Recycling of desktops will only happen for flexibly assigned desktops. This is independent from the
desktop provider.

9.6.4. Oracle VDI Fast Preparation Is Failing

FastPrep can fail for numerous reasons, but the most common are networking and user permissions.
Always ensure that your template (and clones) can correctly resolve the domain name used. Also ensure
that the domain and desktop administrators provided have the appropriate permissions.

In the event that FastPrep fails a Windows system error code is usually returned. These error codes can be
checked on MSDN:


Some examples are:

1326 = Logon failure: unknown user name or bad password.
- Check your domain administrator and password

1355 = The specified domain either does not exist or could not be contacted.
- Verify the spelling of your domain and ensure the desktop can resolve the domain name. This is typically
  caused by incorrect DNS settings. If using Oracle VM VirtualBox NAT networking, ensure the host has the
correct DNS server in /etc/resolv.conf.

9.6.5. Can I Use Wild Cards in Token Names to Represent a Group of Thin
Clients in Order to Assign These Thin Clients to a Pool?

No, but Oracle VDI defines two special tokens to assign all Sun Ray Clients or all Smart Cards to a pool.

AnySunRayClient.000 is a predefined token to assign all Sun Ray Clients (Sun Ray hardware and Oracle
Virtual Desktop Client) together to a pool. The user will get a desktop from the pool if the Sun Ray Client is
used without a Smart Card.

AnySmartCard.000 is a predefined token to assign all Smart Cards to a pool. The user will get a desktop
from the pool if the Sun Ray Client is used with a Smart Card.

Alternatively, you can create tokens in bulk and have them associated to users by using the Oracle VDI
CLI as described in Section 5.8.3, “How to Assign Tokens to Users”. Then you can make pool assignments
based on existing groups of users in your user directory, or groups you would define especially for Oracle
VDI installations using Custom Groups.

Do?

The alsa driver in the guest desktop tries to autodetect the ac97 hardware clock. This method does not
work with Oracle VM VirtualBox ac97 emulation. Sometimes the driver gets results which look sane but
are actually not, and calculates the clock frequency based on that, getting a wrong value. The ac97_clock
option in alsa_base.conf disables autodetection.

To disable the autodetection:

1. Run the following in the command line of the Ubuntu desktop.

   # sudo gedit /etc/modprobe.d/alsa-base.conf
2. Add following line to the end of the `alsa-base.conf` file.

```
options snd-intel8x0 ac97_clock=48000
```

3. Restart the desktop.

### 9.6.7. Audio Does Not Play After Changing the Audio Configuration for Oracle VM VirtualBox Hosted Desktops in Oracle VDI Manager

If you change a desktop's configuration (for example, audio) from Oracle VDI Manager, the changes will not take effect until the desktop has been unregistered/re-registered on an Oracle VM VirtualBox host. Simply restarting the desktop from within will not result in this behavior. To force the unregister/register, choose either Power Off or Shutdown from Oracle VDI Manager and then choose Start.

### 9.6.8. How Do I Specify USB Redirection for Sun Ray Clients?

You can adapt the Kiosk session parameters using the Sun Ray Admin GUI. See Section 6.2.1, “About the Oracle VDI Sun Ray Kiosk Session” and Section 6.2.2, “How to Modify the Bundled Sun Ray Kiosk Session” for details. Add the desired drive mapping after any other `uttsc` specific settings:

```
<specific settings for Desktop Selector> - <any other uttsc specific settings> -r disk:<drive name>=<path>
```

### 9.6.9. USB Devices Are Not Detected

Section 5.1.4, “How to Enable USB Redirection” has details of how to configure support for USB devices. If USB devices are not detected in a desktop, follow these steps:

- Check that USB redirection is enabled in the pool.
- Check that the client supports USB redirection.
- Check that Sun Ray Clients are using the latest firmware.

For instructions on how to update Sun Ray Client firmware, see `Sun Ray Client Firmware` in the `Sun Ray Software 5.3 Administration Guide`.

- If the USB device is a USB 2.0 device, check that a USB 2.0 (EHCI) controller is configured in the desktop or template and is enabled in the virtual machine.
- If MS-RDP is the selected RDP protocol for the pool, ensure the USB redirection component of the Sun Ray Windows connector is installed in the desktop or template.
- For VMware vCenter or Microsoft Hyper-V desktop providers, check that USB drivers are installed in the template or desktop.
- For Oracle VDI Hypervisor desktop providers:
  - Check that the desktop provider is using the release of Oracle VM VirtualBox that is shipped with your Oracle VDI release.
  - Check that desktop or template is using the correct version of the Oracle VM VirtualBox Guest Additions.

See Section 9.6.12, “Checking the VirtualBox Guest Additions Version”
9.6.10. What Are the Differences Between MS-RDP and VRDP?

For more detailed information about the differences, refer to the Section 5.1.7, “Choosing Between VRDP and MS-RDP”.

9.6.11. Cloning Fails if the Sysprep Timezone Setting Does not Match the Host Timezone

The Sysprep process removes a template's timezone setting before cloning and uses the default Sysprep setting (GMT) instead. If the virtualization host is in a different timezone than GMT, the mismatch causes cloning to fail. The workaround for this issue is:

1. Disable cloning in the pool's Cloning tab.
2. Click Edit in the System Preparation section of the Cloning tab.
3. In the Edit System Preparation window, change the TimeZone setting from 85 to the appropriate code for your timezone.
   For example, the timezone code for India Standard Time is 190.
4. Click Save.
5. Enable cloning in the pool and check if the problem is still reproducible.

9.6.12. Checking the VirtualBox Guest Additions Version

When troubleshooting problems with desktops, it is worth checking the version of Oracle VM VirtualBox guest additions installed in a desktop. The guest additions version can be checked in Oracle VDI Manager and on the command line, but only while the desktop or template is running.

In Oracle VDI Manager:
1. Go to Pools and select a pool.
2. Go to the Desktops or Templates tab and select a desktop or template.
3. Click the Virtual Machine link.
   The guest additions version is shown on this page.

On the command line:

• Use the vda desktop-show <desktop> command to display the guest additions version for a desktop.
• Use the vda template-show <template> command to display the guest additions version for a template.

To determine the <desktop> or <template>, see Section 5.8.7, “Obtaining the ID of a Desktop or Template”.

9.6.13. Starting A Desktop Fails With an "Error Getting State" Message

It can occur that a desktop fails to start, and the following message is shown in the cacao logs:

```
FINER: thr#7620 THROW com.sun.vda.service.api.ServiceException: Error getting state for desktop 'Win700000016' on host 'vdi1.example.com'.
at com.sun.vda.service.vbox.VBDesktop.start(VBDesktop.java:1299)
```
The problem is caused by an existing registered virtual machine (VM) that has the same name as the desktop that failed to start, but for some reason the existing VM is inaccessible.

The solution is to unregister the inaccessible VM, as follows:

1. Log in as the VirtualBox user (typically root) on the VirtualBox host that hosted the failed desktop.
2. Use the `VBoxManage list vms` command to list all the registered VMs on the host, for example:

   ```
   # VBoxManage list vms
   "Win700000013" {a7aeff15-f6fb-4c10-bbf4-499bb568c551}
   "<inaccessible>" {15a0fdd9-69cb-4de2-b4a9-954633917f82}
   "Win700000008" {405b5579-793b-4e80-9f60-0b2df73ebadc}
   "Win700000019" {c47d23dc-875f-45c3-820d-bf64d013019f}
   ```

   The output shows lists the VM name in quotes, for example "Win700000013" and the UUID of the VM in curly brackets, for example {a7aeff15-f6fb-4c10-bbf4-499bb568c551}. Inaccessible VMs display `<inaccessible>` instead of the name, as shown in the example above.

3. Unregister all inaccessible VMs.

   Use the `VBoxManage unregistervm <UUID>` command to unregister the VM, for example:

   ```
   # VBoxManage unregistervm 15a0fdd9-69cb-4de2-b4a9-954633917f82
   ```

After you have deleted the inaccessible VMs, you should be able to start the failed desktop.

### 9.7. Logging In and Accessing Desktops

#### 9.7.1. Users Cannot Access Their Desktops

1. On a terminal trigger the following command:

   ```
   /opt/SUNWvda/lib/vda-client -u <user>
   ```

2. If things work as expected, then the vda-client will trigger the startup of the corresponding desktop and should return an IP (for example. 10.16.46.208) or DNS name (for example, xpdesktop01) for accessing the user's desktop. If the RDP port differs from the default, then it will be appended to the IP/DNS name (for example. 10.16.46.208:49259 or xpdesktop01:49259)

3. With that information it should now be possible to establish an RDP connection to the desktop.

4. If no IP or DNS name is returned by vda-client, Oracle VDI might not be able to resolve the user ID in the user directory.

   To check that, change the log level for directory services as described in Section 9.2.1, “I Am Having Some Trouble With the User Directory. Can I Adjust the Log Level to Get More Information?”.

5. Check the Cacao log file for entries of the type:

   ```
   FINEST: userId=<user ID> -> DN=<dn>
   ```

   See Section 8.3.2, “How to Check the Oracle VDI Log Files” for details.

6. If `<dn>` is null, that means that no user matching the user id `<test user>` was found in the user directory. It might be necessary to customize the list of attributes `ldap.userid.attributes` to match the directory schema as explained in Section C.1, “How to Edit LDAP Filters and Attributes”.
7. If <dn> is not null, that means that the user matching the user id <test user> was correctly found in the user directory.

9.7.2. A User Can Log in But Their Desktop is Not Responding

A user might find that they can log in to Oracle VDI, but they cannot use a desktop because the virtual machine is not responding.

If this happens, the solution is to restart the desktop. This can be performed by an administrator (for example with the vda desktop-restart command) or by the user.

For a user to restart their desktop, they must first disconnect from the desktop by moving the mouse up to the top of the screen and clicking the "X" on the remote desktop pulldown menu. When the Desktop Selector screen is displayed, the user selects the non-responsive desktop and clicks the Reset button to restart the desktop. Restarting a desktop is the same as rebooting a traditional PC, and users also see a warning that they might lose their unsaved data. Once the desktop is rebooted, it can be connected to from the Desktop Selector screen. Desktops provided by the following provider types cannot be restarted in this way:

- Generic desktop provider
- Microsoft Remote Desktop provider
- Sun Ray Kiosk Session provider

9.7.3. Error - "Currently There Is No Desktop Available Or Assigned to You"

Oracle VDI typically returns the above message for the following reasons:

- There are no desktops directly assigned to the user.
- There is a pool assigned to the user, but no desktops in the pool are available or free to use.
- A desktop has been selected, but it is in an unusable state, typically the startup of the desktop has failed for whatever reasons.

If this message occurs, check the Cacao log file, see Section 8.3.2, “How to Check the Oracle VDI Log Files”.

To establish the root cause, complete the following steps:

1. Check that your desktop/pool assignments are correctly recognized by your system.

   The Oracle VDI Kiosk login takes advantage of an internal CLI (vda-client) to retrieve that information. You can manually trigger this CLI from a terminal (root privileges are not necessary):

   ```bash
   $ /opt/SUNWvda/lib/vda-client -a query -u <user>
   Password: xxxxx
   Windows 7,Windows7000003,8,User
   ```

   The CLI will ask for the user's password. So you have to enter the same credential information as on the Kiosk session login screen (if authentication is disabled on your system, the vda-client CLI will still prompt for a password, but you can leave this blank then - your input is not validated in this case).

   If everything works, then you should get a CSV list of desktop/pool assignments. The format is something like

   <pool name>,<desktop name>,<desktop ID>,<origin>
If you get an error here, or the system reports no assignments, check the Cacao logs. Look for entries of the ClientRequestWorker that handles vda-client requests:

```plaintext
FINEST: Received request from vda-client (127.0.0.1): query(user=username)
...
FINEST: Sent response to vda-client: Windows 7,Windows70000003,8,User
...
```

There might be a couple of issues that could cause problems:

- Authentication failed
- The user name could not be found in LDAP and as a result no user DN could be determined
- No desktop assignments found for the determined user DN.

The log entries between the request received and sent response should give you some insights here.

2. If step 2 worked, request a desktop for your user.

Again this can be done via the vda-client CLI:

```plaintext
$ /opt/SUNWvda/lib/vda-client -a start -u <user> [-P <poolname> [-D <desktopId>]]
Password: xxxxx
servername:49281
```

The `<poolname>` and `<desktopId>` parameters are only necessary if multiple desktops are assigned and you want to startup a specific desktop. If there is only one desktop or pool assigned (or you just want to startup the default desktop), then you do not need to provide these parameters. If everything works, then the CLI will return the name (or IP) of the user's desktop/virtual machine optionally followed by a colon and the number of the RDP port.

If that does not work (the CLI reports an error), then you should again take a look into the logs:

```plaintext
...
FINEST: Received request from vda-client (127.0.0.1): start(user=username)
...
FINEST: Sent response to vda-client: servername:49281
....
```

Again the log entries between the request received and sent response should give you some insights about any issues here.

One typical issue is that no suitable host to startup the desktop has been found. In that case you should first check the memory available for running the desktop/virtual machine.

### 9.7.4. Is It Possible to Customize the Desktop Login Screen?

Adapting the Oracle VDI login screen, which is displayed on Sun Ray Clients, is supported, with some limitations.

It is possible to add a company logo (upper left corner) and to replace the background of the desktop login/selection dialog (middle of the screen) with a custom image. However, there is no way to change the
text position and colors of buttons and input elements. Due to this limitation we also require a fixed size
background image - otherwise the dialog input elements would appear misplaced on the screen.

Place your custom image(s) in the Kiosk session directory under `/etc/opt/SUNWkio/sessions/vda` - ensure that file permissions (readable for everyone) are correct. The file names must be `dialog_background.png` and `company_logo.png` respectively. For the start you might want to
download the sample background image below and make the desired modifications there.

Either quit the existing Sun Ray Kiosk session (click on quit button) or perform a cold restart of Sun Ray
services to enforce the creation of new Kiosk sessions. The images should now appear in the Oracle VDI
login/desktop selection screen.

**Figure 9.2. Position of a Company Logo on a Customized Desktop Login Screen**

The other more complex alternative is to replace the default Oracle VDI kiosk session with an adapted
version. The Oracle VDI web service API offers all the functionality needed to communicate with the Oracle
VDI service for retrieving a list of assigned desktops and starting desktops. You can create your own GUI
(login screen and Desktop Selector) using this web service API, but this requires more programming effort.

### 9.7.5. The Sun Ray Client Is Cycling and Cannot Connect to a Virtual Machine

1. Verify that you have a virtual machine available to connect to.
2. Verify that remote access is correctly configured on your guest operating system.
3. Verify that the Oracle VDI host can communicate with either your vCenter or your Oracle VM VirtualBox
   host.
   
   The firewall on the vCenter server might be blocking the communication.
   
   The user name or password might be incorrect.
4. Verify that the VMware tools are installed on the Windows guest OS.
5. If connecting to Windows 7 desktops using Microsoft RDP, ensure that users log in within 30 seconds.
   
   By default Windows 7 disconnects an RDP connection if no-one logs in within 30 seconds.
9.7.6. Users Cannot Log in to Ubuntu 8.04 Desktops Because the Network Is Not Enabled

Ubuntu has the old "Debian style" network behavior so that every MAC address change (every clone) bumps the network interface name by one. The result is that getting a working network configuration requires a few admin mouse clicks. The only solution to this is at template preparation time by excluding the Oracle VM VirtualBox MAC address range (08:00:27:*;) from the "persistent net" machinery in /lib/udev/rules.d/75-persistent-net-generator.rules and then purging /etc/udev/rules.d/70-persistent-net.rules.


9.7.7. How Do I Control Client Redirection with client.autoredirect Properties?

By default, when users disconnect from their session, they are redirected to the first Sun Ray server contacted. You can configure the redirection behavior with the vda command-line interface.

To ensure redirection to the first Sun Ray server contacted, for instance, to restore the default behavior if it has been modified, you can specify it explicitly with this setting:

```
# /opt/SUNWvda/sbin/vda settings-setprops -p client.autoredirect.firstserver=enabled
```

You can ensure that users are directed to their home server with this setting:

```
# /opt/SUNWvda/sbin/vda settings-setprops -p client.autoredirect.homeserver=enabled
```

9.7.8. Hotdesking Redirect Does Not Work With Windows XP Professional and Microsoft RDP

For Windows XP Professional virtual desktops, the hotdesking redirect to the original VDI Center does not work if Microsoft RDP (MS-RDP) is selected as the desktop protocol for the pool.

For Windows desktops, Oracle VDI can distinguish between a desktop disconnect and a desktop logout. If a user selects Start > Logout from the Windows start menu, the user is logged out of the Windows desktop and the Oracle VDI (kiosk) session. If the user selects Start > Disconnect, then the user is disconnected from the Windows desktop while remaining logged into VDI. If disconnected but not logged out, user returns to the desktop selection screen and can, for example, select a different desktop without the need to log in again. This disconnect behavior is controlled by the client.logout.always setting, which is enabled by default for security reasons. When it is enabled, the user is automatically logged out of Oracle VDI upon disconnecting from a Windows desktop. If the setting is disabled, however, then a disconnect does not result in a logout from the Oracle VDI session.

As part of the Oracle VDI logout process, the Sun Ray Client is redirected to the initially/first contacted Oracle VDI Center. This behavior is especially useful when dealing with multiple VDI centers. Unfortunately, the distinction between logout and disconnect does not work for Windows XP Professional virtual desktops, if Microsoft RDP (MS-RDP) is selected as the desktop protocol for the pool. In this specific case, because Windows XP returns the wrong exit code, Oracle VDI interprets a Start > Logout as a desktop disconnect. Consequently, the user is not logged out of Oracle VDI, and the Sun Ray Client is not redirected to the initial Oracle VDI Center.

The workaround is either to use VirtualBox RDP (VRDP) instead of MS RDP or to ensure that users are always logged out of Oracle VDI when they disconnect from their desktop. As explained above, the
client.logout.always setting is already enabled by default. If you have changed this behavior, you can reset it with the following command:

```
# /opt/SUNWvda/sbin/vda settings-setprops -p client.logout.always=Enabled
```

9.8. Administration Tools

9.8.1. I Cannot Log in to Oracle VDI Manager

This is most likely an issue with cacao or the vda service

1. If the Oracle VDI host runs into a virtual machine, check that the machine has enough RAM

2. Check the status of cacao and the vda service as described in Section 9.9.2, “The System Is Not Reacting as Expected”.

3. Try restarting the service:

```
/opt/SUNWvda/sbin/vda-service restart
```

9.8.2. I Get a Blank Screen After Successfully Logging into the Oracle VDI Manager

This is most likely an issue with the MySQL database

1. Try restarting the service

```
/opt/SUNWvda/sbin/vda-service restart
```

2. If problem persists, you need to troubleshoot the MySQL database:

If you are using the embedded Oracle VDI MySQL Server database, it is important to know that the database is quite demanding regarding physical resources, this specifically concerns CPU power, RAM and network bandwidth. The first thing to check is always if the network connectivity is provided and that the database service is running.

Run the following command to check if the embedded MySQL Server database Master and Slave (if configured) are running.

```
/opt/SUNWvda/sbin/vda-db-status
```

On Oracle Solaris platforms, you can also check that the status of the database on the Master or Slave host with the following command:

```
# svc status svc:/application/database/vdadb:default
```

If everything is fine you should see something similar to this:

```
STATE STIME FMRI
online Mrz_18 svc:/application/database/vdadb:default
```

If the database service is not running, start it.

On Oracle Solaris platforms, use either of the following commands:

```
# svcadm enable svc:/application/database/vdadb:default
```

```
# svcadm clear svc:/application/database/vdadb:default
```
On Linux platforms, use the following command:

```
# /etc/init.d/vda-db-init start
```

If none of this helps, check the MySQL log files for possible root causes for your database problems. The log files in `/var/opt/SUNWvda/mysql`. Information about the MySQL Cluster log file format can be found in the official MySQL documentation [MySQL Cluster Log Messages](#).

### 9.8.3. Error - "You Have Been Logged out Because a Consistent Response Could Not Be Guaranteed"

Refer to the Troubleshooting item [Section 9.8.1, "I Cannot Log in to Oracle VDI Manager"].

### 9.8.4. How Can I Change the Password of an Oracle VDI Host?

If you need to change the root password of an Oracle VDI host, run the following UNIX command.

```
# passwd root
New Password: <enter new password>
Re-enter new Password: <confirm>
```

### 9.8.5. How Do I Change the Password of a Remote MySQL Database?

During the initial configuration of Oracle VDI (using an external database), an Oracle VDI database user account (default, `vdadb`) was created.

1. Change the password on the MySQL side by using the following MySQL CLI commands.

   ```
   mysql> UPDATE mysql.user SET password=PASSWORD('<new_password>') WHERE user='vdadb';
   mysql> FLUSH PRIVILEGES;
   ```

2. To change the password on Oracle VDI, reconfigure Oracle VDI.

   See [Section 2.3.4, “Reconfiguring Oracle VDI on a Host”](#).

### 9.8.6. Does the MySQL Database Store All Sun Ray Software Configuration?

No, the Sun Ray Software configuration is stored in an LDAP-based datastore.

### 9.8.7. The vda Command Reports That Oracle VDI Is Not Running But Other Commands Say It Is

**Problem:** You run the `vda` command and you see the error message, "This command cannot be used because Oracle Virtual Desktop Infrastructure is not running on this server". However when you run the `cacaoadm` and `vda-db-status` commands, they show that Oracle VDI is running.

**Solution:** Check your `/etc/hosts` file to see if you have an IPv6 entry for localhost. If you have, comment out that entry and run the `vda` command again.

### 9.8.8. Users Do Not Show Up in Users and Groups in Oracle VDI Manager

It might be necessary to customize the LDAP filters `ldap.user.object.filter` and `ldap.user.search.filter` as described in [Appendix C, User Directory LDAP Filters and Attributes](#), especially if the user directory is OpenLDAP or Novell eDirectory.
9.8.9. Is There a Way to Modify the Cacao Logging Behavior So That a Long History Can Be Maintained?

Yes. See Section 8.3.3, “How to Change Logging for Oracle VDI”.

9.8.10. Jobs Do Not Finish Even After You Cancel Them with Oracle VDI Manager

You can force to abort all active jobs:

1. Verify that the Oracle VDI service is running.

2. Enter the following command in the shell:

   ```
   # /opt/SUNWvda/mysql/bin/mysql  
   --defaults-file=/etc/opt/SUNWvda/my.cnf -D vda -u root -p -e "UPDATE 
   t_job SET status = 'CANCELED', endtime = NOW() 
   WHERE status IN ('RUNNING','QUEUED','CANCELLING') AND type <> 'DESTROY_POOL'"
   ```

3. If asked for a password, enter the MySQL database administrator password selected when you configured Oracle VDI on the primary host.

   If the administrator password was automatically generated, see Section 9.8.12, “How Do I Log in to the Embedded MySQL Server Database?”.

   If you are using a remote MySQL database, use the remote database administrator user and password.

9.8.11. Can I Adjust the Logging Level for the Oracle VDI Logs?

By default, all Oracle VDI service messages are logged in the Cacao log file. To change the logging level or the log history, see Section 8.3.2, “How to Check the Oracle VDI Log Files”.

9.8.12. How Do I Log in to the Embedded MySQL Server Database?

Caution
Logging in to the Oracle VDI database in order to change settings and data is not supported. Only use the Oracle VDI administration tools to perform these tasks.

1. Obtain the database password.

   When you configure the primary host in an Oracle VDI Center and you use the embedded MySQL Server database, you can either provide your own password for the database administrator or have a password automatically generated.

   To obtain the password, run the following command as root:

   ```
   # /opt/SUNWvda/sbin/vda-center getprops -s vda.password
   ```

   Caution
   The password is displayed in clear text. Ensure that no-one else can see your screen.

2. Log in to the embedded Oracle VDI MySQL Server database.

   On the Oracle VDI host that has the master or slave database, run the following command as root:
When prompted, type the administrator password.

### 9.9. Oracle VDI

#### 9.9.1. Oracle VDI Hangs Intermittently When Running on x2270 Hardware

Due to a bug in the Oracle Solaris `ahci` driver, if Oracle VDI is running on Oracle Solaris 10 10/09 or Oracle Solaris 10 9/10 on Sun x2270 hardware may hang.

To work around the problem, add the following line in the `/etc/system` file and reboot the server:

```
set idle_cpu_no_deep_c = 1
```

#### 9.9.2. The System Is Not Reacting as Expected

A restart of the vda service is recommended.

Restart the Common Agent Container:

```
# cacaoadm stop -f -i vda
# cacaoadm start -i vda
```

On Linux platforms, the `cacaoadm` command is in `/opt/sun/cacao2/bin`.

Check the Cacao log file, see Section 8.3.2, “How to Check the Oracle VDI Log Files”.

To check the Cacao status:

```
cacaoadm status -i vda
```

To check the status of the vda service:

```
cacaoadm status -i vda com.sun.vda.service
```

#### 9.9.3. How Do I Configure DHCP in Oracle VDI?

First, install and configure Oracle VDI using `vda-install` and `vda-config`, see Chapter 2, *Installing Oracle VDI and Configuring Oracle VDI Centers*. This installs Sun Ray Software and configures the Kiosk settings. You can then adapt things as needed using the typical Sun Ray Software commands. For example, use `utadm -a <interface name>` to configure a dedicated interconnect for the Sun Ray Clients. This will also ask you for the desired DHCP settings.
Appendix A. Automated Administration Scripts

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The vda and vda-center commands can be used in scripts for automated administration.

Reading the Return Code

The vda and vda-center commands return the following exit codes:

- 0: Successful completion
- 1: An error occurred
- 2: Invalid command line options or arguments were specified

Waiting for a Job to Finish

Some vda subcommands return immediately but start an action in the background, known as a job.

The vda job-wait command enables you to wait for a specific job to be completed before the next command is performed.

```bash
# vda job-wait --help
Wait until the job ends

Usage:
vda job-wait [-t <timeout> | --timeout=<timeout>] <job>
-?, --help                  Print this help list
Options:
-t <timeout>, --timeout=<timeout>
  Timeout in seconds to wait
Operand:
*<job>                     The id of the job
'*' denotes mandatory parameters.
```

Parsing the Output of the CLI

A number of the vda and vda-center subcommands support a parsable option so that the output is formatted for easy parsing as a list of lines of colon-separated (':') fields.

The syntax of the option is:

```bash
-x, --parseable Display output suitable for programmatic parsing.
```

The following sections describe the format of output for the subcommands that support the parsable option.

A.1. Parsing vda Commands that Result in Jobs

vda Subcommands That Result in a Single Job

The following vda subcommands result in a single job:
Subcommands That Result in a Multiple Jobs

- `desktop-export`: Export a desktop.
- `pool-hv-import`: Import Microsoft Hyper-V desktops into the pool.
- `pool-vb-import`: Import Oracle VM VirtualBox desktops into the pool.
- `pool-vb-import-unmanaged`: Import unmanaged Oracle VM VirtualBox desktops into the pool.
- `provider-migrate-host`: Migrate desktops from a host.
- `provider-replace-storage`: Replace a storage.
- `provider-suspend-storage`: Suspend a storage.
- `revision-create`: Create a revision
- `revision-export`: Export a revision.
- `revision-sysprep`: Sysprep a revision.
- `template-create`: Copy a revision to a new template.
- `template-desktop`: Copy the template to a new desktop.
- `template-export`: Export a template.
- `template-revert`: Revert a template to the most recent revision.

**Parsable Output:** one line with the following value.

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job ID</td>
<td>integer</td>
</tr>
</tbody>
</table>

### Subcommands That Result in a Multiple Jobs

The following vda subcommands result in multiple jobs:

- `desktop-delete`: Delete desktops.
- `desktop-duplicate`: Duplicate desktops.
- `desktop-restart`: Restart desktops.
- `desktop-start`: Start desktops.
- `desktop-stop`: Stop desktops.
- `desktop-suspend`: Suspend desktops.
- `desktop-template`: Convert the desktops to templates.
- `pool-delete`: Delete pools and their desktops.
- `pool-reset`: Reset cloning for the pool.
- `provider-storage-orphan-delete`: Delete orphan disks.
- `revision-clone`: Clone desktops from revisions.
• **revision-delete**: Delete revisions.
• **revision-desktop**: Copy revisions to desktops.
• **template-delete**: Delete templates.
• **template-restart**: Restart templates.
• **template-start**: Start templates.
• **template-stop**: Stop templates.
• **template-suspend**: Suspend templates.

**Parseable Output**: list of lines with the following values.

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job ID</td>
<td>integer</td>
</tr>
</tbody>
</table>

**A.2. Parsing vda Command Output**

In addition to the commands that result in jobs, the following vda commands have parseable output:

• **vda admin-list**
• **vda admin-show**
• **vda desktop-search**
• **vda directory-list**
• **vda group-list**
• **vda group-show**
• **vda job-list**
• **vda job-show**
• **vda pool-desktops**
• **vda pool-list**
• **vda pool-show**
• **vda pool-templates**
• **vda pool-users**
• **vda provider-list**
• **vda provider-list-hosts**
• **vda provider-list-networks**
• **vda provider-list-storage**
• **vda provider-list-templates**
vda admin-list

List all administrators with their roles.

**Parsable Output:** list of lines with the following values separated by a colon (":").

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Username</td>
<td>string</td>
</tr>
<tr>
<td>Roles</td>
<td>comma-separated string</td>
</tr>
</tbody>
</table>

vda admin-show

Show details for the administrator.

**Parsable Output:** one line with the following values separated by a colon (":").

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Description</td>
<td>string</td>
</tr>
</tbody>
</table>

Followed by a list of lines with the following values separated by a colon (":").

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Role Name</td>
<td>string</td>
</tr>
<tr>
<td>Role Description</td>
<td>string</td>
</tr>
</tbody>
</table>

vda desktop-search

Search for a desktop or desktops.

**Parsable Output:** list of lines with the following values separated by a colon (":").

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desktop ID</td>
<td>long</td>
</tr>
</tbody>
</table>
### vda directory-list

List all user directories.

**Parsable Output:** list of lines with the following values separated by a colon (':').

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>string</td>
</tr>
<tr>
<td>Status</td>
<td>OK</td>
</tr>
<tr>
<td>AD Domain or Base DN</td>
<td>string</td>
</tr>
</tbody>
</table>

### vda group-list

Lists all custom groups.

**Parsable Output:** list of lines with the following values separated by a colon (':').

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Custom Group Name</td>
<td>string</td>
</tr>
</tbody>
</table>

### vda group-show

Show the pools assigned to the custom group.

**Parsable Output:** list of lines with the following values separated by a colon (':').

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pool Name</td>
<td>string</td>
</tr>
</tbody>
</table>

### vda job-list

List the existing jobs.

**Parsable Output:** list of lines with the following values separated by a colon (':').

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job Title</td>
<td>The title of the job, for example, Cloning Desktop desktop_name</td>
</tr>
</tbody>
</table>
vda job-show

Show the job details.

**Parsable Output:** one line with the following values separated by a colon ("":").  

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job Title</td>
<td>The title of the job, for example, Cloning Desktop desktop_name</td>
</tr>
<tr>
<td>Target of the Job</td>
<td>string</td>
</tr>
<tr>
<td>Status of the Job</td>
<td>Queued</td>
</tr>
<tr>
<td>Start Time</td>
<td>hh:mm:ss</td>
</tr>
<tr>
<td>End Time</td>
<td>hh:mm:ss</td>
</tr>
<tr>
<td>Job Details</td>
<td>string</td>
</tr>
<tr>
<td>Cancellable</td>
<td>true</td>
</tr>
</tbody>
</table>

vda pool-desktops

List all desktops from the pool.

**Parsable Output:** list of lines with the following values separated by a colon ("":").  

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desktop Name</td>
<td>string</td>
</tr>
<tr>
<td>Desktop ID</td>
<td>long</td>
</tr>
<tr>
<td>Machine State</td>
<td>Running</td>
</tr>
<tr>
<td>Desktop State</td>
<td>Used</td>
</tr>
<tr>
<td>DN of Assigned User</td>
<td>string</td>
</tr>
</tbody>
</table>

vda pool-list

List all pools.

**Parsable Output:** list of lines with the following values separated by a colon ("":").
### vda pool-show

Show detailed information about the pool.

**Parsable Output for non-PC Pools**: one line with the following values separated by a colon (":").

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignment Status</td>
<td>Enabled</td>
</tr>
<tr>
<td>Type of Desktop Assignment</td>
<td>Personal</td>
</tr>
<tr>
<td>Desktop Provider Name</td>
<td>string</td>
</tr>
<tr>
<td>Cloning Status</td>
<td>Enabled</td>
</tr>
<tr>
<td>Number of Cloning Jobs</td>
<td>integer</td>
</tr>
<tr>
<td>Template</td>
<td>None</td>
</tr>
<tr>
<td>Number of Available Desktops</td>
<td>integer</td>
</tr>
<tr>
<td>Number of Assigned Desktops</td>
<td>integer</td>
</tr>
<tr>
<td>Total Number of Desktops</td>
<td>integer</td>
</tr>
<tr>
<td>Guest Pool</td>
<td>Enabled</td>
</tr>
</tbody>
</table>

**Parsable Output for PC Pools**: one line with the following values separated by a colon (":").

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignment Status</td>
<td>Enabled</td>
</tr>
<tr>
<td>Type of Desktop Assignment</td>
<td>Personal</td>
</tr>
<tr>
<td>Desktop Provider Name</td>
<td>string</td>
</tr>
<tr>
<td>Number of Available Desktops</td>
<td>integer</td>
</tr>
<tr>
<td>Number of Assigned Desktops</td>
<td>integer</td>
</tr>
<tr>
<td>Total Number of Desktops</td>
<td>integer</td>
</tr>
<tr>
<td>Guest Pool</td>
<td>Enabled</td>
</tr>
</tbody>
</table>

### vda pool-templates

List all templates from the pool.

**Parsable Output**: list of lines with the following values separated by a colon (":").

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Template Name</td>
<td>string</td>
</tr>
<tr>
<td>Template ID</td>
<td>long</td>
</tr>
</tbody>
</table>
### vda pool-users

List all users of the pool.

**Parsable Output:** list of lines with the following values separated by a colon (":").

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of the User or Group</td>
<td>string</td>
</tr>
<tr>
<td>Kind of Object</td>
<td>User</td>
</tr>
<tr>
<td>DN of the User or Group</td>
<td>string</td>
</tr>
</tbody>
</table>

### vda provider-list

List all desktop providers.

**Parsable Output:** list of lines with the following values separated by a colon (":").

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desktop Provider Name</td>
<td>string</td>
</tr>
<tr>
<td>Provider Type</td>
<td>Oracle VM VirtualBox</td>
</tr>
<tr>
<td>Status</td>
<td>OK</td>
</tr>
</tbody>
</table>

### vda provider-list-hosts

List all hosts for the Oracle VM VirtualBox, Microsoft Hyper-V, or Microsoft Remote Desktop desktop providers.

**Parsable Output for Oracle VM VirtualBox and Microsoft Hyper-V Providers:** list of lines with the following values separated by a colon (":").

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Host Name</td>
<td>string</td>
</tr>
<tr>
<td>Status</td>
<td>Enabled</td>
</tr>
<tr>
<td>Enabled</td>
<td>Enabled</td>
</tr>
<tr>
<td>CPU Usage</td>
<td>xx% (x.x GHz</td>
</tr>
<tr>
<td>Memory Usage</td>
<td>xx% (x.x GB</td>
</tr>
<tr>
<td>Number of Desktops</td>
<td>integer</td>
</tr>
</tbody>
</table>

**Parsable Output for Microsoft Remote Desktop Providers:** list of lines with the following values separated by a colon (":").
List all networks for the desktop provider.

**Parsable Output:** list of lines with the following values separated by a colon (`:`).

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subnet Label</td>
<td>String</td>
</tr>
<tr>
<td>Subnet Address</td>
<td>String</td>
</tr>
<tr>
<td>Availability</td>
<td>`All Hosts</td>
</tr>
</tbody>
</table>

List all storage servers for the desktop provider.

**Parsable Output for Oracle VM VirtualBox and Microsoft Hyper-V Providers:** list of lines with the following values separated by a colon (`:`).

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage Name</td>
<td>string</td>
</tr>
<tr>
<td>Status</td>
<td>`Enabled</td>
</tr>
<tr>
<td>ZFS Pool</td>
<td>string</td>
</tr>
<tr>
<td>Capacity</td>
<td><code>xxx.x GB</code></td>
</tr>
<tr>
<td>Usage</td>
<td><code>xx.x GB</code></td>
</tr>
<tr>
<td>Number of Desktops</td>
<td>integer</td>
</tr>
</tbody>
</table>

**Parsable Output for VMware vCenter Providers:** list of lines with the following values separated by a colon (`:`).

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage Name</td>
<td>string</td>
</tr>
<tr>
<td>Storage ID</td>
<td>string</td>
</tr>
<tr>
<td>ZFS Pool</td>
<td>string</td>
</tr>
<tr>
<td>Capacity</td>
<td><code>xxx.x GB</code></td>
</tr>
<tr>
<td>Usage</td>
<td><code>xx.x GB</code></td>
</tr>
<tr>
<td>Number of Desktops</td>
<td>integer</td>
</tr>
</tbody>
</table>
vda provider-list-templates

List the templates for the desktop provider.

**Parsable Output for Oracle VM VirtualBox and Microsoft Hyper-V Providers:** list of lines with the following values separated by a colon (‘:’).

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Template Name</td>
<td>string</td>
</tr>
<tr>
<td>Template ID</td>
<td>long</td>
</tr>
<tr>
<td>User Directory Name</td>
<td>string</td>
</tr>
</tbody>
</table>

**Parsable Output for VMware vCenter Providers:** list of lines with the following values separated by a colon (‘:’).

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Template Name</td>
<td>string</td>
</tr>
<tr>
<td>Template ID</td>
<td>string</td>
</tr>
<tr>
<td>Path</td>
<td>string</td>
</tr>
</tbody>
</table>

vda provider-list-unmanaged

List the desktops from the virtualization platform that are not managed by any desktop provider.

**Parsable Output for Oracle VM VirtualBox and Microsoft Hyper-V Providers:** list of lines with the following values separated by a colon (‘:’).

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Host Name</td>
<td>string</td>
</tr>
<tr>
<td>Desktop Name</td>
<td>string</td>
</tr>
<tr>
<td>Desktop ID</td>
<td>long</td>
</tr>
</tbody>
</table>

**Parsable Output for VMware vCenter Providers:** list of lines with the following values separated by a colon (‘:’).

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desktop Name</td>
<td>string</td>
</tr>
<tr>
<td>Desktop ID</td>
<td>string</td>
</tr>
<tr>
<td>Path</td>
<td>string</td>
</tr>
</tbody>
</table>

vda provider-show

Show detailed information about the desktop provider.

**Parsable Output for Oracle VM VirtualBox and Microsoft Hyper-V Providers:** one line with the following values separated by a colon (‘:’).

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>OK</td>
</tr>
<tr>
<td>Value</td>
<td>Data Format</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>Pool Names</td>
<td>comma-separated strings</td>
</tr>
<tr>
<td>Total Number of Desktops</td>
<td>integer</td>
</tr>
<tr>
<td>Number of Used Desktops</td>
<td>integer</td>
</tr>
<tr>
<td>CPU Usage of all Hosts</td>
<td>xx%</td>
</tr>
<tr>
<td>Total Memory of all Hosts</td>
<td>xx.xx GB</td>
</tr>
<tr>
<td>Memory Usage of all Hosts</td>
<td>xx%</td>
</tr>
<tr>
<td>Number of Storage Servers</td>
<td>integer</td>
</tr>
<tr>
<td>Total Capacity of the Storage Servers</td>
<td>xxx.x GB</td>
</tr>
<tr>
<td>Usage of the Storage Servers</td>
<td>xx%</td>
</tr>
<tr>
<td>Number of Networks</td>
<td>integer</td>
</tr>
<tr>
<td>Network Availability</td>
<td>All Hosts</td>
</tr>
<tr>
<td>Comment</td>
<td>string</td>
</tr>
</tbody>
</table>

**Parsable Output for VMware vCenter Providers:** one line with the following values separated by a colon (`:`).

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>OK</td>
</tr>
<tr>
<td>Pool Names</td>
<td>comma-separated strings</td>
</tr>
<tr>
<td>Total Number of Desktops</td>
<td>integer</td>
</tr>
<tr>
<td>Number of Used Desktops</td>
<td>integer</td>
</tr>
<tr>
<td>Server</td>
<td>string</td>
</tr>
<tr>
<td>Datacenters</td>
<td>comma-separated strings</td>
</tr>
<tr>
<td>Number of Storage Servers</td>
<td>integer</td>
</tr>
<tr>
<td>Total Capacity of the Storage Servers</td>
<td>xxx.x GB</td>
</tr>
<tr>
<td>Usage of the Storage Servers</td>
<td>xx%</td>
</tr>
<tr>
<td>Comment</td>
<td>string</td>
</tr>
</tbody>
</table>

Followed by a list of lines with the following values separated by a colon (`:`).

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cluster Name</td>
<td>string</td>
</tr>
<tr>
<td>Cluster CPU Used</td>
<td>xx%(xx.xx MHz</td>
</tr>
<tr>
<td>Cluster Total Memory</td>
<td>xx.xx GB</td>
</tr>
<tr>
<td>Cluster Used Memory</td>
<td>xx%(xx.xx MB</td>
</tr>
</tbody>
</table>

**Parsable Output for Non-Farm Remote Desktop Providers:** one line with the following values separated by a colon (`:`).

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>OK</td>
</tr>
<tr>
<td>Pool Names</td>
<td>comma-separated strings</td>
</tr>
<tr>
<td>Value</td>
<td>Data Format</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Number of Active Sessions</td>
<td>integer</td>
</tr>
<tr>
<td>Number of Disconnected Sessions</td>
<td>integer</td>
</tr>
<tr>
<td>Host Farm</td>
<td>false</td>
</tr>
<tr>
<td>CPU Usage of all Hosts</td>
<td>xx%</td>
</tr>
<tr>
<td>Total Memory of all Hosts</td>
<td>xx.xx GB</td>
</tr>
<tr>
<td>Memory Usage of all Hosts</td>
<td>xx%</td>
</tr>
<tr>
<td>Comment</td>
<td>string</td>
</tr>
</tbody>
</table>

**Parsable Output for Farm Remote Desktop Providers:** one line with the following values separated by a colon (':').

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td></td>
</tr>
<tr>
<td>Pool Names</td>
<td>comma-separated strings</td>
</tr>
<tr>
<td>Host Farm</td>
<td>true</td>
</tr>
<tr>
<td>Comment</td>
<td>string</td>
</tr>
</tbody>
</table>

**Parsable Output for Generic Providers:** one line with the following values separated by a colon (':').

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pool Names</td>
<td>comma-separated strings</td>
</tr>
<tr>
<td>Total Number of Desktops</td>
<td>integer</td>
</tr>
<tr>
<td>Number of Used Desktops</td>
<td>integer</td>
</tr>
<tr>
<td>Comment</td>
<td>string</td>
</tr>
</tbody>
</table>

**Parsable Output for Kiosk Providers:** one line with the following values separated by a colon (':').

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pool Names</td>
<td>comma-separated strings</td>
</tr>
<tr>
<td>Session Type</td>
<td>Sun Java Desktop System 3</td>
</tr>
<tr>
<td>Comment</td>
<td>string</td>
</tr>
</tbody>
</table>

**vda provider-storage-orphans**

List the orphaned disks of the storage.

**Parsable Output:** list of lines with the following values separated by a colon (':').

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZFS Volume</td>
<td>zfs_pool/volume_id</td>
</tr>
<tr>
<td>Size</td>
<td>xxx.x GB</td>
</tr>
<tr>
<td>Used Size</td>
<td>xxx.x GB</td>
</tr>
</tbody>
</table>
vda role-list

List all roles.

**Parsable Output:** list of lines with the following values separated by a colon (`:`).

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Role Name</td>
<td>string</td>
</tr>
<tr>
<td>Role Description</td>
<td>string</td>
</tr>
</tbody>
</table>

vda template-revisions

List the revisions of the template.

**Parsable Output:** list of lines with the following values separated by a colon (`:`).

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revision Name</td>
<td>string</td>
</tr>
<tr>
<td>Revision ID</td>
<td>long</td>
</tr>
<tr>
<td>Creation Date</td>
<td>timestamp</td>
</tr>
<tr>
<td>Is It Master</td>
<td>yes</td>
</tr>
<tr>
<td>Cloned Desktops</td>
<td>string</td>
</tr>
</tbody>
</table>

vda token-desktops

Show the desktops assigned to the token.

**Parsable Output:** list of lines with the following values separated by a colon (`:`).

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desktop Name</td>
<td>string</td>
</tr>
<tr>
<td>Desktop ID</td>
<td>integer</td>
</tr>
<tr>
<td>Pool Name</td>
<td>string</td>
</tr>
<tr>
<td>Type of Assignment</td>
<td>flexible</td>
</tr>
<tr>
<td>Is Default Desktop</td>
<td>true</td>
</tr>
</tbody>
</table>

vda token-search

Search for tokens that match the search criteria.

**Parsable Output:** list of lines with the following values separated by a colon (`:`).

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Token</td>
<td>string</td>
</tr>
<tr>
<td>Name of the Associated User</td>
<td>string</td>
</tr>
</tbody>
</table>
vda token-show

Show the desktops available for the token.

**Parsable Output:** list of lines with the following values separated by a colon (":").

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN of the Associated User</td>
<td>string</td>
</tr>
</tbody>
</table>

vda user-desktops

Show the desktops assigned to the user.

**Parsable Output:** list of lines with the following values separated by a colon (":").

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desktop Name</td>
<td>string</td>
</tr>
<tr>
<td>Desktop ID</td>
<td>integer</td>
</tr>
<tr>
<td>Pool Name</td>
<td>string</td>
</tr>
<tr>
<td>Type of Assignment</td>
<td>flexible</td>
</tr>
<tr>
<td>Is Default Desktop</td>
<td>true</td>
</tr>
</tbody>
</table>

vda user-search

Search for users or groups in the user directory that match the specified search criteria.

**Parsable Output:** list of lines with the following values separated by a colon (":").

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of the user or group</td>
<td>string</td>
</tr>
<tr>
<td>Kind of object</td>
<td>User</td>
</tr>
<tr>
<td>DN of the user or group</td>
<td>string</td>
</tr>
</tbody>
</table>

vda user-show

Show the desktops available for the user.

**Parsable Output for a User:** list of lines with the following values separated by a colon (":").

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pool Name</td>
<td>string</td>
</tr>
</tbody>
</table>
A.3. Parsing vda-center Command Output

The following vda-center commands have parsable output:

- `vda-center agent-status`
- `vda-center status`

**vda-center status**

List the status of the hosts in an Oracle VDI Center.

**Parsable Output:** list of lines with the following values separated by a colon (`:`).

<table>
<thead>
<tr>
<th>Value</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hostname</td>
<td>string</td>
</tr>
<tr>
<td>Host Status</td>
<td>Up</td>
</tr>
<tr>
<td>Service</td>
<td>VDI Database</td>
</tr>
<tr>
<td>Service Status</td>
<td>Up</td>
</tr>
</tbody>
</table>

Followed by one empty line and one line with the number of hosts in the Oracle VDI Center.

**vda-center agent-status**

**Parsable Output:** one line with the length of time (in milliseconds) that the Oracle VDI Center Agent has been up, followed by one line with the fingerprint of the Oracle VDI Center Agent's certificate.
Appendix B. Defaults for the Software Bundled With Oracle VDI

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B.1. Sun Ray Software ................................................................. 253
B.2. Oracle VDI ............................................................................ 254

This chapter lists the defaults for the software bundled with Oracle VDI. See About the Oracle VDI Software for details of the bundled software.

B.1. Sun Ray Software

Oracle VDI Configuration

1. /opt/SUNWut/sbin/utconfig

   Configure basic Sun Ray Software settings:
   • Administrator password
   • Server for a failover group (FOG)
   • FOG signature

2. /opt/SUNWut/lib/support_lib/srwa_config_update

   Configure Sun Ray Software Web Administration:
   • Tomcat home directory
   • HTTP ports (1660, 1661)
   • Web service user name (utwww)
   • Remote access (enabled)

3. /opt/SUNWkio/bin/kioskuseradm create -l utku -g utkiosk -i auto -u -c

   Configure Kiosk user accounts.

4. /opt/SUNWut/lib/utrcmd -n
   /opt/SUNWut/sbin/utreplica -p -a
   /opt/SUNWut/sbin/utreplica -s

   Replicate from Primary to Secondary hosts.

5. /opt/SUNWut/sbin/utadm -L on

   Enable LAN access.

6. /opt/SUNWut/sbin/utadminuser -a root
   /opt/SUNWut/sbin/utadminuser -d admin

   Additionally, the following line is commented out in the file /etc/pam.conf:

   utadmingui auth sufficient /opt/SUNWut/lib/pam_sunray_admingui.so.1
Enable root user access.

7. /opt/SUNWut/sbin/utkiosk -i session -f
   
   Set Kiosk Session value to vda.

8. /opt/SUNWut/sbin/utpolicy -a -g -z both -k both -m
   
   Set Kiosk Policy for both card users and non-card users.

B.2. Oracle VDI

Oracle VDI Configuration

On Linux platforms, cacoadm is located at /opt/sun/cacao2/bin/cacoadm.

1. svc://application/rdpb-broker  
svc://application/rdpb-proxy
   
   Create RDP Broker SMF service and Proxy SMF services (Oracle Solaris platforms only).

2. Configure VDA web service:
   
   • Ports are configured (1800 / 1801)
   
   • webuser is set to noaccess on Oracle Solaris, and to daemon on Linux.
   
   • Remote access is enabled

3. cacoadm stop -f -i vda
   
   Stop CACAO.

4. cacoadm set-param java-flags=-Xms4M -Xmx256M -Dcom.sun.management.jmxremote -Dfile.encoding=utf-8 -i vda
   
   Set Java and file-encoding flags.

5. cacoadm start -i vda
   
   Start CACAO.

6. cacoadm enable -i vda
   
   Set CACAO to start at boot.

System Preparation

On Windows XP virtual machines:

sysprep.exe -mini -reseal -activated -quiet

On Windows Vista and Windows 7 virtual machines:

sysprep.exe -generalize -oobe -shutdown -quiet
C.1. How to Edit LDAP Filters and Attributes

Oracle VDI uses various LDAP filters and attribute lists to look up and interpret the data stored in the user directory.

Oracle VDI comes with some default LDAP filters that are suitable for Active Directory or Oracle Directory Server Enterprise Edition. But these filters might be incompatible with other types of directories and might need to be modified.

For production, it is always recommended to customize those filters to match most closely the LDAP schema of the directory.

This section explains how to edit those filters, and the values recommended per type of directory.

See Section 3.14, “About LDAP Filters and Attributes” for details about how Oracle VDI makes use of the different filters and attributes.

Before You Begin

Before editing LDAP filters and attributes, review Section C.2, “LDAP Filters and Attributes for Users, Groups, and Containers” and Section C.3, “LDAP Filters and Attributes for Global Oracle VDI Centers”.

The syntax of the LDAP filters and the validity of the LDAP attributes is not verified by Oracle VDI when you edit those values. So make sure you validate the LDAP filters and attributes before you set those values.

LDAP filters and attributes can be validated using an external LDAP tool such as ldapsearch.

Oracle VDI Manager Steps

1. Log in to Oracle VDI Manager.
2. Select a company in the Settings category.
3. Select the Active Directory or LDAP tab.
4. Click Edit LDAP Configuration.
5. Edit the settings and click Save button.

**CLI Steps**

1. List the LDAP filter used to identify objects of type 'user' and the LDAP filter used to search for users according a search criteria.

```
/opt/SUNWvda/sbin/vda directory-getprops
```

For example:

```
example$ /opt/SUNWvda/sbin/vda directory-getprops -p ldap.user.object.filter,ldap.user.search.filter
ldap.user.object.filter:
(\{|(objectclass=user)(objectclass=person)(objectclass/inetOrgPerson)
(objectclass=organizationalPerson))(!(objectclass=computer))
ldap.user.search.filter:
(\{|(cn=SEARCH_STRING)(uid=SEARCH_STRING)(mail=SEARCH_STRING))
```

2. Customize the LDAP filter used to search for users according a search criteria, for Active Directory:

```
/opt/SUNWvda/sbin/vda directory-setprops
```

For example:

```
example$ /opt/SUNWvda/sbin/vda directory-setprops -p ldap.user.search.filter="\{|(cn=SEARCH_STRING)(uid=SEARCH_STRING)(mail=SEARCH_STRING))"
 Settings updated.
```

```
example$ /opt/SUNWvda/sbin/vda directory-getprops -p ldap.user.search.filter
ldap.user.search.filter:
(\{|(cn=SEARCH_STRING)(uid=SEARCH_STRING)(mail=SEARCH_STRING))
```

### C.2. LDAP Filters and Attributes for Users, Groups, and Containers

<table>
<thead>
<tr>
<th>Oracle VDI Manager Name</th>
<th>CLI Property Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Filter</td>
<td><code>ldap.user.object.filter</code></td>
<td>LDAP filter used to identify objects of type user.</td>
</tr>
</tbody>
</table>
| User Search Filter      | `ldap.user.search.filter`      | LDAP filter used to search for users according a search criteria. Searches for users can be done using the user-search command or in Oracle VDI Manager.  

*SEARCH_STRING is the place holder for the search criteria.* |
| User ID Attributes      | `ldap.userid.attributes`       | List of comma-separated LDAP attributes storing the userid value for user objects. This is used to find a user given its userid. |
| User Member Attributes  | `ldap.user.member.attributes`  | List of comma-separated LDAP attributes on a user object storing the groups the user is a member of.  |
| User Short Attributes   | `ldap.user.short.attributes`   | List of comma-separated LDAP attributes on a user object that can be used in a group member attribute. |
### Default LDAP Filters and Attributes for Users, Groups and Containers

<table>
<thead>
<tr>
<th><strong>Oracle VDI Manager Name</strong></th>
<th><strong>CLI Property Name</strong></th>
<th><strong>Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Group Filter</td>
<td>ldap.group.object.filter</td>
<td>LDAP filter used to identify objects of type group.</td>
</tr>
<tr>
<td>Group Search Filter</td>
<td>ldap.group.search.filter</td>
<td>LDAP filter used to search for groups according a search criteria. Searches for groups can be done using the user-search command or in Oracle VDI Manager. <strong>$SEARCH_STRING</strong> is the place holder for the search criteria.</td>
</tr>
<tr>
<td>Group Member Attributes</td>
<td>ldap.group.member.attributes</td>
<td>List of comma-separated LDAP attributes on a group object storing the users member of the group.</td>
</tr>
<tr>
<td>Group Short Attributes</td>
<td>ldap.group.short.attributes</td>
<td>List of comma-separated LDAP attributes on a group object that can be used in a user member attribute. This is typically used for Primary Group membership, which is specific to Active Directory.</td>
</tr>
<tr>
<td>Container Object Filter</td>
<td>ldap.container.object.filter</td>
<td>LDAP filter used to identify objects of type container. Containers can be selected as root for custom group filters in Oracle VDI Manager.</td>
</tr>
<tr>
<td>Container Search Filter</td>
<td>ldap.container.search.filter</td>
<td>LDAP filter used by Oracle VDI Manager to search for containers according a search criteria, when selecting a root for a custom group filter. <strong>$SEARCH_STRING</strong> is the place holder for the search criteria.</td>
</tr>
<tr>
<td>Default Attributes</td>
<td>ldap.default.attributes</td>
<td>List of comma-separated LDAP attributes loaded in the cache when looking up an object. It should contain all the attributes used in the other filters and attribute lists.</td>
</tr>
</tbody>
</table>

### C.2.1. Default LDAP Filters and Attributes for Users, Groups and Containers

The following table contains the default LDAP filters and attributes for users, groups, and containers.

<table>
<thead>
<tr>
<th><strong>Oracle VDI Manager Name</strong></th>
<th><strong>Default Value</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>User Filter</td>
<td>(&amp;(</td>
</tr>
<tr>
<td>User Search Filter</td>
<td>(</td>
</tr>
<tr>
<td>User ID Attributes</td>
<td>uid,sAMAccountName,userPrincipalName,mail</td>
</tr>
<tr>
<td>User Member Attributes</td>
<td>memberof,primaryGroupID</td>
</tr>
<tr>
<td>User Short Attributes</td>
<td></td>
</tr>
<tr>
<td>Group Filter</td>
<td>(</td>
</tr>
</tbody>
</table>
### C.2.2. Active Directory Settings for Users, Groups, and Containers

The following table contains the recommended settings for Active Directory for users, groups, and containers.

If you use either the `userPrincipalName` attribute or the `mail` attribute for user identification, use this attribute instead of `sAMAccountName` in the following settings.

<table>
<thead>
<tr>
<th>Oracle VDI Manager Name</th>
<th>Default Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group Search Filter</td>
<td>(</td>
</tr>
<tr>
<td>Group Member Attributes</td>
<td>member, uniquemember</td>
</tr>
<tr>
<td>Group Short Attributes</td>
<td>primaryGroupToken</td>
</tr>
<tr>
<td>Container Object Filter</td>
<td>(</td>
</tr>
<tr>
<td>Container Search Filter</td>
<td>(</td>
</tr>
<tr>
<td>Default Attributes</td>
<td>dc, o, ou, cn, uid, mail, member, uniquemember, memberof, sAMAccountName, primaryGroupToken, primaryGroupId</td>
</tr>
</tbody>
</table>

### C.2.3. Oracle Directory Server Enterprise Edition Settings for Users, Groups, and Containers

The following table contains the recommended settings for Oracle Directory Server Enterprise Edition for users, groups, and containers.

<table>
<thead>
<tr>
<th>Oracle VDI Manager Name</th>
<th>Recommended Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Filter</td>
<td>(&amp;(objectclass=user)!((objectclass=computer)))</td>
</tr>
<tr>
<td>User Search Filter</td>
<td>(</td>
</tr>
<tr>
<td>User ID Attributes</td>
<td>sAMAccountName</td>
</tr>
<tr>
<td>User Member Attributes</td>
<td>memberof, primaryGroupID</td>
</tr>
<tr>
<td>User Short Attributes</td>
<td></td>
</tr>
<tr>
<td>Group Filter</td>
<td>(objectclass=group)</td>
</tr>
<tr>
<td>Group Search Filter</td>
<td>(cn=$SEARCH_STRING)</td>
</tr>
<tr>
<td>Group Member Attributes</td>
<td>member</td>
</tr>
<tr>
<td>Group Short Attributes</td>
<td>primaryGroupToken</td>
</tr>
<tr>
<td>Container Object Filter</td>
<td>(objectclass=container)</td>
</tr>
<tr>
<td>Container Search Filter</td>
<td>(cn=$SEARCH_STRING)</td>
</tr>
<tr>
<td>Default Attributes</td>
<td>cn, member, memberof, sAMAccountName, primaryGroupToken, primaryGroupId</td>
</tr>
</tbody>
</table>
## C.2.4. OpenDS Settings for Users, Groups, and Containers

The following table contains the recommended settings for OpenDS for users, groups, and containers.

<table>
<thead>
<tr>
<th>Oracle VDI Manager Name</th>
<th>Recommended Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Filter</td>
<td>(objectclass=person)</td>
</tr>
<tr>
<td>User Search Filter</td>
<td>(</td>
</tr>
<tr>
<td>User ID Attributes</td>
<td>uid</td>
</tr>
<tr>
<td>User Member Attributes</td>
<td>memberof</td>
</tr>
<tr>
<td>User Short Attributes</td>
<td></td>
</tr>
<tr>
<td>Group Filter</td>
<td>(objectclass=groupofuniquenames)</td>
</tr>
<tr>
<td>Group Search Filter</td>
<td>(cn=$SEARCH_STRING)</td>
</tr>
<tr>
<td>Group Member Attributes</td>
<td>uniquemember</td>
</tr>
<tr>
<td>Group Short Attributes</td>
<td></td>
</tr>
<tr>
<td>Container Object Filter</td>
<td>(</td>
</tr>
<tr>
<td>Container Search Filter</td>
<td>(</td>
</tr>
<tr>
<td>Default Attributes</td>
<td>dc,ou,cn,uid,uniquemember,memberof</td>
</tr>
</tbody>
</table>

## C.2.5. OpenLDAP Settings for Users, Groups, and Containers

The following table contains the recommended settings for OpenLDAP for users, groups, and containers.
The following table contains the recommended settings for Novell eDirectory for users, groups and containers.

<table>
<thead>
<tr>
<th><strong>Oracle VDI Manager Name</strong></th>
<th><strong>Recommended Setting</strong></th>
</tr>
</thead>
</table>
| User Filter                 | As a minimum, you must remove `(!(objectclass=computer))` from the default user filter as this causes an error.  
  The recommended setting is: `(objectclass=person)`. |
| User Search Filter          | `(|(cn=$SEARCH_STRING)(uid=$SEARCH_STRING))` |
| User ID Attributes          | `uid` |
| User Member Attributes      | `memberof` |
| User Short Attributes       | - |
| Group Filter                | `(objectclass=groupofnames)` |
| Group Search Filter         | `(cn=$SEARCH_STRING)` |
| Group Member Attributes     | `member` |
| Group Short Attributes      | - |
| Container Object Filter     | - |
| Container Search Filter     | - |
| Default Attributes          | `cn,uid,member,memberof` |

C.2.6. Novell eDirectory Settings for Users, Groups, and Containers

The following table contains the recommended settings for Novell eDirectory for users, groups and containers.
C.3. LDAP Filters and Attributes for Global Oracle VDI Centers

Oracle VDI uses the following LDAP filters and attributes to interpret the Oracle VDI Center data stored in the user directory.

The default values are intended for compatibility with Active Directory and Oracle Directory Server Enterprise Edition. It is recommended to edit the default values in order to use the more specific ones for your type of directory.

If you choose to use different objects and attributes than the defaults to store the Oracle VDI Center data, you need to adapt the LDAP filters and attributes accordingly.

See Section 3.13, “How to Prepare a User Directory for Global Oracle VDI Centers” for a detailed example.

<table>
<thead>
<tr>
<th>Oracle VDI Manager Name</th>
<th>CLI Property Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VDI Center Name</td>
<td>ldap.vdicenter.displayname.attributes</td>
<td>List of attributes on an Oracle VDI Center object that contains display name.</td>
</tr>
<tr>
<td>VDI Host Filter</td>
<td>ldap.vdihost.object.filter</td>
<td>Filter to match an Oracle VDI host object.</td>
</tr>
<tr>
<td>VDI Host DNS Name Attributes</td>
<td>ldap.vdihost.dnsname.attributes</td>
<td>List of attributes on an Oracle VDI host object that contains the DNS name or IP address of the host.</td>
</tr>
<tr>
<td>VDI Center Name</td>
<td>ldap.user.vdicenter.attributes</td>
<td>List of attributes on a user object that contains the Oracle VDI Center DN.</td>
</tr>
</tbody>
</table>
### C.3.1. Default LDAP Filters and Attributes for Global Oracle VDI Centers

The following table contains the default LDAP filters and attributes for Global Oracle VDI Centers.

<table>
<thead>
<tr>
<th>Setting Name</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>VDI Center Name</td>
<td>displayName,ou</td>
</tr>
<tr>
<td>VDI Host Filter</td>
<td>(</td>
</tr>
<tr>
<td>VDI Host DNS Name Attributes</td>
<td>dNSHostName,ipHostNumber,cn</td>
</tr>
<tr>
<td>VDI Center User Attributes</td>
<td>seeAlso</td>
</tr>
</tbody>
</table>

### C.3.2. Active Directory Settings for Global Oracle VDI Centers

The following table contains the recommended settings for Active Directory for Global Oracle VDI Centers.

<table>
<thead>
<tr>
<th>Setting Name</th>
<th>Recommended Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>VDI Center Name</td>
<td>displayName,ou</td>
</tr>
<tr>
<td>VDI Host Filter</td>
<td>(objectClass=computer)</td>
</tr>
<tr>
<td>VDI Host DNS Name Attributes</td>
<td>dNSHostName,ipHostNumber</td>
</tr>
<tr>
<td>VDI Center User Attributes</td>
<td>seeAlso</td>
</tr>
</tbody>
</table>

### C.3.3. Oracle Directory Server Enterprise Edition Settings for Global Oracle VDI Centers

The following table contains the recommended settings for Oracle Directory Server Enterprise Edition for Global Oracle VDI Centers.

<table>
<thead>
<tr>
<th>Setting Name</th>
<th>Recommended Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>VDI Center Name</td>
<td>ou</td>
</tr>
<tr>
<td>VDI Host Filter</td>
<td>(objectClass=device)</td>
</tr>
<tr>
<td>VDI Host DNS Name Attributes</td>
<td>ipHostNumber,cn</td>
</tr>
<tr>
<td>VDI Center User Attributes</td>
<td>seeAlso</td>
</tr>
</tbody>
</table>
This appendix contains basic instructions on installing and configuring of a remote database for use with Oracle VDI. For comprehensive information on installing and configuring MySQL can be found in the MySQL documentation at http://dev.mysql.com/doc.

D.1. How to Install and Configure a Remote MySQL Database (InnoDB)

The following procedure describes how to install MySQL 5.1 with an InnoDB storage engine on an Oracle Solaris x86 host.

1. Create the file /etc/my.cnf, and add the following content.

```
[mysqld]
user=mysql
datadir=/usr/local/mysql/data
basedir=/usr/local/mysql
port=3306
socket=/tmp/mysql.sock
max_allowed_packet=20M
#transaction_isolation=READ-COMMITTED
lower_case_table_names=1
max_connections=1000
skip-locking
key_buffer=16K
table_cache=4
sort_buffer_size=64K
net_buffer_length=2K
thread_stack=64K
wait_timeout=31536000
innodb_data_home_dir=/usr/local/mysql/data
innodb_data_file_path=ibdata1:10M:autoextend
innodb_log_group_home_dir=/usr/local/mysql/data
innodb_buffer_pool_size=50M
innodb_additional_mem_pool_size=10M
innodb_log_file_size=5M
innodb_log_buffer_size=10M
innodb_flush_log_at_trx_commit = 1
innodb_lock_wait_timeout = 50
```

2. Create a user "mysql" and a group "mysql" by running the following commands.

```
# groupadd mysql
# useradd -g mysql mysql
```

3. Get the MySQL tar file, untar it, and keep it in the / directory.

4. Create the directory /usr/local, by running the following command.

```
# mkdir /usr/local
```
5. Change to the new directory, and create a symbolic link, called "mysql", that points to the MySQL files in the directory, by running the following commands.

```
# cd /usr/local
# ln -s /mysql-5.1.30-solaris10-i386 mysql
# ls -lrt
```

```
total 2
lrwxrwxrwx 1 root root 35 Nov 12 17:33 mysql -> /export/mysql-5.1.30-solaris10-i386
bash-3.00#
```

6. Make sure that the directory contains the proper owner and group permissions by running the following commands.

```
# chgrp -R mysql /mysql-5.1.30-solaris10-i386
# chown -R mysql /mysql-5.1.30-solaris10-i386
```

7. Check the permissions for the directory as well.

```
# cd /usr/local/mysql
# ls -lrt
```

```
-rw-r--r-- 1 mysql mysql 19071 Nov 15 13:07 COPYING
-rw-r--r-- 1 mysql mysql 5139 Nov 15 13:07 EXCEPTIONS-CLIENT
-rw-r--r-- 1 mysql mysql 8767 Nov 15 13:07 INSTALL-BINARY
-rw-r--r-- 1 mysql mysql 1410 Nov 15 13:07 README
drwxr-xr-x 2 mysql mysql 1536 Nov 15 13:07 bin
drwxr-xr-x 2 mysql mysql 512 Nov 15 13:07 data
drwxr-xr-x 2 mysql mysql 1024 Nov 15 13:07 docs
drwxr-xr-x 2 mysql mysql 1024 Nov 15 13:07 include
drwxr-xr-x 3 mysql mysql 1024 Nov 15 13:06 lib
drwxr-xr-x 4 mysql mysql 512 Nov 15 13:06 man
drwxr-xr-x 10 mysql mysql 512 Nov 15 13:07 mysql-test
drwxr-xr-x 2 mysql mysql 512 Nov 15 13:07 scripts
drwxr-xr-x 27 mysql mysql 1024 Nov 15 13:07 share
drwxr-xr-x 5 mysql mysql 1024 Nov 15 13:07 sql-bench
drwxr-xr-x 2 mysql mysql 512 Nov 15 13:07 support-files
```

8. From the `/usr/local/mysql` directory, run the following command, and check that it provides the corresponding output.

```
# ./scripts/mysql_install_db --user=mysql
```

To start mysqld at boot time you have to copy support-files/mysql.server to the right place for your system

PLEASE REMEMBER TO SET A PASSWORD FOR THE MySQL root USER !
To do so, start the server, then issue the following commands:

```
/usr/local/mysql/bin/mysqladmin -u root password 'new-password'
```

Alternatively you can run:
```
/usr/local/mysql/bin/mysql_secure_installation
```

which will also give you the option of removing the test databases and anonymous user created by default. This is strongly recommended for production servers.

See the manual for more instructions.

You can start the MySQL daemon with:
```
cd /usr/local/mysql ; /usr/local/mysql/bin/mysqld_safe &
```

You can test the MySQL daemon with mysql-test-run.pl
```
cd /usr/local/mysql/mysql-test ;
```
perl mysql-test-run.pl

Please report any problems with the /usr/local/mysql/scripts/mysqlbug script!


9. From the /usr/local/mysql directory, run the following command, and check to see that you get the corresponding output.

```
# ./bin/mysqld_safe --defaults-file=/etc/my.cnf --ledir=/usr/local/mysql/bin --user=mysql &
[1] 15885
# 090323 22:36:26 mysqld_safe Logging to '/usr/local/mysql/data/wipro-33.err'.
090323 22:36:26 mysqld_safe Starting mysqld daemon with databases from /usr/local/mysql/data
```

10. Now, leave the terminal just the way it is. To make sure the process you just enabled is running all the time, go to the console and start this process.

```
# cd /usr/local/mysql/bin
# ./mysql --user=root
Welcome to the MySQL monitor. Commands end with ; or g.
Your MySQL connection id is 1
Server version: 5.1.30 MySQL Community Server (GPL)
Type 'help;' or 'h' for help. Type 'c' to clear the buffer.
mysql>
```

11. Stop the MySQL daemon by running the following command in a terminal, if you want to stop the daemon.

```
# ./mysqladmin shutdown
```

When the command is run, the terminal, that was left alone, should give the following output.

```
# /usr/local/mysql/bin/mysqld_safe --defaults-file=/etc/my.cnf --ledir=/usr/local/mysql/bin
--user=mysql &
[1] 16017
# 090323 22:47:38 mysqld_safe Logging to '/usr/local/mysql/data/wipro-33.err'.
090323 22:47:38 mysqld_safe Starting mysqld daemon with databases from /usr/local/mysql/data
090323 22:49:31 mysqld_safe mysqld from pid file /usr/local/mysql/data/wipro-33.pid ended
```

D.2. How to Create a Privileged Database Administrator

Oracle VDI requires the credentials of a privileged database administrator in order to create the Oracle VDI database on a remote database.

The following procedure describes how to create a privileged administrator.

For more information about MySQL user account management, refer to the MySQL Server Administration chapter of the MySQL Reference Manual.

1. Use the MySQL command line tool to enter the MySQL interactive mode as root.

```
# ./mysql --user=root
```

2. Use the MySQL GRANT statement to create the privileged administrator.

In the following example, a user is granted all privileges.

```
mysql> GRANT ALL PRIVILEGES ON *.* TO '<user>'@'localhost' IDENTIFIED BY ' /
In the following example, a user is granted a limited set of privileges that are sufficient to create the Oracle VDI database.

```
<password>' WITH GRANT OPTION;
mysql> GRANT ALL PRIVILEGES ON *.* TO '<user>'@'%' IDENTIFIED BY '/'
          <password>' WITH GRANT OPTION;
mysql> GRANT ALL PRIVILEGES ON *.* TO '<user>'@'<localhost DNS name>'
          /' IDENTIFIED BY '<password>' WITH GRANT OPTION;
```

Where `<user>` and `<password>` are the user name and password of the user account.
Appendix E. Glossary

The following is a glossary of terms used for Oracle Virtual Desktop Infrastructure (VDI).

A

ALP
The Appliance Link Protocol is used between Sun Ray Clients and the Sun Ray server.

agent
A software entity that performs tasks on behalf of another software entity.

C

CLI
Command Line Interface.

custom group
A set of users defined by a filter on the user directory.

D

demon
Programs that start automatically during system startup and run in the background without user interaction are usually called services in Windows and daemons in UNIX.

data store
A data store allows configuration settings to be replicated and kept synchronized with other servers automatically.

desktop
A virtual machine containing a desktop instance that is executed and managed within Oracle VDI, and accessed through RDP.

desktop provider
An entity that provides unified access to the virtualization platforms that include Oracle VM VirtualBox, Microsoft Hyper-V, VMware vCenter, Microsoft Remote Desktop, Sun Ray Kiosk and Generic.

DTU
Sun Ray Desktop Terminal Units (DTU). Replaced by the term Sun Ray Clients.

E

ESX
Type 1 hypervisor by VMware.
F

flexible assignment
  Desktops can be temporarily assigned to users as needed from a pool. When a user stops using
  the assigned desktop, the desktop can be recycled and made available for other users. Flexible
  assignment is suitable for people who typically work in one or a few applications and have fewer
  requirements for customizing their desktop environment.

G

Global Oracle VDI Center
  A feature that extends the basic "hot desking" experience known from a single Oracle VDI environment
  to encompass multiple Oracle VDI environments. It helps when users travel from one site to another
  site and need access to their desktops.

golden image
  A desktop template used to create new desktops. See also template.

guest operating system
  An operating system that runs on a virtual machine.

guest pool
  A pool with the "Guest" flag turned on. It provides desktops for users who have no assignments to
  desktops or other non-guest pools on the Oracle VDI Center they are currently connecting to. Used by
  the Global Oracle VDI Center feature.

GUI
  Graphical User Interface. Oracle VDI Manager is a browser-based graphical user interface to configure
  the Oracle VDI Center.

H

host
  The physical computer on which virtual machines are running.

hotdesking
  The ability for a user to remove a smart card, insert it into any other Sun Ray Client, and have the
  user's session "follow" the user. This enables a user to have instantaneous access to the user's
  windowing environment and currently running applications from multiple Sun Ray Clients. This is useful
  when employees are not assigned to a specific workplace.

Hyper-V
  Hypervisor by Microsoft. Full name is Microsoft Hyper-V.

hypervisor
  A program or specialized operating system to run virtual machines on a host. Type 1 hypervisors are
  "bare metal", while type 2 hypervisors need a standard operating system.

K

kiosk mode
  Kiosk mode is a facility that enables Sun Ray Software to run desktops and applications in a way that
  bypasses the normal authentication methods of the underlying operating system.

kiosk session
  A user session running in kiosk mode.

kiosk session type
  A set of scripts and configuration files that define the kind of user session that runs in kiosk mode.
Oracle VDI comes with a predefined kiosk session type, called Oracle Virtual Desktop Infrastructure. This session type uses the Sun Ray Windows connector to establish a Remote Desktop Protocol (RDP) connection to a virtual machine.

In addition to this, the Oracle VDI Sun Ray Kiosk Session desktop provider enables you to use a different Sun Ray kiosk type instead of a regular Oracle VDI desktop.

**lifecycle**
A desktop is cloned from a template into a pool, used, perhaps reused, recycled, deleted: this is its lifecycle.

**master revision**
The template's revision that will be used by default for desktop cloning in pools. Use the command 'Apply for Cloning in Pool' to use a specific revision instead.

**Oracle VDI**
Oracle Virtual Desktop Infrastructure provides a complete solution for managing, hosting, and providing access to virtualized desktop operating systems hosted in the data center.

**Oracle VDI Manager**
The administration GUI used for management of desktops through the &product-short-name;.

**personal assignment**
Desktops can be personally assigned to users. When a user stops using a personally assigned desktop, the desktop will be stored with their desktop settings, and it will not be recycled for other users.

**policy**
In this context, policies are settings that specify parameters such as timeout intervals, maximum age, and others that affect the lifecycles of desktops in pools.

**pool**
A collection of desktops sharing the same characteristics. Pools ordinarily contain desktops that are available for assignment as well as those that are no longer in active use and are waiting to be recycled or deleted.

**RDP**
Microsoft Remote Desktop Protocol.

**recycling**
When a desktop originating in a pool has not been used for a specified interval or if certain other criteria apply, it is recycled. Recycling can include being returned to the pool for reassignment, reset to snapshot and reused, or deleted. In the latter case, a new desktop might by cloned for the pool.

**resume**
To return a suspended desktop to operation, use the resume feature. See also suspend.
revision
   Snapshot of a template.

S

SGD
   Oracle Secure Global Desktop.

SSH
   Secure Shell, a network protocol that enables exchange of data over a secure channel, using public-key cryptography for authentication.

SSL
   Secure Sockets Layer, a cryptographic protocol used for secure data transfer.

service
   Programs that start automatically during system startup and run in the background without user interaction are usually called services in Windows and daemons in UNIX.

snapshot
   A reproduction of the virtual machine at a given point in time, including the state of the data on all the virtual machine's disks, including whether the virtual machine was powered on, powered off, or suspended.

storage
   Location for storage of configuration settings. See also data store.

Sun Ray Software
   Sun Ray Software is needed to host Sun Ray sessions for Sun Ray Clients. Sun Ray Software is installed as part of Oracle VDI.

suspend
   To save the current state of a running virtual machine. To return a suspended virtual machine to operation, use the resume feature. See also resume.

system preparation
   System preparation refers to modifications made to a Windows guest operating system in a virtual machine, typically as it is being deployed. Customization options include changing the new virtual machine's identification and network information.

T

template
   A master or golden image of a desktop. Templates are special desktops that are used for cloning new desktops.

token
   A unique string that identifies a user. Sometimes this is provided by a smart card.

V

vCenter
   A tool by VMware to manage an ESX server.

VDA
   Virtual Desktop Architecture. Many Oracle VDI components, such as scripts, use vda as a prefix.

VDI
   Virtual Desktop Infrastructure.
VDI Center
   One or more Oracle VDI hosts working together. See also Global Oracle VDI Center.

VDI Manager
   See Oracle VDI Manager.

VirtualBox
   Type 2 hypervisor. Full name is Oracle VM VirtualBox.

virtual disk
   A file or set of files that appears as a physical disk drive to a guest operating system. These files can be on the host machine or on a remote file system.

virtual display client
   A Sun Ray hardware client.

virtual machine
   A virtualized x86 PC environment in which a guest operating system and associated application software can run. Multiple virtual machines can operate on the same host system concurrently.

virtual machine configuration file
   A file containing a virtual machine configuration, created when you create the virtual machine. It specifies which virtual devices, such as disks and memory, are present in a virtual machine and how they are mapped to host files and devices.

virtual network
   A network connecting virtual machines that does not depend on physical hardware connections.

X

Xinerama
   An extension to the X Window System that enables the use of two or more physical displays as one large virtual display. Xinerama mode allows the display of a single desktop across multiple monitors.

X RandR
   The X Resize, Rotate and Reflect extension to the X Window System, which enables clients to resize, rotate, and change screen resolution settings dynamically. For Sun Ray Software and Oracle VDI, this extension is especially useful when a user hotdesks to Sun Ray Clients that use monitors of different sizes or resolutions than the one where a given session began.
Appendix F. Licenses for Third-Party Components

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This appendix contains licenses for third-party components that might be included in the product.

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Apache WS Common Utils 1.0.1
Castor XML 1.2
For a complete list of committers to the Castor project, please see http://www.castor.org/1.2/contributors.html

JAX-RPC 1.1

OpenCSV 1.8

Shale Remoting 1.1.0
Copyright 2004-2007 The Apache Software Foundation

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The Apache Software Foundation (http://www.apache.org/).

This product contains code written by David Geary and Cay Horstmann
for the first edition of Core JavaServer Faces.

Wiseman 1

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