Successful Solutions to Virtual Desktop Infrastructure

Zhi-Xue Xu, San Jose State University

Available at: https://works.bepress.com/zhi-xue_xu/7/
Successful Solutions to Virtual Desktop Infrastructure

Zhi-Xue Xu
Academic Technology
San Jose State University
Jan. 26, 2015

The Virtual Desktop Infrastructure (VDI) has been applied for our business and education. The Virtual Desktop Infrastructure created a new virtual method for computer desktop applications and development.

The Virtual Desktop Infrastructure has included some special character and benefits comparing with physical desktop. We can use these VDI character and benefits for our IT PC applications. These character and benefits involved Simple to Use, Support Multiple Devices, Keep the Data Secure and Available, flexible Hardware and Software, Active Directory Integration, lower cost and so on.

The Successful Solutions to Virtual Desktop Infrastructure will consist of two sections: server and storage based, and Cloud Computing based. Many companies VMware, Microsoft, Citrix, and Oracle have provided Successful Solutions to Virtual Desktop Infrastructure that included software applications. The Virtual Desktop Infrastructure also has been created and applied by Cloud Computing Technology.

The Successful Solutions to Virtual Desktop Infrastructure has become an important application in the computer environment. The Virtual Desktop Infrastructure application has showed stronger life force. With the technology development of Virtual Desktop Infrastructure, we can believe that the Virtual Desktop Infrastructure will be widely applied to many fields.
1. Benefits from Virtual Desktop Infrastructure

We can get some benefits from Virtual Desktop Infrastructure that physical desktops didn’t have. Of course, according to the cost of the Virtual Desktop Infrastructure with current solutions, some peoples have different opinions. They think the cost of physical desktops will be less cost than the cost of Virtual Desktop Infrastructure. In fact virtual desktops can measurably reduce PC operation costs that included hardware replacement, desktop maintenance and technician service time. These arguments about the cost can’t block the development and applications of Virtual Desktop Infrastructure, because Virtual Desktop Infrastructure has special benefits in the IT PC environment that included desktop centralization and management, easy to Data recoverability and protection, Customizable applications and users control, hosted Desktops by mobile devices and Better solution for Security problems. We should learn and realize the benefits of Virtual Desktop Infrastructure comparing with physical PCs.

1.1 Desktops centralization and simple and effective management

The Virtual Desktop Infrastructure is a good tool for desktops centralization and simple and effective management. All virtual desktops will be created by VDI server or Cloud computing. The administrators
can quickly set up a new virtual machines that you need. The desktops administrator can be easy to monitor and manage the Virtual Desktops. The administrator can know how many virtual desktops in the network system and how many desktops are running by server or cloud consoles, and solve the problems in time, and improve desktop support efficiency.

The administrator can also manage user’s profiles, policies, privileges and PC applications access by VDI management software. The Virtual Desktop Infrastructure obviously reduce costs.

1.2 Customizable applications and users control

According to user’s request, VDI administrator can provide special applications software for individual user. In complex applications, VDI administrator can provide flexibility to modify the software and interface to meet users’ widely varying need.

From a central console VDI administrator can create and delete user accounts, and control users’ privileges for Virtual Desktops. The VDI administrators need to ensure that it is easy for users to configure the software as they wish with users’ privileges.

1.3 Data protection and disaster recovery

The Virtual Desktop Infrastructure will be better for data protection and disaster recovery. The virtual desktops in server or cloud can be easy to configure the group policy for all virtual desktops’ data protection. All data files will be stored in VDI servers. If user mistake to delete data and files, these deleted delete data and files can be found in server backup. In VDI the applications and data are automatically synced and saved to centrally managed servers and integrated into the VDI serve or Cloud computing under server data protection strategies.

The Virtual Desktop Infrastructure provided the disaster recovery very well. The VDI server allows the virtual desktop to return to operation quickly after disasters. If the virtual desktop is crashed, VDI administrator can recreated virtual desktop immediately from the images of desktop. We don’t worry about computer hardware compatibility in the disaster recovery.

1.4 Accessing and using virtual desktops from anywhere and anytime

We can access and use the virtual desktops from anywhere and anytime by Virtual Desktop Infrastructure, because the VDI servers or Cloud Computing are working 24/7. The VDI allows users changing locations to use virtual desktops through network system. There is no moving for virtual desktop.

1.5 Hosted Virtual Desktops by mobile devices

The Virtual Desktops not only can be hosted by PCs, Laptops, and thin clients, also mobile devices iPad, tablet, smart phone can host the virtual desktops. Because the virtual desktops can be working on Web-based.

1.6 Better solution for Security problems

The virtual desktops are created and saved in VDI servers. This also means users’ data files are saved in the devices of VDI servers. At normal the users don’t worry about security problems in virtual desktops. The VDI administrators have configured the virtual desktop security in VDI servers.
The desktop images can be managed and configured on a servers rather than on each virtual desktop computer. The VDI administrators can use the right security tools to configure the security challenges in the desktop before creating the images of desktop that will be used to virtual desktops in VDI environments.

The security configuration of VDI server or Cloud computing will be an important issue that related with virtual desktops. Some security software companies have provided security software to protect the VDI server that including anti-malware, intrusion prevention, web application protection, host firewall, integrity monitoring, and log inspection, and ensure no any security problems to create virtual desktops.

It is not only limited on above benefits from virtual desktops. The speed of operation of virtual desktops are faster that dependent on VDI server and network. There is no hardware requirement for client to access the virtual desktops. More and more peoples are trying to apply for virtual desktop Infrastructure. The number of the virtual desktop Infrastructure creation has been increased every day in the virtual IT environment.
2. Successful Solution to Virtual Desktop Infrastructure from VMware

The VMware solution for Virtual Desktop Infrastructure is based on server and storage, and sold under name VMware Virtual Desktop Manager (VDM) for desktop virtualization. In 2008 VMware changed name to VMware View.

In April 2014 VMware View became Horizon View with the launch of Horizon 6 (with View) is virtual desktop infrastructure (VDI) platform that delivers virtualized and remote desktops and applications through a single platform, giving end users access to all of their Windows and online resources through one unified workspace.

2.1 Physical Topology Connection Structure of VMware solution for VDI

The Physical Topology Connection Structure of VMware solution for VDI will include View Connection Server, ESX Server to running virtual desktops, Virtual Center Management Server and Microsoft Active Directory for authentication.
The VMware View or Horizon View (View) have the following key components:

a. View Connection Server

The View Connection Server manages secure access to virtual desktops and works with Virtual Center to provide advanced management capabilities.
b. View Agent

This View Agent runs on each virtual desktop and is used for session management and single sign-on. With VDM Client. This View agent can be installed on a virtual machine template so that virtual desktops created from that template automatically include the View Agent. The virtual desktops will be in an Active Directory domain that trust agreement with the View Connection Server domain.

When users connect to their virtual desktops, they are automatically logged in to their domain. The single sign-on are available in same domain or trust agreement exists.

c. View Client

The View Client runs on a Windows PC as a native Windows application and allows users to connect to their virtual desktops through View. This View Client connects to a View Connection Server and allows the user to log on using any of the supported authentication mechanisms. After logging in, users can select from the list of virtual desktops for which they are authorized. This step provides remote access to their virtual desktop and provides users with a familiar desktop experience.

View Client also works closely with View Agent to provide enhanced USB support. View extends this support to include additional USB devices. We can specify View USB support in View Client during the installation.

d. View Web Access

This View Web Access is similar to View Client but provides a View user interface through a Web browser. View Web Access is included automatically during the View Connection Server installation. VDM Web Access is supported on Linux and Mac OS/X. All necessary View software is installed automatically on the client through the Web browser. View Web Access on Linux uses rdesktop and on Mac OS/X uses Microsoft Remote Desktop Connection Client for Mac.

View Web Access can also be used on a Windows client with VDM Client. A user obtains the required software on their client device by accessing a View Connection Server with a Web browser. If the VDM Client software is installed with USB support by a user with administrative rights, View Web Access on Windows has complete View USB support.

e. View Administrator

The View administration can be through a Web browser. The View administrators can make configuration settings, and manage virtual desktops and entitlements of desktops of Windows users and groups.

The View Administrator also provides an interface to monitor log events on a View Server and is installed with View Connection Server.
f. Microsoft Active Directory for authentication

Each View Connection Server must be joined to an Active Directory domain. This allows user authentication for View against Active Directory for the joined domain and for additional user domains with which a trust agreement exists.

By authenticating users against an existing Active Directory, an organization can simplify the operational management of View by ensuring that the management of user accounts is handled in one place. If a user account is disabled in Active Directory, that user cannot log in to VDM. Policies, such as restricting permitted hours of login and the expiration date for passwords, are also handled through existing Active Directory operational procedures.

The VMware virtual desktop infrastructure solution also consists of VMware ESX Server, VMware Virtual Center, and VMware Virtual Desktop Manager. VDI provides an end-to-end virtual desktop solution that allows administrators to easily deploy and manage virtual desktop environments.

2.2 Installation of VMware Horizon 6.0 for VMware solution to VDI

The work steps of Installation of VMware Horizon 6.0 for VMware solution to VDI are the following:

1) Set up the required administrator users and groups in Active Directory.
2) Install and set up VMware ESXi servers and vCenter Server.
3) Install View Composer on the vCenter Server system.
4) Installing View Connection Server.
Fig. 2.3 Installing VMware Horizon View Connection Server

5) Configure SSL certificates for View servers.

Fig. 2.4 Showing a valid SSL certificate

6) Complete the initial set-up of your View environment.
7) Create desktop pools that run on VDI-based single-user machines.

Fig. 2.5 Creating desktop pool in VMware Horizon View

Fig. 2.6 Add desktop pool by View Administrator
8) Create desktop and application pools that run on session-based Remote Desktop Services (RDS) hosts.

Fig. 2.7 RDS hosts to provide RDS sessions to users

9) Control user access to desktops and applications.
10) Install Horizon Client on end users’ machines and mobile devices and have end users access their remote desktops and applications.
2.3 Using VMware solution for VDI

After installation of View connection server, ESX Server to running virtual desktops, Virtual Center Management Server and Microsoft Active Directory for authentication users can access the virtual desktops by all kinks of clients that included Windows, Mac OS X, Thin client and mobile devices. You can access and use the desktops by Web Browser directly. Another, you can install view client software to access and connect the virtual desktops.
San Jose State University has applied VMware solution of VDI to computer lab. The Computer Lab, University House Services has used view clients to connect campus ITS View Connection server. Students can use virtual desktops from VMware solution of VDI in the computer lab.
3. Successful Solution to Virtual Desktop Infrastructure from Microsoft

Microsoft has provided the Successful Solution to Virtual Desktop Infrastructure. Microsoft Windows Server 2008 and Windows 2012 has become more powerful for the solution of Virtual Desktop Infrastructure. The Remote Desktop Services (RDS) deliver delivering virtual desktop infrastructure (VDI). We can use multiple servers, and manage VDI role services by using Server Manager and Windows PowerShell. We can enable secure remote access with Remote Desktop Gateway (RD Gateway) and publish selected applications that you want to Remote Desktop Web Access (RD Web Access).

Hyper-V in Windows Server 2008 and Windows Server 2012 is an important section to enables creating a virtualized server computing environment. Hyper-V can create and manage virtual machines and their resources. Each virtual machine is in an isolated execution environment and allows users to run multiple operating systems simultaneously on one physical computer.

3.1 Basic Characteristics of Microsoft solution for VDI from Windows Server 2012 and 2012 R2

The Windows Server 2012 operating system has provided a single platform from which to deliver any type of hosted desktop that included virtual desktops. The Windows Server 2012 VDI environment aimed at supporting 2,500 users. Remote Desktop Services (RDS) in the Windows Server 2012 provides to configure RemoteApp programs and manage virtual desktops.

Using Remote Desktop Services (RDS) is same like to use physical desktop for users. Remote Desktop Protocol is available to both session and virtual desktops. The network protocol in RDP v. 8 performs well. RDP can display bandwidth-intensive content, and reduce networking overhead.

The users can connect the virtual desktops in the personal collection. User profile disks allow users to preserve personalization settings across session collections and pooled virtual desktop collections.

RDS in Windows server 2012 supports USB devices, printers, scanners, biometric readers, webcams, or Voice over IP headsets. User can use touchscreens and tablets when connecting to a session or Virtual desktops.

Windows server 2012 supports Web access for virtual desktops. Windows Server 2008 R2 also supported web-based single sign-on for RemoteApp programs.

Each virtual desktop is isolated from each other in Windows Server 2012. This isolation allows users to run multiple operating systems simultaneously on one physical computer.

RDS provides users the ability to disconnect from their workspaces, and then reconnect from a different location. The users can save time, and still work on previously applications.

The Remote Desktop Services (VDS) and Virtual Desktop Infrastructure (VDI) components that included RD Virtualization Host, RD Session Host, RD Connection Broker [RDCB], and Windows PowerShell management application programming interfaces in Windows Server 2012 support tens of thousands of VDI guest VMs or server-hosted RD sessions.

The Remote Desktop Connection Broker (RDCB) configuration in two Windows Servers 2012 configurations can be supported for up to 5,000 users. The connection broker can scale out farther by adding additional RDCB servers. The virtual desktops and remote desktop services, Windows Server
2012 can be running Windows 8 operating system, the Windows 7 with Service Pack (SP) 1 operating system with the RDP8 update.

3.2 Main role services of Remote Desktop (RD) Virtualization Host Server and Hyper-V

The Remote Desktop (RD) Virtualization Host Server consists of several main role services as follows:

**RD Connection Broker**

The RD Connection Broker allows users to reconnect to their existing virtual desktops, RemoteApp programs, and session-based desktops, and enables users to evenly distribute the load among RD Session Host servers in a session collection or pooled virtual desktops in a pooled virtual desktop collection.

The RD Connection Broker provides access to virtual desktops in a virtual desktop collection.

**RD Web Access**

Remote Desktop Web Access (RD Web Access) enables users to access RemoteApp and Desktop Connection through the Start menu on a computer that is running Windows 8, Windows 7, or through a web browser. RemoteApp and Desktop Connection provides a customized view of RemoteApp programs and session-based desktops in a session collection, and RemoteApp programs and virtual desktops in a virtual desktop collection.

**RD Virtualization Host**

Remote Desktop Virtualization Host (RD Virtualization Host) integrates with Hyper-V to deploy pooled or personal virtual desktop collections within the organization.

**RD Session Host**

Remote Desktop Session Host (RD Session Host) enables a server to host RemoteApp programs or session-based desktops. Users can connect to RD Session Host servers in a session collection to run programs, save files, and use resources on those servers.

**RD Gateway**

Remote Desktop Gateway (RD Gateway) enables authorized users to connect to virtual desktops, RemoteApp programs, and session-based desktops on an internal corporate network from any Internet-connected device.

**RD Licensing**

Remote Desktop Licensing (RD Licensing) manages the licenses required to connect to a Remote Desktop Session Host server or a virtual desktop. You can use RD Licensing to install, issue, and track the availability of licenses.
Fig. 3.1 Installing RD Connection Broker, RD Web Access and RD Virtualization Host in Windows Server 2012

**Hyper-V**

The Hyper-V role enables users to create and manage a virtualized computing environment by using virtualization technology that is built in to Windows Server 2012. The required components include Windows hypervisor, Hyper-V Virtual Machine Management Service, the virtualization WMI provider, and other virtualization components such as the virtual machine bus (VMbus), virtualization service provider (VSP) and virtual infrastructure driver (VID).
Fig. 3.2 Tools that included Hyper-V and Windows PowerShell in Server Manager

The management tools for the Hyper-V role consist of:

GUI-based management tools: Hyper-V Manager, a Microsoft Management Console (MMC) snap-in, and Virtual Machine Connection, which provides access to the video output of a virtual machine so you can interact with the virtual machine.

Hyper-V-specific cmdlets for Windows PowerShell. Windows Server 2012 includes a Hyper-V module, which provides command-line access to all the functionality available in the GUI, as well functionality not available through the GUI.
Fig. 3.3 Hyper-V Manager: Creating new virtual machine, Virtual Switch manager, Virtual SAN Manager

If users use Server Manager to install the Hyper-V role, the management tools are included unless you specifically exclude them. If you use Windows PowerShell to install the Hyper-V role, the management tools are not included by default. To install the tools, use the parameter –IncludeManagementTools. For instructions about installing the Hyper-V role.

3.3 Work Steps of Microsoft solution for VDI in Windows Server 2012

There are two deployment types, Microsoft Virtual Desktop Infrastructure (VDI) Quick Start and Microsoft Virtual Desktop Infrastructure (VDI) standard deployment in Microsoft Virtual Desktop Infrastructure (VDI) deployment, Microsoft Server 2012.

Here we can begin through a VDI Quick Start deployment. We will install all the necessary Remote Desktop Services role services on one computer to let user install and configure them in a test environment. The VDI Quick Start deployment will complete to install the Remote Desktop Connection Broker (RD Connection Broker), Remote Desktop Virtualization Host (RD Virtualization Host), and Remote Desktop Web Access (RD Web Access) role services on a single computer, and create a pooled virtual desktop collection that is based on a virtual hard disk of the virtual desktop template. We also
will create a Hyper-V network switch named RDS Virtual and assign the pooled virtual desktop to that switch.

This experiment of Microsoft solution for VDI will be consist of three computers. One computer is running Windows Server 2012 for domain controller, DNS, DHCP and an enterprise root certification authority (CA). Second intranet member server is running Windows Server 2012. This server is configured as the VDI Quick Start deployment server. The third computer is running Windows 8 as client that is used to connect to the VDI Quick Start deployment.

Physical Connection for Test of VDI Solution from Microsoft Server 2012

Fig. 3.4 Experiment of Microsoft solution for VDI in Windows Server 2012

**Work Step1: Complete the base configurations for Domain Controller**

Domain Controller Configuration: Creating and installing DNS, DHCP, and Active Directory. Creating a user account.
Work Step 2: configurations for member server

Member Server: Joined Domain Controller

Step 2.1 On the Select installation type page, click Remote Desktop Services installation, and then click Next.
Step 2.2 On the Select deployment type page, click Quick Start or standard deployment, and then click Next.
Step 2.3 On the Select deployment scenario page, click Virtual machine-based desktop deployment, and then click Next.
Fig. 3.8 Virtual machine-based desktop deployment

Step 2.4 On the Review role services page, click Next.
Fig. 3.9 Review role services page

Step 2.5 On the Specify RD Connection Broker server page, select the server that will act as the RD Connection Broker server, and then click Next
Step 2.6 On the Specify RD Web Access server page, select the server that will act as the RD Web Access server, and then click Next.
Step 2.7 On the Specify RD Virtualization Host server page, select the machine that will be the RD Virtualization Host, and then click Next.
Fig. 3.12 Specify RD Virtualization Host server page

Step 2.8 On the Specify RD Virtualization Host server page, select the machine that will be the RD Virtualization Host, and then click Next.
Fig. 3.13 Specify RD Virtualization Host server page

Step 2.9 On the Confirm selections page, make sure you are happy with your choices. If you are, select the Restart the destination server automatically if required check box, and then click Deploy.
Fig. 3.14 Confirm selections page

Step 2.10 Installing RD Connection Broker role service, RD Web Access role services and RD Virtualization Host role services
Fig. 3. 15 Installing RD Connection Broker role service, RD Web Access role services and RD Virtualization Host role services

After successfully completing this process, the RD Connection Broker, RD Web Access, and RD Virtualization Host are installed.

Work Step3: Working on Hyper-V manager to create a new virtual machine

Step 3.1 Configure Network for creating new virtual machine
Fig. 3.16 Configure Network for creating new virtual machine

Step 3.2 Connect Virtual Hard Disk for creating new virtual machine
Fig. 3.17 Connect Virtual Hard Disk for creating new virtual machine

Step 3.3 Installation Options for new virtual Machine
Fig. 3.18 Installation Options for new virtual machine

Step 3.4 Completing the new virtual machine
Fig. 3.19 completing the new virtual machine

Step 3.5 Virtual machine on Hyper-V Manager
Fig. 3.20 Virtual machine on Hyper-V Manager

Step 3.6 Power on Virtual Machine, and insert Windows 8 installation CD to CD drive, Boot from CD.
Fig. 3.21 Begin to install Windows 8 virtual desktop

Step 3.7 Work steps to install Windows 8 virtual desktop is same with installing Windows 8 on physical desktop, continue to install Windows 8
Fig. 3.22 Continue to install Windows 8 virtual desktop

Step 3.8 Continue to install Windows 8 virtual desktop
Fig. 3.23 Continue to install Windows 8 virtual desktop

Step 3.9  Finished installing Windows 8 virtual desktop
Fig. 3.24 Finished installing Windows 8 virtual desktop

Step 3.10 Working on sysprep.exe on Windows 8 virtual desktop for generalize

Typing the command as follows:

```
%windir%\system32\sysprep\sysprep.exe /generalize /00be /shutdown /mode:m
```
Fig. 3.25 Working on sysprep.exe in virtual desktop

Work Step 4: Adding RD Licensing Server
Fig. 3.26 Success to add Remote Desktop Licensing role server

Work Step 5: Configure the deployment

Step 5.1 No configure for RD Gateway
Fig. 3.27 No configure for RD Gateway

Step 5.2 Active Directory configuration
Fig. 3.28 Active Directory configuration

**Work Step 6: Creating Virtual Desktop Collection**

Step 6.1 Click Create Virtual Desktop Collection
Fig. 3.29 Creating Virtual Desktop Collection

Step 6.2 Requirements to create a virtual desktop collection
Fig. 3.30 Requirements to create a virtual desktop collection

Step 6.3 Name Collection
Fig. 3.31 Name Collection

Step 6.4 Pooled virtual desktop collection
Fig. 3.32 Pooled virtual desktop collection

Step 6.5 Specify the virtual desktop template
Fig. 3.33 Specify the virtual desktop template

Step 6.6 Specify the virtual desktop setting
Fig. 3.34 Specify the virtual desktop setting (1)
Fig. 3.35 Specify the virtual desktop setting (2)

6.7 Specify users and user groups
Fig. 3.36 Specify users and user groups

Step 6.8 Specify virtual desktop allocation
Fig. 3.37 Specify virtual desktop allocation

Step 6.9 Specify virtual desktop storage
Fig. 3.38 Specify virtual desktop storage

Step 6.10 Specify user profile disks
Fig. 3.39 Specify user profile disks

Step 6.11 Confirm selections to create collection
Fig. 3.40 Confirm selections to create collection

Step 6.12 Creating Collection
Fig. 3.41 Creating Collection

Step 6.13 Creating Collection in Server Manager
Fig. 3.42 Creating Collection in Server Manager

Step 6.14 Virtual Machine Collection
Fig. 3.43 Virtual Machine Collection

**Work Step 7: Connection to the virtual desktop collection**

Step 7.1 In the Internet Explorer address bar, type https://vdi*.vditest.edu/RDWeb, and then press ENTER.
Fig. 3.43 Web Accessing

Step 7.2 Login Work Resources
This work steps of Microsoft solution for VDI in Windows Server 2012 evaluation version has proved that Microsoft provided good solution for VDI by using Windows Server 2012. We can use Windows Server 2012 that included domain controller, DNS, DHCP, Hyper-V, Remote Desktop Connection Broker (RD Connection Broker), Remote Desktop Virtualization Host (RD Virtualization Host), and Remote Desktop Web Access (RD Web Access) role services to the solution for VDI.

Microsoft Virtual Desktop Infrastructure (VDI) lets us to use Windows Server 2012 or 2012 R2 to deploy remote desktop services architectures that provide users the flexibility to work anywhere accessing their windows desktop or application environment running in the datacenter.

Microsoft solution for VDI enables access to multiple Windows environments from the same client device. This VDI solution also enable users to pursue “Bring Your Own Device Programs” where they use their personally owned hardware for personal, work and study. Windows Thin PC is another technology that leverages VDI technology by enabling users to reuse existing PCs as thin clients.
4. Citrix Solution to Virtual Desktop Infrastructure

Citrix has provided a complete, flexible solution that delivers Windows applications and desktops to any user on any device by desktop virtualization. Citrix application and desktop virtualization technology helps us to keep simplifying management and improving security and reducing costs.

4.1 Technical Frame of Citrix solution for VDI by XenDesktop 7.6

Citrix has provided a new product XenDesktop 7.6 for solution of VDI. The XenDesktop 7.6 is a good product for developing a virtual desktop and application solution. The technical framework has showed a foundation to understand the technical architecture for the most common virtual desktop/applications.

There are five work layers on the Technical Framework. The virtual desktop solution from Citrix is based on these five work layers.

- **User layer**: Defines the unique user groups, endpoints and locations. There are four distinct delivery groups corresponding to different sets of users.

- **Access layer**: Defines how a user group gains access to their resources. Focuses on secure access policies and desktop/application stores. Users access a list of available resources through StoreFront. For users not on the internal, protected network, like the Office Workers and Contractors user groups, must establish a SSL encrypted tunnel across public network links to the NetScaler Gateway, which is deployed within the DMZ area of the network.

- **Resource lay**: Defines the virtual desktops, applications and data provided to each user group. Four types of resources are provided to the users:
  
  a) **Pooled Desktops**: A hosted desktop-based Windows operating system where the desktop interface is remotely displayed, the virtual machine is individually shared amongst a pool of users and is reset to a clean state after each use.
  
  b) **Personal Desktops**: A hosted desktop-based Windows operating system where the desktop interface is remotely displayed, the virtual machine is permanently assigned to a single user and all changes persist for the lifetime of the desktop.
  
  c) **Hosted Apps**: A hosted server-based Windows operating system where the virtual machine is shared amongst a pool of users simultaneously while each user is encapsulated within their own session and only the application interface is remotely displayed.
  
  d) **Remote PC Access**: A traditional, local Windows desktop, assigned to a single user and can be physically accessed locally or accessed remotely.

- **Control layer**: Defines the underlying infrastructure required to support the users accessing their resources. The Delivery Controller authenticates users and enumerates resources from StoreFront while creating, managing and maintaining the virtual resources. All configuration information about the XenDesktop site is stored within the SQL database.
- **Hardware layer**: Defines the physical implementation of the overall solution. The corresponding hosts provide compute and storage resources to the Resource Layer workloads. One set of hosts centrally delivers virtual servers and virtual desktops from the data center while a second set of hosts correspond to the Access and Control layer servers.
Fig. 4.1 Technical Frame of Citrix solution for VDI by XenDesktop 7.6
4.2 Citrix products for solution of VDI

Citrix has provided product XenDesktop 7.6 for desktop virtualization solutions, and meet the needs of the organization’s users. There are system requirements for Citrix XenDesktop 7.6. The XenApp 7.6 and XenDesktop 7.6 have different delivers for desktop virtualizations. The key technology components of FlexCast Management Architecture (FMA) in XenDesktop 7.6 included Citrix Receiver, StoreFront, Delivery Controller, Virtual Delivery Agent (VDA), Broker Service, Broker agent, Monitor Service, ICA File/Stack, Site Database, NetScaler Gateway, Director, and Studio. These key technology components supported and constructed Citrix Solution for Virtual Desktop Infrastructure.

4.2.1 System requirement for Citrix XenDesktop 7.6

The prerequisite software include .NET and C++ packages. The Citrix installation media also contains some of this prerequisite software.

If user wants to install all the core components (Controller with SQL Server Express, Studio, Director, StoreFront, and Licensing) on a single server, user needs a minimum of 3 GB of RAM to evaluate the product; more is recommended when running an environment for users. Performance will vary depending on the exact configuration, including the number of users, applications, desktops, and other factors.

The main components of XenDesktop 7.6 are the following:

**Delivery Controller**

Supported operating systems:
- Windows Server 2012 R2, Standard and Datacenter Editions
- Windows Server 2012, Standard and Datacenter Editions
- Windows Server 2008 R2 SP1, Standard, Enterprise, and Datacenter Editions

**Requirements:**
- Disk space: 100 MB. Connection leasing (which is enabled by default) adds to this requirement; sizing depends on the number of users, applications, and mode (RDS or VDI). For example, 100,000 RDS users with 100 recently-used applications require approximately 3 GB of space for connection leases; deployments with more applications may require more space. For dedicated VDI desktops, 40,000 desktops require at least 400-500 MB. In any instance, providing several GBs of additional space is suggested.
- Microsoft .NET Framework 3.5 SP1 (Windows Server 2008 R2 only).
- Microsoft .NET Framework 4.5.1 (4.5.2 is also supported).
- Windows PowerShell 2.0 (included with Windows Server 2008 R2) or 3.0 (included with Windows Server 2012 R2 and Windows Server 2012).
- Visual C++ 2005, 2008 SP1, and 2010 Redistributable packages

**Database**

66
Supported Microsoft SQL Server versions for the Site Configuration Database (which initially includes the Configuration Logging Database and the Monitoring Database):

- SQL Server 2014, Express, Standard, and Enterprise Editions.
- SQL Server 2012 SP1, Express, Standard, and Enterprise Editions. By default, SQL Server 2012 SP1 Express is installed when installing the Controller, if an existing supported SQL Server installation is not detected.
- SQL Server 2008 R2 SP2, Express, Standard, Enterprise, and Datacenter Editions.

The following database features are supported (except for SQL Server Express, which supports only standalone mode):

- SQL Server Clustered Instances
- SQL Server Mirroring
- SQL Server 2012 AlwaysOn Availability Groups

Windows authentication is required for connections between the Controller and the SQL Server database.

**Studio**

Supported operating systems:
- Windows 8.1, Professional and Enterprise Editions
- Windows 8, Professional and Enterprise Editions
- Windows 7 Professional, Enterprise, and Ultimate Editions
- Windows Server 2012 R2, Standard and Datacenter Editions
- Windows Server 2012, Standard and Datacenter Editions
- Windows Server 2008 R2 SP1, Standard, Enterprise, and Datacenter Editions

Requirements:
- Disk space: 75 MB
- Microsoft .NET Framework 4.5.1 (4.5.2 is also supported)
- Microsoft .NET Framework 3.5 SP1 (Windows Server 2008 R2 and Windows 7 only)
- Microsoft Management Console 3.0 (included with all supported operating systems)
- Windows PowerShell 2.0 (included with Windows 7 and Windows Server 2008 R2) or 3.0 (included with Windows 8.1, Windows 8, Windows Server 2012 R2, and Windows Server 2012)

**Director**

Supported operating systems:
- Windows Server 2012 R2, Standard and Datacenter Editions
- Windows Server 2012, Standard and Datacenter Editions
- Windows Server 2008 R2 SP1, Standard, Enterprise, and Datacenter Editions

Requirements:
- Disk space: 50 MB.
- Microsoft .NET Framework 4.5.1 (4.5.2 is also supported).
- Microsoft .NET Framework 3.5 SP1 (Windows Server 2008 R2 only)
- Microsoft Internet Information Services (IIS) 7.0 and ASP.NET 2.0. Ensure that the IIS server role has the Static Content role service installed. If these are not already installed, you are prompted for the Windows Server installation media, then they are installed for you.
- Supported browsers for viewing Director:
  - Internet Explorer 11 and 10. Compatibility mode is not supported for Internet Explorer. You must use the recommended browser settings to access Director. When you install Internet Explorer, accept the default to use the recommended security and compatibility settings. If you already installed the browser and chose not to use the recommended settings, go to Tools > Internet Options > Advanced > Reset and follow the instructions.
  - Firefox ESR (Extended Support Release).
  - Chrome.

Virtual Delivery Agent (VDA) for Windows Server OS

Supported operating systems:
- Windows Server 2012 R2, Standard and Datacenter Editions
- Windows Server 2012, Standard and Datacenter Editions
- Windows Server 2008 R2 SP1, Standard, Enterprise, and Datacenter Editions

The installer automatically deploys the following requirements, which are also available on the Citrix installation media in the Support folders:
- Microsoft .NET Framework 4.5.1 (4.5.2 is also supported)
- Microsoft .NET Framework 3.5 SP1 (Windows Server 2008 R2 only)

The installer automatically installs and enables Remote Desktop Services role services, if they are not already installed and enabled.

Several multimedia acceleration features (such as HDX MediaStream Windows Media Redirection) require that the Microsoft Media Foundation be installed on the machine on which you install the VDA. If the machine does not have Media Foundation installed, the multimedia acceleration features will not be installed and will not work. Do not remove Media Foundation from the machine after installing the
Citrix software; otherwise, users will not be able to log on to the machine. On most Windows Server 2012 R2, Windows Server 2012, and Windows Server 2008 R2 editions, the Media Foundation feature is installed through the Server Manager (for Windows Server 2012 R2 and Windows Server 2012: ServerMediaFoundation; for Windows Server 2008 R2: DesktopExperience). However, N editions do not include certain media-related technologies; you can obtain that software from Microsoft or a third party.

**Hosts / virtualization resources**

**Supported platforms:**

- XenServer.
  - XenServer 6.5
  - XenServer 6.2 SP1 plus hotfixes (you must apply SP1 to enable application of future hotfixes)
  - XenServer 6.1
- VMware vSphere. No support is provided for vSphere vCenter Linked Mode operation.
  - VMware vSphere 5.5 Update 2
  - VMware vSphere 5.5 Update 1
  - VMware vSphere 5.5
  - VMware vSphere 5.1 Update 2
  - VMware vSphere 5.0 Update 2
- System Center Virtual Machine Manager - Includes any version of Hyper-V that can register with the supported System Center Virtual Machine Manager versions.
  - System Center Virtual Machine Manager 2012 R2
  - System Center Virtual Machine Manager 2012 SP1
  - System Center Virtual Machine Manager 2012

**4.2.2 Citrix Products XenApp 7.6 and XenDesktop 7.6**

XenApp and XenDesktop are virtualization solutions that give IT control of virtual machines, applications, licensing, and security while providing anywhere access for any device.

XenApp and XenDesktop share a unified architecture called FlexCast Management Architecture (FMA). FMA’s key features are the ability to run multiple versions of XenApp or XenDesktop from a single Site and integrated provisioning. The key technology components of FMA included Citrix Receiver, StoreFront, Delivery Controller, Virtual Delivery Agent (VDA), Broker Service, Broker agent, Monitor Service, ICA File/Stack, Site Database, NetScaler Gateway, Director, and Studio.
XenApp and XenDesktop have a set of management tools. The management tools simplify and automate IT requirements and tasks. The users can manage public, private and hybrid cloud deployments.

The XenApp delivers XenApp published apps, also known as server-based hosted applications, XenApp published desktops, also known as server-hosted desktops, VM-hosted apps and Windows applications delivered with Microsoft App-V using the same management tools user use for the rest of the XenApp deployment.

XenDesktop delivers VDI desktops, Hosted physical desktop, Remote PC access, Server VDI, and Capabilities that allow users to continue to use their virtual desktops while not connected to the network.

- The XenApp 7.6 and XenDesktop 7.6 includes new features that make it easier for users to access applications and desktops and for Citrix administrator to manage applications.
- The session prelaunch and session linger features help users quickly access server-based hosted applications by starting sessions before they are requested (session prelaunch) and keeping application sessions active after a user closes all applications (session linger).
- Support for unauthenticated (anonymous) users that means users can access server-based hosted applications and server-hosted desktops without presenting credentials to StoreFront or Citrix Receiver.
- Connection leasing makes recently used applications and desktops available even when the Site database is unavailable.
- Application folders in Studio make it easier to administer large numbers of applications.

Other new features in this new release allow users to improve performance by specifying the number of actions that can occur on a Site’s host connection, display enhanced data when users manage and monitor the Site, and anonymously and automatically contribute data that Citrix can use to improve product quality, reliability, and performance.
Working Overview to Citrix Solution for VDI

Fig. 4.2 Working Overview to Citrix Solution for VDI
Where

Citrix Receiver

A software client that is installed on the user device, supplies the connection to the virtual machine via TCP port 80 or 443, and communicates with StoreFront using via the StoreFront Service API.

StoreFront

The interface that authenticates users, manages applications and desktops, and hosts the application store. StoreFront communicates with the Delivery Controller using XML.

Delivery Controller

The central management component of a XenApp or XenDesktop Site that consists of services that manage resources, applications, and desktops; and optimize and balance the loads of user connections.

Virtual Delivery Agent (VDA)

An agent that is installed on machines running Windows Server or Windows desktop operating systems that allows these machines and the resources they host to be made available to users. The VDA-installed machines running Windows Server OS allow the machine to host multiple connections for multiple users and are connected to users on one of the following ports:

- TCP port 80 or port 443 if SSL is enabled
- TCP port 2598, if Common Gateway Protocol (CGP) is enabled, which enables session reliability
- TCP port 1494 if CGP is disabled or if the user is connecting with a legacy client

Broker Service

A Delivery Controller service that tracks which users are logged in and where, what session resources the users have, and if users need to reconnect to existing applications. The Broker Service executes PowerShell and communicates with the Broker agent over TCP port 80. It does not have the option to use TCP port 443.

Broker agent

An agent that hosts multiple plugins and collects real-time data. The Broker agent is located on the VDA and is connected to the Controller by TCP port 80. It does not have the option to use TCP port 443.

Monitor Service

A Delivery Controller component that collects historical data and puts it in the Site database by default. The Monitor Service communicates on TCP port 80 or 443.
ICA File/Stack

Bundled user information that is required to connect to the VDA.

Site Database

A Microsoft SQL database that stores data for the Delivery Controller, such as site policies, machine catalogs, and delivery groups.

NetScaler Gateway

A data-access solution that provides secure access inside or outside the LAN’s firewall with additional credentials.

Director

A web-based tool that allows administrators access to real-time data from the Broker agent, historical data from the Site database, and HDX data from NetScaler for troubleshooting and support. Director communicates with the Controller on TCP port 80 or 443.

Studio

A management console that allows administrators to configure and manage Sites, and gives access to real-time data from the Broker agent. Studio communicates with the Controller on TCP port 80.

4.3 Working on Citrix solution for VDI by Xendesktop 7.6

Citrix has provided XenDesktop 7.6 trial evolution. We can work on Xendesktop 7.6 trial version to understand the Citrix solution for VDI. There are nine components, Citrix Receiver, StoreFront, Citrix Studio, Citrix Director, Delivery Controller, Server OS machines, Virtual Delivery Agent, and NetScaler Gateway in the Xendesktop 7.6.

We can download XenDesktop 7.6 trial evolution from Citrix Web Homepage, and create an installation DVD. This experiment of Citrix solution for VDI will need Windows Server 2012, Domain Control, XenServer and Client computer Windows 7 or Windows 8.
We will install XenDesktop 7.6 on member Server, Windows Server 2012 (Single Server). This installation included Create Master VDA, Citrix Studio, Director, Storefront, Delivery Controller, Machine Catalogs, Delivery Groups, Hosted Share Desktop and Applications in Server, VDI Desktop and MS App-V (outside Studio).

Work step 1: Insert the XenDesktop 7.6 DVD to Member Server, Windows Server 2012 and launch Autorun Wizard.
Fig. 4.4 Installation Wizard.

Work step 2: Click Start for installing XenDesktop, and select Delivery Controller under get Started.
Fig. 4.5 Selecting Delivery Controller under get Started

Work step 3: Install all the core components on a single server.
Fig. 4.6 Installing core Components
Fig. 4.7 Installing Microsoft SQL 2012 Express

Work Step 4: automatically configure Windows firewall
Work step 5: installing the core components
All the components are installed automatically, including any missing prerequisites. The process takes about 20-25 minutes.
Fig. 4.10 All the components are installed automatically
Fig. 4.11 Finished installing core components
Fig. 4.12 Core components on Applications in Windows Server 2012

Work step 6: Configuring Citrix Studio
Fig. 4.13 Welcome to Citrix Studio
Fig. 4.14 Typing Site Name
Fig. 4.15 Providing a name for the database

Creating a database automatically.
Fig. 4.16 Creating a database automatically

Fig. 4.17 Connect to Citrix XenServer
For the evaluation, use one NIC and the same network interface for all VMs.
No for Microsoft App-V.

Fig. 4.20 Configuring App V-Publishing

Fig. 4.21 Finished configuring for Studio

Work step 7: Installing Virtual Delivery Agent for Windows Desktop OS
Fig. 4.22 Installing Delivery Agent for Windows Desktop OS

Fig. 4.23 Creating a Master Image
Fig. 4.24 Installing core components

The Virtual Delivery Agent allows this desktop to communicate with the broker (controller) and the end user (Citrix Receiver).

Fig. 4.25 Delivery Control

If using Machine Creation Services, the controller address is auto-configured.

This installs all the necessary components for the Virtual Delivery Agent.
Fig. 4.26 Features

Fig. 4.27 Installing Firewall
Click Install to start the installation. The machine needs to reboot after some of the components have been installed.

Preparing to configure Windows. Do not turn off your computer.
Fig. 4.30 Installing prerequisites and components

Work step 8: Install Virtual Delivery Agent on the master image (server OS)

Fig. 4.31 Installing Virtual Delivery Agent
Fig. 4.32 Environment: Crate a Master Image

Fig. 4.33 Installing Core Components

Fig. 4.34 Delivery Controller
Fig. 4.35 Features

Fig. 4.36 Firewall
Fig. 4.37 Summary

Fig. 4.38 working on features
Work step 9: Creating the machine catalog

Now that the master image is ready, you can return to Studio and complete Step 2 of the First Run Wizard.

Click Set up machines under the Machine Catalog option (2).
Fig. 4.40 creating the machine catalog in site setup

Fig. 4.41 click creating the machine catalog

Fig. 4.42 Operation System
Fig. 4.43 machine management

Fig. 4.44 Master Image
Fig. 4.45 Virtual Machines

Fig. 4.46 Active Directory Computer Accounts
Fig. 4.47 Summary

Summary

Machine type: Windows Server OS
Machine management: Virtual
Provisioning method: Machine creation services (MCS)
Resources: WWCo
Master Image name: XenApp_Base
VDA version: 7.6 (recommended, to access the latest features)
Number of VMs to create: 2
Virtual CPUs: 2

Machine Catalog name:
XenApp
Machine Catalog description for administrators: (Optional)

Example: Windows 7 SP1 desktops for the London Sales office

To complete the deployment, assign this Machine Catalog to a Delivery Group by selecting Delivery Groups and then Create or Edit a Delivery Group.

Fig. 4.48 Creating Catalog WinApps in Studio
The dashboard Action pane (click Studio in left pane) shows task status. Create two machine catalogs: one for testing application delivery and another for hosted shared desktops.

Work step 10: Publish desktops and applications

Fig. 4.49 Publish desktops and applications

Click #3, Create a Delivery Group, Applications and Assign Users

If the First Run Wizard is no longer be available, use the Create Delivery Group Wizard to launch the workflow from Studio.

Fig. 4.50 Creating Delivery Groups
Fig. 4.51 Delivery Type

Fig. 4.52 Machines with Operation System
Fig. 4.53 Assign users

Fig. 4.54 Summary

Fig. 4.55 Search for Win7
Work step 11: Create server OS delivery groups

Select option 3 in the First Run Wizard to Set up Delivery Groups.

Fig. 4.56 Creating server OS delivery groups in Site

If the First Run Wizard is no longer be available, go to Studio > Delivery Groups > Actions (on right pane) > Create Delivery Group to launch the workflow.

Fig. 4.57 Creating delivery groups in Windows Server OS

Select the server machine catalog, described as RDS MCS Random in the table.
Select Desktops and applications as delivery type
Fig. 4.60 Creating users

Fig. 4.61 Select applications
Fig. 4.62 Choose Applications

Fig. 4.63 Storefront
Summary

- Source Machine Catalog: Apps
- Machine type: Windows Server OS
- Allocation type: Random
- Number of machines added: 1 unassigned
- Delivery type: Desktops and Applications
- Users: TME Lab, Citrix Eval
- Applications: 2
- Scopes: -

Delivery Group name:
Hosted Shared 2012

Display name:
Hosted Shared 2012

Delivery Group description for users (Optional): 

Fig. 4.64 Summary

Fig. 4.65 Delivery Group
The VM is turned on and registers with the controller. Registration state changes to Registered.

Work step 12: Configuring the StoreFront server

The StoreFront management console is now integrated with Studio. The StoreFront console is also available as a standalone console.

XenDesktop 7.6 comes with a default store that is available once the first delivery group is created. Web store is in the form: http://<servername>/Citrix/StoreWeb
For evaluations, the auto-created store quickly allows access to the environment.

The StoreFront console is also available as a standalone console.

As a best practice, StoreFront services are installed on a server separate from the delivery controller. For this evaluation, you will use a single server for all components.
Work step 13: End-user session launch (Citrix Receiver)

Launch published desktops and applications using Citrix Receiver

Citrix Receiver is the lightweight client that enables access to applications and desktops. Once a user is authenticated, you will have access to applications and desktops hosted on XenDesktop.

On a client machine, Windows 7 in this case, open a browser and go to the default Storefront URL.
Fig. 4.73 Install Receiver in the client

Log in as a domain user Click the +sign at the left edge of the screen, and click All Apps to see list of available apps.

Click a few apps and add them to your self-service portal.

Fig. 4.74 a few apps and add them to your self-service portal

You can switch between your list of apps and your list of desktops using the selection bar at the bottom of the screen.
You can search for an app or desktop by name, using the Search bar on top.

Fig. 4.75 Applications and Desktops

Fig. 4.76 Windows 7 operation system

XenDesktop 7.6 allows you to provision and access hosted shared apps and desktops. With XenDesktop 7.6, you deliver VDI desktops from the same console as hosted applications and desktops.

In this experiment Win7 and Win8 are VDI desktops, while Hosted Shared 2012 is server based, as the name suggests.

Fig. 4.77 Server and Desktops
When you click the Hosted Shared 2012 desktop icon, the desktop is a Windows Server 2012 desktop (as seen in this picture).

![Windows Server 2012 desktop](image)

**Fig. 4.78 Windows 2012 Server**

**Work step 14: Operations helpdesk and monitoring with Director**

Access the Director console with this easy URL: [http://<yourservername>/Director](http://<yourservername>/Director)

![Director console](image)

**Fig. 4.79 Web Director console**

This is a snapshot of the dashboard. It clearly shows relevant information, such as connected sessions, failed sessions, average logon time, and so on.
Click through on the dashboard to drill down into details of the parameters such as connection or session details, type of delivery group, etc.

Failure reason, client version, server group, end-user IP, etc., help IT admins resolve any issues.

The details of the parameters such as connection or session details, type of delivery group, etc.

This concludes the evaluation of XenDesktop 7.6. Through this process, we learned how to install a basic deployment of XenDesktop 7.6, configure a Studio site and create machine catalogs. Using delivery groups, you provisioned both apps and desktops from a single, unified console, including full support for Windows 8.1 with a high level of interactivity and graphics. Finally, we experienced the powerful...
monitoring, troubleshooting and analytical features of Director, seeing how simple and easy it is to manage day-to-day operations of a large-scale virtualized desktop environment.

Now we have completed these tasks and seen how a basic deployment functions, use the XenDesktop 7.6 documentation to experience all the components and features available with this release, such as rich graphics using GPU cards, Windows media multicast support, Citrix Receiver for HTML5, configuration logging, delegated administration, App-V integration, hybrid cloud provisioning and more.
5. Oracle Solution for Virtual Desktop Infrastructure

Oracle Solution for Virtual Desktop Infrastructure has provided access to virtualized desktops hosted in a data center, and enables organizations to simplify administration and reduce operating costs. Oracle provides a VDI solution that runs on a single, inexpensive server.

**Oracle Solution for Virtual Desktop Infrastructure by Single Server**

Fig. 5.1 Oracle Solution for Virtual Desktop Infrastructure by Single Server

New Oracle Virtual Desktop Infrastructure 3.5.1 software is now available. This new release can scale from a single server to the Enterprise. Oracle provides a VDI solution that runs on a single, inexpensive server.

5.1 Single Server Architecture of Oracle solution for VDI

The Single Server Architecture of Oracle solution for VDI included Server to run Oracle Solaris or Oracle Linux Operating System, Oracle VM VirtualBox 4.2.10, Oracle Virtual Desktop Infrastructure 3.5 and Windows & desktop template.

- Server to run Oracle Solaris or Oracle Linux Operating System.
• Oracle VM VirtualBox is installed on the base operating system. Use the `vb-install` script, which is delivered with Oracle Virtual Desktop Infrastructure to install and configure the Oracle VM VirtualBox webservice which is used to orchestrate virtual machine operations.

• Oracle Virtual Desktop Infrastructure is installed on the base operating system. Once installed, it should be configured to point to the required user directory (typically Active Directory) and a VirtualBox Desktop Provider should be configured to use Local Storage. This Local Storage is simply a filesystem location with ample storage capacity to hold the virtual disks of the virtual desktop population. A new desktop pool that is configured to offer a pool of flexible desktops should be created and the Windows desktop template should be imported as the master template for this pool.

• The Windows desktop is a virtual machine image that is configured as required by the customer. After it is imported into Oracle Virtual Desktop Infrastructure, it serves as the master template for subsequent clones. These clones are the virtual desktops that end users ultimately run and interact with.

5.2 Base and Performance Configurations Specifications in Single Server VDI Solution

The Base and Performance Configurations Specifications in Single Server VDI Solution are the following:

<table>
<thead>
<tr>
<th>Base Configuration</th>
<th>Performance Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sun Server X3-2L based on Intel Xeon E5 2660 processors</td>
<td>Sun Server X3-2L based on Intel Xeon E5 2690 processors</td>
</tr>
<tr>
<td>128 GB 1600 MHz RAM (expandable to 512 GB)</td>
<td>256 GB 1600 MHz RAM (expandable to 512 GB)</td>
</tr>
<tr>
<td>16 x 600G SAS-2 10K RPM disks</td>
<td>26 x 600G SAS-2 10K RPM disks</td>
</tr>
<tr>
<td>Based on a customized “Large” configuration on the Oracle store</td>
<td>Offered as “Large” configuration on the Oracle store</td>
</tr>
<tr>
<td>Targeted at 90-95 users per system</td>
<td>Targeted at 180-190 users per system</td>
</tr>
</tbody>
</table>

5.3 Working on Oracle solution for VDI

5.3.1 Four element in Oracle solution for VDI

An Oracle VDI system consists of four elements: Virtualization, storage, access and management.

• **Virtualization:** The virtualization platform (hypervisor) that runs the virtual desktops. Each desktop runs in a separate virtual machine.

• **Storage:** The storage space used to store the virtual disks used for the desktops.

• **Access:** The means for logging in to virtual desktops and using them. Oracle VDI supports Oracle Sun Ray Clients and Remote Desktop Protocol (RDP) clients.

• **Management:** The Oracle VDI service that processes user requests for desktops and instructs the virtualization platform and storage to provide and start a virtual machine.
5.3.2 Oracle VDI System Requirements

**Oracle VDI Hardware Requirements**

The basic hardware requirements for Oracle VDI are:

- At least 4 gigabytes (GB) of random-access memory (RAM)
- Quad core x86-64 (64-bit) central processing unit (CPU), with virtualization support (Intel VT-x or AMD-V)
- At least 32 gigabytes (GB) of free disk space
- 1 gigabit (Gbit) network interface card (NIC)

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

**Operation Systems support Oracle VDI**

Oracle Linux (64-bit) on x86 platforms, releases 5.8 and 6.3.

Oracle Solaris (64-bit) on x86 platforms, releases Oracle Solaris 10, 11.1 or later

5.3.3 Oracle VM VirtualBox requirements

Oracle VDI release 3.5 includes release 4.2.10 of Oracle VM VirtualBox. Other, Oracle VDI 4.1.18 bundled with Oracle VDI release 3.4.1 and Oracle VDI 4.1.14 bundled with Oracle VDI release 3.4.

5.3.4 Installing Oracle VDI and VirtualBox

**Work step 1:** On Oracle Linux hosts and type:

```
# unzip vda_3.5_linux.zip
# cd vda_3.5_linux
```

After installation VDI 3.5, you will be prompted to configure Oracle VDI.

1 New Oracle VDI Center

2 Join Oracle VDI Center

Select (1/2):

Type 1 (for a new Oracle VDI Center).

Review the settings for a new Oracle VDI Center:

Name: VDI Center
Administrator Password: ********
VDI Administrator (super-user): root
DNS name of this host: vdi.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):

After configuring VDI Administrator and DNS, you can accept the defaults and create VDI Center. You can type c to change the configuration settings. After a few minutes, the installation is complete.

**Work step 2: Installing VirtualBox**

Unzip the VirtualBox software archive, change working directory to the extracted directory, and install the software with the `vb-install` script, as follows:

```
# unzip vbox_4.2.zip
# cd vbox_4.2
# ./vb-install
```

**Work step 3: Logging in to the Oracle VDI Web Administration Tool**

Log in to the Oracle VDI web administration tool, Oracle VDI Manager. Using a browser, go to `https://<host-name>:1801`. The browser displays a security warning and prompts you to accept the security certificate. Accept the security certificate.

![Fig. 5.2 Logging in to the Oracle VDI Web Administration Tool](image)

```
**Work step 4: Creating a Company, User Directory**

In the **Companies** table, click the **New** button. The **New Company** wizard is displayed in a new window. Click the **Next** button to move though the various steps of the wizard. On the Choose User Directory step, select **LDAP**.

![Fig. 5.3 Creating a Company, User Directory](image)

![Fig. 5.4 User Directory Type.](image)
Fig. 5.5 Specify Connection

Fig. 5.6 Define Company

Fig. 5.7 Company added
Work step 5: Testing the Company Configuration

Now that you have configured a company, it is important to test whether it works. You need to start Oracle Virtual Desktop Client. There should be an application icon for Oracle Virtual Desktop Client in the either the Start Menu (Windows platforms), the Launch Menu (Linux platforms), or the Applications folder (Mac OS X platforms).

After a few moments, the Oracle VDI Desktop Login screen is displayed. Enter your Active Directory or LDAP user name and password, and a domain name, and then click Log In.
After a few moments, the Desktop Selector screen is displayed together with a message to say that there are no desktops available to you.
Work step 6: Connecting the Virtualization Platform

You connect Oracle VDI to the virtualization platform that runs the desktops for users, in Oracle VM VirtualBox. To do this, you create a desktop provider in Oracle VDI Manager and then specify the virtualization resources (hosts and storage) you want to use.

Log in to Oracle VDI Manager, and select Desktop Providers in the navigation tree on the left. The All Desktop Providers page is displayed.

In the Desktop Providers table, click the New button. The New Desktop Provider wizard is displayed in a new window. Click the Next button to move though the various steps of the wizard. On the Select Desktop Provider Type step, select Oracle VM VirtualBox,

Fig. 5.12 Select Desktop Provider Type

On the Specify New Host step, enter the details of your Oracle VDI host where you installed VirtualBox:

- **Host**: The fully qualified DNS name or IP address of the VirtualBox host.

- **SSL Port**: The port number used for SSL connections to the VirtualBox host. This is the port you specified when you installed VirtualBox. The default port is either port 443 or 18083, depending on whether the root user is used to run VirtualBox on the host.

- **SSH Port**: The port used for SSH connections to the VirtualBox host. The default is port 22.

- **User Name** and **Password**: The credentials of the user that runs VirtualBox on the host. The credentials must be for the user you specified when you installed VirtualBox on the host.
Click **Next**. On the Verify Certificate step, check that the SSH and SSL certificate details are correct and click **Next**. You are returned to the Specify Hosts step so that you can add more VirtualBox hosts if you want. A message is displayed to confirm that you have added the VirtualBox host. If you add multiple hosts to a desktop provider, Oracle VDI load balances them. As you only want to add a single host, select **Select Existing Hosts** and click **Next**.

**Fig. 5.14 Select Existing Hosts**

On the **Specify New Storage** step, enter the details of the storage that is used to store the virtual disks of the desktops. As Oracle VDI supports several different types of storage, the details you enter depend on the storage type selected. As you will be using a local file system for storage, select **Local Storage** from the **Storage Type** drop-down list. Enter the path to where you want to store the virtual disks in the **Path** field.

**Fig. 5.15 Specify New Storage**
Click **Next**. A desktop provider can only have one local storage and local storage cannot be mixed with any of the other supported storage types. For this reason, you cannot add any more storage to the desktop provider. Other storage types can be mixed and can have multiple storage hosts. If you add multiple storage hosts, Oracle VDI load balances the storage hosts. The Define Desktop Provider step is displayed. Enter a name for the desktop provider in the **Name** field, as shown in Figure 5.6. The name can be anything you like, for example, the location of your VirtualBox hosts.

![Fig. 5.16 Define Desktop Provider](image)

Click **Next**. On the Review step, check your configuration and then click **Finish** to create the desktop provider. The wizard is closed, a message is displayed on the All Desktop Providers page to confirm that the desktop provider has been created, and the new desktop provider is now listed in the Desktop Providers table.

![Fig. 5.17 Desktop Provider Added](image)

The All Desktop Providers page provides a management overview of the desktop provider, its overall status, the number of desktops, the CPU and memory load, and the storage usage. You can change the configuration of the desktop provider at any time. In the Desktop Providers table, click the desktop provider name in the **Name** column. The **Summary** tab is displayed.
Work step 7: Working with VirtualBox Virtual Machine

7.1 Using an Existing VirtualBox Virtual Machine

a) Start the virtual machine.

b) Install the VirtualBox guest additions Make sure the version of the Guest Additions you install matches the VirtualBox version you installed.

c) Configure the virtual machine operating system.

d) Shut down the virtual machine.

e) Copy the virtual machine settings file and disk image to the `/var/tmp` directory on your Oracle VDI host.

7.2 Importing an Existing Virtual Machine into VirtualBox
In the File menu, select Import Appliance. The Appliance Import wizard is displayed in a new window,
Click Choose, browse to the location containing the *.ovf or *.ova file of the virtual machine you want to import, and click Open. The Appliance Import Settings step is displayed.
Make any adjustments you want to the displayed settings (you can also change the settings later) and click **Import**. The Appliance Import Wizard is closed and after a few moments, the imported virtual machine is listed in Oracle VM VirtualBox Manager.

After the import, select the imported virtual machine and in the toolbar click the **Settings** button. Review the virtual machine settings to make sure that the virtual machine has the hardware it needs to operate. Make sure that the virtual machine has a CD/DVD drive.

Once you have reviewed the settings, select the imported virtual machine and in the toolbar click the **Start** button. Verify that the virtual machine works.

Next, you need to install the VirtualBox Guest Additions.

### 7.3 Creating a New Virtual Machine in VirtualBox

To create a new virtual machine, you need to start VirtualBox. On the host where you installed Oracle VDI and VirtualBox, select the **Applications** menu on the desktop, then the **System Tools** menu, and then **Oracle VM VirtualBox**. Alternatively, you can run the VirtualBox command in a terminal. The Oracle VM VirtualBox Manager is displayed.

![Oracle VM VirtualBox Manager](image)

**Fig. 5.22 Oracle VM VirtualBox Manager**
In the toolbar, click the **New** button. The Create Virtual Machine wizard is displayed in a new window. The wizard enables you to configure the basic details of the virtual machine. Enter a descriptive name for the virtual machine in the **Name** field and select the operating system and version that you are going to install from the drop-down lists. It is important to select the correct operating system and version as this determines the default settings VirtualBox uses for the virtual machine. You can change the settings later after you have created the virtual machine.

![Create Virtual Machine Wizard](image)

**Fig. 5.23 VM Name and OS Type**

Click the **Next** button to move though the various steps of the wizard. On the Memory Size step, you can simply accept the default. This is the amount of host memory (RAM) that VirtualBox assigns to the virtual machine when it runs. You can change the settings of the virtual machine later, when you import the template into Oracle VDI.

On the Hard Drive step, ensure **Create a virtual hard drive now**, and click **Next**.
On the following steps, select VDI (VirtualBox Disk Image) as the hard drive file type, Dynamically allocated as the physical storage type, and accept the defaults for the virtual disk file location and size, and then click Create to create the virtual machine. The wizard is closed and the newly-created virtual machine is listed in Oracle VM VirtualBox Manager.
Since you want to install an operating system in the virtual machine, you need to make sure the virtual machine can access the installation media. To do this, you edit the virtual machine settings. In Oracle VM VirtualBox Manager, select the virtual machine and then click the Settings button in the toolbar. The Settings window is displayed. In the navigation on the left, select Storage.
In the Storage Tree section, select **Empty** below the IDE Controller. The CD/DVD Drive attributes are displayed. Click the CD/DVD icon next to the **CD/DVD Drive** drop-down list and select the location of the installation media, as follows:

- To connect the virtual CD/DVD drive to the host's physical CD/DVD drive, select **Host Drive** drive-name.
- To insert an ISO image in the virtual CD/DVD drive, select **Choose a virtual CD/DVD disk file** and browse for the ISO image.
Click **OK** to apply the storage settings. The Settings window is closed. If you connected the virtual machine's CD/DVD drive to the host's physical CD/DVD drive, insert the installation media in the host's CD/DVD drive now. You are now ready to start the virtual machine and install the operating system.

In Oracle VM VirtualBox Manager, select the virtual machine and click the **Start** button in the toolbar. A new window is displayed, which shows the virtual machine booting up. Depending on the operating system and the configuration of the virtual machine, VirtualBox might display some warnings first. It is safe to ignore these warnings. The virtual machine should boot from the installation media.
Fig. 5.28 An Installation Program in a Running Virtual Machine

You can now perform all your normal steps for installing the operating system. Be sure to make a note of the user name and password of the administrator user account you create in the virtual machine, which you will need in order to log in to the virtual machine. Do not join the virtual machine to a Windows domain (it can be a member of a workgroup) as the domain configuration is performed later. The virtual machine might reboot several times during the installation. When the installation is complete, you might also want to let Windows Update install any software updates.

7.4 Installing the VirtualBox Guest Additions

The VirtualBox Guest Additions consist of device drivers and system applications that optimize the operating system for better performance and usability. One of the usability features required in this guide is automated logons, which is why you need to install the Guest Additions in the virtual machine. For a Windows 7 desktop template, you also enable Windows media redirection for enhanced playback of multimedia content played in Windows Media Player (including content displayed in Internet Explorer).
In the Window containing the running virtual machine, select **Install Guest Additions** from the **Devices** menu.

> ![Install Guest Additions Menu](image)

**Fig. 5.29 Install Guest Additions Menu**

When the AutoPlay window is displayed (prompting you to run the `VBoxWindowsAdditions.exe` program), close the window **without installing the Guest Additions**. Closing the window leaves the ISO image used to install the Guest Additions inserted in the virtual CD/DVD drive. You need to install the VirtualBox Guest Additions from the command line to get all the features we need.

> ![AutoPlay Window](image)

**Fig. 30 AutoPlay Window**

In the virtual machine, on the Windows Start menu, type **run** in the search field and press Return. The Run dialog is displayed. Enter `D:\VBoxWindowsAdditions.exe /with_autologon /with_vboxmmr` in the **Open** field, and press the Return key. If you are preparing a Windows XP desktop template, you can omit the `/with_vboxmmr` command line switch.
When you are prompted, click **Yes** to install the Guest Additions. The VirtualBox Guest Additions Setup wizard is displayed in a new window.

Click the **Next** button to move through the various steps of the wizard. Accept all the default settings and then click **Install** to install the Guest Additions. If a Windows Security dialog is displayed that prompts you to install device software, click **Install**.
When the Guest Additions installation is complete, ensure **Reboot now** is selected (see Figure 6.16) and click **Finish**.

---

**Fig. 5.33 Windows Security Dialog**

**Fig. 5.34 Reboot Step After Installing the Guest Additions**
The VirtualBox Guest Additions Setup wizard closes and the virtual machine is rebooted. When the virtual machine reboots, log in.

7.5 Additional Virtual Machine Preparation

In order to make automated logons work and to join the computer to a domain, you need to enable the built-in Administrator account and disable the Windows Secure Authentication Sequence (Ctrl+Alt+Del). To do this, you have to edit the local security policies in the virtual machine.

In the Windows Start menu, enter run in the search field and press the Return key. The Run dialog is displayed. Enter Local Security Policy in the Open field. The Local Security Policy window is displayed. Select Local Policies and then Security Options. Find the Accounts: Administrator account status policy. Double-click the policy, select Enabled, click Apply, and then click OK. Check that the policy is shown as enabled in the Security Setting column.
Next find the **Interactive logon: Do not require CTRL + ALT + DEL** policy. Double-click the policy, select **Enabled**, click **Apply**, and then click **OK**. Check that the policy is shown as enabled in the **Security Setting** column.

![Local Security Policy](image)

**Fig. 5.37 Secure Authentication Sequence Policy**

Close the Local Security Policy window. Now you need to create a password for the built-in Administrator account. Start the Windows Control Panel, select **User Accounts**, select the Administrator user, and set a password. Verify that the Administrator account works by logging out of Windows, and then log in again as the Administrator user.

Once you have logged in as the Administrator user, the next step is usually to install any software that users need, and the device drivers for any special devices that users will be using, such as USB printers or storage devices.

The default VirtualBox hardware configuration for a Windows virtual machine uses devices that have drivers that are included with Microsoft Windows by default. Oracle VDI release 3.5 includes support for smart cards in Windows desktops when using VirtualBox. VirtualBox does this by emulating a USB smart card device. However, the drivers for the device are not included with Windows. You should download the drivers for this device and install them. You can download the drivers from:


On the download page, select the SCR335 device and the required operating system, browse for the SCR3xxx PC/SC Installer, and then download the **SCR3xxx_Win_drivers_only_installer_V<version>.zip** file.

If you are using preparing a Windows 7 or later template, Windows might be able to install the required drivers automatically using Windows Update when it detects the device.

The virtual machine is now ready to be used as a template for creating desktops.

**Work step 8: Creating the Desktops**

In Oracle VDI, desktops are organized into pools so that desktops with similar characteristics can be grouped and for ease of management. In this chapter, you create a pool. After creating the pool, you import a virtual machine so that it can be used as a template for cloning and then you enable cloning so
that the pool is filled with desktops. Finally, you assign users to the pool so that they can access the desktops.

8.1 Creating a Pool

In Oracle VDI Manager, in the navigation tree on the left, select **Pools**, and then select the company you created. Pools are always linked to a company, so that users from different companies can only access the desktops that they are authorized to access. The Company Pools page is displayed.

![Company Pools Page](image)

**Fig. 5.38 Company Pools Page**

In the **Pools** table, click the **New** button. The **New Pool** wizard is displayed in a new window. Click the **Next** button to move though the various steps of the wizard. On the Select Pool Type step, select the desktop provider you created from the **Desktop Provider** drop-down list and then select **Dynamic Pool** as the **Pool Type**.

![Select pool Type](image)

**Fig. 5.39 Select pool Type**

The **Desktop Provider** setting links the pool to the virtualization resources you want to use to run the desktops. The **Pool Type** settings are a group of predefined configuration settings that make it easier for you to create the type of pool you want. You can change any of the configuration settings later. The key decisions about a pool are:

- **Desktop fulfillment**: Whether individual desktops are added to the pool manually, or whether desktops are automatically added in bulk by cloning a template.

- **Desktop type**: Whether desktops are manually assigned to individual users before they log in (personal desktops), or whether desktops are automatically assigned to users only when they log in
(flexible desktops). Flexible desktops can be re-used or deleted once a user logs out. Personal desktops are never re-used.

The simplest option for administration and for testing purposes is the **Dynamic Pool** option. With this option, a template is cloned to fill the pool with desktops and the desktops are automatically assigned to users.

On the Select Template step, ensure *(None)* is selected from the **Template** drop-down list and that *none* is selected in the **System Preparation** drop-down list. If you were already using a template in another pool, this step in the wizard enables you to select that template. You configure the template and system preparation settings later, when you configure cloning for the pool.

![Fig. 5.40 Select Template](image)

On the Select Pool Size step, leave the **Preferred Size** setting as the default and ensure that the **Enable Automatic Cloning** option is not selected. You configure these settings later, when you configure cloning for the pool.

![Fig. 5.41 Select Pool Size](image)

On the Define Pool step, enter a name for the pool in the **Name** field. The name can be anything you like, for example it could contain the name of the operating system or the name of the department that will use the desktops.
On the Review Step, click **Finish** to create the pool. The wizard is closed, a message is displayed on the Company Pools page to confirm that the pool has been created, and the new pool is now listed in the Pools table.

The Company Pools page provides an overview of each pool, how many desktops it contains and how the desktops are assigned to users.

8.2 Importing a Template into a Pool

You need to add your template to the pool so that it can be used to clone desktops.

In the Company Pools table, click the pool name in the **Name** column. The **Summary** tab is displayed. Click the **Template** tab. The Pool Templates page is displayed.
In the Templates table, click the **Import Template** button. The Import Template window is displayed. On the **Folder** tab, you can import a template from the `/var/tmp` directory on this host, or from an NFS share either on this host or on another host. On the **Hypervisor** tab, you can import the template directly from a VirtualBox installation on this host or another host.

If you copied a virtual machine settings file and disk image to the `/var/tmp` directory, click the **Select Folder** button and, if not automatically loaded, select the settings file and disk image from the drop-down lists. Make sure the **Delete original desktop after successful import** option is *not selected*.

![Fig. 5.45 Import Template From Folder](image)

If you followed the steps in Chapter 6 for importing an existing virtual machine into VirtualBox or for creating a new template in VirtualBox, click the **Hypervisor** tab. Select the template from the list of desktops for this host, and then make sure the **Delete original desktop after successful import** option is *not selected*. Figure 7.9 shows an example.

![Fig. 5.46 Import Template From Hypervisor](image)

Click **OK** to start importing the template. The Import Template window is closed, and a message is displayed on the **Template** tab to say that the template is being imported.
Many of the actions that you perform in Oracle VDI result in jobs that run in the background. While the jobs are in progress, you can continue to perform other actions. Importing a template is one action that results in a job. In the top right-hand corner of Oracle VDI Manager, select **Jobs Running**. The Jobs Summary window is displayed.

The Jobs Summary window shows detailed information about the progress and status of each job. Some jobs can also be canceled. Close the Jobs Summary window.

Once the import template job is completed, the template is listed in the Templates table on the **Template** tab. If you click the arrowhead next to the template name in the **Name** column, you will notice that Revision 1 of the template has been created automatically and that this revision is marked as the master revision.
Fig. 5.49 Template and Revision

When you use cloning, the desktops are created from the revision. A revision is simply a save point that records the exact state of a virtual machine. You can make changes to the template at any time, for example to install new software and test that it works as expected. Once you are happy with the changes, you create a new revision and mark it as the master (using the buttons on the Template tab) so that the new revision is used to clone new desktops. Later if you discover problems with the revision, you can simply go back to an earlier revision by marking the earlier revision as the master.

You can also make changes to the template from within Oracle VDI Manager. To do this, select the template (not the revision) and click the Open Console button. The Console page is displayed and from here you can start, stop, and connect to the virtual machine in much the same way as you did in Oracle VM VirtualBox Manager.
8.3 Setting Up Cloning

You need to set up cloning so that the pool can be automatically filled with the required number of desktops. As part of this you also perform the configuration to enable the cloned desktops to join a Windows domain.

Click the Cloning tab for the pool.
In the Automatic Cloning group, select **Enable Automatic Cloning** and, if you want, change the name in the **Name Pattern**. The name pattern is used to generate the name of the cloned virtual machine. This is also the name of the computer that is registered in the Windows domain.

In the Pool Metrics group, you configure the number of desktops in the pool, as follows:

- **Preferred Size**: The number of desktops the pool normally has. Set this to 2.
- **Maximum Size**: The maximum number of desktops in the pool. Set this to 3.
- **Free Desktops** and **Production Priority**: Leave these settings at the default.

In the Desktop Cloning group, select the template you imported into the pool from the **Template** dropdown list. The template you select does not have to be a template in the pool, it could be a template in another pool for the same company.

In order to deploy desktops that are cloned from a template, some kind of system preparation is required. You can use the Microsoft Windows System Preparation tool (known as SysPrep) or Oracle VDI Fast Preparation (known as FastPrep). SysPrep requires additional preparation in the template, which includes installing the Windows Deployment tools in the template and running the sysprep program to remove the unique information (such as the computer name) from the template. FastPrep is faster than SysPrep because it does not require this additional preparation, and it simply updates the computer name.
Cloned Desktops group, click **Create** next to **System Preparation**. The Create System Preparation File window is displayed.

In the System Preparation drop-down list, select **Oracle VDI Fast Preparation** making sure that you select the option that matches the operating system of your template. In the remaining fields, enter the required details as follows:

- **Windows Domain**: The fully-qualified domain name of the Windows domain that the desktops will join.

- **Domain Administrator** and **Domain Administrator Password**: The credentials of a domain administrator with permission to create a computer account and join the domain. You can prefix the administrator name with the domain, for example my.domain.com\Administrator.

- **Computer Container DN**: The distinguished name of the container that Active Directory uses for computers. You can leave this field blank if the default container ou=Computers is used.

- **Read-only Domain Controller**: Only select this option if the domain controllers (Windows Server 2008 and later) are configured as read-only.

- **Desktop Administrator** and **Desktop Administrator Password**: The credentials of the administrator account in the template. These credentials are used to change the computer name, join a domain, and optionally execute the custom script. For Windows 7 and later, this must be the built-in Administrator account.

- **Custom Script**: Leave this field blank. You can use this field to specify a script that runs after FastPrep is complete.

![Create System Preparation File](image)

**Fig. 5.54 FastPrep Configuration**

Click **OK** to complete the FastPrep specification. The Create System Preparation File window is closed. A message is displayed to say that the system preparation file has been successfully added.

In the Desktop Cloning group, you can use the **Machine State** to specify the state you want the desktop virtual machines to be in immediately after they are cloned. Select **Running** from the drop-down list. If the virtual machines are powered off (the default), the desktops do not consume any system CPU and memory resources. You can use the **Available Running Desktops** setting to specify the number of running desktops that Oracle VDI keeps running for when users log in. If you provide running desktops, users are able to log in and start working quickly because they do not have to wait for the virtual machine to boot.
The settings in the Desktop Recycling group control what happens to the desktops when they are no longer in use. When a desktop is no longer in use, it is automatically recycled by Oracle VDI. What happens to the recycled desktop is controlled by the **Policy** setting, as follows:

- **Reset to Snapshot**: The desktop is powered off and then reset to the snapshot that was taken just after the desktop was cloned (this is the default).
- **Reuse Desktop**: The desktop is reused and remains in its existing state.
- **Delete Desktop**: The desktop is deleted and, if this means the pool does not have the required number of desktops, a fresh desktop is cloned from the template.

A desktop is recycled, when it remains unused for the period of time configured in the **Idle Timeout** field. You see desktop recycling in action. To make recycling happen quickly, change the **Idle Timeout** to 3 minutes.

Click **Save**. A message is displayed to confirm that the settings have been applied, and after a few moments, the Jobs Running indicator in the top right hand corner should show that there are some jobs running.
In the top right-hand corner of Oracle VDI Manager, select **Jobs Running**. The Jobs Summary window is displayed. You should see that the jobs that are currently running are the desktops being cloned in the pool.

Close the Jobs Summary window. Click the **Desktop** tab. As the desktops are cloned, they are listed in the Desktops table. Initially the Desktop State column shows the desktops as Reserved. This indicates that Oracle VDI is working on the desktop, in this case, probably running the Oracle VDI fast preparation. The virtual machine state might change depending on the virtual machine state you selected on the Cloning tab. Eventually the Desktop State column shows that the cloned desktops are Available.

The Available state means that the desktops are ready to be used.

**8.4 Assigning Users to Desktops**

You need to assign users to the pool so that they can access the desktops in the pool.

Click the **User Assignment** tab for the pool.
To assign users to the pool, click the Add button in the Assigned Users and Groups table. The Assign Pool window is displayed.

Oracle VDI enables you to assign users to a pool in several ways. The best option for administration is to search a user directory for users and groups. Assigning groups in the user directory to the pool is the most efficient, as this indirectly assigns the members of the group to the pool. Whenever the group membership changes, the users that can access the desktops are automatically updated.

To search the user directory, select **User or Group**, enter the user or group you want to search for in **Search Users and Groups** field, and then click **Search**. The search has the * wildcard built in and is not case sensitive. The search results are returned and listed in a table. The results are limited to the first 100 matches.
Fig. 5.62 Searching for a User

However, for the purposes of this guide, the easiest option is to use the built-in custom group which enables any user in the user directory to access a desktop in the pool. To do this, select **Custom Group** and then select the box next to the Any User group.

Fig. 5.63 Any User Assignment

Click OK. The Assign Pool window is closed. A message is displayed that confirms the assignment has been added.

Fig. 5.64 User Assignment Added

Another option for assigning users to a pool is to use the smart card functionality of the Sun Ray environment. Oracle VDI refers to smart cards as tokens. If you assign tokens to a pool, users can use a Sun Ray Client to automatically authenticate themselves to Oracle VDI and access their desktops.

In Oracle VDI Manager, you can also assign individual desktops to individual users on the **Desktop** tab for the pool. However, this converts the desktop from a flexible desktop (available for use by any user) to a personal desktop (only available for use by that user). It is best to use flexible desktops as much as possible as this simplifies desktop administration because most of the processing takes place automatically and in bulk. Personal desktops can only be administered manually and individually.

Now that you have assigned users to the pool, the next step is to log in and access a desktop.

**Work step 9:** Connecting to a Desktop
Now that the pool has been filled with desktops, you can log in to Oracle VDI and connect to a desktop. For this you need to start Oracle Virtual Desktop Client. On the Connect Virtual Desktop Client screen, enter the fully qualified DNS name of your Oracle VDI host in the **Server** field and click **Connect**.

After a few moments, the Oracle VDI Desktop Login screen is displayed. Enter the Active Directory or LDAP user name and password of a user in the user directory, and a domain name, and then click **Log In**.

Fig. 5.65 Oracle VDI Desktop Login Screen

After a few moments, your windows desktop should display and you should be automatically logged in to Windows. You might see a message in the Windows desktop that says your desktop is being prepared before the actual desktop is displayed. You can now use the desktop just like a regular computer.

If the user name you used had been assigned to more than one desktop or pool, the Desktop Selector screen is displayed after you log in to Oracle VDI. The Desktop Selector screen enables you to choose the desktop you want to use. If you configure support for multiple monitors, you can also connect to multiple desktops simultaneously.
In the desktop, go to the Windows Control Panel, select **System and Security**, and **System**. Check the System information for the desktop. It should show that the computer is joined to the domain, and that the computer name is the name of the desktop in the pool. Check the name of the user in the Windows Start Menu. It should show the correct user name.
**Work step 10:** Managing Desktop

When you configure pools to use cloning to produce flexible desktops, Oracle VDI automatically manages the desktops in the pool for you. It is worthwhile taking the time to watch the life cycle of a desktop so that you understand the administration benefits of this approach.

While you are still logged in to your desktop, click the **Desktop** tab for the pool in Oracle VDI Manager. In the Desktop State column of the Desktops table, notice that the state of one of the desktops is now shown as used and the name of the user that using the desktop is also displayed.
Now go back to your desktop and log out of Windows, using the normal Windows method for logging out. After you are logged out of Windows, you should be automatically logged out of Oracle VDI. In Oracle VDI Manager, go to the **Desktop** tab for the pool. After a few moments, the desktop state changes to Idle but the user is still assigned the desktop.

Although a user is assigned to the desktop, the assignment is temporary and the desktop is still a flexible desktop. If the user logs in again during the idle timeout period, they reconnect to the same desktop. Once the desktop has remained in the Idle state for the idle timeout period, the user assignment is removed and the desktop is recycled. The desktop state is changed to Available and the desktop can then be used by any user assigned to the pool.
On the Desktop tab, you can also perform manual actions on individual desktops. Select a desktop in the Desktop table and then click the More Actions drop-down list.

Select a desktop in the Available state, and then select the Delete Desktop action. After a few moments a new cloning job should start, because cloning is still enabled for the pool and the number of desktops in the pool is less than the pool's configured preferred size.

In the Desktops table, click the name of a desktop in the Name column. The Desktop Summary page is displayed.
Fig. 5.72 Desktop Summary Page

Here we can see detailed information about the desktop and the virtual machine. We can also change the configuration of the virtual machine and even connect to it.

We have seen how to perform all the configuration needed for Oracle VDI solution by using a single-host Oracle VDI deployment. The host can perform all the functions required to deliver virtual desktops to users, including cloning and storing the virtual desktops, as well as managing the connections to those desktops. Users can connect to their desktops using different Sun Ray Clients, including Oracle Virtual Desktop Client for iPad and Android, and they can move between Sun Ray Clients (hotdesk) and reconnect to their desktop.

This above single-host configuration demonstrated is only for evaluation deployments. The Oracle production deployment a minimum of two hosts configured in this way and joined together to form an Oracle VDI Center is required. It is also possible to use separate hosts for Oracle VDI, the virtualization platform, and the storage, so that a single Oracle VDI Center can host many thousands of desktops.
6. Solution to Virtual Desktop Infrastructure from Cloud Services Providers

Many cloud providers have provided cloud solution for Virtual Desktop Infrastructure. The VDI cloud based solution has good benefits for Virtual Desktop Infrastructure. We will introduce some successful VDI cloud providers that included Amazon WorkSpace (AWS), Microsoft Azure, Tunkey Desk, dinCloud, Apps4rent, Unidesk and so on.

We also can create and build the VDI Cloud solution yourself. Citrix has provided creating Cloud services. They can help you to build public and private clouds. According to your current situation, you can use the servers that you have to create hybrid cloud. EMC also has cloud service to build the cloud with VMware virtual computers’ applications. Citrix has cloud product to support deliver every application workload. Microsoft Azure is software for cloud based with virtual computers. Under the limited budget we also can build solutions for Cloud VDI.

6.1 Cloud VDI solution from Amazon WorkSpace (AWS)

Amazon WorkSpaces is a managed desktop computing service in the cloud. This is service that called Desktop as a Service (DaaS). The DaaS is a little different with traditional virtual desktop infrastructure (VDI). The main different is that all user data files will be saved in cloud computing. The users will not be worry about the client hardware and software maintenance. Amazon WorkSpaces allows users to easily provision cloud-based desktops that allow end-users to access the documents, applications and resources they need with the device of their choice, including laptops, iPad, Kindle Fire, Android tablets, and zero clients.

In the AWS Management Console, users can provision a high-quality cloud desktop experience for any number of users at a cost that is highly competitive with traditional desktops and half the cost of most virtual desktop infrastructure (VDI) solutions.

The Cloud VDI solution from Amazon WorkSpace have many befits:

- Simple to Use: The users can be easy to manage cloud-based desktop, and don’t have to worry about hardware and software maintenance. There is no complex usages.
- Support Multiple Devices: The users can used PC, Mac and Mobile device to access the desktop in the cloud computing.
- Keep Your Data Secure and Available: The users manage their data is stored on multiple client devices, helping users keep the data secure.
- Choose the Hardware and Software users need: The users can choose different CPU, Memory and storage that AWS provided. AWS offers preinstalled applications or users can bring their own licensed software.
- Active Directory Integration: lets users integrate with the organization’s Active Directory so that the users can continue to use their existing credentials to access their organization’s resources.

The Cloud VDI solution from Amazon WorkSpace has applied and used in many fields that included Mobile Device Access, Secure, Remote in different locations, terminate users, students’ training and Developers.
Virtual Desktop infrastructure (VDI) solutions by Cloud Computer Technology

Fig. 6.1 Using Virtual desktops in the Cloud Computing

Amazon WorkSpaces have provided 12 months of access to the AWS Free Tier that included Amazon EC2: 750 hrs/month of Windows and Linux t2, micro instance usage, Amazon S3: 5GB of storage, Amazon RDS: 750 hrs/month of Micro DB Instance usage, and Amazon DynamoDB: 25 GB of storage, up to 200 million requests/month. The users can be free to try using virtual desktop from AWS.
6.2 Cloud VDI Solutions from Microsoft Azure

Microsoft Azure is Microsoft's application platform for the public cloud. Microsoft Azure has created a good Cloud VDI solution. The basic services include the components of Azure, Management Portal, computer, Data Management, network, and Develop Services. The additional services are Identity and Access, Mobile, Backup, Messaging and Integration, Compute Assistance Performance, Big Compute and Data, Media, and Commerce Getting Started.

The compute is one important of the basic service in Microsoft Azure. The Compute service consists of three options as follows:

- **Virtual Machines** gives you control over your own virtual machine, including the operating system.
- **Websites** offers a range of applications, frameworks, and templates for you to build large, scalable web applications and presence websites quickly, and then efficiently manage development, test, and operations.
- **Cloud Services** is a platform-as-a-service (PaaS) option tuned to create highly scalable and fault resistant applications, but with more flexibility than Websites.

**Azure Virtual Machines** gives us full control over virtual machine instances in the cloud. The user can create virtual desktop with VDH. Azure offers a gallery of stock VHDs (called “images”) that contain a bootable operating system. The Virtual Machines are stored in Azure Storage blobs. The application can be run within one or more Virtual Machines.

**Azure Websites** runs a website application in the cloud without having to manage the underlying web server. The users can run websites and web applications. This computer model offers a managed web environment. The developer can create websites and web applications in the public cloud.

**Azure Cloud Services** provides a place to run highly scalable custom code on a Platform as a Service (PaaS) environment. The users can build a cloud application without much administration, and support Desktop as a Service (DaaS).
Fig. 6.2 Azure provides Internet-accessible application services running in Azure datacenters.

6.3 Cloud VDI Solution from Tunkey Desk

Tunkey Desk has provided Cloud –Hosted Virtual Desktops. The Tunkey Desk platform is versatile, accessible, reliable, secure and cost effective.
The users can any Internet connected devices, PC, Mac, Thin Clients, Tablets, Smartphones, iPad and iPhones. The applications of virtual desktop included Microsoft Office, Exchange, QuickBooks, and virtually any software. The SSAE-16 Certified, SOX & HIPAA Compliant, Automated backups have been applied to the Security, Data Protection & Policy Controls.

![Desktop Cloud](image)

**Fig. 6.3** TurnKey Desk Cloud-Hosted Virtual Desktop

The benefits of TurnKey Desk VDI solution included low cost, Mobility and Universal Accessibility, Integrate the Entire Office Network, Simple to Use, Security and Policy Controls, Automated Backups and Data Protection, Compliance and Policy Controls, Centralized Management, Flexibility, Training and Quality Control and Virtual Desktops are Green-Friendly.

**6.4 Cloud VDI solution from dinCloud**

dinCloud has become the number 1 brand is hosted virtual desktops from their Research and Development days in 2012. dinCloud has just won the “Best VDI Solution Award” at the 2012 UP-START Cloud Awards, which recognizes extraordinary achievements in the cloud computing industry.

Hosted Virtual Desktops (HVDs) from dinCloud offer several benefits. These include cost savings and an increase in control, security, agility and productivity.

dinCloud spent over 18 months developing and perfecting the hosted virtual desktop technology to satisfy users’ requirements.
6.5 Cloud VDI Solution from Apps4rent

Apps4rent has provided Citrix Virtual Desktop and Microsoft VDI services, and help you moving your desktop to the cloud. The benefits of Apps4rent VDI solution will be included as follows:

- Great experience even in low bandwidth situations
- Access to desktop from virtually anywhere and on multiple devices
- Extended access to critical business apps
- Enhanced business continuity and security features
- Savings of both time and money
Fig. 6.5 Moving your desktop to the cloud from Apps4rent

The Free Applications available with all Apps4Rent Virtual Desktop plans as follows:

- **Browsers:** Internet Explorer, Firefox, Google Chrome.
- **Media Players:** Windows Media Player, VLC Player.
- **Messengers:** Skype, Live (MSN) Messenger, Yahoo Messenger, AOL Messenger.
- **Utilities:** Acrobat Reader, PDF Creator, FileZilla (FTP), Remote Desktop Connection, Windows Live Mail, MS Paint, WordPad, Calculator, Notepad, Notes Gadget, 7-Zip (Zip and RAR), Windows Search for User Documents
- **Open Office (OpenOffice.org):** Writer (word processor), Calc (spreadsheet), Impress (presentations), Draw (illustrations), Base (database) and Math (math equations).
- **Microsoft Office Standard 2013 (Office.Microsoft.com/standard):** Word, Excel, PowerPoint, Outlook with Business Contact Manager, OneNote, Publisher.
- **Microsoft Office Professional 2013 (Office.Microsoft.com/professional):** Word, Excel, PowerPoint, Outlook, OneNote, Publisher, Access, Lync.
- **Shared space for users is available for accounts with multiple Hosted Desktops/VDI.**

The benefit of Cloud VDI Solution from Apps4rent also included Virtual Desktop Maximizes Flexibility, Virtual Desktop Maximizes Profits, Virtual Desktop Maximizes Reliability, Virtual Desktop Maximizes and Productivity.

6.6 Cloud VDI Solution from Unidesk

Unidesk provides the management of Windows desktops and applications in the cloud, plus acclaimed support to help you master VDI. Unidesk has applied Microsoft Hyper-V, VMware Horizon View and VSphere and Citrix XenDesktop to Cloud VDI solution.
Fig. 6.6 Management of Windows desktops and applications in the cloud from Unidesk

Unidesk includes everything you need to provision, patch, and manage virtual desktops, plus acclaimed support to help you master VDI.

The price for virtual desktop is reasonable. For sample, the total cost for 100 desktops will be $19,600.00 with three years maintenance.

Their customers included Santa Barbara City College, Tennessee Tech University, California Dept. of Water Resources, Mercer University, Tulare County, California, Fresno County Office of Education, University of Wisconsin Oshkosh, Hartnell College, University of South Carolina, University of Maryland and so on.

There are many providers offer good solutions for Virtual Desktop Infrastructure. Here we can't list each Cloud VDI providers, but many common benefits of Cloud VDI Solution are same. We can choose the best Cloud VDI provider that will be satisfied your demands and requirements for your Virtual Desktop Infrastructure.

Conclusion

The solution about Virtual Desktop Infrastructure is a very important development topic in IT virtual computers field. At normal the virtual computers will be included virtual servers and virtual desktops. VMware, Microsoft, Citrix, and Oracle have provided successful solutions for Virtual Desktop Infrastructure by software. Due to limited budget, we can begin to use Cloud VDI solutions from providers to obtain the benefits of the VDI solution to replace with physical desktops.