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Abstract

The goal of this integration note is to describe Citrix XenDesktop technology, architecture, and implementation on ProLiant servers. The audience is both internal and external customers.

What is Citrix XenDesktop?

In a traditional PC workstation environment, users have a virtually unlimited ability to install or remove software. IT departments often use products, such as terminal servers, that provide a stable but locked down desktop environment to the user.

Desktop virtualization involves server-based computing that gives system administrators the ability to centrally manage and host desktop virtual machines in the data center while giving end users a full PC desktop experience. Desktop virtualization provides many of the advantages of a terminal server, but can provide users added flexibility, such as the ability to install and configure applications, as well as the ability to access virtual desktops from other locations. Virtual desktops are dynamically assembled on demand, providing users with new, personalized desktops each time they log on, as well as high-speed network responsiveness.

Citrix XenDesktop allows both medium and large businesses to take advantage of the benefits and cost savings of virtualization. XenDesktop delivers Microsoft Windows XP or Vista virtual desktops to users on a wide variety of endpoints, which are devices such as thin clients that provide users with a desktop computing environment.

On the desktop side, XenDesktop integrates with Citrix XenServer to provide desktop virtualization, which enables many Windows-based desktop operating systems (such as Windows XP or Vista) to be centrally hosted in the data center and delivered to users anywhere. HP provides an integrated version of the Citrix XenServer hypervisor (virtualization layer) for HP ProLiant servers. XenServer can be used as a stand-alone virtual machine server or upgraded and combined with other ProLiant servers running the HP integrated Citrix XenServer to create pools of servers sharing storage and enabling live migration of virtual machines between servers. On the server side, XenServer provides server virtualization, enabling one hardware device to host multiple server operating systems (such as Windows Server 2003) to provide better server utilization and data center consolidation.

Virtual Desktops

Virtual desktops are desktop operating systems (for example, Windows XP) running on a virtual machine (VM) that, in turn, runs on XenServer (Figure 1). The XenDesktop solution also uses virtual desktop agents, software running in a virtual machine (VM) that enables the operating system to make its desktop available to another computer (or endpoint device). The agents communicate with XenDesktop and control the start/stop of the virtual desktops as defined for the idle pool (the group of available virtual desktops). When a user logs out, XenDesktop communicates directly with the XenServer and requests that the agent restart the virtual machine so the virtual desktop will be available for a new user.
Although desktops are virtual and actually running on remote servers, the user experience is equivalent to that of a local Windows desktop. From a user’s perspective, logging on to a virtual desktop is the same as logging on to a local one. Using Microsoft Active Directory allows users to enter their credentials once and be connected to their desktops.

As shown in Figure 2, XenDesktop dynamically assembles virtual desktops, enabled through the separation of the operating system, applications, and user settings, thereby simplifying endpoint management. XenDesktop also allows administrators to manage virtual desktop connections and assign users to dedicated or pooled virtual desktops. Using endpoints that support XenDesktop, such as thin clients, eliminates the need for local hard drives and allows the bulk of the processing to occur in the data center. Along with server and data center consolidation, this can lead to higher utilization, and greater consolidation and centralization, resulting in increased security, more efficient computing, reduced power consumption, and lower cooling costs.
Why use the HP integrated XenServer?

A side effect of virtual machine software such as Citrix XenServer is that it hides unique ProLiant features and impedes full platform management. Affected HP technologies include iLO Advanced Pack, OEM versions of Microsoft Windows Server products, Remote Graphics Software (RGS) for virtual desktop applications (VDI), and HP Systems Insight Manager (HP SIM) software. Therefore, HP developed the HP ProLiant Virtual Console (PVC) solution to expose ProLiant features in a virtualized environment. This solution models the virtual platform as an extension of the physical platform, allowing ProLiant customers to easily deploy and manage a virtual server the same way they deploy and manage a physical server.

HP ProLiant Virtual Console

The HP/Citrix XenDesktop product combines HP-integrated Citrix XenServer with Citrix XenDesktop to develop a unique XenDesktop solution that is simpler to deploy and manage. The HP/Citrix XenDesktop product uses HP PVC to remove the complexity from virtualization installations and provide management capabilities unique to HP (Figure 3).
HP PVC greatly simplifies single-server virtual machine management, either remotely using HP iLO, or using one of PVC’s unique features – Virtual KVM (Keyboard, Video, and Mouse). Using the server’s local KVM, HP PVC provides the same graphical interface to set up and manage virtual machines that is used to set up and manage individual physical servers. This reduces the need for a separate management server or even a network. HP PVC is included as a standard feature and is only available in the HP editions of XenServer.

The HP PVC management tool is included as part of the HP-integrated Citrix XenServer and is designed to allow management of virtual machines and a single physical ProLiant server. While HP PVC can be used to manage individual servers, Citrix XenCenter is a stand-alone application that can be used to manage an expanded pool of servers and resources (see page 7). HP has worked closely with Citrix to verify that HP PVC and Citrix XenCenter co-exist and complement each other in the management of HP-integrated Citrix XenServer on HP ProLiant hardware.

HP has tightly integrated Citrix XenServer into HP ProLiant server platforms (Figure 4) to enable fast and straightforward installation, configuration and virtual machine management. Distributing virtualization technology in this manner combines seamless integration with the ability to take advantage of HP ProLiant server management.
Additional information about the HP ProLiant Virtual Console is available from the technology brief “Integrated hypervisor virtualization technologies in HP BladeSystem ProLiant server blades and ProLiant servers”:

Faster provisioning

In addition, the HP and Citrix XenDesktop solution provides faster provisioning of virtual desktops using Citrix Provisioning Server, and it also provides the ability to dynamically allocate virtual machines between different types of systems. When using the Provisioning Server, after building the desktop that is to be provisioned (replicated) to the pool, XenDesktop manages the number of virtual desktops active at a given time based on preset rules. Provisioning uses operating streaming technology to deliver a single, standard desktop image on-demand to the virtual desktop running in the data center. The shared desktop image is centrally configured, delivered, and managed.

Versions of XenDesktop available from HP

HP offers Citrix XenDesktop in three integrated packages on select HP ProLiant servers.
- Citrix XenDesktop HP Standard Edition
- Citrix XenDesktop HP Advanced Edition
- Citrix XenDesktop HP Enterprise Edition
The Standard Edition includes the HP Select version of XenServer; the Advanced and Enterprise Editions include the Enterprise version of XenServer, which allows resource pooling and live migration. HP suggests that users install XenDesktop using HP PVC and either a directly connected keyboard, mouse and monitor, or use HP Integrated Lights-out 2 (iLO2).

Table 1 highlights differences among the different editions of XenDesktop.

**Table 1. XenDesktop Edition differences**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Standard</th>
<th>Advanced</th>
<th>Enterprise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Components</td>
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<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>- Desktop Delivery Controller</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Virtual Machine Infrastructure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secure Remote Access</td>
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<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Scalability</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>- Virtual Desktop Provisioning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Resource Pooling and XenMotion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Integrated Application Delivery</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>- XenApp for Virtual Desktops</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Citrix XenDesktop HP Standard Edition**

The Standard edition is available integrated at manufacturing or as a field-installed option. It offers an all-in-one solution with integrated Citrix XenServer and HP PVC for single server management.

Citrix XenServer HP Standard Edition allows users to create an unlimited number of virtual machines per server, with up to 32 GB memory per virtual machine. Citrix XenServer HP Standard Edition leverages an HP ProLiant server’s direct-attached storage (DAS). Customers who choose the HP BladeSystem platform can expand their storage capacity by using an SB40c storage blade, which occupies an adjacent slot in the Blade Enclosures.

**Citrix XenDesktop HP Advanced Edition**

The Advanced Edition includes all the capabilities of the Standard Edition as well as resource pooling and live migration using XenMotion. XenServer resource pools provide the ability to view multiple servers and their connected shared storage as unified resource pools, enabling flexible deployment of virtual machines based on resource needs. Live migration allows virtual machines to be moved from server to server within a XenServer resource pool without service interruption, allowing administrators to match applications with computing availability.

The Advanced Edition also provides virtual desktop provisioning. XenCenter, a stand-alone application that runs on a host Windows system (Windows 2003, 2008, or XP), can be used for virtual machine management across multiple servers. XenCenter can be used to create and manage virtual machines, create resource pools and shared storage, and do live migration.

**Citrix XenDesktop HP Enterprise Edition**

Citrix XenServer HP Enterprise Edition includes all the capabilities of Citrix XenServer HP Advanced Edition plus application delivery. Application delivery provides applications and data to users in almost any location on almost any device. Centralizing applications and then virtualizing access to them allows delivery of applications as a service and provides on-demand access to users.
Citrix XenServer HP Enterprise Edition requires remote storage such as internet Small Computer System Interface (iSCSI), Network File System (NFS), or Storage Area Network (SAN) shared storage, live migration, and automatic virtual machine placement.

**Integration with HP SIM and VMM**

Citrix XenServer HP Select and Enterprise Editions integrate with HP System Insight Manager (HP SIM) agents and ProLiant Essentials Virtual Machine Management (VMM) for active hardware management. HP SIM, the HP hardware management solution hosted on Microsoft Windows, Linux or HP-UX operating environments, manages the lifecycle of HP servers and storage. HP SIM can be extended with optional plug-ins for more extensive management for HP ProLiant servers and storage.

HP VMM is an extension of HP SIM capabilities, providing the unified management for both physical and virtual machines. HP VMM provides central management and control capabilities for VMware, Microsoft and Citrix XenServer virtual machines.

**The HP XenDesktop solution**


**Hardware requirements for XenDesktop 2.1**

XenDesktop installation requires the following hardware:

- **Virtualization hosts**
  - CPU
    - Intel VT or AMD-V CPUs, which must support hardware virtualization.
    - Minimum recommended clock speed 1.5 GHz.
  - Memory – minimum 4-GB RAM
  - Disk – 32-GB storage
  - Network Interface Card (NIC) - 100 Mbps (megabits per second) or faster network interface card

- **Endpoints**
  - A device running Windows XP with Service Pack 2 or Windows Vista with or without Service Pack 1.

- **HP PVC or XenCenter host**
  - HP PVC is the preferred mechanism to manage a single server, while a XenCenter host is used to manage multiple servers. XenCenter can run on a desktop computer using Windows XP, Windows Server 2003, or Windows Vista. XenCenter can perform all functions of HP PVC, in addition to live migration and resource pooling.

**Setup and deployment**

Incorporating a virtual desktop solution into an organization requires considering the numerous organizational requirements as well as providing a flexible infrastructure that is easy to manage and maintain. The solution should be tested in a small-scale production environment before the full rollout begins. This allows the organization to validate that all requirements are met, all components function properly, and the proper configuration and optimizations have been made.
Please note that the number of users the XenServer solution can support is directly related to the amount of available memory. Detailed setup information is available in the HP Virtual Desktop Infrastructure with Citrix XenDesktop Getting Started Guide:

Deploying HP XenDesktop requires downloading the XenDesktop software from the Web. The integrated XenServer hypervisor is shipped on a flash memory device such as a USB key. Customers can power on a server with the USB key and immediately begin configuring the virtualized environment.

**Note**
It is advisable to build the environment with redundancy. The entire architecture can be made redundant with the duplication of key components.

**XenDesktop deployment sequential tasks**
XenDesktop deployment is a set of sequential tasks. The following list illustrates the order of a typical deployment.

**XenDesktop administration:**
1. Installing the VM infrastructure
2. Installing and configuring XenCenter
3. Creating the virtual machines
4. Configuring Active Directory for XenDesktop
5. Installing Desktop Delivery Controller
6. Installing and configuring the Provisioning Server
7. Preparing the virtual desktop image
8. Preparing and provisioning virtual desktops
9. Creating multiple virtual desktops
10. Running secure connections with XenServer

**XenDesktop endpoints:**
1. Preparing the endpoint
2. Converting the endpoint to full-screen-only mode
3. Connecting to a virtual desktop from a thin client
4. Monitoring virtual desktop usage

**HP XenDesktop primary components**
The HP XenDesktop solution includes XenServer, XenCenter, virtual desktops and agents, and the following components:

- Citrix Desktop Delivery Controller - A component that manages the connections between users’ endpoint devices and the virtual desktops.
- Citrix Provisioning Server - This component can stream a single desktop image to create multiple virtual desktops on one or more servers in a data center, greatly reducing the amount of storage required compared to other methods of creating virtual desktops.
• License server - A component that validates licenses for Desktop Delivery Controller and Provisioning Server. It is installed simultaneously with Desktop Delivery Controller.

• Citrix Desktop Receiver - Software running on an endpoint that enables the device to connect to a virtual Windows XP or Vista desktop running on a server.

• Independent Computing Architecture (ICA) protocol - A communications protocol used between endpoints and the virtual desktops. With ICA, all desktop logic executes on the desktop host. Only screen updates, mouse clicks, and keystrokes are transmitted to the user’s computer (endpoints).

• XenDesktop Setup wizard - A wizard that automates parts of the creation, delivery, and maintenance of large virtual desktop installations. This wizard integrates Citrix components so that system administrators can quickly create multiple desktops.

• XenServer Tools - Tools that provide custom Windows drivers and a management agent.

**XenDesktop additional components**

Additional XenDesktop components provide the following features:

• Secure delivery - When users connect from outside the corporate firewall, XenDesktop can use Citrix Access Gateway technology to secure these connections with secure sockets layer (SSL). Access Gateway is a hardened SSL virtual private network (VPN) appliance that is deployed in the demilitarized zone (DMZ)\(^1\) to provide a single secure point of access through the corporate firewall.

• Client-side application virtualization - Also known as streaming, this component enables applications to be delivered and run in a protected, virtual environment on client devices. Applications are first packaged by recording their installation profile and determining what is required for streamed operation. The resulting package is stored on a file share and then downloaded to users as required. The package is cached on the local device where it runs locally. Normally this in isolation from other applications and processes running on the endpoint.

• Server-side application virtualization - Also known as presentation virtualization, this component separates an application’s user interface from its program logic, enabling the user interface to be used remotely while the program logic runs on the server. The server encrypts and sends to the endpoint any changes to the user interface while the user’s input is returned to the server for processing.

**HP thin clients**

Thin clients are at the heart of HP’s remote client portfolio of desktop virtualization solutions. Desktop and mobile thin clients are solid-state devices that connect over a network to a centralized server where all processing and storage takes place, providing reduced maintenance costs, minimal application updates, higher security levels, and greater energy efficiency.

Users can access XenDesktop using the following thin client options:

• Program Neighborhood Agent (PN Agent): Using the Program Neighborhood Agent in conjunction with the Web Interface, users can manually launch their XenDesktop session from their desktop.

• Web Client (Browser): The Web Client is used with the Browser Mode. The Web Client enables users to access the XenDesktop group from within a familiar browser environment.

• Desktop Appliance (DA): Desktop Appliance leverages existing devices and is designed to deliver a full desktop experience when connecting to Citrix’s XenDesktop. This mode automatically launches XenDesktop immediately after powering on.

\(^1\) In many sites, a secure network area that sits between the corporate servers and the Internet is referred to as the DMZ. It is usually separated by firewalls that restrict traffic flow between the corporate servers and the Internet.
Why use HP thin clients?

HP recommends thin clients be deployed to serve as access devices. While it is possible to redeploy desktops as general access devices, maximum savings and efficiency comes from stateless, low power devices.

**Management savings**

HP t5000 series thin clients are stateless devices that remove many risks from user environments. Recovery and patching the thin client environment can take significantly less time compared to the traditional desktop environment.

Enhanced manageability also comes in the form of increased reliability. Thin clients do not possess the failure-prone components such as hard drives and multiple, large fans found in a desktop. In the unlikely event of a failure, since no user data is stored locally, a thin client can be replaced by the average end user. This can greatly reduce the need for remote support.

Deployment of thin client solutions is also a key area for management savings. The typical thin client deployment is completed in only minutes, and the device itself can be installed by the end user and imaged and configured remotely. Thin clients are managed from a single console with control handed over to the administrator, not the end-user. Remote administrators can manage images and firewall settings and even disable external ports to prevent unauthorized copying of corporate data.

**Risk reduction**

No company wants to be in the headlines as having lost private data, yet all too frequently data is lost. Generally, it is in a portable format such as USB key, CD-ROM or even a laptop hard drive. Thin clients that are properly configured allow necessary levels of data access for end users, but can assist IT in insuring the data is not converted into a portable data format. Typically, a traditional locked-down desktop still has a hard drive and the ability to write information to external devices.

**Power savings**

Today’s higher performing desktops draw more electricity than ever. Faster processors and hard drives use more energy. A thin client from HP eliminates the need for local hard drives and allows the bulk of the processing to occur in the data center. This allows for more efficient processors within the user environment that utilize less electricity and require less cooling capacity.

**Longer lifecycle**

HP t5000 series thin clients can extend the lifecycle of end-user devices. Since core application processing moves to the data center, the thin client does not need cutting-edge processor and memory speeds to function. Thin clients do not have failure-prone components such as hard disk drives. These two factors are large drivers for short desktop refresh cycles. Extending refresh by one to two years adds dramatic savings to managing the end-user environment.

Why not reutilize existing devices?

While there is an initial purchase savings to be found by reutilizing existing access devices (desktops), HP does not suggest this approach. Reutilizing existing systems can pose the following limitations which limit longer term return on investment:

- Higher power consumption than stateless devices.
- Component failure remains possible in the user environment, potentially resulting in continuing high support costs.
- Converting existing resources to be more secure is time consuming and expensive conversion.
- Incurring excessive licensing costs from multiple locations for corporate applications.
To reutilize existing systems, the following steps should be taken:

- Convert the device to a read-only state through domain policy, local system policy or both.
- Remove any existing programs that can be provided by HP virtual desktops.
- Remove local logins from these systems and require any network activity be directed toward approved resources (connection brokers, media servers, domain resources).
- Run anti-virus software at the end-user access device.
- Implement a throw-away policy for malfunctioning access devices to minimize desk-side support costs.
For more information

For additional information, refer to the resources listed below.

<table>
<thead>
<tr>
<th>Resource description</th>
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<td>Getting Started with Citrix XenDesktop</td>
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Call to action

Send comments about this paper to TechCom@HP.com.