

Deployment of Oracle PeopleSoft HCM on VMware Infrastructure *using Unisys ES7000/one Enterprise Server*



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Infrastructure
using Unisys ES7000/one Enterprise Server

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Contents

| | | |
|------------|--|-----------|
| 1. | Introduction | 1 |
| 2. | Oracle PeopleSoft Enterprise Applications | 2 |
| 2.1. | Oracle PeopleSoft Enterprise Architecture | 2 |
| 3. | VMware Infrastructure | 4 |
| 3.1. | VMware® ESX Server..... | 5 |
| 3.2. | VMware® VirtualCenter..... | 6 |
| 4. | Benefits of Using VMware Infrastructure..... | 7 |
| 4.1. | Server Containment..... | 7 |
| 4.2. | Rapid Provisioning | 8 |
| 4.3. | Change Management | 9 |
| 4.4. | High Availability, Business Continuity, and Disaster Recovery..... | 10 |
| 5. | Oracle PeopleSoft Enterprise Deployment on VMware Infrastructure .. | 12 |
| 5.1. | Deployment Environment..... | 12 |
| 5.2. | Software Summary | 13 |
| 5.3. | Hardware Summary | 13 |
| 5.4. | Unisys Enterprise Servers | 14 |
| 5.5. | Deployment Approach Summary..... | 15 |
| 6. | VMware Infrastructure Installation..... | 17 |
| 6.1. | ESX Server Host Configuration | 17 |
| 7. | Create a Virtual Machine..... | 21 |
| 7.1. | VMware Virtual Machine Installation | 21 |
| 7.2. | Guest Operating System Installation..... | 21 |
| 7.3. | VMware® Tools Installation | 22 |
| 7.4. | Virtual Machine Time Synchronization | 24 |
| 7.5. | Add a Virtual Disk..... | 25 |
| 8. | Oracle PeopleSoft Application Tier Installation | 28 |
| 8.1. | Mount Installation Disks on Virtual Machine | 28 |
| 8.2. | BEA Tuxedo Installation..... | 28 |
| 8.3. | Oracle PeopleSoft Application Server Installation..... | 30 |
| 8.4. | Oracle Client Installation | 32 |
| 8.5. | PeopleSoft Domain Configuration and Boot | 34 |
| 9. | Application Web Tier Installation..... | 35 |
| 9.1. | Conversion From A Physical Web Server As An Alternative..... | 35 |
| 9.2. | Connecting the web tier and the application tier | 37 |
| 10. | Gold Image for PeopleSoft Application Tier Deployment | 38 |

- 10.1. Virtual Machine Shutdown 38
- 10.2. Virtual Machine Template 38
- 10.3. Clone from Virtual Machine Template 39
- 10.4. Customize the Cloned Virtual Machine 40
- 11. VMware High Availability 43**
- 11.1. Network Card Redundancy 43
- 11.2. Configure HA Cluster 44
- 12. VMware VMotion 47**
- 12.1. Configure VMkernel Port..... 47
- 12.2. Live Migration 47
- 12.3. Cold Migration 48
- 12.4. Live Migration of Oracle PeopleSoft application servers 48
- 13. Best Practices 58**
- 14. Conclusion 60**
- 15. Resources..... 61**
- 15.1. VMware..... 61
- 15.2. Oracle PeopleSoft..... 61
- 15.3. Unisys..... 61
- Appendix 1 – Oracle PeopleSoft Server Processes 62**
- Appendix 2 – Oracle PeopleSoft Server Administration..... 63**
- PSADMIN command line options 63
- PSADMIN Domain Creation Execution..... 64
- Appendix 3 – Oracle Shared Library Name..... 66**
- Appendix 4 – Unisys Server Compatibility with VMware Infrastructure 3 66**

1. Introduction

Oracle's PeopleSoft Enterprise applications are designed to address the most complex business requirements. They provide comprehensive business and industry solutions, enabling organizations to significantly improve performance. PeopleSoft provides human resource management, financial, manufacturing, student administration, and customer relationship management software.

VMware is the global leader in virtual infrastructure software for industry-standard systems. The world's largest companies use VMware solutions to simplify their IT, fully leverage their existing computing investments and respond faster to changing business demands. VMware provides a robust, well-tested and high performance software suite for customers to reap benefits ranging from server containment, rapid provisioning, and high availability to change management.

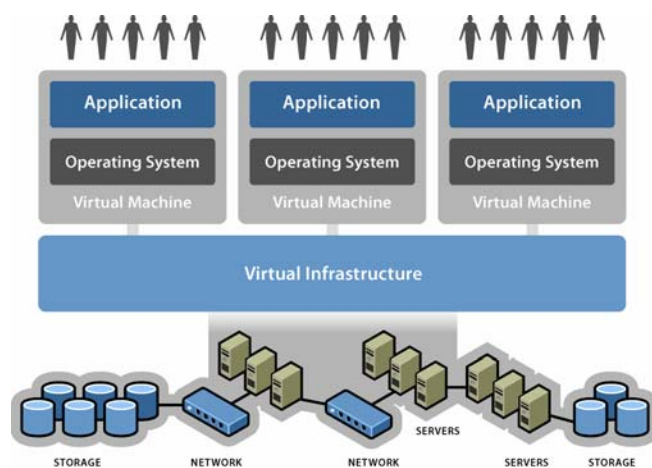


Figure 1. VMware Infrastructure

The multi-tier architecture of Oracle's PeopleSoft Enterprise software makes it a good candidate for virtualization. Through careful design, you can choose to virtualize some or all of the tiers of the software suite. These virtualization efforts will provide lower total cost of ownership (TCO) and higher return on investment (ROI).

This paper shows you how to deploy PeopleSoft Enterprise Human Capital Management (HCM) on VMware® Infrastructure 3. It provides instructions for converting physical machines to virtual machines, creating virtual machines, installing PeopleSoft Enterprise components, and creating a gold image to streamline provisioning of new PeopleSoft environments. It also explains how to leverage advanced features such as VMware® VMotion™ and VMware® High Availability (HA).

2. Oracle PeopleSoft Enterprise Applications

The Oracle PeopleSoft Enterprise applications provide a comprehensive suite of software to fulfill enterprise customer requirements, including solutions for human resource management, financials, manufacturing, student administration, and customer relationship management.

2.1. Oracle PeopleSoft Enterprise Architecture

The whole PeopleSoft software suite moved from a client-server based design to a web-centric design, called *Pure Internet Architecture (PIA)*, with PeopleSoft version 8 releases. This design allows all of the business functions of a company to be accessed and operated upon via a web browser.

PeopleTools technology provides a foundation for the PeopleSoft Internet Architecture. PeopleTools is a proprietary development platform that includes many components developers need to create applications including a scripting language, design tools to define various types of metadata, a standard security structure, and batch processing tools. This meta-data driven platform allows PeopleSoft applications to run on top of many different operating systems such as Windows and Linux, and database platforms such as Oracle, Microsoft SQL Server, Sybase server and IBM DB2. The meta-data describes data for user interfaces, tables, messages, security, navigation and portals.

In general, the PeopleSoft Pure Internet Architecture can be described as having 3 tiers¹.

1. Web Tier
2. Application Tier
3. Database Tier

See

Figure 2 for a graphic depiction of the Pure Internet Architecture.

Web Tier

The web tier front-end enables customer access to the business functions provided by the application tier. The web servers in this tier are Java-enabled to run the Java servlets that handle a wide range of PeopleSoft transactions.

Customers have the option of provisioning a third-party load balancer to route requests to the web servers. In addition, PeopleSoft provides an internal function that distributes the load of one web server across multiple application servers. Each web server routes requests to a number of application servers, according to its configuration.

Application Tier

The application tier consists of a number of application servers. An application server executes business logic and issues SQL queries to the database server. It consists of a number of PeopleSoft services and server processes that handle transaction requests.

An application server uses BEA Tuxedo® to manage database transactions and BEA JOLT to facilitate transaction requests issued from the Internet.

¹ The architecture can be viewed as having 4 tiers, counting the web browser as another tier.

Database Tier

PeopleSoft supports many different database platforms including Oracle Database, Microsoft SQL Server, Sybase server and IBM DB2. The database tier is accessed via standard SQL queries. The database server hosts a database engine and a PeopleSoft database, which includes all the object definitions, system tables, application tables, and data.

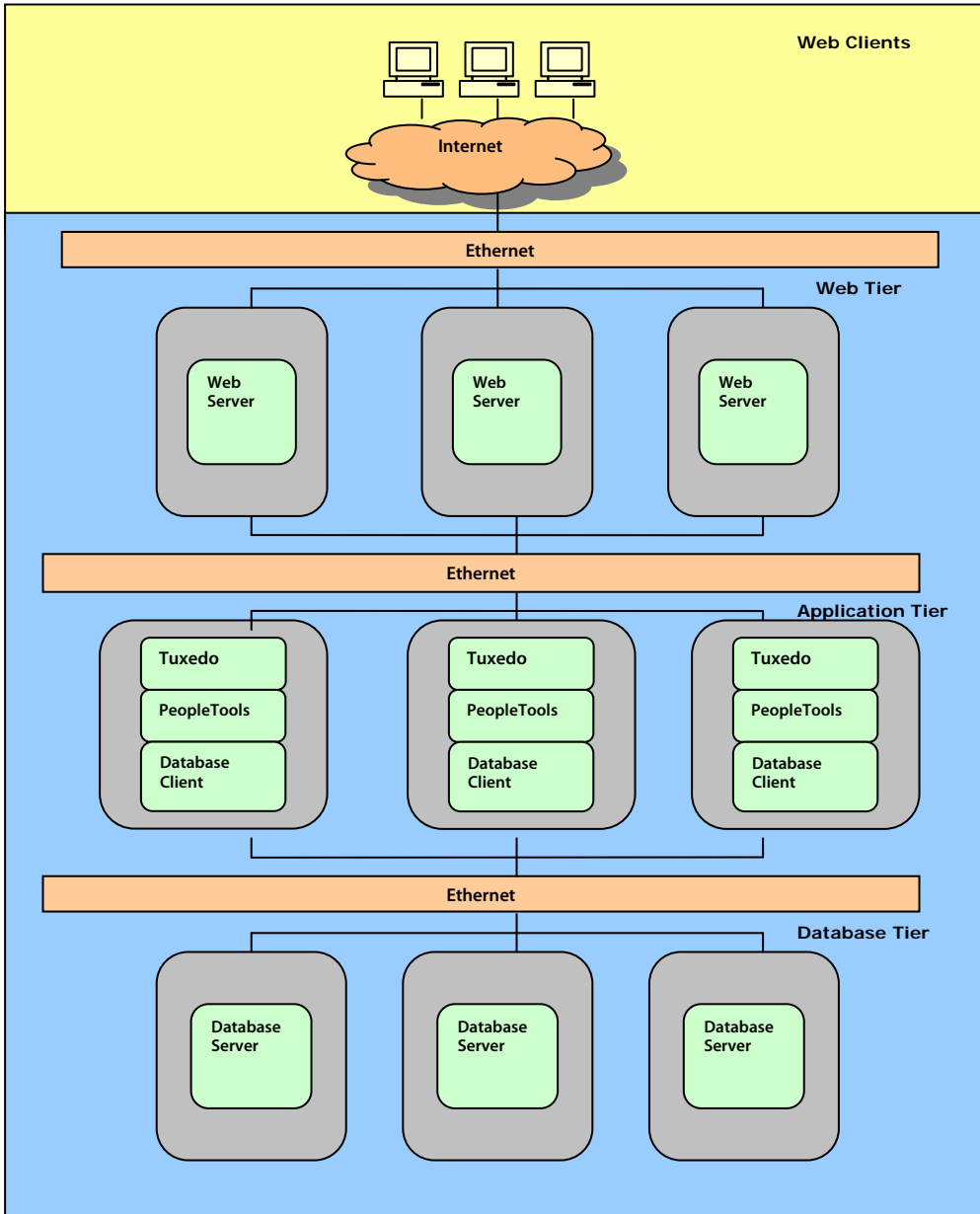


Figure 2. Oracle PeopleSoft Enterprise – Pure Internet Architecture (PIA)

3. VMware Infrastructure

VMware Infrastructure simplifies IT environments so that you can leverage your storage, network, and computing resources to control costs and respond quickly to changing business needs. The VMware Infrastructure approach to IT management creates virtual services out of the physical infrastructure, enabling administrators to allocate these virtual resources quickly to the business units that need them most.

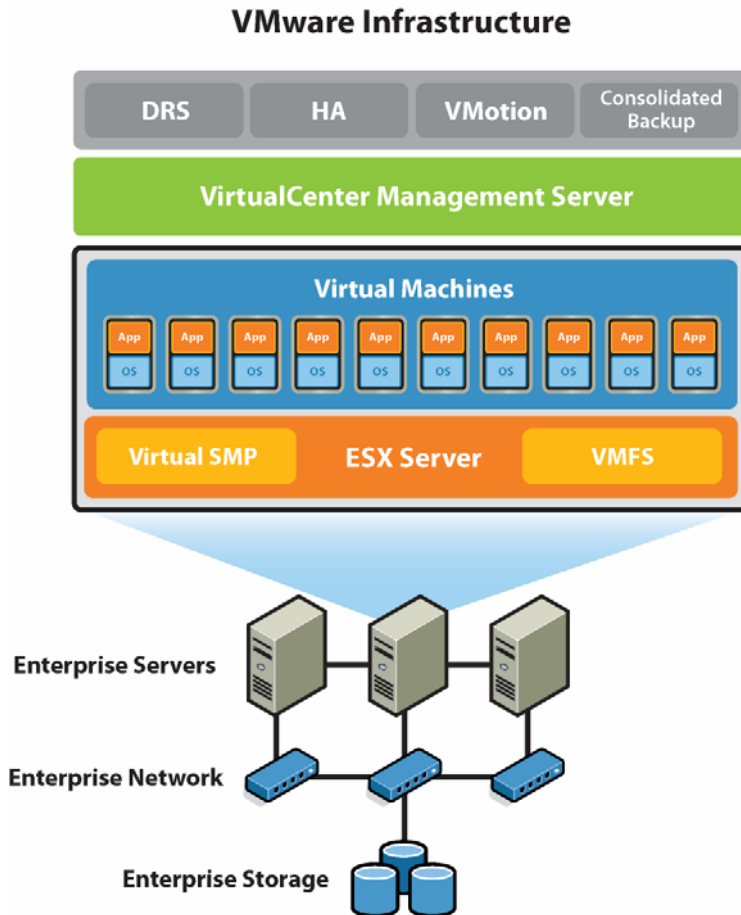


Figure 3. VMware Infrastructure

VMware Infrastructure 3 is the next generation of industry-leading infrastructure virtualization software that virtualizes servers, storage, and networking, allowing multiple unmodified operating systems and their applications to run independently in virtual machines while sharing physical resources. This deployment guide explains the installation and configuration of two VMware Infrastructure 3 software components:

3.1. VMware® ESX Server

VMware® ESX Server abstracts processor, memory, storage, and networking resources into multiple virtual machines, giving IT greater hardware utilization and flexibility.

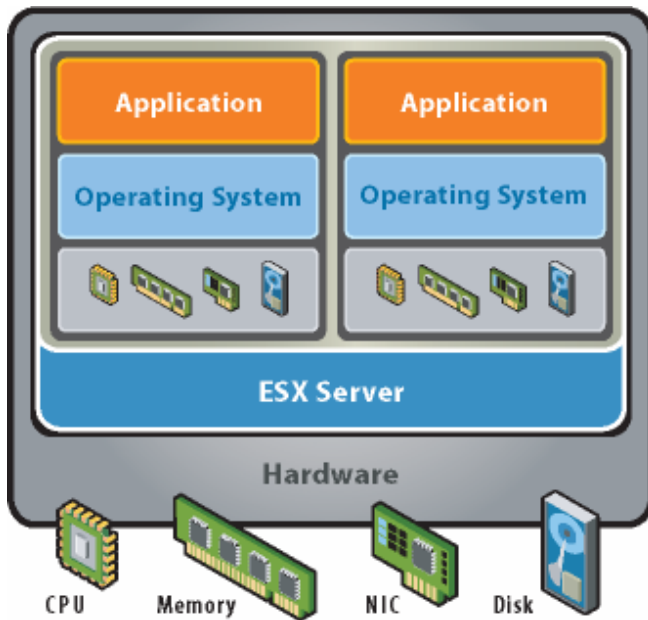


Figure 4. VMware Infrastructure 3 - ESX Server

3.2. VMware® VirtualCenter

VMware® VirtualCenter enables rapid provisioning of virtual machines and performance monitoring of physical servers and virtual machines. VirtualCenter intelligently optimizes resources, ensures enhanced high availability to all applications in virtual machines, and makes IT environments more responsive with virtualization-based distributed services such as VMware High Availability (HA) and VMware VMotion.

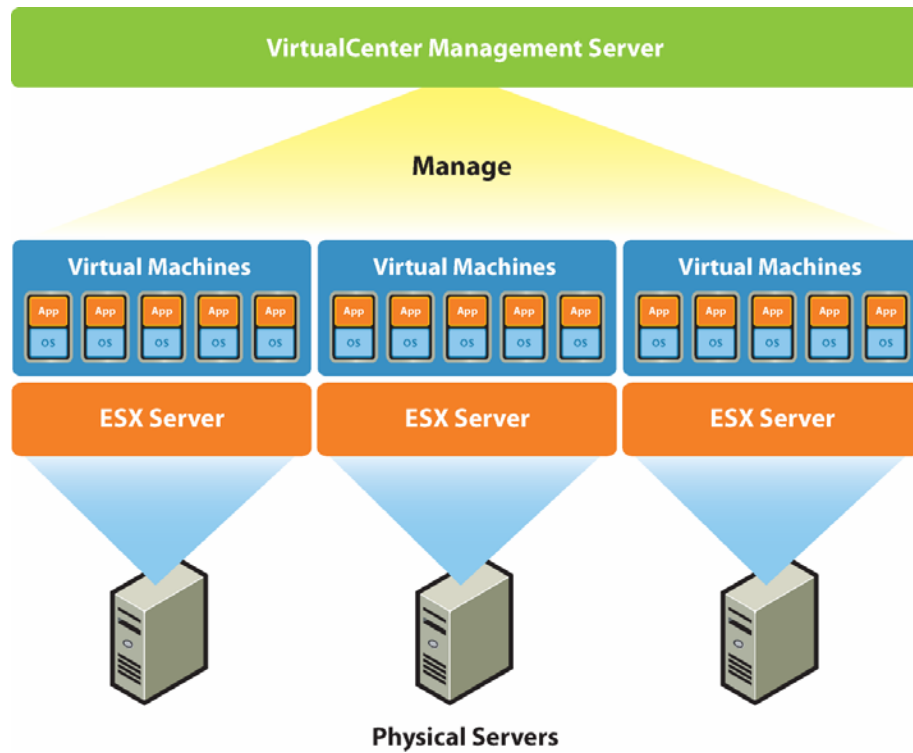


Figure 5. VMware VirtualCenter Management Server

4. Benefits of Using VMware Infrastructure

VMware software delivers capabilities that streamline the deployment and maintenance of Oracle PeopleSoft Enterprise in a virtualized environment. Some of these key capabilities include:

- Server containment
- Rapid provisioning
- Change management
- High availability, business continuity and disaster recovery

4.1. Server Containment

Traditional Oracle PeopleSoft Enterprise deployments generate significant server sprawl due to the need to provision separate systems for development, test and production environments. Each developer requires a dedicated environment and each test cycle requires dedicated servers assigned for the duration of the tests. Along with the development requirements, the necessity of dedicated systems for each layer of the Oracle environment results in over-provisioning, manageability, and resource challenges, all leading to higher operational and ownership costs.

VMware virtualization technology contains server sprawl and increases server utilization by running multiple Oracle PeopleSoft Enterprise components in virtual machines consolidated onto fewer, highly scalable, reliable enterprise-class systems. Customers using VMware Infrastructure have been able to consolidate ten or more servers per physical processor, and have seen many other benefits as outlined below.

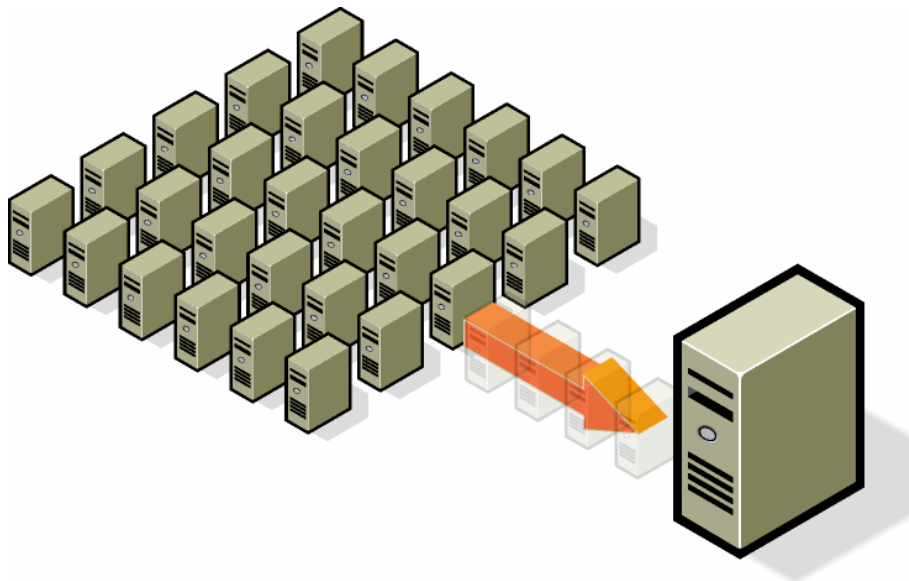


Figure 6. Server Containment

Key Benefits:

1. Provide dedicated and isolated environments for all developers, consolidated onto as few as one physical system.
2. Run multiple Oracle PeopleSoft Enterprise components on the same physical system, providing consolidation benefits such as less hardware, datacenter space, and power consumption, while lowering total cost of ownership (TCO).
3. Increase the average utilization of physical servers, leading to efficient capacity utilization.
4. Eliminate the need for dedicated hardware and provide interoperability with multiple operating systems and Oracle PeopleSoft application versions residing on the same system.
5. Eliminate the need for dedicated test systems with multiple test environments sharing the same physical server.

4.2. Rapid Provisioning

VMware virtualization solutions significantly reduce the time required to provision new instances (development, test, or production) of Oracle PeopleSoft Enterprise environments. In a non-virtualized environment, a new Oracle PeopleSoft Enterprise deployment typically requires the procurement of new hardware, followed by installation and configuration of the operating system and the Oracle PeopleSoft application software. This process consumes significant time and IT resources. Users of VMware Infrastructure can take advantage of Virtual Machine libraries and templates to provision new pre-configured Oracle PeopleSoft Enterprise environments in minutes. These features enable rapid Oracle PeopleSoft Enterprise deployment with sophisticated automation capabilities, centralized administration and management of hardware resources while giving business units and Oracle PeopleSoft application owners complete control over Oracle PeopleSoft application resource utilization.

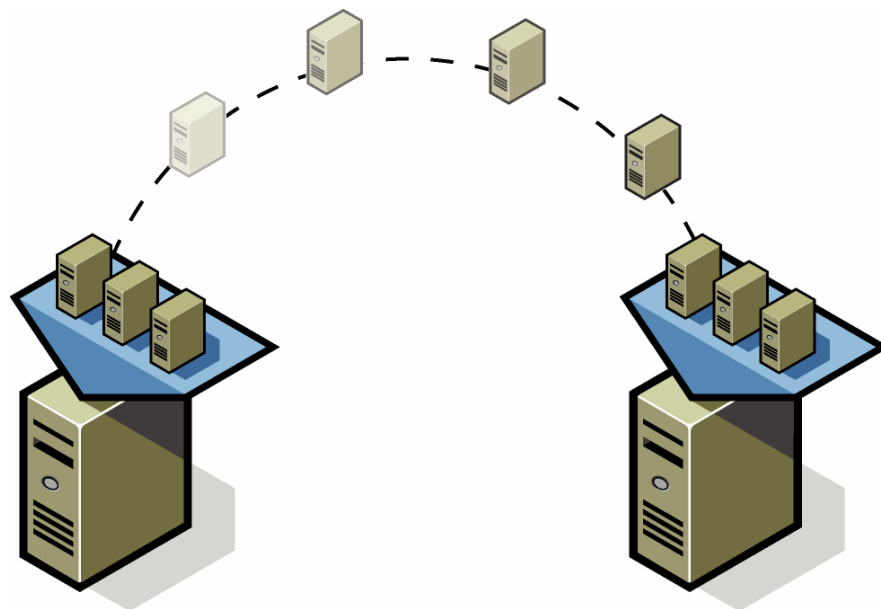


Figure 7. Rapid Provisioning

Key Benefits:

1. Rapidly provision new Oracle PeopleSoft component instances from virtual machine templates.
2. Pass Oracle PeopleSoft development and test images back and forth between test and development users.
3. Recreate distributed Oracle PeopleSoft component instances from a production environment on a single physical system for test purposes.
4. Move test/QA instances to production in minutes.
5. Reset test images, after test completion, from templates and virtual machine libraries, cutting down on test setup and reset time.
6. Store different Oracle PeopleSoft component instances and versions in virtual machine libraries that can be provisioned instantly.
7. With the VMware® Snapshot feature, roll back development and test images during problem resolution.
8. Rapidly provision additional Oracle PeopleSoft application server instances to accommodate additional load requirements.

4.3. Change Management

Testing patches and upgrades are high on the list of IT challenges facing Oracle customers. IT departments face two key change management challenges:

- Testing patches and upgrades for compatibility with standard corporate hardware, operating system, and Oracle configurations.
- Efficiently deploying critical patches and upgrades throughout the enterprise.

Traditionally, IT organizations procure hardware that duplicates production systems and create test beds that mirror the operating system and Oracle configurations of the production environment. With VMware Infrastructure, users can clone a set of production virtual machines, or create a set of virtual machine libraries that mirror production. They can use these images to provision the test environment and test the latest patches and upgrades against Oracle PeopleSoft Enterprise applications, eliminating the need for dedicated hardware to perform these tests. The patches can then be rolled into production with minimal interruption to end users. In case of Oracle PeopleSoft application problems, the virtual machines can be instantly rolled back to their pre-patched state using Snapshots.

Key Benefits:

1. Accelerate change management with fewer system resource requirements.
2. Test patches on multiple configurations (guest operating system, Oracle PeopleSoft Enterprise versions, etc.) concurrently all hosted on the same physical system.
3. Instantly roll back Oracle PeopleSoft virtual machines (during problem resolution) using VMware Snapshots.
4. Create a library of standard production configurations to perform change management testing and deployment.

- Dynamically migrate Oracle PeopleSoft server instances on virtual machines to other systems to perform hardware maintenance or system changes on the current physical system, without disruption to end users.

4.4. High Availability, Business Continuity, and Disaster Recovery

VMware virtualization solutions work alongside Oracle PeopleSoft application capabilities to deliver enhanced infrastructure and high availability for critical business functions. Using VMware Infrastructure, you can implement a unified disaster recovery (DR) platform that allows production Oracle PeopleSoft instances on virtual machines to be recovered in the event of hardware failure, without investing in costly one-to-one mapping of production and DR hardware.

A typical Oracle PeopleSoft Enterprise solution consists of multiple layers and instances running simultaneously and working together to provide failover and load balancing. VMware VMotion enhances this capability by enabling the live migration of running virtual machines from one physical server to another with zero downtime, continuous service availability, and complete transaction integrity. Live migration of virtual machines allows companies to perform hardware maintenance without scheduling downtime and disrupting business operations.

VMware High Availability provides easy to use, cost-effective high availability for Oracle PeopleSoft applications running in virtual machines. In the event of physical server failure, affected virtual machines are automatically restarted on other physical servers that have spare capacity. VMware HA minimizes downtime and IT service disruption while eliminating the need for dedicated stand-by hardware and installation of additional software. VMware HA provides uniform high availability across the entire virtualized IT environment without the cost and complexity of failover solutions tied to either operating systems or specific Oracle PeopleSoft applications.

VMware® Consolidated Backup provides an easy to use, centralized facility for LAN-free backup of virtual machines. Consolidated Backup simplifies backup administration and reduces the load for ESX Server host machines.

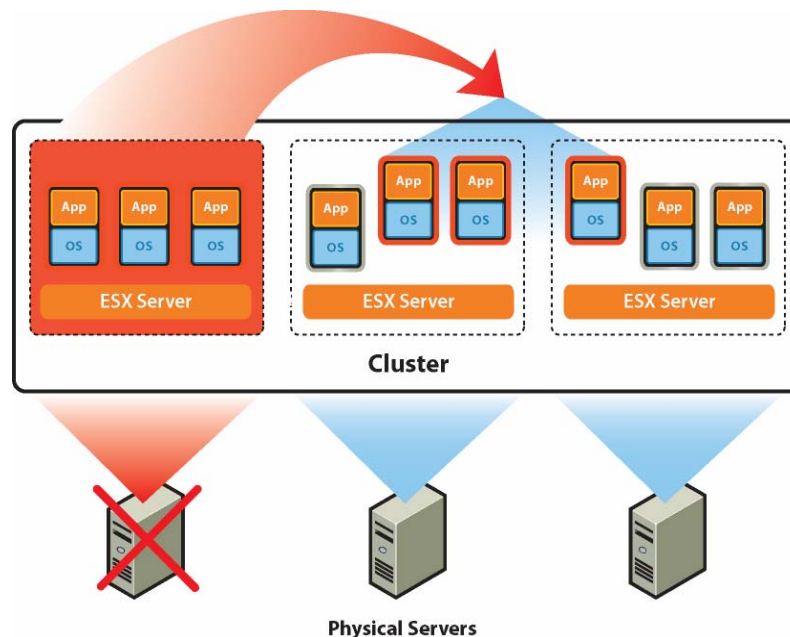


Figure 8. VMware High Availability

Key Benefits:

1. Save layers of images for regression (that is, keep exact versions of operating system, Oracle PeopleSoft applications, patches, state etc.) using Snapshots and Consolidated Backup.
2. Use Snapshots to enable point-in-time restores and rollbacks during test and development problem resolution.
3. Automatically detect failure of physical servers running Oracle PeopleSoft application instances in production, and automatically restart failed Oracle PeopleSoft application virtual machines with VMware HA.
4. Ensure capacity availability to support Oracle PeopleSoft application virtual machine failovers.
5. Perform full and incremental file backup of virtual machines with VMware Consolidated Backup.
6. Migrate Oracle PeopleSoft application virtual machines from failing server hardware without disruption to end users with VMware VMotion live migration.
7. Fail over during disaster recovery by using SAN replication and restarting Oracle PeopleSoft application virtual machines in DR sites.

5. Oracle PeopleSoft Enterprise Deployment on VMware Infrastructure

You can streamline the deployment of Oracle PeopleSoft Enterprise by leveraging the features provided by VMware Infrastructure. This section outlines the procedures of a deployment approach practiced in the Unisys lab.

NOTE: The approach illustrated in this section serves as a suggestion and is by no means the recommended approach for Oracle PeopleSoft Enterprise deployment. Refer to Oracle PeopleSoft documentation for more information.

5.1. Deployment Environment

Figure 9 shows the deployment environment in the Unisys lab located in Pleasanton, CA. One ESX Server host is installed on a Unisys ES7000/one Enterprise Server, another one is installed on a Unisys ES3040 Server. A VirtualCenter Management Server is installed on another Unisys ES3040 Server. A VirtualCenter Client is installed on an IBM Lenovo X60 laptop.

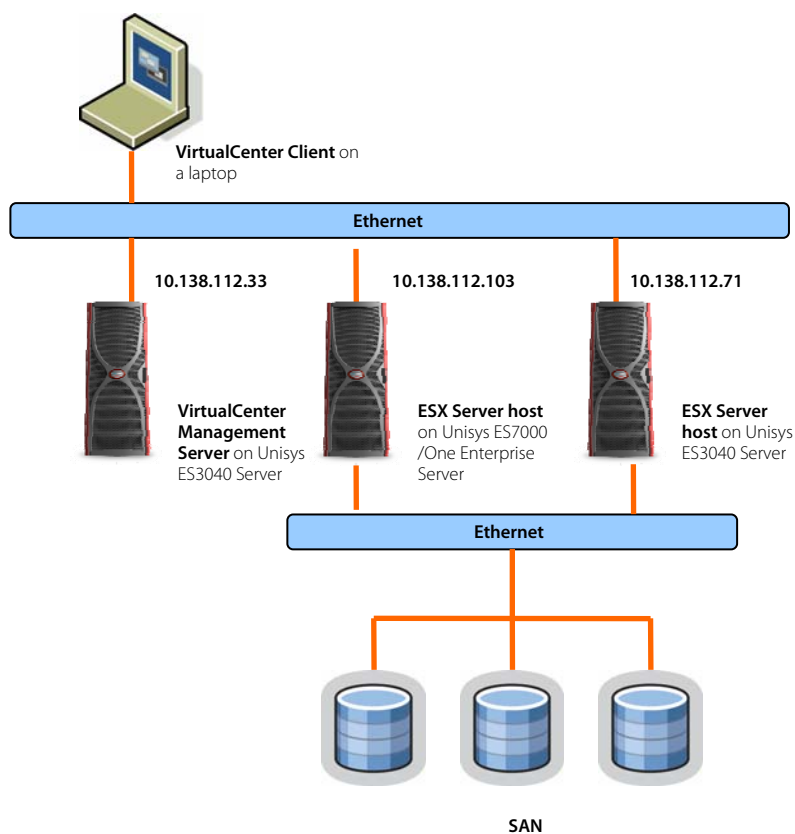


Figure 9. Sample VMware Infrastructure Environment for Oracle PeopleSoft Enterprise deployment

5.2. Software Summary

The table below lists the software used in the deployment outlined in this guide.

| Category | Software |
|-------------------------------|--|
| Infrastructure | <ul style="list-style-type: none"> VMware Infrastructure 3 (VI3) |
| Applications/Software | <ul style="list-style-type: none"> Oracle PeopleSoft Tools 8.46 BEA Tuxedo 8.1 Oracle Client 10.2.0.1.0 |
| Guest Operating System | <ul style="list-style-type: none"> Red Hat Enterprise Linux AS 4.0 |

5.3. Hardware Summary

The table below outlines the hardware used to support the virtualized Oracle PeopleSoft Enterprise installation.

| Category | Hardware |
|--|---|
| ESX Server hosts | <ul style="list-style-type: none"> Unisys ES7000/One Enterprise Server Unisys ES3040 Server |
| VirtualCenter Management Server | <ul style="list-style-type: none"> Unisys ES3040 Server |
| VirtualCenter Client | <ul style="list-style-type: none"> IBM X60 Lenovo laptop computer |

5.4. Unisys Enterprise Servers

The Unisys ES7000/one servers are the next generation of Unisys Enterprise Servers based on the Unisys Cellular Multi-Processing (CMP) architecture. The ES7000/one Enterprise Server offers a flexible, single server solution that can be configured to meet enterprise workloads as they change. With the ability to grow from 4 to 32 Intel® Xeon® MP™ processors, or from 4 to 32 Intel® Itanium® 2 processors, the ES7000/one Enterprise Server scales beyond conventional Intel® processor-based platforms while delivering improved price/performance.

The ES7000/one Enterprise Server has the ability to create up to eight independent partitions that concurrently run different operating systems, making it an excellent solution for consolidating applications, migrating from expensive proprietary RISC systems, deploying business intelligence applications, and running large-scale databases.

For VMware Infrastructure deployments, the ES7000/one Enterprise Server is uniquely versatile in that it can be configured as a large, vertically-scalable ESX Server host or, alternately, as smaller, multiple ESX Server hosts in a horizontal scaling topology. The capacity of more processors in a single host affords the virtual machines more flexibility for larger SMP configurations, resulting in greater productivity and efficiency. The integrated Unisys Server Sentinel management software enables multi-way reconfiguration without any changes to the physical configuration of the server frame.



Figure 10. Unisys ES7000/one Enterprise Server

5.5. Deployment Approach Summary

This section explains how to streamline deployment of an Oracle PeopleSoft Enterprise environment. You can create a virtual machine by installing it in VMware Infrastructure 3, or by converting a physical machine. After all the proper installation and configuration of applications on its guest operating system, a virtual machine can serve as a gold image from which you can clone other virtual machines and efficiently deploy an Oracle PeopleSoft Enterprise environment with respect to your architecture plans. At the end of this exercise, you will have an Oracle PeopleSoft Enterprise environment consisting of one virtual web server and two virtual application servers, connecting to a physical database server.

Deployment steps include:

1. Prepare a VMware Infrastructure environment
 - a. Procure hardware for two ESX Server hosts, one VirtualCenter Management Server and one VirtualCenter Client.
 - b. Install ESX Server on the host machines.
 - c. Install VirtualCenter Management Server.
 - d. Install VirtualCenter Client.
2. Create an application server virtual machine.
 - a. Create a virtual machine on one ESX Server host.
 - b. Add the necessary virtual disk(s) to the virtual machine.
 - c. Install guest operating system (RHEL AS 4.0) on the virtual machine.
3. Install and configure Oracle PeopleSoft Enterprise environment
 - a. Install and configure BEA Tuxedo software.
 - b. Install and configure PeopleTools.
 - c. Install and configure Oracle Client².
4. Convert a physical web server to a virtual machine³
 - a. Perform VMware Converter Cold Clone.
 - b. Configure the virtual web server to connect to the installed Oracle PeopleSoft application server.
5. Create gold image (virtual machine template) for application server⁴
 - a. Clone the virtual machine created in step 3.
 - b. Launch the cloned virtual machine.
6. Configure the cloned virtual machine
 - a. Configure the network interfaces.
 - b. Add the network address of the virtual machine to the web server configuration.
7. Configure VMware High Availability cluster
 - a. Configure NIC teaming.
 - b. Configure redundant service console port.
8. Configure VMware VMotion
 - a. Configure VMKernel Port.
 - b. Perform Live Migration.
 - c. Perform Cold Migration.

² This section assumes an existing Oracle database. Customers with other database systems can substitute the installation of a corresponding client.

³ Note that you can create a virtual machine and install a web server on it in a manner similar to installing an application server. Components of a web server, including BEA Weblogic, will need to be installed and configured.

⁴ You can create a gold image (virtual machine template) for a web server virtual machine in a manner similar to this step.

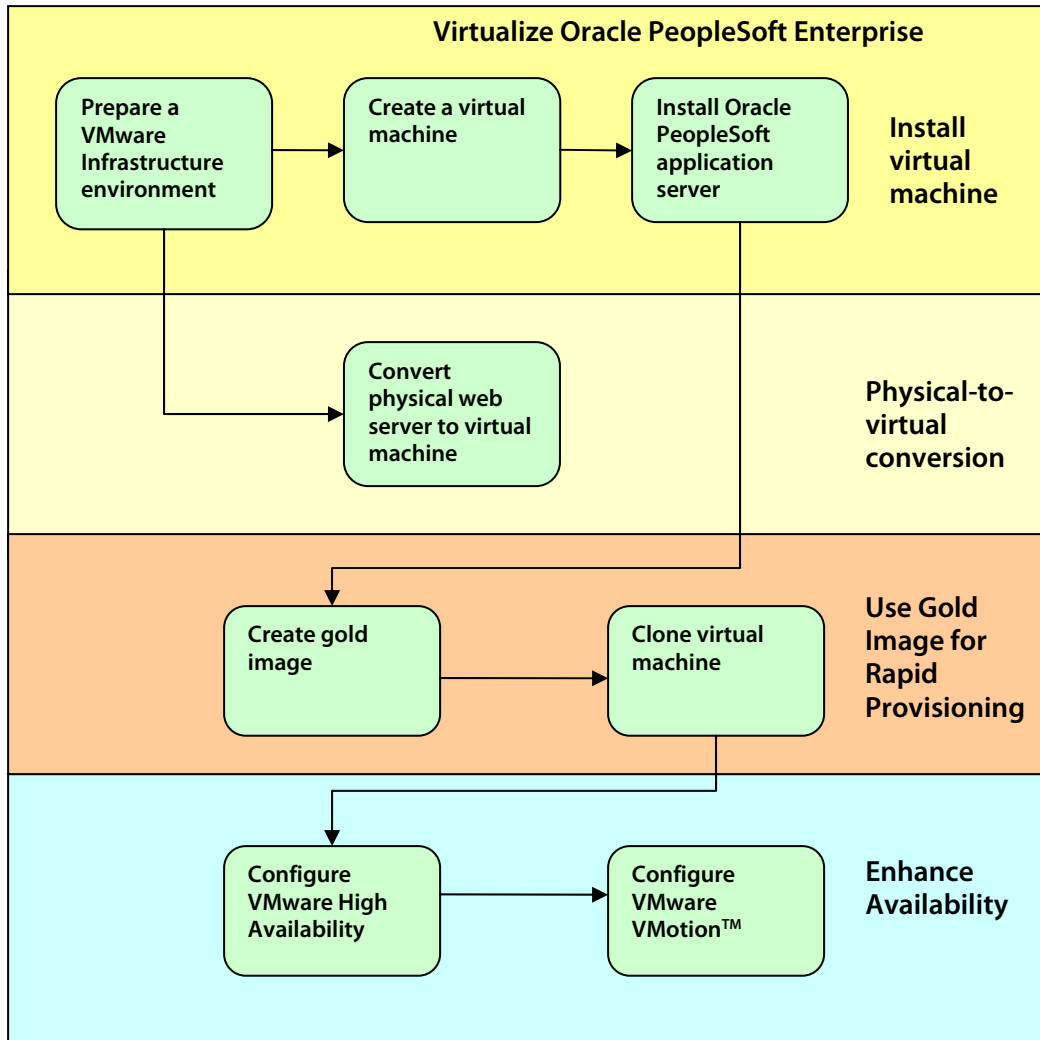


Figure 11. Oracle PeopleSoft Enterprise Deployment Approach

6. VMware Infrastructure Installation

VMware Infrastructure consists of a number of components:

- ESX Server
- VirtualCenter Management Server
- VirtualCenter Client
- License Server

The installation procedures for each component are shown in detail in the guide located here: http://www.vmware.com/pdf/vi3_installation_guide.pdf.

6.1. ESX Server Host Configuration

- Configure at least one datastore on a shared storage. In the Unisys lab, a datastore called ORAPSFT of size 500 GB was created on the shared storage.
- Synchronize the clocks on both ESX Server hosts.

6.1.1. Add New Physical Shared Storage

In order to add a shared storage system, such as a new LUN, after ESX Server has been installed, follow the procedure below to rescan and add the shared storage system to the infrastructure using VirtualCenter Client.

- Select the desired ESX Server host in Inventory View.
- Click on the Configuration tab.
- Click on **Add Storage...** on the top right corner.
- In the Add Storage Wizard, enter the following:

| | |
|----------------------------|---|
| Disk/LUN | Select Disk/LUN |
| Device Location | A list of available LUNs should appear in the window to the right. Select the device to add. |
| Current Disk Layout | (Indication that the disk is blank should be shown) Click on Next. |
| Properties | Datastore Name ORAPSFT |
| Formatting | Keep the defaults. Make sure that the checkbox for Maximize Capacity has been checked. |
| Ready to Complete | Click on Finish . |

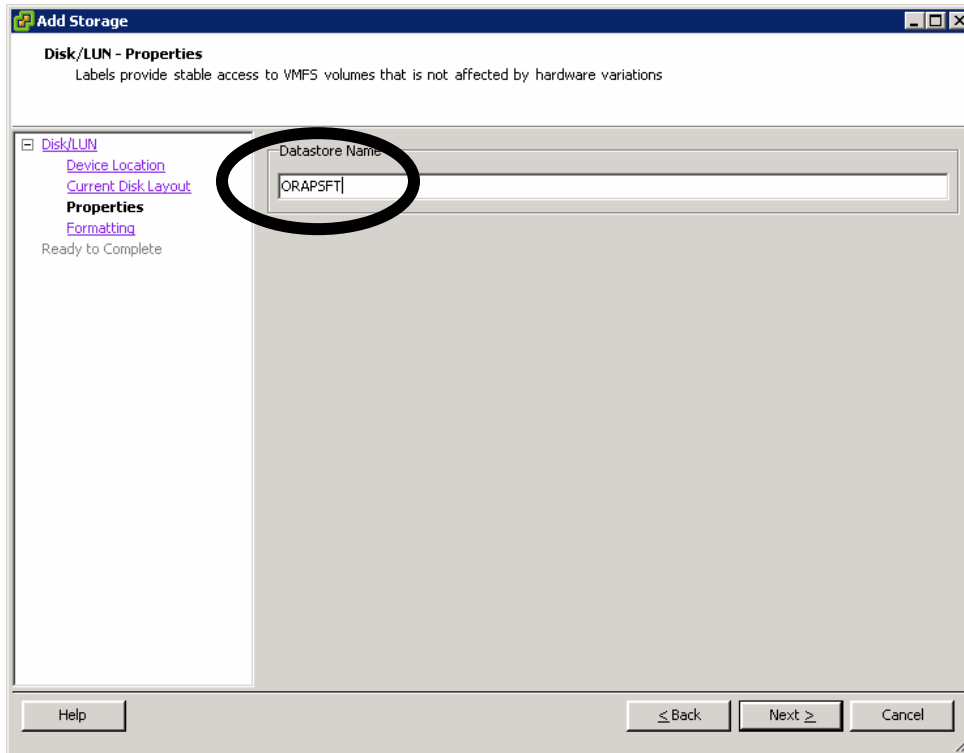


Figure 12. Specify name for the new datastore

6.1.2. ESX Server Host Time Synchronization

It is in general a good practice to have the clock of an ESX Server host synchronized with a trusted source. You can then use the synchronized clock as the source to synchronize the clocks on virtual machines.

NTP is installed by default on ESX Server 3.0.1. To enable it, follow the procedure below:

- Log in to the ESX Server service console.
- Edit the configuration files (/etc/ntp.conf, /etc/ntp/step-tickers, /etc/hosts) on the service console.
- Allow NTP client to go through the firewall.
- Restart NTP daemon.

Configuration File Modification

Edit the configuration files according to the table listed below:

| File Name | Suggested Content | Reference |
|---------------|---|---|
| /etc/ntp.conf | restrict 127.0.0.1 restrict default kod nomodify notrap server 0.pool.ntp.org server 1.pool.ntp.org server 2.pool.ntp.org driftfile /var/lib/ntp/drift | <ul style="list-style-type: none"> • http://www.pool.ntp.org/use.html for using NTP server pools • http://www.eecis.udel.edu/~mills/ntp/html/acc_opt.html for a full description of the access control commands. • http://www.eecis.udel.edu/~mills/ntp/html/not |

| | | |
|-----------------------|--|---|
| | | es.html for a more complete definition of the drift file. |
| /etc/ntp/step-tickers | 0.pool.ntp.org 1.pool.ntp.org 2.pool.ntp.org pool.ntp.org | |
| /etc/hosts | IP_ADDR 0.pool.ntp.org IP_ADDR 1.pool.ntp.org IP_ADDR 2.pool.ntp.org IP_ADDR pool.ntp.org | Adding these entries to /etc/hosts saves unnecessary DNS queries. It is an optimization step. |

Open NTP Client Port

There are two alternative ways to open the NTP client port:

1. By running the ESX Server configuration command on ESX Server service console.
 - o Run "esxcfg-firewall --enableService ntpClient"
2. By using VirtualCenter Client.
 - o Select the ESX Server host in Inventory View.
 - o Go to **Configuration Tab**.
 - o Click on **Security Profile**.
 - o Click on **Properties** in the upper right corner of the screen.
 - o Check **NTP Client**.

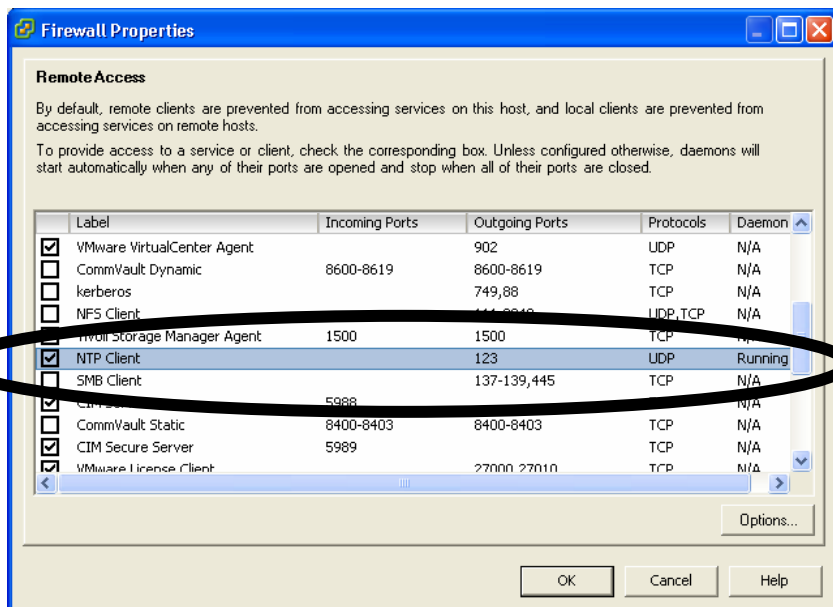


Figure 13. Firewall Properties Sheet for enabling NTP Client

Restart and Monitor NTP Service

To restart the NTP daemon for time synchronization to take effect, follow the procedure below:

- Log in as root to the service console.
- Execute the following commands:

| Commands | Effect |
|---------------------------------|---|
| # service ntpd restart | Restart the service. |
| # chkconfig --level 345 ntpd on | Enable the NTP daemon to autostart when the server is rebooted. |
| # hwclock --systohc | Set the local hardware clock to the NTP synchronized local system time. |

7. Create a Virtual Machine

This section shows the procedure of creating a virtual machine, covering the topics of virtual machine configuration, guest operating system installation and VMware-tools installation.

7.1. VMware Virtual Machine Installation

Follow the procedure below to add a virtual machine to an ESX Server host, using the VirtualCenter Client:

- Host > New Virtual Machine
- In the New Virtual Machine Wizard, enter the following:

| | |
|-------------------------------|--|
| Wizard Type | Virtual Machine Configuration |
| | Typical |
| Name and Folder | Virtual Machine Name: |
| | PSFTAPPVM1 |
| Datastore | Select a datastore that is visible to both ESX Server hosts. In this scenario, [ORAPSFT] is chosen. |
| Guest Operating System | Guest Operating System: |
| | Linux |
| | Version: |
| | Red Hat Enterprise Linux 4 |
| CPUs | Number of Virtual Processors: |
| | 1 |
| Memory | 4 GB⁵ |
| Network | Number of NICs: |
| | 1 |
| | NIC 1: |
| | VM Network/ Connect at Power On |
| Virtual Disk Capacity | Disk Size: |
| | 30 GB⁶ |
| Ready to Complete | Click on Finish |

7.2. Guest Operating System Installation

Follow the procedure below to install a guest operating system, in this case Redhat Enterprise Linux (RHEL 4 AS), on a newly added virtual machine, using the VirtualCenter Client:

- Power on the virtual machine **PSFTAPPVM1**.
- At the prompt for boot, enter the desired Linux version to install: **rhel4u2as**.
- Connect the Virtual CD ROM to an ISO Image or the local CD ROM drive.
 - Click on the button Virtual CDROM (ide0:0) and follow the instructions.
- Select the language/keyboard type according to your settings.
- When prompted for installation method, select "Local CDROM."
- In the installation wizard, enter the following:

⁵ Unisys ES7000/one server provides 32 GB of memory. VMware recommends that you allocate sufficient memory to each virtual machine.

⁶ VMware recommends that you plan carefully for the disk size needed. 30 GB is only a suggestion.

| | |
|---------------------------------------|---|
| Welcome Page: | Click on Next |
| Disk Partition Setup: | Create the partitions as needed. For this exercise, create at least the following mountpoints: /opt for PeopleSoft software. /u01 for Oracle Client. |
| Boot Loader Configuration | Leave as default. |
| Network Configuration | For the HA scenario, only one Ethernet card is needed. |
| | Etho0: 10.138.112.80 /255.255.255.0 |
| | Host Name: PSFTAPPVM1 |
| | DNS settings: Enter proper DNS servers and default gateway. |
| Firewall Configuration: | Leave as default. |
| Additional Language Support | Leave as default. |
| Time Zone Selection | Select desired time zone. |
| Set Root Password | Select desired root password. |
| Package Installation Selection | <p>Customize software packages to be installed.</p> <ul style="list-style-type: none"> • Select X Window System. • Select GNOME Desktop Environment. • Select Editors. <ul style="list-style-type: none"> ○ Click on Details and select preferred text editor. • Select Graphical Internet. • Select Text-based Internet. • Select Graphics. • Select Server Configuration Tools. • Select Legacy Network Server. <ul style="list-style-type: none"> ○ Click on Details. ○ Select rsh-server. ○ Select telnet-server. • Select Development Tools if required. • Select Legacy Software Development. • Select Administration Tools. • Select System Tools. <ul style="list-style-type: none"> ○ Click on Details. ○ Select sysstat. • Select Printing Support if required. |
| About to Install | Click on Next . |

7.3. VMware® Tools Installation

VMware® Tools provides extra drivers to improve the performance of graphics and networking. In addition, it provides services such as time synchronization. To install VMware Tools, follow the procedure below:

- Select the virtual machine on which you want to install VMware tools.
- Right-click on the virtual machine in Inventory view and select Install VMware Tools.
- Mount CD-ROM (e.g. mount /dev/cdrom /mnt/cdrom).
- In /mnt/cdrom, there is an rpm file and a tar.gz file::
 - VMwareTools-3.0.1-32039.i386.rpm
 - VMwareTools-3.0.1-32039.tar.gz

- Use the command “**rpm -Uvh VMwareTools-3.0.1-32039.i386.rpm**” to install the package.
- After the package has been installed, run **/usr/bin/vmware-config-tools.pl**.
 - follow the prompted instructions to install the network drivers as necessary.

NOTE: For more information about vmware tools, refer to http://www.vmware.com/pdf/server_vm_manual.pdf.

7.4. Virtual Machine Time Synchronization

VMware recommends that you perform time synchronization on the virtual machines. The following procedure shows how to use VMware Tools to achieve time synchronization:

- Launch VMware Tools in the guest operating system.
 - Log in as **root**.
 - Launch x-windows (e.g. startx).
 - Start a terminal.
 - In the terminal, run the command `"/usr/bin/vmware-toolbox&"`
- Go to the options tab of vmware-toolbox and check the box labeled **"Time Synchronization between the virtual machine and the console operating system."** See **Figure 14**.

NOTE: This synchronization mechanism works only if the clock on the guest operating system is set to an earlier time.

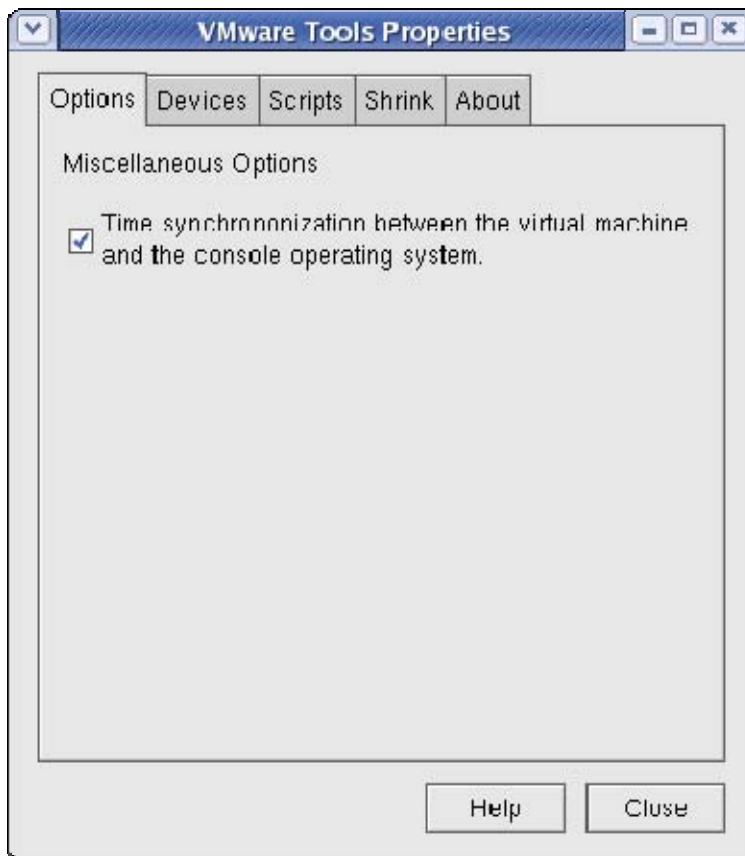


Figure 14. Time Synchronization Using VMware Tools.

7.5. Add a Virtual Disk

You may need to add a virtual disk after a virtual machine has been created. To add a virtual disk to a virtual machine, follow the procedure below:

Use the VirtualCenter Client:

- Select the virtual machine to add the virtual disk.
- Right click on the virtual machine in Inventory View.
- Select **Edit Settings**.
- Click on **Add**.
- In **Add Hardware Wizard**, enter the following:

| | |
|--------------------------|---|
| Device Type | Hard Disk |
| Select a Disk | Create a new virtual disk |
| Disk Capacity | Disk Capacity |
| | 40 GB |
| | Location |
| | Select [ORAPSFT] since it is connected to both ESX Server hosts, or select store with virtual machine if virtual machine is stored in ORAPSFT. |
| Advanced Options | Virtual Device Node |
| | SCSI (0:1) |
| | Mode |
| | Leave as default. |
| Ready to Complete | Click on Finish . |

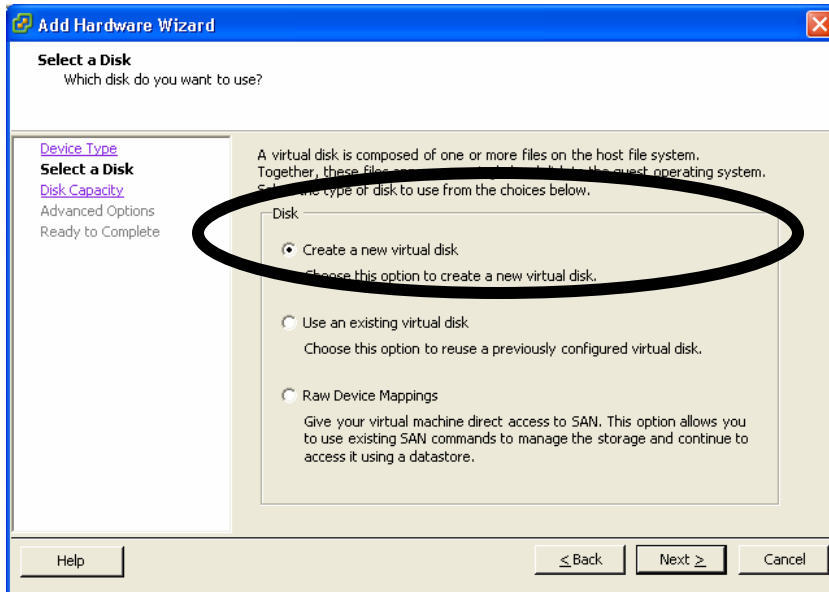


Figure 15. Step to select a disk during virtual disk addition.

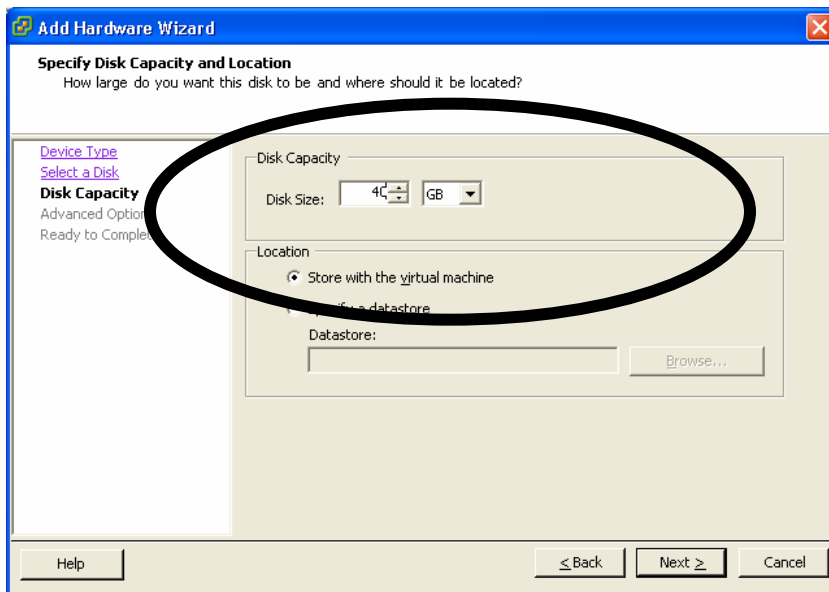


Figure 16. Step to specify disk capacity and location during virtual disk addition.

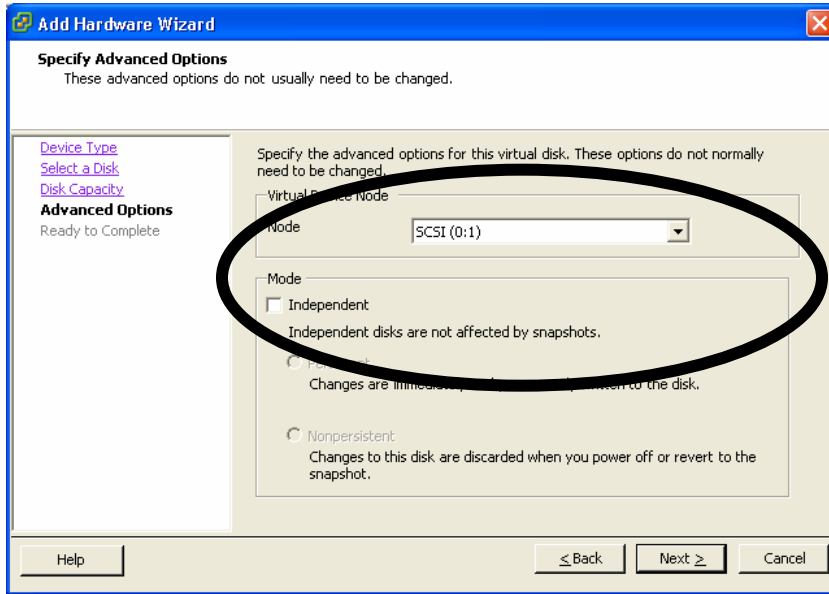


Figure 17. Step to specify advanced options during virtual disk addition.

8. Oracle PeopleSoft Application Tier Installation

This section outlines the procedure to install Oracle PeopleSoft application server in a virtual machine hosted on VMware Infrastructure 3.

8.1. Mount Installation Disks on Virtual Machine

You can choose from the alternatives outlined in this section to mount the installation disks on a virtual machine.

8.1.1. Mount DVD

The Unisys Servers have built-in DVD ROM drives on which you can directly mount the Oracle PeopleSoft Enterprise installation disks. To do so, click on the button labeled **Virtual CDROM (ide0:0)** on the VirtualCenter Client and follow the prompts.

8.1.2. Mount ISO Images

An alternative to mounting the disks directly on a DVD ROM drive is to convert them into ISO images and store them in an NFS mount, which can be mounted onto an ESX Server host machine. The ISO images can then be installed on the virtual machines as if they were loaded directly into a local DVD ROM drive.

Follow the procedure below to mount the ISO Images on ESX Server service console:

- Create a new directory **ISOs** in /VMimages
- Mount NFS share on the newly created directory.
 - Run command in the form of "**mount -t nfs server_ip:/mnt/ISOs /VMimages/ISOs**"
- Change the DVD/CD-ROM drive configuration to mount the ISOs:
 - Right-click on the virtual machine in Inventory View.
 - Select **Edit Settings**.
 - In the **Connection** section, check **Use ISO image**.
 - Browse to the desired ISO image in the /VMimages/ISOs directory.
 - Click on **OK**.

8.2. BEA Tuxedo Installation

You have to install BEA Tuxedo before setting up your PeopleSoft application server because it uses Tuxedo to perform transaction management, messaging, and administration. This section outlines the procedure to install BEA Tuxedo:

- Ensure that there is at least **235 MB** of free disk space on the application server.

- Complete the pre-installation checklist below:

| Item | Description | Example Value |
|------------------------------|---|----------------------|
| BEA Home | The high level directory for the installation of all BEA products | /bea |
| TUXDIR | The directory for the installation of Tuxedo system software | /bea/tuxedo81 |
| Username ⁷ | The UNIX user name of the Application Server Administrator (Tuxedo owner) | [tuxedo] |
| Groupname | Specify the UNIX group name of the Tuxedo owner. | [tuxedo] |

- Designate the Tuxedo owner.
 - Log in as root.
 - Create the UNIX group and the user that you specified in the checklist table above (e.g. tuxedo/tuxedo).
- Install Tuxedo on UNIX.
 - Login as the Tuxedo owner (e.g. tuxedo).
 - Mount the PeopleSoft installation disk using the mount procedures outlined in section 8.1.
 - Change directory to the mount-point of the installation disk.
 - Execute the shell script **install.sh**
sh ./install.sh.

⁷ You can select any user name and group name as desired. For simplicity, it is suggested that you use the Tuxedo convention.

- o Follow the prompts:

| Prompt | Standard PeopleSoft Response |
|--|---|
| Please select a platform: | Specify the number associated with the desired operating system you wish to install. Choose 3 for Linux. |
| BEA Home being defaulted to /bea (y/n): | Type y to indicate yes or n to suggest an alternative BEA Home. |
| Tuxedo 8.1 will be installed to /bea/tuxedo81(y/n): | Acknowledge the Tuxedo installation location or suggest an alternative. |
| Accept default TListen password 'password' (y/n): | Enter password. This password is used when you use the BEA WebGUI Monitor. You can choose to leave it as default. |
| Continue with installation of Tuxedo 8.1 (y/n): | Type y to continue with installation. |

8.3. Oracle PeopleSoft Application Server Installation

The Oracle PeopleSoft Installer is a Java-based tool. You run the Oracle PeopleSoft installer from your PeopleTools CD to install the necessary products on the target machine. The files installed depend on the license, the operating system on the target machine, the database platform, and the selected server option. This section outlines the procedure for installing an Oracle PeopleSoft application server⁸.

8.3.1. Prerequisites

- At least **4.5 GB** of free space
- At least **1.5 GB** of free temporary disk space, which is needed only for the duration of the installation process. The process uses the directory defined by the **TEMP** environment variable on the installation computer.
- Access to root account
- Java Virtual Machine⁹

8.3.2. Check kernel parameters

Check that the kernel parameters are configured to meet the minimum requirements:

- Log in as root.

⁸ PeopleSoft Application Server software includes PSADMIN, COBOL for remote calls and Verity.

⁹ The Java Virtual Machine (JVM) bundled with the installer is used if there is no JVM installed on the installation machine.

- Use the command "ipcs -l" to show the current IPC limits.
- Check if they meet the following limits:

| | |
|-------------------------------------|--------------------|
| fs.file-max | 65536 |
| net.ipv4.ip_local_port_range | 1024 65000 |
| kernel.msgmni | 1024 |
| kernel.msgmax | 131072 |
| kernel.msgmnb | 131072 |
| kernel.shmmni | 4096 |
| kernel.shmmax | 2097152 |
| kernel.shmall | 1073741824 |
| kernel.sem | 250 256000 64 1024 |

- If the limits are not met, edit /etc/sysctl.conf file accordingly. After editing the file, use the "sysctl -p" command or restart the system to invoke the new settings.

8.3.3. Install Oracle PeopleSoft Application Server

- Log in as root.
- Start x-windows if it has not been started.
- Mount the Oracle PeopleSoft installation disk using the mount procedures outlined in section 8.1.
- Change directory to the mount-point of the installation disk.
- Run the setup program
./setup.linux.

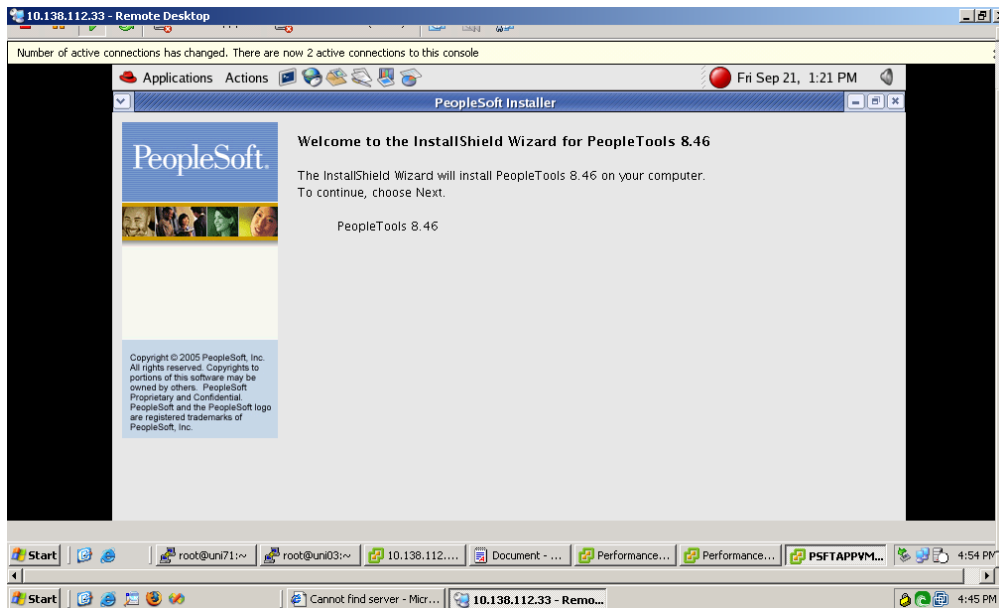


Figure 18. Install PeopleTools 8.46

- Click **Next** in the Welcome screen.
- Click the radio button to accept the license agreement and click **Next**.
- Enter your license code and click **Next**.
- Choose a Unicode or non-Unicode database and click **Next**.
- Select **Application Server** and click **Next**.
- Specify the directory where you want to install PeopleTools and click **Next**.
- Enter the Tuxedo directory.
- The next screen lists the PeopleTools components/features for which you are licensed. Accept the defaults for the PeopleTools features and click **Next**.
- Check the information in the installation confirmation window. If the information is correct, click **Next**. Otherwise click **Back** to make the necessary changes.
- When prompted, change the CD during the installation process.
- Click **Finish** to complete the setup.

8.4. Oracle Client Installation

This exercise assumes a pre-existing Oracle database. For a PeopleSoft Application Server to be able to communicate with the Oracle database, you have to install a database client such as Oracle Client. This section outlines the installation procedure of Oracle Client¹⁰.

To install Oracle Client, follow the procedure below:

- **Setup Oracle account.**
 - Execute the following commands as root in the guest operating system:
 - `groupadd oinstall`
 - `groupadd dba`
 - `useradd -g oinstall -G dba -s /bin/ksh oracle`
 - `chown -R oracle:dba /home/oracle $ORACLE_HOME`
 - `passwd oracle`
- Mount the Oracle Client installation disk using the mount procedures outlined in section 8.1.
- Change directory to the mount-point of the installation disk.
- Run the Oracle Installer.
 - **./runInstaller**
- Click **Next** in the Welcome page.
- Specify the inventory directory and the name of the group that has write permission to the inventory directory (e.g. **/home/oracle/orainventory** for the inventory directory and **oinstall** for the group name), and click **Next**.
- Selection the installation type **Administrator** and click **Next**.
- Specify Oracle home name and path (e.g. **OraClient10g_home1** and **/u01**) and click **Next**.
- If all the specific prerequisites are met, click **Next**. Otherwise, click **Back** to fix the failed prerequisites and retry.
- Click **Install** in the Summary page.
- Monitor the installation progress and wait until it finishes.
- When the installation finishes, Oracle Net Configuration Assistant launches. Click **Next** in the Welcome page.
- Select the naming methods (e.g. **Local Naming**) and click **Next**.
- Enter the service name (e.g. **PS**) and click **Next**.

¹⁰ Using Oracle 10g results in PeopleSoft Application Server domain failing to start, the name of one of the shared library has to be changed in order to resolve this issue. See Appendix 3.

- Select the protocol (e.g. **TCP**) and click **Next**.
- Enter the host name of the database server (e.g. **10.138.112.102**) and the port number (e.g. the standard port number **1521**) and click **Next**.
- Choose whether to perform a connection test to the database and click **Next**.
- Click **Next** in the test status page.
- Enter the net service name (e.g. **PS**) and click **Next**.
- Select **No** to configure another net service name and click **Next**.
- Click **Next** in the configuration complete page.
- Click **Finish** in the Oracle Net Configuration Assistant page.
- Execute two configuration scripts **/home/oracle/orainventory/orainstRoot.sh** and **\$ORACLE_HOME/root.sh** and click **OK**.
- Click **Exit** in the End of Installation page.

8.5. PeopleSoft Domain Configuration and Boot

You will need to create and configure a PeopleSoft domain before booting it. The application server is in service after the domain is booted.

To create a PeopleSoft domain, follow the procedure below:

- Launch the PSADMIN program:
/opt/PT8.46/appserv/psadmin
- Enter **1** to administer an application server.
- Enter **2** to create a domain.
- Enter the name of the domain that you wish to create, e.g. **PS**.
- Select the configuration template, e.g. **3** for a medium-size domain.
- Enter **'y'** to configure the domain.
- In the configuration menu, change the items according to your requirements. For the environment in the Unisys lab, the configuration is as below:

| | |
|--------------------|----------|
| DBNAME | PS |
| DBTYPE | ORACLE |
| UserId | PS |
| UserPswd | PS |
| DomainID | TESTSERV |
| ConnectID | people |
| ConnectPswd | peop1e |

- After properly configuring the items, enter **11** to load the configuration.
- Enter **1** to boot the domain.

9. Application Web Tier Installation

You can install a web server virtual machine in a procedure similar to that for an application server virtual machine. Refer to PeopleSoft Installation guide titled *Enterprise PeopleTools 8.46 Installation for Oracle* for the installation details of the necessary web server components.

This section outlines the procedure to convert a physical web server to a web server virtual machine as an alternative for the customers who have a pre-installed web server. The procedure illustrates the P2V (physical to virtual) capability provided by VMware® Converter. The same procedure can be used to migrate your PeopleSoft applications from a physical environment to a virtual machine environment.

9.1. Conversion From A Physical Web Server As An Alternative

A server in the Unisys lab had a pre-installed web server hosted on Windows Server 2003 for the PeopleSoft Internet Architecture (PIA). Instead of installing a web server virtual machine from scratch, VMware Converter was leveraged to import the physical web server as a virtual machine to the VMware Infrastructure.

VMware Converter allows you to convert a physical machine with pre-installed operating system and applications to a virtual machine and import it into the VMware Infrastructure. You have the option to convert a running physical machine to a virtual machine or to convert an idle machine to a virtual machine (i.e. Cold Clone).¹¹

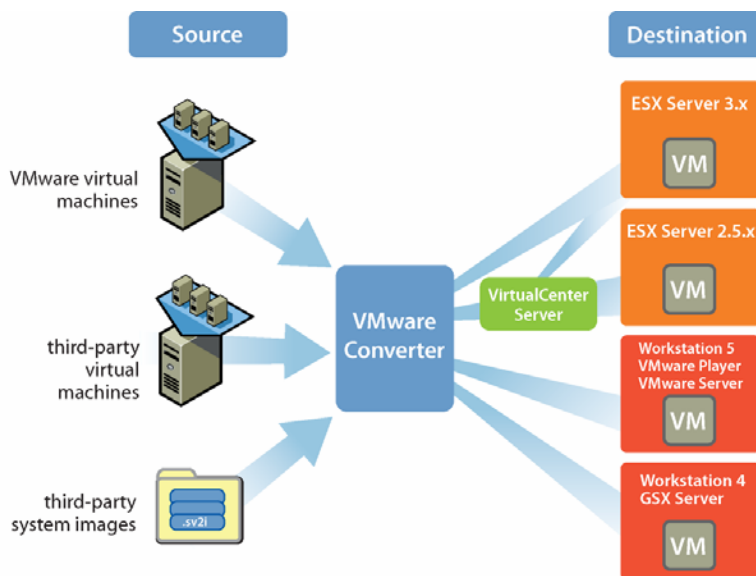


Figure 19. VMware Converter

¹¹ VMware Converter provides functionalities to clone a running physical machine. Refer to VMware Converter documentation for more details.

Follow the procedure below to convert a physical machine to a virtual machine image using Cold Clone:

To boot off the CD, set options, and start the application:

- Burn a Converter Boot CD from the Cold Clone iso image distributed on the VMware Converter disk.
- Insert the Converter Boot CD in the source machine and restart the machine.
- Within 10 seconds, press any key to boot into the operating system on the CD.
- Configure the network parameters such as static IP address, subnet mask, and so forth.
- Optionally, in the Network Configuration dialog box, change the location for the temporary files, including the logs. (**NOTE:** By default, temporary files are stored in RAM disk. After the VMware Converter application is launched, the directory for temporary files cannot be modified.)
- The VMware Converter application launches.

To start the wizard:

- Click **Import Machine** in the upper left part of the toolbar.
- Click **Next** on the Welcome to the VMware Converter Import Wizard page.

To select your source data:

You can choose which of the source machine's volumes to import and indicate the size you want them to be in the new virtual machine. You can also import with all disks unchanged.

- On the Source page, click **Next** to move on to the Source Data page.
- To import all disks unchanged, make sure the **Import all disks and maintain size** radio button is selected and follow the remaining steps in this procedure.
- Deselect any volumes you do not want to import.
- Specify the volume size you want in the **New Disk Space** drop-down combo box, and click **Next**. The choices are:
 - Maintain Size (<size from Total Size column>): Choose to keep the original volume size.
 - Min Size (<size from Used column, plus a little additional>): Choose to import just the used portion from the volume, with a small amount of space added.
 - <Type Size in GB>: Choose to enter a specific size in gigabytes.
 - <Type Size in MB>: Choose to enter a specific size in megabytes.

To import your source machine as an ESX Server Virtual Machine:

Follow these steps if you are importing the virtual machine to run in ESX Server or in ESX Server managed by VirtualCenter.

- Click **Next** on the Destination header page to move to the Destination type page.
- Select VMware ESX Server radio button and click **Next**.
- In the *Destination Login* page, log on to its destination server and click **Next**.
- In the *Virtual Machine Name* page, enter the name you want to assign to the virtual machine, and click **Next**.
- In the *Host* page, choose the specific host for the virtual machine and click **Next**.
- Specify the datastore for the virtual machine's configuration files and disks, and click **Next**.
- Map the virtual machine's network adapters to a VirtualCenter network in the Networks page, and click **Next**.

To install VMware Tools on the virtual machine:

- On the customization page select **Install VMware Tools** and deselect **Customize the identity of the new virtual machine**¹². Click **Next**.

To complete the import task creation:

- Review the summary of the settings for the new virtual machine.
- To have the new virtual machine powered on after the conversion is completed, select **Power on the new Virtual Machine after creation**. Click **Finish**.

To customize the virtual machine manually:

- Change the computer name of the virtual machine
 - Go to **control panel > system**.
 - Go to **Computer Name** tab.
 - Click on **Change** button.
 - Enter the new computer name (e.g. **PSFTWEBVM1**).
 - Click **OK**.
- Change the TCP/IP configurations of the virtual machine
 - Go to **control panel > network connections**.
 - Right click on the desired network connection and select **properties**.
 - Select **Internet Protocol (TCP/IP)** and click on **Properties**.
 - Enter the IP address and DNS server configurations and click **OK**.

9.2. Connecting the web tier and the application tier

In order to connect the web tier with the application tier, the configuration file of the web server(s) needs to be changed. Follow the procedure below to configure the web server:

- Open the configuration file **configuration.properties**¹³.
- Change the value of the key **pserver** to point to the IP address(es) of the application server(s). For example: **pserver=10.138.112.80:9000**

¹² You can choose to customize the virtual machine as part of the process. Refer to the VMware Converter User's Manual for the procedure.

¹³ In the Unisys lab, the virtual web server has the configuration file **configuration.properties** in the path `C:\PT8.46\websrv\Kannan\applications\peoplesoft\PORTAL\WEB-INF\psftdocs\KM`

10. Gold Image for PeopleSoft Application Tier Deployment

VMware Infrastructure allows you to install the software suite on one virtual machine and create a template based on that virtual machine. This template serves as a gold image for rapid provisioning of the rest of the virtual machines. Oracle PeopleSoft Enterprise users can leverage VMware Infrastructure to achieve the same rapid provisioning of their application tier.¹⁴ This section explains the process of creating a gold image from the virtual machine created in section 7.

10.1. Virtual Machine Shutdown

Shut down the virtual machine **PSFTAPPVM1** gracefully by shutting down the PeopleSoft domain first.

Shutdown the PS Domain:

- Launch the PSADMIN program.
- **/opt/PT8.46/appserv/psadmin**
- Enter **1** to administer an application server.
- Enter **1** to administer a domain.
- Select the **PS** domain.
- Enter **2** for the domain shutdown menu.
- Enter **1** for normal shutdown.
- Enter **q** until you exit out from the program.

Shutdown the virtual machine:

- In an x-windows console window, execute **shutdown now -h**.

10.2. Virtual Machine Template

This section outlines how to create a virtual machine template from **PSFTAPPVM1** by cloning it to template.

10.2.1. Virtual Machine Template Creation

Follow the procedure before to perform virtual machine template creation:

- Make sure that **PSFTAPPVM1** is shut down.
- In VirtualCenter Client, select PSFTAPPVM1 in Inventory View.
- Right click on PSFTAPPVM1 and select **Clone to Template ...**
- Enter the following parameters in the wizard:

¹⁴ You can use the virtual machine cloning feature to achieve cloning of the database tier as well. The procedure is similar to the cloning of the application tier. VMware highly recommends that you evaluate the virtualization of the database tier in your deployments carefully.

| | |
|--------------------------|---|
| Name and Folder | Template Name |
| | PSFTAPPTEMP |
| Host / Cluster | Select the host desired for the cloned virtual machine to reside in. 10.138.112.103 is used in this scenario. |
| Datastore | Pick a datastore that is preferably visible to both ESX hosts: ORAPSFT |
| Disk Format | Select Compact |
| Ready to Complete | Click Finish |

10.3. Clone from Virtual Machine Template

You can use the virtual machine template to clone other Oracle PeopleSoft application servers. To clone another Oracle PeopleSoft application server, follow the procedure below:

- In VirtualCenter Client, select **PSFTAPPTEMP** in **Virtual Machines & Templates** View.
- Right click on **PSFTAPPTEMP** and select **Clone...**
- Enter the following parameters in the wizard:

| | |
|----------------------------|---|
| Name and Folder | Virtual Machine Name |
| | PSFTAPPVM2 |
| Host / Cluster | Select the host desired for the cloned virtual machine to reside in. 10.138.112.103 is used in this scenario. |
| Datastore | Pick a datastore that is preferably visible to both ESX hosts: ORAPSFT |
| Guest Customization | Select Do not customize |
| Ready to Complete | Click Finish |

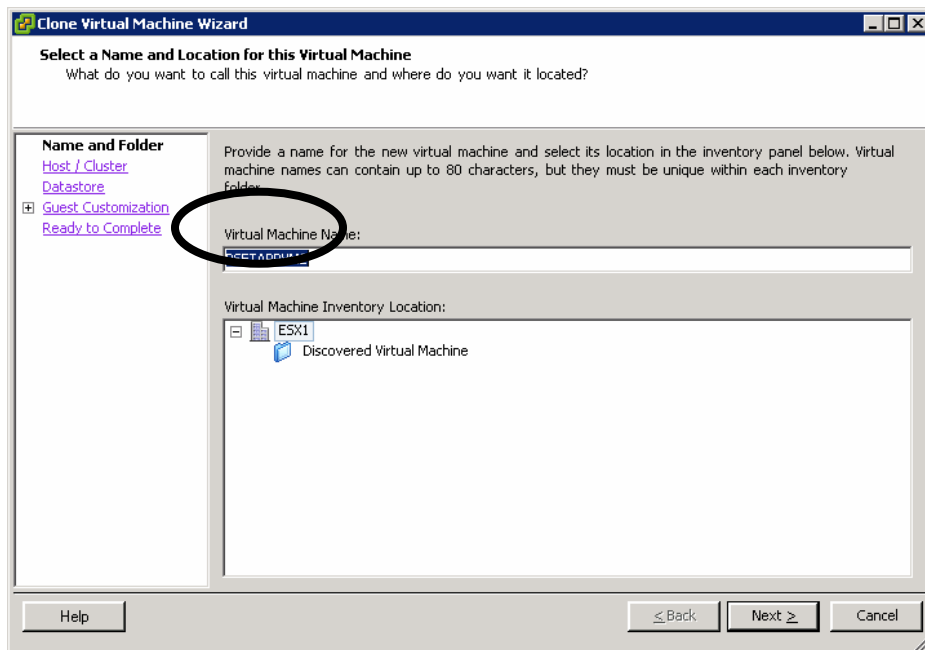


Figure 20. Specify name for the cloned virtual machine.

10.4. Customize the Cloned Virtual Machine

Before the cloned virtual machine can start functioning as an Oracle PeopleSoft application server, it needs to be customized.

To customize the virtual machine, follow the procedure below:

- Turn on the virtual machine **PSFTAPPVM2**.
- Configure the network interface:

| | |
|---|---|
| <p>As root, execute: # system-config-network</p> | <ol style="list-style-type: none"> 1. Make sure that the IP address and subnet mask are configured properly. 2. Make sure that the MAC address reflects the new hardware. Press the probe button in the GUI to perform a hardware probe. 3. Make sure that the host name does not collide with any existing hosts. |
| <p>As root, execute: # /etc/init.d/network restart</p> | <p>Make sure that the new settings take effect.</p> |
| <p>Modify /etc/hosts</p> | <p>Make sure that the new host name is entered in this file. An example is shown below:</p> <pre>127.0.0.1 localhost 10.138.112.82 PSFTAPPVM2.oracle.com PSFTAPPVM2</pre> |

1. Configure the **PS** Domain:
 - Launch the PSADMIN program
/opt/PT8.46/appserv/psadmin
 - Enter **1** to administer an application server
 - Enter **1** to administer a domain
 - Select the **PS** domain
 - Enter **4** to configure the PS domain
 - In the configuration menu, change the items according to your requirements. For the environment in the Unisys lab, the configuration is as below:

| | |
|--------------------|-------------------------------|
| DBNAME | PS |
| DBTYPE | ORACLE |
| UserId | PS |
| UserPswd | PS |
| DomainID | TESTSERV2¹⁵ |
| ConnectID | people |
| ConnectPswd | peop1e |

- After properly configuring the items, enter **11** to load the configuration.
- Enter **1** to boot the domain

¹⁵ Using a different DomainID for a different PeopleSoft application server is recommended.

10.4.1. Connect the Web Tier to the Cloned Application Server

You need to configure the web server in order for it to connect to the cloned application server. Follow the procedure outlined in section 9.2 and change the value of the key **psserver** to point to the IP address(es) of the cloned application server(s).

For example: **psserver=10.138.112.80:9000, 10.138.112.82:9000**

10.4.2. Start and stop a web server

After the configuration of a web server changes, you need to restart the web server. See below for the commands used with a BEA WebLogic server.

| | |
|---------------------|--|
| setEnv.cmd | Sets the environment according to the latest configuration file. ¹⁶ |
| startPIA.cmd | Starts the Pure Internet Architecture (web server instance) |
| stopPIA.cmd | Stops the Pure Internet Architecture (web server instance) |

¹⁶ The path of these commands depends on the installation. In the virtual web server in the Unisys lab, the path is c:\PT8.46\websevr\Kannan.

11. VMware High Availability

VMware High Availability (HA) is a feature that automatically restarts on another available ESX Server host any virtual machines residing on a failed ESX Server host. The restart of the virtual machines finishes within minutes, without human intervention. VMware HA enhances availability of the Oracle PeopleSoft Enterprise Servers.

11.1. Network Card Redundancy

Unisys ES7000/One servers and ES3040 servers have 4 NIC cards. You can configure network card redundancy in two ways using VMware Infrastructure:

- NIC Teaming
- Redundant Service Console Port

11.1.1. NIC Teaming

NIC teaming groups NIC cards together to serve one virtual switch. To add a new NIC card to a virtual switch, follow the procedure below:

- Select desired host.
- Go to Configuration Tab.
- Go to Networking.
- Select **Properties** for vSwitch0.
- Go to **Network Adaptors Tab**.
- Select **Add**.

In the Add Adaptor Wizard, enter the following:

| | |
|------------------|---|
| Adaptor | Select the network adaptor. |
| NIC order | Have the new NIC card moved down to be a Standby adapter. |
| Summary | Click on Finish. |

11.1.2. Redundant Service Console Port

To build a redundant service console port that is connected to a separate NIC card in case the other one fails, follow the procedure below:

Use VirtualCenter Client:

- Select desired host.
- Go to Configuration Tab.
- Go to Networking.
- Select **Add Networking**.

- In the **Add Network Wizard**, enter the following:

| | |
|----------------------------|---|
| Connection Type | Select Service Console . |
| Network Access | Create a virtual switch using a NIC that has not been connected to any virtual switch, e.g. vmnic1. |
| Connection Settings | Port Group Properties |
| | Network Label: Service Console 2 |
| | IP Settings |
| | IP Address: 10.138.112.84 /Subnet Mask: 255.255.255.0 |
| Summary | Click on Finish . |

11.2. Configure HA Cluster

To configure a VMware HA cluster, follow the procedure below:

- In VirtualCenter Client:
 - Right-click on **Data Center** and select **New Cluster**.
 - In the New Cluster Wizard, enter the following:

| | |
|--------------------------|--|
| Cluster Features | Name |
| | PSFTCLUS |
| | Cluster Features |
| | VMware HA |
| VMware HA | Host Failures |
| | Number of host failures allowed: 1 |
| | Admission Control |
| | Select Do not start virtual machines if they violate availability constraints . |
| Ready to Complete | Click on Finish . |

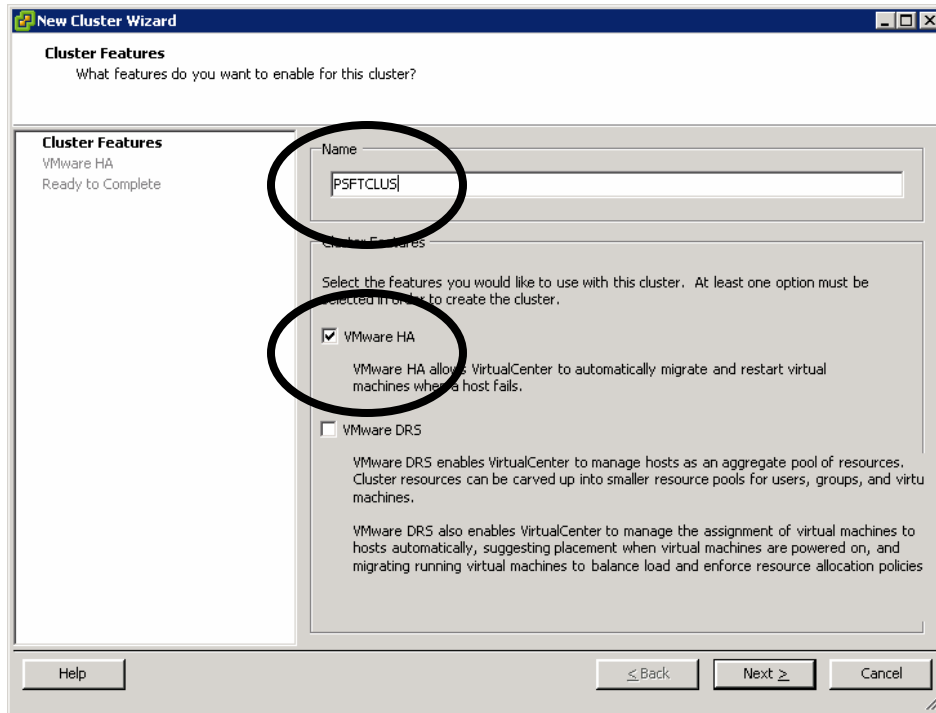


Figure 33. Configure HA Cluster – Cluster Features

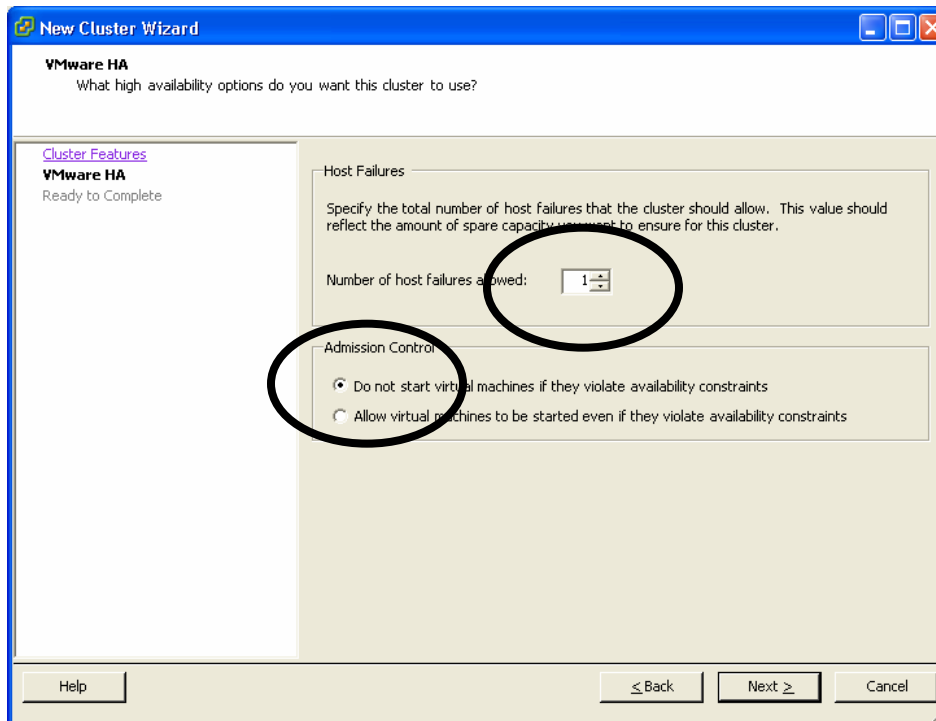


Figure 34. Configure HA Cluster – VMware HA – Host Failures + Admission Control

- Drag-and-drop both of the ESX Server hosts to PSFTCLUS.

11.2.1. PSADMIN auto-start configuration

Note that VMware HA does not restart the psadmin process when it restarts a virtual machine. Configure the kernel so that the psadmin program boots the application server domain when the virtual machine is restarted.

To boot the application server domain during kernel boot time, include the following line in */etc/rc.local*:

```
psadmin -c boot -d PS
```

12. VMware VMotion

VMware VMotion migrates the virtual machine(s) from one ESX Server host to another without disruption of the services running on the virtual machine(s). This feature is called *Live Migration*. You can leverage Live Migration for scenarios such as scheduled maintenance of a particular ESX Server host. By doing so, you can move the virtual machines without causing any interruption to end users.

Before configuring VMware VMotion, ensure the following:

- The hardware of the two ESX Server hosts, in particular the CPU, is compatible.
- All the virtual switches have identical configurations for both ESX Server hosts
- A VMkernel Port is configured on both ESX Server hosts.

12.1. Configure VMkernel Port

To configure a VMkernel Port, follow the procedure below:

- In VirtualCenter Client, select the desired ESX Server host.
- Go to **Configuration Tab/Networking**.
- Select **Add Networking**.
- In the **Add Network Wizard**, enter the following:

| | |
|----------------------------|---|
| Connection Type | Select VMkernel . |
| Network Access | Use vSwitch0 . |
| Connection Settings | Port Group Properties |
| | Network Label: VMkernel |
| | Check the box labeled "Use this port group for VMotion." |
| | IP Settings |
| | IP Address: 10.138.112.86 /Subnet Mask: 255.255.255.0 |
| Summary | Click on Finish. |

12.2. Live Migration

To perform *Live Migration* on a virtual machine, follow the procedure below:

- In VirtualCenter Client, right click on the desired virtual machine.
- Select **Migrate**.
- In the Migrate Virtual Machine Wizard, enter the following:

| | |
|-----------------------------|--|
| Select Destination | Select the redundant ESX Server host. 10.138.112.71 is chosen in this scenario. |
| Select Resource Pool | Leave as default. |
| Migration Priority | Select High Priority . |
| Ready to Complete | Click on Finish. |

Once all the virtual machines on the original ESX Server host have been successfully migrated to the other host, it is safe to put the original host in maintenance mode and perform maintenance work on it.

12.3. Cold Migration

To perform a cold migration on a virtual machine, follow the procedure below:

- Shut down the application and database processes in the virtual machine.
- Power off the virtual machine.
- Right-click on the virtual machine in Inventory View.
- Select **migrate**.
- In the **Migrate Virtual Machine Wizard**, enter the following:

| | |
|-----------------------------|---|
| Select Destination | Select the redundant ESX Server host. In this scenario, it is 10.138.112.71 . |
| Select Resource Pool | Leave as default. |
| Select Datastore | Select Keep virtual machine configuration files and virtual disks in their current locations . |
| Ready to Complete | Click on Finish . |

12.4. Live Migration of Oracle PeopleSoft application servers

In the Unisys lab, a test sequence was executed to validate VMware VMotion, outlined below:

- The physical environment was as section 5.1 depicts.
- On ESX Server **10.138.112.103**, 2 virtual machines were deployed:
 - Oracle PeopleSoft application server **10.138.112.80 (PSFTAPPVM1)**
 - Oracle PeopleSoft application server **10.138.112.82 (PSFTAPPVM2)**
- On ESX Server **10.138.112.71**, 1 virtual machine was deployed.
 - Oracle PeopleSoft Web Server **10.138.112.90 (PSFTWEBVM1)**
- The virtual web server was configured to route the requests to the 2 virtual PeopleSoft application servers in a round-robin fashion.
- ESX Server hosts **10.138.112.103** and **10.138.112.71** were configured to form a HA cluster and were VMotion-enabled.
- The database server **10.138.112.102** was populated with human resource data of a fabricated company.
- Mercury Load Runner was used to run a script that simulates 300 concurrent users doing the following actions:
 - View paycheck as employee.
 - Update salary as manager.
- The script ran indefinitely until manual stop.
- When the workload ran and reached a stable state, loads and activities of physical machines and virtual machines were captured by monitoring tools.

- Live migration of **PSFTAPPVM1** from ESX server **10.138.112.103** to ESX server **10.138.112.71** was performed.
- It was validated that the workload ran smoothly with negligible impact during VMotion.

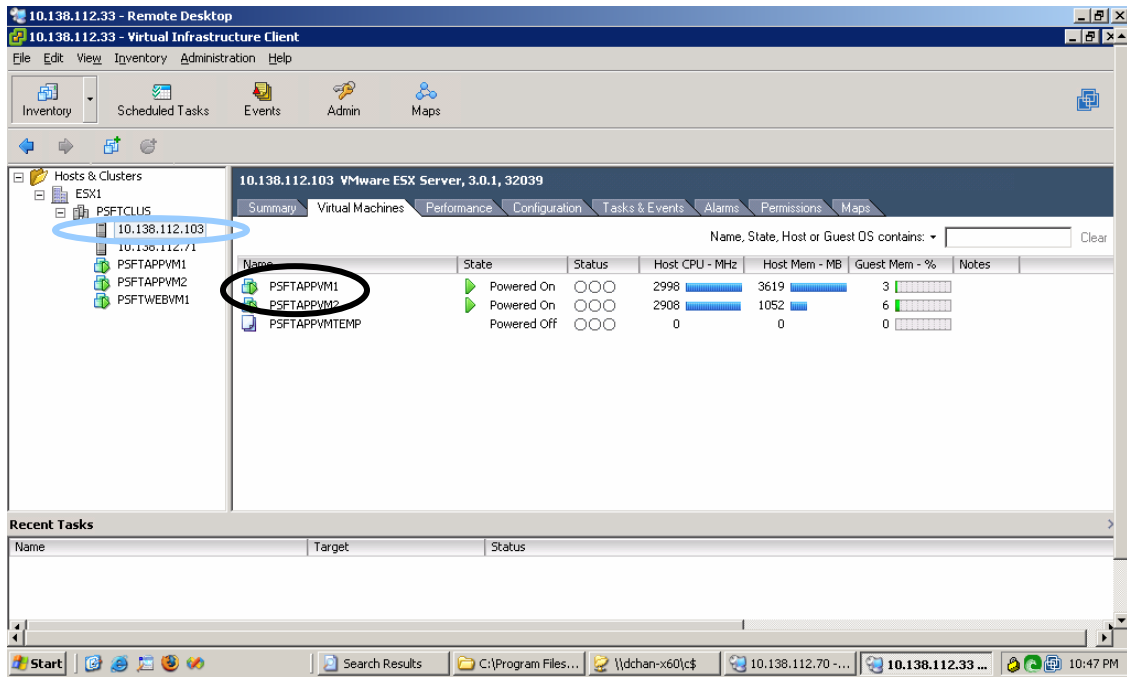


Figure 21. Two virtual PeopleSoft application servers hosted on source ESX Server host 10.138.112.103 before VMotion.

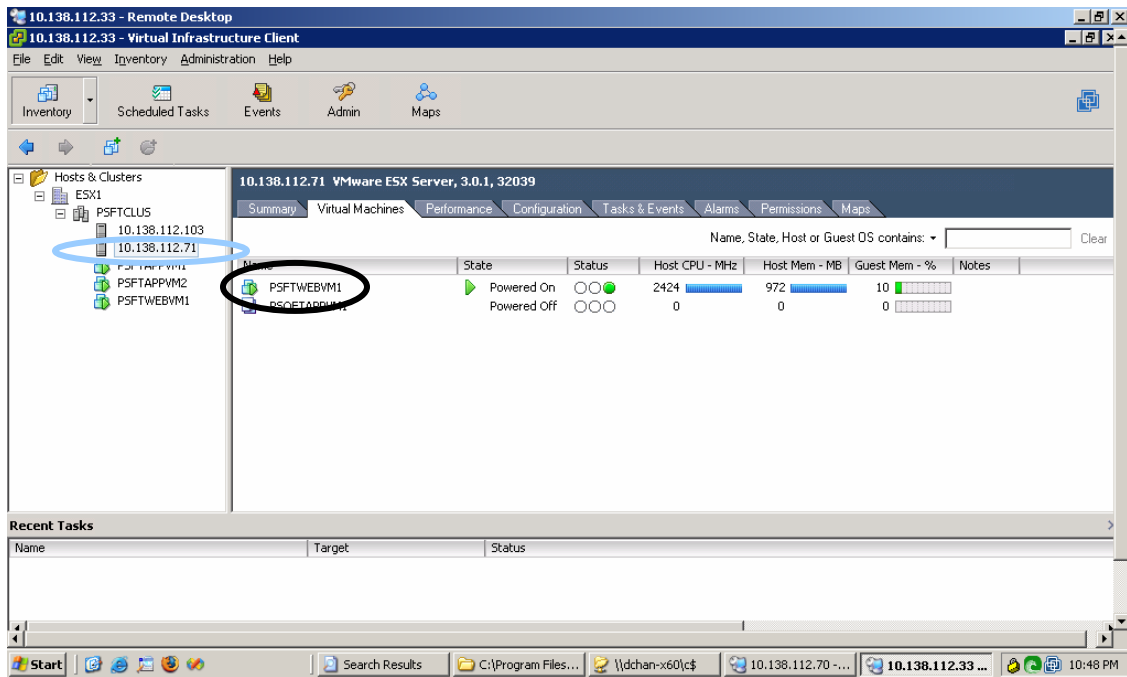


Figure 22. One virtual web server hosted on target ESX Server host 10.138.112.71 before VMotion.

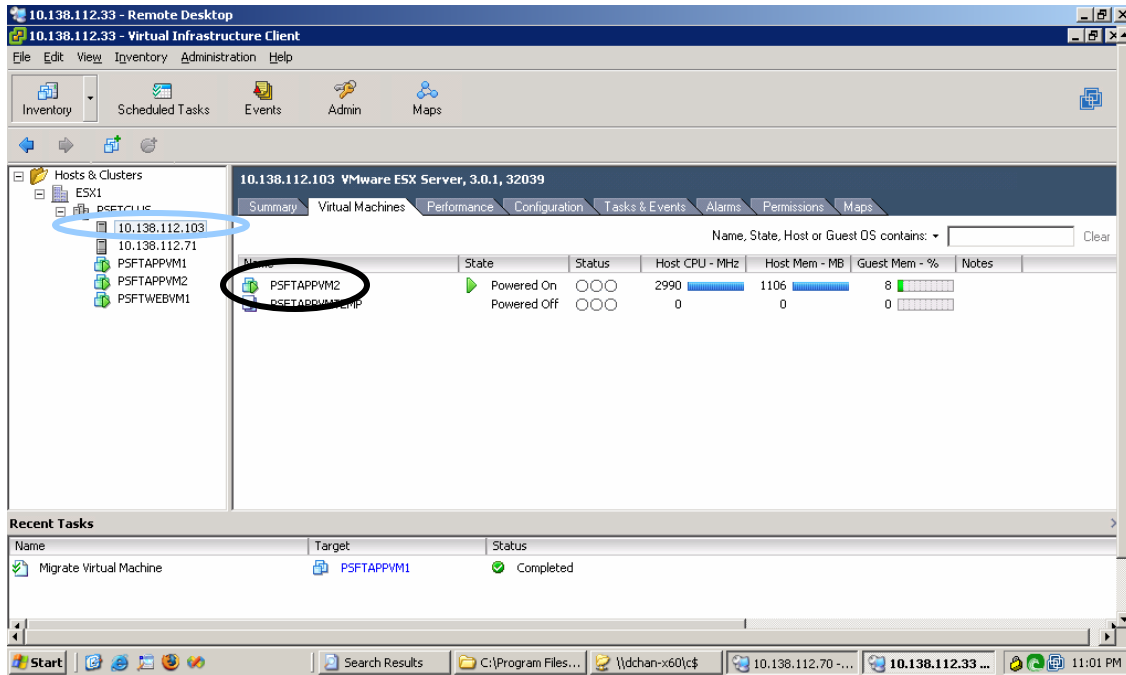


Figure 23. One virtual PeopleSoft application server hosted on source ESX Server host 10.138.112.103 after VMotion.

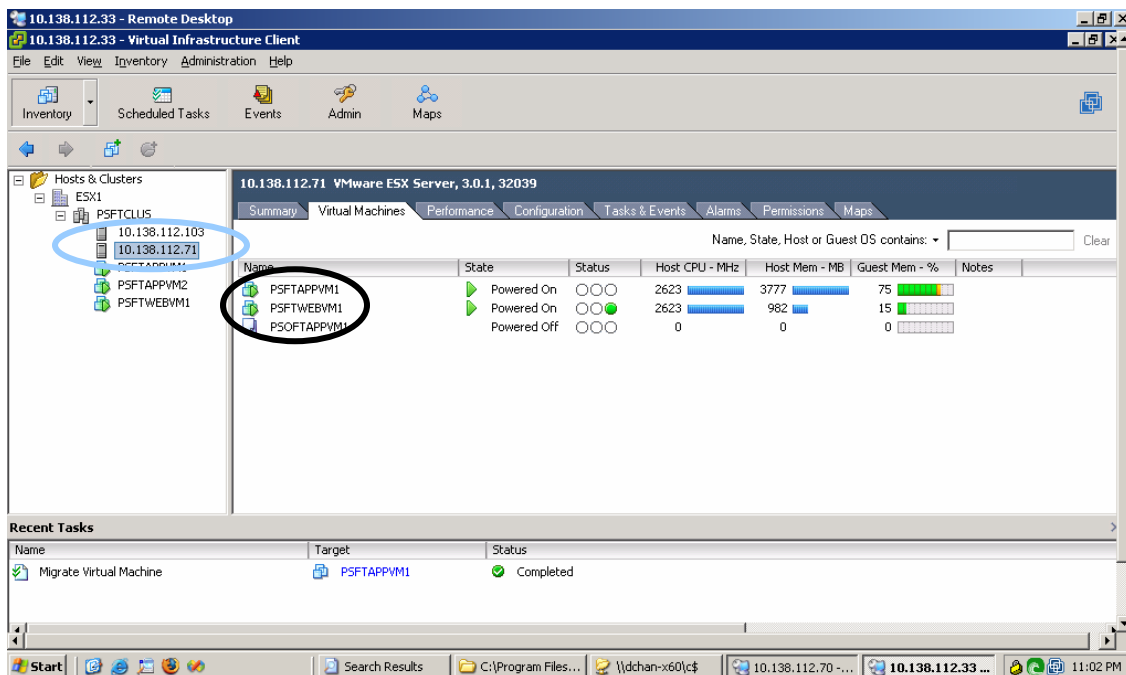


Figure 24. One virtual PeopleSoft application server and one virtual web server hosted on target ESX Server host 10.138.112.71 after VMotion.

12.4.1. ESX Server Host CPU Usage During the Live Migration Process

As PSFTAPPVM1 successfully performed live-migration from source ESX Server host machine 10.138.112.103 to target ESX Server host 10.138.112.71, the CPU usage of the two ESX Server hosts changed, reflecting a lighter load on the source ESX Server host and a heavier load on the target ESX Server host. See the figures below.

12.4.1.1. CPU Usage of Source ESX Server Host 10.138.112.103

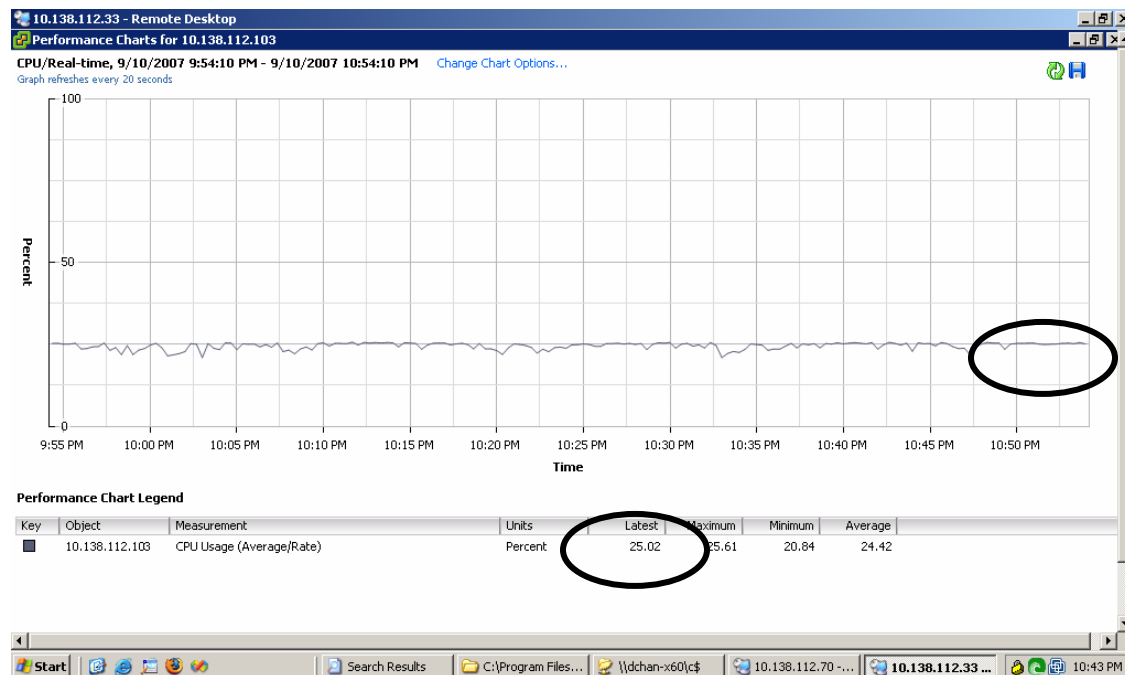


Figure 25. CPU usage of the source ESX Server host 10.138.112.103 at 25.0% before VMotion

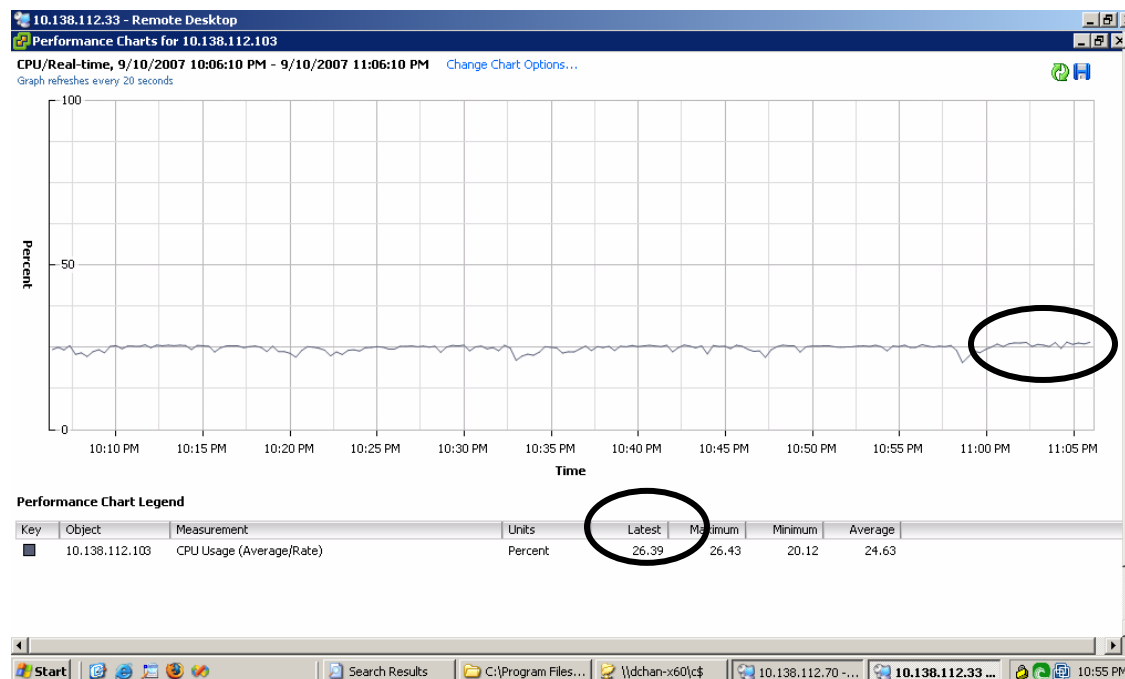


Figure 26. CPU usage of the source ESX Server host 10.138.112.103 at 26.4% during VMotion

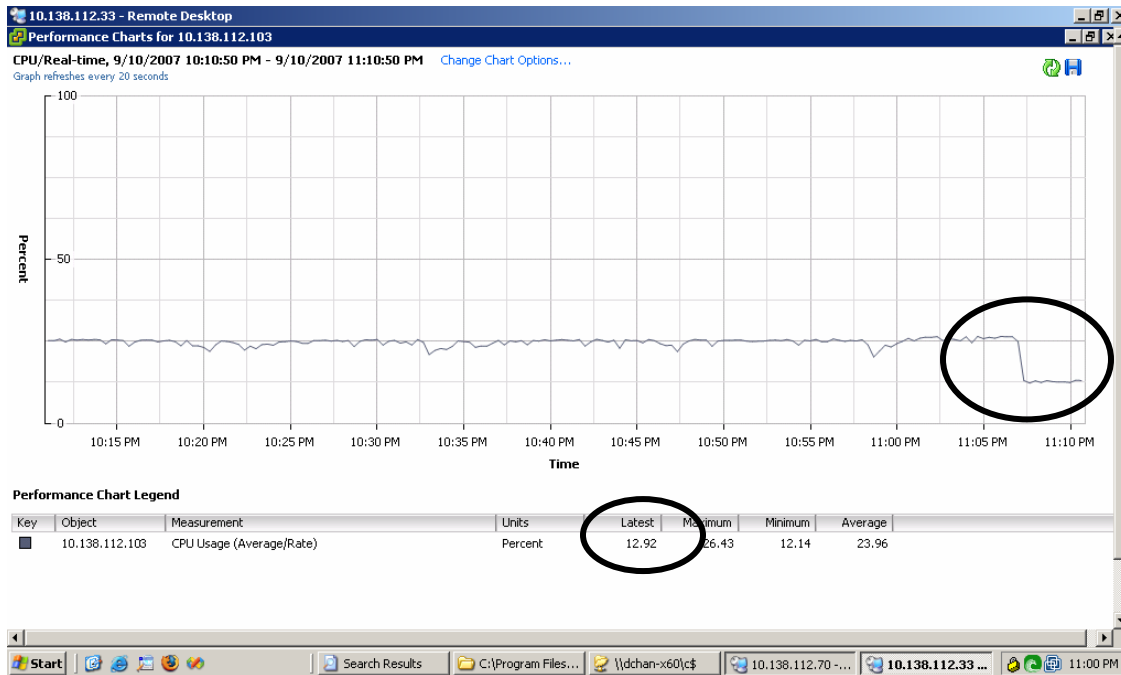


Figure 27. CPU usage of the source ESX Server host 10.138.112.103 at 12.9% after VMotion.

12.4.1.2. CPU Usage of Target ESX Server Host 10.138.112.71

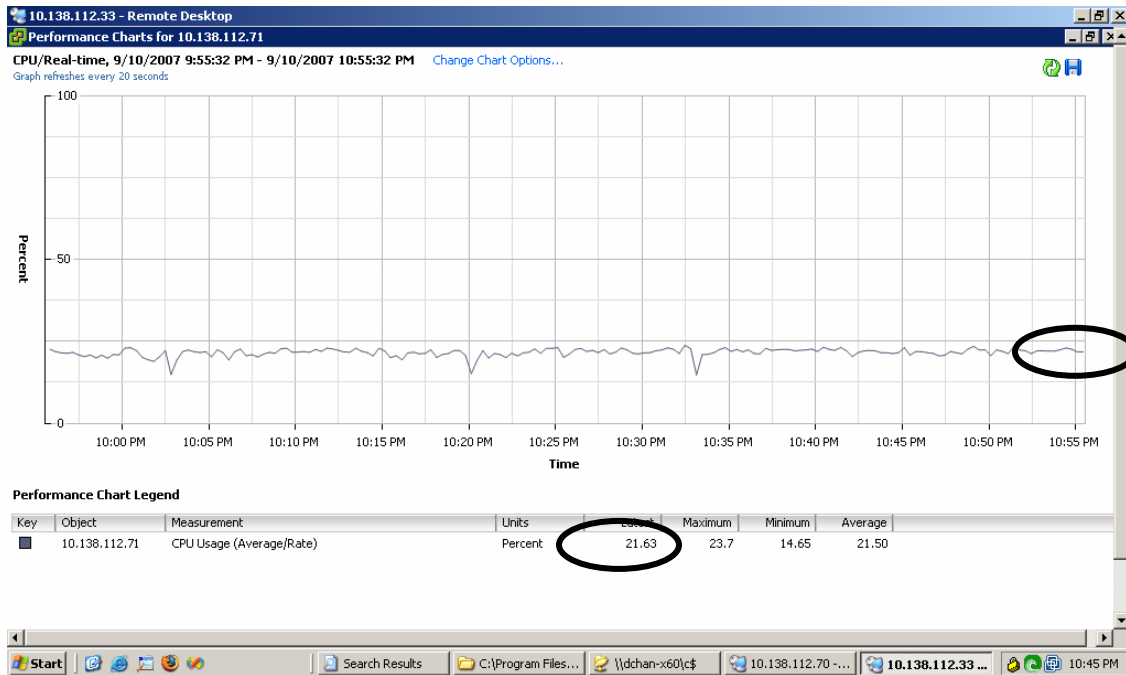


Figure 28. CPU usage of target ESX Server host 10.138.112.71 at 21.6% before VMotion

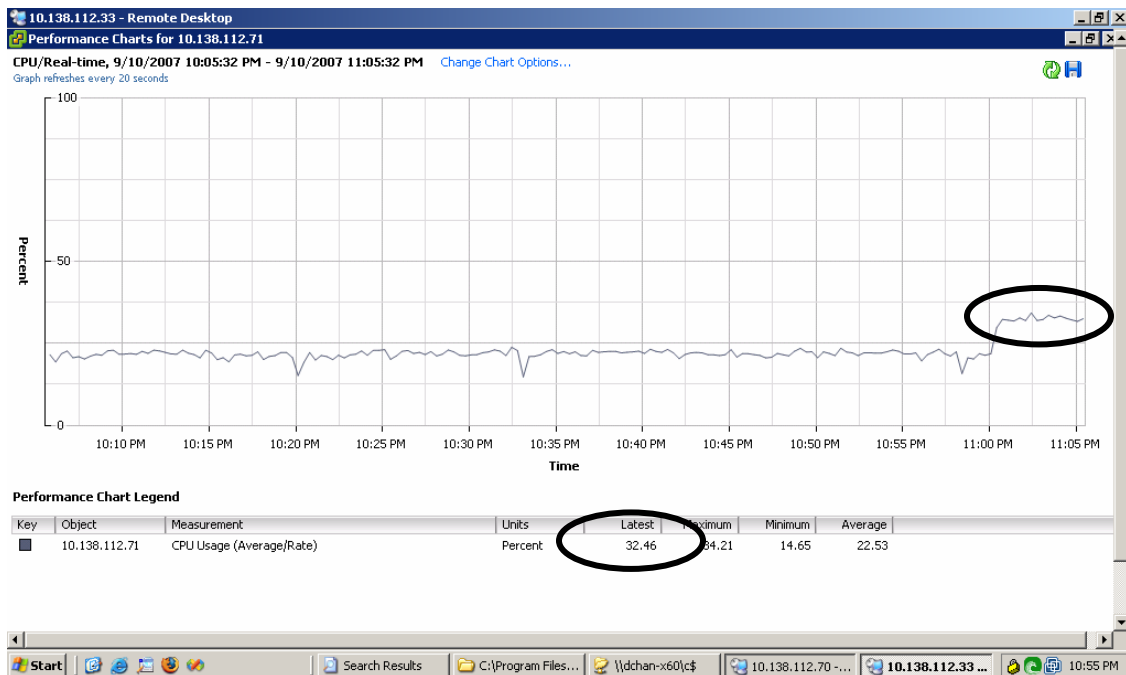


Figure 29. CPU usage of the target ESX Server host 10.138.112.71 at 32.5% during VMotion

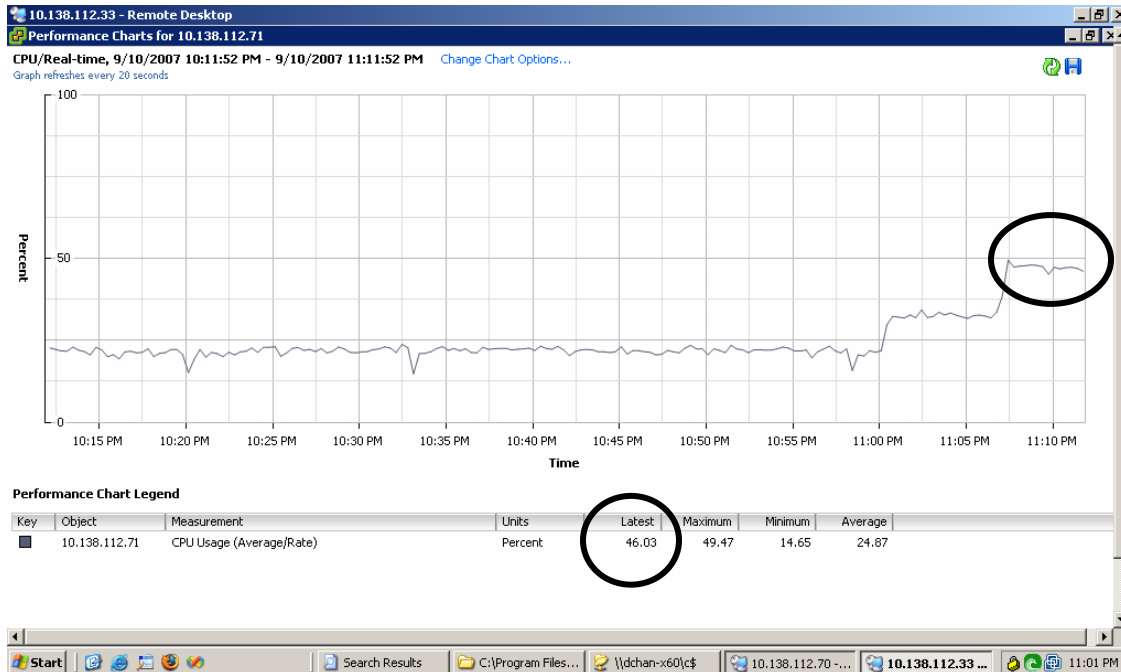


Figure 30. CPU usage of target ESX Server host 10.138.112.71 at 46.0% after VMotion

12.4.1.3. Summary of CPU Usage of the ESX Server Host Machines

The CPU usage of the source ESX Server host machine 10.138.112.103 was at **25.0%** before VMotion. During VMotion, it rose by 1.4% to **26.4%**, accounting for the activities for VMotion. After VMotion, it dropped to **12.9%**. The difference between the CPU usage of the source ESX Server host before and after VMotion is 12.1%.

The CPU usage of the target ESX Server host 10.138.112.71 was at **21.6%** before VMotion. During VMotion, it rose by 11.1% to **32.5%**. After VMotion, the CPU usage moved to **46.0%**, which is 24.4% above the CPU usage before VMotion.

NOTE: The target ESX Server host has half as many physical CPU's as the source ESX Server host¹⁷.

¹⁷ The source ESX Server 10.138.112.103 has 8 CPUs and the target 10.138.112.71 has 4 CPUs.

12.4.2. Workload States During Live Migration Process

This section traces the states of a workload for 300 users submitted to the virtual PeopleSoft environment during a live-migration process – before, during and after VMotion.

12.4.2.1. Before VMotion

Before performing VMotion, a workload for 300 users was submitted by a script run by Mercury Load Runner to the virtual PeopleSoft environment. The workload drove the virtual PeopleSoft virtual machines and the states of their resource usage were captured. These states were then compared to the states during and after VMotion to validate that VMotion had negligible impact on the workload.

Load Of 300 Users Submitted And Sustained

A workload of 300 users ran smoothly and was sustained at a consistent transaction rate for about 7.5 minutes. See **Figure 31** for the illustration of number of users sustained in the workload.

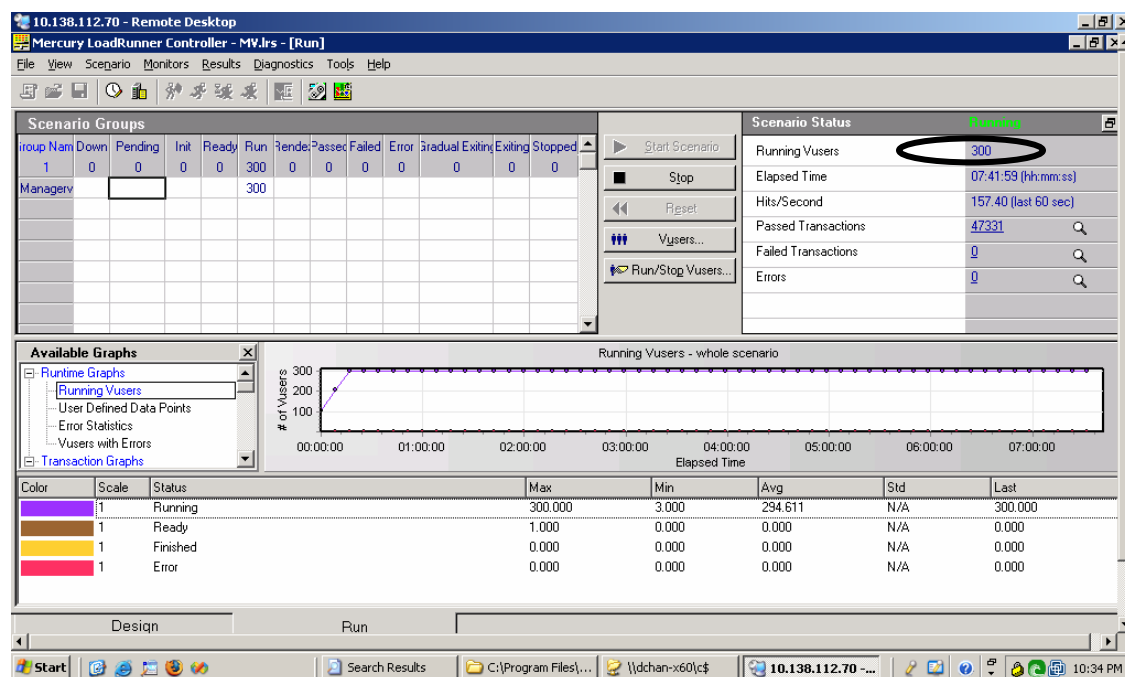


Figure 31. Mercury Load Runner workload of 300 users sustained by the virtual PeopleSoft environment.

12.4.2.2. During VMotion

During VMotion, all 300 users continued their actions without any interruption. The connections remained active and the transactions continued to pass without any problems. See below for more details.

Users Continued Actions Without Interruption

During the live-migration process of **PSFTAPPVM1**, all 300 users continued their actions without interruption. The Mercury Load Runner GUI showed that the number of users remained at 300 during the whole process without any re-connection. See

Figure 32.

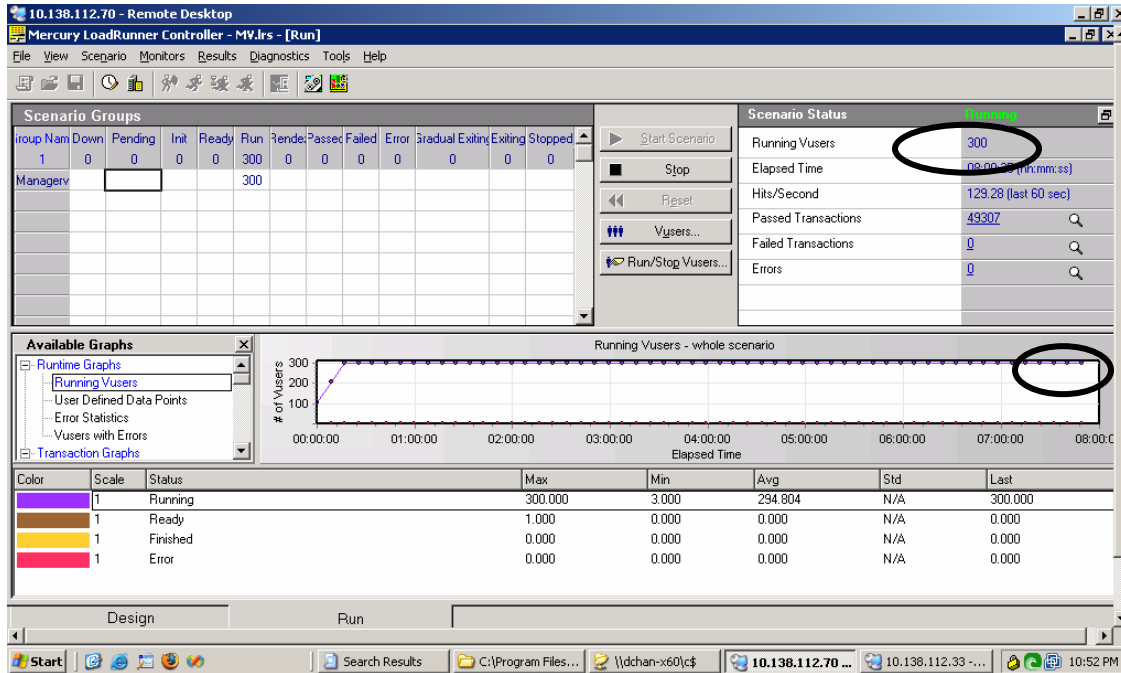


Figure 32. All 300 users remained connected during VMotion

12.4.2.3. After VMotion

After VMotion, Mercury Load Runner showed that the 300 users continued to run without any interruption and the transaction rate remained very similar to before VMotion. See details below.

Users Continued Actions Without Interruption

After performing live-migration of PSFTAPPVM1 to ESX Server 10.138.112.71, the number of users still remained at 300 without any re-connection during the process. See

Figure 33.

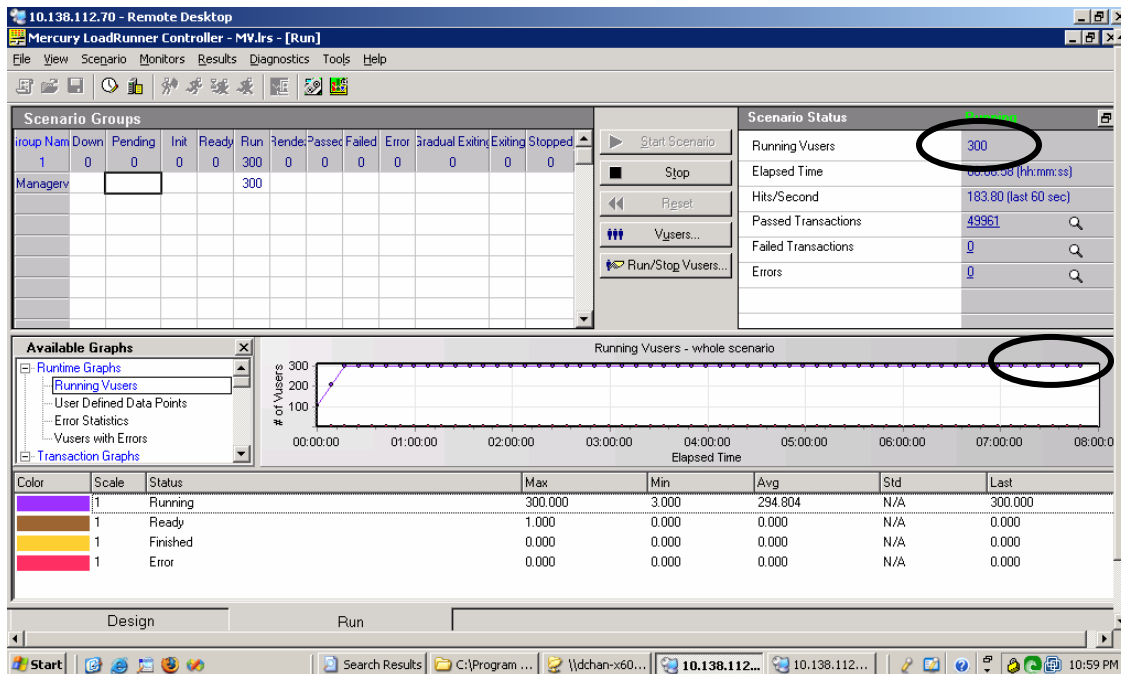


Figure 33. 300 users remained connected after VMotion.

12.4.3. Summary of Live Migration of Virtual Peoplesoft Application Server

The live migration of a virtual PeopleSoft application server PSFTAPPVM1 showed that the workload was not interrupted and even the transaction rate remained the same during the process¹⁸. In summary, VMware VMotion Live Migration did not result in any interruption to the workload and the end users. It is a feature that enables customers to move running application virtual machines between ESX Server hosts, minimizing downtime during hardware maintenance and enhancing overall application availability.

¹⁸ The recorded average-transaction-rate even improved by 0.4 seconds after VMotion.

13. Best Practices

Refer to the best practices below for deployment planning and designing.

Careful Planning

Scrutinize your service level agreement and carefully lay out the peak and average load to help planning. Understand the hardware needed to sustain workload requirements and procure sufficient hardware resources for the planned workload. Carefully plan the deployment of virtual machines that will run on the ESX Server hosts.

Avoid Memory Over-Commitment

Avoid memory over-commitment in virtual machine configuration. Memory over-commitment can result in paging-to-disk activity, which is detrimental to the Oracle PeopleSoft Enterprise workload performance. Allocate sufficient memory for the virtual machines to avoid paging-to-disk.

Start with 1 or 2 vCPU Virtual Machines

Start with 1 or 2 vCPU virtual machines. Stay at 1 or 2 vCPU unless careful analysis using system tools shows value for higher-vCPU virtual machines. VMware recommends that you use a combination of system OS tools and VMware monitoring tools (such as VirtualCenter resource monitoring).

NOTE: vmkusage and esxtop are monitoring tools to monitor CPU, memory and IO characteristics but need to run on the ESX Server service console. VMware does not recommend running any program on the service console unless directed to do so by the administrator or VMware support

Use Latest Processor Generation

VMware highly recommends using servers built with the latest processor generation (e.g. Intel Xeon 51xx/53xx, AMD Opteron rev.E/F at the time of this writing).

Leverage VMware High Availability Features

Use VMware High Availability and VMotion to provide enhanced high availability and fault tolerance. VMware High Availability can ensure that a virtual machine on a failed ESX Server host can be restarted in a timely manner on another ESX Server host in the same HA cluster. Use VMotion to move a virtual machine from one ESX Server host to another one without having to shut it down, eliminating downtime to the service.

NOTE: VMware HA does not provide process level fail-over but rather a virtual machine level restart.

Leverage VMware Virtual Machine Templates

To deploy additional virtual machines efficiently, create templates from virtual machines with pre-installed and pre-configured OS and/or Oracle software. You can archive a library of templates for later use, and can benefit tremendously from leveraging the template-cloning feature.

Leverage VMware Snapshots

VMware Snapshots are ideal for journaling virtual machine states at different times. You can generate a snapshot of your virtual machines before making any changes, such as upgrading and patching. In case the changes cause undesirable results, you can easily roll back to a previous snapshot with all of the original states saved.

VMware Tools

Install the latest VMware Tools on the guest operating systems of all virtual machines to ensure high performance in memory, network bandwidth and graphics.

Avoid Running Programs in the ESX Server Service Console

Running programs in the ESX Server service console can adversely affect the performance of virtual machines and the ESX Server host if the programs consume excessive amounts of CPU or memory.

VMware recommends that you not use the ESX Server service console directly for any administrative tasks. Use the VMware® VirtualCenter management interface, as well as SDK interfaces if required, for the administration of virtual machines running the Oracle PeopleSoft Enterprise environment.

VMware NIC teaming

Purchase more than one NIC card for an ESX Server host machine, and group the cards as a NIC team to provide redundancy and increased performance resulting from traffic distribution across the NIC cards.

14. Conclusion

Oracle PeopleSoft Enterprise software provides comprehensive business and industry solutions, enabling organizations to significantly improve business performance and productivity. Deployment and maintenance of multi-tier Oracle PeopleSoft applications in a physical environment is not a trivial task. VMware Infrastructure enables you to streamline Oracle PeopleSoft deployment and maintenance by providing the following capabilities:

- Server containment
- Rapid provisioning
- Change management
- High availability: business continuity and disaster recovery

With careful design and planning, you can make Oracle PeopleSoft virtualization a streamlined and efficient process. This paper provides procedures for performing a physical-to-virtual machine conversion, streamlining deployment using a gold image and enhancing availability by way of VMware High Availability and VMware VMotion. You can leverage these features and procedures to improve your Oracle PeopleSoft virtualization process. In addition, VMware recommends that you leverage features such as VMware® Snapshot and VMware® Consolidated Backup to make your Oracle PeopleSoft virtual environment more robust.

15. Resources

You can find more information about VMware and Oracle PeopleSoft products via the links listed below:

VMware Official Website: www.vmware.com
Oracle Official Website: www.oracle.com
Unisys Official Website: www.unisys.com

15.1. VMware

VMware Infrastructure 3 product website:
http://www.vmware.com/products/data_center.html
VMware Infrastructure 3 download website:
<http://www.vmware.com/download/vi/eval.html>
VMware support website
<http://www.vmware.com/vmtn/>
VMware Best Practices Papers
http://www.vmware.com/pdf/vsmp_best_practices.pdf
http://www.vmware.com/pdf/vi_performance_tuning.pdf
VMware Products
<http://www.vmware.com/products/>
VMware Infrastructure 3 system compatibility guide
http://www.vmware.com/pdf/vi3_systems_guide.pdf¹⁹
VMware Converter
<http://www.vmware.com/download/converter/>

15.2. Oracle PeopleSoft

Oracle PeopleSoft Enterprise Website:
<http://www.oracle.com/applications/peoplesoft-enterprise.html>
PeopleTools 8.4: PeopleSoft Internet Architecture Administration
http://download.oracle.com/docs/cd/B28722_01/psft/acrobat/tr84aps-b0302.pdf
Online Performance Configuration Guidelines for PeopleTools 8
http://www.peoplesoft.com/media/en/pdf/red_paper_opcg_84.pdf

15.3. Unisys

Unisys ES7000/One Enterprise Server Website
https://www.unisys.com/products/enterprise_servers/index.htm
Unisys ES7000 Virtualization Website
http://www.unisys.com/products/enterprise_servers/virtualization.htm

¹⁹ The compatibility guide lists the models of Unisys servers that are compatible with VMware Infrastructure 3. Refer to it for Unisys server compatibility information.

Appendix 1 – Oracle PeopleSoft Server Processes

An Oracle PeopleSoft application server domain includes the following server processes. Note that, depending on the configuration options, not all the server processes necessarily run on a server domain.

| | |
|-----------------|---|
| PSAPPSRV | It performs the functional requests, such as building and loading components, and provides the memory and disk-caching feature for PeopleTools objects on the application server. PSAPPSRV is <i>required</i> for any domain. |
| PSQCKSRV | It performs quick, read-only SQL requests. It is designed to improve performance by reducing the workload of PSAPPSRV and <i>optional</i> . |
| PSQRYSRV | It is designed to handle any query executed by PeopleSoft Query. It improves performance by reducing the workload of PSAPPSRV and is <i>optional</i> . |
| PSSAMSRV | It is the SQL Access Manager, which handles the conversational SQL mainly associated with PeopleSoft Application Designer. PSSAMSRV is <i>required</i> for any domain. |
| PSOPTENG | It is the Optimization Engine process, which provides optimization services in the PeopleSoft Optimization Framework. It is <i>needed only if the Optimization Plug-in is used</i> . |

Appendix 2 – Oracle PeopleSoft Server Administration

PSADMIN command line options

| Command | Example | Result |
|-----------|---|---|
| boot | psadmin -c boot -d PS | Boots an application server domain PS |
| Shutdown | psadmin -c shutdown -d PS | Shuts down an application server domain PS, using a "normal" shutdown method |
| Shutdown! | psadmin -c shutdown! -d PS | Shuts down an application server domain PS, using a "forced" shutdown method |
| Create | psadmin -c create -d PS -t small [-s <startup_string> -p <port_string>] | <p>Creates an application server configuration file with specified template, where -t specifies the template (e.g. small, medium, large) to use.</p> <p>-s and -p switches are optional.</p> <p>The syntax for the startup string specified after -s is: DBNAME/DBTYPE/USER_ID/ USER_PSW/DOMAIN_ID/ADD_TO_PATH/CNCT_ID/ NCT_PSWD/SERV_NAME</p> <p>The syntax for the port_string specified after -p is: WSL_PORT/JSL_PORT/JRAD_PORT</p> |
| configure | psadmin -c configure -d PS | Invokes the psadmin editor |

PSADMIN Domain Creation Execution

PSADMIN domain creation listing

```
PSADMIN -- Tools Release: 8.46
Copyright (c) 1988-2005 PeopleSoft, Inc. All Rights Reserved.

-----
PeopleSoft Server Administration
-----

1) Application Server
2) Process Scheduler
q) Quit

Command to execute (1-2, q): 1

-----
PeopleSoft Application Server Administration
-----

1) Administer a domain
2) Create a domain
3) Delete a domain
4) Import domain configuration
q) Quit

Command to execute (1-4, q) : 2

Please enter name of domain to create :PS

Configuration templates:

1) small
2) developer
3) medium
4) large

Select config template number: 3

Creating domain...
Copying application server configuration files...
Copying Jolt repository file...
```

```

Copying Java Query client files...
Domain created.

Would you like to configure this domain now? (y/n) [y] :y
    
```

PSADMIN domain configuration sample listing

```

-----
Quick-configure menu -- domain: PS
-----

Features                                     Settings
=====                                     =====
1) Pub/Sub Servers   : No                    13) DBNAME   :[PS]
2) Quick Server     : No                    14) DBTYPE   :[ORACLE]
3) Query Servers    : No                    15) UserId   :[PS]
4) Jolt             : Yes                   16) UserPswd :[PS]
5) Jolt Relay       : No                    17) DomainID :[TESTSERV]
6) PC Debugger      : No                    18) AddToPATH :[,]
7) Event Notification: Yes                  19) ConnectID :[people]
8) MCF Servers      : No                    20) ConnectPswd:[peop1e]
9) Perf Collator    : No   10) Analytic Servers : No  21) ServerName :[]
                                                22) WSL Port  :[7000]
                                                23) JSL Port  :[9000]
                                                24) JRAD Port :[9100]

Actions
=====
11) Load config as shown
12) Custom configuration
h) Help for this menu
q) Return to previous menu

HINT: Enter 13 to edit DBNAME, then 11 to load

Enter selection (1-24, h, or q): 11
    
```

Appendix 3 – Oracle Shared Library Name

For PT8.4x, the internal Oracle shared library name that PeopleSoft module libpsora.nn is looking for is libclntsh.so.9.0. In case the Oracle 10g client is used, a symbolic name can be created to resolve a shared-library-loading problem. To create the symbolic name, perform the following:

- Log in as the Oracle owner.
cd \$ORACLE_HOME/lib
ln -s \$ORACLE_HOME/lib/libclntsh.so.10.1 libclntsh.so.9.0

Appendix 4 – Unisys Server Compatibility with VMware Infrastructure 3

The table below shows the Unisys server support by VMware Infrastructure 3²⁰.

Table 17. Unisys Server Support

| Product | Model | ESX Server 3.0 | ESX Server 3.0.1 | ESX Server 3.0.2 |
|-----------|-------------------|----------------------|-----------------------|-----------------------|
| ES7000 | ES7000/one | X ^{1, 2} | X ^{1, 2, 11} | X ^{1, 2, 11} |
| | ES7000/510 | X ^{5, 12} | X ^{5, 12} | X ^{5, 12} |
| | ES7000/520 | X ^{5, 12} | X ^{5, 12} | X ^{5, 12} |
| | ES7000/530 | X ⁵ | X ⁵ | X ⁵ |
| | ES7000/540 | X ^{5, 12} | X ^{5, 12} | X ^{5, 12} |
| | ES7000/600 | X ^{1, 2} | X ^{1, 2} | X ^{1, 2} |
| ClearPath | Dorado 300 Series | X ^{1, 2, 3} | X ^{1, 2, 3} | X ^{1, 2, 3} |
| | Libra 600 Series | X ^{2, 3, 4} | X ^{2, 3, 4} | X ^{2, 3, 4} |

- ¹ Both single and dual-core Intel processor support.
- ² Up to 16 dual-core processors with Hyperthreading disabled.
- ³ Supported on the Intel partition only.
- ⁴ Single-core not offered.
- ⁵ Single-core processor support only.
- ⁶ Dual-core processor support only.
- ⁷ Dual-core Intel Xeon 5000 series processors.
- ⁸ Dual-core Intel Xeon 5100 series processors.
- ⁹ Quad-core Intel Xeon 5300 series processors.
- ¹⁰ Dual-core Intel Xeon 7000 series processors.
- ¹¹ Dual-core Intel Xeon 7100 series processors.
- ¹² G3 processor support only.

Figure 34. Unisys Server Support by VMware Infrastructure 3

²⁰ Check the latest VMware document for the current compatibility list. The table only represents the list at the time of this document.



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