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PeopleSoft VM Templates for Exalogic

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Introduction

This red paper is a practical guide for system architects planning a PeopleSoft implementation on Oracle® Exalogic Elastic Cloud. This document provides guidance for using the PeopleSoft VM Templates to reduce the time required to deploy a PeopleSoft Application. The instructions and recommendations provided in this document incorporate best practices from both PeopleSoft and Exalogic. The information in this document concerns PeopleTools 8.53 and later.

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Structure of This Red Paper

This red paper provides guidance for optimizing PeopleSoft implementations on Exalogic.

Oracle updates this document as needed so that it reflects the most current feedback from the field. Therefore, the structure, headings, content, and length of this document may vary with each posted version. To see if the document has been updated since you last downloaded it, compare the date of your version to the date of the version that is posted on My Oracle Support.

Related Materials

This paper is not a general introduction to PeopleSoft or Exalogic and is written for experienced IT professionals with a good understanding of the PeopleSoft Internet Architecture and Oracle Exalogic.

To take full advantage of the information in this document, you should have a basic understanding of Exalogic system administration and how to administer PeopleSoft PeopleTools.

This document does not replace the PeopleTools 8.5x PeopleBooks. Before you read this document, you should become familiar with the PeopleSoft Internet Architecture information in the PeopleTools PeopleBooks to ensure that you have a well-rounded understanding of the technology.

The following guides discuss many of the fundamental concepts that are related to PeopleSoft PeopleTools.

- PeopleTools PeopleBook: Getting Started with PeopleTools

- PeopleTools PeopleBook: System and Server Administration

- Hardware / software certifications on MyOracle Support

Additionally, you should be familiar with the documentation that is delivered with Oracle Exalogic. In particularl you should be familiar with the way in which virtual resources are administered through Enterprise Manager Ops Center (EMOC).

Overview

This red paper explains how you can accelerate the deployment of your PeopleSoft system on Exalogic. Underpinning this solution is the PeopleTools VM template that has been created specifically for Exalogic.

Never before has it been possible to deliver a pre-packaged PeopleSoft environment runtime that has been tailored specifically for a hardware platform.. Until the arrival of Exalogic, system planners were faced with the challenge of installing, configuring and tuning a system by trial and error. By following the best practices defined in this document you can drive down the cost of managing your PeopleSoft Application by starting from a proven reference environment.

This document deals with the following topics:

Design – planning your environment: Overview of the PeopleSoft VM templates and a review of the features of Exalogic that will contribute to a more efficient PeopleSoft deployment. This section also discusses steps that should be taken before proceeding.

Best practices for deployment of PeopleSoft on Exalogic: A look at the considerations to be borne in mind when planning your deployment.

The Provisioning Lifecycle: How to use the VM templates to create vServers and how to manage the lifecycle of these vServers including maintenance and upgrade.

Additional Oracle products: Overview of additional products from Oracle that can help reduce maintenance and increase the value of your PeopleSoft deployment on Exalogic.

Example / Reference Topologies: To provide tangibility around the principles described in the previous sections, a number of example deployment scenarios are presented.

You can turn back now if you feel that any these subjects are not applicable. You also may skip to sections of this document that resonate most with your situation.

Who Should Read This Paper?

Anyone planning a PeopleSoft deployment on Oracle Exalogic will take value from the material in this paper. This paper is tailored for a technical audience with background in PeopleSoft system administration. Experience with past implementations of PeopleSoft systems is expected.

Before You Begin

If you're reading this document it is assumed that you're using or planning on using Oracle Exalogic to deploy a PeopleSoft system. At this point you should be familiar with the way in which virtual resources are managed through Enterprise Manager Ops Center (EMOC). Readers of this document are expected to be building environments using virtual machine (VM) templates for PeopleSoft. The material in this document will be of reduced value if you're not using the VM templates on Exalogic.

This document does not discuss the following topics:

- **Application database provisioning**: PeopleSoft installations that are planned and managed using the guidance below will require a pre-existing PeopleSoft Application database to be present. You may use any number of supported deployments for PeopleSoft database including Oracle Exadata and conventional bare metal deployments on non-Exalogic/Exadata hardware.

- **PeopleSoft web architecture**: Production grade PeopleSoft deployments always include additional logical tiers through which clients will reach the system. This includes proxy servers, load balancers, identity management servers etc. These are referred to as being part of the web architecture.

Common Terms

The following table provides definitions for some of the common terms that are used in this guide.

TABLE 1. COMMON TERMS

TERM	DEFINITION
CPU	Central Processing Unit aka processor
EM, EMCC	Enterprise Managed Cloud Control, or EM12c
EMOC	Enterprise Manager Ops Center is the web base console for managing your Exalogic machine.
IPC	Inter-Process Communication – POSIX operating system facility for shared memory, queues and semaphores.
Mid-Tier	Non-database components of the PeopleSoft architecture. Primarily Application Server, Process Scheduler and PIA,
OATS	Oracle Application Testing Suite.
OTD	Oracle Traffic Director – software based load balancer developed especially for Exalogic
OVM	Oracle Virtual Machine – Enterprise grade virtualization solution for managing VMs
PIA	PeopleSoft Pure Internet Architecture – web server tier of a PeopleSoft Application.
VM	Virtual Machine
vServer	Virtual server. Notionally equivalent to a Virtual Machine in Oracle VM.
YUM	Yellow Dog Update Manager

Getting Started

This section helps you plan your PeopleSoft deployment on Exalogic.

Understanding PeopleSoft VM Templates

The VM templates represent the best possible starting point for a PeopleSoft environment on Exalogic. A template is a fully packaged virtual machine instance containing the operating system, installed software and configuration required to construct a PeopleSoft runtime environment. This means that the following are included in the PeopleSoft VM template:

- Operating System and required additional software packages

- Required system configuration to run PeopleTools

    o PeopleSoft Administrator OS accounts

    o Inter-Process Communication (IPC) configuration

    o Kernel parameter configuration

- Third parties upon which PeopleTools depends:

    o Oracle Tuxedo plus current patch

    o Oracle Weblogic

    o Oracle DBMS client installation

- PeopleTools plus current patch

Accelerated Provisioning

Using the VM templates allows you to skip past the initial steps of provisioning a PeopleSoft environment such as:

- Install operating system

- Configure the host – create user accounts, set kernel parameters, IPC, file handle limits etc.

- Install additional optional software and PeopleTools dependencies[1]

- Install 3rd party products such as Tuxedo and Weblogic at the desired patch levels.

- Create and configure PeopleSoft domains

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[1] This includes software packages such as the C++ runtime and other OS patches that might be required by PeopleSoft.

Accelerated deployment is the primary motivator for using VM templates. In addition to shortening the time to deploy, VM templates also serve as a reference implementation that has been created specifically by Oracle. This embodies the best practices for installing a traditionally complex enterprise software product. This section is intended to briefly introduce the VM templates and why they are central to the concepts presented in this paper. Additional benefits of using Oracle VM templates are documented in the Oracle VM section on the Oracle Technical Network [9].

Template Customization

From a virtual machine template, any number of virtual machine instances can be created. Each virtual machine instance can contain one or more PeopleTools logical tiers. A virtual machine could therefore run one or more Application Server, Process Scheduler or PIA instances. The VM template contains a generic configuration and is delivered production ready. However, the VM template is intended to be customized to suit the needs of your organization. The way in which the VM template is customized is described later in this document. The term vServer and VM are used interchangeably to describe a virtual host that has been created from a VM template.

Pre-Sized Templates

In addition to containing a full PeopleSoft runtime environment the VM template comes with a recommended virtual resource profile. This means that the template has runtime resource requirements for disk, memory and virtual CPU. Therefore, a fixed amount of virtual resources should be assigned to vServers that you create from the VM template. These resources are required by the runtime components that comprise a PeopleSoft mid-tier environment, specifically the Application Server, Process Scheduler and PIA domains. These resource requirements were calculated from benchmarks recorded on Exalogic hardware with user load simulation [5].

You will use the VM template and its sizing recommendations as a starting point for your deployment. As you tune the VM templates and make customizations for your deployment you may notice different resource requirements for your PeopleSoft Application. This is an important aspect of scaling your environment: identifying what resources must be added or removed from the system as the user population changes.

VM templates for PeopleSoft and other Oracle products can be downloaded from MyOracle Support (MOS). Once downloaded, the template can be imported into your Exalogic environment and vServers can be created from that template. The creation of vServers involves little more than assigning a virtual network configuration and starting the vServer instance. This is documented in greater detail in both the Exalogic Administrator's Guide and the Deployment Guide[6] that accompanies the VM template download. Readers familiar with administering virtual machines in virtualization products such as Oracle VM or VMware will find the deployment and initialization process to be intuitive.

Understanding Exalogic Features and PeopleSoft

One of the goals of this document is to reconcile the features of Exalogic with the functionality offered by PeopleSoft. The Exalogic Data Sheet [7] and System Overview white paper [8] provide background information about the terminology in this section. The diagram below is a depiction of the vertical Exalogic solution stack for PeopleSoft. The optimization and tight integration of these products contributes to better performance and lower management costs of PeopleSoft on Exalogic.
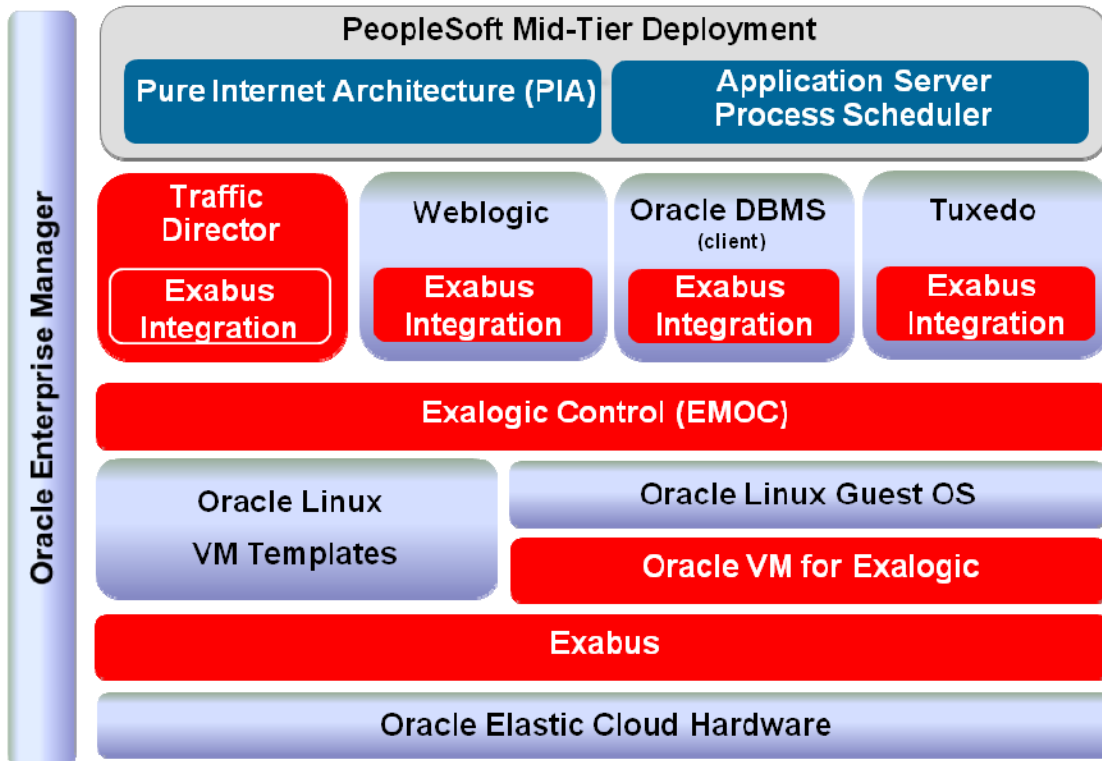
Storage - ZFS

Exalogic storage is the primary storage used for all compute nodes in a rack. The storage is connected to the compute node via Infiniband. Traditional concerns associated with access latency and reliability of network file systems are not seen with Exalogic. Exalogic is designed specifically for sharing file systems between hosts. This means that sharing file system based content is a lucrative way of reducing space usage and maintenance costs associated with duplication.

Administrators traditionally create a PS_HOME and PS_APP_HOME for every host that is running PeopleSoft domains. This redundancy is unnecessary with Exalogic because this approach does not contribute to performance, security or reliability. It is recommended that a single network-shared PS_APP_HOME be created and shared between vServers. With this approach, in addition to space

saved on storage, the vServers themselves have a lower ownership cost because each one does not contain separate PeopleSoft installations to be managed.

More information about PS_HOME and PS_APP_HOME is available in the Mid-Tier Deployment Best Practices white paper [2].

Network - Infiniband

Communication between compute nodes within Exalogic[2] takes place exclusively over Infiniband. The low latency, high bandwidth characteristics of Infiniband mean that communication between vServers does not incur network latency overhead traditionally associated with physically partitioned applications. The tendency to co-locate logical tiers of a PeopleSoft Application on conventional hardware is not necessary in Exalogic deployments. For example, on non-Exalogic systems administrators will frequently place PIA and Application Server domains on the same host. This results in shorter response times by reducing the volume of network traffic. With Exalogic, network performance does not constrain your PeopleSoft deployment architecture. This allows greater flexibility in the way your system architecture is designed. You can focus on availability and security without concern for performance degradation when planning the size and number of vServers and logical tiers they contain.

Added Value Oracle Products

This section provides some information about additional Oracle products that can be used to increase performance and manageability of your PeopleSoft Application on Exalogic. These products have all been optimized for Exalogic.

EMCC with Exalogic and PeopleSoft

Enterprise Manager Cloud Control (EM 12c) allows you to manage your full application infrastructure from a single web based console. This means that it is not necessary to use different vendor utilities to manage different parts of the environment. Using the plug-ins delivered with Enterprise Manager, you can manage Oracle Database and Oracle Weblogic as part of a PeopleSoft deployment. It is also recommended to use the PeopleSoft plug-in which allows management of PeopleSoft components from the same console. Without the PeopleSoft plug-in, many of the familiar PeopleTools management tasks would be performed on each individual host running a PeopleSoft logical tier. This includes health management tasks such as examining log files or checking hard resource usage such as

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[2] This applies to connections between compute nodes within a rack, between racks and to Exadata machines. vServers created on compute nodes also communicate over Infiniband and thus achieve the same performance benefits as *bare metal* installations. Bare metal refers to environments where the installation of the operating system and software applications is directly onto the hardware.

memory and CPU. PeopleSoft domain administration functionality achieved through PSAdmin can be replaced by remote administration tasks that can be achieved from a web-based console. Exalogic has the capacity to run large numbers of vServers in a single compute node and rack, EMCC is the recommended management utility for the entire engineered system.

Oracle Traffic Director

Oracle Traffic Director (OTD) is included as part of your Exalogic license. This means that you have unlimited use of OTD as your Application Delivery Controller (ADC) of choice. OTD runs inside the Exalogic machine and has been optimized to run within the Exabus I/O subsystem. The inclusion of OTD means that it is unnecessary to connect an external load balancer over a conventional 10GbE link. Instead, OTD sits inside the Exalogic fabric and routes traffic directly to the load balanced servers over Infiniband. OTD is engineered for Exalogic and therefore does not require complex manual setup steps. This mitigates concerns frequently heard about performance and complexity associated with software load balancing. Using OTD simplified your deployment through tighter coupling with Exalogic and by eliminating unnecessary third party products and licenses from your solution stack. There is more detailed information about OTD in the Exalogic System Overview white paper [8].

Oracle Application Testing Suite

Identifying the quantity of resources your system requires is an important step when provisioning a production system. The production PeopleSoft environment must comfortably support the maximum number of concurrent users. The most reliable way to do this is to simulate load on the system and observe PeopleSoft Application response time and system resource availability during this time. Simulation of real users involves the use of load generation tools that can emulate business transactions representative of the way the system will be used. Oracle Application Testing Suite (OATS) has been used as the basis for creating load testing benchmarks for the PeopleSoft Exalogic VM templates discussed in this document. Specifically, the Oracle Load Testing (OLT) product of OATS has been used for this purpose.

Oracle Load Testing allows you to record a series of test scenarios. While accessing the PeopleSoft Application, OLT observes the on-page actions you take manually as http requests made to the web server. You can record the types of activities and workflows that your PeopleSoft Application users would follow as test scenarios. These recorded test scenarios are used by OLT when conducting load simulation tests. The test scenarios can be customized using seed data through the OpenScript platform and the data bank which is used as a repository of test data. OATS does not require any server side instrumentation. The test controller and load generator can be run independently on a single client machine for smaller tests. Test cases with higher workload can be orchestrated from a single controller with one or more generators which simulate the actions of browser clients.

OATS is licensed separately from Exalogic and Enterprise Manager. It is necessary to procure a license independent of your Exalogic assets.

Design – Planning Your Deployment

Understanding how to take advantage of the VM templates is an important step in the planning and design process. This requires you to understand the proposed value of the VM template in terms of reducing your management costs. Frequently this requires you to reconcile the pre-packaged format of the template with your organizational standards. You will notice significant differences in terms of file system locations for installed software, OS users and groups, Application Server domain configuration etc. Keep in mind that many of these items can be easily modified in the template once you begin working with it. In other cases it would be desirable to change your organizational processes to follow the standards embodied by the template. This will initially be a trial and error process. You should expect to go through multiple iterations before settling on a reliable and repeatable process that you are comfortable with.

While planning your PeopleSoft deployment on Exalogic you will take into account many of the same considerations applicable to conventional environments. You will still need to plan for disaster recovery, failover, application security, patching etc. You will find that some of these activities are less complex with Exalogic. This is because the VM templates were engineered specifically for Exalogic. With VM templates for Exalogic you have the unique opportunity to implement standards that are advocated by Oracle. Following well-established standards reduces application ownership costs by implementing proven and well-documented patterns.

You will take advantage of the unique characteristics of the hardware and the additional Oracle products described earlier in this document. This will help you to create a PeopleSoft deployment that incorporates technology pre-tested by Oracle with the unique requirements of your installation.

An important part of the planning phase is identifying what additional configuration and customization needs to be done to the VM templates. Some examples of design considerations include:

- Security:
    - The level of access permitted to and from the vServer. The authentication model used for OS users
    - Firewall configuration
- Networking:
    - How many network adapters must be assigned to the vServers
    - Separate networks for admin and application traffic
- Capacity planning:
    - Understanding the user population
    - Predicting the high and low usage times
- System capacity and availability needs
- Change control process definition and configuration management
- Failover systems

- Disaster recovery

- Auditing, logging and detecting faults

- Web Architecture: components residing on front of PIA

    o Application Delivery Controller / Load balancer

    o Proxy servers

    o Network switches

- Interaction with non-Exalogic environments

    o MS Windows Process Schedulers

    o External databases

    o External content providers - PeopleSoft Integration Framework

The above design should proceed in parallel with the deployment of a demo system as described in the next section. Creating a demo system from the VM templates will be a useful learning experience for planning your system. This will be instrumental in identifying the characteristics of the VM templates that will help you implement an optimal system. See the sample deployments later in this document. These sample deployment may provide guidance during the design phase.

The Provisioning Lifecycle

This section provides insight into managing a PeopleSoft environment on Exalogic. This starts with how to begin creating vServers from VM templates and continues to explain how to apply maintenance and manage customizations.

This provisioning lifecycle is described here in multiple stages. These are addressed below.
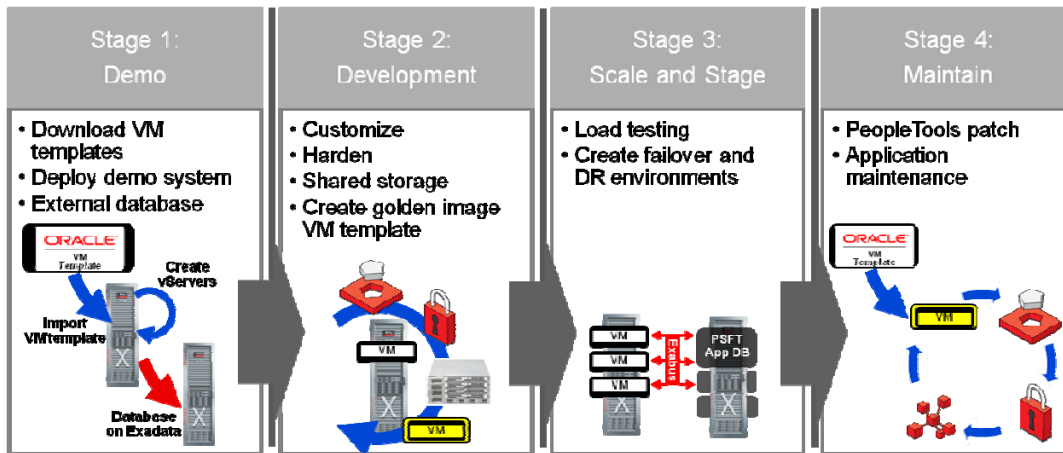
Stage 1: Demo System

The first time you plan to deploy the VM templates in your Exalogic machine it will be desirable to start with a small, simple environment. This experimental environment will be accessed by very few users and should have limited availability within the corporate network. In addition, the vServers on which it runs should have restricted access to the rest of the network. This environment will require a database that has been created specifically for the demo environment. This document does not address database creation in Exalogic.

The main purpose of the demo environment is to understand how to deploy vServers from VM templates. The detailed steps that must be followed to deploy this type of environment are described in the documentation that accompanies the template that you have downloaded.

Creating vServers from VM Templates

Once you have downloaded the VM template for PeopleSoft you will start to create vServers from Enterprise Manager Ops Center (EMOC). The approach by which vServers are created is the same for all VM templates. The steps by which vServers are created are described in chapter 9 of the Oracle Exalogic Elastic Cloud Administrator's Guide [6]. The documentation that accompanies the VM template will specify the virtual resource requirements of the vServer. There is a degree of flexibility in the virtual resources that can be assigned to the vServer. Typically, more workload to be handled by a vServer implies the need for more virtual resources. For a demo system the virtual resource requirements are typically quite modest because fewer users are accessing the demo system. For initial demonstration and evaluation purposes the recommended virtual resources will be more than adequate.

The VM templates come pre-loaded with all the basic software required to run Process Scheduler, Application Server and PIA domains. In addition, the VM template contains an initialization script that is intended to create these domains on your behalf. You may decline to use the template reconfiguration script functionality and choose to manually configure your vServer. If you choose to use the template reconfiguration script you simply respond to a series of prompts displayed to you at the command shell. These prompts will allow you to submit preferences such as:

- Which logical tiers you would like to run in your vServer: Application Server, Process Scheduler or PIA.

- Database host address and connectivity information for accessing the database.

- The location of the mid-tier PeopleSoft Application.

Using the template reconfiguration script helps you get a vServer up and running quickly in a PeopleSoft environment. Any number of vServers can be created in this way. The later section on Template Customization provides more details about how you can make changes to the delivered template to modify the way this template reconfiguration script works.

Having deployed the demo system the following will be apparent:

- The automatic initialization scripts of the VM template create a basic configuration that will not match exactly the requirements of your runtime environment.

- All third party products and current patches are installed, with the exception of a COBOL compiler and runtime.

- Only PeopleTools is deployed, no PeopleSoft Application SQRs, COBOL files etc are present for the Application.

- Shutting down the vServer will result in the domain processes being stopped. Rebooting the vServer will result in the PeopleSoft domain processes being restarted and immediately available to participate in the runtime.

Stage 2: Development System

This section addresses the steps that you will follow to develop your own template from the one you obtained from Oracle. This is not to be confused with development activities that are pursued through PeopleTools Application Designer or customizations to COBOL or SQR programs.

As noted earlier, it is anticipated that you will need to make changes to the delivered VM templates in order to make it useable in your Exalogic infrastructure. Examples of such changes include:

- Enablement / disablement of services. For example: iptables firewall

- Reconfiguration / addition / removal of PeopleTools domains

- Addition of file system customizations such as SQR or COBOL

- Additional file system mount points

- Security or user profile changes

Rather than making the above changes in each vServer you create, it is more efficient to make them in a single vServer, create a template from that vServer and deploy new vServers based on your *golden image* template.

Making Changes to the Template

The VM template has been delivered as a generic system intended to be extended and customized by you. You are encouraged to retain as many of the delivered configuration and file deployment locations as possible. This may require internal process changes and therefore may not be desirable. Although such process change may appear disruptive, aligning your deployment with the delivered system will reduce the costs of upgrade and make interactions with Oracle support more productive. Striking this balance is something that you will need to figure out.

Exalogic provides a mechanism by which a vServer can be saved as a template. This capability is crucial to making practical use of the VM templates in your organization. The approach that should be taken is as follows:

1. **Identify vServer Types**

    Each organization has its own preferences for how and where PeopleSoft domains are run. These may be based upon well defined standards or may be defined by other factors such as security which requires logical and physical isolation of tiers of a PeopleSoft system. This impacts topological decisions concerning which hosts on the network run which types of PeopleSoft domains. Some administrators prefer to create few domains with high user capacity. Others administrators prefer to create many smaller domains, sometimes with multiple domains running on the same machine. These flavors of domain also introduce variations depending upon the type of services that are run on the domains. This is seen most commonly with the creation of Application Server domains specifically intended for Integration Broker services. The assessment of your functional needs will result in the identification of one or more *vServer types*. These vServer types will be distinguished by their distinct *characteristics*.

    Restricting the number of distinct vServer types should be one of the goals of this exercise. This is because each distinct vServer type will require you to implement specific changes that represent that vServer type. The vServer type will then be saved as a golden image template from which any number of vServers may be created.

2. **Customize**

    You have identified the characteristics of each vServer type in the previous step. For each of these vServer types you will create a new vServer instance. You will implement these distinct characteristics in each of the vServers you have created. For example, such a characteristic may be the opening of specific ports on the firewall or the addition or removal of administrator accounts.

When you have finished configuring the vServers you are ready to save each vServer as a VM template. Saving the vServers as golden image VM templates allows many instances of the same type of vServer to be created as needed. To create this golden image template you will save a customized vServer as a template. This can be thought of as a more efficient form of cloning. This golden image template approach accommodates assignments such as hostnames and network configuration at deployment time. The process by which a vServer is customized and saved as a template is described in the later section on template customization.

3. Create

You will now create as many vServers as required by your initial deployment. These vServers will be created from the VM templates that you created in the previous step. Create as many instances as required. Create back-up and failover instances. The steps associated with deploying your PeopleSoft environments for test, staging and production systems are described later.

The steps involved in managing vServers, VM templates and their associated lifecycle are described in the Oracle Exalogic Elastic Cloud Administrator's Guide [6].

Apply Change Packages

Prior to deploying a test, staging or production system, maintenance will typically be applied to the PeopleSoft Application. Applying maintenance specifically refers to taking fixes in the form of updates. This is PeopleSoft terminology for patching a PeopleSoft Application. For the different PeopleSoft Applications these may take the form of bundles, fixpacks or maintenance packs. The application of maintenance typically places more recent versions of 'managed objects' in the PeopleSoft Application Database. Some fixes are also applied to the Application Home (PS_APP_HOME). As noted earlier, the recommended approach for installing a PeopleSoft Application Home is to place it on a shared location that can be accessed by all vServers that will run Application Server or Process Scheduler domains. The creation of this single shared location results in fewer places where change packages must be applied. In principle, the approach is the same as deploying a non-Exalogic system. See the Lifecycle Management Tools (LCM) PeopleBook[3] for more information.

Stage 3: Deploy Test, Staging and Production

At this point you will have created a plan for your test, staging and production systems. You will also have created one or more golden image templates that contain the base PeopleTools template and any additional software and configuration required by your deployment. You are now ready to deploy a system comprised of multiple vServers. It is assumed that you have a database available to which your Application Server and Process Scheduler vServers can connect. The database will have been upgraded to have the correct PeopleSoft Application and PeopleTools meta-data definitions applied. This must be consistent with the version of PeopleTools that the mid-tier vServers are running.

You will implement your test, staging and production systems on your Exalogic hardware. The three environments will run in separate network segments within the same Exalogic fabric. Each system will contain the required number of vServers to support the user population. For example, your test

system may only be used for functional and system testing. Unless load testing is occurring on your test environment you will require fewer resources than your staging and production systems. It may suffice to have a single Application Server, Process Scheduler and PIA server. Your staging system will act as a practice move to production. This should be a replica of your production site. The purpose of the staging system is to exercise the process that you have for moving to production. Final load testing on the staging system will allow you to identify the runtime resource requirements of your production system. This is a crucial final step before implementing a production system.

Scaling

Production systems must be designed to tolerate increase and decrease in system demand. Scaling a production system happens in two phases that are described below.

1. **Initial Deployment System**

To create a starting infrastructure it is necessary to gauge the amount of resources required to run your PeopleSoft Application. This is something that will be a function of the size of the user population and the way in which they use the PeopleSoft Application. There are no hard and fast rules for the amount of resources required for a specific number of users. Production systems vary considerably due to database performance, the type of transactions being performed and additional demand on the system due to scheduled jobs, integrations etc. As a starting point in estimating the required resources, it is suggested that you consult the benchmark results [5] announced at Oracle Open World 2012 to help calculate the virtual resources to assign to each vServer. This will act as a starting point for performing load testing on your system. You are recommended to perform load testing using a load simulation tool such as Oracle Application Testing Suite (OATS). See the earlier section in this document that introduces OATS.

2. **Post Deployment Scaling**

Post deployment scaling is a reaction to a planned or unplanned increase in demand on a production system. You may prepare for this in a number of ways. If the increase in system demand is anticipated, it is possible to schedule starting up additional vServers in your Exalogic environment. This scheduling can be achieved through the use of operating system utilities such as cron in combination with the EMOC command-line interface for managing the lifecycle of vServers within an Exalogic compute node. If the increase is demand requires additional mid-tier components, you may create these components as needed based upon a well designed golden image template. This underlines the importance of creating a golden image template that creates vServers that can be started and immediately join a running system.

High Availability (HA) - Failover and Disaster Recovery (DR) Systems

Failover systems are an important part of system planning. The profile of the availability model you will choose is driven by your organization's tolerance for failure. For example, for business critical systems zero downtime is required. This will often require a DR system geographically separated from the primary system in a configuration which will support seamless failover in the event of a failure.

Active/Active PeopleSoft Systems

In active/active failover the system should be able to tolerate the failure of any node in the system and recover from that failure without administrative intervention. Database, Application Servers, Process Schedulers all support this capability. Multiple instances of PIA are placed on front of the Application Server domains to ensure that the system is continually available upon failure of any single PIA instance. PIA can be configured to balance its connections across multiple Application Server domains. PIA also allows specific Application Server domains to be used for failover only. If a PIA server or HTTP Proxy server becomes unavailable the load balancer will route clients to the available instances in the deployment. In an active/active system it is necessary to *overprovision* the system as a mechanism for tolerating failure on single nodes within the system.

Active/Passive PeopleSoft Systems

Active / passive failover systems are represented as an exact replica of the primary. The failover system is usually inactive at the time of failover and brought online as soon as possible after failure has been detected. This may be a manual mechanism by way of alert generation or automated through third party tools or in-house scripting.

The failover system is comprised of a series of vServers that contain the same configuration and file systems as the primary. These mid-tier failover vServers can be placed in a suspended state and can be started immediately upon failure. In a suspended state these vServers do not consume any virtual resources such as CPU or RAM. They are represented simply as filesystem entities until started. Due to the low diskspace footprint of vServers created from VM templates, there is low resource cost overhead to retaining an active/passive HA system for PeopleSoft.

As with any disaster recovery system, geographic co-location is ill-advised. At minimum the HA and anti-affinity features of Exalogic should be used to ensure that all vServers within a production PeopleSoft system are not running on the same Exalogic compute node. There is more information on this subject in the Exalogic Elastic Cloud Administrator's Guide [6].

Finally, it is essential that a DR plan is in place and has been exercised. The DR system must also be patch current and represent the same configuration as the primary system. As this paper does not address HA solutions for Oracle Database, you are encouraged to review the High Availability and Clustering white paper [10] for more information.

Stage 4: Maintenance

This section discusses managing change in a PeopleSoft Exalogic deployment. This specifically concerns the use of VM templates. Because maintenance of a PeopleSoft Application is an ongoing activity, it is essential to streamline the process of taking maintenance.

The VM templates have been designed with the goal of reducing the time required to deploy newer versions of PeopleTools. Following the recommendations in this paper to make optimal use of these VM templates will help you reduce those costs.

PeopleTools Patching

As noted earlier, the most recent PeopleTools release is always available as a VM template for Exalogic. An updated VM template is made available to coincide with each PeopleTools patch release. This means that the VM template for the current PeopleTools release will always contain the most current PeopleTools patch and any software dependencies. This includes OS patches, third party products and configuration. This means that you can use the VM templates as a vehicle for PeopleTools maintenance.

There are two primary approaches to maintaining an environment deployed from VM templates.

1. **Taking newer versions of patched templates** and deploying them to an existing environment. The advantage of this approach is that you get all fixes including any third party updates. With this approach it is necessary to apply customizations, harden the vServer and re-save as a golden image template. If you have repeatable, efficient and automatable processes for customizing a template this will be an easier approach for you.

2. **Patching existing vServers** already in your deployment. This is the same approach as taken for bare metal environments. You would get the patch installation and any third parties such as CPUs, Tuxedo patches and so on and install them to all vServers in your enterprise. The advantage of this approach is that you can retain all of the customizations you have made in your existing vServers.

Application Lifecycle Management (LCM)

PeopleSoft Applications are maintained different from PeopleTools patches. The approach that is taken to maintain a PeopleSoft Application involves the use of utilities such as Change Assistant and the PeopleSoft Environment Management Framework (EMF). In contrast with a PeopleTools patch, updates of a PeopleSoft Application frequently center on the application database. However, changes are also made to the installed Application PS_APP_HOME. This means that the approach to maintaining a PeopleSoft Application is the same as a non-Exalogic deployment.

However, to make this approach easier you are recommended to use the decoupled PS_APP_HOME (Application Home) approach discussed earlier in this document. A decoupled Application Home means that the Application installation will not reside on the vServer on which Application Server and Process Scheduler domains run. Decoupling the PS_APP_HOME – placing it on storage outside the vServer -- allows vServers to be replaced without the PS_APP_HOME being lost. In addition, a shared PS_APP_HOME means that Application updates can be applied to a single, shared PS_APP_HOME. This is more efficient than each vServer having an exclusive PS_APP_HOME, each of which has updates applied independently.

Upgrade

Upgrade is an opportunity to begin using the PeopleSoft VM templates and the decoupled PS_APP_HOME strategy that is advocated earlier in this document. Upgrading to a newer release of a PeopleSoft Application typically involves installing a new base version of PeopleTools. You are

therefore recommended to implement your upgrade considering the design principles described earlier in this guide.

A Detailed Look at Template Customization

There are a number of ways in which the template can be customized. Changes can be made to the startup scripts in addition to changes that can be made to the installed software.

Understanding the Template Reconfiguration Script

Also known as the first-boot script, this script is used the first time the vServer is started. This script is used to setup the vServer to run the desired parts of the PeopleTools infrastructure.

The functionality in the template reconfiguration script has been designed to be overridden and customized. This shell script is in fact comprised of a number of different shell scripts each of which is responsible for slightly different functionality during the vServer initialization process. These scripts are all contained within the directory `opt/oracle/psft/vm`

When the vServer is started the 'appbatch-start' operating system service is activated[3]: This service will start any Application Server and Process Scheduler domains that are in the PS_CFG_HOME of the psadm2 user. See the documentation that accompanies your template download for information about psadm2 and other OS users that are included in the VM template. When the vServer is shutdown, the appbatch-start service is stopped. This will result in the PeopleSoft domains being shutdown in an orderly fashion. This means that PeopleTools Application Server domains will complete any in-progress client requests that they are handling before shutting down. Equivalently, when the vServer is started it will instantly become available to handling incoming requests from PIA as well as Process Scheduler domains being able to take queued process requests.

vServer Cleanup

The template reconfiguration script also plays an important role in vServer cleanup. vServer cleanup occurs when the vServer is to be reset to its original state. This is typically in the case that the vServer has been mis-configured and must be restored to its original state. In addition to playing a restorative role, this script is used when the vServer is to be saved as a template. The main effect of invoking the cleanup operation is to remove the Application Server, Process Scheduler and PIA domains. Log files and other configuration artifacts are also removed. Other aspects of the vServer remain intact. For instance, no PeopleSoft Application software is removed, no system services are modified. This means

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[3] This feature is configurable. Upon first boot of the vServer you may decline this functionality when prompted.

that you can install additional software packages, change users, groups, file system ownership etc. These changes will remain intact after the cleanup operation is run. This is the way you will make changes specific to your organizational standards while using the pre-packaged VM template. While logged in as the root user the cleanup script is invoked as follows:

```
/usr/sbin/oraclevm-template --cleanup
```

Changing the Template Reconfiguration Script

Located in the same directory as the template the reconfiguration script is the 'extension' script. The script `/opt/oracle/psft/vm/oraclevm-template-ext.sh` is used for extending or overriding the content in the rest of the scripts. This is the entry point for you to append operations at the beginning and end of the first boot process. Among many other possibilities, this *extension script* allows you to override details used in PeopleTools domain creation or even create additional domains with completely different configuration settings. By limiting your changes to the extension script you will be better able to reuse the script when you subsequently deploy a newer version of the VM template. The extension script can therefore be considered a rudimentary form of plug-in. This is documented in the VM Template Development and Customization Guide white paper [4].

Typical Modifications to Template Scripts

This section describes some typical activities that would be added.

Note: These can all be achieved using the extension script described above.

Mount Network File Systems

- A shared PeopleSoft Application mid-tier installation – (PS_APP_HOME) - is recommended to be used. This will reside outside the vServer on a network file system. This means that the mount command is used to ensure that it is available.

- The report repository being used by PIA is required to be in a file system location shared by all the PIA servers in a deployment. This shared location also needs to be mounted.

- Additional third party programs may be required by your PeopleSoft Application or organizational system management standards. The installation programs for these software components will typically be located in a repository on the network in a location sometimes known as a 'jukebox'. This location may need to be mounted in order to install these additional software components.

- An automounter will frequently be run as a daemon process in the vServer.

The first two mount instructions above may be permanent, remaining in the mount table because they will be required to remain valid after a restart. However, the third one which is used for installing software might only be required for the duration of the installation process. This illustrates the variations you can achieve with the extension script and the use of general Linux scripting knowledge.

User Account Management

The VM Templates come pre-packaged with a number of user accounts. These accounts are local to the VM template. These accounts are used for different administrative activities that will need to be performed on the vServer. Some changes that the administrator may wish to make include:

- The default passwords on the pre-delivered accounts will need to be changed from their default values.

- In some cases these accounts will be removed and replaced with directory authenticated accounts that use NIS or Kerberos or other network based authentication services.

- The file system content that is owned by these accounts may need to be changed to being owned by a different user. In addition to ownership, the group level visibility of the directories may need to be changed.

There is more information about these accounts and the file system artifacts that they own in the installation guide that accompanies the template that you downloaded.

Installation of Additional Software Packages

- A COBOL compiler and runtime may be required[4] by your PeopleSoft Application. This is required in order to compiler the COBOL programs delivered with your PeopleSoft Application. The COBOL compiler is a separately licensed product. The COBOL runtime does not require licenses on each of the runtime vServers. Only the host compiler must have a valid license. This means it will be sufficient to install the COBOL compiler on a designated machine for compilation and install the COBOL runtime on each machine that will run PeopleTools Application Server or Process Scheduler domains. Additional details concerning COBOL licensing are available on MyOracle Support.

- Immediately after the template is deployed the PeopleSoft administrator must check that no required-at-install changes must be made to PeopleTools or any of the third-party products. This information is published on MyOracle Support. This is especially important for Critical Patch Updates (CPUs) which may be required to address reported security vulnerabilities. Using the most recently published PeopleTools VM template means that it is unlikely that additional patches or fixes will be required.

- System maintenance requires installed software packages to be periodically updated. Yum or other package managers will need to be deployed such that the vServer can be updated as necessary. This is something that will need to be configured by the administrator.

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[4] Some PeopleSoft applications such as Human Capital Management and Financials make extensive use of COBOL programs.

Full Automation

Administrators make heavy use of shell scripting in order to automate as much of the provisioning and management cycle as possible. The goal of extending the template reconfiguration script is to eliminate all manual steps involved in taking a newer VM template from Oracle. Once a stable set of initialization scripts have been created, they can be reused each time you wish to take a newer version of the base PeopleTools template from Oracle.

It will therefore take upfront effort to understand how to automate each of the customizations that need to be applied. Examples of these customizations are shown in the previous section. Many of these can be automated using Linux shell scripting, silent installation programs and additional utilities for remote access such as sftp and ssh. Administrators will already be familiar with how to script these steps and typically have scripts to perform these tasks already.

Reference Topologies for PeopleSoft on Exalogic

This section presents a number of example topologies that take are intended to serve as example reference environments for planning your PeopleSoft implementation on Exalogic. These examples include additional products from Oracle to assist with scalability and availability. These can of course be substituted with solutions more appropriate to your product and existing licensed software solution.

Example: Production System

The diagram below presents a high level overview of a production deployment on Exalogic. This deployment has failover and load balancing built into it. A DR system is not illustrated. The DR system would be an exact replica of the above deployment residing in a separate data center. This is a minimal production system with capacity for 1500-3000 users.
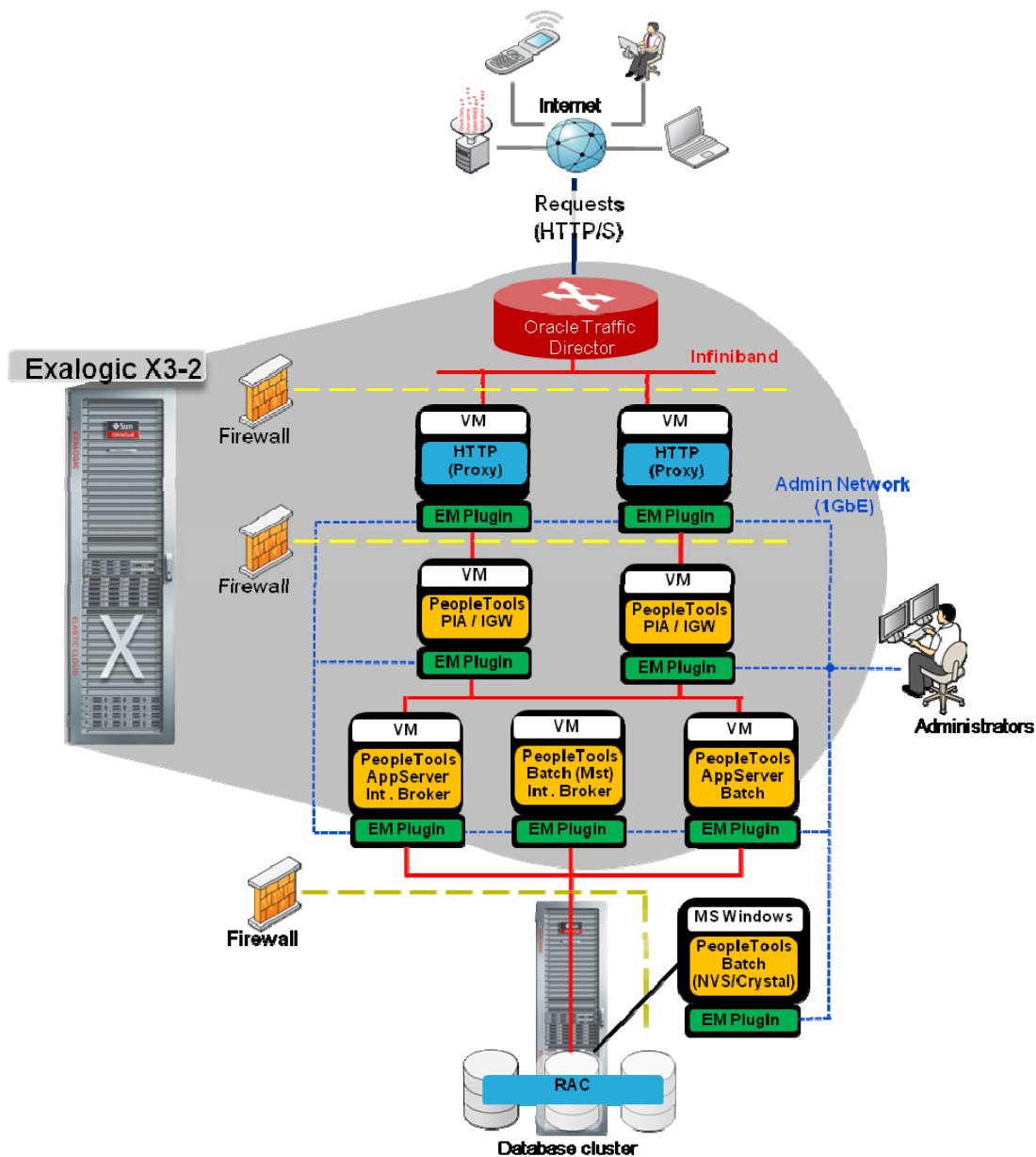
Network: There are three primary network segments present in this deployment.

- 1GbE admin network: for administrative operations, backup, etc.

- 10GbE user network: external traffic reaching the Exalogic machine

- Infiniband network over which user traffic passes within the Exalogic machine. The Infiniband network is also continuous between the Exalogic and Exadata machines.

Firewalls: This deployment includes a DMZ between the HTTP Servers and PIA servers. All traffic outside the PIA servers is considered to be untrusted.

Resources:

- vServers running Application Server and Process Scheduler domains have 22GB RAM and 6 vCPUs per vServer.

- vServers running PIA and HTTP (proxy) server have 10GB RAM and 4vCPUs each.

Load Balancer: An instance of OTD is placed on two separate compute nodes within the edge partition of the Exalogic machine. HA is enabled between the two OTD instances. SSL is ended at the OTD load balancer. OTD routes the traffic to the two proxy servers inside the Infiniband network.

HTTP Servers: Running Apache and the Weblogic proxy plug-in, each HTTP server is associated with a single PIA server.

PIA Servers and Application Server: Requests are load balanced between two Application Server domains. Failover is built into this model whereby client traffic will transfer to the available machine upon failure. One Application Server domain is dedicated to Integration Broker.

Process Scheduler: A master and non-master Process Scheduler run on different vServers.

Database: An Oracle RAC Cluster is used to provide highly available database servers to the PeopleSoft Architecture running on the Exalogic infrastructure. This example depicts a RAC cluster in Exadata.

Example: Shared PeopleSoft Homes Environment

A recommended deployment for Exalogic is to create a single shared Application Home (PS_APP_HOME) made available to all vServers running PeopleTools Application Server and Process Scheduler. This deployment takes advantage of the ZFS file system as a highly available shared storage device between virtual hosts attached to the Infiniband fabric.

In the diagram below, multiple vServers may use the same PS_APP_HOME – PeopleSoft Application installation, as a shared file system. This is achieved by creating individual vServers with file system mount points to the shared PS_APP_HOME. As described earlier in this document, this can be achieved by creating a *golden image template* containing this mount point and creating any number of vServers from this template. vServers that access the shared PS_APP_HOME are limited to read-execute access.

Customizations to file system artifacts such as SQR, COBOL and so on can reside on this shared Application Home. Rather than copying customizations to many vServers they can be restricted to a single location.

The runtime vServers access the shared PS_APP_HOME over Infiniband. This guarantees file system access that is equivalent to accessing file system locations local to the vServer. Each vServer contains its own PS_HOME and third party products required by the Application runtime. Application Server and Process Scheduler domains running in this environment can be sized according to the needs of the PeopleSoft Application. Fewer domains can be created with more resources dedicated per vServer.

Alternatively, many smaller domains can be created by taking advantage of the minimal disk footprint of the vServers.

Using a shared PS_APP_HOME simplifies maintenance. Traditional administrative techniques for applying change packages are followed. Since the storage is shared, only a single vServer is needed to apply the changes via the EMF agent. As shown below, a dedicated vServer running on the Admin Network can be used to apply maintenance to a shared PS_APP_HOME. This is a more secure approach because it is not necessary to run the EMF infrastructure on the runtime vServers. There is no write access required from the runtime vServers to PS_APP_HOME.
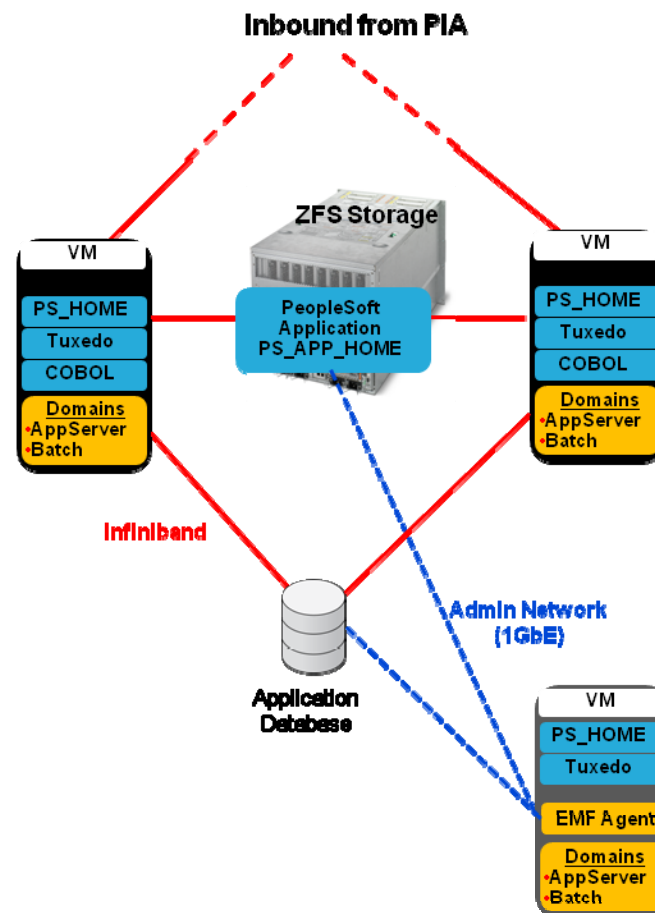
References

1. "Deploying Oracle PeopleSoft Maximum Availability Architecture" white paper
http://www.oracle.com/technetwork/database/features/availability/maa-peoplesoft-bestpractices-134154.pdf

2. "PeopleTools: Mid-Tier Deployment Best Practices" white paper
http://docs.oracle.com/cd/E29604_01/psft/html/docset.html

3. PeopleTools Online PeopleBooks
http://docs.oracle.com/cd/E17566_01/epm91pbr0/eng/psbooks/psft_homepage.htm

4. "PeopleSoft Oracle Virtual Machine Templates Development and Customization Guide" white paper
See Doc ID 1385319.1 at http://support.oracle.com/

5. "Oracle Engineered Systems Success With PeopleSoft", Oracle Open World 2012
http://www.oracle.com/us/products/applications/peoplesoft-enterprise/tools-tech/con9204-1872853.pdf

6. Oracle Exalogic Elastic Cloud Administrator's Guide
http://docs.oracle.com/cd/E18476_01/doc.220/e25258/toc.htm

7. "Oracle Elastic Cloud X3-2", data sheet
http://www.oracle.com/us/products/middleware/exalogic/exalogic-elastic-cloud-x3-2-ds-1863831.pdf

8. "Oracle Exalogic Elastic Cloud: System Overview", white paper
http://www.oracle.com/us/products/middleware/exalogic/exalogic-system-overview-1724075.pdf

9. "Creating and Using Oracle VM Templates: The Fastest Way to Deploy Any Enterprise Software", white paper
http://www.oracle.com/us/technologies/027001.pdf

10. "Clustering and High Availability for Enterprise Tools 8.5x", white paper
See Doc ID 747378.1 at http://support.oracle.com/

Revision History

TABLE 2. REVISION HISTORY

DATE	CHANGE
March 2013	Created document.

ORACLE®

PeopleSoft VM Templates for Exalogic
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