

**Deploying Oracle® Application Server 10g on
Dell PowerEdge™ Servers with Linux**

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Executive Overview

Over the past ten years, one of the most significant trends in corporate IT has been the emergence of the Application Platform Suite (APS). An Application Platform Suite provides the infrastructure for corporations to develop and deploy their own applications, as well as deploying third-party applications. The main enabling technology for Application Platform Suites is Java™ 2 Enterprise Edition software. J2EE provides not only powerful software tools for Enterprise development, but also provides comprehensive standards to help ensure inter-operability of all deployed applications.

While object-oriented data models are at the heart of J2EE implementations, it is possible to map an object-oriented model to a traditional relational model. This is more than an academic exercise, since the bulk of corporate data is currently stored in relational databases. This is not likely to change soon, since relational databases provide the performance, security, and high availability characteristics that corporations demand for storing persistent data. Fortunately, the combination of J2EE-enabled Application Platform Suites and persistent relational database stores has proven to be remarkably flexible and robust, and is now considered the standard platform for application development and deployment.

Therefore, it should be no surprise that one of the leading APS is offered by the leading database vendor, Oracle® Corporation. Oracle Application Server (OracleAS) 10g Enterprise Edition offers the advantage of tight integration with Oracle Database 10g. Moreover, Oracle Application Server 10g Enterprise Edition provides a comprehensive solution for developing, integrating, and deploying a corporation's applications, portals, and Web sites. The robust architecture of Oracle Application Server Enterprise Edition is designed to provide outstanding J2EE performance and to support a broad spectrum of applications. Major categories of Oracle Application Server applications include Business Intelligence, portal applications, wireless applications, identity management, and business integration tools. Not only does Oracle Application Server provide a platform for developing new categories of applications, it also offers a consolidated framework for deploying legacy Oracle applications, such as Forms and Reports. In addition, Oracle Application Server middleware forms the core of Oracle's Fusion strategy for integrating diverse Enterprise applications.

Of course, deploying Enterprise class applications with Oracle Application Server software requires Enterprise class hardware. Dell PowerEdge Servers and Dell/EMC® Enterprise Storage provide a robust, scalable platform for deploying Oracle Application Server 10g applications. In addition, Dell Hardware and Software solutions lead the market in providing value for the Enterprise Infrastructure, on a cost effective basis. Dell engineering works directly with Oracle Corporation to provide tested and validated solutions. This benefits customers by providing a "risk-free" installation experience.

One of the more important benefits that this whitepaper provides is in discussing the architectural options for Oracle Application Server 10g. Oracle Application Server can be deployed in a variety of different topologies allowing individual components to be distributed across multiple servers, or to be duplicated in a clustered configuration. This provides benefits both in terms of application performance and High Availability. Due to this flexibility, Administrators are faced with a large number of architectural and

deployment decisions for an Oracle Application Server 10g implementation. This paper will examine a variety of deployment options including two-tier, three-tier, and multi-tier topologies. An example architecture for an Enterprise Business Intelligence/Forms topology will also be discussed.

The main focus of this whitepaper is to provide a step-by-step deployment guide for installing Oracle Application Server 10g on the Red Hat Linux Operating System with Dell PowerEdge Servers and Dell/EMC storage. The example installation utilizes a three-tier model with the following components:

- Client tier
- Portal/Business Intelligence tier
- Infrastructure/Data tier

This topology has the advantages of relatively simple installation and maintenance, along with reasonable performance.

Detailed installation instructions for the following commonly deployed Oracle Application Server modules are discussed:

- Oracle Containers for J2EE (OC4J)
- OracleAS Web Cache
- Oracle Identity Management (single sign-on, OID)
- Oracle Forms Services
- Oracle Reports Services
- OracleAS Portal

Of course, these examples cannot possibly cover all of the available topologies or deployment options. However, this whitepaper will cover the core installation and administration techniques that are required for most Oracle Application Server deployments.

Introduction – Oracle Application Server 10g

Overview

Oracle Application Server 10g is a layered product. It consists of multiple interdependent software modules, logically grouped into tiers. The various software tiers can be installed together on a single server, or can be installed in a distributed fashion across multiple servers. The basic software tiers offered by Oracle Application Server include the following:

- J2EE and Web Cache tier
- Portal and Wireless tier
- Business Intelligence and Forms tier
- Infrastructure tier

In order to understand the key features of Oracle Application Server, it is important to understand that the underlying technology is constantly evolving and the software modules are being frequently upgraded by Oracle. At any given time, there may be multiple versions of Oracle Application Server software available for installation. The version (or versions) that a business may choose to install will depend on the mix of components that they wish to deploy. At the time this whitepaper was written (January 2007), there were two major releases available for Oracle Application Server: Oracle Application Server 10g Release 2 and Oracle Application Server 10g Release 3. The following sections will introduce the key features of each software version, and strategies for deploying both versions, where appropriate.

Oracle Application Server Key Components

Despite the name, Oracle Application Server 10g does not offer much in the way of pre-packaged applications. This is in contrast to Oracle E-Business Suite 11i which offers applications targeted at specific financial and business processes. Instead of providing functionally-focused applications, Oracle Application Server 10g provides an integrated development platform, which corporations can use to develop their own business function specific applications.

Nevertheless, some of Oracle's legacy development tools are so familiar to customers that they are considered "applications" in their own right. This is certainly the case with Oracle Application Server 10g Forms Services and Reports Services, which replace the classic, client-heavy Oracle Forms and Oracle Reports with thin-client versions.

The following sections describe the individual components of Oracle Application Server. The component listing is organized by tiers. This is significant, since components within a tier are most commonly installed together.

J2EE and Web Cache Tier

The J2EE and Web Cache tier contains the core components that are necessary to develop and deploy Enterprise Java applications. Following is a description of the key components.

Oracle HTTP Server – provides the underlying deployment platform for a variety of programming languages and technologies. Oracle HTTP Server is based on the time-tested technology of the Apache HTTP Server, with significant enhancements in the areas of load balancing, administration, and configuration. Oracle HTTP Server can serve as either a forward or reverse proxy server, it can also be configured to host static and dynamic pages over the web, and it can even host entire web-based applications.

Oracle Application Server Containers for J2EE (OC4J) – Oracle Application Server Containers for J2EE (OC4J) provides a certified implementation of the industry standard J2EE specification (either 1.3 or 1.4, depending on the version installed). Oracle Application Server is entirely written in Java and runs on a Java Virtual Machine (JVM). OC4J adds value because it is lightweight, scalable, and runs faster than many other J2EE implementations. OC4J supports a wide variety of Java-based APIs, including:

- Java Server Pages (JSP)
- Java Servlet
- Enterprise JavaBeans
- Java Database Connectivity (JDBC)
- Java Transaction API (JTA)
- Java Message Services (JMS)
- JavaMail
- JavaBeans Activation Framework
- Java API for XML (JAXP)
- J2EE Connector Architecture
- Java Authentication and Authorization Services (JAAS)

OracleAS Web Cache – Oracle AS Web Cache is a state-of-the-art Web caching and proxy server solution that provides server acceleration and load balancing for both static and dynamic Web content. In addition, OracleAS Web Cache offers many advanced features, including intelligent caching, page assembly, compression features, and Edge Side Includes (ESI).

Oracle TopLink – Oracle Application Server TopLink is a tool that simplifies the otherwise demanding task of mapping Java objects to Oracle relational database models. This tool allows developers that are comfortable with Java programming techniques to extend programming for persistent objects into the relational realm, without requiring knowledge of SQL and PL/SQL syntax. Oracle Application Server TopLink can be used to greatly reduce the time required to build high-performance J2EE applications.

Oracle JDeveloper – Oracle JDeveloper is an integrated set of tools to enable rapid J2EE and XML development. JDeveloper offers a full suite of wizards, editors, visual design tools, and deployment tools. Many developers have found the fast Java debugger, the Java profiler, and the CodeCoach tools to be superior to any similar tools on the market.

These tools allow developers to easily build high-quality, standard J2EE components, including applets, JavaBeans, JavaServer pages, servlets, and Enterprise JavaBeans.

Portal and Wireless Tier

The Portal and Wireless tier is a middle tier that is built over a base of Oracle HTTP server and OC4J components. The unique components for this tier include:

Oracle Portal – Unlike the average portal building toolset, Oracle Application Server does not require extensive programming or complicated maintenance routines. In fact, Oracle Instant Portal allows those new to this field to build simple portals with little to no programming. Oracle Instant Portal also provides a framework for self-service content management and publishing, as well as deploying, publishing, and consuming Web services.

Oracle Application Server Wireless (Oracle Wireless) – Oracle Wireless allows corporations to develop and deploy wireless applications that can deliver content to any device on any wireless network, regardless of the protocol. Oracle Wireless provides e-mail and location-based services, as well as full support for XML and J2EE standards. This enables developers to build enterprise-class wireless applications that can be seamlessly deployed across the corporation.

Business Intelligence and Forms Tier

Oracle Business Intelligence Suite is a comprehensive suite of enterprise business intelligence (BI) products that provide a rich set of tools for analyzing corporate data. Like the Portal and Wireless tier, the Business Intelligence and Forms tier is a middle tier that is built over a base of Oracle HTTP server and OC4J components. The components for this tier include:

Oracle Business Intelligence Discoverer – OracleBI Discoverer is a business intelligence tool that allows non-technical users to analyze corporate data through intuitive interfaces. This integrated business intelligence solution includes capabilities for ad-hoc queries, reporting, analysis, and Web-publishing. OracleBI Discoverer can be used to access a wide variety of data sources, including multidimensional OLAP databases, data marts, data warehouses, or online transaction processing systems.

Oracle Application Server Personalization – OracleAS Personalization provides web users with a customized experience by offering recommendations based on real-time analysis of user history and user profiles. OracleAS Personalization is beneficial to Web stores, application hosting environments, business call centers, and any business with a web-based customer interface.

Oracle Application Server Reports Services – OracleAS Reports Services provides tools to develop and deploy high-quality, dynamically generated reports, while supporting large user communities. Any data source can be used to build reports, and any format is supported. It also includes Oracle Reports Developer, which uses servlets and JSP to support complex data models and diverse deployment environments.

Oracle Application Server Forms Services – OracleAS Forms Services enables corporations to develop and deploy forms based applications, similar in functionality to the classic Oracle Forms. One of the key differences is that instead of a heavy client deployment, Forms applications are deployed to **Java** clients in a Web environment. OracleAS Forms Services automatically optimizes performance, and scalability is enhanced by automatic load-balancing across all available Forms servers. OracleAS Server Forms Services consists of four components:

- **Forms Servlet:** When a user starts a Forms application, the Forms Servlet is used to establish the initial connection. The client session receives the HTML file that contains the Forms Client applet.
- **Forms Client Applet:** A Java applet that runs in the client browser. It provides the user interface for the Forms Runtime Process.
- **Forms Listener Servlet:** A **servlet** running in the **OC4J servlet container**. It manages the both the Forms Runtime Process and network connections to the Forms Runtime process.
- **Forms Runtime Process:** A process that runs in an Oracle Application Server **instance**. The runtime process maintains the connection between the Forms Client applet and the database.

Infrastructure Tier

The infrastructure tier consists of components that store and distribute the product meta-data and security information that is required to run Oracle applications. The infrastructure tier contains the following components:

Oracle Application Server Metadata Repository – OracleAS Metadata Repository is an information store for data that describes each installed Oracle Application Server component (including infrastructure components). This metadata enables both infrastructure and middle tier instances to optimally manage their components. OracleAS Metadata Repository can be installed into a new or existing Oracle Enterprise Edition database.

Oracle Identity Management – Oracle Identity Manager provides central control of all user accounts and access privileges for enterprise IT resources. Oracle Identity Management includes the following components:

- **Oracle Internet Directory** – Oracle Internet Directory is the Oracle implementation of Lightweight Directory Access Protocol (LDAP), version 3. All users are created and managed via OID, providing centralized authentication for the enterprise.
- **Single Sign-On (SSO)** – Single sign-on (SSO) allows application users (or application components requiring authentication) to log in once and gain access to all applications managed by OracleAS.
- **Delegated Administration Service** – Delegated Administration Services uses proxies to assign administrative privileges to trusted users and administrators.
- **Directory Integration Platform** – Directory Integration and Provisioning is used to synchronize Oracle Internet Directory and external directories and repositories, such as third-party LDAP implementations.
- **Oracle Application Server Certificate Authority** – The OracleAS Certificate authority manages and publishes X.509v3 certificates. OracleAS Certificate

Authority supports PKI-based (strong) authentication methods and provides assertion services.

Other Components

There are several other optional components that may be important in some cases, depending on corporate business requirements. These components include:

Oracle Integration – Oracle Integration provides a true Service-Oriented Architecture (SOA) that can be used to build an enterprise infrastructure for application-to-application communication. Even though the applications may be dissimilar in many ways, Oracle Integration makes use of standards-based tools to communicate between heterogeneous platforms.

Oracle BPEL Process Manager – Oracle BPEL utilizes cutting-edge technology to provide methods for assembling a set of discrete services into an end-to-end process flow that closely emulates natural Business processes. Oracle BPEL Process Manager offers substantially reduced cost and effort for designing Enterprise applications containing mission-critical business logic.

Oracle Business Activity Monitoring – Oracle Business Activity Monitoring (Oracle BAM) provides a comprehensive set of tools for building interactive dashboards and related business alert mechanisms. Oracle BAM provides crucial aid for business executives and operations managers that need to make decisions based on real-time data.

Oracle Enterprise Manager – Oracle Enterprise Manager 10g Grid Control is the primary tool offered by Oracle for monitoring and managing everything in the Oracle environment, including Oracle databases, Oracle Application Server, and Oracle Collaboration Suite. Grid Control offers comprehensive management and monitoring capabilities, including automatic monitoring for all targets.

Oracle Application Server 10g Release 2 Features

Oracle Application Server 10g Release 2 is a full featured release, integrating all software modules. Therefore, it is entirely possible to build an Enterprise OracleAS implementation with just Release 2 components.

At the most basic level, OracleAS Release 2 is composed of middle tier components and infrastructure tier components. (See the detailed descriptions in the previous section.)

The middle tier components include the following install types and components:

- J2EE and Web Cache – this install type includes the following components:
 - Oracle HTTP Server
 - Oracle Application Server Containers for J2EE (OC4J)
 - OracleAS Web Cache
 - Oracle JDeveloper (optional)
 - Oracle TopLink (optional)
- Portal and Wireless – this install type includes all of the J2EE and Web Cache components, plus the following components:
 - OracleAS Portal

- OracleAS Wireless
- Business Intelligence and Forms – this install type includes all of the J2EE and Web Cache components, the Portal and Wireless components, and the following components:
 - OracleAS Personalization
 - OracleBI Discoverer – includes the following components:
 - OracleBI Discoverer Plus
 - OracleBI Discoverer Viewer
 - OracleBI Discoverer Portlet Provider
 - OracleAS Reports Services
 - OracleAS Forms Services

The Infrastructure tier components include:

- OracleAS Metadata Repository – optionally integrated with a corporate Oracle database
- Oracle Identity Management Components

OracleAS Release 2 features flexible, expandable implementation options. Middle tier components may be distributed across multiple servers. This can be done to improve performance or for management convenience. The group that contains these distributed components is called an OracleAS Farm. An OracleAS Farm shares a common Metadata repository. Another option is to duplicate or “clone” an Application Server to one or more copies. This forms an OracleAS Cluster. OracleAS Clusters are used to implement High Availability architectures, as well as to improve performance.

Oracle Application Server 10g Release 3 Features

Oracle Application Server 10g Release 3 (10.1.3) is a focused release, centered on J2EE Applications. This release features the following middle tier components:

- Oracle HTTP Server
- Oracle Containers for J2EE (OC4J)
- Oracle Enterprise Manager 10g Application Server Control
- Oracle Process Manager and Application Server

There are several improvements in the J2EE implementation. The new version of OC4J containers meets the J2EE 1.4 specification. There is also a new version of Application Server Control that is based on the Java Management Extensions (JMX) technology. Oracle Process Manager and Notification Server (OPMN) performs an enhanced role, including improved clustering capabilities. OC4J also includes a new, more flexible method for grouping OC4J instances that is different from the Release 2 Farms/Clusters model. The new OC4J grouping method facilitates the deployment and management of J2EE applications across a cluster topology.

At the time of this whitepaper (January 2007) no software modules other than those listed above were supported by OracleAS Release 3. Specifically, the following modules are not supported:

- Portal and Wireless middle tier
- Business Intelligence and Forms middle tier

- Infrastructure tier

Choosing Oracle Application Server Releases

Since OracleAS 10.1.3 is not a complete replacement for OracleAS 10.1.2, Administrators attempting either an upgrade or a fresh install may be confused by the options presented by the two versions. Fortunately, the decisions required are not as difficult to make as it first may appear. Depending on your requirements, it is fairly easy to make some general recommendations.

First of all, it is important to understand that OracleAS 10.1.3 can work with certain 10.1.2 components. It is possible to redeploy 100% 10.1.2 J2EE applications under 10.1.3 (in fact, this is encouraged). It is also possible to use 10.1.2 Web Cache as a reverse proxy for either 10.1.2 or 10.1.3. The 10.1.2 version of Oracle Identity Management can also be used with 10.1.3. Finally, OracleAS Portal version 10.1.2 (or version 10.1.4) can be used to publish OracleAS 10.1.3 content. (Note that Portal still requires the presence of a 10.1.2 version of OC4J.)

Given these facts, if you wish to install or upgrade OracleAS, answering some simple questions will help you to determine the correct path. After examining the list of supported 10.1.3 components listed above, will you need to install any OracleAS components that do not appear in the 10.1.3 list? If the answer is no, you can start by performing a clean install of 10.1.3.

If the answer is yes, you will need to first install the 10.1.2 version of the components. For middle tier components, this implies that a 10.1.2 version of Oracle HTTP server and OC4J must also be installed. Note that the “compatible” list just discussed requires a layer of 10.1.2 components. Even if you have 100% Java applications that you wish to redeploy under 10.1.3, you may find it convenient to first install under 10.1.2. Therefore, the general case is that you should start by performing a full install under 10.1.2.

Do you need to install 10.1.3 at all? The answer is yes if you have “home grown” J2EE applications that you wish to deploy or redeploy with the latest and most advanced architecture (applications typically developed with JDeveloper and TopLink). If your main goal is to utilize applications generated through Forms Services, Report Services, or Portal, version 10.1.3 may not add much value for you.

Note that if you do install 10.1.3, it is not truly an “upgrade”. Rather, it is the installation of independent products, which can interoperate in certain cases.

Since the majority of those installing Oracle Application Server will need to install OracleAS 10.1.2, that will be the focus of this whitepaper. Those wishing to upgrade their J2EE components are encouraged to refer to the “Oracle Application Server Upgrade and Compatibility Guide 10g Release 3 (10.1.3)”.

Deploying Oracle Application Server 10g

Deploying Oracle Application Server 10g isn't quite as simple as picking a server and placing a CD in the media tray. Rather, a number of decisions have to be made up front that will influence how OracleAS is deployed. The first decision is to choose the architectural model. This can include the choice of one-tier, two-tier, three-tier, or multi-tier options. Of course, the success of the implementation will also depend on the choice of servers. Dell PowerEdge servers offer flexible options for OracleAS deployment, whether you choose to deploy a few powerful servers or a distributed architecture over several smaller (but fast) servers. The performance of the OracleAS implementation is largely determined by the decisions made in the planning stage, so planning the OracleAS deployment should not be taken lightly.

Choosing the Number of Tiers

By design, Oracle Application Server 10g offers a large variety of deployment options. At the simplest level, it is possible to install all OracleAS components on a single server. This is often done for small installations or test servers. In this scenario, the J2EE, Web Cache, Infrastructure, and Portal/Business Intelligence/Forms applications are all installed on the same server. This is essentially a "two-tier" installation, since all OracleAS components are installed in a single server-side tier (in fact, on a single machine), and the client web browsers and applets are the client-side tier.

It should be noted that this does not necessarily include the corporate database, which is frequently accessed by Oracle Applications. The only OracleAS-specific database component is the Metadata Repository. By default, this is installed in a small stand-alone database on the OracleAS server, along with the rest of the Infrastructure components. The actual corporate data accessed by applications (i.e. financial data, transaction histories, etc.) is stored in a pre-existing database, which is usually located on a separate server, and is accessed remotely via the network. For performance reasons, it is recommended to separate OracleAS components from the production corporate database. An example of a basic two-tier implementation is illustrated in Figure 1.

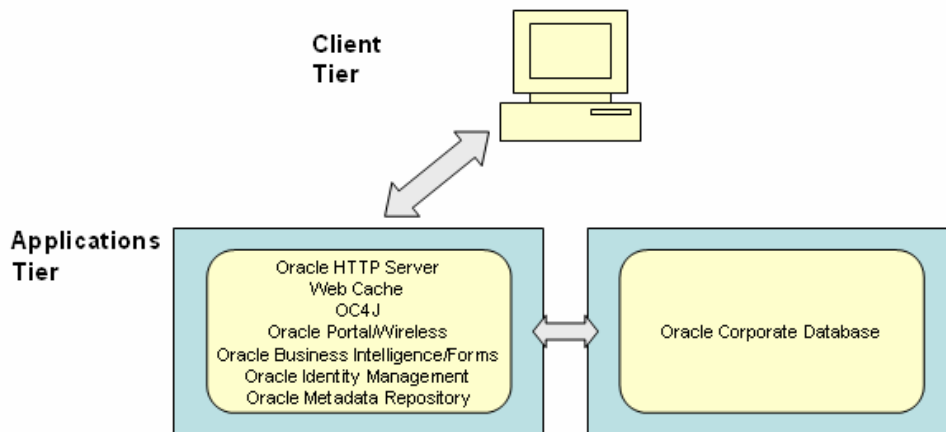


Figure 1. Basic Two-Tier OracleAS Deployment Topology

An improvement to the two-tier model is to install the Metadata Repository component into the pre-existing corporate database with the “Repository Creation Assistant” tool. This splits the Metadata Repository from the other Infrastructure components, but it removes the need to host a small database on the OracleAS server. Even in a two-tier model, separating the Metadata repository out from the other components improves performance. An example of a two-tier implementation with metadata hosted in the corporate database is shown in Figure 2.

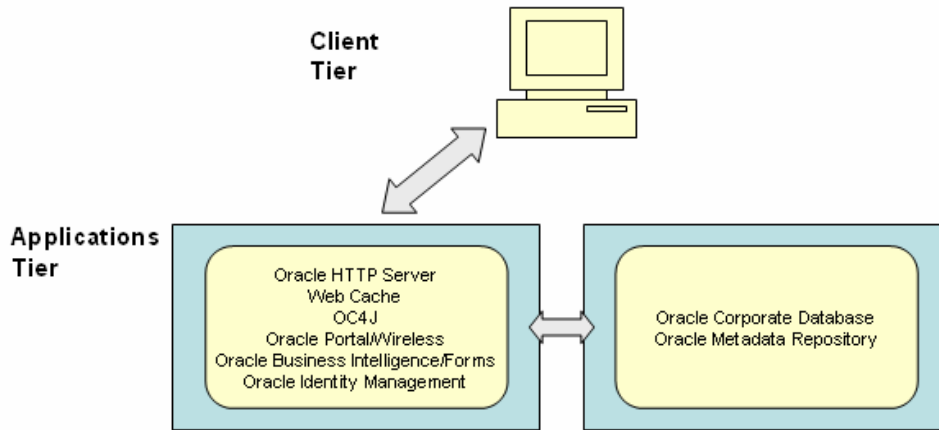


Figure 2. Improved Two-Tier OracleAS Deployment Topology

If at least two servers are available for OracleAS, a three-tier model can be implemented. In the simplest scenario, one server contains the J2EE, Web Cache, and Portal/BI/Forms applications. A second server contains the Infrastructure components, including security-related components such as Identity Management, OID, and Single Sign On, as well as the Metadata Repository. The separation of Infrastructure components from other components increases security (with an optional firewall) and also improves performance by lowering contention for server resources. Again, it is recommended to deploy the Metadata Repository into a pre-existing corporate database with the “Repca” tool. Figure 3 illustrates a simple three-tier implementation.

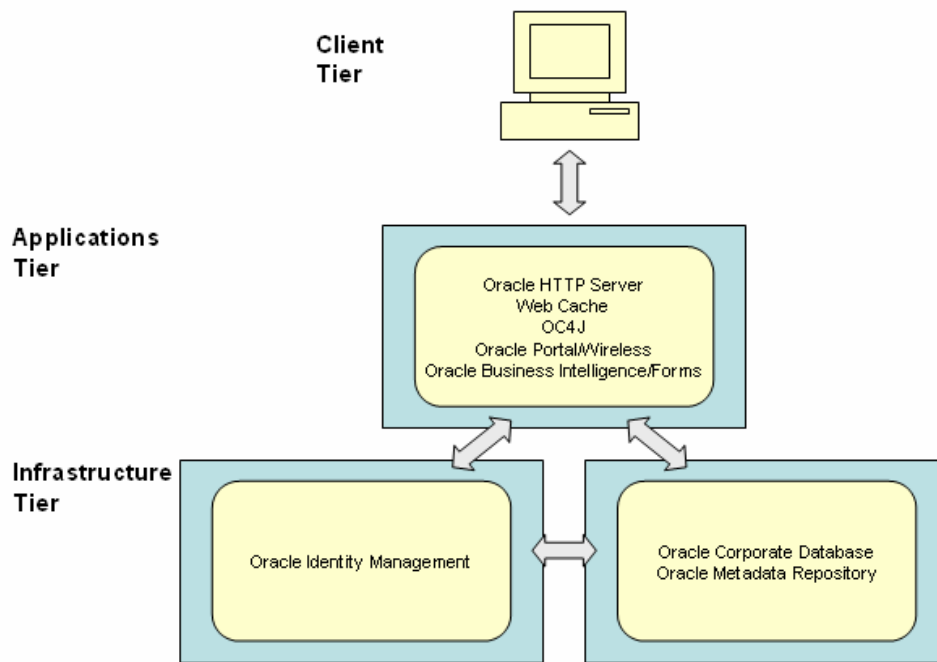


Figure 3. Basic Three-Tier Deployment Topology

With three OracleAS servers, the components in the three-tier model can be distributed for improved performance. An example is illustrated in Figure 4. The first middle tier server hosts the Portal/Wireless components and the second middle tier server hosts the Business Intelligence/Forms components. J2EE and Web Cache components are also installed on both middle tier servers. The Infrastructure tier is implemented on the third server. Splitting the components across three servers minimizes contention for server resources, while still allowing coordination between the components. This topology provides reasonable performance with a minimal server count, and this is the topology utilized in the installation example below.

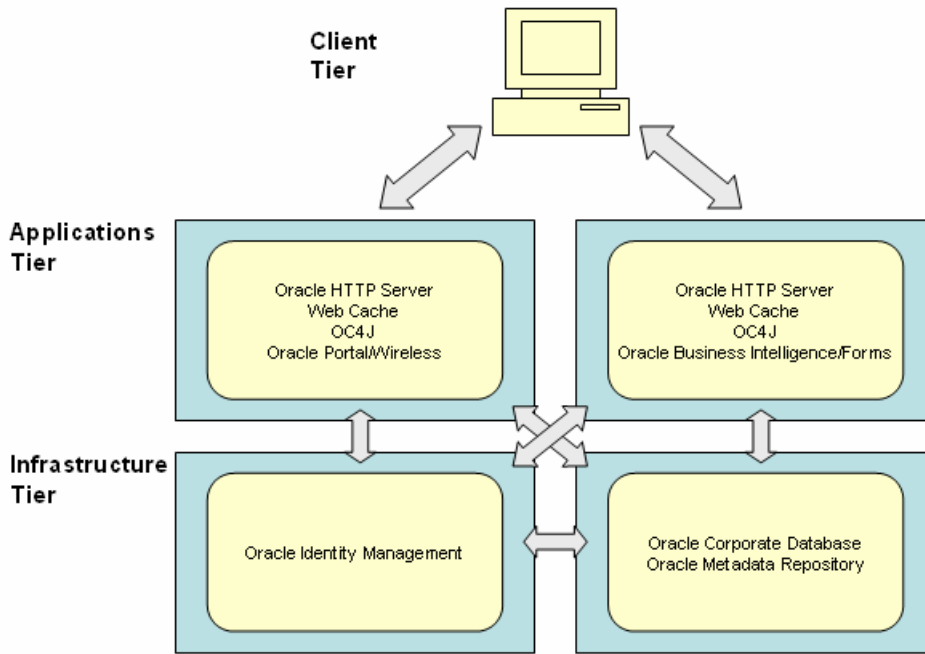


Figure 4. Preferred Three-Tier OracleAS Deployment Topology

With four or more servers, a simple multi-tier topology can be built. An example with five OracleAS servers is illustrated in Figure 5. This topology places two OracleAS clustered servers with J2EE and Web Cache components “in front” of the other two servers, intercepting user requests and input, and caching frequently accessed web content for rapid response. Behind the Web Cache, the second and third servers hosts “middle tier” components such as Portal, Wireless, Business Intelligence applications and Forms/Reports.

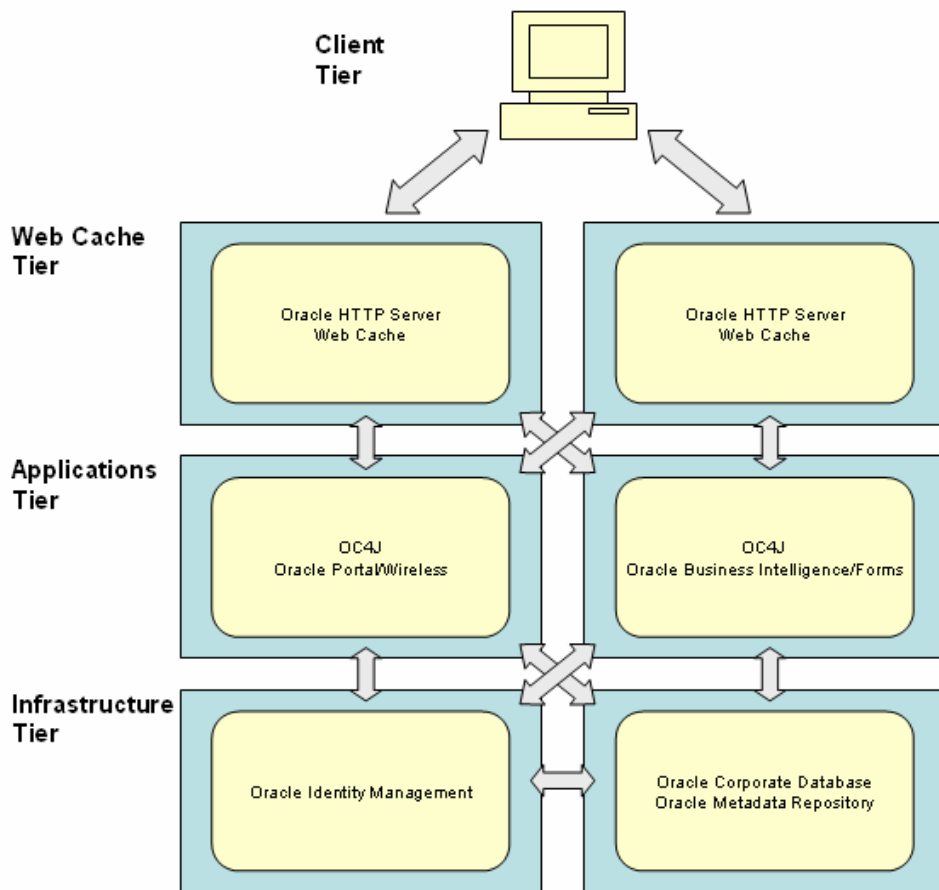


Figure 5. Basic Multi-Tier OracleAS Deployment Topology

An Enterprise Deployment Scenario

There are a couple of good reasons why it may be desirable to consider more complex deployment models. The more advanced topologies require more than three servers and potentially more than three tiers. One reason to utilize a multi-server, multi-tier model is scalability. Oracle active-active clustering techniques can be used to increase performance as you add servers. Another important reason to use a multi-server, multi-tier model is to achieve high availability. Even if the three server topology is sufficient to meet your performance requirements, it offers little protection in case of server or component failure. Each server is a potential point of failure for your applications, since there is no redundancy. Fortunately, Oracle clustering addresses this issue as well, providing redundancy and failover capability in case of server failure.

The architecture illustrated in Figure 6 is an Enterprise class, multi-tier topology for Oracle Application Server. This features a variety of techniques for providing scalability, load balancing, and high availability. One technique is to distribute components across multiple servers. The set of distributed applications is considered an OracleAS Farm.

The key step that coordinates the members of a farm is registration of all member components with a common Metadata Repository.

In addition, OracleAS Cluster technology (based upon OC4J containers) is used to “clone” application servers. These OracleAS clusters have built-in failover capabilities. Load balancing is provided by the use of load balancing routers. These routers must be capable of load balancing a variety of protocols, including TCP/IP, http, and LDAP.

The Infrastructure tier is split into three parts. The Single Sign On and Delegated Administration Services are placed in a clustered middle tier setting. For additional security, the middle tier is separated via a firewall from the remaining Infrastructure tier components, which include Oracle Internet Directory and the Metadata Repository. The Metadata Repository and the corporate database components are implemented within Oracle Real Application Clusters. For the highest level of security, the Metadata Repository for Applications and Security are placed on separate Real Application Clusters.

Most real world deployments will not be this complex, or include this many servers. However, all of the basic techniques for implementing an Enterprise class deployment are illustrated. For Further information, see the Oracle document “Oracle Application Server Enterprise Deployment Guide 10g Release 2 (10.1.2)”.

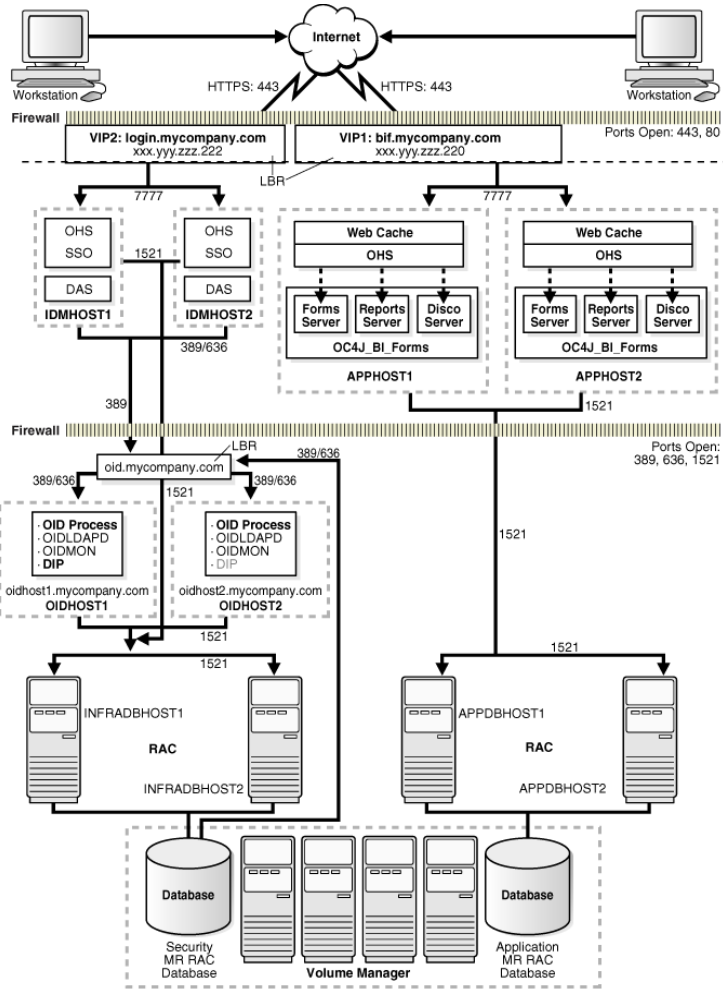


Figure 6. Enterprise Deployment Architecture for MyBIF.com (courtesy of Oracle Corporation, "Oracle Application Server Enterprise Deployment Guide 10g Release 2 (10.1.2)", 2006)

Advantages of Running OracleAS on Dell PowerEdge Servers

One of the key decisions in planning an Oracle Application Server deployment is the choice of hardware. By choosing Dell hardware, you can be confident that your deployment will be a success. Dell PowerEdge Servers and Dell/EMC Enterprise Storage provide a robust, scalable platform for deploying Oracle Application Server 10g applications. Dell offers three server classes that are appropriate for implementing Oracle Application Server:

- A 1U rack server with two processor sockets (currently the PowerEdge 1950)
- A 2U rack server with two processor sockets (currently the PowerEdge 2950)
- 4U rack servers with four processor sockets (currently the PowerEdge 6850 and PowerEdge 6950)

Equivalent tower servers are also available.



Figure 7. Preferred Dell PowerEdge Servers for Oracle Application Server

Dell PowerEdge servers utilize state-of-the-art processing architectures. In addition, Dell offers powerful “lights out” Enterprise monitoring tools, including Open Manage software and Digital Remote Access Cards.

Dell works closely with Oracle to help ensure maximum compatibility for their enterprise software. Oracle’s engineering teams rely on Dell platforms and Linux to help architect their scalable grid technologies. Oracle Enterprise Manager enables the monitoring of all Dell servers without the need for an external console. For the database tier, Dell offers Tested and Validated Configurations that can greatly reduce the complexity and time for deployment (see www.dell.com/oracle).

Dell Hardware Sizing Recommendations

In general, Dell servers with at least two processor sockets are recommended for OracleAS. For performance purposes, at least two processors are required to perform the CPU-intensive operations that OracleAS typically features. Internal disks in a RAID 1 or RAID 5 configuration are required, with at least 32 GB of available space. These disks can be Serial Attached SCSI or Serial ATA. Optionally, external Fibre Channel disk storage may be used for supplemental storage (not recommended for the boot partition). At least two network ports are required, preferably on two separate Network Interface cards.

The “entry level” servers for OracleAS are servers in the Dell PowerEdge 1950 series. These are 1U rack servers, with dual processor sockets and two expansion slots. These servers are designed to function as web servers or small application servers. In the three

tier configuration detailed above, a PowerEdge 1950 is ideal for a stand-alone J2EE server or one or more servers utilizing Web Cache as a front-end for a set of application servers. In the Enterprise topology, PowerEdge 1950 servers are ideal for clustered J2EE and Web Cache servers.

Dell PowerEdge 2950 servers are useful for a wide variety of OracleAS roles. These are 2U rack servers with two processor sockets and three expansion slots. These servers are ideal for the middle or infrastructure tiers. They may also be used as Corporate Database / Metadata Repository servers for small-medium size databases.

Dell PowerEdge 6850 and PowerEdge 6950 servers are 4U rack servers, with four processor sockets and seven expansion slots. This server class is typically used for large corporate databases. In some cases, these servers can be used as a powerful middle tier or infrastructure tier servers. However, it is generally preferred to use multiple PowerEdge 2950 servers to “scale out” middle/infrastructure tiers to enable load balancing and redundancy.

Linux OS Installation – Preparing the System for Oracle Application Server

Installing the Linux Operating System to prepare for an OracleAS implementation need not be a daunting task. The Linux OS installation process can be broken down to five basic steps:

1. Meeting the minimum hardware requirements
2. Choose the correct OS version
3. Basic OS installation
4. Post-installation configuration
5. Configuration for the Metadata Repository

Minimum System Requirements

Before beginning the installation process, it is important to configure the hardware to meet or exceed the minimum system requirements for Oracle Application Server. Ideally, the requirements should be checked before the Linux Operating System is installed, or even before the hardware is ordered from Dell. However, it is not uncommon that an existing server is re-purposed, or the OS is installed before all of the requirements are fully checked. For these reasons, it is useful to know how to confirm that the requirements have been met by issuing commands from the Linux command line, so relevant OS commands will be listed below.

The easiest requirement to meet is the requirement for processors. At minimum OracleAS requires at least one 300 MHz processor. Dell recommends at least two processors. In fact, all of the recommended Dell systems listed above support two sockets (single core or dual core), with speeds at 1.6 GHz and above. To check processor speeds in Linux, use the following command:

```
# cat /proc/cpuinfo | grep MHz
```

To install and manage OracleAS, a monitor is recommended, whether locally attached or networked through a KVM. The monitor should support at least a 256 color display. If problems are encountered with a monitor, they are more commonly the fault of improper driver settings at the OS level, rather than an actual hardware restriction. To verify the performance of a monitor (or more specifically, the monitor driver) in Linux, issue the following command:

```
# /usr/X11R6/bin/xdpyinfo (check for a depth of at least 8 bits per pixel)
```

Oracle Application Server can require a substantial amount of memory, depending on the modules that are installed on a specific server. The memory required is cumulative, so if you install all modules on the same server, you may need as much as 3.5 GB of RAM/ Keep in mind that you should reserve approximately 1 GB for the OS. Table 1 shows the memory required per tier:

OracleAS Tier	Memory Required
J2EE and Web Cache	512 MB
Portal and Wireless	1 GB
Business Intelligence and Forms	1 GB
OracleAS Infrastructure	1 GB

Table 1

To verify the RAM available in Linux, use the following command:

```
# grep MemTotal /proc/meminfo
```

OracleAS also requires a certain amount of disk space for each component, as well as disk space for temporary storage and OS swap space. In general, each server in an OracleAS cluster will have its own copy of data on disk, the contents of which are locally managed. The disk space may be local to the server or on an external SAN or NAS device. Only a couple of cases require disks shared between nodes – Oracle Failover Clusters (not covered here), and the Metadata Repository, if it is stored in a Real Application Cluster Database. In these two cases, the disk must be on an external SAN or NAS device. Table 2 shows the disk requirements:

OracleAS Tier or OS Component	Disk Requirement
J2EE and Web Cache	900 MB
Portal and Wireless	1.2 GB
Business Intelligence and Forms	2 GB
OracleAS Infrastructure	3.7 GB
/tmp	400 MB
Swap Space	512 MB

Table 2

To check free disk space, use the following Linux command:

df -h

To check temp space, use the following Linux command:

df -k /tmp

To check swap space, use the following Linux command:

grep SwapTotal /proc/meminfo

OS Selection

For the purposes of this paper, it is assumed that you will be installing the Red Hat Enterprise Linux distribution of Linux. Dell strongly advises that the Advanced Server (AS) edition be utilized as opposed to the Enterprise Server (ES) edition. Dell performs Oracle testing using Red Hat AS, which is fully supported by Dell Support.

Another choice to make is the exact version of Red Hat Enterprise Linux AS to install. Both versions 3.0 or 4.0 of the OS are supported for either OracleAS versions 10.1.2 or 10.1.3. Red Hat Enterprise Linux version 4.0 is clearly preferred due to numerous new features and improvements. However, some sites may still be using version 3.0 for their databases or other applications. If version 3.0 is chosen, Update 3 or higher is supported. For version 4.0, Update 1.0 or higher is supported.

Finally, the choice of a 32-bit OS or a 64-bit OS should be considered. The 32-bit version of Linux is referred to as the “x86” kernel. The 64-bit version of Linux is referred to as the “x86_64” kernel. Installing the 32-bit version of OracleAS is fully supported on the x86 version of Linux. Currently, Oracle does not provide a 64-bit version of Oracle Application Server for the EM64T platform. It is possible to install the 32-bit version of Oracle Application Server on the x86_64 version of Linux. This requires some care in setting up the installation and runtime environments.

Basic OS Installation

The actual OS installation is not that difficult. In fact, there are three different wizard-driven installation packages to choose from:

1. The Dell “Oracle Database 10g – Linux Deployment” CDs. These CD ISO images are a free download from Dell, located at http://www.dell.com/content/topics/global.aspx/solutions/en/oracle_solution?c=us&cs=555&l=en&s=biz&~section=005 Choose the “Oracle Database 10g

Validated Configuration” link. Choose the correct Red Hat version, and you may then download two CD ISO images and documentation. These CDs are designed for preparing the operating system for an Oracle Database 10g database install, but they work for preparing for an Oracle Application 10g install, as well. To start the Linux installation, boot from the first CD. At the menu, choose option 4 to select “Red Hat Enterprise Linux 4 AS for Oracle Database (x86_64)”. You will be prompted to insert each of the Red Hat CDs. The server will then reboot to complete the OS install. You will be prompted for input for user preferences, etc. You then need to insert the second CD, mount the CD, and run the install script. You may then run a set of shell scripts to complete the Oracle setup. Refer to the Linux Deployment guide for detailed instructions. Using this installation method means that most of the post-installation steps listed below for preparing for OracleAS will be performed by the Dell scripts.

2. The Dell “Installation and Server Management” CD. This CD automates the installation of Red Hat Enterprise Linux AS. The CD is shipped with Dell PowerEdge servers, or can be downloaded from <http://support.dell.com>. Like the Dell Oracle Deployment CDs, this CD allows the operating system to deliver additional software or customization specific to PowerEdge systems, including correct device drivers for detected hardware components. To use this CD, first disconnect any USB devices attached to your server. Next, insert the Installation and Server Management CD into your CD drive and reboot your system. Follow the directions on the screen and the instructions in the documentation that came with your CD. Because this installation method is automatic and installs “Typical” packages, you will need to augment the OS with additional packages and configuration, as detailed below.
3. A custom install directly from the Red Hat Installation CDs. To perform a custom installation using the Red Hat CDs, insert the Installation CD 1 into your CD drive and reboot your system. A Welcome screen appears that gives you several choices for the type of installation to perform. Press <Enter> at the boot: prompt to select Graphical Installation Mode. You may get a message that the operating system cannot detect any disks in the system during the installation process. If so, use a device driver diskette for your storage controller. You may then download the latest device driver diskette image for your controller from the Dell Support website at <http://support.dell.com>, and follow the instructions for using the diskette. Review the notes on the left-hand side of the screen as you proceed through the installation. Also, review the Installation Guide on the Red Hat Documentation CD. If you are installing or reinstalling Red Hat Enterprise Linux on a system with a Dell utility partition, at the appropriate prompt, select “Install boot loader on first sector of boot partition”. Performing this action maintains the ability to boot to the utility partition because the system does not overwrite the master boot record. If you are not sure if you have a utility partition, view the existing partitions with Disk Druid in the installer. The utility partition is located on either the /dev/sda1 or /dev/hda1 partition. Choose either the “Everything” set of installation packages or the “Advanced Server” set of application packages. In either case, you will need to install additional RPM packages after the OS install, either from the CDs or from the Red Hat website at <http://rhn.redhat.com>.

Post-Installation OS Configuration

After the Red Hat Enterprise Linux AS operating system is installed; there are several post-installation steps that are required to prepare your servers for OracleAS installation. The first step is to check which version of the OS is installed (3.0 or 4.0), especially if you did not perform the OS installation yourself. To check the OS version, use the command:

```
# cat /etc/issue
```

It is important to install the required Red Hat update version, as listed above for Red Hat 3.0 and 4.0. If the wrong version is installed, you will need to either re-install with the correct CD or upgrade your OS to the EXACT version listed above (DO NOT use the Red Hat tool “update” to get the latest updates). To check the update version:

```
# cat /etc/redhat-release
```

It is also necessary to check the version of OS packages installed against the list of OracleAS requirements. To check for the version (or existence) of individual packages, use the following command:

```
# rpm -q package_name
```

If a required package is found to be missing, it can be installed with the following command:

```
# rpm -ivh package_name
```

If a required package is installed, but the version of the package is too low, the problem can be resolved by locating or downloading the correct version, and upgrading with the following command:

```
# rpm -ivh package_name
```

In some cases, Oracle requires that a 32-bit package be installed, even if you are working with a 64-bit OS. To install 32-bit packages on a 64-bit system, you may need to use the `--force` option and the `--nodeps` option of the rpm utility:

```
# rpm -ivh --force --nodeps package_name
```

It is important to keep in mind that if OracleAS is installed on a 64-bit Red Hat, you will need to use a 32-bit shell emulation for installation purposes and for any subsequent OracleAS sessions. You can place the following command in the `.bash_profile` environment file for each OracleAS server user:

```
# linux32 bash
```

You should also make sure that the packages that you install match the architecture of the OracleAS requirements. To check the architecture of an installed package:

```
# rpm -q package_name --queryformat "%{arch}\n" (should be i686 for Intel)
```

The following rpms are required (same version or higher) for Red Hat Enterprise Linux AS/ES 3.0 x86 (32-bit):

- glibc-2.3.2-95.27
- glibc-common-2.3.2-95.27
- binutils-2.14.90.0.4-35

- compat-glibc-7.x-2.2.4.32.6
- compat-libstdc++-7.3-2.96.128
- compat-libstdc++-devel-7.3-2.96.128
- gcc-3.2.3-42
- gcc-c++-3.2.3-42
- libstdc++-3.2.3-42
- libstdc++-devel-3.2.3-42
- openmotif21-2.1.30-8
- pdksh-5.2.14-21
- setarch-1.3-1
- make-3.79.1-17
- gnome-libs-1.4.1.2.90-34.1
- sysstat-4.0.7-4.EL3.3compat-db-4.0.14-5

The following rpms are required (same version or higher) for Red Hat Enterprise Linux AS/ES 3.0 x86_64 (64-bit):

- glibc-2.3.2-95.27.x86_64.rpm
- glibc-3.2.3-95.27.i686.rpm (32-bit)
- glibc-devel-3.2.3-95.27.x86_64.rpm
- glibc-devel-3.2.3-95.27.i386.rpm (32-bit)
- gcc-3.2.3-20.x86_64.rpm
- libgcc-3.2.3-20.x86_64.rpm
- libgcc-3.2.3-20.i386.rpm (32-bit)
- setarch-1.3-1.x86_64.rpm
- pdksh-5.2.14-21.x86_64.rpm
- openmotif21-2.1.30-8.i386.rpm
- compat-glibc-7.x-2.2.4.32.5.i386.rpm (32-bit)
- compat-gcc-7.3-2.96.122.i386.rpm
- sysstat-4.0.7-4.x86_64.rpm
- gnome-libs-1.4.1.2.90-34.1.i386.rpm (32-bit)
- compat-db-4.0.14-5.1.i386.rpm (32-bit)

The following rpms are required (same version or higher) for Red Hat Enterprise Linux AS/ES 4.0 x86 (32-bit):

- glibc-2.3.4-2.9
- glibc-common-2.3.4-2.9
- binutils-2.15.92.0.2-13
- compat-libstdc++-296-2.96-132.7.2
- gcc-3.4.3-22.1
- gcc-c++-3.4.3-22.1
- libstdc++-3.4.3-22.1
- libstdc++-devel-3.4.3-22.1
- openmotif21-2.1.30-11.RHEL4.4
- pdksh-5.2.14-30
- setarch-1.6-1
- make-3.80-5
- gnome-libs-1.4.1.2.90-44.1

- sysstat-5.0.5-1
- compat-db-4.1.25-9
- control-center-2.8.0-12
- xscreensaver-4.18-5.rhel4.2

The following rpms are required (same version or higher) for Red Hat Enterprise Linux AS/ES 4.0 x86_64 (64-bit):

- binutils-2.15.92.0.2-13.x86_64.rpm
- compat-db-4.1.25-9.i386.rpm (32-bit)
- compat-db-4.1.25-9.x86_64.rpm
- control-center-2.8.0-12.x86_64.rpm
- gcc-3.4.3-22.1.x86_64.rpm
- gcc-c++-3.4.3-22.1.x86_64.rpm
- glibc-2.3.4-2.9.i686.rpm (32-bit)
- glibc-2.3.4-2.9.x86_64.rpm
- glibc-common-2.3.4-2.9.x86_64.rpm
- gnome-libs-1.4.1.2.90-44.1.x86_64.rpm
- libstdc++-3.4.3-22.1.i386.rpm (32-bit)
- libstdc++-3.4.3-22.1.x86_64.rpm
- libstdc++-devel-3.4.3-22.1.i386.rpm (32-bit)
- libstdc++-devel-3.4.3-22.1.x86_64.rpm
- make-3.80-5.x86_64.rpm
- pdksh-5.2.14-30.x86_64.rpm
- sysstat-5.0.5-1.x86_64.rpm
- xscreensaver-4.18-5.rhel4.2.x86_64.rpm
- setarch-1.6-1.x86_64
- openmotif21-2.1.30-11.RHEL4.4.i386.rpm (32-bit)

For all Red Hat kernels, add the following lines to /etc/security/limits.conf:

```
*   hard  nofile 65536
*   soft  nproc 2047
*   hard  nproc 16384
*   soft  nofile 2048
*   hard  nofile 65536
```

If it does not already exist, add the following line to the /etc/pam.d/login file:

```
session required /lib/security/pam_limits.so
```

Of course, a user account and appropriate groups are required before Oracle software can be installed. The following commands (run as root) will set up the oracle user, as well as the oinstall and dba groups (the dba group is only required for the Metadata Repository server):

```
# groupadd -g 701 dba
# groupadd -g 700 oinstall
# useradd -c "Oracle software owner" -u 700 -g oinstall -G dba oracle
# passwd oracle password
```

Directories for Oracle software installation should be created before installation. Use the following commands to create the directories, set ownership, and set permissions:

```
# mkdir /opt/oracle
# mkdir /opt/oracle/oraInventory
# mkdir /opt/oracle/product
# mkdir /opt/oracle/product/10.1.2
# mkdir /data
# mkdir /data/db
# chown -R oracle.oinstall /opt/oracle
# chown -R oracle.dba /data/db
# chmod -R 775 /opt/oracle /data/db
```

By default, the oracle user utilizes the bash shell as the login shell. The following entries in the file `/home/oracle/.bash_profile` set up the oracle user's environment:

```
export TMP=/tmp
export TMPDIR=/tmp
if [ $USER = "oracle" ]; then
    if [ $SHELL = "/bin/ksh" ]; then
        ulimit -p 16384
        ulimit -n 65536
    else
        ulimit -u 16384 -n 65536
    fi
fi
```

Note that environment variables such as `ORACLE_HOME` are not set for the Oracle install. Additional environment variables can be set after the install.

Oracle will use default port numbers for the OracleAS install. However, there may be some conflicts with reserved ports in the `/etc/services` file. These conflicts typically involve services that you will not use anyway, such as Linux LDAP services. If possible, comment out any entries for ports 389, 636, and 1521 in the `/etc/services` file. If you wish to use alternate ports, or any custom port numbers, create a file named `staticports.ini` with the following format:

J2EE and Web Cache

```
Oracle HTTP Server port = port_num
Oracle HTTP Server Listen port = port_num
Oracle HTTP Server SSL port = port_num
Oracle HTTP Server Listen (SSL) port = port_num
Oracle HTTP Server Diagnostic port = port_num
Java Object Cache port = port_num
DCM Java Object Cache port = port_num
DCM Discovery port = port_num
Oracle Notification Server Request port = port_num
Oracle Notification Server Local port = port_num
Oracle Notification Server Remote port = port_num
Application Server Control port = port_num
Application Server Control RMI port = port_num
Oracle Management Agent port = port_num
```

Web Cache HTTP Listen port = *port_num*
Web Cache HTTP Listen (SSL) port = *port_num*
Web Cache Administration port = *port_num*
Web Cache Invalidation port = *port_num*
Web Cache Statistics port = *port_num*
Log Loader port = *port_num*
ASG port = *port_num*

Business Intelligence and Forms
Reports Services SQL*Net port = *port_num*
Reports Services discoveryService port = *port_num*
Reports Services bridge port = *port_num*

Infrastructure
Oracle Internet Directory port = *port_num*
Oracle Internet Directory (SSL) port = *port_num*
Oracle Certificate Authority SSL Server Authentication port = *port_num*
Oracle Certificate Authority SSL Mutual Authentication port = *port_num*
Ultra Search HTTP port number = *port_num*

Configuration for the Metadata Repository

For any server that will host the OracleAS Metadata Repository, there are special requirements for Red Hat kernel parameters. The Metadata Repository is an actual Oracle database, and has the same requirements as any Oracle database on Red Hat Linux. This includes kernel parameters for shared memory, semaphores, and network parameters. You can check the current kernel parameter settings with the following commands:

```
# /sbin/sysctl -a | grep sem (semmsl, semmns, semopm, and semmni)
# /sbin/sysctl -a | grep shm (shmall, shmmax, and semmni)
# /sbin/sysctl -a | grep msg (msgmax, msgmnb, and msgmni)
# /sbin/sysctl -a | grep file-max (file-max)
# /sbin/sysctl -a | grep ip_local_port_range (ip_local_port_range)
```

If you need to make any changes, you should place the required entries in the `/etc/sysctl.conf` file. This will make the changes persist through reboots. The following entries are required:

```
kernel.shmall = 2097152
kernel.shmmax = 2147483648
kernel.shmmni = 4096
# semaphores: semmsl, semmns, semopm, semmni
kernel.sem = 256 32000 100 142
fs.file-max = 131072
net.ipv4.ip_local_port_range = 10000 65000
kernel.msgmni = 2878
kernel.msgmax = 8192
kernel.msgmnb = 65535
```

All of the changes in `/etc/sysctl.conf` will automatically become effective at the next boot. To make the changes effective immediately, simply issue the command:
sysctl -p

Configuring the Dell Hardware

Following OS configuration, there are several steps that need to be performed to configure the Dell hardware. These include installing and configuring Dell PowerConnect™ network switches, configuring networking on the servers, and configuring external storage. Installing Dell network switches is among the easiest tasks. If you use default settings, a Dell PowerConnect switch can be up and running almost as soon as you power it up. However, if you wish to configure advanced options such as Virtual LANs, you must perform some switch configuration steps. In addition, the more advanced PowerConnect switches are “Managed” switches that offer a management interface for ongoing management via the network. To configure switches, Dell offers a web interface and command line options, which can be implemented via a serial cable or a network interface. Configuring switch options is beyond the scope of this whitepaper, but more information and manuals can be found at <http://support.dell.com>.

External storage is not required for OracleAS, but it is not uncommon to store the Metadata Repository on external storage. In fact, if the Metadata Repository has been installed into an existing Real Application Cluster database, external storage will be used. This is because RAC requires shared external storage. Dell has partnered with EMC to offer the Clariion Fibre Channel Storage Array series for external storage. An outline of the steps to set up a Storage Area Network (SAN) is detailed below.

Configuring Basic Networking

Once you have installed Dell PowerConnect switches and have connected network cables between the switch (or switches) to the server NICs, it is time to configure basic networking on each server. The following steps describe how to configure basic networking within Red Hat Linux:

1. Log in as root.
2. Edit the network device file `/etc/sysconfig/network-scripts/ifcfg-eth#`, where # is the number of the network device, and configure the file as follows:
DEVICE=eth0
ONBOOT=yes
IPADDR=<Public IP Address>
NETMASK=<Subnet mask>
GATEWAY=<Gateway address>
BOOTPROTO=static
HWADDR=<MAC Address>
SLAVE=no
3. Edit the `/etc/sysconfig/network` file, and, if necessary, replace `localhost.localdomain` with the fully qualified public node name. For example, the line for node 1 would be as follows:

HOSTNAME=node1.domain.com

4. Type: **service network restart**
5. Type **ifconfig** to verify that the IP addresses are set correctly.
6. To check your network configuration, ping each public IP address from a client on the LAN outside the cluster.
7. Connect to each node to verify that the public network is functioning and type **ssh <public IP>** to verify that ssh is working.
8. On each node, modify the /etc/hosts file by adding the following lines (where FQN is the fully qualified hostname and shortname is the hostname without the domain).
127.0.0.1 localhost.localdomain localhost
<IP web cache node> <FQN web cache node> <shortname web cache node>
<IP applications node> <FQN applications node> <shortname applications node>
<IP infrastructure node> <FQN infrastructure node> <shortname infrastructure node>
<IP database node> <FQN database node> <shortname database node>
9. On each node, modify the /etc/resolv.conf file by adding the following lines.
nameserver <Primary DNS server address>
nameserver <Secondary DNS server address>
domain <your domain name>
10. Issue the command:
route add default gw <Gateway address>

One of the motivations for installing the Enterprise OracleAS topology is to configure high availability, with no single points of failure. By default, a server network cable from a server to a switch represents a single point of failure. If the switch fails, the network cable fails, or the NIC fails, network communication will cease and applications will become unavailable. To avoid these failure scenarios, a common practice is to implement network bonding. Network bonding utilizes at least two network ports per server, which are bonded together as a single logical port. The ports are connected to two different switches, which are connected together (or “trunked”). This provides redundancy and (optional) load balancing. If a cable is disconnected, the network bond will fail over to the other port, and service will continue.

The following steps illustrate how to setup network bonding:

1. Log in as root.
2. Add the following line to the /etc/modprobe.conf file (or /etc/modules.conf file for Red Hat 3.0):
alias bond0 bonding
3. For high availability, edit the /etc/modprobe.conf file and set the option for link monitoring. The default value for miimon is 0, which disables link monitoring. Change the value to 100 milliseconds initially, and adjust it as needed to improve performance. Type:
options bonding miimon=100 mode=1
4. In the /etc/sysconfig/network-scripts/ directory, create or edit the ifcfg-bond0 configuration file. For example, using sample network parameters, the file would appear as follows:
DEVICE=bond0

IPADDR=172.168.0.10
NETMASK=255.255.255.0
NETWORK=172.168.0.0
BROADCAST=172.168.0.255
GATEWAY=172.168.0.1
ONBOOT=yes
BOOTPROTO=none
USERCTL=no

5. The entries for NETMASK, NETWORK, BROADCAST, and GATEWAY are optional. DEVICE=bondn is the required name for the bond, where n specifies the bond number. IPADDR is the private IP address. To use bond0 as a virtual device, you must specify which devices will be bonded as slaves.
6. For each device that is a bond member, perform the following steps:
7. In the directory /etc/sysconfig/network-scripts/, edit the ifcfg-ethn files containing the following lines (where ethn is the name of a port participating in a bond):
DEVICE=ethn
HWADDR=<MAC ADDRESS>
ONBOOT=yes
TYPE=Ethernet
USERCTL=no
MASTER=bond0
SLAVE=yes
BOOTPROTO=none
8. Type **service network restart** and ignore any warnings.
9. On each node, type **ifconfig** to verify that the private interface is functioning. The private IP address for the node should be assigned to the private interface bond0.
10. When the private IP addresses are set up on every node, ping each IP address from one node to ensure that the private network is functioning.
11. Type **ssh <private IP>** to connect to each node and verify that the private network and ssh are functioning correctly.

Installing and Configuring the Dell|EMC SAN

Preparing external Dell|EMC SAN storage for use with Oracle is accomplished in three phases:

- Preparing the Clariion storage array.
- Preparing the Fibre Channel switches.
- Preparing the host-based storage drivers

The following steps provide an overview of the major tasks required to set up a functioning SAN. However, the actual process is fairly detailed, and is best performed by a Dell Consultant or after attending Dell's SAN training.

1. Initial hardware setup – this includes placing hardware in racks, connecting cables between components, and powering up the storage array.
2. Install Host Bus Adapters in the PowerEdge servers
 - a. Two HBAs are required for high availability.
 - b. Both PCI-Express and PCI-X versions are available

- c. Be sure to use slots with the same PCI version and bus speed for both HBAs on each cluster server (there is a diagram of slots on the top inside cover of the servers).
3. Initialize the CXx00 array – This involves accessing the storage array through a serial connection or cross-over cable, and setting key parameters, such as the IP addresses for the management interface for each storage processor. In addition, any required array based software is installed or upgraded at this time.
4. Install host based software –
 - a. Qlogic/Emulex HBA drivers - In addition to installing the correct version of the HBA driver, it is important to update the Qlogic or Emulex system BIOS to the currently supported level.
 - b. Navisphere™ Agent – this host-based agent will be used to register connected hosts with the storage array.
 - c. PowerPath™ – this software is used to configure failover and load balancing between fibre channel connections on a given server.
5. Configure Fibre Channel switches – this step involves connecting to the switches via a serial or web interface.
 - a. The IP address for the switch is entered. Initial configuration is performed, in preparation for zoning.
 - b. Perform Zoning on Fibre Channel switches – This step is performed on the network via a web interface. Zoning is the process of mapping servers to the storage array and granting specific access right to servers.
6. Configure storage with Navisphere – these are the key steps for organizing and presenting storage to the servers. Included are:
 - a. Create RAID groups from sets of disks
 - b. Subdivide the RAID groups into logical disk units called LUNs
 - c. Create a storage group that includes the servers and LUNs for the Oracle RAC system. The components of this storage group will be allowed to connect to each other.
7. Access storage through each server in the cluster – all servers should now have the same view of the shared external storage. PowerPath software adds value by managing multiple connections to the storage array per server for path failover and load balancing.

Verifying that the SAN is Ready for Oracle

Once the RAID Groups, LUNs, and Storage Groups have been prepared on the Clariion array; and zoning has been performed on the Fibre Channel switch; simply connecting the fiber cable to the HBAs should allow the servers to see storage. One of the key tools to view the storage configuration is the command:

```
# less /proc/partitions
```

This command allows you to scroll through a list of storage devices visible to the server (hit “q” to exit). At first you will see a list of physical devices, in the form of /dev/sd*a*, where “*a*” is one or more letters. This list may be as many as four times as big as the actual number of physical LUNs configured on the server. Each possible pathway to a given physical disk through a separate HBA port and switch port counts as a separate device. Ultimately, this view of disks would not work for connecting to Oracle without further configuration (Oracle would suffer from “double vision” in its view of the disks).

Once PowerPath software is configured, new logical disk devices of the form `/dev/emcpowera` are added to the end of the list. These logical devices correspond one-to-one to the actual physical LUNs. Do not be alarmed if the `emcpower` logical devices do not show up immediately after installing PowerPath. Often, you have to reboot each server to see the logical disk devices. To confirm the mapping of `/dev/sda` physical devices to `/dev/emcpowera` logical devices, issue the following command as the root user:

```
# powermt display dev=all
```

At this point, it is necessary to create at least one OS partition on each of the LUNs. The command to create partitions is “`fdisk`”. A typical session with `fdisk` to create a single partition on a LUN would proceed like the following:

```
# fdisk /dev/emcpowera
  p (to create a primary partition)
  1 (to create partition 1)
<return> (to accept the first block as the start of the partition)
<return> (to accept the final block as the end of the partition)
  w (to write the partition header to the disk)
```

Following the creation of partitions, the disks need to be formatted with file systems (or the equivalent). Oracle is actually rather flexible, allowing disks to be formatted with standard Linux file systems, the Oracle Cluster File System, Oracle Automatic Storage Management Disk Group format, or simply left as raw disk devices. The last four options are most appropriate for working with Oracle Real Application Cluster databases (configuring Oracle RAC is beyond the scope of this whitepaper). It is usually most appropriate to configure external storage designated for OracleAS servers with a Linux file system. The following command formats a partition as a Linux ext3 file system with a large number of potential files and a label to mount the file system with:

```
# mke2fs -j -N 5000000 -L /myfilesystem /dev/emcpowera1
```

Create a mount point for the file system by creating an empty directory with the command:

```
# mkdir /myfilesystem
```

To mount the file system at boot time, place a line in the `/etc/fstab` file with syntax similar to the following:

```
LABEL=/myfilesystem          /myfilesystem    ext3  defaults    0 0
```

To test the mount immediately, issue the command:

```
# mount -t ext3 /dev/emcpowera1 /myfilesystem
```

Use the following commands to confirm the file systems:

```
# mount
# df -h
```

The SAN should now be configured to work with OracleAS.

Installing and Configuring Oracle Application Server

The following sections describe basic installation procedures for a three-tier OracleAS topology. In addition, post-installation procedures for several OracleAS components are described.

Installation Process – Three-tier Topology

In this topology, one server will be reserved for Portal components, the second server is reserved for Business Intelligence/Forms components, and the third server is reserved for the Infrastructure tier. Ideally, these three servers will be Dell PowerEdge 2950 servers. The fourth server is a database server that contains the corporate data that the OracleAS components will interact with. If possible, you are encouraged to install the Metadata Repository in an existing database on the fourth server with the “RePCA” tool. The Metadata Repository can also be installed in an Oracle Real Application Cluster database. Ideally, the database server (or servers) consists of one or more Dell PowerEdge 2950 or 6x50 servers.

The following installation order should be used if you wish to install the Oracle Metadata Repository with the other Infrastructure components.

1. Install the Infrastructure tier and Metadata Repository.
2. Install the Portal tier.
3. Install the BI/Forms tier.

If you wish to install the Metadata Repository into an existing database, the following installation order should be used:

1. Install the RePCA tool.
2. Install the Metadata Repository schema in an existing database.
3. Install other Infrastructure tier components.
4. Install the Portal tier.
5. Install the BI/Forms tier.

The following sections give examples of both approaches.

Installing the Infrastructure tier and the Metadata Repository Together

Use the following steps to install all Infrastructure components on one server, including Oracle Internet Directory and the Metadata Repository:

1. Login as the root user at the console, or use the “su” command to become the root user.
su
2. Place the CD or DVD in the media tray. The automount directory should be located by one of the two following commands:
ls /mnt/cdrom
ls /media/cdrom

If the CD or DVD is not mounted, issue the following commands (one should work):

```
# mount /dev/cdrom /media/cdrom
```

```
# mount /dev/cdrom /mnt/cdrom
```

3. Setup X-Windows access:

```
# xhost +
```

4. Log in as the oracle user:

```
# su - oracle
```

5. Set the DISPLAY environment variable to your current location:

```
# export DISPLAY=hostname:0.0
```

6. From the current directory, launch the installer (do not launch from the CD or DVD mountpoint):

CD:

```
# mountpoint/1012disk1/runInstaller
```

DVD:

```
# mountpoint/application_server/runInstaller
```

7. In the Welcome screen, click **Next**.

8. In the Specify inventory directory and credentials screen, enter the following:

- a. Enter the full path of the inventory directory – enter a full path to the oracle inventory directory, i.e.

```
/opt/oracle/oraInventory
```

- b. Specify Operating System group name – enter the group name that will have write permissions to the inventory directory, i.e.

```
oinstall
```

- c. Click **Next**.

9. Run oraInstRoot.sh dialog – when prompted, open another command window and run the oraInstRoot.sh script in the Inventory directory as the root user. When finished, click **Continue**.

10. In the Specify File Locations screen, enter the following:

- a. Name – enter a name to identify the new Oracle software home directory, i.e.

```
OH_INFRA
```

- b. Path – Enter the full path to the new Oracle software home. Oracle will create the directory, if necessary. Example:

```
/opt/oracle/product/10.1.2/oraInfra
```

- c. Click **Next**.

11. In the Select a Product to Install screen, select **OracleAS Infrastructure** and click **Next**.

12. In the Select Installation Type screen, select **Identity Management and OracleAS Metadata Repository** and click **Next**.

13. In the Product-specific Pre-Requisite Checks screen, check for warnings regarding pre-requisites not met. If you need to change something, it is best to exit, fix the problem, and restart the installation. Click **Next** when ready.

14. In the Confirm Pre-Installation Requirement screen, check that you have met all listed requirements, and check all of the checkboxes. When finished, click **Next**.

15. In the Select Configuration Options screen, select the following:

- a. Select **Oracle Internet Directory**

- b. Select **OracleAS Single Sign-On**

- c. Select **OracleAS Delegated Administration Services**

- d. Select **OracleAS Directory Integration and Provisioning**

- e. Do not select **OracleAS Certificate Authority**
 - f. Do not select **High Availability and Replication**.
 - g. Click **Next**.
16. In the Specify Port Configuration Options screen, select **Automatic** and click **Next**.
 17. In the Specify Namespace in Internet Directory screen, select **Suggested Namespace** and click **Next**.
 18. In the Specify Database Configuration Options screen, enter the following:
 - a. Global Database Name – enter the fully qualified name for your database, usually a database name followed by your internet domain, i.e. **mydb.mycompany.com**
 - b. SID – enter the system identifier, or the short form of the database name (the first part of the global database name), i.e. **mydb**
 - c. Select Database Character Set – select the default character set for the database.
 - d. Database File Location – enter the path to store database files under. The path must already exist with write permissions for the oracle user. The installer will create a subdirectory with the SID name, i.e. **/data/db/mydb**
 - e. Click **Next**.
 19. In the Specify Database Schema Passwords screen, enter the passwords for the administrative database users. Click **Next** when finished.
 20. In the Specify Instance Name and ias_admin Password screen, enter the following:
 - a. Instance Name – enter a name for this Infrastructure instance, i.e. **infra**
 - b. ias_admin Password and Confirm Password – enter the ias_admin user password.
 - c. Click **Next**.
 21. In the Summary screen, verify the selections and click **Install**. The installation now proceeds.
 22. When the Run root.sh dialog appears, open a command window as the root user and run the root.sh script in the Oracle Home directory. After finishing the script, click **OK**.
 23. The Configuration Assistants screen appears automatically and shows the progress of the Configuration Assistants.
 24. When the End of Installation screen appears, click Exit to finish the installation.

Installing the Metadata Repository in an Existing Database

This approach is an alternative to the previous installation method. The first step in this method is to install the Metadata Creation Repository Assistant on the database server:

1. Login as the root user at the console, or use the “su” command to become the root user.
su
2. Place the CD or DVD in the media tray. The automount directory should be located by one of the two following commands:
ls /mnt/cdrom
ls /media/cdrom

If the CD or DVD is not mounted, issue the following commands (one should work):

```
# mount /dev/cdrom /media/cdrom
```

```
# mount /dev/cdrom /mnt/cdrom
```

3. Setup X-Windows access:

```
# xhost +
```

4. Log in as the oracle user:

```
# su - oracle
```

5. Set the DISPLAY environment variable to your current location:

```
# export DISPLAY=hostname:0.0
```

6. From the current directory, launch the installer:

CD:

```
# mountpoint/runInstaller
```

DVD:

```
# mountpoint/repga/runInstaller
```

7. In the Welcome screen, click **Next**.

8. In the Specify File Locations screen, enter the following:

- a. Name – enter a name for this repca installation, i.e.

```
repca_10_2_0
```

- b. Destination Path – enter the fully qualified path of a new Oracle Home for the Repository Creation Assistant, i.e.

```
/opt/oracle/product/10.2.0/repca_1
```

- c. Click **Next**.

9. In the Language Selection screen, choose any languages that you want to install for the Repository Creation Assistant. Move the languages to the **Selected Languages** box. English and the OS default language are always included. Click **Next**.

10. In the Launch Repository Creation Assistant screen, choose **Yes** if you want to run repca immediately after finishing the installation. Otherwise, click **No**. It is recommended to click No, so that you can verify pre-installation requirements before running repca. Click **Next** when finished.

11. In the Summary screen, click **Install** to start the installation.

12. In the Configuration Assistants screen, the installer will launch the Repository Creation Assistant, if you chose to run this assistant.

13. In the End of Installation screen, select **Exit** to exit the installer.

Before running the Repository Creation Assistant, there are several pre-requisites that have to be met for the existing database. The full list can be found at: http://download-west.oracle.com/docs/cd/B14099_19/sol.1012/repca.1012/repca/toc.htm, and all pre-requisites can be tested for and prepared for manually, using the commands in the referenced manual. In addition, a shortcut is available for testing requirement compliance. You can run the prerequisite check tool:

```
# ORACLE_HOME/repca/prereq/DBPrereqChecker -DBHOST dbhost -DBPORT dbport -DBNAME dbname -SYSPWD syspassword [-LOGDIR logdir] [-Help]
```

Where *ORACLE_HOME* is the Oracle Home directory just installed, the *dbhost* is the database hostname, the *dbport* is the port on which the database port is listening (usually 1521), *syspassword* is the SYS user password for the database, and *logdir* is an optional

log file directory. You may run the prerequisite checker several times, correcting any problems noted after each run.

After successfully running the prerequisite checker, the Repository Creation Assistant can be run. The details of the installation depend on the type of database (standalone, Oracle RAC) and the storage option chosen (file system, raw, CFS, ASM). The following example assumes that ASM Disk Groups are utilized:

1. Make sure the database is running and the listener associated with the database is running.
2. Set the NLS_LANG environment variable for the oracle session:
export NLS_LANG=american_america.us7ascii
3. Launch repca from the repca Oracle Home directory:
cd Repca_Oracle_Home
runRepca
4. In the Welcome screen, click **Next**.
5. In the Specify Oracle Home screen, enter the following:
 - a. Oracle Home – Enter the full path of the Oracle Home for the database, i.e.
/opt/oracle/product/10.2.0/db_1
 - b. Log File Directory – enter the full path where the log files for the Repository Creation Assistant are to be written.
 - c. Click **Next**.
6. In the Select Operation screen, select **Load** if you want to load the database without registering with the Oracle Internet Directory. Since you don't have an OID yet, choose this option. Otherwise, choose the **Load and Register** option. Click **Next**.
7. In the Specify Database Connection Information Screen, enter the following information:
 - a. SYS Password – enter the SYS password for the database
 - b. Single Node Instance or Real Application Cluster Database – choose the appropriate option, then enter information for the following fields:
 - i. Hostname – enter the short hostname or the fully qualified hostname (for RAC, enter hostname:port for the first node)
 - ii. Port – for a Single Node Instance, enter the listener port here
 - iii. Service Name – enter the service name for the database connection (use the global service name for RAC)
 - c. Click **Next**.
8. In the Specify Storage Options screen, select **Automatic Storage Management (ASM)**.
9. In the Select Disk Group screen, select the disk group that you want to use to install the Repository on. Click **Next**.
10. In the Specify Tablespace Information screen, choose the appropriate **Size** for each tablespace (large or small, depending on the anticipated load). Click **Next**.
11. If the SYSTEM and UNDO tablespaces are set to autoextend, you may see the Warning: Check Disk Space screen appear. Check that the respective tablespaces have adequate disk space available.
12. Specify Oracle Internet Directory Configuration – this screen and the next two screens appear only if you chose the **Load and Register** option earlier.

- a. Internet Directory Hostname - enter the hostname or fully qualified hostname of the computer that is running Oracle Internet Directory.
 - b. Internet Directory Port - enter the port number for Oracle Internet Directory.
 - c. **Use SSL to Connect to Oracle Internet Directory for Registration Purposes** - select this option if you want perform registration by connecting to the Oracle Internet Directory using SSL.
 - d. Click **Next**.
13. Specify Login for Oracle Internet Directory - enter the Username and Password to log in to Oracle Internet Directory. The user must belong to the iASAdmins group. You can use simple names (i.e., **myuser**) or the user's DN (i.e., **cn=orcladmin**).
 14. In the Specify Oracle Context screen, enter the location in Oracle Internet Directory where you want to register the OracleAS Metadata Repository.
 - a. **Root Oracle Context (cn=OracleContext)** - Select this option to register OracleAS Metadata Repository in the root Oracle context.
 - b. **Custom Oracle Context** - Select this option to register OracleAS Metadata Repository in a specific realm in Oracle Internet Directory. Enter the DN of the realm in the provided field
 - c. Click **Next**.
 15. When the Loading Repository screen is displayed, the schemas are created and the tablespaces are populated.
 16. When the Success screen is displayed, click **OK** to exit the Repository Creation Assistant.

After installing the Repository in a database, there are a couple of post-installation steps that may need to be performed:

1. Update the *Database_Oracle_Home/network/admin/sqlnet.ora* file to use LDAP to connect to the ORASSO_PS schema:
NAMES.DIRECTORY_PATH= (LDAP, TNSNAMES, ONAMES, HOSTNAME)
2. If you installed the Metadata Repository in a 9.0.6 database, you will have to create an Oracle Ultra Search instance. See the "Oracle Ultra Search Administrators Guide" for more information.

The last major step in this procedure is to install Oracle Identity Management and OID while referencing the existing Metadata Repository:

1. Login as the root user at the console, or use the "su" command to become the root user.
su
2. Place the CD or DVD in the media tray. The automount directory should be located by one of the two following commands:
ls /mnt/cdrom
ls /media/cdrom
If the CD or DVD is not mounted, issue the following commands (one should work):
mount /dev/cdrom /media/cdrom
mount /dev/cdrom /mnt/cdrom
3. Setup X-Windows access:

- # **xhost +**
4. Log in as the oracle user:
su - oracle
 5. Set the DISPLAY environment variable to your current location:
export DISPLAY=hostname:0.0
 6. From the current directory, launch the installer (do not launch from the CD or DVD mountpoint):
CD:
mountpoint/1012disk1/runInstaller
DVD:
mountpoint/application_server/runInstaller
 7. In the Welcome screen, click **Next**.
 8. In the Specify inventory directory and credentials screen, enter the following:
 - a. Enter the full path of the inventory directory – enter a full path to the oracle inventory directory, i.e.
/opt/oracle/oraInventory
 - b. Specify Operating System group name – enter the group name that will have write permissions to the inventory directory, i.e.
oinstall
 - c. Click **Next**.
 9. Run oraInstRoot.sh dialog – when prompted, open another command window and run the oraInstRoot.sh script in the Inventory directory as the root user. When finished, click **Continue**.
 10. In the Specify File Locations screen, enter the following:
 - a. Name – enter a name to identify the new Oracle software home directory, i.e.
OH_INFRA
 - b. Path – Enter the full path to the new Oracle software home. Oracle will create the directory, if necessary. Example:
/opt/oracle/oraInfra
 - c. Click **Next**.
 11. In the Select a Product to Install screen, select **OracleAS Infrastructure** and click **Next**.
 12. In the Select Installation Type screen, select **Oracle Identity Management** and click **Next**.
 13. In the Product-specific Pre-Requisite Checks screen, check for warnings regarding pre-requisites not met. If you need to change something, it is best to exit, fix the problem, and restart the installation. Click **Next** when ready.
 14. In the Confirm Pre-Installation Requirement screen, check that you have met all listed requirements, and check all of the checkboxes. When finished, click **Next**.
 15. In the Select Configuration Options screen, select the following:
 - a. Select **Oracle Internet Directory**
 - b. Select **OracleAS Single Sign-On**
 - c. Select **OracleAS Delegated Administration Services**
 - d. Select **OracleAS Directory Integration and Provisioning**
 - e. Do not select **OracleAS Certificate Authority**
 - f. Do not select **High Availability and Replication**.
 - g. Click **Next**.
 16. In the Specify Port Configuration Options screen, select **Automatic** and click **Next**.

17. In the Specify Repository screen, enter the following to identify the existing Metadata Repository:
 - a. Username – Enter a username with DBA privileges to log into the Repository database
 - b. Password – enter the DBA user's password
 - c. Hostname and Port – enter the hostname and Listener port for the database, i.e. **host:port**.
 - d. Service Name – enter the fully qualified service name used to connect to the database, i.e. **mydb.mycompany.com**
 - e. Click **Next**.
18. In the Specify Namespace in Internet Directory screen, select **Suggested Namespace** and click **Next**.
19. In the Specify Instance Name and ias_admin Password screen, enter the following:
 - a. Instance Name – enter a name for this Infrastructure instance, i.e. **Infra**
 - b. ias_admin Password and Confirm Password – enter the ias_admin user password.
 - c. Click **Next**.
20. In the Summary screen, verify the selections and click **Install**. The installation now proceeds.
21. When the Run root.sh dialog appears, open a command window as the root user and run the root.sh script in the Oracle Home directory. After finishing the script, click **OK**.
22. The Configuration Assistants screen appears automatically and shows the progress of the Configuration Assistants.
23. When the End of Installation screen appears, click Exit to finish the installation.

Installing the Portal/Wireless Tier

To install the Portal/Wireless tier, use the following procedure:

1. Follow the instructions above to launch the installer (do not launch from the CD or DVD mountpoint):
 CD:
`# mountpoint/1012disk1/runInstaller`
 DVD:
`# mountpoint/application_server/runInstaller`
2. In the Welcome screen, click **Next**.
3. In the Specify inventory directory and credentials screen, enter the following
 - a. Enter the full path of the inventory directory – enter a full path to the oracle inventory directory, i.e. **/opt/oracle/oraInventory**
 - b. Specify Operating System group name – enter the group name that will have write permissions to the inventory directory, i.e. **oinstall**
 Click **Next**.
4. Run orainstRoot.sh dialog – when prompted, open another command window and run the orainstRoot.sh script in the Inventory directory as the root user. When finished, click **Continue**.
5. In the Specify File Locations screen, enter the following:

- a. Name – enter a name to identify the new Oracle software home directory, i.e. **OH_PORTAL**
 - b. Path – Enter the full path to the new Oracle software home. Oracle will create the directory, if necessary. Example:
 - c. **opt/oracle/product/10.1.2/oraPortal**
 - d. Click **Next**.
6. In the Select a Product to Install screen, select **Oracle Application Server 10g** and click **Next**.
 7. In the Select Installation Type screen, select **Oracle Portal and Wireless** and click **Next**.
 8. In the Product-specific Pre-Requisite Checks screen, check for warnings regarding pre-requisites not met. If you need to change something, it is best to exit, fix the problem, and restart the installation. Click **Next** when ready.
 9. In the Confirm Pre-Installation Requirement screen, check that you have met all listed requirements, and check all of the checkboxes. When finished, click **Next**.
 10. In the Select Configuration Options screen, select the following:
 - a. Select **Oracle Application Server Portal**
 - b. Select **Oracle Application Server Wireless**
 - c. Click **Next**.
 11. In the Specify Port Configuration Options screen, select **Automatic** and click **Next**.
 12. In the next screen, enter information for connecting to the previously installed Oracle Internet Directory:
 - a. In the Register with Oracle Internet Directory screen:
 - i. Hostname – enter the hostname of the Infrastructure server where OID is configured.
 - ii. Port – enter the port that the Oracle Internet Directory listens on. The port number can be found in the ORACLE_HOME/install/portlist.ini file (where ORACLE_HOME is the home for OracleAS).
 - iii. If you select the **Use Only SSL Connections with this Oracle Internet Directory** option, the port number used above should be read from the “Oracle Internet Directory (SSL)” entry in the portlist.ini file.
 - iv. Click **Next**.
 - b. In the Specify OID Login screen, enter the following:
 - i. Username – enter the Oracle Administrative user, **orcladmin**.
 - ii. Password – enter the same password as the ias_admin user in the Infrastructure tier.
 - iii. Click **Next**.
 13. In the Select Oracle Application Server 10g Metadata Repository screen, select the Metadata Repository that is appropriate for this Portal instance.
 14. In the Specify Instance Name and ias_admin Password screen, enter the following:
 - a. Instance Name – enter a name for this Portal instance, i.e. **Portal**
 - b. ias_admin Password and Confirm Password – enter the ias_admin user password.
 - c. Click **Next**.

15. In the Summary screen, verify the selections and click **Install**. The installation now proceeds.
16. When the Run root.sh dialog appears, open a command window as the root user and run the root.sh script in this instance's Oracle Home directory. After finishing the script, click **OK**.
17. The Configuration Assistants screen appears automatically and shows the progress of the Configuration Assistants.
18. When the End of Installation screen appears, click Exit to finish the installation.

Installing the Business Intelligence and Forms Tier

To install the Business Intelligence and Forms tier, use the following procedure:

19. Follow the instructions above to launch the installer (do not launch from the CD or DVD mountpoint):
 CD:
`# mountpoint/1012disk1/runInstaller`
 DVD:
`# mountpoint/application_server/runInstaller`
20. In the Welcome screen, click **Next**.
21. In the Specify inventory directory and credentials screen, enter the following
 - a. Enter the full path of the inventory directory – enter a full path to the oracle inventory directory, i.e./**opt/oracle/product/10.1.2/oraInventory**
 - b. Specify Operating System group name – enter the group name that will have write permissions to the inventory directory, i.e. **oinstall**
 Click **Next**.
22. Run orainstRoot.sh dialog – when prompted, open another command window and run the orainstRoot.sh script in the Inventory directory as the root user. When finished, click **Continue**.
23. In the Specify File Locations screen, enter the following:
 - a. Name – enter a name to identify the new Oracle software home directory, i.e.**OH_FORMS**
 - b. Path – Enter the full path to the new Oracle software home. Oracle will create the directory, if necessary. Example:
 - c. **opt/oracle/oraForms**
 - d. Click **Next**.
24. In the Select a Product to Install screen, select **Oracle Application Server 10g** and click **Next**.
25. In the Select Installation Type screen, select **Business Intelligence and Forms** and click **Next**.
26. In the Product-specific Pre-Requisite Checks screen, check for warnings regarding pre-requisites not met. If you need to change something, it is best to exit, fix the problem, and restart the installation. Click **Next** when ready.
27. In the Confirm Pre-Installation Requirement screen, check that you have met all listed requirements, and check all of the checkboxes. When finished, click **Next**.
28. In the Select Configuration Options screen, select the following:
 - a. Select **Oracle Business Intelligence Discoverer**
 - b. Select **Oracle Application Server Personalization**
 - c. Select **Oracle Application Server Reports Services**

- d. Select **Oracle Application Server Forms Services**
 - e. Click **Next**.
29. In the Specify Port Configuration Options screen, select **Automatic** and click **Next**.
30. In the next screen, enter information for connecting to the previously installed Oracle Internet Directory:
- a. In the Register with Oracle Internet Directory screen:
 - i. Hostname – enter the hostname of the Infrastructure server where OID is configured.
 - ii. Port – enter the port that the Oracle Internet Directory listens on. The port number can be found in the ORACLE_HOME/install/portlist.ini file (where ORACLE_HOME is the home for OracleAS).
 - iii. If you select the **Use Only SSL Connections with this Oracle Internet Directory** option, the port number used above should be read from the “Oracle Internet Directory (SSL)” entry in the portlist.ini file.
 - iv. Click **Next**.
 - b. In the Specify OID Login screen, enter the following:
 - i. Username – enter the Oracle Administrative user, **orcladmin**.
 - ii. Password – enter the same password as the ias_admin user in the Infrastructure tier.
 - iii. Click **Next**.
31. In the Select Oracle Application Server 10g Metadata Repository screen, select the Metadata Repository that is appropriate for this BI/Forms instance.
32. In the Provide Outgoing Mail Server Information screen, enter the outgoing mail server (SMTP) to be used with Reports Services.
33. In the Specify Instance Name and ias_admin Password screen, enter the following:
- a. Instance Name – enter a name for this BI/Forms instance, i.e. **Forms**
 - b. ias_admin Password and Confirm Password – enter the ias_admin user password.
 - c. Click **Next**.
34. In the Summary screen, verify the selections and click **Install**. The installation now proceeds.
35. When the Run root.sh dialog appears, open a command window as the root user and run the root.sh script in this instance’s Oracle Home directory. After finishing the script, click **OK**.
36. The Configuration Assistants screen appears automatically and shows the progress of the Configuration Assistants.
37. When the End of Installation screen appears, click Exit to finish the installation.

Post Installation Oracle Application Server Configuration

There are a few steps that should be completed shortly after installation. These include setting environment variables for accessing Oracle Application Server, identifying OracleAS ports, and accessing the OracleAS Welcome page.

Configuring OracleAS Environment Variables

Before attempting any OracleAS administration, the default environment variables for the Oracle OS user need to be setup. Edit the `/home/oracle/.bash_profile` file. The final result should appear as follows (leaving previous settings in place).

```
export ORACLE_HOME=/opt/oracle/product/10.1.2/db_1
PATH=$PATH:$ORACLE_HOME/bin:$ORACLE_HOME/dcm/bin:$ORACLE_
HOME/opmn/bin
export LD_LIBRARY_PATH=$ORACLE_HOME/lib:$LD_LIBRARY_PATH
export PATH
export TMP=/tmp
export TMPDIR=/tmp
if [ $USER = "oracle" ]; then
    if [ $SHELL = "/bin/ksh" ]; then
        ulimit -p 16384
        ulimit -n 65536
    else
        ulimit -u 16384 -n 65536
    fi
fi
```

Note that the `ORACLE_HOME` environment variable can only be set to point to the software home for one OracleAS product. If you have multiple homes (such as Forms and Portal), you may have to manually override the default variable when managing the other products. Also note that the `DISPLAY` environment variable is not set by default. For Oracle Application Server 10g, only a few tools such as `oidadman` require that `DISPLAY` be set. The `DISPLAY` variable can be set manually, if needed.

Checking OracleAS Ports

Before you can administer OracleAS, you will need to know the port numbers for each component. You should also cross-check the `/etc/services` file to make sure that there are no conflicts with reserved ports. Port information is located in the file `$ORACLE_HOME/install/portlist.ini`. Note that there will be a different `portlist.ini` file for each unique `ORACLE_HOME`.

The following is an example of a `portlist.ini` file:

```
;OracleAS Components reserve the following ports at install time.
;As a post installation step, you can reconfigure a component to use a different port.
;Those changes will not be visible in this file.
```

```
[System]
Host Name = host1.mycompany.com
```

```
[Ports]
Oracle HTTP Server port = 7777
Oracle HTTP Server Listen port = 7778
```

Oracle HTTP Server SSL port = 4443
Oracle HTTP Server Listen (SSL) port = 8250
Oracle HTTP Server Diagnostic port = 7200
Application Server Control RMI port = 1850
Oracle Notification Server Request port = 6003
Oracle Notification Server Local port = 6100
Oracle Notification Server Remote port = 6200
Log Loader port = 44000
Java Object Cache port = 7000
DCM Discovery port = 7101
Application Server Control port = 1156
Enterprise Manager Agent port = 1830
Web Cache HTTP Listen port = 7777
Web Cache HTTP Listen (SSL) port = 8250
Web Cache Administration port = 9400
Web Cache Invalidation port = 9401
Web Cache Statistics port = 9402
<End of Example>

Accessing the OracleAS Welcome Page

The following URL is the default for accessing the OracleAS Welcome Page:

<http://hostname.domain:7777>

If the default port was not used, the actual URL is listed in the file:

`$ORACLE_HOME/install/setupinfo.txt`

The OracleAS Welcome page provides access to a variety of resources:

- Information about New Features in Oracle Application Server 10g
- A “Quick Tour” of Oracle Application Server 10g
- A link to the Oracle Application Server 10g documentation library
- Release Notes for the Linux platform
- Demonstrations and code samples for Oracle Application Server 10g
- A link to the Oracle Enterprise Manager 10g Application Server Control Console

Figure 8 shows an example OracleAS welcome page.



Welcome
to Oracle Application Server 10g Release 2 (10.1.2)

Overview

Oracle Application Server 10g Release 2 (10.1.2) is an integrated, standards-based application platform suite that allows organizations of all sizes to respond better to changing business requirements.

The Oracle Application Server application platform suite can improve your organization's ability to predict and respond to market dynamics, enhance productivity, and simplify your information technology environment, all while allowing you to use your existing investments to their full potential. Oracle Application Server 10g Release 2 (10.1.2) achieves these goals through:

- **Service-Oriented Computing:** Oracle Application Server uses a service-oriented computing architecture to facilitate the development of enterprise applications as business services, which enables you to build a flexible enterprise application infrastructure.
- **Grid Computing:** The Oracle Application Server architecture coordinates the use of large numbers of low

Release Notes
Read the latest Release Notes on Oracle Technology Network for important information about Oracle Application Server 10g Release 2 (10.1.2).

New Features
For details about new features for Oracle Application Server 10g Release 2 (10.1.2), visit [Oracle Technology Network](#).

Oracle Application Server Logins
To manage and monitor Oracle Application Server, [log on to Oracle Enterprise Manager 10g Application Server Control](#):
username: ias_admin
password: specified during install

Figure 8. OracleAS Welcome Page

Administering Oracle Application Server

There are a variety of tools for managing Oracle Application Server. These include command line tools and web based tools. All of the Oracle Application Server 10g tools are fully integrated within the Oracle Grid Control framework. These tools can be used to perform administrative tasks such as starting and stopping components, configuring components, and monitoring OracleAS resources.

Starting and Stopping OracleAS

Command line tools are often used for starting and stopping OracleAS instances or individual components. The tool that should be used depends on the intended scope of your start or stop command. To start or stop an entire OracleAS instance, the `runstartupconsole.sh` command. To start or stop individual components, the `opmnctl` command should be used.

The syntax used to start and stop instances depends on what instances are installed on an individual host. The following commands run from the middle tier Oracle Home, and they start and stop both the middle tier instance and the infrastructure instance, if they are installed on the same host:

```
$ORACLE_HOME/bin/runstartupconsole.sh start all
$ORACLE_HOME/bin/runstartupconsole.sh stop all
```

These commands start and stop the following in the Oracle Home for the Infrastructure:

- The Metadata Repository Instance
- The Net Listener
- OracleAS Instance processes for Oracle Identity Management, Oracle Internet Directory, OC4J_Security, DCM, and OPMN
- Enterprise Manager Database Control and Application Server Control Console

These commands start and stop the following in the Oracle Home for the middle tier:

- OPMN and all of the processes that OPMN manages, including: DCM, Oracle HTTP Server, OC4J instances, OracleAS Web Cache, OracleAS Forms Services, and OracleAS Reports Services
- Enterprise Manager Application Server Control Console

If you want to start or stop both the infrastructure tier and the middle tier, without affecting Enterprise Manager, you can run the following commands from the middle tier Oracle Home. (Remember, this is only for the case where the middle tier and infrastructure tier are installed on the same host.)

`$ORACLE_HOME/bin/runstartupconsole.sh start allas`

`$ORACLE_HOME/bin/runstartupconsole.sh stop allas`

If you want to start or stop only the Enterprise Manager, but not start the middle tier or the infrastructure tier, you can run the following commands from the middle tier Oracle Home. (Remember, this is only for the case where the middle tier and Infrastructure tier are installed on the same host.)

`$ORACLE_HOME/bin/runstartupconsole.sh start allem`

`$ORACLE_HOME/bin/runstartupconsole.sh stop allem`

If you have implemented a three-tier architecture, the Infrastructure instance will be located on a different server than the Middle tier instance. In this scenario, you can stop or start the Infrastructure instance by issuing the following commands from the Infrastructure Oracle Home:

`$ORACLE_HOME/bin/runstartupconsole.sh start`

`$ORACLE_HOME/bin/runstartupconsole.sh stop`

These commands start and stop the following in the Oracle Home for the Infrastructure:

- The Metadata Repository Instance
- The Net Listener
- OracleAS Instance processes for Oracle Identity Management, Oracle Internet Directory, OC4J_Security, DCM, and OPMN
- Enterprise Manager Database Control and Application Server Control Console

The Metadata repository can sometimes be slow to shutdown. If this is the case, use the following commands from the ORACLE_HOME directory for the Metadata repository instance:

`# su - oracle`

`# $ORACLE_HOME/bin/sqlplus “/ as sysdba”`

`SQL> shutdown immediate;`

`SQL> exit`

Similar to the above, if the Middle tier is located on a different server than the Infrastructure tier, you can issue the following commands from the middle tier Oracle Home to start and stop the instance:

```
$ORACLE_HOME/bin/runstartupconsole.sh start  
$ORACLE_HOME/bin/runstartupconsole.sh stop
```

These commands start and stop the following in the Oracle Home for the middle tier:

- OPMN and all of the processes that OPMN manages, including: DCM, Oracle HTTP Server, OC4J instances, OracleAS Web Cache, OracleAS Forms Services, and OracleAS Reports Services
- Enterprise Manager Application Server Control Console

The `opmnctl` command can be used to start, stop, or restart individual OracleAS components.

```
$ORACLE_HOME/bin/opmnctl startproc ias-component=component  
$ORACLE_HOME/bin/opmnctl stopproc ias-component=component  
$ORACLE_HOME/bin/opmnctl restartproc ias-component=component
```

The `opmnctl` command can also be used to start, stop, or restart the sub-processes of a component:

```
$ORACLE_HOME/bin/opmnctl startproc process-type=process  
$ORACLE_HOME/bin/opmnctl stopproc process-type=process  
$ORACLE_HOME/bin/opmnctl restartproc process-type=process
```

You can start or stop most opmn managed processes with the following commands:

```
$ORACLE_HOME/bin/opmnctl startall  
$ORACLE_HOME/bin/opmnctl stopall
```

The `startall` command does not automatically start the Log Loader component. Instead, you have to use the component level syntax:

```
$ORACLE_HOME/bin/opmnctl startproc ias-component=LogLoader
```

In a multi-tier, multi-server deployment, OracleAS instances have to be started and stopped in a particular sequence. Regardless of how many servers are involved, start up OracleAS instances in the following order:

1. Start any Infrastructure instances that contain only a Metadata Repository instance. You do not need to use `opmnctl` to start any processes, and you do not need to start Application Server Console.
2. Start any Infrastructure instance that contains Oracle Internet Directory. If the same server contains an OID instance and a Metadata Repository instance, start the Metadata Repository instance first.
3. Start OracleAS middle-tier Clusters. If there are multiple clusters, start them in any order.
4. Start other middle-tier instances.

Stop the instances in the following order:

1. Stop OracleAS middle-tier Clusters.
2. Stop other middle-tier instances.

3. Stop any Infrastructure instances that contain only a Metadata Repository instance.
4. Stop any Infrastructure instance that contains Oracle Internet Directory. If the same server contains an OID instance and a Metadata Repository instance, stop the Metadata Repository instance first.

The Application Server Control Console can also be used to start, stop, and restart components:

1. From the OracleAS Welcome page, click the link to the Application Server Control Console home page.
2. On the Application Server Control Console home page, scroll to the System Components section.
3. In the **Select** column, choose the components you want to start, stop, or restart.
4. Click the **Start**, **Stop**, or **Restart** button on the top right of the System Components section.

You can also use the **Start All** or **Stop All** buttons, but neither works for the Log Loader component. You have to use the component level buttons to start and stop Log Loader.

You can also enable or disable components from the Application Server Control Console home page by clicking on the Enable/Disable Components link. On the page that is displayed, components or groups of components can be enabled or disabled. Disabled components are not started with the other instance components and are not listed in the System Components list.

Additional component level controls are available on the individual component home pages.

Administering OracleAS Components

Each OracleAS component has its own administration tools. Most of these are available as web pages. There are also a few key command line administration tools. One example of a command line administration tool is the `opmnctl` command, introduced above. It is used to administer Oracle Process Manager and Notification Server, which is used to manage and monitor most components. The `opmnctl` command can be used to get the status of all components on your OracleAS server, as shown in the example below.

```
# $ORACLE_HOME/bin/opmnctl status
```

```
Processes in Instance: mid.myhost.myco.com
```

ias-component	process-type	pid	status
LogLoader	logloaderd	N/A	Down
dcm-daemon	dcm-daemon	2787	Alive
DSA	DSA	N/A	Down
OC4J	home	2964	Alive
OC4J	OC4J_BI_Forms	2965	Alive

OC4J	OC4J_Portal	2967	Alive
WebCache	WebCache	2958	Alive
WebCache	WebCacheAdmin	2959	Alive
HTTP_Server	HTTP_Server	2961	Alive
Discoverer	ServicesStatus	2960	Alive
Discoverer	PreferenceServer	2963	Alive
wireless	performance_server	2985	Alive
wireless	messaging_server	2986	Alive
wireless	OC4J_Wireless	2987	Alive

Another command line tool is dcmctl, which is used with Distributed Configuration Management. DCM can be used to save and restore configuration information, manage OracleAS Farms and Clusters, and deploy new applications. If you begin changing your application environment after installation, and then wish to revert to your original configuration, you can use the following command:

```
# $ORACLE_HOME/bin/dcmctl restoreInstance
```

To manage the Oracle HTTP Server, you can connect to the following URL:

<http://hostname.domain:7778>

You will see the Application Server home page. From here, click the link for **Application Server Logins** to login to the Application Server Control Console. From this home page, click on **HTTP Server** to begin managing Oracle HTTP Server.

You can manage Web Cache in a similar way. You can access the Application Server Home page with the following URL:

<http://hostname.domain:7777>

From here, click the link for **Application Server Logins** to login to the Application Server Control Console. From this home page, click on **Web Cache** to begin managing OracleAS Web Cache.

Another method for configuring Web Cache is to use the OracleAS Web Cache Manager. The Web Cache Manager can be accessed from the following URL (Check the portlist.ini file for the correct port):

<http://hostname.domain:9400/webcacheadmin>

You can login to webcache as either `ias_admin` or `administrator`. The password for both is the `ias_admin` password entry that you set during installation.

You can manage Portal with the following URL. Use the Web Cache port number:

<http://hostname.domain:7777/pls/portal>

Login as the user `Portal`. The password is the original `ias_admin` password (even if you changed the password after installation).

To manage Forms Services, use the following URL. Use the Web Cache port number:

<http://hostname.domain:7777/forms/frmservlet>

Login with the `oracladmin` user with the `oracladmin` password.

To manage Reports Services, use the following URL. Use the Web Cache port number:
http://hostname.domain:7777/reports/rwservlet/getserverinfo

Login with the oracladmin user with the oracladmin password.

Oracle Internet Directory is administered with the following command line tool:
\$ORACLE_HOME/bin/oidadmin

To access the OracleAS Single Sign-On Administration pages, use the following URL:
http://hostname.domain:7777/pls/orasso

Use the ias_admin login and password.

Monitoring the Application Server with Application Server Control

The Application Server Control Console component of Oracle Enterprise Manager is one of the primary tools for managing and monitoring Oracle Application Server 10g. The Application Server Control Console home page can be accessed one of two ways:

1. Use the port number for Application Server Control that was assigned at installation time. The port is listed in the file:
\$ORACLE_HOME/install/setupinfo.txt
Use the URL:
http://hostname.domain:port
2. Access Application Server Control from the OracleAS Welcome Page. On the Welcome page, click **Logon to the Oracle Enterprise Manager 10g Application Server Control Console**. Use the ias_admin user name and password.

The Application Server Control Console provides a top-level overview of the status of the Application Server. You can drill down to get more detailed information about specific components, and you can start and stop any combination of components and processes. The following links are available:

- **Logs** – use this link to access Oracle Application Server Logs and the Oracle Application Server Log Repository.
- **Topology** – presents a graphical view of the OPMN hierarchy.
- **J2EE Applications** – lists deployed OC4J applications.
- **Ports** – lists all of the ports currently in use, and allows you to change them.
- **Infrastructure** – allows you to configure Identity Management, Grid Control Management, and OracleAS Farm Repository Management.
- **Backup/Recovery** – assists you in backing up and recovering Instance data.
- **Enable/Disable Components** – allows you to temporarily disable components for maintenance purposes.
- **Create OC4J Instance** – allows you to create new instances of selected components.
- **System Components** – allows you to choose components to manage, or link to the component home pages

- **Process Management** –allows you to monitor OPMN managed processes and sub-processes
- **All Metrics** – links to a page with all performance metrics

ORACLE Enterprise Manager 10g
Application Server Control

Logos Topology Preferences Help

Farm >

Application Server: core.acme.com

Home J2EE Applications Ports Infrastructure Backup/Recovery

Page Refreshed Nov 29, 2004 12:06:32 PM

General

Status **Up**
 Host [stac252.us.oracle.com](#)
 Installation Type **J2EE and Web Cache**
 Oracle Home **jdk101/oracle/appserv1**
 Farm [asdb.us.oracle.com](#)

CPU Usage

Application Server (1%)
 Idle (20%)
 Other (79%)

Memory Usage

Application Server (17% 348MB)
 Free (2% 46MB)
 Other (81% 1,619MB)

System Components

Select All | Select None

Select	Name	Status	Start Time	CPU Usage (%)	Memory Usage (MB)
<input type="checkbox"/>	home	↑	Nov 29, 2004 11:25:07 AM	0.00	44.02
<input type="checkbox"/>	HTTP Server	↑	Nov 29, 2004 11:25:08 AM	0.18	65.26
<input type="checkbox"/>	Web Cache	↑	Nov 29, 2004 11:25:07 AM	0.00	33.04
<input checked="" type="checkbox"/>	Management	↑	Nov 29, 2004 11:25:40 AM	0.47	205.35

TIP This table contains only the enabled components of the application server. Only components that have the checkbox enabled can be started or stopped.

Related Links

- [Process Management](#)
- [All Metrics](#)

Figure 9. The Application Server Control Console home page

The Topology link presents a page with a graphical view of OPMN, which is particularly useful for OracleAS Farms. Drill-down is available, with enhanced performance monitoring and management control at the component level.

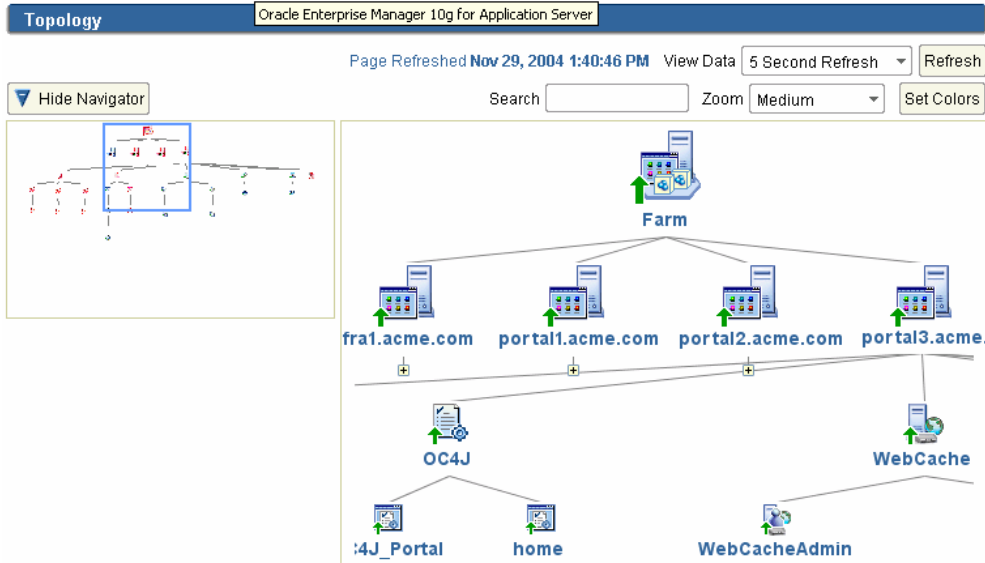


Figure 10. Oracle Application Server Topology View

From the main home page, clicking on the host name opens the Host Home page. This page gives a detailed breakdown of host resource usage. Useful links for monitoring **Top Processes** and **Filesystems** are included at the bottom of the page.

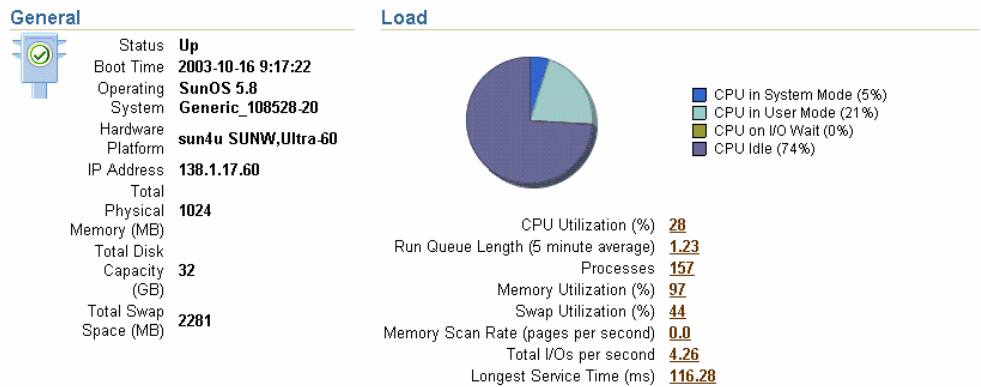


Figure 11. The Host Home Page

One of the most useful pages for monitoring Application Server performance is available from the main home page. The All Metrics link displays a page with links to all available Application Server metrics.

All Metrics

Collected From Target Nov 10, 2004 12:54:41 PM

Expand All Collapse All
Metrics
▼ 1012_core_100604.plaquerr-sun.us.oracle.com
▼ Response
UpDown Status
▼ Application Response
Application URL Status
Application URL Response Time (seconds)
▼ OPMN Process Information Metrics
Component CPU Usage (%)
Idle CPU Time (%)
Component Memory Usage (MB)
Component Memory Usage (%)
Free Memory (MB)
Free Memory (%)
Total Memory (MB)
Component Start Time (ms since epoch)
Component Up Time (ms)
Component Up/down Status
▼ Resource Usage
CPU Usage (%)
Other CPU Usage (%)
CPU Idle Time (%)
Memory Usage (MB)
Memory Usage (%)
Other Memory Usage (MB)
Other Memory Usage (%)
Free Memory (MB)
Free Memory (%)

Figure 12. The All Metrics Page

Dell/Oracle Best Practices for OracleAS

The following are some Best Practices for deploying Oracle Application Server 10g with Dell hardware:

1. It is a best practice to distribute functions in middle tiers across OracleAS Farms. For example, you could place J2EE and Web Cache components on one server, Forms and Reports on a second server, and Portal and Wireless applications on a third server. What makes all of these distributed components an OracleAS Farm is that they share a common Metadata Repository. The main benefit of utilizing OracleAS Farms is that load is distributed across more servers, so that higher total throughput can be achieved.
2. It is also a best practice to achieve scalability of individual functions or sets of functions in middle tiers through OracleAS clustering (or “cloning”).
3. When both OracleAS Farms and Clusters are implemented, this implies that multiple servers will be used for middle tiers. It is a best practice to use multiple small to medium servers to “scale out” middle tiers, rather than a few large servers with several CPUs to “scale up.” This will tend to lead to more Dell PowerEdge 2950 and 1950 servers for middle tiers, as opposed to Dell PowerEdge 6850 and PowerEdge 6950 servers.

4. It is a best practice to use the Repository Creation Assistant to install the Oracle Metadata Repository in an existing Oracle Database.
5. To achieve scalability for the Infrastructure/Data tier, it is a best practice to host the Metadata Repository/Corporate Database on Oracle Real Application Clusters. This configuration provides high availability and enhanced database performance. Database servers that are commonly used include Dell PowerEdge 2950 servers for small and medium size databases, or PowerEdge 6850/PowerEdge 6950 servers for large databases.
6. To achieve load balancing across OracleAS Clusters and RAC clusters, load balancing routers must be used. Software load balancers, such as Web Cache can balance TCP/IP and http load, but cannot handle LDAP load balancing. For this reason, dedicated hardware load balancers such as F5 Networks BIG-IP routers are required.
7. Dell/EMC Clariion shared storage is required for Oracle RAC databases, but is optional for middle tier servers.
8. For security purposes, a firewall between the outside world and middle tier servers is strongly recommended. A firewall between middle tier components and Infrastructure components is desirable for Enterprise deployments.

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Summary

Application Servers that implement Java 2 Enterprise Edition standards have become one of the leading method for deploying Enterprise applications.. All Application Servers must interface with Corporate Databases. Oracle Application Server 10g has a distinct advantage over other J2EE Application Servers, due to tight integration with Oracle Enterprise Edition databases and Oracle Grid Control.

Dell PowerEdge Servers and Dell/EMC Clariion SAN storage provide a flexible and reliable platform for deploying Oracle Application Server 10g. Dell PowerEdge Servers offer the power that is necessary to drive processing intensive applications, and offer attractive price/performance ratios. All of the dual socket Dell PowerEdge servers are appropriate for OracleAS implementations, with the choice of servers depending on the deployment topology and the total load.

In this whitepaper, a “blueprint” was provided for a three-tier Oracle Application Server 10g deployment on the Red Hat Linux Operating System. Step-by-step installation instructions were provided for the following components:

- Oracle Application Server Containers for J2EE (OC4J)
- Oracle Application Server Web Cache
- Oracle Identity Management (single sign-on, OID)
- Oracle Forms Services
- Oracle Reports Services
- Oracle Portal

The options available for expanding to a multi-tier Enterprise deployment topology were also discussed. Dell/Oracle Best Practices for implementing a scalable, highly available middle tier were provided to guide Administrators in successfully implementing Oracle Application Server 10g on Dell PowerEdge servers.

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