

Chapter 1

Introducing Oracle Application Server 10g and Components

ORACLE APPLICATION SERVER 10g ADMINISTRATION I EXAM OBJECTIVES COVERED IN THIS CHAPTER:

- ✓ **Oracle Application Server Key Components and Features**
 - Describe the solution areas addressed by Oracle Application Server
 - Describe the key components of Oracle Application Server
- ✓ **Analyzing Oracle Application Server Architecture**
 - Explain the different installation options for Oracle Application Server
 - Explain the installation dependencies of Oracle Application Server components



Oracle Application Server 10g (OracleAS) can be overwhelming at first glance; each version of OracleAS brings more functionality at every tier of an enterprise's computing infrastructure. Once you

break it down into its components and how each component benefits your e-business, it becomes easier to manage and use.

In this chapter we'll cover two broad topics: understanding the key components of OracleAS and understanding how each of the components of OracleAS is installed and how they fit together in a number of common scenarios.

In the first half of this chapter, we'll start by introducing some of the terminology that you will use throughout this book to understand the architecture and components of OracleAS. We'll then present an overview of each component and its functionality. This includes one of the key management features that glues the components together in a common management interface: Oracle Enterprise Manager Application Server Control.

In the second half of the chapter, we will delve more deeply into the OracleAS architecture and give a brief overview of the different installation types; we will present the complete installation walkthrough in Chapter 2, "Performing Installation Tasks." At the end of the chapter, you will see an example of a common four-tier OracleAS deployment.

Understanding Oracle Application Server Key Components and Features

It's just as important to understand the terminology used in an OracleAS environment as it is to know each of the components available in the environment. We will present both of these topics in the following sections.

First, we'll go over some of the terms that are important in a discussion of application server components. Make sure you understand and memorize each of these terms because we will use them throughout the book.

Next, we'll review the two major OracleAS component groups, OracleAS Infrastructure components and OracleAS Middle-Tier components, and show you how the Infrastructure components provide the framework and glue that holds the Middle-Tier components together.

Finally, we'll present a high-level introduction to Oracle Enterprise Manager Application Server Control, the web-based management application that gives you complete visibility and control over your entire application server environment.

Oracle Application Server Terminology

Understanding the terminology surrounding the OracleAS components is half the battle in understanding how the components work and what each component does. In the following sections, we will present the key terms that we will use in the rest of this chapter and throughout the book.

OracleAS Installation

An *OracleAS installation* is the set of executables and configuration files you create when you install one or more OracleAS components. One physical server will host the Infrastructure components plus one or more of the other components, such as the Oracle HTTP Server, Oracle Portal, or Web Cache; because the installation process occurs twice in this scenario, you consider it two OracleAS installations.

OracleAS Instance

An *OracleAS instance* is an operational OracleAS installation that runs one or more of the OracleAS components at any tier. For example, an installation of Web Cache and HTTP Server on a single server is one OracleAS instance.

While the terms *instance* and *installation* are often used interchangeably, it is important to note that an installation is the set of files installed into an Oracle home, whereas the instance is the set of processes associated with those files.

Metadata Repository

A *metadata repository* is an Oracle database, created during the Infrastructure installation, that contains the persistent metadata required by various OracleAS instances. While some components of OracleAS can use a flat file for storing metadata, it is strongly recommended that you use an Oracle database to ensure reliability, scalability, and recoverability of the metadata.

Directory Server

A *directory server* is an OracleAS component that defines a hierarchical view of organizational data such as employees, resources, and applications. Directory servers can facilitate protection of components in the hierarchy by limiting access to particular branches in the hierarchy. Oracle's LDAP-compatible directory service is called Oracle Internet Directory, or OID.

Single Sign-On Server

An OracleAS *Single Sign-On server* (SSO server) is an OracleAS component that allows a user to authenticate explicitly one time and transparently on successive connections to other data or applications. Strong authentication is always used along with a single password to authenticate with other applications.

OracleAS Infrastructure

The OracleAS *Infrastructure* is a combination of middle-tier applications such as the Metadata Repository, Oracle Internet Directory, and Single Sign-On. The OracleAS Infrastructure components support other middle-tier applications.

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OracleAS Farm

An OracleAS *farm* is a collection of OracleAS instances that share the same configuration data; this configuration can be stored in an operating system file or in the OracleAS Metadata Repository. Every farm has one and only one metadata repository.

OracleAS Cluster

An OracleAS *cluster* is a collection of application server instances within a farm that have identical configuration and application deployment. The cluster appears as a single unit to client requests and facilitates load balancing and fault tolerance. Conceptually, a clustered OracleAS component functions similarly to two or more database instances within a Real Application Clusters (RAC) environment.

Oracle Enterprise Manager 10g Application Server Control

Oracle Enterprise Manager 10g Application Server Control (OEM 10g AS Control) is a web application that manages individual OracleAS instances, an OracleAS farm of application server instances, or an OracleAS cluster.

Oracle Enterprise Manager 10g Grid Control

Oracle Enterprise Manager 10g Grid Control manages all network, application, and database servers in the enterprise.

OracleAS Infrastructure Components

The primary purpose of the OracleAS Infrastructure is to support middle-tier applications. It facilitates the deployment of SSO, OID, and AS clusters using Oracle Database 10g, either stand-alone or in a RAC configuration.

Whether your Infrastructure installation contains one component or all Infrastructure components, you consider the installation to be one of your managed OracleAS instances, controllable via Oracle Enterprise Manager Application Server Control.

In the following sections, I'll give a brief overview of the following OracleAS Infrastructure components:

- Oracle Internet Directory
- OracleAS Single Sign-On
- OracleAS Delegated Administration Services
- OracleAS Certificate Authority
- Oracle Database 10g

Oracle Internet Directory, OracleAS Single Sign-On, OracleAS Delegated Administration Services, and OracleAS Certificate Authority are the identity management components of the OracleAS distributed security solution, Oracle Identity Management.

Oracle Internet Directory

Oracle Internet Directory, or OID, is an LDAP version 3 directory service that enables retrieval of information about users, services, and applications. The directory entries are stored in an Oracle database. OID is part of Oracle's distributed security solution, *Oracle Identity Management*. OID implements three levels of user authentication:

- Anonymous
- Password based
- Certificate based using SSL to provide both authenticated access and encrypted communication

OracleAS Single Sign-On

Oracle Single Sign-On Server, or SSO, is another component of Oracle Identity Management that validates a user's credentials against OID. Once a user validates their credentials using OID, they do not have to reenter a username and password for any authorized applications.

OracleAS Certificate Authority

OracleAS Certificate Authority (OCA) generates and publishes public key infrastructure (PKI) certificates to support strong authentication between OracleAS applications and clients. OCA publishes its certificates in OID and automatically removes revoked certificates as well as certificates that have expired.

OracleAS Delegated Administration Services

OracleAS Delegated Administration Services, or DAS, enables you to store all of your user, group, service, and application data in OID while at the same time distributing the administration of that data to other administrators and even end users, depending on their job roles and capabilities.

Oracle Database

Although some components don't need a place to store metadata, and other components can store configuration information in one or more files, it is advantageous to use an Oracle database to store your OracleAS metadata. The scalability and failover capabilities of Oracle RAC mesh nicely with the scalability and failover capabilities in every other tier of an OracleAS deployment.

OracleAS Middle-Tier Components

Other Oracle middleware components outside of the Infrastructure components can be assigned to eight broad categories:

- Oracle HTTP Server
- OracleAS Containers for J2EE
- J2EE and Internet applications
- Portal

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- Wireless
- Business Intelligence
- Web Cache
- E-business integration

In the following sections, I'll break down each component with a high-level overview and into bite-size pieces if necessary. In addition, I'll stress the relationship and interoperability of each component.

Oracle HTTP Server

Oracle HTTP Server (OHS) is the underlying deployment platform for all application types and services within OracleAS. It not only provides the framework for hosting static and dynamic pages, it also acts as a front end by listening for requests for OC4J applications, described in the next section. OHS is based on the open-source Apache HTTP server and supports many of the common platform-independent *modules*, also known as *mods*, such as `mod_php` and `mod_perl`. In addition, OracleAS provides a number of modules specific to OracleAS such as `mod_oc4j` and `mod_osso`. Here is a list of the most commonly used OHS modules:

mod_php Supports the open-source scripting language PHP (PHP: Hypertext Preprocessor) to support the dynamic generation of HTML pages

mod_security Protects web applications from both known and unknown attacks

mod_fastcgi Provides an optimized environment for persisting and running C, C++, and Java Common Gateway Interface (CGI) applications

mod_perl Routes requests containing Perl code to the Perl interpreter

mod_plsql Routes requests for PL/SQL (Procedural Language/Structured Query Language) stored procedures to one of the database servers

mod_oc4j Provides communication with OracleAS Containers for J2EE (OC4J), as well as providing basic load-balancing tasks for clustered OC4J instances

mod_oradav Supports file and database distributed authoring and versioning on the Web (Web-based Distributed Authoring and Versioning, or WebDAV)

mod_oss1 Provides support for certificate sharing and Secure Sockets Layer (SSL) protocol, ensuring secure communications using strong encryption

mod_osso Forwards requests to OracleAS Single Sign-On (SSO)

The secure version of HTTP, the HTTPS OSI model Application layer protocol, uses the SSL protocol at the OSI model Transport layer to ensure security during a web session.



SSL, or Secure Sockets Layer, is a protocol developed by Netscape Corporation to transmit private documents over the Internet. The main components of SSL are a public key and a private key: everyone who will send a document knows the public key, and only the recipient of the document knows the private key.

OracleAS Containers for J2EE

OracleAS Containers for J2EE (OC4J) is a fully compliant Java 2 Platform, Enterprise Edition (J2EE) 1.3 certified server written in Java that runs on a standard Java Virtual Machine (JVM). The HTTP server module `mod_oc4j` calls one of many J2EE virtual machines that may contain one or many Enterprise Java Beans (EJB), Java Server Pages (JSPs), servlets, and database connections.



A J2EE application is an application written in Java using the J2EE application programming interfaces (APIs) and is deployed on a J2EE-compatible server. In addition, a J2EE application may span multiple tiers over several hosts.

For example, a J2EE application in an OC4J container may receive requests from a client via an HTTP request to send and receive their e-mail using the JavaMail API, display the mail message using the JSP API, and archive their e-mail to a database using the Java Database Connectivity (JDBC) API.



Do not confuse the commonly used term OC4J instances with OracleAS instances. An OracleAS instance can contain several OC4J instances. Therefore, throughout this book we will use the term *OC4J container* to refer to an OC4J instance.



For a refresher and tutorial on J2EE terminology and the latest version, see <http://java.sun.com/j2ee/1.4/docs/tutorial/doc/>.

J2EE and Internet Applications

OracleAS provides a number of toolkits and environments to make development, testing, and deployment of Internet applications easier than ever. In addition, support for integration of existing legacy PL/SQL applications into the OracleAS framework leverages existing skill sets and facilitates existing code reuse.

Here are the J2EE and Internet applications that an OracleAS developer is likely to use during the application development cycle:

- OracleAS TopLink
- Oracle JDeveloper
- Oracle Application Development Framework
- OracleAS Web Services
- Oracle XML Developer Kit
- Oracle PL/SQL Server Pages
- Oracle Content Management SDK
- OracleAS MapViewer

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OracleAS TopLink

In a nutshell, OracleAS TopLink provides a framework to manage object-to-relational data persistence. Even though modern databases such as Oracle Database 10g can store objects natively, the current database design may not be taking advantage of these features. Therefore, a product such as TopLink can help bridge the gap when there is a disparity in design principles, skill sets, and technologies.

In addition to object-to-relational mapping features, TopLink facilitates advanced object caching to minimize database access. Also included in the TopLink developer framework is a number of different dynamic query languages such as query by example (QBE), Java expression-based queries, Enterprise Java Bean Query Language (EJB QL), and Structured Query Language (SQL).

Oracle JDeveloper

As its name implies, JDeveloper is a J2EE development environment for business applications and web services. It includes everything that a traditional IDE has, supporting the entire development life cycle of design, edit, develop, test, debug, deploy, and optimize. It is designed to create all standard J2EE components such as applets, JavaBeans, JSPs, servlets, and EJB. It is certified for every major operating system platform, including Windows and Unix versions such as Solaris and Linux.

As are many of the OracleAS tools, JDeveloper is written entirely in Java. Unlike many other Java-based IDEs, it contains full support for Oracle SQL, PL/SQL, and Extensible Markup Language (XML). It can access the database directly and enables you to view, create, modify, and delete database objects such as tables, indexes, views, triggers, and so forth.

Oracle Application Development Framework

Oracle Application Development Framework, or Oracle ADF, is the runtime framework included with Oracle JDeveloper. It eases the partitioning of a J2EE application into the presentation tier, business tier, and integration tier.

OracleAS Web Services

OracleAS Web Services runs as servlets in an OC4J container. A *servlet* is a small Java program that runs on the web server (as opposed to the client browser) and takes client requests from the browser, generates dynamic content, and sends the response back to the browser.

OracleAS Web Services provides development and runtime support for web applications, such as generating J2EE .ear files and providing common functionality to other web applications using a standard interface.

Oracle XML Developer Kit

OracleAS includes the Oracle XML Developer Kit (XDK) to provide the libraries and utilities to create, store, and maintain XML-formatted data in a database or to exchange data between heterogeneous platforms and programming languages using a common format.

Oracle PL/SQL Server Pages

To leverage the existing expertise of PL/SQL programmers, OracleAS includes two tools: Oracle PL/SQL Server Pages and the Oracle PL/SQL Web Toolkit. Both tools rely on the HTTP server module called `mod_plsql` that maps client browser requests into PL/SQL stored procedures,

which in turn retrieve data from one or more databases and generate HTTP responses (such as HTML pages built on-the-fly) to display in a web browser.

Oracle Content Management SDK

The Oracle Content Management SDK (CM SDK) contains all the pieces you need to quickly develop a content management system: a content and metadata repository, protocol servers, and class libraries. As expected, the CM SDK integrates easily with other Oracle products such as Oracle Text, Oracle Workflow, and Oracle *interMedia*. Also, this SDK is managed along with all other J2EE and Internet applications in OEM AS Control.

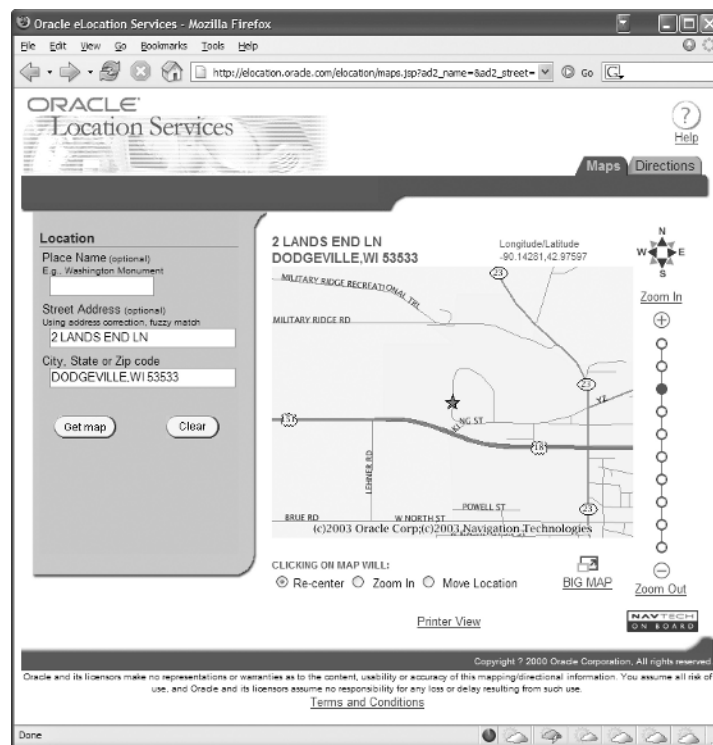
OracleAS MapViewer

OracleAS MapViewer is a customizable tool for rendering maps using spatial data (coordinates) managed by Oracle Spatial or Oracle Locator. MapViewer uses base maps, mapping metadata, themes, and styles to return a map image or a URL image.

In a MapViewer application, the client application requests a map with a center location and other parameters and the MapViewer returns the map image enhanced with data plotted on top of the map, such as a street location or nearby hotels and restaurants.

On one of the Oracle websites, a web application using MapViewer accepts a street address, city, state, and zip code and returns a map with a star indicating the location, as you can see in Figure 1.1.

FIGURE 1.1 MapViewer application sample page



Portal

A *portal* is a website that provides a single access point to many different web applications and data sources, in many cases by using a single authentication method. To use an analogy, a portal is a customized web desktop with access to many different applications and data sources just as a Windows or Linux desktop is personalized for the user with access to many different local applications. A *portlet* is a component of a portal page; essentially, a portal comprises one or more portlets.

OracleAS Portal includes a Portal Developer Kit for developing portal applications as well as integration with Oracle Ultra Search to perform advanced search queries against all information managed by the portal. As a result, you can automatically use Ultra Search features such as near matches, soundex matches, and fuzzy matches.

Wireless

Oracle Wireless is the infrastructure that scales down the content of a portal to fit on a wireless device. Only the subset of portlets that generate OracleAS Wireless XML content is available to the wireless device.

In addition, Oracle Wireless supports advanced messaging techniques such as voice messaging, Short Message Service (SMS), and wireless e-mail.

The wireless capabilities of Oracle Wireless extend to wireless sensor technology in Oracle Sensor Edge Server: Oracle Sensor Edge Server easily integrates information from sensor technology into your business applications. For example, placing Radio Frequency Identification (RFID) sensors on all SKUs and instantaneously collecting location information for each SKU as it moves from manufacturer to warehouse to retail store to consumer can allow a company to react more quickly to inventory changes and trends.

Business Intelligence

The Business Intelligence (BI) components of OracleAS provide functionality and benefits via a web interface for employees in the enterprise as well as customers who buy the products or services provided by the enterprise. OracleAS Discoverer and Reports Services provide varying levels of reports depending on the needs and expertise of the end user; OracleAS Forms Services provides a robust data entry platform in a web interface that was previously only available via thick client applications. To drive incremental sales, OracleAS Personalization tailors the customer's experience based on previous visits to the website.

OracleAS BI Discoverer

OracleAS Business Intelligence Discoverer is the anchor for Oracle's application server BI solution. Using BI Discoverer, you can give your users immediate access to information via pre-defined or ad-hoc queries against data marts, data warehouses, and On-Line Transaction Processing (OLTP) systems.

OracleAS Reports Services

OracleAS Reports Services gives you the ability to build and publish reports from a variety of sources, whether it is text files, spreadsheets, or databases. You access Reports Services using

a web browser and HTTP to an OC4J report services container, which in turn queries the Reports server. Alternatively, a full Oracle Reports client accesses the same Reports server directly and can retrieve the same reports.

OracleAS Forms Services

OracleAS Forms Services makes web-based data entry forms work much like data entry forms on desktop applications: immediate and strong validation as well as automatic completion. OracleAS Forms Services runs as a Java applet in the client browser. An *applet* is a Java program that runs from an applet viewer or is embedded in a web page.

OracleAS Personalization

OracleAS Personalization collects and stores customer data such as shopping preferences and purchase history in an Oracle database. Using this historical data, Oracle AS Personalization builds predictive models to recommend future purchases on return visits to the e-commerce site.

Web Cache

OracleAS Web Cache is a web caching solution that caches both static and dynamically generated web content. It is highly scalable and can even cache content for non-Oracle application servers. As with many other components of OracleAS, Web Cache can be clustered to prevent a single point of failure and to ease configuration and management of multiple cache servers. Conversely, you can configure Web Cache to cache content for more than one application server instance.

E-Business Integration

Not only is it important to integrate your applications and data sources for maximum usability and minimum redundancy, it's also important to make sure your integrated environment is scalable and manageable. OracleAS Integration Services gives you these features plus seamless query and transactional access to Oracle and non-Oracle data sources alike.

The three components of OracleAS—OracleAS InterConnect, OracleAS Integration B2B, and OracleAS BPEL Process Manager—help you achieve these goals.

OracleAS InterConnect

OracleAS InterConnect integrates your Oracle applications with any third-party applications or third-party middleware and makes it appear as though the third-party applications are running under OracleAS. The integration can occur within the enterprise or outside of the enterprise to locations accessible via the Internet.

OracleAS Integration B2B

OracleAS Integration B2B targets the business-to-business (B2B) exchange of services, information, and products; it connects to external trading partners using a variety of process, document, and exchange protocols. It can connect to the enterprise's e-business suite via an XML gateway and integrate into enterprise applications using OracleAS Interconnect.

OracleAS BPEL Process Manager

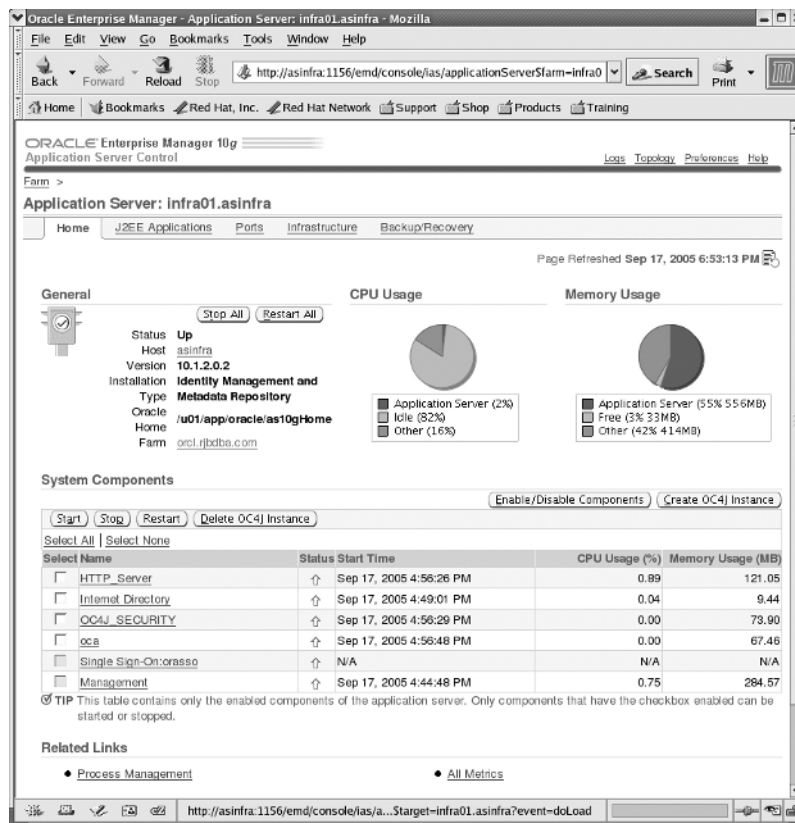
OracleAS BPEL Process Manager helps you to model and deploy business processes based on the Business Process Execution Language (BPEL). The BPEL Designer provides a graphical interface for building BPEL processes and how you send XML messages to and from remote services.

Oracle Application Server Management

Oracle Enterprise Manager Application Server Control, or OEM Application Server Control, is the functional counterpart to OEM Database Control for Oracle 10g Database; it is the “glue” that helps you manage all components of Application Server from a centralized web console.

In Figure 1.2, you can see how OEM Application Server Control centralizes the management of the application server’s components as well as provides information about the host server itself.

FIGURE 1.2 OEM Application Server Control home page



As with many, if not all, of Oracle's graphical toolsets, there is a set of equivalent command-line utilities that perform all of the tasks available via the web interface when a web interface may not be available or when the only connection to your server outside of the firewall is a terminal server connection. The following list includes the command-line utilities you will commonly use to manage and configure your server:

dcmtl The Distributed Configuration Management (DCM) tool manages the AS configuration and maintains the configuration repository.

opmctl The Oracle Process Management and Notification Server command monitors all AS processes and restarts them when needed.

ocactl The Oracle Certificate Administration tool creates, manages, and expires secure certificates.

emctl The Enterprise Manager tool starts, stops, and manages security for Oracle Enterprise Manager 10g.

oidctl The Oracle Internet Directory tool starts and stops Oracle Internet Directory.

webcachectl The Oracle Web Cache tool administers OracleAS Web Cache in a stand-alone environment.

Analyzing the Oracle Application Server Architecture

Now that you have a good understanding of the terminology and the functionality of OracleAS components, it's time to put some of the pieces together by assigning them to tiers. A *tier* is a hardware layer consisting of one or more servers that implement a particular class of OracleAS components. In a nonclustered environment, most deployments of OracleAS use as few as two servers and up to four servers to implement these tiers:

Client tier Web browsers for end users

Web tier Oracle HTTP Server, Web Cache, and load balancing

Application server tier OracleAS Infrastructure, management, Portal, Wireless, Reports, developer tools

Database tier Oracle Database 10g to store OracleAS metadata, application data, and other persistent data, such as OID entries

In the following sections, we'll put the individual pieces of OracleAS into their respective tiers by presenting a typical four-tier deployment; in addition, we'll give you a head start on Chapter 2 and explain some of the installation dependencies.

Oracle Application Server Products and Installation Types

All installation types for OracleAS are accessible from the initial Oracle Universal Installer (OUI) window, as you can see in Figure 1.3. From this window, you can proceed to install the Middle-Tier components, the Infrastructure components, or the developer kits.

FIGURE 1.3 OracleAS OUI product window

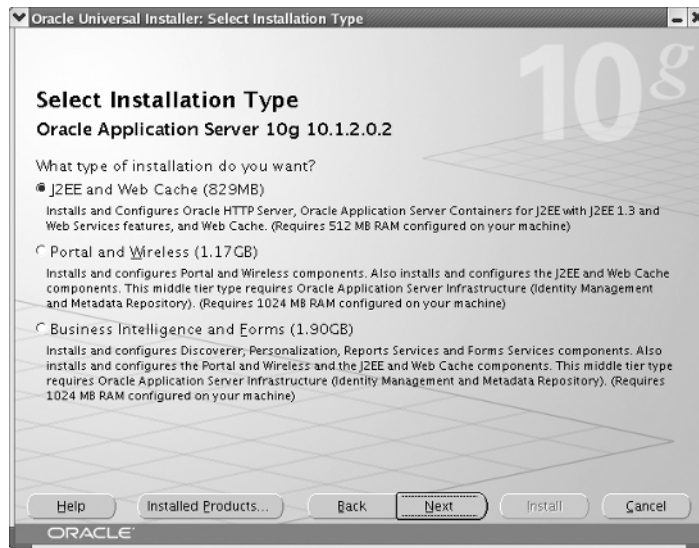


Oracle Universal Installer installs Application Server Control for any installation type, whether it is the Application Server components or the Infrastructure components.

OracleAS Middle-Tier Installation Types

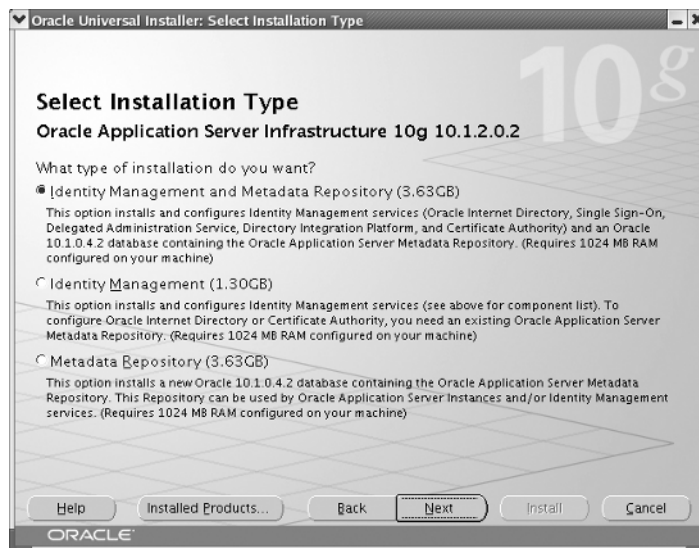
The OracleAS middleware components fall into three categories: J2EE and Web Cache, Portal and Wireless, and Business Intelligence and Forms. You do not need to install the J2EE and Web Cache components separately if you install either Portal and Wireless or Business Intelligence and Forms; these two options install J2EE and Web Cache automatically. Figure 1.4 shows the middleware installation types.

All Application Server 10g installations except for J2EE and Web Cache require access to an Infrastructure instance.

FIGURE 1.4 OUI middleware installation types

OracleAS Infrastructure Installation Types

The OracleAS Infrastructure components fall into two categories: OracleAS Identity Management components and OracleAS Metadata Repository components. If you want to install both groups on the same server, the installer provides a single option, as you can see in Figure 1.5.

FIGURE 1.5 OUI Infrastructure installation types

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You will find a thorough discussion of component installation and a list of all installation tasks in Chapter 2. If you do not install both components in the same installation step, install the metadata repository first, then identity management. If you choose both, the installer chooses the correct order for installation.



If you want to use an existing database for the OracleAS Metadata Repository, you can use the Repository Creation Utility, a separate installation CD.

Installation Prerequisites

Certain Middle-Tier products require an Infrastructure installation: specifically, Portal and Wireless and Business Intelligence and Forms. If you install only the J2EE and Web Cache products, you still need an Infrastructure installation if you want to create AS clusters or you want to support single sign-on.

Metadata Repository Components

The Oracle Metadata Repository contains three subsets of metadata: product metadata, identity management data, and configuration management data. The identity management components discussed earlier in this chapter—Oracle Internet Directory (OID), Single-Sign On (SSO), and OracleAS Certificate Authority (OCA)—all use all three types of metadata; Delegated Administration Services (DAS) uses only the identity management and configuration management components.

The three services that support the three types of metadata are as follows:

Product Metadata Service Schemas for Portal and Wireless components

Identity Management Service Security metadata containing all administration and user privileges

Configuration Management Service Schemas containing OracleAS instance configuration

OracleAS Developer Kits

The third middleware installation option, OracleAS Developer Kits, installs APIs to support the following application types:

- OracleAS Portal
- OracleAS Wireless
- XML
- LDAP (OID)

This installation type does not include an integrated development environment (IDE); if you need an IDE, you can install Oracle JDeveloper as part of the Oracle Developer Suite or OracleAS Java Edition.

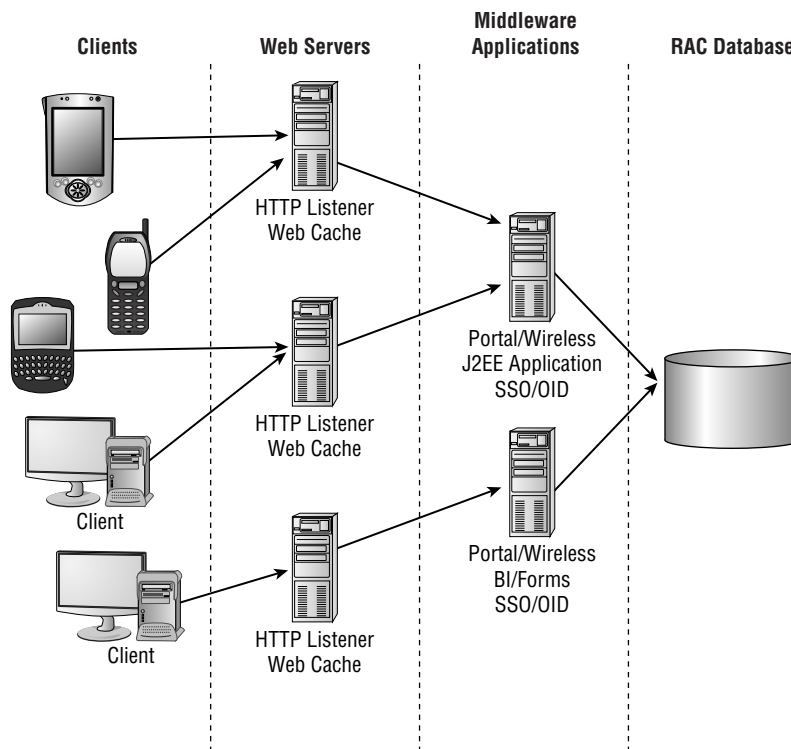
Introducing a Typical OracleAS Deployment

In this section, we'll create a hypothetical enterprise application server topology with components at all four tiers: the client tier, web tier, middle tier, and database tier. The client tier consists of many types of devices, including PCs with web browsers, cell phones, and wireless PDAs. We need three hosts to respond to HTTP requests and cache the results. Because we will have a lot of traffic for both J2EE applications and Business Intelligence Discoverer requests, we have two middleware hosts. Finally, the Infrastructure metadata and user data resides on a three-node RAC database.

Figure 1.6 shows the OracleAS components in the appropriate tier.

As you can see in Figure 1.6, two OracleAS instances are sharing the same metadata repository, but this may cause performance problems as the number of users or the number of middle-tier instances increases.

FIGURE 1.6 OracleAS components by tier



Summary

Oracle Application Server is a complex framework that has components at every tier of an enterprise, from the client to the backend database. In the first part of this chapter, we reviewed the application server terminology and provided a brief description of the main components of OracleAS to give you a foothold for understanding how the pieces fit together.

You can place the components of OracleAS into two broad categories: Infrastructure components and Middle-Tier components. The Infrastructure components control many of the backend processes, such as authorization, caching, and metadata management. The Middle-Tier components, in contrast, are generally more application specific, such as OracleAS Reports Services, OracleAS Portal, and any applications that use OracleAS Containers for J2EE (OC4J).

Next, we presented the dependencies and components you need to understand when you perform an installation of OracleAS. Specifically, during an Infrastructure installation, you must install the OracleAS Metadata Repository components before installing the identity management components. In addition, a metadata repository installation is required for all middleware installations except for J2EE and Web Cache.

Finally, we presented a sample deployment of OracleAS using a variety of client devices in a four-tier model with high availability and failover capabilities at the web server and database level.

Exam Essentials

Understand the OracleAS terminology. Be able to define the key terms you use to describe the function of the components in an OracleAS environment, such as *OracleAS installation*, *OracleAS instance*, *infrastructure*, *repository*, *server*, *farm*, and *cluster*.

Describe the components that make up an Infrastructure instance installation. Understand how the Infrastructure components store metadata for an OracleAS deployment. Be able to explain the dependencies between the Infrastructure components.

Describe the components that make up a middle-tier instance installation. Understand the functionality of each middle-tier component. Be able to identify the tools used to develop middle-tier applications.

List the primary command-line tools that provide equivalent functionality to OEM AS Control. Describe the function of each command-line tool and when you should use it.

Identify the OracleAS installation types. Understand the dependencies between different OracleAS installation types. Identify the Infrastructure and Middle-Tier components that each type of installation comprises.

Be able to place OracleAS components into a logical topology. Understand how each tier functions in an *n*-tier environment and be able to place each OracleAS component into the appropriate tier using a topology diagram.

Review Questions

1. Which of the following components are not parts of the OracleAS Infrastructure? (Choose all that apply.)
 - A. Metadata Repository
 - B. Business Intelligence Discoverer
 - C. Single Sign-On
 - D. Oracle Internet Directory
 - E. Oracle Containers for J2EE
2. You install the OracleAS Infrastructure and the OracleAS Portal and Wireless option on the same server in two installation sessions and into two different Oracle home directories. How many installations and instances do you have?
 - A. One installation and two instances
 - B. Two installations and one instance
 - C. Two installations and two instances plus the number of instances configured for the Oracle Database 10g component
 - D. Two installations and two instances
3. An OracleAS instance can contain how many OC4J instances?
 - A. As many as will fit into the server's memory.
 - B. Zero, because there is no correlation between OracleAS instances and OC4J instances.
 - C. Exactly one. OracleAS instances are functionally the same as OC4J instances.
 - D. Up to four.
4. The metadata repository is created during which installation type?
 - A. During every OracleAS installation
 - B. During the Infrastructure installation
 - C. During the Developer Kits installation
 - D. During the Portal and Wireless or Business Intelligence and Forms installation
5. Which of the following characteristics does not apply to an OracleAS cluster?
 - A. All instances within the cluster are part of the same farm.
 - B. The cluster appears as a single unit to client requests.
 - C. Clusters automatically provide load balancing and fault tolerance.
 - D. An Oracle RAC database is an example of a cluster.
 - E. All of the above.

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6. Which of the following components is not a part of Oracle Identity Management?
 - A. Oracle Internet Directory
 - B. Oracle Database
 - C. OracleAS Certificate Authority
 - D. OracleAS Delegated Administration Services
 - E. OracleAS Single Sign-On
7. What is the primary function of Oracle Internet Directory?
 - A. Generates and publishes PKI certificates
 - B. Validates a user's credentials against OID
 - C. Stores metadata for most components of OracleAS
 - D. Maintains authentication and authorization information in an LDAP 3 directory
 - E. Assigns administrative duties to non-administrators
8. What is the primary function of OracleAS Single Sign-On?
 - A. Generates and publishes PKI certificates
 - B. Validates a user's credentials against OID
 - C. Stores metadata for most components of OracleAS
 - D. Maintains authentication and authorization information in an LDAP 3 directory
 - E. Assigns administrative duties to non-administrators
9. What is the primary function of OracleAS Certificate Authority?
 - A. Generates and publishes PKI certificates
 - B. Validates a user's credentials against OID
 - C. Stores metadata for most components of OracleAS
 - D. Maintains authentication and authorization information in an LDAP 3 directory
 - E. Assigns administrative duties to non-administrators
10. What is the primary function of Oracle Database?
 - A. Generates and publishes PKI certificates
 - B. Validates a user's credentials against OID
 - C. Stores metadata for most components of OracleAS
 - D. Maintains authentication and authorization information in an LDAP 3 directory
 - E. Assigns administrative duties to non-administrators

11. What is the primary function of Delegated Administration Services?
- A. Generates and publishes PKI certificates
 - B. Validates a user's credentials against OID
 - C. Stores metadata for most components of OracleAS
 - D. Maintains authentication and authorization information in an LDAP 3 directory
 - E. Assigns administrative duties to non-administrators
12. The components _____ reside in the web tier, whereas the components _____ reside in the middleware tier.
- A. Web Cache and HTTP Server, OC4J Containers and BI Discoverer
 - B. OC4J and BI Discoverer, Web Cache and HTTP Server
 - C. OC4J and Web Cache, BI Discoverer and HTTP Server
 - D. BI Discoverer and Web Cache, OC4J and HTTP Server
13. Which of the following components are middleware installation components of OracleAS? (Choose all that apply.)
- A. Oracle HTTP Server
 - B. Oracle Internet Directory
 - C. Web Cache
 - D. Portal
 - E. Wireless
 - F. BI Discoverer
14. Which of the following components are not Infrastructure components of OracleAS? (Choose all that apply.)
- A. Web Cache
 - B. Oracle HTTP Server
 - C. Business Intelligence and Forms
 - D. Oracle Internet Directory
 - E. Single Sign-On
15. Which of the following is not a module supported by the HTTP server?
- A. mod_php
 - B. mod_fastcgi
 - C. mod_plsql
 - D. mod_j2ee
 - E. mod_osso

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- 16.** Identify the HTTP module that optimizes the execution of C++, C, and Java CGI applications.
- A.** mod_fastcgi
 - B.** mod_perl
 - C.** mod_cpp
 - D.** mod_cgi
- 17.** OracleAS Containers for J2EE (OC4J) can contain all but which one of the following Java components?
- A.** Enterprise Java Beans (EJB)
 - B.** Java Server Pages (JSPs)
 - C.** Servlets
 - D.** Applets
 - E.** Database connections
- 18.** Your database was designed years ago using traditional relational design principles, but your new application development team is using pure object-oriented techniques with Java. Which of the following OracleAS development tools will facilitate object-to-relational mappings without redesigning the backend database using Oracle Database objects?
- A.** Oracle JDeveloper
 - B.** Oracle XML Developer Kit
 - C.** Oracle PL/SQL Server Pages
 - D.** OracleAS TopLink
- 19.** Identify the component of OracleAS Business Intelligence that collects and stores customer preferences and shopping data.
- A.** Customer Relationship Management (CRM)
 - B.** Preference Manager
 - C.** Recommendation Engine
 - D.** Personalization
- 20.** Identify the two types of components that can be installed during an OracleAS Infrastructure installation.
- A.** Identity Management and Web Cache
 - B.** Identity Management and Metadata Repository
 - C.** Web Cache and Metadata Repository
 - D.** Metadata Repository and HTTP Server
 - E.** Metadata Repository and OracleAS Developer Kits

Answers to Review Questions

1. B, E. The OracleAS BI Discoverer is part of the middleware tier. Oracle Containers for J2EE, or OC4J, is used to deploy applications in the middleware tier.
2. D. An installation is the set of executables and configuration files installed in a single Oracle home to support a set of OracleAS components. One of your installations creates an Infrastructure instance and the other installation creates a Portal and Wireless instance. Therefore, there are two installations and two instances.
3. A. An OracleAS instance can support as many OC4J instances as will fit into memory on the server. To avoid confusion, you should refer to an OC4J instance as an OC4J container.
4. B. The metadata repository is created during the Infrastructure installation and is required for most components of OracleAS except for the J2EE and Web Cache installation type.
5. E. A cluster is a collection of application server instances within a farm that have identical configuration and application deployment; the cluster appears as a single unit or target to a client application or user. Since an Oracle RAC database can be part of an OracleAS installation, it is a clustered component of OracleAS.
6. B. While Oracle Database stores the metadata for many components of OracleAS, including OID, it is not considered a part of Oracle Identity Management.
7. D. Oracle Internet Directory is an LDAP version 3 directory service that enables retrieval of information about users, services, applications, and which users can access the services and applications.
8. B. One of several components of OID, Single Sign-On validates a user's credentials against OID and allows transparent access to other applications without reauthenticating.
9. A. OracleAS Certificate Authority (OCA) generates and publishes public key infrastructure (PKI) certificates to support strong authentication between OracleAS and clients.
10. C. Oracle Database stores metadata and directory data for most components of OracleAS.
11. E. OracleAS Delegated Administration Services permits the distribution of administrative duties throughout the enterprise.
12. A. The web tier contains only the Web Cache and HTTP components. The middleware tier contains all other components except for the client browser and the database repository.
13. A, C, D, E, F. The only component in the list that is not one of the middleware components is Oracle Internet Directory, which is part of an Infrastructure installation.
14. C. The only component in the list that is not one of the Infrastructure components is Business Intelligence and Forms, which is part of a middleware installation.
15. D. There is no module called `mod_j2ee`. However, the module `mod_oc4j` provides communication with OracleAS Containers for J2EE as well as basic load balancing for clustered OC4J instances.

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- 16.** A. `mod_fastcgi` provides an optimized environment for running C, C++, and Java CGI applications. There are no modules called `mod_cpp` and `mod_cgi`. `mod_perl` routes only Perl code to the Perl interpreter.
- 17.** D. OC4J containers can contain one or many EJB, JSPs, servlets, and database connections, but not applets. Applets run only within the client browser.
- 18.** D. The OracleAS TopLink component provides a framework to manage object-to-relational data persistence in a relational database.
- 19.** D. There are no components named Recommendation Engine, Preference Manager, and Customer Relationship Management in the OracleAS suite.
- 20.** B. The only two Infrastructure installation types are Identity Management and Metadata Repository.