

## Oracle Application Development and Integration

### Oracle 9iAS



### Executive Summary

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### *Our vision*

Our vision is to be the partner for success in the new economy.

### *Our mission*

Our mission is to build relationships and develop innovative solutions which help dynamic people and organizations create and realize value.

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## Summary

Since the introduction of the Enterprise JavaBeans standard (EJB) and the Java 2 Enterprise Edition standard (J2EE), only two major players, BEA and IBM, have dominated the Java application server market. BEA has been leading the market with the easy-to-use and feature-rich WebLogic server, while IBM has positioned WebSphere as a low-cost product backed by a world-wide service organization. In the \$1.6 billion application server market, BEA ranks first with 35 percent market share, followed by IBM with 30 percent market share.

In addition to BEA and IBM, there are some 15 Java based application server products on the market, including products from Sun Microsystems, Oracle and SyBase, as well as a couple of open-source projects. All of these products have a relatively small market share, which is likely to be caused by viability concerns, product shortcomings or failure to support the J2EE standards.

Oracle has been in the application server market for several years, but their previous application server products fell short of market expectations. When we reviewed the JDeveloper suite in early 1999, we concluded that "JDeveloper suite offers tight and easy integration between JDeveloper and Oracle Application Server, but the easy integration jeopardizes platform and tool independence, making transition to other platforms or tools hard to accomplish. Another point of concern is the JDeveloper 1 instability" We were also skeptical about the proprietary JCORBA standards and proprietary EJB implementation. (Israelsen, Ternent 1999).

To avoid costly and time-consuming development work, Oracle has licensed or brought existing products and tied them together. The J2EE container for example, is licensed from Orion technologies while the web server is the market-proven open-source Apache web server. The buy, license or acquire approach is similar to the approach BEA have been practicing over the last 24 months. This approach may cause concern regarding timely support, and it is imperative that the end product is backed by a responsive service organization. To address this concern, Oracle's development group directly supports all technical issues, including issues related to the licensed components and Apache, thus providing the customer with an one-stop support organization.

By increasing the features and functions of the application services, also known as the footprint, application server vendors become more competitive in the marketplace. The three major competitors, BEA, IBM and now Oracle, carry an increasingly number of features in the areas of portal and content management, workflow, personalization and EAI. The consequence of this consolidation is that proprietary products in this space are likely to loose market share. For the IT organization this may translate into higher license fees, but it also translates into a more homogeneous architecture based on J2EE, and potentially lower cost of ownership because the IT organization can focus on fewer tools and languages.

With the release of Oracle 9iAS (Oracle 9 internet Application Server), Oracle has turned a new chapter and this time it looks as Oracle has created a serious competitor to WebLogic and WebSphere. 9iAS is a completely new product, with no heritage from the previous Oracle application server products. The Application Server footprint has been extended significantly, offering more functions and services than the competitors.

## The Application Server Market Change

When application servers was first released, the feature set was concentrated services that would allow a development team to focus on business requirements rather than non-functional (system) requirements, such as uptime, reliability and scalability. For application servers, in both the J2EE and .NET space, this translates into 5 core services:

- **Transaction services.** Transaction services coordinate transactions across multiple systems. For example, a money transfer between two bank accounts requires a guarantee that the money is deducted from one account and added to other another. Failure to complete both steps results in account errors. The transaction services ensures that the all steps are completed altogether or, in case of an error, that the account balances is rolled back to the state before the transaction originated.
- **Distributed Object Services.** Distributed object services allow an application to utilize components across multiple servers and multiple applications. Using distributed object services, it is possible to architect an enterprise solution so that one server handles all account services while another server handles all reporting services.
- **Directory services.** Directory services are used to enable components to locate and interact with other components across machines and networks. Directory services are required for distributed object services.
- **Availability services.** Availability services provide fail over and load balancing by implementing redundant services. Fail over improves uptime by allowing service requests to be redirected if a server hardware or software failure occurs. Load balancing improves scalability by allowing multiple servers to work in parallel, thereby increasing the total number of transactions that can be handled in any given period of time.
- **Security services.** Application services provide security through authentication and authorization of users and applications.

As the J2EE application server market matures, we see an increased commitment to value-added services that extend beyond the core services of the application server. BEA, IBM and Oracle all extended their services to differentiate themselves in the application server market. The additional services are either provided out-of-the-box or as optional modules:

- **Workflow.** One application seldom provides all the functionality required completing increasingly complex business functions for the Enterprise. Workflow services consolidate multiple separate processes into business processes.
- **Portal.** Portal services enables a consolidated view on a web page, often gathered from multiple sub-systems. Portal services are often integrated with personalization services to allow individual user profiles and presentation (e.g. my.yahoo!).
- **Content management.** Content management includes services to store, revise and release content to the portal and other front-ends.

- **Integration.** Enterprise Application Integration enables intelligent data exchange and transformation across a network of heterogeneous systems and applications. Integration is the key component of most portal implementations.
- **Business Intelligence.** Business Intelligence covers a wide range of tools to manage business, identify new business opportunities and manage risk. Business Intelligence suites usually include performance management, activity based management, business intelligence and sales intelligence.

As more and more services become available on the application server, the enterprise will benefit from migrating existing applications to the application server. Migrating existing and often proprietary applications to the standardized J2EE platform allows the enterprise to take advantage of the latest delivery technologies such as web, portal and wireless interfaces. Meanwhile the cost of ownership will decrease because the applications will be deployed using the same platform architecture and the same development language, thereby reducing the need for specialized and proprietary skills. Although technology goes through shorter and shorter life cycles, the J2EE architecture is expected to be a viable platform until year 2010 and possibly way beyond this date.

## Application Server Migration Strategy

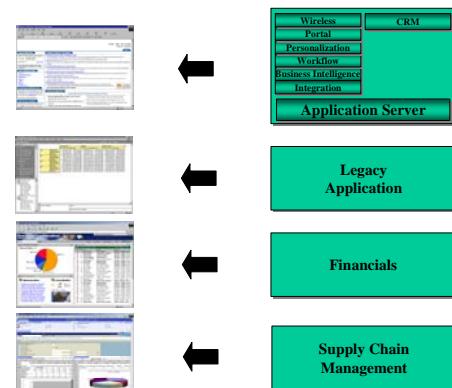
Few, if any, enterprises will benefit from using a cut-over deployment strategy in which all applications are converted to the application server and then deployed. A safer, and more economical approach, is utilize the EAI and portal features of the application server to act as the front-end for other enterprise applications, and gradually convert proprietary and legacy applications to the application server.

The life cycle for an application server implementation is likely to pass through several iterations, where each iteration increasing cohesiveness and integration of the Enterprise. The following example illustrates how the entire Enterprise gradually can become fully integrated using the Oracle Application Server platform. Actual life cycle can be different depending on ROI models for the Enterprise software.

### Life Cycle Stage 1

Figure 1 depicts a vanilla Oracle implementation with Oracle CRM.

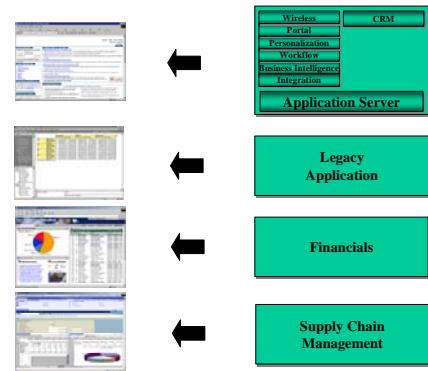
In this scenario, existing Enterprise Applications such as financial systems, supply chain management and legacy systems function as separate entities with different and incoherent user interfaces, logon procedures, usernames and passwords.



## Life Cycle Stage 2

In the second stage of the life cycle, Enterprise Applications are integrated through the Portal Single-sign on (SSO) feature, or even tightly coupled through InterConnect module.

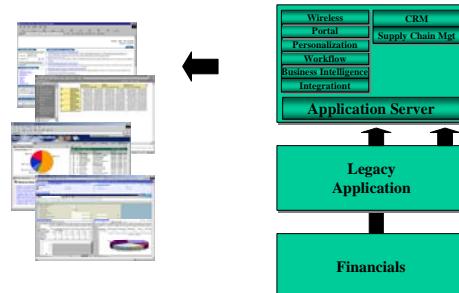
Portlets and wireless applications can access external systems that are connected to the Oracle Application Server using the InterConnect module.



## Life Cycle Stage 3

In the third stage of the life cycle, legacy and proprietary applications are converted to the application Server.

Performance, scalability, availability and functionality increase as applications are converted and fully integrated on the J2EE architecture.

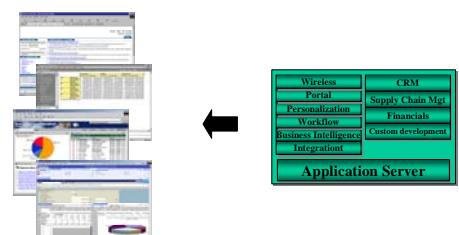


## Life Cycle Stage 4

The fourth and final stage of the life cycle occurs when all applications are integrated on the application server platform.

At this stage all applications in the Enterprise share a cohesive and extensible platform. Maintainability increases substantially as the Enterprise only needs to maintain one platform and one language.

Additional features and functionality can be added by developing in-house components and applications that interact with the application server.



## Technical Features Overview

Oracle 9iAS is available in two versions. The features are listed in the table below followed by the description of some of them.

Feature	Standard Edition	Enterprise Edition
J2EE container	•	•
WebServer (HTTP Server)	•	•
Portal	•	•
Internet File System	•	•
Discover (BI)		•
Web Caching		•
Forms Service		•
InterConnect		•
Personalization		•
Workflow	(optional)	(optional)
Wireless	(optional)	(optional)

### *Oracle9iAS HTTP Server*

Based on the industry leading Apache Web Server, Oracle's HTTP Server is HTTP listening entry point to Oracle9iAS. It provides a completely configured, tested, and supported version of the Apache Web Server version 1.3.22. Oracle HTTP Server incorporates extended Apache functionality to provide SSL and HTTPS support. Oracle's HTTP Server dispatches requests to invoke program logic written in Java, PL/SQL, PERL, or as CGI executables via a standard Apache mod architecture.

Some important mods are:

- **mod\_oc4j.** This module acts as a connector to route requests to and responses from Oracle9iAS Containers for J2EE (OC4J).
- **mod\_osso.** This module enables the transparent use of Oracle9iAS Single Sign-On across all Oracle9iAS components.
- **mod\_ossi.** This module provides standard support for HTTPS protocol connections Oracle9iAS.
- **mod\_fastcgi.** Oracle9iAS enables the execution of both CGI and FastCGI programs, which may be written in C, C++ or Java.
- **mod\_oraDAV.** Oracle9iAS supports Web-based Distributed Authoring and Versioning (WebDAV). WebDAV is a protocol extension to HTTP 1.1 that supports distributed authoring and versioning.
- **mod\_Perl.** For users, wanting to script web pages in Perl.

- **mod\_plsql.** It provides the ability to create dynamic web pages using PL/SQL. Mod\_PL/SQL is an Apache module that routes HTTP requests to PL/SQL stored functions and stored procedures in an Oracle database.
- **Proxy Plug-In Support for Netscape and Microsoft IIS.** It offers a Proxy Plug-in to enable the use of these Web Servers with Oracle9iAS.

## ***Oracle9iAS J2EE container***

Oracle9iAS container for J2EE (OC4J) provides a fast, lightweight, highly scalable, easy-to-use and complete Java2 Enterprise Edition (J2EE) container written entirely in Java, which executes on the standard Java Development Kit (JDK) Virtual Machine (Java VM) available on many operating systems and hardware platforms. It provides complete support for J2EE 1.3 APIs including JSPs, Servlets, and Enterprise JavaBeans. OC4J supports Enterprise Java Beans (EJB) 2.0; Servlets 2.3 JavaServer Pages (JSP) 1.2; JTA 1.0; JNDI 1.2; JMS 1.0; JDBC 2.0 Extension; JavaMail 1.2, JAF 1.0, JAXP 1.1, Connector 1.0 (JCA) and JAAS 1.0.

Some of the capabilities of OC4J include:

- **100% Compatible with Tomcat.** Oracle9iAS' Servlet Engine is a 100% compatible with the Tomcat Servlet Engine delivered by the Apache consortium.
- **Productive Development with Tag Libraries.** Oracle9iAS also provides a number of JSP Tag libraries to make developers productive including Tag libraries to interface with EJBs, to support connection pooling, to send and receive e-mail messages, to access files either in the file system or in Oracle's Internet File System, to embed XML result sets into JSP pages, to access a range of multi-media content, to access the personalization recommendation engine API, and to execute Web searches/queries.
- **Messaging via JMS.** Complete integration with Oracle's Advanced Queuing (OracleJMS) that supports both Publish/Subscribe and Request/Reply or Point-to-Point messaging. OracleJMS provides guaranteed, in-order, once-only delivery of messages over a variety of transports including HTTP, SMTP, FTP, SOAP, and Oracle Net Services (SQLiNet).
- **CORBA Interoperability.** CORBA interoperability provides the capability to build J2EE Applications/EJBs and access them as CORBA services from CORBA clients. These facilities include support for the RMI-over-IIOP Protocol facilities and support for the Interoperable Naming, Security and Transaction specifications.
- **Support for J2EE frameworks.** Oracle9iAS provides Business components for Java (BC4J), which is a 100% Java and XML frameworks, based on industry standard J2EE design patterns. It also provides support for Apache frameworks such as Struts, Cocoon, Turbine etc.

## ***Oracle9iAS Web cache***

The Oracle9iAS Web Cache is designed to improve performance, improve scalability, improve high availability and reduce latency of Internet applications. It operates as a caching reverse proxy server that is situated in front of Oracle HTTP Server. It improves the performance of Web

server instances by storing frequently accessed pages (both static and dynamically generated) in memory.

Following are the important features supported by it.

- **Page Fragment caching and Dynamic Content Assembly.** It supports the new Edge Side Includes (ESI) functionality, which enables web cache to aggregate portions of web pages and reassemble them on the fly for individual users. ESI is the result of joint development effort between Oracle and Akamai, and has now been proposed as an open standard.
- **Surge Protection.** It prevents back-end Web servers from overloading when request volumes are high. If the number of request exceeds the limit set for a Web server, the incoming request is placed in a queue.
- **Transparent Fail over.** It detects failures of the backend web servers and automatically routes the request to remaining web servers in a cluster. Periodic checking of the status of web servers is also supported.
- **Partitioned Web Cache clusters.** Oracle9iAS Web cache clustering enables multiple cache instances to work together as a single logical cache extending the application availability by supporting failure and recovery detection of cache instances.

### ***Oracle9iAS Discoverer***

Shifting from the world of client server architecture the Oracle9iAS Discoverer uses a Web browser based interface that makes it easy for novice and experienced users to create queries, navigate through data and publish report results. Some of the important features supported are Advanced Query Prediction, which can determine how long it will take for a query to run, before it is executed, Enhanced-scheduling facilities and integration with Oracle9iAS Portal. It provides two distinct Discoverer portlets – a list of workbooks portlets and result set portlet, using which the users can execute and publish query results.

### ***Oracle9iAS Reports Services***

It is a runtime component of Oracle Reports and has fully embraced the J2EE standard enabling seamless integration with servlets and JSPs. Reports can be created using JSP layout wizard or manually, utilizing JSP custom tags. The entire report can be defined using XML tags and saved as an XML file. It performs high quality data publishing in a number of different formats such as Unicode, Adobe's PDF, HTML, HTML CCS, XML, Postscript, PCL Delimited Text, Excel and RTF. It can combine data from multiple sources into a single report including Oracle8i, 9i databases, XML feeds, Oracle Express and any JDBC enabled Data source.

### ***Oracle9iAS Clickstream Intelligence***

It is a Web Analytics tool that enables users to capture and analyze aggregate information about Web site usage namely Web site throughput/performance, Visitor Traffic Patterns, effectiveness of specific web pages or types of content and customer loyalty (percentage of repeat visitors vs. new visitors). It has following major components (i) The Clickstream Data Mart that provides a robust, extensible data model. (ii) Extract, Transform, Load (ETL) facilities

which extracts parsed data and loads it in a highly scalable manner into the Data mart (iii) Log Analyzers that read Web Server Logs, parses cookies and query string data to capture application data. (iv) Pre-built reports for measuring web traffic and improving Web site effectiveness.

## **Oracle9iAS Wireless**

It provides a comprehensive solution by certifying a large number of devices, networks and gateways ensuring that any Application can be accessed across any network, any device, and any wireless protocol gateway. It offers a J2EE and XML standards compliant programming model that radically simplifies how developers create, deploy and manage Wireless accessible applications and portals.

Key features include:

- **Unified J2EE, XML and HTTP Programming Model.** Oracle9iAS Wireless provides application developers independence from the underlying wireless infrastructure - underlying networks, protocols, devices, gateways and other wireless complexities. Oracle9iAS isolates content acquisition from content delivery through an intermediary format layer, Oracle9iAS Wireless XML, between the source format and the target format. It is a set of DTDs (Document Type Definitions) and XML document conventions used to define content and internal objects. Once the content has been received in this form, using XSL style sheets, Oracle9iAS Wireless transforms these XML documents to the mark up language and protocol format appropriate for the specific mobile device.
- **MultiChannel Unification.** Finally, by using a unified Programming Model, Oracle9iAS also makes any application created to be easily accessed simultaneously from multiple channels - e-mail, browser, push, voice, and any device's micro browser - with consistent state across all these different access channels.
- **Productive Wireless Development Tool.** To make wireless developers highly productive, Oracle9iAS provides advanced Wireless Development Tools including - (i) The Service Designer is used by developers to design new wireless services, link services together, and to manage wireless applications; (ii) The Content Manager is used to manage the end user's view of the wireless services; (iii) and the User Manager controls the users, groups and the access control privileges they have to various system resources.
- **Mobile PIM (Personal Information Management).** It offers a number of facilities that can be used to very quickly Wireless enable existing applications. These include: (i) Mobile Access to Email - send and receive of e-mail to mobile devices including voice access to e-mail; (ii) Mobile LDAP Access - people finder access from mobile devices; (iii) Wireless Instant Messaging - send and receive instant messages to wireless devices; (iv) Mobile Calendaring and Scheduling - schedule meetings from mobile devices; (iv) Mobile Unified Messaging - enter and access information from unified messaging repositories from wireless devices; and (v) the ability to connect to any IMAP/LDAP server.

- **Mobile Commerce.** For mCommerce, Oracle9iAS Wireless provides facilities for secure mobile transactions; secure storage of user identity in an mWallet (mobile Wallet); and support for the most common payment mechanisms.

## **Oracle Portal**

Oracle9iAS Portal is a web-based application for building and deploying e-business portals. It provides a secure, manageable environment for accessing and interacting with enterprise software services and information resources.

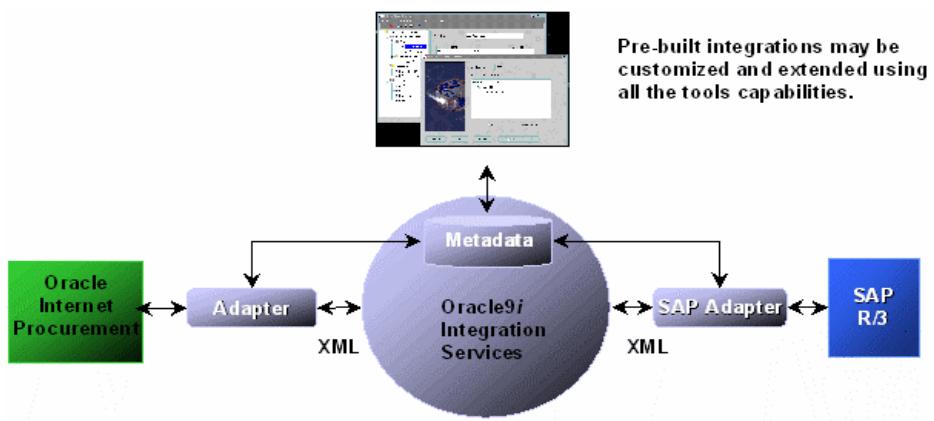
Key features include:

- **Self-service content publishing.** It enables the users to easily publish and manage the content on the web with a consistent look and feel to the site. Content publishers can also take advantage of content approval and routing capabilities to specify one or more individuals for review/approval.
- **Support of WebDAV facilities.** It provides support for WebDAV standard giving users additional publishing flexibility and desktop integration.
- **Enhanced Enterprise search.** From their Enterprise Portal, users can execute enterprise-wide information searches to find information that may sit in multiple applications on many different internal systems. It achieves this through Oracle Ultrasearch. Ultrasearch is an enterprise Intranet search facility that consists of a highly scalable, schedulable web crawler that can be targeted to search various Intranet and Internet sites.
- **One Place to Authenticate Users (Single Sign on).** When accessing these different internal systems, users can go to a single place to authenticate themselves. Once they have Single Sign-On, they do not need to remember multiple user names and passwords to access different systems.
- **New J2EE-based Portlet Interface.** The Java Portal Developer Kit (PDK-Java) provides a portal-independent user interface for creating and managing external portlet providers. This gives developers a declarative way to create secure, custom portlets on existing J2EE applications.
- **Pre-Built Portlets.** In addition to using the PDK to build custom portlets, it includes many pre-built portlets including People Search, Approval and Notification portlets, Folder portlets, extensive Search portlets Business Intelligence portlets and Report portlets.
- **ISV Portlets.** Plug-in portlets are available from over a 100 partners including Webex, InfoSpace, Factiva, MapInfo and Inktomi.
- **Web Cache Integration.** Portal page assembly logic utilizes Web Cache's invalidation-based caching features to pre-populate the cache, allowing many page requests to be served entirely from the cache and a significant reduction in calls to the portal database.

## Oracle InterConnect

Oracle Interconnect is a component of Oracle 9iAS Enterprise Edition. It is modeled using hub-spoke architecture. It comes with a set of adapters for accessing various applications and system. Adapters such as HTTP/S, Oracle Advance Queueing, Oracle database, FTP, MQSeries are available free of charge. Adapters such as SAP, PeopleSoft, Siebel, Jddwards, CICS can be purchased separately. In addition custom adapters can be built using Oracle 9iAS Interconnect adapter SDK. Data transformation is achieved in the adapters.

Oracle Interconnect uses Oracle's messaging infrastructure (Database and Advanced queues), Oracle Enterprise manager as a runtime management console for troubleshooting, monitoring performance, starting and stopping components for single centralized location. Optionally Oracle Workflow can also be used for business process driven integration.



## J2EE support

J2EE compliance	Oracle 9iAS	BEA WebLogic	IBM WebSphere
EJB	1.1	2.0	1.0
Servlets	2.2	2.2	2.0
JSP	1.1	1.1	1.0
JDBC	2.0	2.0	2.0
JNDI	1.2	1.2	1.1
JMS	1.0.2	1.0.2	1.0.1

## Footprint

Footprint type	Oracle 9iAS	BEA WebLogic	IBM WebSphere
Download file size	10 MB	32 MB	45 MB
Disk space	15 MB	45 MB	66 MB
Minimum memory	20 MB	256 MB	512 MB
Per session memory	50 % BEA	100 %	125 % BEA
Install/config time	< 20 min	1 hour	4-5 hours

The footprint numbers are from the Oracle 9iAS presentation.