
Sharing 9iAS Experiences !!!

Pradeep Navalkar

Senior Systems Supervisor

M-co, The Marketplace Company Limited

Tomorrow's winners will be those who can identify and respond quickly to new opportunities and demands of the rapidly changing marketplaces. And today's leaders are those who possess the ability to do that.

This paper aims to provide a background of our systems, and share some of our experiences with the Oracle 9iAS product. Note that this paper is not intended to fully describe the Oracle 9iAS product.

Background

M-co works with industries and governments around the world, helping to set up and operate trading exchanges for vital commodities and services such as electricity, gas, transport and telecommunications.

M-co has been involved in the design, implementation and operation of marketplaces around the world. The New Zealand Electricity Market (NZEM), which settles over one billion dollars annually, is one such proven example. NZEM is a voluntary multi-lateral trading contract where most of the New Zealand wholesale electricity gets traded. The NZEM parties analyse the electricity prices using COMIT (Commodity Market Information Trading System).

COMIT was the first electricity trading system in the world to be accessible through the Internet. COMIT underpins the operation of New Zealand's wholesale electricity market providing the 'gateway' to the market for participants. Using COMIT, market participants actively trade electricity and also have access to key market data for decision-making.

M-co has also been involved in building other marketplaces overseas, including the trading of green electricity certificates. COMIT is used as an example in the rest of the paper. However, most of the discussion in this paper also applies to our other systems.

Business and System needs

Other than our reputation being at stake, we are liable for financial disadvantages if certain key business requirements are not met. Due to the nature of the markets and trading, certain absolute requirements are imposed on our underlying systems.

Performance: The system needs to be real quick. COMIT handles an average of one hundred thousand orders per day.

Reliability: Participants are fully reliable on the available trading systems to be able to operate and meet their needs.

Availability: Users need some form of system available at all times round the clock. This means if our primary systems are not available at any point in time, we need to provide enough levels of alternative systems at all times.

Scalability: Our system needs to be able to handle a realistic amount of users and increasing workload at any given point of time.

Security: Due to our systems being available on the internet, we are faced with ensuring that the data is protected and not compromised at all times.

Supportable and Maintainable: Of course, the last thing we would want to do is to maintain a complex system. Our system support and maintenance needs to be simple and easy.

Leveraging technology: The only reason we will move towards leading technology is if we derive significant business benefit or to be able to meet the other business needs.

Technical Infrastructure

The technical infrastructure of our trading systems is largely driven by the business needs described above. We believe we have a sound technical infrastructure.

Our primary systems are housed on powerful fault tolerant servers, within a dedicated telehousing site. Our redundant secondary systems, which are geographically separated, are updated at quick and regular intervals. The primary and secondary systems are connected via a frame relay link and also an ISDN link.

At all times, we also have internet connections to our primary and secondary sites. This ensures that our users have multiple and redundant access to our systems. This forms an essential component of our 24 x 7 system availability. There are other redundancy levels like an independent and isolated site for emergency, alternate network traffic paths, redundant routers/switches, etc.

Our core trading systems are built using the Oracle web server three-tier model. It is the Oracle Application server that allows us to web-enable our databases. Users are now able to access and update databases through their browsers.

OAS architecture

The Oracle Application Server architecture comprises of three layers, viz. the HTTP listener layer, the OAS layer and the Applications layer. The Applications layer consists of the Cartridge Server and the various cartridges (eg. PL/SQL cartridge that we use).

The Oracle Application Server (OAS) as the middle layer communicates with the Oracle 8i database. The OAS receives user requests, which are served by executing database procedures. As a result, HTML is dynamically generated and sent to the user's browser.

The PL/SQL toolkit enables us to provide user interfaces to carry out the trading functionality. An example is the upload of order files by market participants to our database.

The OAS supports SSL version 3.0.

Limitations of the Oracle Application Server product

We found several limitations with using the Oracle Application Server product (4.0.8.x) over the last few years. Here are just a few of them:

Un-reliable: The OAS is un-reliable, and crashes under certain circumstances.

Limited functionality: The OAS provides limited functionality as a true application or web server layer. For eg. It does not provide any intelligence for growing our business and analysing our customer behaviour and needs.

Support overheads: As a result of its unreliability, there is an additional overhead with respect to supporting the OAS product and also monitoring its availability. We have experienced resource overheads when we want to analyse our system usage for various purposes, eg. Concurrency reporting.

Scalability issues: Though we haven't done exhaustive load and volume tests, we expect that the OAS will break down when subjected to increased number of concurrent users and increased amount of workload. We have found that CPU, memory and disk I/O are bottlenecks with large number of concurrent users.

The scalability factor becomes important when we consider taking our systems internationally and into other markets.

Platform dependency: We have found that the OAS product is more reliable and stable with Solaris 2.6 when compared with Solaris 8.

Limited security: The OAS product only provides 40-bit encryption. We cannot move to 128-bit encryption, which is a minimum standard encryption nowadays.

It is to be noted that the web server is the first port of call for a potential attacker. Hence, security has to be guaranteed.

Lacks maturity: The OAS product is far from robust. As a result, we cannot easily package our trading systems into products, mainly due to the limitations outlined above.

In addition to the above, Oracle does not support the OAS 4.0.8.x product any more. Hence, there was a strong “business case” to move to Oracle 9iAS if we were to retain the Oracle web server model.

Oracle 9iAS described

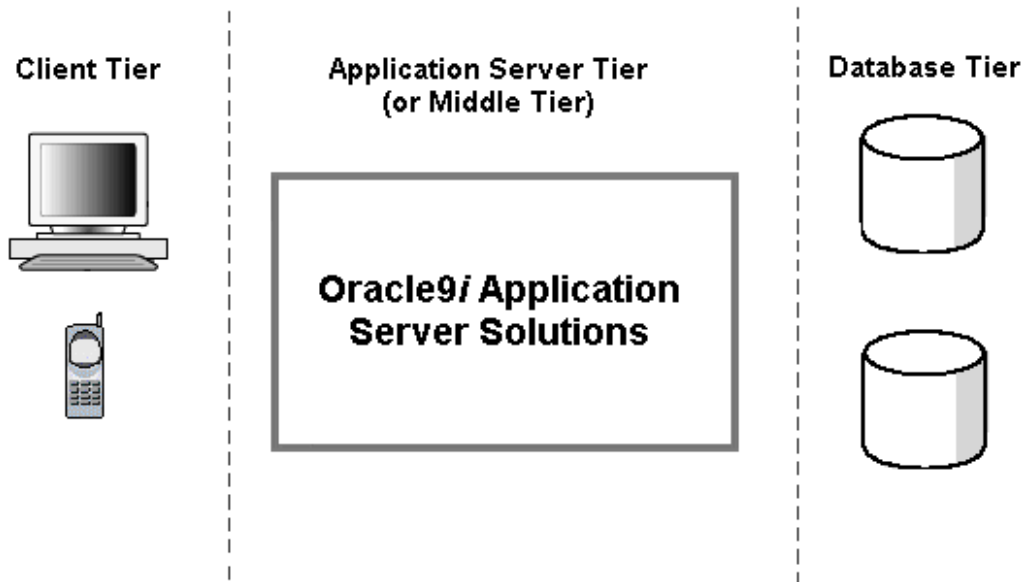
Oracle9AS is a complete standards-based application server that provides a comprehensive and fully integrated platform for running Web sites, J2EE (Java 2 Platform Enterprise Edition) applications, and Web services.

Oracle9AS provides full support for the J2EE platform, XML, and emerging Web services standards. With Oracle9iAS you can simplify information access for your customers and trading partners by delivering enterprise portals, which can be customized and accessed from a network browser or wireless devices. It allows you to redefine your business processes, and integrate your applications and data sources with those from your customers or partners. You can deliver tailored customer experiences via real-time personalization, and assess and correlate Web site traffic patterns using Oracle9iAS integrated business intelligence services.

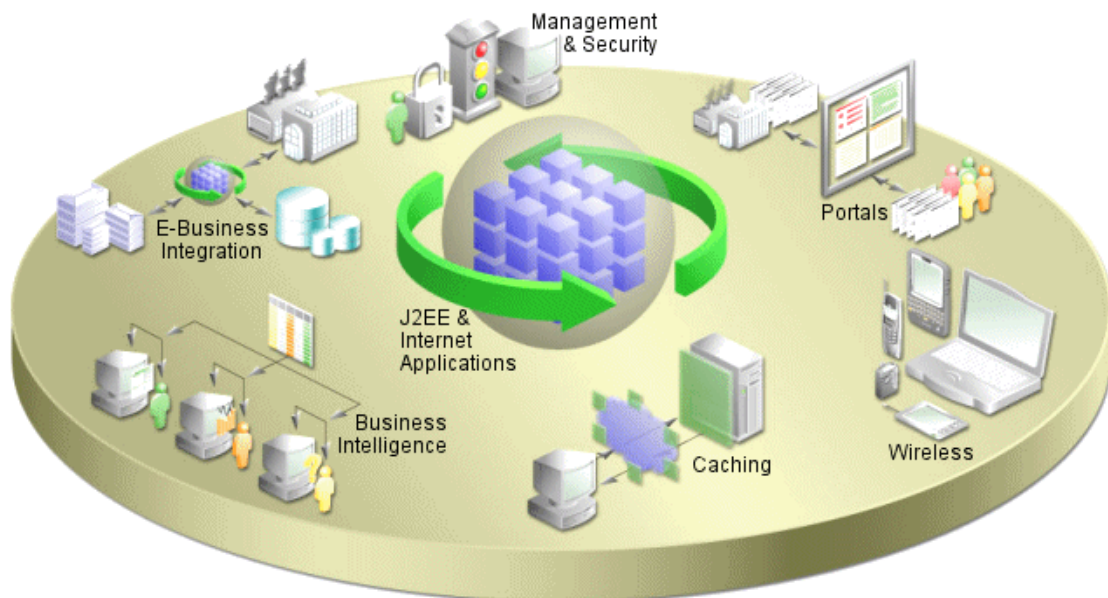
You can also implement a centralized management, security, and directory framework to manage and monitor all of your distributed systems and diverse user communities. Oracle9AS allows you to save on Web site infrastructure by deploying your fast, scalable Internet applications through built-in Web caching, load balancing and clustering capabilities.

Oracle 9iAS architecture

Oracle 9i Application Server (9iAS) uses a three-tiered architecture as shown below.



The diagram below illustrates solutions that Oracle9iAS provides, which include J2EE and Internet applications, portals, wireless, caching, business intelligence, e-business integration, and management and security.



Oracle 9iAS install types

There are four types of application server installations or install types, each providing a set of components. The install types are:

- **J2EE and Web Cache:** Provides a basic Web server that enables you to develop and deploy Java 2 Enterprise Edition (J2EE) applications, use J2EE and Simple Object Access Protocol (SOAP) based Web services, accelerate Web site performance, and manage your application server with a Web-based tool.
- **Portal and Wireless:** Enables you to deploy enterprise portals and wireless applications. Includes all components available in the J2EE and Web Cache install type.
- **Business Intelligence and Forms:** Enables you to analyze clickstream data, personalize applications, perform data analysis, generate Web-based reports, and use Forms-based applications. Includes all components available in the Portal and Wireless install type.
- **Unified Messaging:** Enables you to integrate different types of messages into a single framework. Includes all of the components available in the Business Intelligence and Forms install type.

Note that the above install types are ordered, in that each contains all of the components in the previous install type, plus additional components.

The Oracle9iAS Infrastructure

An Oracle9iAS infrastructure is a type of installation that provides centralized security and management services, configuration information, and data repositories for application server installations.

An infrastructure is installed into its own Oracle home and contains the following pieces:

- **Oracle9iAS Single Sign-On:** This feature enables users to access multiple accounts and applications with a single username and password, and provides single sign-on service across your entire application server enterprise.
- **Oracle Internet Directory:** This is an LDAP-compliant directory service that provides centralized storage of information about users, applications, and resources in your enterprise.
- **Metadata Repository:** This is an Oracle9i Enterprise Edition database that contains schemas and business logic used by application server components and other pieces of the infrastructure.
- **Oracle Management Server (optional):** This is required if you would like to use Oracle Enterprise Manager Console, a Java-based interface for managing the application server instances, databases, and applications in your enterprise.

The following describes and explains some key components of Oracle 9iAS:

Oracle HTTP Server

Oracle HTTP Server is the underlying deployment platform for all programming languages and technologies that Oracle9iAS supports. It provides a Web listener for OC4J (Oracle Components for Java) and the framework for hosting static and dynamic pages and applications over the Web.

Based on the proven technology of the Apache HTTP Server, Oracle HTTP Server includes significant enhancements that facilitate load balancing, administration, and configuration. It also includes a number of enhanced modules, or mods, which are extensions to the HTTP server that extend its functionality for other enterprise applications and services.

Oracle HTTP Server allows developers to program their site in a variety of languages and technologies such as Java, Perl, C, C++, and PL/SQL. Additionally, it can serve as either a forward or reverse proxy server.

Oracle9iAS Web Cache

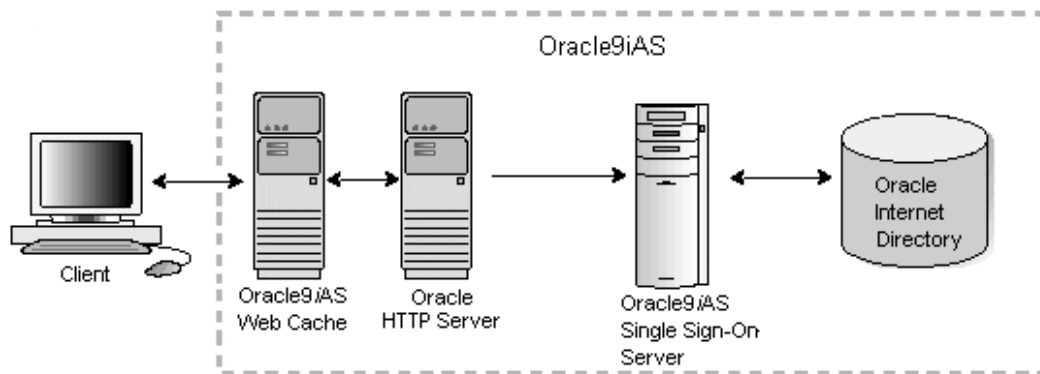
Oracle9iAS Web Cache is a server accelerator caching service that improves the performance, scalability, and availability of frequently visited e-business Web sites. By storing frequently accessed URLs in virtual memory, Oracle9iAS Web Cache eliminates the need to repeatedly process requests for those URLs on the Web server, and it caches both static and dynamically generated HTTP content from one or more application Web servers.

Oracle9iAS Single Sign-On

An important security feature of Oracle9iAS is support of single sign-on (SSO) to Web-based applications. Oracle9iAS Single Sign-On addresses the problem of "too many passwords". With the rapid growth of the Internet, this problem has been increasingly prevalent, causing users inconvenience that typically results in poor security practices, and increased administrative costs.

Oracle9iAS Single Sign-On resolves this problem by enabling users to login to Oracle9iAS and gain access to those applications for which they are authorized, without requiring them to re-enter a user name and password for each application.

It is fully integrated with Oracle Internet Directory (OID), which stores user information. It supports LDAP (Lightweight Directory Access Protocol) based user and password management through OID.



The diagram above shows the architecture of Oracle9iAS Single Sign-On along with Oracle 9iA Web Cache.

Oracle Enterprise Manager

Oracle Enterprise Manager includes a Web-based administration interface, Oracle Enterprise Manager Web site that manages all Oracle9iAS components and features, as well as a console. The Web-based administrative tools provide Oracle9iAS with a lightweight administration interface that can be accessed from anywhere, even through network firewalls.

Clustering technology

Oracle 9iAS's clustering technology provides the foundation for reliability, availability, and scalability in an application server deployment. Clustering enables multiple servers to redundantly serve applications and to provide failover capabilities. Clustered architectures can scale to serve greater concurrent usage and also protect against server failures. The clustering terminology includes Oracle 9iAS instance, cluster and farm.

Load balancing

Load balancing works in parallel with clustering by balancing the load of requests over system resources so that the distribution of traffic is transparent to users. Effective load balancing increases system scalability and availability because system resources are used more efficiently. Oracle9iAS load balances efficiently between threads and processes on a single host, and between hosts in a multiple host deployment, making it desirable to deploy Oracle9iAS in middle-tier server farms.

Other Oracle 9iAS components

Note that the other 9iAS components and services (eg. Oracle 9iAS Portal, Oracle 9iAS Forms and Reports Services, Oracle 9iAS Wireless, Developer Kits, Oracle 9iAS Integration, etc) are not discussed here in depth. Please refer to the Oracle 9iAS core documentation for details.

9iAS looks promising

Oracle 9iAS promises to address all the challenges that Oracle's customers (including us) face as we refine our business processes to become an e-business.

Performance and caching: Oracle 9iAS Web Cache claims to increase the performance and throughput of our web site by caching both static and dynamically generated web content. The other Oracle 9iAS features desirable for our trading systems include page fragment caching, dynamic content assembly, web server load balancing, web cache clustering and failover.

Reliability and availability: In addition to the above web cache features, Oracle 9iAS provides fault tolerance, death detection and restart, failover, and connection rerouting features, which assure high reliability and availability of systems.

Robustness: The Oracle 9iAS product is robust and mature, and can answer to the requirements of e-business users and IT directors alike. The product enables quick delivery of highly scalable applications. Moreover, it is well integrated with Oracle's own database technology.

Development and deployment: Oracle 9iAS effectively handles development and deployment challenges viz, complex interfaces, enterprise integration, standardization, systems management, etc.

Security: Oracle 9iAS supports encryptions higher than 128 bit, and can also perform PKI authentication. Oracle Wallet Manager provides the management of public-key security credentials on both Oracle clients and servers.

Business Intelligence Services: The business intelligence services of Oracle 9iAS can generate reports on the website activity by analyzing clickstream data and perform dynamic ad-hoc query reporting and analysis.

Note that clickstream analysis is a broad method for companies to analyse their customer's behaviour, eg. where customers enter its site and where they exit.

No compromises: Oracle 9iAS does not compromise any of performance, availability, reliability, scalability and security while delivering all of these needs simultaneously.

With the above desired features, we can now boast about taking our trading systems to a new level.

9iAS challenges

As can be seen already, the Oracle 9iAS is a different product altogether when compared with the Oracle Application Server 4.0.8.x.

At the time of writing this paper, we are in the process of adopting the architecture and getting Oracle 9iAS to suit our requirements. Hence, here are just a few of our challenges that we can share at this stage:

Configuration and setup: Installation and configuration of Oracle 9iAS can be a nightmare. Here are a few reasons why:

- a) A good understanding of the 9iAS architecture is necessary.
- b) The 9iAS design and requirement needs to be done upfront.
- c) It is not easy to familiarize oneself with the 9iAS product.
- d) The process gets more complicated with Oracle changing the architecture and components across the next releases in some way or the other.
- e) There are new and additional ports that 9iAS uses. This means more work for network and security administrators.

Resource hungry product: Certain Oracle 9iAS features and install types require a lot of memory and disk space. Knowing these requirements before hand and adequate testing of systems is recommended.

Learning curve: Due to lack of an appropriate “Quick start guide”, it is a major exercise to learn the Oracle 9iAS product, the architecture and then configure it to one’s own requirements and purpose.

Integration challenges: The Oracle 9iAS product requires a fair amount of integration, and hence the cost needs to be accounted for. Moreover, there does not seem to be an easy migration path from OAS 4.0.8.x to Oracle 9iAS.

Migrating our trading systems: Migration of our trading systems to Oracle 9iAS plays a crucial part, especially due to the continually evolving nature of our production systems. This is one of the biggest challenges, and hence the migrated systems need to be tested well. Appropriate planning and execution is necessary to ensure minimal impact to our 24 x 7 users and production systems.

Summary

Finally, here are only a few points to consider while moving to the 9iAS family of products:

- Identify clear business benefits that will be achieved due to migration to Oracle 9iAS
- Don’t assume technology, tools and products to be simple plug-n-play
- Design your Oracle 9iAS application server enterprise according to your system needs
- Choose only those required 9iAS components and services that you will use and need
- Configure and tune your Oracle 9iAS to get the best out of it
- Do not underestimate the integration effort, especially in taking a system to production

-
- Carry out enough testing so that there are no surprises later on
 - Once you are happy with the basic components, plan to leverage benefits from the technology

References

Refer to “Oracle 9iAS core documentation” for more info on product features and benefits.

About the Author

Pradeep Navalkar has a bachelor of computer science, and works as a senior systems supervisor with M-co (www.m-co.com). He has 10 years of IT experience, almost all of this with Oracle's database, products and technologies.

Pradeep has been involved in system design and development, system upgrades and implementations, database and system administration, providing operational management and mentoring roles.

Prior to M-co, Pradeep has provided his services to Logica, Air New Zealand and Kale Consultants.

pradeep.navalkar@m-co.co.nz