

Oracle9i Integration: The Foundation of EBusiness

An Oracle White Paper

December 2000

EXECUTIVE OVERVIEW

EBusiness will completely reshape many industries in the next few years. Companies who successfully implement eBusiness solutions will realize reduced costs, increased revenue, faster time-to-market, and increased customer satisfaction. There is one trait common to all eBusiness solutions—integration.

Established companies have built and linked their IT infrastructure over time, in order to meet changing requirements. The result has been a confusing tangle of connections across departments and business units. A hub and spoke model provides a more extensible and manageable mechanism for integration. All the communications between various applications happen through a single hub, providing a central point of integration.

Oracle9i offers the most complete and the most comprehensive platform for integration. As is demonstrated by its extensive history running critical business applications for the most demanding solutions, Oracle provides a robust set of features critical for integration, including high availability, security, scalability, and flexibility. It offers secure and standard communication mechanisms, which enable messaging and data access between integration hubs and applications. Oracle's sophisticated process management enables automation of all types of business processes, and business intelligence features provide a means for auditing, and for process and business optimization. Finally, the Oracle9i platform provides the necessary tools to implement and manage an integrated solution.

INTRODUCTION

EBusiness will completely reshape many industries in the next few years. Companies who successfully implement eBusiness solutions will realize reduced costs, increased revenue, faster time-to-market, and increased customer satisfaction. Recognizing that eBusiness capabilities may become a key differentiator in the future, enterprises are rushing to integrate their systems with those of their customers and suppliers.

Companies have been buying and selling goods electronically on a limited scale for years, using privately negotiated protocols and private networks. It was restricted to large companies, and a few of their large partners and suppliers. The emergence of the Internet is bringing about dramatic changes in the number of companies participating in electronic commerce. Enterprises view the Internet as a ubiquitous,

and, more importantly, affordable platform to get closer to their customers, partners, and suppliers. However, while the Internet is an affordable connectivity platform, and its public protocols and standards make it easy for companies to inter-operate, it is not yet an enterprise platform.

Enterprises find that putting up a Web front (personalizing content, electronic payments, and catalog management) is the easier aspect of becoming an eBusiness. Implementing the business-to-business aspects of such commerce is harder. EBusiness commerce requires enterprises to integrate their back office applications with their front-office applications, as well as those of their partners, suppliers, and customers. The end-to-end processing of complex business processes requires the seamless integration and collaboration of a variety of enterprise applications.

A variety of terms are used to describe interactions within an enterprise, and between an enterprise and its customers and partners. Application-to-application (A2A) integration and Enterprise Application Integration describe the process of integrating applications within a company. Business-to-business (B2B) describes integration between business partners, Business-to-consumer (B2C) describes electronic interactions between a business and consumers, and Application Service Provider (ASP) hosting describes interactions with an application hosted by a third-party. However, there is one trait common to successful implementation of all these models—integration. Without integration, the Internet is merely a cheap network connectivity solution.

INTEGRATION ARCHITECTURE

To communicate efficiently with the external world, enterprises need to integrate both their internal business processes, and those with their partners and customers. Internet-enabled applications by themselves do not make an enterprise an eBusiness—they must all be integrated.

Integration enables enterprises to automate business processes as well as to get a global, consolidated view of all important business objects such as customers, orders, inventory and accounts. Integration requires the synchronization and coordination of multiple heterogeneous and autonomous applications through an enterprise and its partners.

Established companies have built their IT infrastructure over time, merging ERP applications with innovative new supply chain, business intelligence, or customer service applications. Often, different business units within a company have their own IT organizations, each with different applications. Changing business requirements within companies over the years have inextricably linked applications in a confusing tangle of connections across departments and business units, as shown in Figure 1.

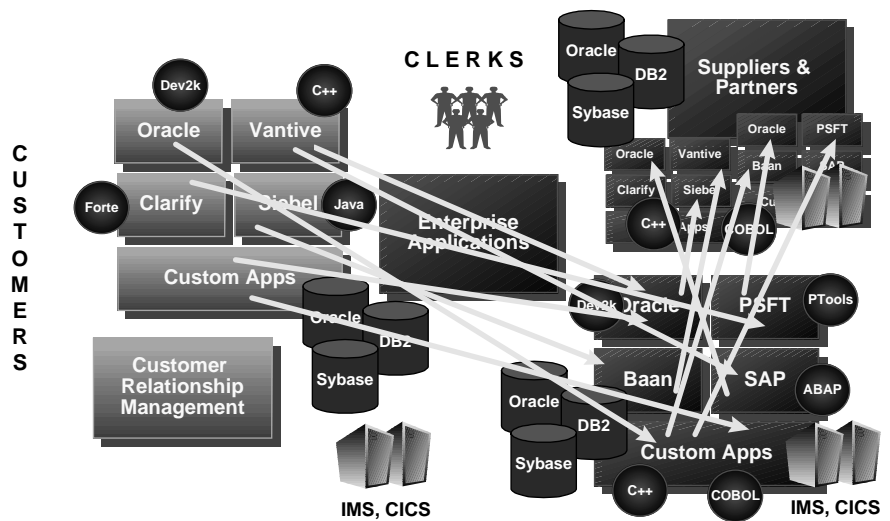


Figure 1: The "Typical" Enterprise

The boxes in figure 1 represent a large variety of applications. Some of the applications requiring integration are described in the following sections.

Packaged Applications

A traditional enterprise uses a variety of packaged applications for a variety of tasks. These applications include CRM applications such as Oracle CRM, Vantive, and Siebel, as well as ERP applications such as Oracle ERP, SAP, and Peoplesoft. Each application has its own application interface and its own data format. A purchase order in Oracle Applications is entirely different from a purchase order in SAP. The challenge is to integrate these applications and a variety of other applications in a single coherent framework.

Legacy Applications

An enterprise may manage some business processes using legacy applications. These applications have very limited interface supports. These applications need to be integrated with very little or no change to the application.

Custom Applications

Many enterprises have created custom applications that provide them a competitive advantage over others in their industry. These customers need to integrate these custom applications, as they would lose their advantage if they were to replace these applications with a packaged application.

Hosted Applications

Increasingly, companies are starting to host their business applications at Application Service Providers (ASPs). Hosting allows companies to quickly implement new systems with a minimal investment and without having to hire additional IT professionals, and then purchase, install, and support the application.

However, the need to integrate these hosted applications with in-house and partner or customer applications is still critical to a successful eBusiness.

Partner and Customer Applications

To fully recognize the benefits of eBusiness, companies must integrate their systems with those of their partners and customers. This requires integration from within the enterprise and across the internet. By tightly integrating applications between suppliers and customers, companies can reduce costs and increase revenues.

Electronic Marketplaces

Many industries are implementing electronic marketplaces to efficiently bring together a multitude of suppliers with their customers. Integration with these marketplaces will streamline the purchasing and sales operations.

Distributed Hub and Spoke Model

The hub and spoke model provides an extensible and manageable mechanism for integration. All the communications between various applications happen through a single hub. The hub provides a central point of control and management. The workflow between different applications is managed within the hub. This hub offers the single point of integration. Integrating a new application to the hub enables the integration of the new application to other applications. Communications between different applications can be stored and used for extracting intelligence on how to improve business efficiency. Later just the workflow in the hub needs to be modified to get the required business benefit.

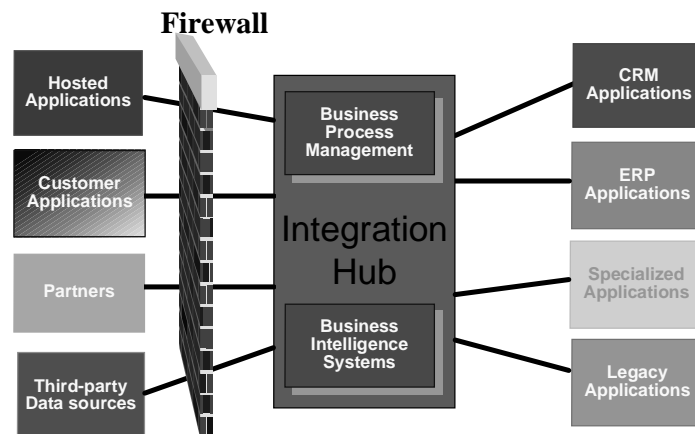


Figure 2: Hub and Spoke Architecture

Multiple hubs can be deployed to support groups of applications within a corporate Intranet. Business messages can be automatically propagated between hubs. This feature is useful when the application originating the business event is on a different hub than the application that is interested in that business event.

ORACLE9i/INTEGRATION PLATFORM

Oracle9i offers the most complete and the most comprehensive platform for integration. As is demonstrated by its extensive history running critical business applications for the most demanding solutions, Oracle provides a robust set of features critical for integration, including high availability, security, scalability, and flexibility. It offers secure and standard communication mechanisms, which enable messaging and data access between integration hubs and applications. Oracle's sophisticated process management enables automation of all types of business processes, and business intelligence features provide a means for auditing, and for process and business optimization. Finally, the Oracle9i platform provides the necessary tools to implement and manage an integrated solution.

As shown in figure 3, the Oracle9i platform can serve as the hub in an integrated environment, enabling eBusiness within the enterprise, and with partners and marketplaces across the internet.

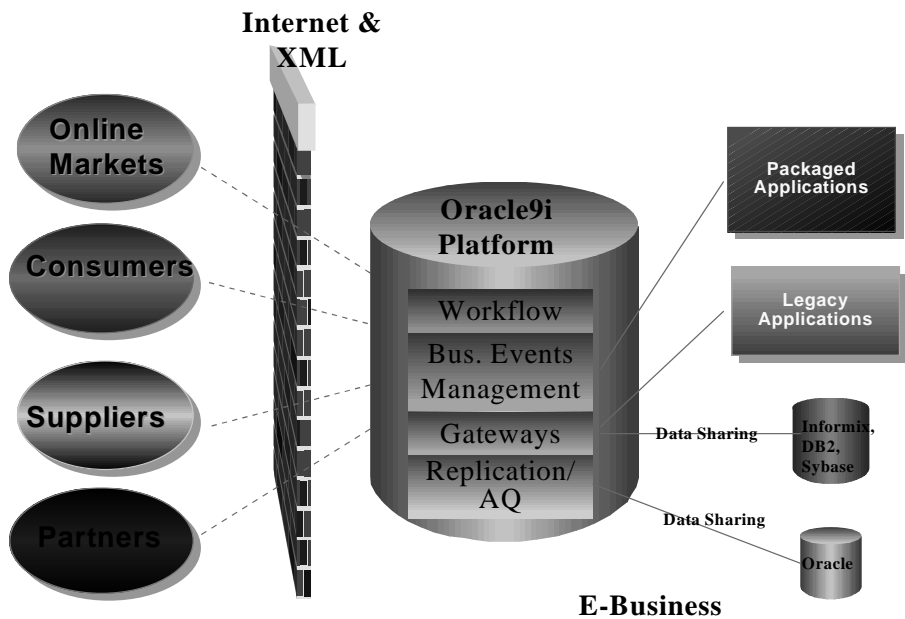


Figure 3: Oracle9i Integration Platform

Robust Platform

Successful eBusinesses are relying upon their IT infrastructure to provide greater efficiencies in their business operations. However, with this efficiency comes a greater dependence on their systems. The integration hub is the most critical component of any integration solution. All applications communicate with and rely upon messages flowing through the hub. Should the hub fail to perform as required, the enterprise will grind to a halt. Given the critical nature of the hub, it must be developed using a highly available, secure, scalable, and flexible platform.

High Availability

Oracle9i provides the highest levels of reliability and availability. Acknowledging that failures will happen, Oracle9i provides near instantaneous recovery from system faults, meeting the most stringent service level agreements. It provides robust features to protect from data errors and disasters. Oracle9i also includes tools to minimize planned downtime, critical for any interactions with global business partners in a 24x7 environment.

Security

The Internet by its very nature is pervasive. Everyone can access everything. Hence, enterprises have to protect their integration infrastructure from all forms of unauthorized use. Only relevant information and operational access should be provided to the appropriate Internet users.

Oracle9i provides advanced security options, to ensure data access is restricted to those users entitled to view or modify the data. Oracle Advanced Security allows for enhanced authentication of user identities through integrating technologies such as token cards and biometrics. To facilitate management of users and authentication data across a distributed environment, Oracle provides Oracle Internet Directory, a single repository of user information based on LDAP.

The Oracle9i platform provides complete end-to-end security over the Internet for all communications. Only authorized and authenticated parties can perform business operations. The platform provides authentication of internet users using a single-sign on, simplifying access to distributed applications made available via a portal. In a three-tier model, the platform can authenticate the user by the application server using single-sign-on, and then connect as a common application users authorized to perform operations on behalf of the end-user. This preserves traditional client-server security models in today's three-tier world.

Scalability and Flexibility

Scalability and flexibility are also requirements for the integration infrastructure. It must be able to evolve to satisfy the integration needs of partners and customers. Should the infrastructure become a bottleneck, the implications can be far-reaching, impacting the productivity of users of all the integrated applications.

The Oracle9i platform includes the Oracle9i Application Server, which extends the capabilities of the platform in a multi-tier environment. Oracle9i provides a set of services that let customers deploy internet enabled database applications, including integration hubs. Any application (or integration hub) can be developed in a simple single tier model, yet be deployed in a multi-tiered model to best meet the needs of the environment. Oracle9i Application Server transparently extends the capabilities of the database to applications running in the middle-tier.

Just as with an application running in the database, applications running on other servers can efficiently connect to Oracle and third-party data stores, and can send

messages to other applications directly from the application. The Oracle9i Application Server Database Cache improves performance and simplifies application design by intelligently caching data in the middle tier, and acting as a proxy for many database services and operations.

Secure, Standard Communication

The Internet has revolutionized how people or enterprises communicate. Modern day communication is over email or a web browser. The IT infrastructure supporting B2B services must support both these forms of communication.

Internet Protocols

The Oracle9i platform has a built-in web server that allows communications over both the web, via the HTTP protocol, and email, via the SMTP protocol. Since most firewalls are already configured to allow messages using these protocols to pass, there is no need to make any holes in the firewalls for communications with external business partners. The platform provides special server-side applications, that handle messages sent over http and smtp. These servlets parse the messages and perform the appropriate message queuing operations.

Transmission of data across the Internet must be secure, so only the intended recipient can read the data. Oracle9i allows secure business communications over the Internet, using the Secure Sockets Layer (SSL). SSL in the Oracle database server provides encryption of network traffic and authentication of clients and servers, to prevent unauthorized users from reading the data during transmission.

Standard Communication Language

XML has emerged as a standard for eBusiness data representations. The XML datatype has been added to the Oracle Server to support operations on XML data. Oracle9i message queuing not only supports XML datatype payloads but also allows definitions of subscriptions based on contents of XML messages. This is a very powerful functionality for online market places where multiple vendors can define their subscriptions based on the contents of the orders.

With the Oracle9i platform, business actions can be communicated in the XML-format over the Internet. A partner can pick up outstanding orders from an eBusiness over the Internet using XML-based messages.

Messaging and Data Access

At the heart of any integration is the sharing of data among various applications in the enterprise. The Oracle9i platform provides a variety of mechanisms for applications requiring data-level integration. The choice of mechanism is dependent upon the nature of the application.

Advanced Queuing

Message queuing offers an asynchronous method of data sharing between business entities using business messages. An application can put a message for one or more messages in a queue. Different applications can pick up these messages, or the messages can be forwarded to another queue. Such a store and forward model is less vulnerable to network, machine, or application failures, as the applications sending and receiving the messages are loosely coupled and run independently. Changes to the architecture of one application do not affect others.

Oracle9i Advanced Queuing (AQ) is a database-integrated message queuing system. Messages are automatically stored in the database, and can be retained after consumption. This enables automatic auditing, transaction support, and business process intelligence, critical features for an eBusiness. Messages can be queried using SQL, providing critical information about active and consumed messages. Applications need not continually poll for new messages, as the Oracle9i platform can notify them when new messages await their attention. This reduces overhead on the application and simplifies development.

Advanced Queuing is fully internet enabled. Messages can be sent over the internet via http(s) and smtp to perform message queuing operations. Messages arriving at the server are inserted into a queue, and can trigger notifications in the form of an email or other database actions. For example, a purchase order sent via the internet, can automatically trigger a business workflow to process the order. That workflow can include an email notification to the appropriate business manager.

Data and Message Transformation

Applications are designed independently of each other. So, the messages they understand are different from each other. In order to integrate these applications, messages have to be transformed. There are various existing solutions to handle these transformations. The Oracle9i platform provides a transformation infrastructure that can be used to transform AQ messages as they arrive or are delivered. Transformations can be specified as PL/SQL functions, and can call third-party functions implemented in C, Java, or PL/SQL. In addition, XSLT transformations, using XML style sheets, can be specified for XML messages.

Messaging Gateway for Integration with Third Party Messaging Systems

Messaging gateways have been provided to propagate messages from Oracle9i advanced queues to third-party message queuing systems such as MQ Series or TIBCO Rendezvous. Configuration of these messaging gateways is similar to that of the Oracle transparent gateways. Once they are set up, from the application user's perspective, the propagation from AQ to other message queuing systems and vice versa behaves as if the propagation is from one AQ queue to another. The gateway agent automatically picks up the message from an AQ queue and

propagates it to the appropriate third-party queue. Similarly, it picks up messages from the third-party queues and propagates them to an AQ queue.

Replication

The advanced replication features of the Oracle9*i* platform allow multiple copies of the same data to be maintained consistently. Consider two or more applications, each with their own database, sharing common business objects, such as customer information. The changes an application makes to these common business objects in its own database must be reflected in corresponding changes to the other databases. Oracle Advanced Replication ensures that any changes made to any one of the databases are reflected at all of the other databases. Different replication strategies can be used, depending on how often the databases change, who makes the changes, and who is considered to have priority over these changes.

Advanced Replication supports multi-master, materialized view, and hybrid architectures. Multi-master configurations consist of two or more master databases, each containing identical copies of replicated data. Changes can be made at any master site, and those changes will continually propagate to other master sites. Multiple masters allow multiple sites to work collectively, each updating data and then sharing it with other sites. Within an organization, this can provide increased availability, and can be used to load-balance requests for data across multiple sites.

Master sites can also replicate with materialized views. Materialized views are updateable snapshots of a subset (rows or columns) of the data, and are refreshed periodically or on-demand by the remote site. This model is useful in situations where remote users need access to a subset of the data. For example, a distributor may need access to an eBusiness's price list and catalog, or a supplier may need to access parts forecasts and bills-of-materials.

Hybrid configurations are mixtures of master databases and materialized views. There can be multi-tier materialized views as well, where one materialized view is a subset of another materialized view. This provides the most flexibility in distributing data to various applications in a geographically distributed environment.

Transparent Access to Remote Stores

In many cases, an enterprise's data is located in more than a single data store. Direct access of remote data may be more efficient than using messaging or replication to access that data. An eBusiness may replicate often used data to a remote application, but not infrequently accessed data. Should the remote application need to access this data, it must be directly accessed. Oracle9*i* can directly access data in remote Oracle and non-Oracle systems over database links and gateways. Oracle9*i* provides synonyms and views that make remote data appear local, providing location transparency to the application. The Oracle9*i* platform automatically guarantees transactional integrity of distributed updates

through a 2-phase commit mechanism. It also automatically determines the most efficient data access methods for all operations.

In order to integrate with data stores such as Informix, Sybase, IBM DB2, and others, the Oracle9i platform offers transparent gateways. Using a transparent gateway, users can synchronously access data in a non-Oracle data store in the same manner as if the data was contained in an Oracle Server. The gateway automatically translates SQL, meta-data, and data types between the Oracle9i interface and that used by the target database. Gateways are supported by both the Oracle9i database, and Oracle9i Application Server, allowing an application running in any tier to transparently access data. For users maintaining a legacy data store, or who have not yet completed a migration to Oracle, this eliminates the need to customize their applications to work with multiple data stores.

Business Process Management

A complete business task is performed as the result of interactions between a variety of applications or business processes within the enterprise and its business partners. The process of accomplishing this task is called workflow.

For example, an RFQ generated by a business partner can result in starting an internal workflow, which results in the response to the RFQ. The response to the RFQ can either be accepted or rejected. The accepted response may result in placement of the order. The status of the business transaction must be tracked. True integration can be achieved only by integrating the various applications and the accompanying workflow among them.

Oracle9i provides functionality that can be used to define and manage business workflows. The in and out points in the workflow are the Advanced Queuing queues. Oracle Workflow offers dynamic ways to create and modify intra-business workflows.

The Oracle9i platform offers functionality to send email and web-based notifications to its customers, suppliers, and partners. For instance, the Oracle9i platform offers functionality that an exchange can use so that when an RFQ is placed, the interested suppliers can be notified in their preferred manner. This might be an email notification or a web-based notification, or it might even be to start a workflow in the supplier's business to respond to the RFQ. Furthermore, this RFQ can also be propagated to another eBusiness exchange for processing. All these communications are done in a secure manner so that no unauthorized party can tap into these communications. Proof of these interactions can be automatically kept.

Business Intelligence

Enterprises are always looking for ways to improve their efficiency by changing the way different business processes interact with each other. An integrated framework should provide a global view of business and should provide the necessary

information to make business more efficient. In addition, business interactions by their very nature are bound by legal restrictions. Each country has its own legal requirements. For this reason, these business interactions need to be documented.

The Oracle9i platform offers built-in functionality to record these business interactions for the desired duration in a transactional manner. Once the business interaction is committed, it is committed forever. Even in case of natural disaster, the documented business interaction can be recovered. These business documents can be used as a warehouse of business interactions. Oracle9i includes a rich set of tools that can be used to query this warehouse to extract intelligence on improving business processes and practices.

Tools

Oracle9i includes a variety of tools for platform management as well as integration hub development and management. These tools satisfy the needs of a wide spectrum of users, including developers, business analysts, and administrators.

Platform Management Tools

Oracle provides a variety of tools to manage an integration solution. Oracle Enterprise Manager (OEM) is a graphical tool that simplifies administration of the Oracle9i platform. It includes not only configuration assistants, but also event monitors that can generate alerts should trigger conditions exceed specified bounds. These exception events can automatically send messages to email, pagers, and cell phones to expedite any required administrative actions.

With the evolution of eBusiness, LDAP, a directory protocol, has become a single point of managing generic information. Oracle Internet Directory (OID) implements LDAP. The external points of communication, as well as information on various suppliers, partners, and their interests can be maintained in OID. OID offers a single point of management for all business entities. The Oracle Internet directory can act as a single repository for all user information, facilitating the exchange of certificates and other authentication data.

Integration Design Tools

Oracle also provides tools to manage integration functions. Oracle Application Interconnect is a tool that business analysts can use to define the interactions and transformations between heterogeneous applications. It includes visual design tools, a common view of metadata, transformation tools, and packaged application adapters. This speeds integration design and deployment, and greatly simplifies the management of the overall integration solution.

Oracle Workflow Builder is a full GUI tool that can be used by business analysts to design a complete workflow process and its components. It allows specification of item types, process activities, function activities, notification activities, and notification messages. Workflow Builder drastically reduces the time required to implement comprehensive business process management.

A complete integration platform must be extensible, so that it can meet the needs of ever changing applications and business processes. Recognizing that Java has become the development language of choice for building internet enabled and integrated solutions, Oracle provides Oracle JDeveloper, a complete Java development environment. JDeveloper can be used to build and extend the integration environment, including application logic, custom application adapters, and message transformations.

CONCLUSION

Enterprises are quickly embracing eBusiness either by building their own services or by becoming part of online market exchanges. Integrating internal, partner and customer applications allows businesses to realize the true efficiencies of eBusiness, and more quickly react to changing market dynamics.

Oracle9i features address the fundamental requirements behind integration. The platform is truly robust, providing inherent availability, security, scalability, and flexibility. It also offers a wealth of secure and standard communication options, including XML over http(s). Oracle9i's rich messaging and data access features include message queuing, replication, and distributed access to both Oracle and non-Oracle data stores. Oracle Workflow allows business analysts to model, implement and manage sophisticated business processes—spanning applications and business partners. All data and messages are stored in the Oracle9i database, providing automatic auditing of business processes and the ability to extract intelligence to improve business performance. Finally, the Oracle9i platform includes a rich set of development and management tools, allowing business analysts and integration architects to build and manage the best possible integrated solution. With all these integration oriented features, the Oracle9i platform offers the ideal platform for developing, deploying, and managing integrated eBusiness environments.



White Paper Title
December 2000

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