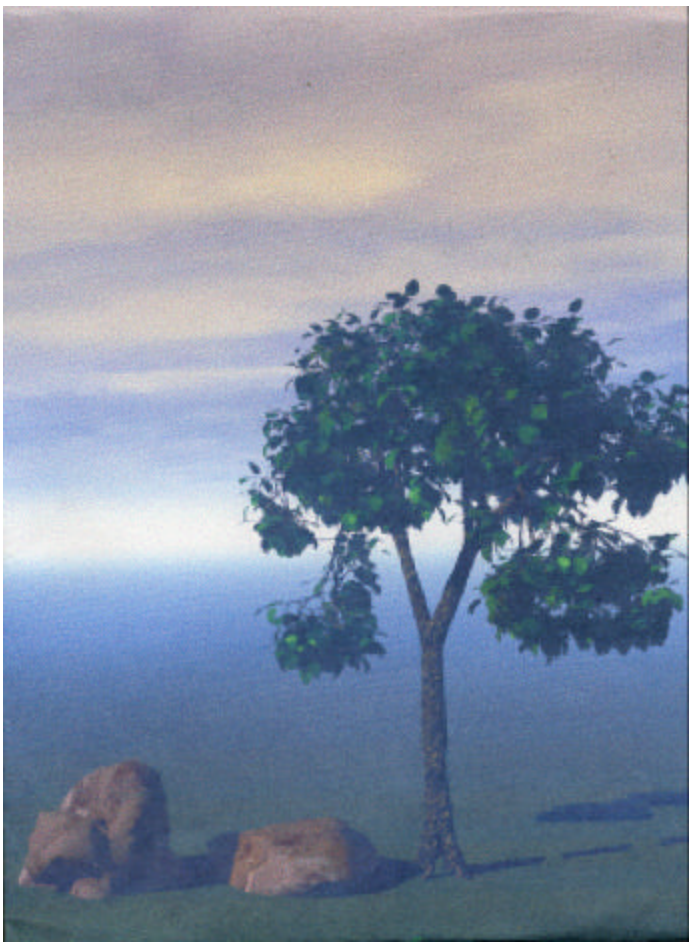
Web Services Market Assessment

Web Services Markets: Market Strategies, Opportunities, and Forecasts 2002-2007



Picture by Joseph Neustadt

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ABOUT THE COMPANY

WinterGreen Research,

founded in 1985, provides strategic market assessments in software, communications products, communications services, and advanced technology.

Reports focus on opportunities to expand existing markets or develop new markets. The reports access corporate positioning, market strategies, and product marketing opportunities. Reports evaluate the impact of new technologies. Reports assess the strategies and positions of leading participants.

The principals of WinterGreen Research have been involved in analysis and forecasting of international business opportunities in telecommunications and advanced computer technology markets for over 30 years.

Research Methodology

WinterGreen Research authors use a structured, consistent, and detailed research approach. The methodology supports an analytical approach to market research. In depth comparisons are made of many aspects of the market. Data relating to Industry segments is developed to permit presentation of forecasts and market share positioned to have substantive value.

Full spectrum research and information services, including market reports, customized research, and customer interviewing are available, reports and research are positioned to provide strategic value to industry participants, strategic planners, and product managers.

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Web Services Market Description

Web Services are the protocols, conventions, and network facilities that make business functions available to authorized persons over the Internet. Information can come from any Web-connected device. A Web service is a discrete business process.
Web services provide a way to describe information according to a particular protocol that is useful for exchange of information over the Web. A Web service defines its functionality and attributes so that other applications can understand it, and makes this functionality available on the Web.

Web Services Market Opportunities, Strategies, and Forecasts, 2002 to 2007

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Web Services Executive Summary

Summary Forecasts Web Services

Web Services promise to provide connectivity from distributed platforms and applications over the Internet into existing servers and mainframes. The ability to publish information into an application from the network is an essential aspect of creating telephone numbers for data.

Web services define an entirely new market that does not yet exist by leveraging existing application server, application integration, and enterprise portal product functionality. These services are best understood by example. They relate to the ability to automate processes that are not now automated.

They relate to transmitting information back to a server. Field service personnel, sales people, or clinicians frequently gather information in the field that is most useful in a range of applications. The ability to transmit that information back from the field will leverage Web services capabilities.

The more traditional view of Web services is that they enable e-business exchanges by publishing services to a directory repository. The difficulty with this is keeping the repository current.

Web services markets are expected to be $152 million in 2002. They are evolving as a portion of the total application integration EAI, application server, and enterprise portal markets. They are expected to reach $3.1 billion by 2007. (See Figure ES-1 and Table ES-2.)

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To get to this level from a standing start would be impossible. This revenue is realized as part of existing product line revenues. The existing products benefit from being Web services enabled. The Web services capabilities drive sales of existing integration and server products, creating a significant market opportunity. Companies that do not offer Web services capabilities in conjunction with other software will be hampered in the overall integration, application server, and portal markets.

FIGURE ES-1
Web Services Portion of Total Application Server, Enterprise Portal, and Message Broker Market, Forecasts, 2002-2007

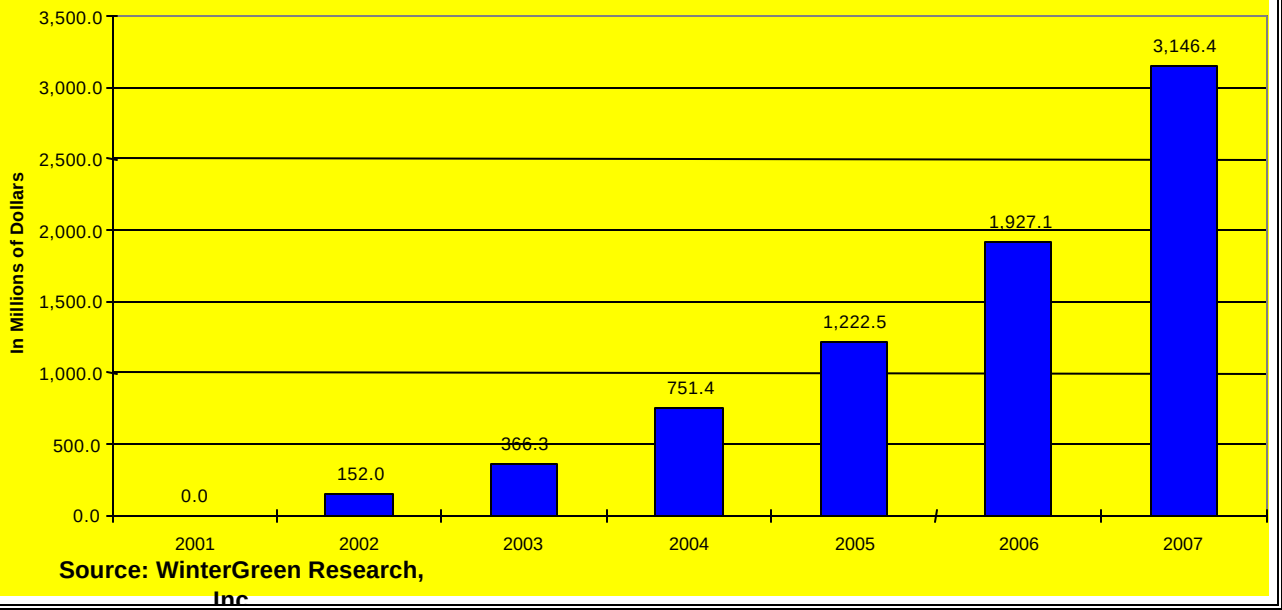

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TABLE ES-2
WEB SERVICES MARKET FORECAST PORTION OF APPLICATION INTEGRATION BROKER, APPLICATION SERVER, AND ENTERPRISE PORTAL MARKETS, 2002-2007
In Millions of Dollars

	2001	2002	2003	2004	2005	2006	2007
Web Services Portion (MM$)							
Integration Broker	0.0	57.4	162.3	377.4	614.4	900.3	1,545.7
Enterprise Portals	0.0	3.7	7.9	14.8	40.1	81.1	151.3
Application Servers	0.0	90.9	196.1	359.1	568.0	945.7	1,449.3
Total Web Services Portion Of Existing Markets	**0.0**	**152.0**	**366.3**	**751.4**	**1,222.5**	**1,927.1**	**3,146.4**
% growth	0.0	n.a.	141.0	105.1	62.7	57.6	63.3

Source: WinterGreen Research, Inc.

Web Services Supplement Basic E-Business Systems

The complexity of proprietary systems comes from the difficulties of interconnecting systems not originally designed to support communication. Web services are protocols designed to achieve interconnection of proprietary systems. The trouble is, the protocols developed by Web services designers do not do the whole job.

In summary, Web services are a group of protocols. These protocols provide an extremely valuable supplement to the basic systems that are used to implement e-business.

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The ability to transmit information back from the field into several applications simultaneously will leverage Web services capabilities. Rather than query, Web services provide essential connectivity to a server from the field. Queries are very complex because of security issues. Queries are also complex because no one knows whether data is available, current, or allowed to be communicated to the requester.

There is a conundrum that occurs as data exchange is automated between computers. What data is permissible to transmit? At some point, humans stop making the decision and thereby lose control.

Publishing information to a UDDI directory or repository is not too effective because it may not be formatted correctly, it may not be current information, and it may simply be the wrong information. Getting information from a system is not yet reliable using Web services, except for very specific types of information, like schedules and so forth that can be managed with e-mail, a portal, or bulletin board as easily as it can with Web services.

In the financial services industry Web services are significant because they enable requesting information from a number of locations and support waiting patiently for a response. The loan approval process is complex and involves going to many locations for information. Web services support that.

In manufacturing, supply chain economics are improved by Web services. The horizontal applications of computerized customer servers, sales support, services support, and scheduling are all enhanced by Web services.

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Reporting back to a server via Web services holds great promise. In a homecare setting, clinicians can report information back to a range of applications using Web services. Likewise in a medical laboratory, pharmacy, or radiology imaging setting Web services are potentially very useful. Results can be published to an electronic patient record using Web services because the unique patient record number of social security number is known.

Promise Of Web Services

The great promise of Web services is that they will catalyze the creation of a business network through which complex aggregations of products and services can flow freely. Syndication represents the premier mode of utilizing Web services efficiently. Syndication has been around a long time. The Internet is extending it as a business model to adapt to new market opportunities.

Syndication As A Web Services Business Model

Syndication represents a change that is about to occur for the selling and distribution of information, services, and products. The same product or service can be sold to many different customers using syndication. Creators create, the marketers market, and the distributors distribute. Each step along the way is a negotiated process. The Web makes this syndication process global.

Enterprise information systems are more distributed. They are being redesigned to provide a single, personalized point of access to relevant business information, wherever it resides. Because systems are more distributed, Web services are finding a place in the market to provide information transport that is transparent to the type and placation of the particular information desired.

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1. Web Services Market Description

1.1 Web Services Definition

Web Services are the protocols, conventions, and network facilities that make business functions available over the Internet to authorized persons. Information can come from any Web-connected device. A Web service is a discrete business process. As a business process, Web services have inherent strengths for implementing efficiencies of computer communication.

The definition of a Web service also describes the limitations. Web services are not a substitute for application integration (EAI). Most of the information in computers is not Web enabled, nor does it fit this definition of data residing in a Web-connected device.

IBM has a strong Web services offering that complements its EAI offering. Tibco, which also has a strong EAI product line, also considers Web services a complement to EAI, not a replacement. Even B to B integration companies without a strong EAI offering, e.g. BEA, segregate simple and complex Web services, where complex Web services are transaction enabled, implement a rules engine, and begin to look like EAI integration platforms.

Web services provide a way to describe information according to a particular protocol that is useful for exchange of information over the Web. A Web service defines its functionality and attributes so that other applications can understand it, and makes this functionality available on the Web.

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A Web service can be registered in electronic yellow pages so that applications can locate a particular type of information. Once a Web Service has been located and examined, the remote application can invoke its service. When the service has been provided, the results are passed back to the requesting application.

Any component or application information can be exposed as a Web Service. Protocols are positioned so that any application can find and invoke Web Services from anywhere on the Web, even when it is hosted on another platform. Multiple Web services can be aggregated into a single application.

Web Services leverage a common set of standard protocols that allow applications to both expose internal Web Services, and access external Web Services. These protocols include the following shown in Table 1-1.

TABLE 1-1

WEB SERVICES COMMON SET OF STANDARD PROTOCOLS

- Simple Object Access Protocol (SOAP)
- Web Services Description Language (WSDL)
- Universal Description, Discovery and Integration (UDDI)
- Business Transaction Protocol (BTP)
- Electronic Business Extensible Markup Language (ebXML)

Source: WinterGreen Research Inc.

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Services inspection language is a service discovery mechanism. It addresses a subset of information formatting requirements using a distributed usage model. The specification uses an XML-based model for building an aggregation of references to existing Web service descriptions.

1.2 Web Services Architecture

Web services architecture is based upon the interactions between three primary roles: service provider, service registry, and service requestor. These roles interact using publish, find, and bind operations.

The service provider is the business that provides access to the Web service and publishes the service description in a service registry. The service requestor finds the service description in a service registry and uses the information in the description to bind to a service. The service registry provides a centralized location for storing service descriptions. A UDDI registry is a service registry. Table 1-2 illustrates Web services architecture.

TABLE 1-2

WEB SERVICES ARCHITECTURE

- Service provider
- Provider is the business that provides access to the Web service
- Provider publishes the service description in a service registry
- Service registry

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TABLE 1-2 (CONTINUED)

WEB SERVICES ARCHITECTURE

- Registry provides a centralized location for storing service descriptions
- UDDI registry is a service registry
- Service requestor
- Requestor finds the service description in a service registry
- Requestor uses the information in the description to bind to a service
- Provider, registry, requestor roles interact
- Publish operations
- Find operations
- Bind operations

Source: WinterGreen Research Inc.

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1.3 Distributed Service Discovery Methods

The centralized service registry is not the only model for Web service discovery. The simplest form of service discovery is to request a copy from the service provider. The service provider can e-mail the service description as an attachment.

This type of service discovery requires prior knowledge of the Web service, as well as the contact information for the service provider. WinterGreen Research is preparing a new study *Telephone Numbers For Data* that provides more insight into this type of information exchange.

A distributed service discovery method that provides references to service descriptions at the service provider's point-of-offering is evolving. The Web services inspection language provides this type of distributed discovery method, by specifying how to inspect a web site for available Web services. The WS-inspection specification defines the locations on a Web site where users can look for Web service descriptions.

The Web services inspection language focuses on distributed service discovery. The WS-Inspection specification complements UDDI by facilitating the discovery of services available on Web sites, but not listed yet in a UDDI registry.

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1.4 Web Services Positioning

Web Services are redefining and transforming the way every company thinks about its applications and its business. Applications are created as discrete pieces of business logic.

Functionality implements a particular task, including but not limited to cost accounting, inventory control, customer relationship management, enterprise resource planning. Table 1-3 illustrates Web Services back end functionality support.

TABLE 1-3

WEB SERVICES BACK END FUNCTIONALITY SUPPORT

- Implements a particular task
- Supports cost accounting
- Supports inventory control
- Supports customer relationship management
- Supports enterprise resource planning.

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Table 1-4 illustrates Web Services mobile worker functionality support.

TABLE 1-4

WEB SERVICES MOBILE WORKER FUNCTIONALITY SUPPORT

- Sales order transmission from field
- Product service field support reporting
- Clinician reporting of patient condition from home
- Services truck roll progress reports
- Trucker progress and destination reporting
- Automated inventory updating

Source: WinterGreen Research, Inc.

Thousands of applications are used within an enterprise. With the Internet, it is becoming useful for these applications to be able to share information. It is not enough for these applications to co-exist, it is useful for them to interact and share information. Web services are positioned to facilitate that sharing of information in very particular ways.

Web services seek to leverage the infrastructure provided by enterprise application integration to permit applications to exchange information. Web services are not enough in themselves to achieve application integration. Complex infrastructure is needed to accomplish that task.

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Web services provide a transport and integration set of protocols that support the orderly exchange of different kinds of information at the level of the browser, not the level of the application or the business process.

1.4.1 Business Imperatives

Businesses are independent entities offering products defined by a brand. Their information technology (IT) systems are surrounded by a firewall. As companies partner with other companies in their supply and distribution chains, the independence is challenged by the need to share information.

Partnering occurs after contract negotiation and painstaking integration of technology at the necessary points of interaction. Web services support that exchange of information outside the firewall, or to the edge of the firewall, protecting the integrity of the information inside databases and inside applications.

Business on the World Wide Web is based on company specific sites. These sites are using Web services to create the new sales channel of the Internet. Building the virtual world is occurring initially using the brick-and-mortar world as a model. However, e-business platforms are evolving a distinct configuration that is molded to the needs of Internet transactions and Internet exchange of information. Web services enable the further evolution of e-business exchanges.

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1.5 E-Business Platforms

Web services are positioned to permit an enterprise to realize the incremental revenue from using the Internet as a distribution channel. The Internet is a way to achieve a distributed business market presence.

The untapped power of the Internet lies in the ability to localize business in specific nodes, and make those local nodes available globally.

In the same manner that all politics is local, so also, all business is local. Web services are positioned to permit large businesses to leverage a local presence and use the Internet to create a universal field of business based on local sites.

The great promise of Web services is that they will catalyze the creation of a business network through which complex aggregations of products and services can flow freely. Syndication represents the premier mode of utilizing Web services efficiently. Syndication has been around a long time. The Internet is extending it as a business model to adapt to new market opportunities.

1.5.1 Syndication As a Business Model

Syndication represents a change that is about to occur for the selling and distribution of information, services, and products. The same product or service can be sold to many different customers using syndication. Creators create, the marketers market, and the distributors distribute. Each step along the way is a negotiated process. The Web makes this syndication process global.

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On the Web, syndication is not limited to the distribution of content. Having a large number of distributors offer the same product to a range of different types of customers is possible. Distributors can offer some customization and some local contact and support. Outsourcers can syndicate manufacturing. Distributors can syndicate systems that automate commerce.

A company can brand a shopping-cart ordering and payment system. This then becomes an outlet to many manufacturers. Another company can syndicate a logistics platform. Another can syndicate fraud detection and credit scoring. Human resource processes can be designed to be useful across a range of industries. Businesses are being created out of syndicated components. Web services are needed to make the syndication work. Web services are a way of distributing a particular business process.

1.5.2 Business Process Management Platforms

Business process management products and integration architecture focus on permitting the business analyst to access and manage information relevant to the decision making process. Business process management provides an advantage to users because of a focus on business process automation across the enterprise and across trading partners, distributors, suppliers, and customers.

Modular architecture allows customers to isolate their business processes from their applications, which gives them the flexibility to add, upgrade, or replace applications in their information technology environment without redefining all of their process interfaces.

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Business process management relates to personal control of information. Personal control of information is facilitated by business process management designs that can be implemented as a process. The process is peripheral to any existing computer. It crosses platforms and operating systems.

Business process management works to let people define the information they want out on a network, retrieve the information from a variety of places including the Internet, and operate on that information to perform useful tasks. Benefits include the following shown in Table 1-5.

TABLE 1-5

BENEFITS OF BUSINESS PROCESS MANAGEMENT PRODUCTS

- Implement automatic configuration integration architecture
- Reuse integration products
- Reuse integration processes
- Gain in the ability to respond quickly to new market initiative
- Position with e-business initiatives
- Adjust to company mergers
- Achieve a competitive advantage
- Lower cost of maintenance
- Maintain fewer interfaces

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1.5.3 Business Process Use Of Web Services

It is a difficult function to modify a business service. For example, to improve throughput in an application, business-oriented tools are needed. IT skill is needed to feed technical information about different adapters and components to the repository. This requires technically oriented tools. Web services form a part of the tools needed, but not the entire toolset.

Integration with existing tools is an issue. E-services tools need to be able to import information from other environments. Modeling tools are used for describing business process flows. Information from modeling tools needs to be imported into the e-services repository. Web services are useful in this context.

Quality of service is an issue. A change to operations could have a considerable impact on business performance. Business tools must offer some mechanism for impact analysis to model proposed changes and assess results. In this respect, Web services can provide some but not all of the information from applications that is needed to improve quality of service.

Security is a key issue. E-services tools need to have some access and version control to ensure that changes to the production system occur in a safe manner. Companies are adopting new ways of setting up IT systems while protecting huge investments in existing IT implementations. An evolution of e-services depends on gradually breaking up the transition into lower-level components. Web services support efforts to impose security in business process management. Most of the Web services offer security features.

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1.6 Customer-Centric, Agile Enterprise

Web services are positioned to implement next-generation e-business services. As the Internet takes hold, the enterprise is shifting to become more customer-centric. This means that customers can to a greater extent dictate the product and services characteristics delivered. To make this happen, the enterprise needs to be able to react to information in a more agile manner.

Enterprises are being positioned to be able to share data and business processes fluidly across the network inside the enterprise. Managers need to be able to take action in real-time. All the constituencies of the enterprise and the extended enterprise need to be interconnected on the network. E-mail is not enough. Data from applications needs to be available in real time.

Enterprise information systems are more distributed. They are being redesigned to provide a single, personalized point of access to relevant business information, wherever it resides. Because systems are more distributed, Web services are finding a place in the market to provide information transport that is transparent to the type and placation of the particular information desired.

Web services are being used to get data from more applications faster, across multiple technologies. One key to achieving the vision of a customer-centric, agile enterprise is through the use of Web services. Web services are positioned to speed development, expand application functionality, and dynamically link applications. Web services are positioned to uniquely tailor application system information reports to individual user requirements. Web Services enable applications to locate and electronically engage business information exchange.

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Web services are one key in a complex communications infrastructure that is being designed to permit offering any service, from anywhere in the world. Application interoperability is supported at the least complex, simple level.

Microsoft desktop clients can access some Java-based applications. Companies are able to register their Web services, opening global channels and fee-based computing opportunities. Web services allow companies to share applications and business logic, syndicating services from multiple sources without having to develop the applications themselves or hard wire connections to trading partners which host these applications.

1.7 Managing Transactions in a Distributed Environment

Trends in transactional requirements for distributed object applications relate to mission critical exchange of information from different applications. Approaches for managing transactions in a distributed environment include the need to have sophisticated application integration functionality available to the system.

Distributed transaction products permit IT organizations to protect their investments in existing applications while moving to distributed object computing. Companies need to leverage the new opportunities presented by the Internet.

Application servers deliver broad-reaching distributed application functionality quickly and cost-effectively. IT departments are turning to distributed object computing as the adaptive software architecture on which to build applications that meet challenging business requirements.

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The explosion of the Internet has fueled a shift to distributed objects and use of Java. Internet business opportunities require a new breed of IT application server solutions that are suited to this new, rapidly expanding forum. A rapidly growing number of organizations are deploying Internet-based services that require an initial, modest IT investment, yet enable the organization to recover that investment nearly overnight with the low-overhead, high-volume sales that they can generate.

The prolific development of these Internet-based applications reinforces the need for a standards-based distributed architecture, which enables functionality and data to be shared across applications and over multiple platforms.

As a growing number of sophisticated services are provided over the Internet, the need arises to coordinate application objects into transactions. Web-based applications typically require flexible access to multiple data sources.

Inventory, customer, or shipping data needs to be available across applications while maintaining data integrity across these data sources to ensure a consistent state. Such applications create the need for a software solution that coordinates their activities, ensuring consistency, isolation, and durability. Web-based applications require a transaction service that enables the following described in Table 1-6 following.

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TABLE 1-6

WEB-BASED TRANSACTION SERVICE REQUIREMENTS

- Coordination of multiple components into a single transaction
- Multiple components to access a single data source or multiple data sources
- Data integrity across multiple data sources
- Security of business over the Internet or corporate intranets
- Load balancing
- Scalability
- Reliability

Source: WinterGreen Research Inc.

1.8 Exchanging Information

Exchanging information between applications is a process that is becoming more loosely coupled. Web services are positioned to create a resilient application information exchange model. Instead of using custom adapters and bridges to exchange data in proprietary formats, XML documents are exchanged. To the extent XML is used it enables organizations more flexibility by exposing services as stateless Web Services.

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Standards such as the J2EE connector architecture (J2EE CA) are transforming integration. Web services seek to define exchange protocols. Electronic interoperability between diverse companies around the world means information needs to be exchanged in a shared and predictable process. ebXML transport standards and OAGIS content standards provide the predictability needed to achieve some interoperability.

ebXML messaging specification utilizing Web services to complement mission critical infrastructure capabilities as those technologies continue to mature.

1.9 Application Building

Application building is moving from a monolithic development style to a more service-oriented "pay as you use" approach. This model is forcing application builders to consider service descriptions to be something much more than just application object interfaces.

Services must expose technical and business capabilities, and they must define the Quality of Services and Service Level Agreements (SLAs).

The J2EE architecture defines a standard for building applications as components. Web Services naturally extends this model to allow multi-party interactions containing J2EE components with participating heterogeneous technologies to occur seamlessly. Future J2EE products eventually will support, and possibly standardize, how Web Services will work that are part of complex business processes participating in multiple business transactions.

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1.10 Software And Platform Interoperability

Proprietary, platform-dependent solutions hinder the interoperability on which distributed computing is based. IT professionals are looking to develop open solutions using industry-standard languages and protocols.

Using industry-approved standards -- such as Java, the common object request broker architecture (CORBA), and the Internet Inter-ORB Protocol (IIOP)--makes applications easier to administer, deploy, and maintain; and results in cross-platform solutions.

1.10.1 Role Of Distributed Transaction Processing

To share data and functionality and ensure data integrity across multiple sources, organizations employing the distributed object-computing model must coordinate the activities of multiple objects into transactions. To do so, they need a transaction-processing solution that reliably delivers business-critical functions, while ensuring transactional integrity and consistency.

IBM Websphere and BEA WebLogic are leading distributed transaction software systems. Web services systems complement these software systems to permit creating a Web-based storefront. A transaction is a unit of work composed of a set of operations. An example is transferring money from one bank to another. The transfer is two separate actions--a debit from one account and a credit to another--that comprise a single transaction.

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A transaction is an atomic unit of work. It either succeeds as a whole or fails as a whole. Performing a transaction means operations either both succeed or both fail. Balance is maintained while transfers and changes are made between accounts.

Transactions do not necessarily involve the transfer of funds. Ordering and transferring inventory from suppliers, updating available quantities of supplies accurately, charging customers appropriately for purchases, and fulfilling customer orders are considered transactions. All of these events require mission critical support.

Web services perform only the most superficial part of the distributed transaction function. The elaborate application server technology is needed to achieve the synchronous process management. The EAI application integration technology is needed to support the asynchronous transaction distributed business process management.

1.10.2 Transaction-Processing Solution

Rapid delivery of business-critical information over the Internet and corporate intranets requires a solution that integrates the functionality of multiple objects, provides these objects with access to multiple data sources, and ensures data integrity, scalability, and security across every business transaction. To establish and maintain a competitive IT edge, organizations of today must implement these types of solutions.

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Global transaction coordination is a necessity in environments with multiple data sources. Database servers (such as Oracle or Sybase), TP Monitors (such as CICS, Tuxedo, IMS), and messaging systems (like MQSeries) are transaction oriented. Whenever an application uses more than one data source in a transaction, global transaction management is needed to coordinate how the transaction accesses those data sources.

1.10.3 Corba Industry Standard For Distributed Objects

Corba has emerged as the de facto standard architecture for distributed object computing. Developed by the Object Management Group (OMG), this distributed object infrastructure enables organizations to build and deploy robust distributed object applications across the Internet and enterprise intranets.

Corba has been adopted by Oracle, Netscape, Novell, Sybase, Informix and Silicon Graphics have integrating CORBA-compliant object request brokers (ORBs) into their products and architectures.

1.10.4 Corba Transaction Service

The CORBA transaction service as defined by the OMG enables mission-critical use of distributed applications by providing transactional integrity. It defines interfaces that allow multiple distributed objects to participate in coordinated transactions. It enables a distributed application to handle the various impediments to transaction completion over the Internet and intranets.

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1.10.5 Difficulties of Corba

Corba has been difficult and expensive to implement. Only very large suppliers in very large industries have been able to enforce Corba adoption. Corba requires that the same technology exist at both ends of the pipe. Web services promise to permit a similar function, but to be easier to implement.

Application integration either of the CORBA, Java, or COM integration models works only if all potential peers can be expected to support that technology in both implementation model and wire protocol. In reality, this was always a very optimistic, marketing-driven wish at best.

Corba had some of the same difficulties that EDI encountered in the market. The adoption of EDI found its natural barriers in IT budgets. The most widely used EDI standards are too complicated and costly to implement and maintain on a large scale and, at the same time, too static because they do not allow businesses to adjust to rapidly changing needs without violating the narrowly defined standards.

Through simplicity and openness, XML enables broader adoption of electronic data exchange by making it less expensive. XML also allows tighter integration of systems across all platforms. It is simple enough to be directly implemented on any platform and any device, and it is agnostic to all the established rivaling camps.

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1.10.6 Distributed Object Computing Model

Web services promise to support application development. IT organizations are turning to the distributed object computing model to re-use business processing functionality. Web services provide an aspect of reuse by providing protocols for information exchange that create interoperability between objects.

By re-using software components, developers can assemble new applications rather than build them from the ground up. The explosion of the Internet has also fueled this shift to distributed object computing, which provides a software architecture that supports robust Web-based applications.

The opportunities presented by Web-based computing bring with them concerns for interoperability, security, scalability, data integrity and access to multiple data sources. Web services support only a portion of the object-oriented business applications requirements. Sophisticated transaction management capabilities have complex EAI infrastructure needs that have to be managed to ensure transactional integrity.

Integrated product architecture provides a flexible framework for developing and deploying transactional applications in an open, distributed environment. Web services are used in conjunction with these tools.

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1.11 Internet

The recent explosion of the Internet and the increasing usage of Intranets have led to the emergence of another class of enterprise applications, adding yet another dimension of complexity to the enterprise. For consumers, the Internet has brought an explosion of new functionality into the home. Communication, purchasing, and education are all impacted.

The Internet supports e-business. The Internet permits customers to enter orders, check status, and transfer funds. Internet tools and techniques relate to transactions in EAI computing environments. Forms-based user interfaces are being replaced by more user-friendly formats. Transient failures and load fluctuations that were characteristic of the Internet are being alleviated as new equipment provides improvements.

The Internet exacerbates both the diversity and numbers of issues for IT departments. Connecting vendor, partner, and customer computers to the enterprise via the Internet increase the number of platform and application types an IT department must accommodate. The prospect of distributing, supporting, and upgrading software for an installed base of hundreds of thousands or millions of computers is a logistical nightmare. Microsoft has achieved an advantage in the market by solving issues relating to client based software implementations.

As businesses strive to increase the reach and range of their services, the ability to integrate Internet and World Wide Web technologies with EAI is evolving.

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Application development platforms support rapid integration of Internet technologies. Web sites simplify the business ability to reach customers and take orders efficiently. Web site design is an essential component of a range of Internet server systems.

1.11.1 Internet Protocol (IP) Mission Critical Functionality

Mission critical functionality is central to making Web services work. The ability to deliver a transaction packet reliably is central to making business work. The transaction must go once and only once. It must be protected. Delivery must be guaranteed.

Computing systems must work reliably. Systems need to run without crashing. It is not sufficient to reboot a system when it goes down. The system must have automatic restart. Communications systems work with 99.999% up time.

Web services are only a small part of this mission critical functionality. They provide a piece of the infrastructure relating to interface and protocol logic. The reliability of the infrastructure has many different aspects.

IP networks provide the foundation for e-business. E-business is conducted over IP, through Intranets, and extranets. VPNs provide secure tunnels offering encryption and firewalls at an attractive price.

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As business applications are deployed over IP, businesses depend on the network. Communication of transactions between partners and customers depends on secure Internet connectivity. Websphere, MQSeries, and WebLogic are examples of network communication middleware infrastructure products that offer mission critical functionality.

1.11.2 Web Services Process Management Toolkit

The Web services process management toolkit allows users to compose Web services, add control logic, and include them into a business process to achieve a business goal. One tool uses the IBM MQSeries® Workflow tool as a process modeler and generates the flow definition language representation of this process. It also allows users to adapt, change, or clone business processes not by writing new code, but simply by changing the process model using a graphical diagram editor.

1.12 E-Services

E-services represent a challenge to IT department, depending as they do on middleware and infrastructure for networks. Challenges presented by e-commerce and e-business represent at the core, demand for Web services in the generic sense.

The use of the Internet to conduct business is central to changes occurring in supply chain management, customer service management, and back end systems. Business processes are being reinvented as economies of scale dramatically improve productivity and reduce costs of doing business.

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Supply chain enhancements include the ability to reduce the cost of processing a purchase order from $125 to $.25. This represents a dramatic improvement in the cost of doing business. Supply chain economies of scale can improve overall profit margins by 18% to 20%. These economies of scale occur because doing business over the Internet is more efficient than paper based systems.

Portals and dynamic brokering represent an opportunity for vendors to provide middleware that supports broadband capabilities. Middleware in both the application server distributed transaction synchronous functionality and EAI asynchronous application integration support form the basis of e-services offerings. E-services depend on partnering and communication. The Internet provides a base for the next generation of business processes.

1.12.1 E-Services Partnering

Time to market is an essential aspect of e-services strategy. Companies can no longer afford two years to build a product and take it to market. Partnering becomes the means to achieve a cohesive, comprehensive product line offering. Best of breed components are interconnected to achieve a state of the art product.

E business services promise to drive markets by implementing anew channel and by facilitating business exchanges that automate interactions between companies. Initially the most significant use of broadband will be for e-services business to business transactions and partnering communication. The economies of scale brought by the Internet promise to remake the supply chain.

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IBM is a market leader in e-business and e-commerce. It has demonstrated initiative and provides momentum to the market. The complete IBM product line has been redesigned to support Internet transaction services support. The IBM operating systems are being able to support Linux. The Lotus Domino Internet servers, WebSphere distributed transaction processing, the WebSphere MQ Series mission critical transaction messaging system, and mainframe Internet server positioning represent some of the IBM e-business initiatives.

IBM global outsourcing dominates the e-services markets. The top five consulting companies also dominate integration systems markets. Hewlett-Packard has developed an e-services initiative that emphasizes the significance of partnering. The HP initiative consists of the articulation of a vision and listening to customers to see how they hear and interpret the communication of that Internet vision.

The theme of e-services partnering initiatives is to encourage the participants to take a risk, to try to implement a strategy, and to know that to do nothing is worse than to try something. The vision is one of a revolution in business practices.

The economies of scale achievable through use of the Internet are driving the e-services vision. The cost of capital is the issue. The cost of attracting customers to a portal is $200 per customer. To get 10 million customers cost $1 billion. There are not very many successful portals. Amazon is the dominant e-retailer. Every bricks and mortar company is setting up an e-business portal. Portals represent the way to distribute goods and services in the new economy.

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Portals provide entry to hundreds of catalogs, or books, CDs, and videos. Portals are used to sell cars. A portal collects a variety of brands in a particular category and provides product assessment and best pricing for every brand. Any particular item can be located via the portal.

Brands represent a significant aspect of e-services because they carry quality and performance recognition in the mind of the purchaser. Market participants are promising capital in return for benefit from the increased business to come from Internet initiatives. Companies provide technology in return for shared value of the future, receiving some percent of transactions. The economic model depends on the relationships and partners. Market participants have developed a collaborative model. It is a change model, representing a totally new culture based on the Internet.

The key element to be considered in e-services is the business model. Leadership in supply chain efficiencies permits companies to achieve a 15% to 18% bottom line advantage. Use of portals and dynamic brokering represents new ways to attract customers to a site. Market participants are positioning to help companies achieve best practices by articulating a vision of using technology to implement a strategy of changed business rules.

Table 1-7 illustrates e-services partnering strategy. Table 1-8 illustrates e-services systems strategy.

Companies positioning to offer value added services equipment to carriers seek to position equipment that permits the development of business services at a logical level. Clients are supported in efforts to share information and enhance key business processes on the web.

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TABLE 1-7

E-SERVICES PARTNERING STRATEGY

- Reinventing business to embrace change
- Concentrating on core business
- Redefining core business to narrow, Internet ready services and products
- Dynamic interaction with customers through the Internet via brokers that collect information from a group of partners
- Process software for systems integration between partners
- Network enablement of transaction processing

Source: WinterGreen Research, Inc.

TABLE 1-8

E-SERVICES SYSTEMS STRATEGY

- Leverage traditional strength of providing systems security
- Articulate vision to take customers into e-services
- Offer bullet proof solutions
- Be aggressive
- Take business and IT strategies to the next level

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TABLE 1-8 (CONTINUED)

E-SERVICES SYSTEMS STRATEGY

- Tap into new revenue streams
- Reach customers by promising solutions differentiation
- Work to hold onto customer loyalty
- Shift the competitive landscape

Source: WinterGreen Research, Inc.

Table 1-9 illustrates assessment of e-services communications equipment positioning.

TABLE 1-9

ASSESSMENT OF E-SERVICES COMMUNICATIONS EQUIPMENT POSITIONING

- Key market assessments mode
- Capacity is essential market aspect
- Internet has billions of customers
- Internet has trillions of transaction dollars
- Open software infrastructure evolving
- Full wireline and wireless communication converging

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TABLE 1-9 (CONTINUED)

ASSESSMENT OF E-SERVICES COMMUNICATIONS EQUIPMENT POSITIONING

- Integration of technology into systems
- Integration of Internet appliances into systems

Source: WinterGreen Research, Inc.

E-services promise to deliver economies of scale for businesses that surpass anything possible in history, creating a revolution in business process. Table 1-10 illustrates e-services. Table 1-11 illustrates e-services marketing directions. Table 1-12 illustrates e-services market positioning.

Dynamic brokering relates to putting customized information of the Web site as the customer visits it, name, preference for a type of book, type of car, first class service, and so forth, whatever is relevant.

TABLE 1-10

E-SERVICES

- Integrated voice over Internet protocol
- Brokering portals
- Dynamic brokering
- Advertising
- Transactions

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TABLE 1-10 (CONTINUED)

E-SERVICES

- Gives business to business exchanges a retail sales model

Source: WinterGreen Research, Inc.

TABLE 1-11

E-SERVICES MARKETING DIRECTIONS

- Services positioning for e-commerce/e-business
- Partnerships to implement range of applications
- Provide applications on tap / SAP, Peoplesoft for small businesses
- Develop e-services portals
- Promote dynamic brokering
- Implement Internet server applications, unified messaging is the model

Source: WinterGreen Research, Inc.

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TABLE 1-12

E-SERVICES MARKET POSITIONING

- Understand the vision
- Offer range of applications and services
- Hide complexity of network
- Provide outsourcing services

Source: WinterGreen Research, Inc.

Internet services are expected to create demand for modular hardware and software. Table 1-13 illustrates e-services modular strategy. Modular systems need to be built with components. Table 1-14 illustrates e-services component strategy.

TABLE 1-13

E-SERVICES MODULAR STRATEGY

- E-services are combination of modules
- Use modules as building blocks
- Use modules to create broader services offerings
- Use modules to create distinctly different services

Source: WinterGreen Research, Inc.

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TABLE 1-14

E-SERVICES COMPONENT STRATEGY

- Define Internet components and pieces
- Develop ways to implement seamless integration of components
- Utilize services components over and over again
- Take component strategy from Corba
- Take object technology and apply it to services business
- Utilize Java applets to create cross platform capabilities

Source: WinterGreen Research, Inc.

E-services represent the essence of broadband market growth opportunity. Table 1-15 illustrates e-services challenge. Core businesses are being redefined and extended vertically and horizontally as the Internet presents new opportunity to leverage expertise in a product or service. Products are being given free or at reduced rates for the opportunity to reach large numbers of people and leverage a presence on an Internet portal.

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TABLE 1-15

E-SERVICES CHALLENGE

- Present e-commerce and e-business components to create e-services
- Use the Internet to conduct business
- Renew effort to define core business
- Extend core business to Internet e-services offerings
- Create transaction management network capability
- Create basis for intelligent network at nodes, for end points, and in transport layers

Source: WinterGreen Research, Inc.

Internet market driving forces are illustrated in Table 1-16.

TABLE 1-16

INTERNET MARKET DRIVING FORCES

- Advent of network computing
- Advent of broadband communications
- Convergence of voice communications and data processing functions

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TABLE 1-16 (CONTINUED)

INTERNET MARKET DRIVING FORCES

- Convergence of data and voice networks
- Implementation of e-commerce for business to business transactions
- Increase in use of electronic commerce by consumers
- Implementation of application integration
- Increase in variety of Internet customer service functions
- Achievement of competitive advantage by linking telephone and computing resources
- Need for improved customer service
- Increased demand for on line services
- Increased availability of a wide variety of on line services
- Use of Internet to achieve software downloads
- Need to bridge limitations imposed by geographical distance and different time zones
- Advent of data center interconnection over the networks via enterprise application integration

Source: WinterGreen Research, Inc.

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1.12.2 Key Functions Of The Online Store

Key functions performed by the online store are illustrated in Table 1-17 following.

TABLE 1-17

KEY FUNCTIONS OF THE ONLINE STORE

- Interacting with remote shoppers using a browser-based UI
- Supporting a Java applet that the customer runs within his Web browser
- Maintaining a product catalog with up-to-date listings
- Providing an order object which initiates the transaction
- Tracking inventory as it enters the warehouse, leaves the warehouse, and is shipped to customers
- Tracking orders as they are received from remote shoppers
- Generating invoices and tracking customer payments online
- Providing secure payment systems for online use
- Providing back-end servers that provide access to shared data (inventory, accounts)
- Providing shared functional objects, (inventory and charge transactional objects)

Source: WinterGreen Research Inc.

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The customer uses the graphical forms of the Java applet to select items to purchase, and then executes the order, likely by pushing a “Place Order” button. The order object is contacted.

The order contacts the IT transaction service, and begins a transaction. The transaction is begun on the intranet, rather than the Internet, to avoid the decreased performance caused by network latency. From this point until the order object requests to commit the transaction, the IT transaction service coordinates the update to the data sources as part of the transaction.

The order contacts the inventory system to determine if the office supply store has enough inventory to fulfill the customer request. The inventory uses the IT session manager to establish a connection to the appropriate data source.

The order contacts the charge to determine if the customer has enough credit in his account to make purchase. If so, it debits his account the appropriate amount.

Distributed transaction systems are implemented with a set of productivity and management tools. Components comprise next generation architecture needed to build enterprise-distributed applications.

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2. Web Services Market Forecasts

2.1 Web Services Supplement Basic E-Business Systems

The complexity of proprietary systems comes from the difficulties of interconnecting systems not originally designed to support communication. Web services are protocols designed to achieve interconnection of proprietary systems. The trouble is the protocols developed by Web services designers do not do the whole job of achieving connectivity.

Web services are in fact an adjunct to application servers, enterprise portals, and enterprise application integration (EAI). Web services are a group of protocols. These protocols provide an extremely valuable supplement to the basic systems that are used to implement e-business.

2.2 Web Services Market Definition

Different languages, modeling tools, database management systems, platforms, operating systems, and applications prevent effective interaction of systems within companies and among partners.

Systems have architectures and platforms designed to do a specific job or mange a particular business process efficiently. Communication is an adjunct to the primary system. Table 2-1 illustrates deterrents to effective interaction of systems.

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TABLE 2-1

DETERRENTS TO EFFECTIVE INTERACTION OF SYSTEMS

- Different languages
- Different modeling tools
- Different database management systems
- Different platforms
- Different operating systems
- Different applications

Source: WinterGreen Research Inc.

Web services change the integration landscape. Companies are able to define applications that employ Web services. They are able to execute these applications over the Web. In this manner Web connectivity can be achieved, but all the application and platform constraints are still in place. Web communication is enabled more effectively.

This means that companies in a supply chain can tightly integrate their systems no matter where they are located. Web services support business-critical transactions. Individuals can create web services. But, individuals do not use Web services. Individuals use e-mail. Web services are designed to permit computers to exchange information.

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Web services can be made available on the Internet. Web services are positioned to leverage the dynamic Internet environment. Web services are positioned to provide more access to corporate information assets. Application information is liberated and re-deployed for new uses.

Web services provide the basis for reusable services if they are based on business processes that are more abstract than the application protocols of the underlying components and software. Ways to achieve reusable Web services are illustrated in Table 2-2.

TABLE 2-2

WAYS TO ACHIEVE REUSABLE WEB SERVICES

- Define a Web service using canonical XML documents
- Define a Web service as a business process in a custom process flow.
- Use process flow to shields clients from the details
- Use process flow to access information in the underlying applications being accessed
- Design a Web service using a standard business protocol
- Use RosettaNet

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TABLE 2-2 (CONTINUED)

WAYS TO ACHIEVE REUSABLE WEB SERVICES

- Make business protocol shield clients from the underlying details of the format for information in the applications being accessed.
- Design a Web service that re-factor the interfaces
- Access underlying components
- Aggregate multiple components to create a Web service

Source: WinterGreen Research, Inc.

2.3 Web Services Platform

Extensible mark-up language (XML) has emerged as the common basic unifying data format between systems and across platforms, particularly the Internet. XML has already reached critical mass. It is easy to understand and use, has virtually unlimited applications, and has been widely accepted throughout the software industry.

XML does carry a lot of overhead.

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XML has become the common data-exchange standard for business-to-business (B2B) e-commerce. By providing a means for moving XML-based content around, SOAP (Simple Object Access Protocol) is positioned to bring a major shift in how applications are built and how data is exchanged across the Internet and in corporate networks.

Time-to-market and first-mover advantages are critical for new business opportunities based on XML and SOAP. SOAP can be integrated immediately in a distributed computing environment. This is achieved through the SOAP application-programming interface (API).

2.3.1 SOAP Role In Distributed Computing Environments

Full platform and language independence for SOAP is guaranteed by the adoption of well-established platform-independent Internet standards (XML and HTTP). The result is that it is possible to use SOAP to execute remote procedure calls (RPCs) between any combination of otherwise incompatible platforms.

Distributed computing technology is heterogeneous. Proprietary standards include DCOM, which can connect from one Microsoft system to another. DCOM does not work well in a widely distributed environment like the Internet. MQSeries and Tib Rendezvous messaging systems have done better because they support cross platform, cross application integration.

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2.4 Web Services Market Forecasts

Web services enhance existing Internet connectivity solutions. They are poised to represent a growing proportion of EAI market segments. Application integration (EAI) represents asynchronous connectivity of applications. This asynchronous connectivity is highly reliable for passing data across networks that may not be concisely connected.

Web services leverage all e-business technologies.

2.4.1 Summary Forecasts Web Services

Web Services promise to provide connectivity from distributed platforms and applications into existing servers and mainframes. The ability to publish information into an application from the network is an essential aspect of creating telephone numbers for data.

Web services promise to define an entirely new market that does not yet exist. These services are best understood by example. They relate to the ability to automate processes that are not now automated.

They relate to transmitting information back to a server. Field service personnel, sales people, or clinicians frequently gather information in the field that is most useful in a range of applications. The ability to transmit that information back from the field will leverage Web services capabilities.

Web services at an expected $152 million in 2002 are evolving as a portion of the total EAI, application server, and enterprise portal markets. They are expected to reach $3.1 billion by 2007. (See Figure 2-3 and Table 2-4.)

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To get to this level from a standing start would be impossible. This revenue is realized as part of existing product line revenues. The existing products benefit from being Web services enabled. The Web services capabilities drive sales of existing integration and server products, creating a significant market opportunity. Companies that do not offer Web services capabilities in conjunction with other software will be hampered in the overall integration, application server, and portal markets.

FIGURE 2-3
Web Services Portion of Total Application Server, Enterprise Portal, and Message Broker Market, Forecasts, 2002-2007

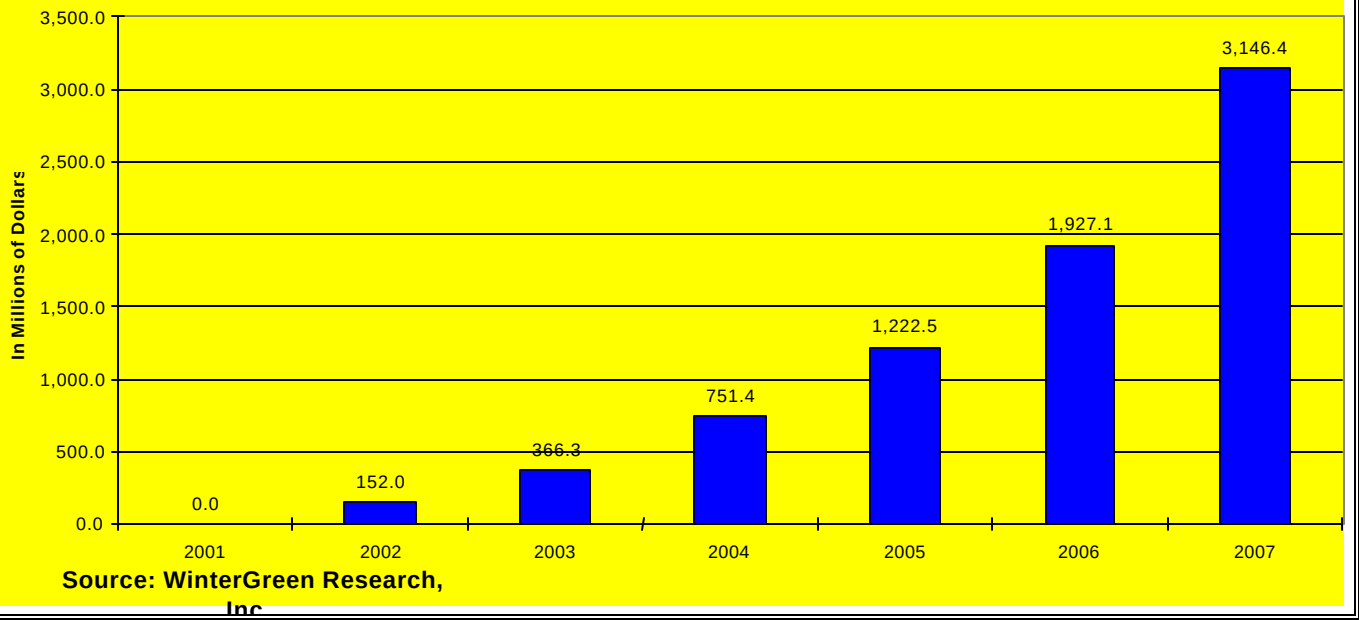

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TABLE 2-4
WEB SERVICES MARKET FORECAST PORTION OF APPLICATION INTEGRATION BROKER, APPLICATION SERVER, AND ENTERPRISE PORTAL MARKETS, 2002-2007
In Millions of Dollars

	2001	2002	2003	2004	2005	2006	2007
Web Services Portion (MM$)							
Integration Broker	0.0	57.4	162.3	377.4	614.4	900.3	1,545.7
Enterprise Portals	0.0	3.7	7.9	14.8	40.1	81.1	151.3
Application Servers	0.0	90.9	196.1	359.1	568.0	945.7	1,449.3
Total Web Services Portion Of Existing Markets	**0.0**	**152.0**	**366.3**	**751.4**	**1,222.5**	**1,927.1**	**3,146.4**
% growth	0.0	n.a.	141.0	105.1	62.7	57.6	63.3

Source: WinterGreen Research, Inc.

2.4.2 Application Server Web Services Forecasts

Web services extend the functionality of applications servers in a fundamental way. Application servers support distributed transaction functionality. Distributed transactions need to be collected from the Web sometimes. Web services facilitate that process.

It is a difficult function to modify an e-business service. To improve throughput in an application, business-oriented capabilities are needed. Skill is needed to make available technical information about different adapters and components so the information can be forwarded to a Web services repository. This requires technically oriented communication protocols. Web services form a part of the capabilities needed, but not the entire product suite.

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Web services are used in application server products to facilitate transport of information formatted for the Internet. Web-services assist with supporting importing information from other environments.

Business process flows need to be accessible to business analysts. Information from modeling needs to be imported into the e-services repository for Web services information to be available on the Internet. Web services are useful in this context of providing information across geographical and time barriers to product managers and executives. Web services at $90.9 million of the total application server markets in 2002 are expected to reach $1.4 billion by 2007. (See Figure 2-5 and Table 2-6.)

FIGURE 2-5
Web Services Portion of Application Server Market, Forecasts, 2002-2007

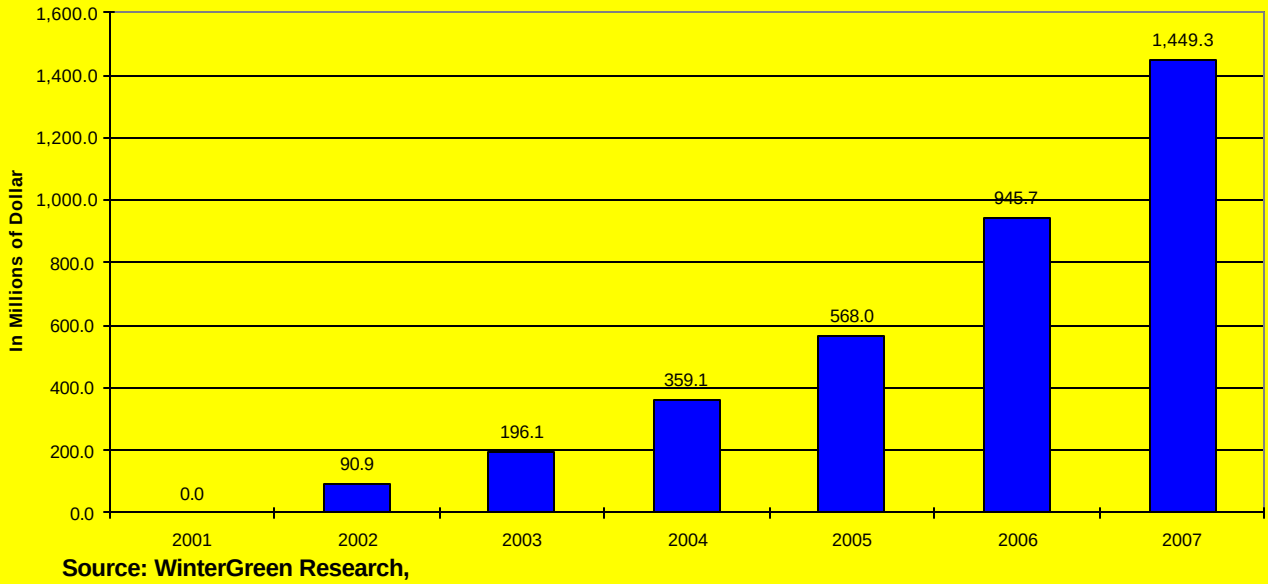

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TABLE 2-6
WEB SERVICES PORTION OF APPLICATION SERVER MARKET FORECAST, 2002-2007
In Millions of Dollars

	2001	2002	2003	2004	2005	2006	2007
Application Servers	1,409.2	1,817.9	2,363.2	3,095.8	4,086.5	5,435.0	7,283.0
% growth	28.0	29.0	30.0	31.0	32.0	33.0	34
Web Services Portion (%)	n.a.	5.0	8.3	11.6	13.9	17.4	19.9
Web Services Portion (MM$)	**0.0**	**90.9**	**196.1**	**359.1**	**568.0**	**945.7**	**1,449.3**
% growth	0.0	n.a.	115.8	83.1	58.2	66.5	53.3

Source: WinterGreen Research, Inc.

2.4.3 Application Integration Web Services Forecasts

The Internet is an expanding network. The packet switching technology depends on layers of functionality to make discontinuities in communication manageable. Complex transactions with multiple sources and destinations represent the need for solutions that demand asynchronous communications.

Web services at $57.4 million of the total application integration EAI markets in 2002 are expected to reach $1.5 billion by 2007. (See Figure 2-7 and Table 2-8.)

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FIGURE 2-7
Web Services Portion of Application Integration Message Broker Market, Forecasts, 2002-2007

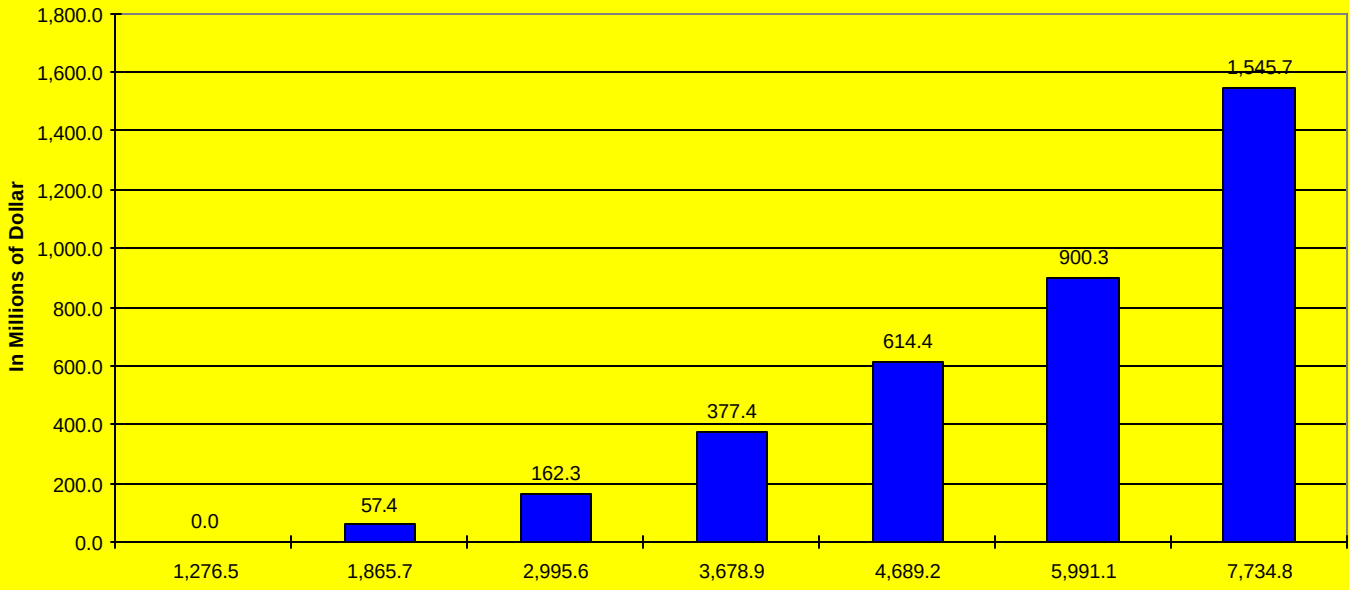

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TABLE 2-8
WEB SERVICES PORTION OF APPLICATION INTEGRATION BROKER
MARKET FORECAST, 2002-2007
In Millions of Dollars

	2001	2002	2003	2004	2005	2006	2007
Total Integration Broker	1,276.5	1,865.7	2,995.6	3,678.9	4,689.2	5,991.1	7,734.8
% growth	12.0	29.5	31.5	29.5	28.6	27.8	26.4
Web Services Portion (%)	n.a.	4.5	8.7	12.6	16.7	19.2	25.8
Web Services Portion (MM$)	**0.0**	**57.4**	**162.3**	**377.4**	**614.4**	**900.3**	**1,545.7**
% growth	0.0	n.a.	182.6	132.5	62.8	46.5	71.7

Source: WinterGreen Research, Inc.

Integration software enables enterprises and users to automatically transmit, receive, filter and personalize digital information in real-time. Systems facilitate real-time, two-way communications between applications across distributed computer networks and mobile information devices such as hand-held computers, pagers and digital cellular phones.

Integration software is in use by over 9,000 of the largest companies in diverse markets including telecommunications, manufacturing, energy, financial services, and insurance.

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2.4.4 Enterprise Portal Web Services Forecasts

Portals are at the center of e-business strategy. Portals are the de facto desktop for the Internet. Portals can be customized to give each user a different presentation, with a unique look and feel, unique content, and unique strengths.

Enterprise portals need Web services to make information transparent to the portal. Information coming in from sales people needs to be in a form useful to people that need to use the information. Web services are useful in positioning portals as a way to communicate with business partners. Web services at $3.7 million of the total enterprise portal markets in 2002 are expected to reach $151.3 million by 2007. (See Figure 2-9 and Table 2-10.)

FIGURE 2-9
Web Services Portion of Enterprise Portal Market, Forecasts, 2002-2007

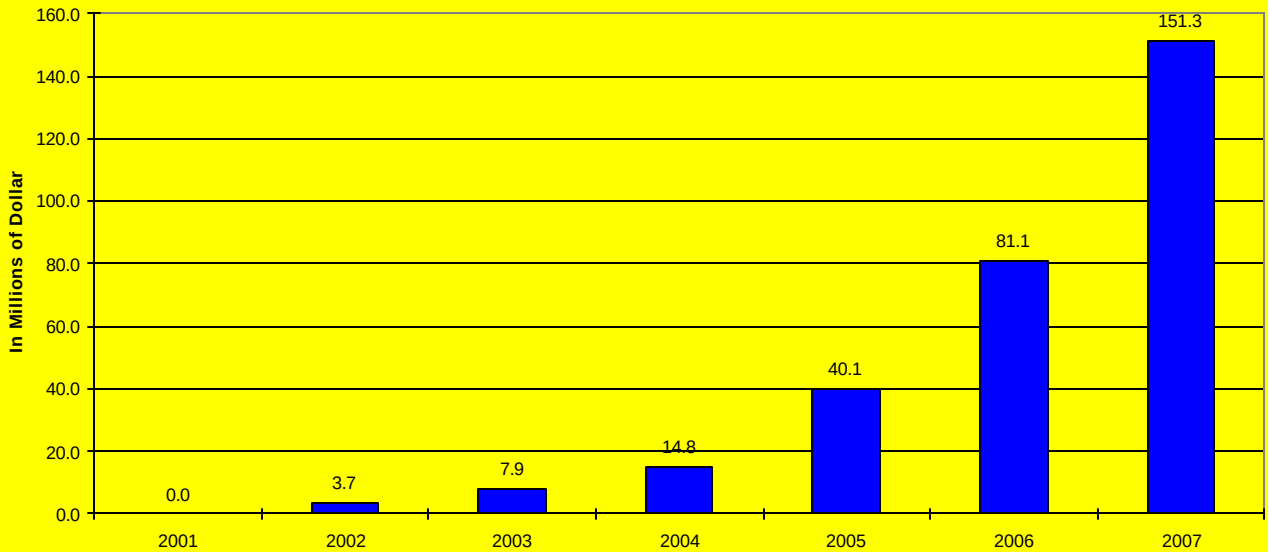

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TABLE 2-10
WEB SERVICES PORTION OF ENTERPRISE PORTAL MARKET FORECAST, 2002-2007
In Millions of Dollars

	2001	2002	2003	2004	2005	2006	2007
Enterprise Portal	**175.7**	**207.3**	**250.9**	**313.6**	**407.7**	**550.3**	**759.5**
% growth	5.0	18.0	21.0	25.0	30.0	35.0	38
Web Services Portion (%)	n.a.	2.1	3.8	5.9	12.8	19.9	27.5
Web Services Portion (MM$)	**0.0**	**3.7**	**7.9**	**14.8**	**40.1**	**81.1**	**151.3**
% growth	0.0	n.a.	113.5	87.9	171.2	102.1	86.6

Source: WinterGreen Research, Inc.

2.5 Application Server, Application Integration, and Enterprise Portal Market Forecasts

Application server, application integration, and enterprise portal markets represent products that provide different ways to manage information that is distributed throughout the enterprise and presented over the Internet.

2.5.1 Application Server Market Forecasts

The market for application server software components and services is likely to grow throughout the forecast period. Large enterprise customers will continue to need basic functions provided by application server systems that make them mission critical, failover, load balancing, and Java application development environments.

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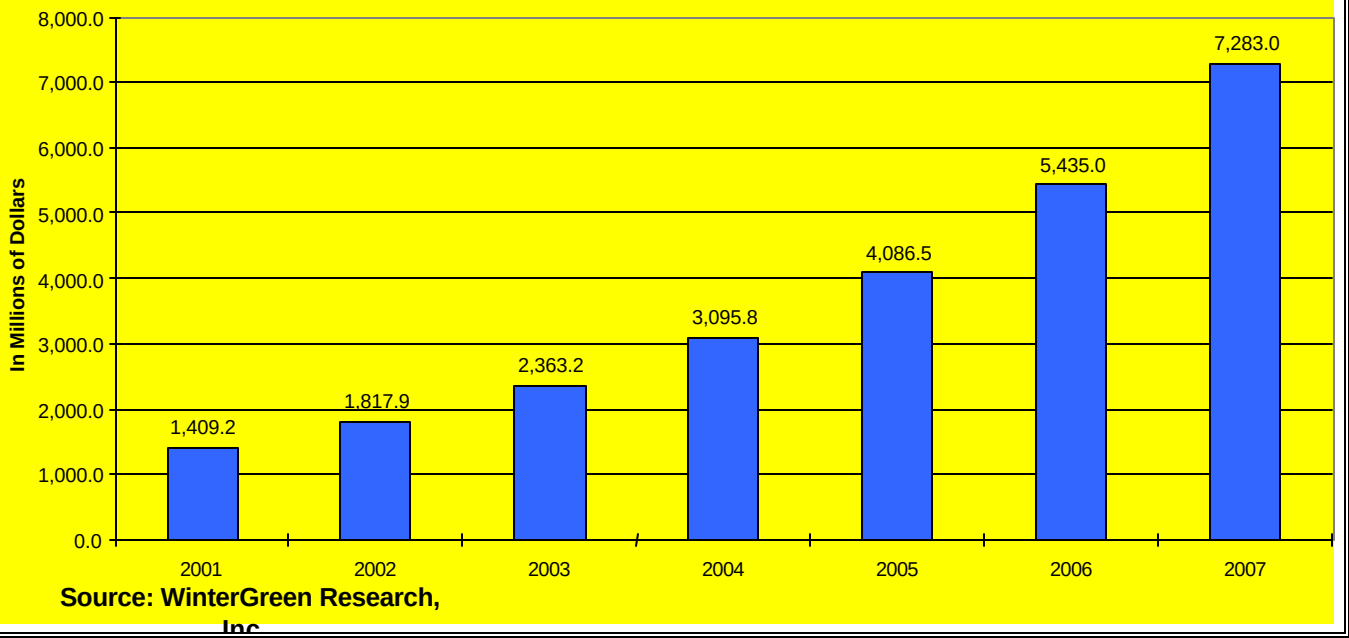
Application servers at $1.4 billion of the total application server markets in 2002 are expected to reach $7.3 billion by 2007. (See Figure 2-11.)

FIGURE 2-11
TOTAL APPLICATION SERVER MARKET FORECASTS, 2002-2007



Source: WinterGreen Research, Inc

2.5.2 Application Server Product Definition

Application servers enable businesses to build and deploy reliable, scalable e-business applications. The primary function is to manage transactions over an internal enterprise network and to support transactions over the Web. The systems are distributed transaction servers that provide failover, load balancing, clustering, and advanced mission critical systems capability.

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Application servers offer a complete platform for Web and wireless e-commerce applications. Application servers include Web servers, enterprise servers, Internet security, database access, and distributed transaction management servers. They have some tools for developing applications.

Application servers offer seamless private and public business process management. They allow companies to maximize e-business opportunities by leveraging existing resources to improve speed-to-market and anticipate IT changes as their business changes.

Application server solutions bridge data across multiple formats, markup languages, and devices. Publisher functions adapt, reformat, and filter content to make it suited for pervasive computing, giving companies better access to customers, business partners and mobile employees on a variety of devices.

The application server product line generally includes Java server pages, Enterprise Java Beans, Java Servlets, Java naming, and Java directory interface. Java mail, Java transaction service, Java transaction API, and Java database connectivity are provided. Cross-client and cross-component support is enabled for any type of application, including those based on CORBA, XML, HTML, DHTML, ActiveX, COM, C, and C++.

2.5.3 Market Growth Factors

Application servers provide software development of applications. The tool vendors typically do not have the broad versatility of tool sets per se. Complementary software supports these tools and performs basic application server and integration functions.

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Internal development groups within prospective customer organizations may develop software and hardware systems. Table 2-12 illustrates applications server market positioning.

TABLE 2-12

APPLICATIONS SERVER MARKET POSITIONING

- Name recognition
- Brand
- Large installed base of customers
- Internet growth
- Supply chain
- E-commerce portals

Source: WinterGreen Research, Inc.

Table 2-13 illustrates market-driving forces for applications servers.

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TABLE 2-13

MARKET DRIVING FORCES FOR APPLICATIONS SERVERS

- Support IT need to continue to develop e-business applications in-house
- Provide more richly integrated systems
- Support automation of stock market and financial markets
- Implement e-business exchanges
- Implement supply chain innovation to increase efficiency of internal enterprise operations
- Extend transaction management to networked computers and the Internet
- Communicate telecommunications, bank, and credit card account information in mission critical manner

Source: WinterGreen Research, Inc.

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2.5.4 Application Segments

Application servers have become core infrastructure for e-business systems and high-volume distributed transaction systems. Web-based retail sites, inventory systems, telecommunications billing applications, commercial bank ATM networks, account management systems, credit card billing systems, and securities trading account management systems are provided.

These Web-based and distributed systems must be highly available, scale to process high transaction volumes, and accommodate large numbers of users. Table 2-14 illustrates e-commerce target markets.

TABLE 2-14

E-COMMERCE TARGET MARKETS

- Internet transactions
- Telecommunications wireless systems
- Bank transactions
- Credit card account information
- Web-based retail sites
- Inventory systems
- Telecommunications billing applications
- Commercial bank ATM networks

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TABLE 2-14 (CONTINUED)

E-COMMERCE TARGET MARKETS

- Account management systems
- Credit card billing systems
- Securities trading account management systems
- Web-based and distributed systems

Source: WinterGreen Research, Inc.

2.5.5 Application Integration Market Forecasts

The market for application integration software components and services is likely to grow throughout the forecast period. Large enterprise customers will continue to need basic functions provided by application server systems that make them mission critical, failover, load balancing, and Java application development environments.

Application integration markets at $1.3 billion in 2002 are expected to reach $7.7 billion by 2007. (See Figure 2-15.)

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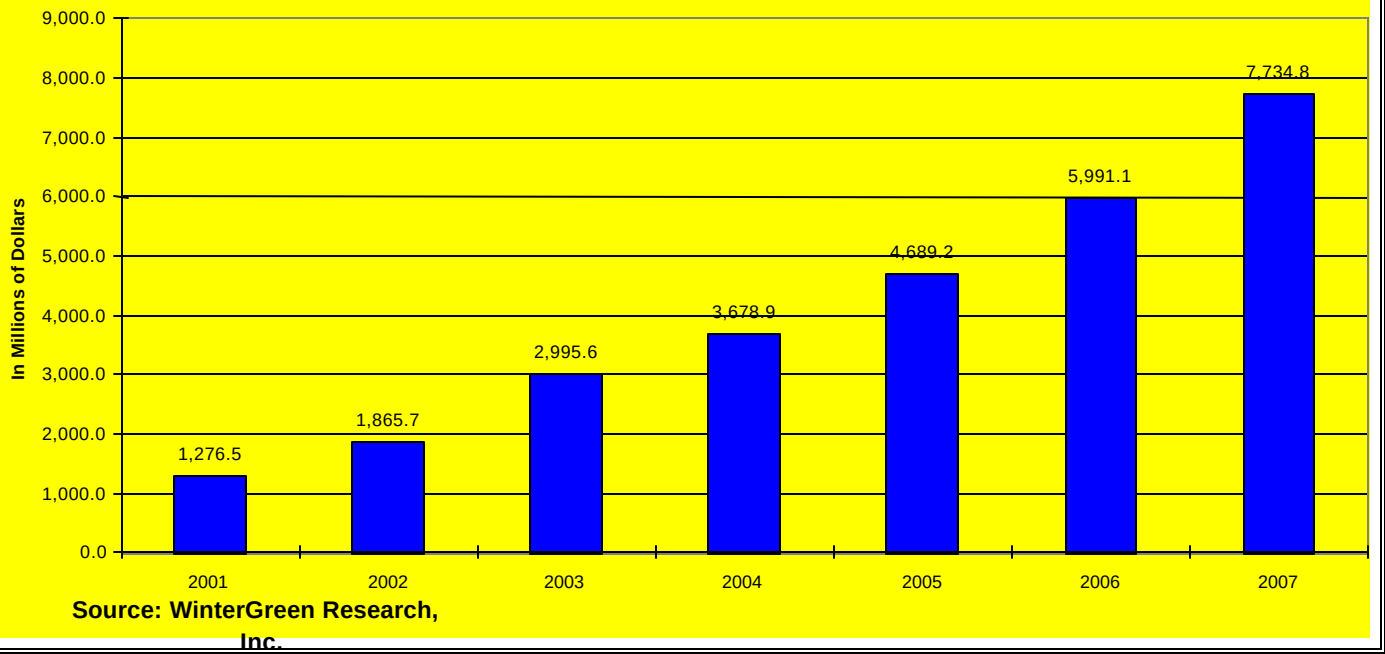
FIGURE 2-15
APPLICATION INTEGRATION BROKER, MARKET FORECAST, 2002-2007



Source: WinterGreen Research, Inc.

2.5.6 Enterprise Portal Market Forecasts

The market for enterprise portal software components and services is likely to grow throughout the forecast period. Large enterprise customers will continue to need basic functions provided by enterprise portal systems support environments.

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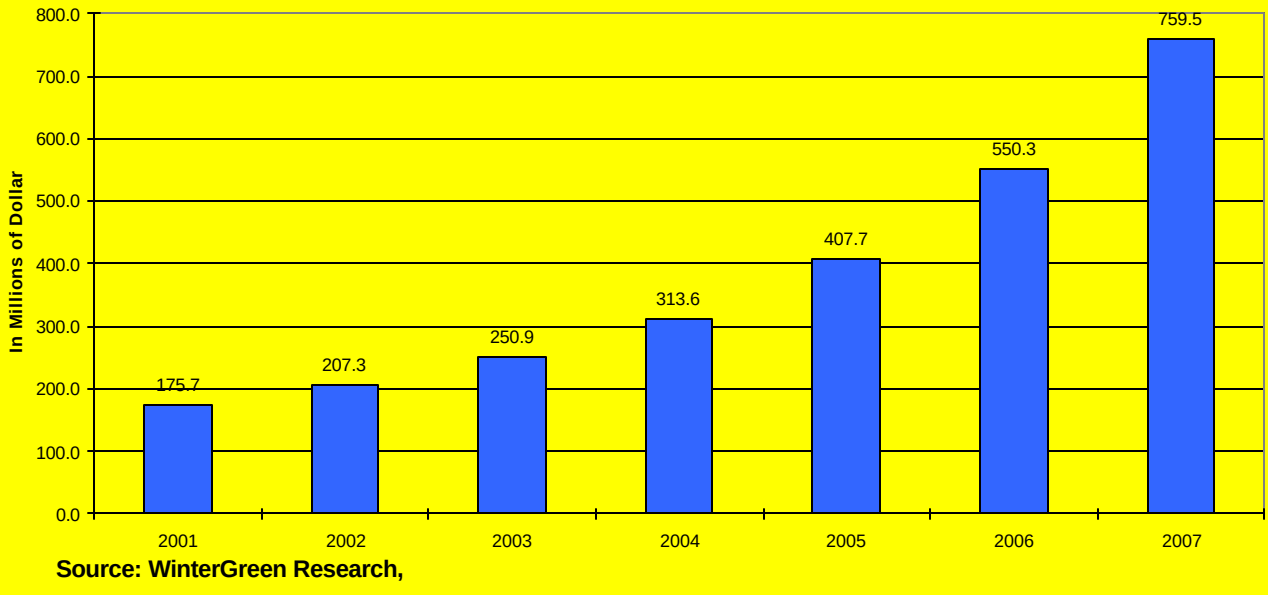
Enterprise portals at $175 million of the total application server markets in 2002 are expected to reach $759 million by 2007. (See Figure 2-16.)

FIGURE 2-16
TOTAL ENTERPRISE PORTAL MARKET FORECASTS, 2002-2007



Source: WinterGreen Research,

2.5.7 Portals at the Center of E-Business Strategy

Portals are at the center of e-business strategy. Portals are the de facto desktop for the Internet. Portals can be customized to give each user a different presentation, with a unique look and feel, unique content, and unique strengths.

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Leading market participants have evolved a brand advantage that entices users to move to different portals. The evolution has made it possible to create portal applications that are not outdated. Users associated with enterprise portals have raised the bar on what defines an adequate portal. As they navigate the Internet, users find portals that do a better job of implementing the conventions or offer additional functionality or increase satisfaction, creating demand for sophisticated information presentation.

The rapid proliferation of the Web as a globally accessible way of accessing information has changed business practices dramatically. Companies can deploy interactive business services more rapidly and cost-effectively.

Enterprise portals are meeting increasing demand for customized, up-to-date access to business information from customers, vendors, partners, and employees. By satisfying this demand an enterprise realizes the benefits of its e-business integration efforts.

Table 2-17 illustrates enterprise portal e-business strategy.

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TABLE 2-17

PORTAL E-BUSINESS STRATEGY

- De facto desktop for the Internet
- Can be customized to give each user a different presentation
- Provide unique look and feel for each user Web access
- Provide unique content for each user
- Provide unique strengths for each user
- Deploy interactive business services more rapidly and cost-effectively
- Meet increasing demand for customized, up-to-date access to business information
- Provide access to customers, vendors, partners, and employees
- Satisfy demand an enterprise realizes the benefits of its e-business integration efforts

Source: WinterGreen Research, Inc.

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2.5.8 Enterprise Portal Strategy

The corporate portal industry has innovative technology, broadest alliance network and most satisfied customers. Market participants seek to establish the portal as a platform. The platform makes aggregating the information and services available to a company from a centralized system that can be managed.

To drive this strategy, enterprise portal vendors seek to maximize the range of software applications integrated into a platform. E-business integrated services include transactional systems, application server systems, business process software, collaboration capabilities, and Web content management capabilities.

Enterprise portal vendors seek to develop distribution capabilities based on technology for syndicating content to other platforms and mobile devices. Alliances with vendors of wireless services, voice portals and other Web platforms support achieving access to content from these types of platforms.

By delivering the resources assembled by the portal to users almost anywhere, vendors enhance the value of the portal. Solutions become an enterprise-wide Web platform. Businesses can use that platform as a delivery channel for new services, from conference room scheduling to online procurement. By deploying hosted services through the portal, customers accelerate time-to-benefit, increase the likelihood of a successful deployment, and take advantage of a being able to access employees, partners, and distributors.

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Enterprise portal platforms support delivery of new services. Enterprise portals can be used to generate additional revenue from existing customers.

2.5.9 Summary Forecasts Application Server, Application Integration, and Enterprise Portal Markets

Application server, application integration, and enterprise portal markets promise to provide connectivity from distributed platforms and applications into existing servers and mainframes. The ability to publish information into an application from the network is an essential aspect of creating telephone numbers for data.

Application server, application integration, and enterprise portal markets at $2.9 billion in 2002 are expected to reach $15.8 billion by 2007. (See Figure 2-18 and Table 2-19.)

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FIGURE 2-18
Total Application Integration Message Broker, Enterprise Portal, and Application Server Web Services Market, Forecasts, 2002-2007

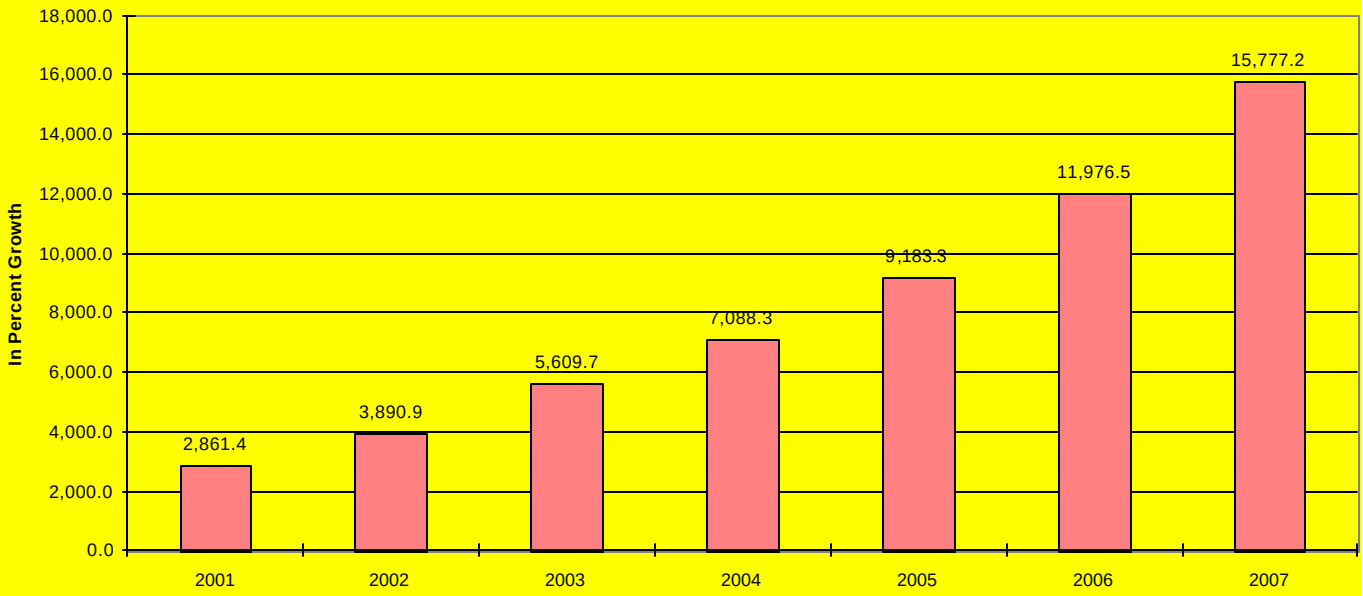

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TABLE 2-19
WEB SERVICES MARKET FORECAST AS A PORTION OF APPLICATION INTEGRATION BROKER, APPLICATION SERVER, AND ENTERPRISE PORTAL MARKETS, 2002-2007
In Millions of Dollars

	2001	2002	2003	2004	2005	2006	2007
Integration Broker (MM$)	1,276.5	1,865.7	2,995.6	3,678.9	4,689.2	5,991.1	7,734.8
Enterprise Portals (MM$)	175.7	207.3	250.9	313.6	407.7	550.3	759.5
Application Servers (MM$)	1,409.2	1,817.9	2,363.2	3,095.8	4,086.5	5,435.0	7,283.0
Total (MM$)	**2,861.4**	**3,890.9**	**5,609.7**	**7,088.3**	**9,183.3**	**11,976.5**	**15,777.2**
Total Web Services Portion Of Existing Markets	**0.0**	**152.0**	**366.3**	**751.4**	**1,222.5**	**1,927.1**	**3,146.4**
% of Existing Markets	0.0	3.9	6.5	10.6	13.3	16.1	19.9

Note: Web Services are not a separate product or separate market. Sale of other Integration, Portal, and Application Servers depends on having products that are enabled with Web Services functionality. Without Web Services, that portion of the market would not exist.

Source: WinterGreen Research, Inc.

2.6 Web Services Market Participants

IBM is the clear leader in the development of Web services. Tibco, Vitria, BEA, and Sybase are market participants with significant leadership position. All market participants in application server, EAI message broker integration, enterprise portal, and business process management need to have a stable of Web services offerings that support their core products. Web services enable other product functionality. Web services are not separate nor do they replace core product offerings.

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Other participants with a significant market presence are Microsoft, GE eXchange Systems, Cape Clear, and Sun with Java.

2.6.1 EAI Application Integration Market Shares

IBM leads application integration infrastructure markets in 2001. Tibco has defined a significant market position as well. IBM and Tibco have been a defining presence in the application integration market, creating demand for infrastructure and lending credibility to all the market participants. IBM has had particular market presence with its strong infrastructure products and advertising campaign indicating its firm dedication to the market.

Integration broker markets represent a response to the Internet. Even the application integration systems that are used on private networks are a response to Internet protocol (IP) technology. As companies seek to exchange information across departments, to integrate acquisitions, and to share information with strategic partners, infrastructure systems are being integrated.

Integration brokers represent point solutions that are very strategic. They include brokers that perform specific functions. Application integration (AI) infrastructure rests on a base of messaging that supplements the information provided by brokers and provides mission critical secure transmission support.

IBM was the market leader in the application integration market in 2001 with 15% market share, up from 13% market share in 2000. Tibco, the number two market participant had 12% market share in 2001. This represents strong market participation in application integration software license markets including share gains, up from10% market share in 2000.

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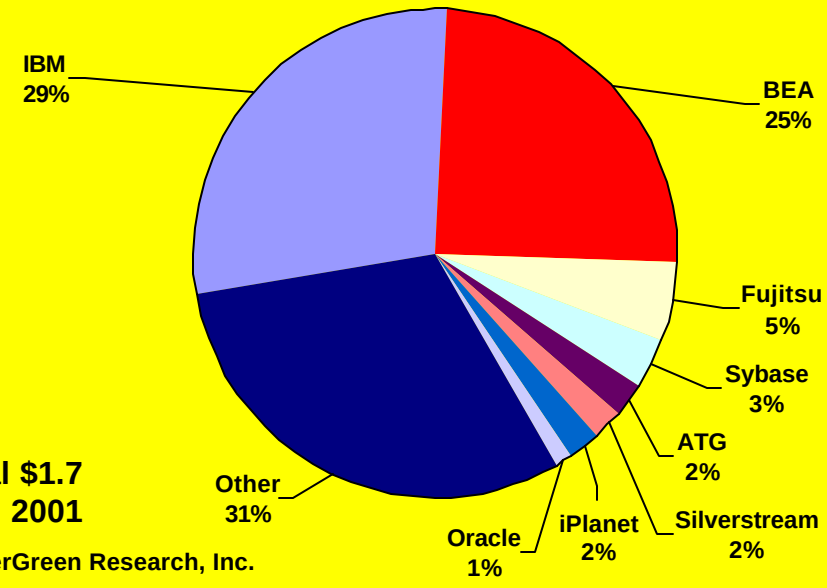
WebMethods had the number three market share in 2001. SeeBeyond was the number four market participant with 7% of the market for software licenses. Vitria, GXS, and Sybase/Neon had measurable market share participation in EAI in 2001.

2.6.2 Application Server Market Shares

IBM and BEA dominate application server markets. Until 2000, BEA had been the market share leader by a wide margin. In 2001, IBM changed its product and strategy to create more equality in the market. By the end of 2001, IBM has achieved a market leadership position as shown in Figure 2-20.

Figure 2-20
Application Server Market



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Competitors are diverse and offer a variety of solutions directed at various segments of this marketplace. These competitors include Fujitsu, iPlanet and Hewlett-Packard. Oracle and Microsoft have released products. Microsoft has said it intends to include more application server and integration functionality in its operating systems.

2.6.3 Enterprise Portal Market Participants

Plumtree, Tibco, and IBM dominate enterprise portal markets. The market leaders have very sophisticated product functionality that provides ease of customization. Competitors are diverse and offer a variety of solutions directed at various segments of this marketplace. Other competitors with measurable market share include SAP / Top Tier, Viador, Peoplesoft, and Sybase.

Million-user scalability, massively parallel processing, and open standards give enterprise portal market participants strategic market advantage.

2.6.4 BPM Market Participants

IBM, followed by Tibco, Vitria, and New Era of Networks / Sybase lead business integration markets. Tibco offers a large suite of products that adapt to changing market conditions. IBM WebSphere MQ Integrator is developed to work on open platforms and runs with a wide range of ERP and legacy systems. WebSphere MQ Integrator and similar products provide an open node architecture. This is facilitating open systems integration in every industry.

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2.6.5 IBM

IBM is the market leader with a leadership position in all market segments. IBM sells application servers and integration functionality along with its IBM proprietary hardware systems. IBM sells into its installed base and to a broad group of e-business industry participants. IBM market advantages relate to its product strength and to significant financial, technical, marketing, and other resources. IBM has great name recognition. The IBM brand is associated with mission critical functionality. Integration of the IBM WebSphere MQSeries mission critical messaging and MQSI integration server leverages the IBM WebSphere product line.

Competitors may try to project that IBM is burdened with a proprietary hardware and database system position, but with the market leading cross platform, cross application WebSphere MQ product IBM is not vulnerable to the criticism. WebSphere MQ Integrator integration product places IBM in the mainstream of open systems application servers.

IBM has the inherent market advantage of bundling application integration functionality with computer hardware and software. IBM has staked a position in the e-business market and is expected to provide strong market participation based on its integration infrastructure product suite. The business process broker has a unique architecture based on state logic that proves to be very powerful.

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2.6.6 BEA Systems

BEA Systems is a leading e-business infrastructure software company. BEA's customers use BEA's products as a deployment platform for Internet-based applications and as a means for robust enterprise application integration. Mainframe, client/server, and Internet-based applications are supported. BEA also provides Enterprise Java Bean (EJB)-based components that perform functions such as personalization, shopping cart, order tracking, inventory and pricing that are used in developing custom applications.

BEA's products have been adopted in a wide variety of industries, including commercial and investment banking, securities trading, telecommunications, airlines, retail, manufacturing, package delivery, insurance and government. Applications deployed on the BEA WebLogic E-Business Platform include e-commerce, enterprise resource planning (ERP), billing and supply chain management. The company employs over 3,000 people and is headquartered in San Jose, California.

BEA strength in the application server market has been its ability to run benchmarks for hardware servers and its open systems positioning. BEA has announced integration functionality to position to compete directly with IBM that has a market leading position in integration markets.

BEA positions to differentiate its application server products based on functionality, interoperability with non-IBM systems, performance and reliability. BEA has been successful in establishing its products as effective solutions to customer e-business and Internet positioning.

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BEA's products have been adopted in a wide variety of industries, including commercial and investment banking, securities trading, telecommunications, airlines, services, retail, manufacturing, package delivery, insurance and government. The BEA WebLogic E-Business Platform(TM) provides infrastructure for building an integrated e-business, allowing customers to integrate private client/server networks, the Internet, intranets, extranets, and mainframe and legacy systems as system components.

BEA's products serve as a platform or integration tool for applications of billing, provisioning, customer service, electronic funds transfers, ATM networks, securities trading, Web-based banking, Internet sales, supply chain management, scheduling and logistics, and hotel, airline, and rental car reservations. Licenses for BEA products are typically priced on a per-central processing unit basis. BEA offers licenses priced on a per-user basis.

2.6.7 Tibco

Tibco rests on a multicasting base that sends information out to multiple nodes simultaneously. The Tibco system is network architecture. Products provide a full complement of publishes subscribe and mission critical functionality.

Tibco Software has positioned Web services capabilities to enhance its business-to-business (B2B) integration software products. Tibco technology implements real-time e-business infrastructure software.

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Tibco Software ActiveExchange™ integration software extends the reach to any size organization needing to conduct business over the Internet. E-marketplaces can efficiently connect to all of their trading partners, including vendors and customers by automating their cross-company business processes.

Processes automated include purchase order management, collaborative forecasting, exchanging business documents, and integrating with internal systems over the corporate network or Internet.

Tibco ActiveExchange complements B2B initiatives. Tibco supports Ariba Integration Packs and the UDDI Internet standard. An Internet B2B yellow pages is offered.

2.6.8 Vitria

Vitria is the market leader in business process markets with 61% market share in 2001. Vitria BusinessWare 2.0 is also a rules broker. Vitria BusinessWare pricing starts at $30,000, licenses are targeted to departmental level systems. Vitria is the defacto industry standard for business process by virtue of the sophisticated packaged business analyst functionality provided.

Vitria has a strong presence in business process systems by virtue of its clear definition of the market needs. That company's strong market growth is a tribute to demand for business process integration systems.

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2.6.9 New Era of Networks / Sybase

New Era of Networks has a superior rules engine. New Era of Networks, in combination with Sybase, has an opportunity to achieve a dominant presence in integration of large database and storage systems. The market participants are discussed in detail throughout the study. However, the variety and different issues to be addressed provide room for many market participants.

2.6.10 Microsoft

Microsoft is including application server and integration functionality in its .NET Web services initiative. The bundling of competing functionality in versions of .NET servers positions Microsoft to compete in the Web services marketplace.

Microsoft has inherent advantages with financial, technical, marketing and other resources. Name recognition, a substantial installed base, and the integration of its broad product line provide strategic advantage in the market. Microsoft features a Web services software environment.

Companies differentiate products from Microsoft positioning based on scalability, functionality, interoperability with non-Microsoft platforms, performance, and reliability.

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2.6.11 Microsoft .net

Microsoft .net initiative represents one of the basic driving forces for Web enablement. Java from Sun Microsystems is the competing force. Web services represent a way to bridge the gap between these two systems. However, Microsoft is committed to proprietary solutions. COM users can talk only to Microsoft platforms.

2.6.12 Microsoft BizTalk Web Services

Microsoft BizTalk Web services elements include XML as the message format. BizTalk is completely structured around XML. It uses a SOAP XML message format. The BizTalk XML message is a SOAP XML message with additional biztags to comply with the framework specification.

BizTalk is a framework specification. Any language can be used to implement a server as long as it complies with the framework. A BizTalk message can be received by an Active Server Page or message queue and forwarded to a running BizTalk server via BizTalk messaging manager.

A message can be sent directly to a compiled orchestration schedule. A complex logic system provides a high-level means of orchestrating a middleware system moving parts. Those moving parts can take the form of a message queue, COM component, BizTalk channel, file, e-mail message, or HTTP-based service.

Long-running, loosely coupled business processes may be implemented. COM or Web development can be achieved by using the designer in Visio to lay out the business flow.

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2.6.13 Microsoft Support For Creating a Highly Available Web

Web-based applications are used to host applications on a flexible platform that provides scalability, reliability, and availability. Clustering technologies can satisfy these needs, providing a solid infrastructure on which to deploy demanding Web applications.

Microsoft® provides different types of clustering technologies for specific situations. A server cluster running the service provides failover capability for software services. Network load balancing provides the means to distribute workloads for TCP/IP protocol services such as HTTP and lightweight directory access protocol (LDAP). Multiple servers increase throughput and availability.

High availability is implemented with a multi-server Web services hosting site. These features are implemented to permit withstanding hardware or software outages that occur on the site individual servers.

Outages can be planned or unplanned. A planned outage is taking a server down for maintenance to perform a software update. The rest of the site stays online providing service to users.

An unplanned outage is a catastrophic server failure. The rest of the site stays online providing service to users because the processes that were providing data services for the site failed over to the remaining server clusters during the server failure. The architecture is designed to both protect the data of such a Web site and to keep the site up and running.

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2.6.14 Microsoft Component Object Model

The Microsoft component object model (COM) was created as the fundamental technology for document integration technology. COM has several names OLE, OCX, ActiveX, DCOM, or COM+.

COM has many of the same limitations as CORBA. Like CORBA, COM is complex to implement independently. If users commit to COM, they commit to one of the Microsoft platforms. This means that with COM, users can talk only to Microsoft platforms.

2.6.15 Sun Microsystems Java

Sun Microsystems Java is positioned to support open systems. Java programming language is the most visible part. The Java virtual machine is central to this technology. JVM is a software-based virtual CPU that executes a special command-set, called bytecode. JVM is designed to be implemented on top of existing platforms. Java programs can be moved between those platforms without changes.

The quality of Java applications depends on the underlying virtual machine and its capabilities. The Java model makes services available to a Java application written in Java.

The software is designed to leverage the power and features of the underlying operating environment, like the high volume transaction capabilities of IBM's OS/390 or the scalability of Sun Solaris platform. Java applications need to make direct calls into the underlying platform using Java's raw native interface bridging technology.

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2.6.16 GE Global Exchange Services E-Business Software

Plug-ins support XML transactions for buying, selling and delivering products through supply chain networks. GE Global eXchange Services e-business software plug-ins allow companies to send and receive electronic documents. The plug-in translates documents from a variety of data formats into an e-standards format.

Open and platform-independent standards leverage data exchange based upon eXtensible Mark-Up Language (XML). One significant obstacle to electronic trading is that company back-office systems communicate using standard data formats that pre-date XML. Plug-ins allow companies to take advantage of XML e-standards without having to significantly re-tool enterprise systems.

GXS plug-in works in conjunction with the application integrator data transformation engine. GXS supports a variety of XML, EDI, legacy and proprietary data formats. Application integrator provides data mapping, translation, and management capabilities for electronically transferring business documents between application programs and between businesses.

2.6.17 Cape Clear Software

Web Services implement a design center for applications. Web Services use a UDDI registry for management. CapeConnect provides a solution that addresses the challenge of integrating a Microsoft COM-based Web site with a Java-based customer management system.

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Cape Clear Web services platform provides in-built support for WebLogic, WebSphere and iPlanet. The company supports major CORBA products such as WebLogic Enteprise, Visibroker, Orbix, and.NET)

CapeConnect is installed pointing to an app server. It provides Web Services interfaces for EJBs and JavaScripts.

It works on a message level, so when a message leaves the app server CapeConnect provides it with a SOAP interface and allows it to communicate directly with other Web Services.

2.6.18 CapeConnect SOAP

CapeConnect is a scalable XML and SOAP-based distributed computing architecture. The Web service platform enables use of SOAP in a distributed computing environment. Enabling components for SOAP means that they can be published on the Internet and accessed by anyone with the right authorizations. An HTTP-compliant client browser can access the information.

Deploying SOAP depends on developers having expertise in XML, distributed object technology, and HTTP. SOAPDirect provides developers with a solution for traversing firewalls between multiple heterogeneous systems located anywhere.

SOAP does not include any specific security protocols. CapeConnect can be used as the secure central point in a distributed computing environment based on XML and SOAP.

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CapeConnect is used to deploy Web Services from IBM WebSphere Application Server. SOAP and UDDI are used to build applications that interoperate over the Internet with other Web Services regardless of their platform and language.

2.6.19 Scalability

CapeConnect is built on stateless or connectionless protocols such as HTTP, HTTPS, and SMTP. CapeConnect can be clustered using existing IP-based load balancing hardware, such as a Cisco local director solution.

CapeConnect invokes EJB or CORBA components by invoking methods on the stubs generated by the specific application server, rather than talking RMI or IIOP directly. The advantage of this approach is that the systemcan leverage smart proxies and automatically get the full benefit of any load-balancing and fail-over features supported by the back-end application server.

2.6.20 J2EE Integration

CapeConnect can be used to expose EJB components as Web Services. CapeConnect introspects the EJB JAR file and deployment descriptor and generates WSDL for all stateless session beans within that JAR file. At runtime, CapeConnect translates SOAP requests into invocations against the back-end EJB component.

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2.6.21 CORBA Integration

CapeConnect can be used to expose new and existing CORBA components as Web Services. CapeConnect takes CORBA IDL as input and generates WSDL for each service. At runtime, CapeConnect translates SOAP requests into invocations against the back-end CORBA component.

2.7 Internet Driving Forces

Market driving forces for the Internet are comprised of a number of direct and indirect factors impacting markets in every industry. Direct factors relate to the need for application integration between every different type of enterprise resource planning (ERP) system.

Supply chains are automated using AI and AI technology. Electronic commerce needs AI to function. These drive Internet expansion. New customer service systems need Internet application server in order to implement customized solutions. Indirect factors relate to the migration of existing products from separate market segments to being subsumed by application servers, including Java logic.

Enterprise application servers are used in the context of corporate adoption of best-of-breed application strategies. The driving force for Internet application presence is the need to leverage economies of scale brought by automation of the supply chain. A desire to develop closer links with customers, suppliers and partners is evolving as systems make cooperation more realistic. Event driven systems drive demand for application integration.

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Dynamically growing businesses must meld applications, databases, operating systems, and hardware platforms. Vendors fold applications seamlessly into networks supporting mainframes, client/server platforms, and PCs.

Companies trying to pick up the IT pieces following a merger or acquisition need application servers that leverage the assets of the enterprise. Those involved in front office/back office integration and those working to comply with new regulations all face the need to implement integration.

Table 2-21 illustrates application server market driving forces.

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TABLE 2-21

INTERNET ENTERPRISE MARKET DRIVING FORCES

- Speed corporate adoption of best-of-breed applications
- Support Internet strategies
- Manage mergers, acquisitions and reorganizations
- Develop closer links with customers, suppliers and partners
- Fold applications seamlessly into networks
- Support mainframes, client/server platforms, and PCs
- Meld applications, databases, operating systems, and hardware platforms
- Integrate packaged ERP applications
- Integrate packaged database applications
- Build interfaces to management systems
- Extend investment in legacy applications
- Enable client/server and network computing
- Provide electronic commerce over the Internet
- Integrate new solutions with legacy applications

Source: WinterGreen Research, Inc.

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E-commerce systems on the Internet drive acceptance of application servers. Figure 2-22 and Table 2-23 illustrate market growth of Internet commerce markets.

FIGURE 2-22
B To C E-Commerce Market Forecasts, 2000-2006

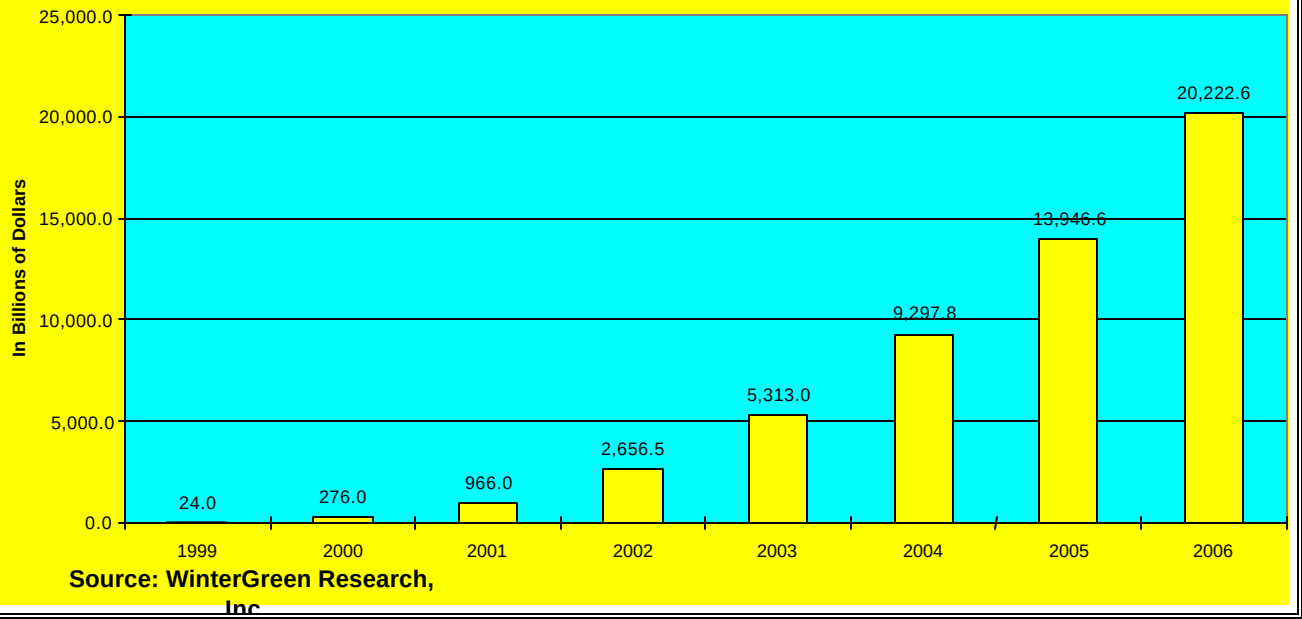

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TABLE 2-23

WORLDWIDE INTERNET TRANSACTIONS CONDUCTED, 2000-2006

In Billions of Dollars

	1999	2000	2001	2002	2003	2004	2005	2006
Consumer	4.8	49.7	154.6	371.9	637.6	929.8	1,255.2	2,022.3
B2B / Supply Chain	19.2	226.3	811.4	2,284.6	4,675.4	8,368.0	12,691.4	18,200.3
Transactions	**24.0**	**276.0**	**966.0**	**2,656.5**	**5,313.0**	**9,297.8**	**13,946.6**	**20,222.6**
% Growth	900.0	1,050.0	250.0	175.0	100.0	75.0	50.0	45.0

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3. Web Services Products

3.1 Web Services Product Description

Web services are an integration layer of protocols that enhance existing product lines. But, this description is inadequate. In their pure form, Web services are positioned to be adapter modules used by developers to create modules within applications whose main function is integration. The modules implement simple business processes.

Rapid delivery of business-critical information over the Internet is driving a need to develop Web services enabled products. Using the Internet for e-business requires a transaction-processing solution. Using simple modules does not manage the complexity of the business process, so complex Web services modules are evolving.

Web services are a group of protocols that leverage existing products. EAI application integration, enterprise portals, business process engines, and application server products are being upgraded to include Web services functionality. In this manner, complexity of the business process is accommodated.

Web services integrate multiple distributed objects located on a network. The objects represent transactions located within the enterprise software applications or at partner/distributor locations. Web services products are used to access multiple data sources. Products are positioned to ensure data integrity and scalability across every business transaction.

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Web services products are basically necessary adjuncts to existing e-business software that enable Web services, but do not provide separate revenue. The Web services products do not define a distinct market segment; they provide incremental revenue to existing products.

Many companies have the need to combine the flexibility of application integration with the support for distributed processing provided by Web services. Web services technology supplements existing product lines to provide application services.

Web services add a new dimension to existing products by defining customer service, performance, reliability, transaction integrity, and security. Web services modules are combined with existing products, bringing standards-based solutions.

3.2 IBM Web Services

IBM Web services are illustrated in Table 3-1. IBM is the far and away leader in Web services, providing sophisticated products based on standards, once the standards have been agreed upon. The base of the IBM leadership position is the broad functionality of its application servers, integration products, e-business portals, and tools products.

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Table 3-1
IBM Web Services

Feature	IBM WebSphere Product/Component Supporting the Feature IBM has a range of e-business products that inplement Web Services. Following is a sample of products that contain Web Services functionality.	
Web Services		
SOAP	IBM WebSphere Application Server, Version 4.5	
SOAP Servlet	IBM WebSphere Application Server, Version 4.5	
SOAP Template Tool	Apache Tools	3
SOAP Client Proxy Tool	Apache Tools	3
Support for Corba	IBM WebSphere Application Server, Version 4.	4
Support for Java	IBM WebSphere Application Server, Version 4.	5
Support for EJB	IBM WebSphere Application Server, Version 4.	5
Support for C++	IBM WebSphere Application Server, Version 4.	5
Support for COM	IBM WebSphere Application Server, Version 4.	3
Support for PowerBuilder	IBM WebSphere Application Server, Version 4.	3
GUI for SOAP Administration	IBM WebSphere Application Server, Version 4.	2
Support XML Elements	IBM WebSphere Application Server, Version 4.	5
Support Arrays	IBM WebSphere Application Server, Version 4.	5
Support User-Defined Datatypes	IBM WebSphere Application Server, Version 4.	3
Support HTTP	IBM WebSphere Application Server, Version 4.	5
Support HTTPS	IBM WebSphere Application Server, Version 4.	5
WSDL		5
GUI to describe services in WSDL Format	IBM WebSphere Application Server, Version 4.	4
GUI-based WSDL generation	IBM WebSphere Application Server, Version 4.	4
UDDI	Java API linked to UDDI	5
Publish Business/Service info to UDDI repository	IBM WebSphere Application Server, Version 4.	4
Publish link to WSDL to UDDI repository	IBM WebSphere Application Server, Version 4.	4
GUI-based UDDI management	IBM WebSphere Application Server, Version 4.	4
Retrieve Business/Service info from UDDI repository	IBM WebSphere Application Server, Version 4.	4

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Table 3-1 (Continued)
IBM Web Services

	IBM WebSphere
Feature	Product/Component Supporting the Feature
Data Integration	
XML to Java binding	IBM WebSphere MQSI MQSeries Integrator
Support for XML Schema	IBM WebSphere MQSI MQSeries Integrator
Support for EDI	IBM WebSphere MQSI MQSeries Integrator
Support for xCBL	IBM WebSphere MQSI MQSeries Integrator
Support for cXML	IBM WebSphere MQSI MQSeries Integrator
Support for SAP	IBM WebSphere MQSI MQSeries Integrator
Support for Seibel	IBM WebSphere MQSI MQSeries Integrator
Support for PeopleSoft	IBM WebSphere MQSI MQSeries Integrator
Support for BroadVision	IBM WebSphere MQSI MQSeries Integrator
Support for JDEdwards	IBM WebSphere MQSI MQSeries Integrator
Support for Oracle Applications	IBM WebSphere MQSI MQSeries Integrator
Support for BizTalk	IBM WebSphere MQSI MQSeries Integrator
Transports Supported with Tradinç	Partnership with Extricity
HTTP	IBM WebSphere MQSI MQSeries Integrator
HTTPS	IBM WebSphere MQSI MQSeries Integrator
TCP/IP	IBM WebSphere MQSI MQSeries Integrator
FTP	IBM WebSphere MQSI MQSeries Integrator
SMTP	IBM WebSphere MQSI MQSeries Integrator
JMS	IBM WebSphere MQSI MQSeries Integrator
EDIINT AS1	IBM WebSphere MQSI MQSeries Integrator
EDIINT AS2	IBM WebSphere MQSI MQSeries Integrator
Security	Kerbos is the base for IBM security initiatives
XML DSIG	WebSphrere Application Server
S/MIME	WebSphrere Application Server
PKI	WebSphrere Application Server
RSA	WebSphrere Application Server
Authentication	WebSphrere Application Server
Non-repudiation	WebSphrere Application Server
Encrypted data compression	WebSphrere Application Server

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Table 3-1
IBM Web Services (Continued)

	IBM WebSphere
Feature	Product/Component Supporting the Feature
Trading Partner Management	
	Evolving standard for all market participants
ebXML CPP/CPA	
Web browser interface for "self service"	
	In development
ebXML	IBM WebSphere can be used as the EJB server, there is no specific dependency on WebSphere. A business may communicate with its partners using one of the several protocols such as HTTP, SMTP, and IBM MQSeries. It may even use different protocols for diffe
Support for ebXML Messaging and Transport	
	IBM WebSphere Commerce Suite,
Support for posting to an ebXML repository	IBM WebSphere Commerce Suite,
Support for TPAs (Trading Partner Agreements)	IBM WebSphere Commerce Suite, Extricity partnership
Business Process Modeling	IBM WebSphere Commerce Suite, MQSI
BPSS Deployment	IBM WebSphere Commerce Suite,
Business Process Engine Support	IBM WebSphere Commerce Suite, MQSI

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Table 3-1
IBM Web Services (Continued)

	IBM WebSphere
Feature	Product/Component Supporting the Feature
Business Process Management	Extensive product line
RosettaNet	Through Extricity as well as Directly
Support for RNIF 1.1	IBM WebSphere Business Integrator software
Support for RNIF 2.0	

Source: WinterGreen Research, Inc.

3.2.1 IBM Web Services Market Presence

IBM has a far more sophisticated Web services offering than the other competitors with Web services market positions. IBM has a significant market leadership position in both application servers and application integration. No other Web services market participant offers this combination of market presence.

Features for different levels of technology drill into detail by providing nuance of functionality necessary for information management and exchange on the Web. Web services range from functionality implemented as TCP/IP or EDI in addition to the SOAP, UDDI, ebXML and other standards generally associated with Web services.

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3.2.2 IBM XML

XML is an extensible language, meaning that there are a lot of different XML versions around. XML elements are discretely differentiated into parsing, validating, schema, and transforming capabilities.

XML elements features referred to as "XML Parsing", "XSLT Transformation", "XML Schema", and so forth. XML features are complicated by which programming languages are supported. "XML Parsing for Java", "XML Parsing for C++" are different.

XML Signature, XML Encryption, SAML, XACML, and XKMS are IBM features. The first two of these are implemented for WAS4. The other technologies are still under development by the standards groups. Neither signature nor encryption is yet a W3C recommendation. There are implementations for them in shipping products (like WAS4).

Apache's Xerces parser for Java, which IBM also develops and uses in products, supports XML schema. Support for schema is present in any product that uses the newest Xerces parser, such as WAS4. IBM contributed their XML parsers for Java and C to form the basis of the Apache Xerces project, and their LotusXSL processor to form the basis of the Apache Xalan project. IBM lead in the development of these open source projects and continues to actively contribute to both initatives.

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XML is supported in some way or another in nearly every e-business software product IBM has. In fact, XML has been referred to as simplified SGML (Standard Generalized Markup Language) built for the Internet. IBM created SGML in their research labs over 20 years ago and donated the technology to the open source community.

3.2.3 IBM Strategy With Respect To Standards

In recent years, IBM has been a strong proponent of standards. IBM is active in all the relevant and significant Web services standards bodies. A standards group initially considers features as specifications when under study.

They are included as features by IBM after working groups at standards bodies adopt a standard. Only a few Web services functions are actually standards in the sense of having reached W3C recommendation status. IBM tends not to support early working drafts of specifications, but has consistently been one of the first, if not the industry first, to fully support web services standards in their products.

IBM has pioneered early implementations of the emerging Web Services standards through their Web Services Toolkit on alphaWorks. Because drafts change a lot while being developed by the working group IBM is apt to wait until a standard has been adopted to implement the function.

There are exceptions of course. XML encryption is a working draft, yet there is an implementation in WAS4. IBM supports many Web services features in a range of products. Many of the Web services features are now or will be supported.

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3.2.4 IBM Support For ebXML

ebXML is not yet supported to any large extent. While IBM does not have explicit support in MQSI for ebXML, the generic XML parser contained within MQSI can handle ebXML messages. The current focus for MQSI is on Web services enablement.

WebSphere studio application developer offers support for many of the features and specifications of Web services, including GUI-based WSDL generation. It publishes to UDDI.

3.2.5 IBM WebSphere Secure J2EE Applications

IBM WebSphere is used to deploying secure J2EE applications. Usage scenarios relate to implementing e-services. End-to-end flow is accomplished using security.

Security policy configuration is a significant aspect of Web services in the IBM configuration. Security information and control is built into Web services configurations. Proactive authorization is achieved.

Securing production applications is vital to the success of the WebSphere application server. The WebSphere product set provides distributed transaction functions and sophisticated infrastructure. WebSphere-based applications can be put into production with the assurance that business processes and data are protected from malicious and inadvertent loss. This has always been true in core, mission-critical intranet-based applications. This is true as these applications are combined with Web-based computing.

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IBM implements Java 2 Enterprise Edition (J2EE) technology to define two primary elements of security: an API set and a set of deployment descriptors. An API set for use within J2EE components is used for determining the requesting principal and its association to a particular role.

A set of deployment descriptors is used for establishing authorization policies to J2EE components based on roles. The J2EE standards do not define the authentication model. APIs are implemented for establishing or manipulating security context. They prescribe an implementation for the roles-based authorization model. IBM application server is certified on J2EE 1.3.

3.2.6 IBM End-To-End Web Services Strategy

IBM has an end-to-end Web services strategy. Servlet applications use J2EE security APIs for application decisions, assembling the servlet, and specifying the security policy for the Web application. Deploying the Web application into the WAS environment, and using the WebSphere runtime to securely access the servlet are enabled.

Resources are protected with the WebSphere server. A method on an Enterprise Java Bean (EJB) is protected. A method on a Web resource is protected.

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3.2.7 IBM Protection Of Resources

Securing EJBs is a priority. When an Internet Inter-ORB Protocol (IIOP) client attempts to execute a method on an EJB the application server must determine whether the principal (client) is permitted to do so. Application servers determine if the method on the Bean is protected, based on the deployment descriptor associated with the EJB module.

Securing Web resources is also a priority. When a user at a Web browser requests a Web resource, WAS determines whether the resource is protected. IBM supports many different resources, including servlet, JavaServer Page (JSP), Hypertext Markup Language (HTML), and Uniform Resource Identifier (URI).

3.2.8 End-To-End Flow From The Security Viewpoint

A WebSphere application server may host applications that are interdependent. Security may be implemented by notifying a Web browser with a requirement that the user to enter a user ID and password to access a servlet. WAS performs authentication.

If needed, it delegates the task to the security server. Using the authentication data including user ID and password received from the user an authentication process is accomplished. On successful authentication, the application server consults the deployment descriptor information to determine the required roles to access the URI.

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It also checks whether the user has been granted at least one of the required roles to access the URI. If authorization succeeds, the application server sets up a security context with the user's credential information and lets the servlet engine handle the request.

The security collaborator performs security checks before a URI is served. After security checks result in a successful authorization, the service request is passed on to the servlet engine.

With this configuration, one servlet can invokes a method on a Java Bean. A method call from a servlet to an EJB or another servlet is intercepted by the underlying security mechanism for authorization approval. On invoking the increment() method on the IncBean, the security collaborator is asked to perform security checks based on the security context set up by the servlet engine. If the user is authorized to invoke the method, the servlet executes successfully and sends the result to the user's Web browser.

3.2.9 IBM Web Services Security Policy Configuration

Security policies illustrated in Table 3-2 can be configured under WebSphere application server.

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TABLE 3-2

IBM WEB SERVICES SECURITY POLICIES

- Authentication policy
- Acquiring the authentication data
- Validating the authentication data
- Third-party authentication support
- Certificate challenge

Source: WinterGreen Research Inc.

Authentication is the process of verifying that users are who they say they are. Acquiring the authentication data of a person and validating the authentication data against a user registry is done. WebSphere security authenticates a person based on the authentication policy associated with a resource.

The WebSphere server supports authentication mechanisms based on validating credentials, such as certificates, tokens, or user ID and password pairs. Credentials are verified against a user registry. User ID and password-based authentication can be performed against a lightweight directory access protocol (LDAP) user registry in which authentication is performed using an LDAP bind.

Table 3-3 illustrates WebSphere server authentication mechanisms.

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TABLE 3-3

THE WEBSPHERE SERVER AUTHENTICATION MECHANISMS

- Based on validating credentials
- Certificates
- Tokens
- User ID
- Password pairs
- redentials verified against a user registry
- User ID and password-based authentication
- Lightweight directory access protocol (LDAP) user registry
- Authentication is performed using an LDAP bind

Source: WinterGreen Research Inc.

WebSphere server supports a third-party authentication scheme. The client and server principals are authenticated to a mutually trusted third party. Any authentication scheme assumes that the client does not trust the server, and the server does not trust the client. The main benefit of a third-party authentication mechanism is that the user registry is administered centrally.

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The authentication policy for performing authentication between a user and a WebSphere server can be specified in terms of the J2EE login configuration tags as part of a Web application deployment descriptor:

Certificate challenge implies that the Web server is configured to perform mutual authentication over Secure Sockets Layer (SSL). The client is required to present a certificate to establish the connection. This certificate is credential mapped to a user registry.

In WebSphere application server certificate challenge type can be used when LTPA is the authentication mechanism. An LDAP or a custom user registry can be used to map the certificate to a user entry. The Form auth-method is useful to configure the server to use an HTML form to retrieve the user ID and password

3.2.10 Role Of IBM Mission Critical Middleware Messaging

Mission critical messaging is a base for application connectivity. Mission critical messaging provides access to cross platform applications and a transport mechanism that is secure. As users achieve more involvement with messaging, they are using message queuing as the basis for implementing application integration.

Connecting platforms provides the enterprise with the ability to make applications work together. An important benefit middleware normally brings to application integration is open connectivity.

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The best middleware products provide a consistent mechanism by which a wide variety of types of systems can be connected together. Common API's and operational procedures help to simplify the tasks that must be carried out when integrating different systems together.

3.2.11 IBM Mission-Critical Functionality

IBM is the premier supplier of mission critical functionality. Mission-critical application systems and underlying platforms are reliable. Mission-critical functionality is needed by any application that inter-operates with a mainframe system. 24x7 around-the-world support lines are associated with mission critical operations whether they are mainframe or distributed processing based. Operational management of enterprise resources is required to achieve mission critical status.

AI tools cope with the wide variety of application-, vendor- and platform-specific communications. Mission-critical means having a professional resources organization dedicated to the success of the enterprise. Mission critical messaging forms the base upon which application integration (AI) can evolve. Table 3-4 illustrates enterprise messaging integration functions.

TABLE 3-4

ENTERPRISE MESSAGING INTEGRATION FUNCTIONS

- Provide mission critical base for information exchange
- Support integration of applications from multiple platforms
- Support integration of mainframes and servers

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TABLE 3-4 (CONTINUED)

ENTERPRISE MESSAGING INTEGRATION FUNCTIONS

- Support integration of clients and servers
- Support integration of home grown systems and packaged applications
- Support integration of home grown systems and Internet applications

Source: WinterGreen Research, Inc.

3.2.12 IBM Websphere MQ Messaging Software

Software enables enterprises to automatically transmit, receive, filter and personalize digital information in real-time across platforms and across applications. Systems facilitate real-time, two-way communications between applications across distributed computer networks and mobile information devices such as hand-held computers, pagers and digital cellular phones.

Products are in use by over 7,000 companies in diverse markets including telecommunications, manufacturing, energy, financial services and Internet portals.

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3.2.13 Linking Internal Operations

WebSphere MQ integration software products enable businesses to link internal operations, internal operations to business partners, and internal operations to customer channels in real time. Software products allow multiple distinct applications, web sites, databases and other content sources to be integrated and managed within a common framework.

Applications integration products enable enterprises to extend their information technology infrastructure and business processes across the Internet to conduct all forms of electronic business using the Internet: business-to-business, business-to-consumer and business-to-employee systems.

Core technology is known as an "integration broker". Brokers are supported with adapters, connectors, XML, transformation engines, rules engines, workflow, and business process engines.

TABLE 3-5

WEBSPHERE MQ INTERNAL ENTERPRISE APPLICATION INTEGRATION

- Provide interconnection between ERP vendor packages, SAP, Peoplesoft, etc.
- Implement message brokers
- Provide adapters
- Provide connectors

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TABLE 3-5 (CONTINUED)

INTERNAL ENTERPRISE APPLICATION INTEGRATION TASKS

- Provide XML
- Provide transformation engines
- Provide rules engines
- Provide workflow
- Provide business process engines

Source: WinterGreen Research, Inc.

Application logic may reside in purchased applications such as ERP, CRM and SCM packages, in databases or in legacy applications within a single company. The logic of business is dependent on infrastructure to connect and interconnect the application information.

Newly developed Internet server code must be tightly integrated with the existing applications and data to deliver end-to-end business functionality.

3.2.14 IBM Integration Of ERP Applications

Integration of ERP applications is generally an integration task within the enterprise. The WebSphere MQ integration infrastructure is devoted to making disparate parts of the organization share information seamlessly.

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Packaged software designed to run core functions of an enterprise is known as enterprise resource planning (ERP) applications. ERP from different suppliers can be integrated using AI. Packaged ERP applications have grown dramatically as the more cost-effective response to enterprise computing.

Flexible and seamless integration of ERP applications from multiple vendors and integration of distributed departmental ERP with mainframe systems is occurring. Companies frequently are using a variety of ERP applications modules as a result of purchasing best of breed applications packages. Mergers and acquisitions also create a mix and match atmosphere in an enterprise IT department.

No single vendor can provide an application infrastructure that responds to all business process needs. Enterprise application packages from multiple vendors are proliferating due to the very complexity of a global entity. Geographical distance between divisions dictates the need for more integration. Large corporations operate with a wide variety of applications.

3.2.15 IBM WebSphere Automated Solutions Positioning

Custom coding of interface logic is a function of the past. Automated, packaged solutions are more efficient and more effective. Packaged solutions provide more functionality, over a longer span of years. Spreading the cost of implementation over a large user base supports improved functionality.

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IBM MQ integration complements stand- alone mission critical messaging. Customers who benefit from AI include those with a profile that matches the user parameters shown in Table 3-6.

TABLE 3-6

IBM APPLICATION INTEGRATION POSITIONING

LOOKS FOR CUSTOMERS THAT HAVE:

- Significant investment in legacy systems
- Multiple strategic partners
- Applications on multiple platforms
- Data stored according to a variety of database schema
- High volume data distribution requirements
- High volume software distribution requirements
- Complex application integration needs that change frequently

PROVIDES INTEGRATION SYSTEMS TO:

- Integrate companies acquired
- Add new applications such as ERP packages
- Extract information from a range of ERP packages
- Adapt to changes in business rules
- Adapt to needs for accessing different applications
- Provide message and event routing
- Provide a significant group of adapters
- Achieve growth through acquisition

Source: WinterGreen Research, Inc.

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3.2.16 WebSphere Studio Application Developer

WebSphere Studio application developer is positioned to support creation of a Web presence. The application developer integrates various Web application development roles into one tool, providing best-of-breed, integrated development support for the following.

- Building J2EE applications with HTML pages, servlets, JavaServer Page (JSP) files, and Enterprise JavaBean (EJB) components
- Creating Web service applications with open standards
- Generating XML documents from DTDs, schemas
- Enabling a collaborative team environment
- Optimizing application performance
- Enabling end-to-end local and remote testing
- Increasing productivity and creating high-quality applications using wizards, code generators and best practices

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3.2.17 Tivoli Web Services Manager

Tivoli Web services manager is a custom systems manager for the Internet. The Tivoli® Web Services Manager is positioned to ensure the availability and performance of a Web infrastructure. There is a three-part approach to Web management.

Tivoli Web services manager helps to baseline and improve the quality of Web access. Using standard internet security protocols, Tivoli Web services manager extends the reach of management outside the firewall. A system can transfer management data without having to open additional firewall ports. Tivoli Web Services Manager enables a client's Web team to dothe following tasks.

- Understand how customers experience a Web site
- Know when critical e-business transactions cannot be completed in a timely fashion
- Manage service level agreements (SLAs)
- Ensure Web content is available and current
- Determine the location of performance problems
- Maintain firewall security policies currently implemented in Web environment

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3.2.18 Lotus Software Web Services Strategy

Lotus software offers solutions for electronic collaboration. Collaboration allows organizations to distribute information and foster efficient communication among employees, customers, and partners in whatever way is best-suited to the situation, the culture, and to the business.

Electronic collaboration can have tremendous cost cutting benefits. Lotus visual presentations can be conducted over the Internet to geographically disbursed participants without anyone having to travel. Another cost cutting tool is online learning, which provides classroom style training and individual study tools.

This can reduce traditional training costs. Tools for collaboration increase productivity and result in quick decision-making abilities by delivering just-in-time information to workers via instant messaging and email. Calendar scheduling helps workers organize meetings and coordinate calendars across departments and time zones. Mobile access gives people the flexibility to work in different places.

Lotus has a strategy to provide collaborative capabilities as Web services that can be integrated into other applications such as ERP, CRM, and portal soltuions. Lotus collaborative capabilities are targeted to a broad audience.

Systems integrators can mix and match collaboration into all sorts of business applications. Using collaborative Web services, IBM customers can increase the value of Lotus software investments by expanding the usage to more areas of their business.

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3.3 GE Global eXchange (GXS) Web Services

GE Global eXchange services have expanded capabilities of supporting industry data exchanges. GXS helps companies reduce costs through Web-based data management and back-office integration.

Table 3-7 illustrates GE Global eXchange services positioning.

TABLE 3-7

GE GLOBAL EXCHANGE SERVICES POSITIONING

- Capabilities for supporting industry data exchanges
- Supply chain automation
- Help for companies to reduce costs through Web-based data management
- Help for companies to reduce costs through back-office integration

Source: WinterGreen Research, Inc.

GE Global eXchange services have added capabilities to the data exchange for industries. The capabilities include Web-based data management and back-office integration components that enable companies to reduce costs and increase profitability through improved supply chain efficiency.

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Hosting by GE Global eXchange Services (GXS) uses Web services capabilities. Systems help petroleum companies manage information associated with the shipment and delivery of products. GXS serves major U.S. refining company, and handles in excess of 50 million transactions annually.

New GXS capabilities help companies to simplify transactions, enhance customer service and automate labor-intensive processes. Companies use the Web to more efficiently collaborate on the direct exchange of products, reducing time-consuming error corrections and eliminating the need for costly in-house reconciliation systems.

Products pass through several suppliers before reaching the final customer. Web-based service enables refiners to reduce time to market by authorizing the entire chain of recipients in advance. Back-office integration enables the timesaving transfer of data directly to from enterprise systems using Internet protocols such as file transfer protocol (FTP) and simple object access protocol (SOAP).

GXS is supporting industries with mission-critical data transactions. It offers companies a broad range of services for supply chain collaboration. Web services are comprised of a set of tools to manage information, increase efficiency and reduce costs.

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3.3.1 GE Global Exchange Services E-Business Software

Plug-ins support XML transactions for buying, selling and delivering products through supply chain networks. GE Global eXchange Services e-business software plug-ins allow companies to send and receive electronic documents. The plug-in translates documents from a variety of data formats into an e-standards format.

Open and platform-independent standards leverage data exchange based upon eXtensible Mark-Up Language (XML). One significant obstacle to electronic trading is that company back-office systems communicate using standard data formats that pre-date XML. Plug-ins allow companies to take advantage of XML e-standards without having to significantly re-tool enterprise systems.

GXS plug-in works in conjunction with the application integrator data transformation engine. GXS supports a variety of XML, EDI, legacy and proprietary data formats. Application integrator provides data mapping, translation, and management capabilities for electronically transferring business documents between application programs and between businesses.

Application integration either of the CORBA, Java, or COM integration models work only if all potential peers can support that technology in both implementation model and wire protocol. In reality, this is always a very optimistic, marketing-driven wish. Having the same connection at each end has not worked because the expense of redesigning systems is too difficult.

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The adoption of EDI found its natural barriers in IT budgets. The most widely used EDI standards are too complicated and costly to implement and maintain on a large scale and, at the same time, too static because they do not allow businesses to adjust to rapidly changing needs without violating the narrowly defined standards.

Through simplicity and openness, XML enables broader adoption of electronic data exchange by making it less expensive. XML also allows tighter integration of systems across all platforms. It is simple enough to be directly implemented on any platform and any device, and it is agnostic to all the established rivaling camps.

3.4 BEA WebLogic Web Services Support For E-Business Platform

BEA classifies Web services into two categories: simple and complex. Like any e-business infrastructure, Web services require comprehensive development tools and a run-time platform that provides the necessary performance, reliability, security, management, personalization, and integration services. The success of a Web service ultimately will depend on the maturity, scalability, and integrity of the underlying platform.

BEA is provides a single, integrated platform that supports both simple and complex Web Services. BEA is leveraging the success of its Java application server. Large-scale deployments in thousands of businesses around the world leverage a heritage in bullet-proof transaction management.

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Leadership has evolved in enterprise Java, XML, and Web Services standards. BEA supports more than 1,900 value-added channel partners with the aim of accelerating the adoption of a distributed business model. Only a small percent of those channel partners understand Web services. An even smaller percent is able to implement Web services.

BEA has positioned to participate in distributed computing for e-commerce with componentized applications. BEA WebLogic Server is enabling the Internet evolution by making Web services viable with the Platform. Table 3-7 illustrates BEA Web services positioning.

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Table 3-7 BEA Web Services

Feature	BEA Weblogic Product/Component Supporting the Feature
SOAP	Apache SOAP implementation of Web Logic Server
SOAP Servlet	Apache SOAP implementation of Web Logic Server
SOAP Template Tool	Apache SOAP implementation of Web Logic Server
SOAP Client Proxy Tool	Apache SOAP implementation of Web Logic Server Using a proxy class generated at design time
Support for Corba	Apache SOAP implementation of Web Logic Server
Support for Java	Apache SOAP implementation of Web Logic Server
Support for EJB	Apache SOAP implementation of Web Logic Server; Transport infrastructure delivers the message to the SOAP processor on the J2EE server stateless EJB
Support for C++	Apache SOAP implementation of Web Logic Server
Support for COM	Apache SOAP implementation of Web Logic Server
Support for PowerBuilder	not available
GUI for SOAP Administration	Apache SOAP implementation of Web Logic Server
Support XML Elements	Apache SOAP implementation of Web Logic Server
Support Arrays	Apache SOAP implementation of Web Logic Server
Support user-defined datatypes	Apache SOAP implementation of Web Logic Server
Support HTTP	Apache SOAP implementation of Web Logic Server: SOAP processor formulates a SOAP message response using the returned result and relays back to the client as an HTTP response.
Support HTTPS	not available have SOAP JMS automation tools for EJB session bean goes to SOAP / WSDL

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BEA Web Services (Continued)

Feature	BEA Weblogic Product/Component Supporting the Feature
WSDL	downloadable from URL automatically generated
GUI to describe services in WSI	Web Logic Server
GUI-based WSDL generation	Web Logic Server
UDDI	
Publish Business/Service info to UDDI repository	Web Logic Server
Publish link to WSDL to UDDI repository	Web Logic Server
GUI-based UDDI management	not available
Retrieve Business /Service from UDDI repository	not available
Data Integration	Leveraging J2EE architecture to replace EAI •Java development without object design or complex APIs –Visual metaphor/framework on which code can be "hung" - programmers thinks of events not classes. –Control architecture / property sheets simplify JMS, JDBC, etc. –Traditional Java developers can jump in at any time and any level. •Framework – build rich web services in 1/10 the time… –Programming model optimized for web services –JWS ties tool and runtime together using a JSP-like metaphor. •Runtime –EJB/J2EE "under the hood" •Standards –JWS ties tools and runtime together in a simple, elegant, JSP-like model; potential J2EE extension.

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BEA Web Services (Continued)

Feature	BEA Weblogic Product/Component Supporting the Feature
XML to Java binding	BTP Collaboration connection servers
Support for XML Schema	BTP Collaboration connection servers
Support for EDI	BTP Collaboration connection servers
Support for xCBL	BTP Collaboration connection servers
Support for cXML	Web Logic Integration
Support for SAP	Web Logic Integration
Support for Seibel	BTP Collaboration connection servers
Support for PeopleSoft	BTP Collaboration connection servers
Support for BroadVision	BTP Collaboration connection servers
Support for JDEdwards	BTP Collaboration connection servers
Support for Oracle Applications	BTP Collaboration connection servers
Support for BizTalk	Web Logic Integration

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BEA Web Services (Continued)

Feature	BEA Weblogic Product/Component Supporting the Feature
Transports Supported with Trading Partners	
HTTP	BTP Collaboration connection servers
HTTPS	BTP Collaboration connection servers
TCP/IP	BTP Collaboration connection servers
FTP	WebLogic and Tuxedo
SMTP	WAP Server
JMS	BTP Collaboration connection servers
EDIINT AS1	not available
EDIINT AS2	not available
Security	
XML DSIG	Web Logic Integration
S/MIME	not available
PKI	PKI encompasses the issuance of digital certificates to individual users and servers, end-user enrollment software, integration with corporate certificate directories, tools for managing, renewing, and revoking certificates, key management and related services BEA WebLogic Server

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BEA Web Services (Continued)

Feature	BEA Weblogic Product/Component Supporting the Feature
RSA	BEA WebLogic Server WebLogic Server has a very powerful Access Control List (ACL) mechanism that allows for fine-grained control of the usage of components running on the server. You can define what can or cannot be executed by which user or group of users right down to the Security realms allow the administrator to import information from existing authorization or authentication systems into the ACL. You can thus import information from the NT security system, from an LDAP system, from the Unix password file, or from the database WebLogic is fairly complete with respect to security. It includes all of the classes for Secure Sockets Layer (SSL) version 3 RSA Encryption Support for X.509 certificates, version 3

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BEA Web Services (Continued)

Feature	BEA Weblogic Product/Component Supporting the Feature
Authentication	BEA WebLogic Server
Non-repudiation	Web Logic Integration
Encrypted data compression	not supported
Trading Partner Management	
ebXML CPP/CPA	Web Logic Integration
Web browser interface for "self service"	Web Logic Integration
ebXML	
Support for ebXML Messaging and Transport	Apache SOAP implementation of Web Logic Server. Using the SOAP encoding rules for the message body, the Stub would marshal the passed argument to XML. The message payload (body) could be packaged as either an ebXML message or a BizTalk message
Support for posting to an ebXML repository	Web Logic Integration Web Logic Integration
Support for TPAs (Trading Partner Agreements)	Web Logic Integration
Business Process Modeling	Web Logic Integration
BPSS Deployment	Web Logic Integration
Business Process Engine Support	Web Logic Integration

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BEA Web Services (Continued)

	BEA Weblogic
Feature	Product/Component Supporting the Feature
Business Process Management	BEA WebLogic Integration Business Process Managemen BEA WeLogic integration is a single platform that delivers application server and business process
RosettaNet	Web Logic Integration
Support for RNIF 1.1	
Support for RNIF 2.0	Web Logic Integration
Support for RNIF Messaging and T	Web Logic Integration

Source: WinterGreen Research, Inc.

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3.4.1 BEA Support For Simple Web Services

Simple Web services provide basic request/response functionality. They are not transactional. They do not provide sophisticated security. Table 3-8 illustrates BEA Simple Web services.

TABLE 3-8

BEA SIMPLE WEB SERVICES

- Provide basic request/response functionality
- Are not transactional
- Do not provide sophisticated security

Source: WinterGreen Research Inc.

Consider a bank or agency that provides businesses with up-to-the-instant credit standings. A business may need to check a potential trading partner's credit standing before completing a business transaction. In this scenario, a request would be sent to the bank's Web Service, processed, and a response returned in real-time. A simple Web Service would streamline this transaction process and reduce the business' exposure to risk.

A request from a business to the bank represents an example of a simple Web service. To complete this process, the business application requiring credit information on a potential trading partner would use a variety of Web services under the BEA model.

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The requester would use XML, SOAP, WSDL, and UDDI to locate the credit check Web Service. These protocols are used to invoke the service, submit the request, accept the result, and return it to the user. This is a simple Web service because it has no real security or transactional requirements, and follows a request/response pattern. Simple Web services implement e-business platforms.

3.4.2 BEA Support For Complex Web Services

Complex Web services are evolving to leverage the e-business advances brought by simple systems. Collaboration, business process automation, transactional integrity, guaranteed delivery, sophisticated security, and multiparty, long-running transaction support are essential characteristics of Web services. Complex systems are evolving support by the BEA WebLogic E-business platform.

By themselves the simple Web services do not have the necessary qualities to provide the enterprise-class communication and integration required for high-value B2B applications. Complex Web services transform the way industries conduct business. These provide the framework for collaboration among trading partners over the Internet. They can be characterized as multi-party, multi-facited transactions. They involve sophisticated security, such as non-repudiation and digital signatures, as well as business-to-business collaboration and business process management.

Table 3-9 illustrates BEA complex Web services.

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TABLE 3-9

BEA COMPLEX WEB SERVICES

- Transform the way industries conduct business
- Provide the framework for collaboration among trading partners over the Internet
- Characterized as multi-party, multi-facited transactions
- Involve sophisticated security
- Support non-repudiation
- Support digital signatures
- Support business-to-business collaboration
- Support business process management

Source: WinterGreen Research Inc.

Complex Web services are needed to accomplish long-running transaction involving many companies. A manufacturer with multiple suppliers would need a complex Web services application that integrates internal applications and connects with external suppliers.

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Complex Web services systems need to access forecast and inventory and loosely integrate with suppliers. Communication through complex Web services is needed because the business processes are complex to understand. Much of the business process is hidden in proprietary or custom application code that no one even understands or knows about. This is the basis of the complexity. A motivating factor for complex Web services application development is to replace the multiple calls, long lead times, and cumbersome manual processes involved in interacting with numerous suppliers. But the automation process is complex.

When inventories reach certain thresholds, an application would automatically send a request for quote (RFQ) to multiple suppliers who have exposed complex Web Services. The Web services applications of these suppliers need to be connected to their internal systems.

Complex Web services permit suppliers to receive the request and respond automatically based on predefined constraints. Constraints include inventory, supplier status, discount levels, and margins. The manufacturer originating RFQ application receives these responses. Generally a person reviews the responses and makes supplier selections for each unique order. Table 3-10 illustrates complex Web services constraints.

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TABLE 3-10

COMPLEX WEB SERVICES CONSTRAINTS

- Inventory
- Supplier status
- Discount levels

Source: WinterGreen Research Inc.

Purchase decisions are generally based on predefined criteria. A confirmation is sent back to the selected suppliers with binding agreement information that may include a purchase order, fulfillment, and desired logistics information.

Suppliers seek to automate the response process with acknowledgement and logistical information. Tracking numbers and export/import documentation that completes the transaction can be automated with a complex Web services process management.

This long-running transaction is characteristic of a complex Web Service and demonstrates the loosely coupled, collaborative relationship between suppliers, partners, and customers.

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3.4.3 BEA Complex Web Services For Independent Trading Exchanges And Logistics Service Providers

BEA complex Web services can be extended to include independent trading exchanges and logistics service providers (LSPs). Exchanges could provide an additional set of suppliers through a Web service.

Logistics service providers can provide detailed information for the movement of goods through a Web service. The manufacturer is able to make transactions contingent on specific criteria, estimated time of arrival, and actual quantities shipped.

3.4.4 BEA Complex Web Services Context-Sensitive Transaction Support

BEA Complex Web Services allow for context-sensitive transactions. In this manner, companies have a way to automate the process of ensuring that the actual goods arrive at the appointed place, as scheduled. In this manner, a complex Web Service exemplifies the higher value characteristics of any business transaction. Table 3-11 illustrates BEA functions of context-sensitive transaction support.

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TABLE 3-11
BEA FUNCTIONS OF CONTEXT-SENSITIVE TRANSACTION SUPPORT

- Multi-party, long-running transaction support
- Collaboration and business process management
- Transactional integrity
- Security
- - Non-repudiation
- - Digital signatures
- Context sensitivity
- - Ordering of steps
- - Described conversations

Source: WinterGreen Research Inc.

Like simple Web Services, UDDI, WSDL, and SOAP are used to seek and invoke a complex service. Higher-level protocols, such as ebXML and BTP are necessary to facilitate the conversation with multiple parties, requiring high security, non-repudiation, and transactional guaranteed delivery.

These additional requirements make a complex Web Service. BEA believes that complex Web services are required for the high-impact, business to business (B2B) applications that transform industries.

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3.4.5 Web Services In BEA WebLogic E-Business Platform

BEA offers both simple and complex Web services features as part of the BEA WebLogic E-Business Platform. BEA is working vigorously with standards-defining organizations. BEA seeks to guide the development of the relevant Web Services standards.

BEA is focused on rigorously supporting Web services standards to protect existing technology investments. New standards are to permit customers to take advantage of syndicated business opportunities.

BEA provides support for SOAP and XML. It has announced support for UDDI and WSDL in BEA WebLogic Server.

BEA WebLogic Integration™ open and extensible product integrates trading partners across the Web. It enables complex Web Services to be deployed with transactional integrity, security, and reliability while supporting the emerging ebXML and BTP standards.

BEA WebLogic Integration builds on simple Web Services to offer the more sophisticated services required for complex B2B commerce and integration. BEA WebLogic personalization server permits Web to be customized around specific content. Services are delivered around a user's preferences, past experience, or business rules.

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3.5 Sybase Web Services

The World Wide Web uses Web services to deliver the weather, the latest news, software, updates, and to download a new piece of software. Requesting services is the next step forward, for which Sybase is positioning software functionality.

Sybase has positioned its SOAP implementations and tools to provide platform-independence for Web services. With Sybase SOAP users can write their own services and use whatever a range of modules for writing components and clients. Everyone can access and react to the Sybase Web services.

Table 3-12 illustrates Sybase Web services positioning.

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Table 3-12	
Sybase Web Services	
Sybase Web Services Collaboration Suite	
Feature	Product/Component Supporting the Feature
Web Services	
SOAP	EAServer Enterprise Edition
SOAP Servlet	EAServer Enterprise Edition
SOAP Template Tool	EAServer Enterprise Edition
SOAP Client Proxy Tool	EAServer Enterprise Edition
Support for Corba	EAServer Enterprise Edition
Support for Java	EAServer Enterprise Edition
Support for EJB	EAServer Enterprise Edition
Support for C++	EAServer Enterprise Edition
Support for COM	EAServer Enterprise Edition
Support for PowerBuilder	EAServer Enterprise Edition
GUI for SOAP Administration	EAServer Enterprise Edition
Support XML Elements	EAServer Enterprise Edition
Support Arrays	EAServer Enterprise Edition
Support user-defined datatypes	EAServer Enterprise Edition
Support HTTP	EAServer Enterprise Edition
Support HTTPS	EAServer Enterprise Edition
WSDL	
GUI to describe services in WSDL format	EAServer Enterprise Edition
GUI-based WSDL generation	EAServer Enterprise Edition
UDDI	
Publish Business/Service info to UDDI repository	EAServer Enterprise Edition
Publish link to WSDL to UDDI repository	EAServer Enterprise Edition
GUI-based UDDI management	EAServer Enterprise Edition
Retrieve Business/Service info from UDDI repository	EAServer Enterprise Edition

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Table 3-12	
Sybase Web Services (Continued)	
Sybase Web Services Collaboration Suite	
Feature	Product/Component Supporting the Feature
Web Services	
Data Integration	
XML to Java binding	EAServer Enterprise Edition
Support for XML Schema	EAServer Enterprise Edition
Support for EDI	e-Biz Integrator
Support for xCBL	e-Biz Integrator
Support for cXML	e-Biz Integrator
Support for SAP	e-Biz Integrator
Support for Seibel	e-Biz Integrator
Support for PeopleSoft	e-Biz Integrator
Support for BroadVision	e-Biz Integrator
Support for JDEdwards	e-Biz Integrator
Support for Oracle Applications	e-Biz Integrator
Support for BizTalk	<not supported>
Transports Supported with Trading Partners	
HTTP	Web Services Integrator
HTTPS	Web Services Integrator
TCP/IP	<not supported>
FTP	<not supported>
SMTP	<not supported>
JMS	<not supported>
EDIINT AS1	<not supported>
EDIINT AS2	<not supported>

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Table 3-12	
Sybase Web Services (Continued)	
Sybase Web Services Collaboration Suite	
Feature	Product/Component Supporting the Feature
Web Services	
Security	
XML DSIG	Web Services Integrator
S/MIME	Web Services Integrator
PKI	Web Services Integrator
RSA	Web Services Integrator
Authentication	Web Services Integrator
Non-repudiation	Web Services Integrator
Encrypted data compression	<not supported>
Trading Partner Management	
ebXML CPP/CPA	Web Services Integrator
Web browser interface for "self service"	<not supported>
ebXML	
Support for ebXML Messaging and Transport	Web Services Integrator
Support for posting to an ebXML repository	<not supported>
Support for TPAs (Trading Partner Agreements)	Web Services Integrator
Business Process Modeling	Process Server
BPSS Deployment	Process Server
Business Process Engine Support	Process Server

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Table 3-12	
Sybase Web Services (Continued)	
Sybase Web Services Collaboration Suite	
Feature	Product/Component Supporting the Feature
Web Services	
RosettaNet	
Support for RNIF 1.1	<not supported>
Support for RNIF 2.0	Web Services Integrator
Support for RNIF Messaging and Transport	Web Services Integrator
Support for PIP 1A1	TBD
Support for PIP 1A2	TBD
Support for PIP 1A3	TBD
Support for PIP 1B1	TBD
Support for PIP 1B2	TBD
Support for PIP 1B3	TBD
Support for PIP 2A1	TBD
Support for PIP 2A2	TBD
Support for PIP 2A3	TBD
Support for PIP 2A4	TBD
Support for PIP 2A5	TBD
Support for PIP 2A6	TBD
Support for PIP 2A7	TBD
Support for PIP 2A8	TBD
Support for PIP 2A9	TBD
Support for PIP 2B1	TBD
Support for PIP 2B2	TBD
Support for PIP 2B3	TBD
Support for PIP 2B4	TBD
Support for PIP 2B5	TBD
Support for PIP 2B6	TBD
Support for PIP 2B7	TBD

Source: WinterGreen Research, Inc.

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3.5.1 Sybase / New Era of Networks Integration Package

Sybase New Era of Networks integration product is focused on providing customers with departmental integration solutions that leverage existing technology investments.

Sybase integration solutions are available for a broad integration market. Products are focused on streamlining business process and information flow between key business applications and systems.

Integration packages are cost-effective, entry-level integration solutions that enable customers to address their specific departmental integration challenges, including streamlined development and deployment and project-based budgets. Sybase offers a suite of solutions geared for enterprise integration initiatives.

Sybase has an integration suite focused on providing customers enterprise wide and departmental integration solutions. Integration accommodates customer network needs, while protecting and enhancing current technology investments. Systems allow an organization to integrate new and existing systems to provide a seamless business process flow.

3.5.2 Sybase Integration Package / Adapters

Integration packages from Sybase include an New Era of Networks® e-Biz Integrator™ suite. Connection points enable the integration of existing business applications or systems. Sybase offers an extensive library of New Era of Networks® adapters.

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Adapters provide pre-defined connections to target applications, mainframes, or legacy systems. By adding additional connection points, customers can add applications.

New Era of Networks e-Biz Integrator integrates new and existing systems to provide a seamless business process flow, which helps customers be more responsive to client and market demands. It links applications with other applications or e-business servers and supports industry standards, such as XML and EDI.

e-Biz Integrator simplifies the process of connecting applications by providing complex transformations and enrichments that synchronize data between different applications, along with the smart routing of data to systems that require the data.

New Era of Networks adapters are designed to work with off-the-shelf, industry-leading business applications. New Era of Networks has adapters PeopleSoft, SAP R/3 and Siebel, mainframe applications, and specific technologies.

Adapter integration reduces development time. They provide reliable, documented and configurable connections between applications by enabling them to work with e-Biz Integrator™. An adapter development kit (e-ADK ®) is available as part of the integration package for customers that need to integrate a custom application or legacy system.

The Integration Package starts at $100,000 and is available for Windows, Solaris, AIX and HP-UX platforms.

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3.5.3 Sybase Adapters for Siebel, PeopleSoft, and SAP R/3

Updated Sybase adapters offer increased business agility through seamless integration with industry-leading business applications. Sybase adapters provide a no-code approach to integration. Through an intuitive user interface, adapters automate the real-time discovery and population of interface definitions, including application customization.

The upgraded adapters automate the real-time discovery of interface definitions, including application customization. New Era of Networks adapters reduce development time and provide connections between applications. Adapters are designed to be reliable, documented, and configurable.

Customers who utilize IBM MQSeries Integrator and/or IBM WebSphere MQ Integrator benefit from the New Era of Networks adapters. These customers can rapidly transfer information in and out business applications.

The New Era of Networks adapters work with IBM MQSeries Integrator and IBM WebSphere MQ Integrator to predefine integration formats into customized application installations.

The New Era of Networks adapter for Siebel enables the rapid integration of Siebel business applications with a customer existing e-business infrastructure through interfaces.

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3.5.4 Sybase Clinical Gateway Solution

Clinical Gateway solution enables clinicians using a Web browser to view consolidated patient information gathered from multiple hospital systems. This system leverages Web services. Clinical Gateway software increases the accessibility of hospital existing legacy systems, enabling organizations to leverage past technology investments.

Clinical Gateway solution uses a standard Web browser to provide clinicians secure access to a consolidated view of clinical data maintained anywhere within the healthcare enterprise.

A browser-enabled solution simplifies communications with clinicians and eliminates the difficulties of rolling out and maintaining multiple applications. Lab, radiology, respiratory therapy solutions are provided to thousands of user desktops. The delivery of clinical information over the Internet increases clinician productivity by enabling information to be securely accessed by clinicians from anywhere a browser is available, whether it is from home, the office or the hospital.

The clinical gateway solution increases the accessibility of existing legacy systems, enabling organizations to further leverage their technology investments.

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3.5.5 Sybase PowerJ for Tightly Integrated J2EE Development

Sybase seeks to leverage its Web services capabilities with both its database offerings and its development tools. Sybase PowerJ is an integrated environment for application development. PowerJ supports Sybase enterprise portal for complete application and component-level development for the Java 2 enterprise edition platform.

Functionality relates to the automation and simplification of processes associated with building, debugging and deploying applications. PowerJ improves ease of use through user interface improvements, code completion, auto scripting, and to-do lists.

PowerJ increases automation of tedious development tasks. Developers can generate efficient, non-proprietary skeletal code and simplify the processes of building, debugging and deploying e-business applications.

3.5.6 Sybase Rules Templates

The open Biz wizard provides a set of customizable rules templates that allow users to create business rules. Rules are used for routing, transformation, and applying security profiles. Workflows can be designed to manage trading partner relationships.

The architecture enables disparate trading communities to come together into larger communities. Flexibility and scalability of core New Era of Networks technology are offered through the functionality from several proven products.

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Capabilities provide data transport, transformation, content-based routing, event notification, business process management, directory services, message tracking, message repository, authentication, and authorization functionality.

The advantages of an open solution based on Web services protocols relate to permitting trading community partners to do business with each other without installing software, adopting the standards of others, and spending a lot of time and money creating and maintaining special gateways.

3.5.7 Sybase ebXML Interoperability and Collaboration

Sybase is playing a key role in business collaboration work. Technology leaders are in a joint initiative with the United Nation's Centre for Trade Facilitation and the Organization for the Advancement of Structured Information Standards (OASIS).

Proof of concept for ebXML has been offered. EbXML is a global standard to let companies more easily and effectively conduct and automate e-business transactions through XML-based messaging.

Healthcare organization can use ebXML to transport and route communication between a physician and external hospitals and labs to automate patient transactions. When XML has many different versions that are incompatible.

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3.6 Tibco Software

TIBCO Software has positioned Web Services capabilities to enhance its business-to-business (B2B) integration software products. Tibco technology implements real-time e-business infrastructure software.

Table 3-13
Tibco Web Services

Feature	Tibco Active Exchange Product/Component Supporting the Feature
Web Services	
Support for Corba	TIBCO Adapter for CORBA
Support for Java	Tibco adapter SDK supports Java and C++ on Windows NT, HP/UX,
Support for EJB	Also TIBCO Adapter for EJB
Support for C++	Tibco adapter SDK supports Tib Rendezvous
Support for COM	Also TIBCO Adapter for COM
Support for PowerBuilder	not available
GUI for SOAP Administration	TIBCO BusinessConnect
Support XML Elements	Tib Integration, Business Connect, Active Enterprise
Support Arrays	TIBCO BusinessConnect
Support user-defined datatypes	TIBCO BusinessConnect
Support HTTP	TIBCO BusinessConnect
Support HTTPS	TIBCO BusinessConnect
WSDL	
GUI to describe services in WSDL format	TIBCO BusinessWorks
GUI-based WSDL generation	TIBCO BusinessWorks
UDDI	
Publish Business/Service info to UDDI reposit	ActiveExchange B2B
Publish link to WSDL to UDDI repository	ActiveExchange B2B
GUI-based UDDI management	ActiveExchange B2B
Retrieve Business/Service info from UDDI repo	ActiveExchange B2B

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Table 3-13
Tibco Web Services (Continued)

Feature	Tibco Active Exchange Product/Component Supporting the Feature
Web Services	
Data Integration	
	Business Connect Supports the creation and binding of XML documents
XML to Java binding	
Support for XML Schema	Business Connect
Support for EDI	Business Connect
Support for xCBL	Business Connect
Support for cXML	Business Connect
Support for SAP	TIBCO Adapter for SAP
Support for Seibel	TIBCO Adapter for Siebel
Support for PeopleSoft	TIBCO Adapter for Peoplesoft
Support for BroadVision	TIBCO Adapter for Broadvision
Support for JDEdwards	TIBCO Adapter for JD Edwards
Support for Oracle Applications	TIBCO Adapter for Oracle Apps
Support for BizTalk	TIBCO BusinessConnect
Transports Supported with Trading Partners	
HTTP	TIBCO BusinessConnect
HTTPS	TIBCO BusinessConnect
TCP/IP	Also TIBCO BusinessConnect
FTP	Also TIBCO BusinessConnect
SMTP	Also TIBCO BusinessConnect
JMS	Also TIBCO BusinessConnect
EDIINT AS1	TIBCO BusinessConnect
EDIINT AS2	TIBCO BusinessConnect

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Table 3-13
Tibco Web Services (Continued)

Feature	Tibco Active Exchange Product/Component Supporting the Feature
Web Services	
Security	
XML DSIG	TIBCO BusinessConnect supports 56- and 128-bit Secure Sockets Layer (SSL) encryption. For authentication, it utilizes digital signatures, X.509 certificates and Public-Key Infrastructure (PKI). It provides automated sub-processes for the signature and enc
S/MIME	TIBCO BusinessConnect can use either PKCS#7 or S/MIME as envelopes for carrying secure documents, supporting encryption and signing in both formats. Private keys for signing documents can be stored in either PKCS#12 or Entrust Profile. To ensure non-repu
PKI	TIBCO Active Enterprise and strategic partner Entrust Deliver Trusted B2B E-Commerce Solutions bundle Entrust's market-leading security software with its TIBCO ActiveExchange™ B2B e-commerce platform
RSA	not available
Authentication	TIBCO BusinessConnect
Non-repudiation	TIBCO BusinessConnect
Encrypted data compression	

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Table 3-13
Tibco Web Services (Continued)

Feature	Tibco Active Exchange Product/Component Supporting the Feature
Web Services	
Trading Partner Management	
ebXML CPP/CPA	TIBCO BusinessConnect
Web browser interface for "self service"	TIBCO BusinessConnect
ebXML	
Support for ebXML Messaging and Transport	TIBCO BusinessConnect
Support for posting to an ebXML repository	TIBCO BusinessConnect (future)
Support for TPAs (Trading Partner Agreements)	TIBCO BusinessConnect
Business Process Modeling	TIBCO BusinessConnect (future)
BPSS Deployment	TIBCO BusinessConnect
Business Process Engine Support	TIBCO BusinessConnect
Business Process Management	
RosettaNet	
Support for RNIF 1.1	TIBCO BusinessConnect
Support for RNIF 2.0	TIBCO BusinessConnect
Support for RNIF Messaging and Transport	TIBCO BusinessConnect
Support for PIP 1A1	TIBCO BusinessConnect
Support for PIP 1A2	TIBCO BusinessConnect
Support for PIP 1A3	TIBCO BusinessConnect
Support for PIP 1B1	TIBCO BusinessConnect
Support for PIP 1B2	TIBCO BusinessConnect
Support for PIP 1B3	TIBCO BusinessConnect
Support for PIP 2A1	TIBCO BusinessConnect

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3.6.1 TIBCO Information Bus

Tibco data distribution software is the TIB (TIBCO Information Bus). Connectors and adapters go into legacy applications. Tibco seeks to leverage the fact Internet has forever changed the way corporations and employees research and use data.

It is positioning to unlock internal corporate data and delivering it in real time. Employees can access external content. Tibco supports personalized web service with e-business infrastructure software. Portals are being developed leveraging Web services protocols.

3.6.2 Tibco Extensibility

Tibco Extensibility products include client applications XML Authority® and XML Instance™. Companies can integrate web documents and web processes.

Tibco Extensibility XML authority and XML instance give design, management, deployment and processing capability to XML documents. DTDs, XML schemas, instance documents and messages are used to implement Web services.

Tibco customers can embed information transport into the collaboration layer XML-enabled information. Companies treat documents as web processing peers where document-based integration occurs by publishing documents as web services.

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Tibco is using application of XML for Internet-enabled business integration. XML-based technology delivers flexibility and scalability for schema-based web services and web processes.

TIBCO examples of XML-based web services include shipping an overnight order, accessing product information, checking a map, translation and more. Combining these web services provides customers flexibility to offer highly specialized and customized solutions for e-business.

Tibco Extensibility provides an enterprise class platform for the development and deployment of XML-enabled e-business applications. Thousands of customers worldwide are using Turbo XML™, XML Authority™, XML Instance™, XML Console™, and XMLschema.com™ to manage the XML development life cycle for enterprise class initiatives.

The TIBCO Extensibility platform offers enterprises a complete XML infrastructure solution for developing and deploying XML-based business processes. Organizations can now fully leverage the flexibility and portability of XML through use of TIBCO's XML platform comprised of the following solutions illustrated in Table 3-14.

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TABLE 3-14

TIBCO'S XML PLATFORM SOLUTIONS

- TIBCO TurboXML™ for creating and editing XML, schemas and DTDs
- TIBCO XMLValidate™ for validating and processing XML in a run-time environment
- TIBCO XMLTransform™ for mapping and transforming XML documents
- TIBCO XMLCanon/Developer™ for storing, managing and distributing XML asset

Source: WinterGreen Research Inc.

3.6.3 TIBCO TurboXML

TIBCO TurboXML is an Integrated Development Environment (IDE) for developing and managing XML assets. With facilities for creating, validating, converting, and managing XML schemas, XML files and DTDs, TurboXML provides a best-of-class XML implementation platform that combines industry leading XML solutions (XML schema authoring, XML instance editing, and XML project management) into an simple and intuitive IDE. TurboXML, which is currently deployed in thousands of organizations around the world, is the first XML IDE to offer comprehensive support for the latest XML standard - the XML Schema Recommendation.

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3.6.4 TIBCO TurboXML Benefits

Comprehensive XML schema compliance provide significant benefits. In addition to DTD, XDR, SOX, and BizTalk schemas, TurboXML provides an integrated development environment where W3C XML schema recommendation (XSD) can be created, edited, validated, or converted.

XML documents can be created and validated in TurboXML based on schemas. TurboXML also provides facilities for converting older XML Schemas to the latest XML specifications.

3.6.5 TIBCO ActiveExchange Cross-Company Business Processes

TIBCO Software ActiveExchange™ integration software extends the reach to any size organization needing to conduct business over the Internet. E-marketplaces can efficiently connect to all of their trading partners, including vendors and customers by automating their cross-company business processes.

Processes automated include purchase order management, collaborative forecasting, exchanging business documents, and integrating with internal systems over the corporate network or Internet.

TIBCO ActiveExchange complements B2B initiatives. TIBCO supports Ariba Integration Packs and the UDDI Internet standard. An Internet B2B yellow pages is offered

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TIBCO ActiveExchange 2.0 has a modular and distributed design, with four separate products included in the overall solution. These products deliver a variety of new features and enhancements that make it easier to use, allow for faster integration of trading partners into electronic trading networks, and make it easier to implement the program.

The following is a list of the significant enhancements:

TIB/BusinessConnectTM is an industrial-strength B2B server that supports a variety of online data exchange standards such as cXML, ebXML and BizTalk. BusinessConnect comes with eXtensible Mark-up Language (XML) schema management tools and an easy-to-use graphical user interface (GUI) process designer that allow the design and automation of custom cross-company business processes with little or no programming. TIB/BusinessConnect offers broad support for electronic data interchange (EDI).

TIB/BusinessConnect supports the RosettaNet implementation framework (RNIF) as well as all published PIPs.

TIBCO BusinessWorks provides comprehensive support for XML, J2EE, and JMS. With full support for standards such as XML, SOAP, and WSDL, TIBCO BusinessWorks is a solution that enables business integration using Web Services.

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3.7 Vitria Web Services

Vitria Web services product enables application connectivity options. Vitria supports key Web Services standards. These key standards include WSDL (Web Services Definition Language), SOAP (Simple Object Access Protocol) and UDDI (Universal Description, Discovery and integration of business for the Web).

Vitria is a market leader in Web services. Vitria product configuration are illustrated in Table 3-15.

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Table 3-15
Vitria Web Services

	Vitria Businessware B2Bi Server
Feature	Product/Component Supporting the Feature
Web Services	**Web Services support in the BusinessWare platform is scheduled for the end of 2001**
SOAP	BusinessWare platform
SOAP Servlet	BusinessWare platform
SOAP Template Tool	BusinessWare platform
SOAP Client Proxy Tool	BusinessWare platform
Support for Corba	BusinessWare platform
Support for Java	BusinessWare platform
Support for EJB	BusinessWare platform
Support for C++	BusinessWare platform
Support for COM	BusinessWare platform
Support for PowerBuilder	No
GUI for SOAP Administration	BusinessWare B2Bi Server
Support XML Elements	BusinessWare platform
Support Arrays	BusinessWare platform
Support user-defined datatypes	BusinessWare platform
Support HTTP	BusinessWare platform
Support HTTPS	BusinessWare platform
WSDL	
GUI to describe services in WSDL format	Not scheduled
GUI-based WSDL generation	BusinessWare platform
UDDI	
Publish Business/Service info to UDDI repository	Trading Partner Manager, Import/Export capability
Publish link to WSDL to UDDI repository	Not scheduled
GUI-based UDDI management	Trading Partner Manager
Retrieve Business/Service info from UDDI repository	Not scheduled

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Table 3-15
Vitria Web Services (Continued)

	Vitria Businessware B2Bi Server
Feature	Product/Component Supporting the Feature
Data Integration	A comprehensive integration platform must combine Web Services with rich support for managing semantic transformations and business processes to enable universal integration-enabling unlimited application-to-application, partner-to-partner and industry-to-industry systems.
XML to Java binding	DOM/Businessware platform
Support for XML Schema	BusinessWare platform
Support for EDI	BusinessWare platform
Support for xCBL	BusinessWare platform
Support for cXML	BusinessWare platform
Support for SAP	BusinessWare platform
Support for Seibel	BusinessWare platform
Support for PeopleSoft	BusinessWare platform
Support for BroadVision	BusinessWare platform
Support for JDEdwards	BusinessWare platform
Support for Oracle Applications	BusinessWare platform
Support for BizTalk	BusinessWare platform, XML DTD
Transports Supported with Trading Partners	
HTTP	BusinessWare B2Bi Server
HTTPS	BusinessWare B2Bi Server
TCP/IP	BusinessWare B2Bi Server
FTP	BusinessWare B2Bi Server
SMTP	BusinessWare B2Bi Server
JMS	Not Available for Trading Partner transport
EDIINT AS1	Not Available
EDIINT AS2	BusinessWare B2Bi Server (early 2002)

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Table 3-15
Vitria Web Services (Continued)

	Vitria Businessware B2Bi Server
Feature	Product/Component Supporting the Feature
Security	
XML DSIG	Not Available
S/MIME	BusinessWare B2Bi Server
PKI	BusinessWare B2Bi Server
RSA	BusinessWare B2Bi Server
Authentication	BusinessWare B2Bi Server
Non-repudiation	BusinessWare B2Bi Server
Encrypted data compression	Encryption supported, no compression
Trading Partner Management	
ebXML CPP/CPA	Configuration (not import/export)
Web browser interface for "self service"	Yes
ebXML	
Support for ebXML Messaging and Transport	BusinessWare B2Bi Server
Support for posting to an ebXML repository	In progress - involved with the specification
Support for TPAs (Trading Partner Agreements)	BusinessWare B2Bi Server
Business Process Modeling	BusinessWare platform
BPSS Deployment	BusinessWare supports functionally with enhancements planned; B2Bi Server
Business Process Engine Support	BusinessWare platform

Source: WinterGreen Research, Inc.

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3.7.1 Vitria WSDL

WSDL is used to define a web service. Vitria customers are able use WSDL to expose Vitria business process management solutions as Web service to simplify internal integration of applications and external collaboration between partners.

3.7.2 Vitria SOAP

SOAP is used to access a web service. Web Services are designed to simplify the labor-intensive and time-consuming problems in integration, connecting to applications and partners using proprietary interfaces.

If all applications and partners could connect and communicate with each other using a universal standard, such as WSDL and SOAP, then the time and cost of integration could be significantly reduced. But, systems are very different and not easily molded into standards.

3.7.3 Vitria UDDI

UDDI provides a repository for storing Web service definitions. Connectivity and process modeling options continue to be available to Vitria customers who choose not to embrace Web Services.

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3.7.4 Vitria Web Services Promise And Limitations

Vitria has positioned Web services as delivering universal connectivity. By providing a simple, standard interface to any application or trading partner cost of exchanging information electronically has been decreased.

Vitria recognizes that Web services by themselves represent just one piece of the integration puzzle. A comprehensive integration platform must combine Web services with rich support for managing semantic transformations and business processes to enable universal integration-enabling unlimited application-to-application, partner-to-partner and industry-to-industry integration.

3.7.5 Vitria Web Services / Business Process Management

Web services are positioned to accelerate demand for business process management by reducing the time and cost required to connect to and communicate with legacy and packaged applications. Web services are positioned to enable companies to focus on higher-level, higher-value integration activities.

Web services provide a standard interface to application or trading partner functions. Web service may act as an interface to a business function provided by an internal application, CRM or ERP system. The Web service may act as an interface to a business function provided by an external partner.

BPM is still needed to controls and coordinate the execution of a collection of Web services within the context of a business transaction.

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A business process model describes, step-by-step how to process a customer order. Web services used in this process include reusable modules of code that perform a variety of functions.

These functions might be check customer credit; check inventory availability; check price; approve order; ship product; and bill customer. Each Web service is an independent code module that can be called standalone to address a specific business question. The combination of Web services and business process management provides a powerful tool for leveraging information exchange automation. Web services are used to deliver tangible business benefits such as time and cost reductions for transaction processing.

3.7.6 Vitria Standards Participation

Vitria's commitment to Web services standards is indicative of the company's broader commitment to maintain its position as the standards leader in the application integration space. Along with IBM, Microsoft and other major software leaders, Vitria co-submitted the specification for WSDL 1.1 in March of 2001. Vitria is an active member of the W3C's XML protocol working group, working on the SOAP specification, and is also an active member of the UDDI advisory group.

In addition, Vitria is an active participant of the following XML and Web Services-related standards bodies: W3C Advisory Committee, W3C XML Core Working Group, W3C XML Query Working Group, W3C XML Schema Working Group, W3C XSL and XSLT Working Groups and the OASIS Registry and Repository Committee.

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3.7.7 Vitria BusinessWare

Vitria Collaboration Center™ integration applications are built on Vitria server, BusinessWare. They are designed to provide Fortune 1000 and Global 2000 companies with solutions that reduce the time to market and cost of doing business with their trading partners.

Vitria collaboration center applications provide a solution for automating business interactions with a company's trading partners. The product supports a range of partner size, trading volume, and technology infrastructure. Customers can prototype collaborative solutions.

3.7.8 Vitria ebXML E-Business Solutions

XML standard designed to accelerate development and deployment of XML-based ebusiness solutions. Vitria Technology ebusiness platform supports ebXML.

ebXML is designed to facilitate open trade between organizations by enabling XML to be used in a consistent manner to exchange electronic business data. Vitria's support for ebXML enables customers to rapidly develop and deploy ebXML-based ebusiness solutions.

Electronic bonding provides the ability for members to automatically link their business processes over the Internet, enabling automatic, system-to-system exchange of business information and transactions in real time. Vitria's BusinessWare provided the basis for a successful demonstration of ebXML-based electronic bonding between two businesses' back office systems.

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The prototype was a joint effort by Vitria and Sun Microsystems, presented to experts from around the world who convened to address progress on Java platform-based global electronic business infrastructure technologies, including the ebXML initiative's 18-month charter for a technical framework that will enable XML (Extensible Markup Language) to be utilized in a consistent manner.

ebXML aligns with a vision of a fluid, seamlessly inter-connected network of exchanges, hubs and trading partners that enable new business relationships to be formed and changed, on demand, in response to constantly shifting market conditions.

Vitria's ebusiness platform is designed to support standards such as ebXML and RosettaNet.

3.7.9 BusinessWare B2Bi Server

BusinessWare B2Bi server product line provides a set of open, standard-based applications and platform services for enterprises. Services are designed to extend existing business relationships to the Web.

Business-benefit is derived from process integration. Scalable architecture and secure, reliable interconnection allows Global 2000 businesses to address the sophisticated interactions necessary to maintain the collaborative relationships in the B2B environment.

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The product line supports over 4,000 existing EDI transaction sets, as well as new XML standards including Rosettanet 2.0, cXML and xCBL. By integrating with existing infrastructure investment, BusinessWare B2Bi server delivers rapid deployment and fast partner ramp-up. Reduced transaction costs, leaner inventory levels, and faster time to market are system benefits.

3.7.10 Vitria EDI

Vitria supports EDI to permit companies to leverage existing infrastructure investment. The predominant vehicle for B2B ecommerce is EDI, which handles a majority of the dollar value of inter-company electronic non-banking transactions.

Using the BusinessWare EDI Module, enterprises are able to automatically translate, transform, and automate data from their systems. As a part of the end-to-end integration solutions EDI needs to be supported. By doing so, Global 2000 companies with significant EDI investments can incorporate trading partners who may only be using XML.

3.7.11 Managing Collaboration and Interactions

The BusinessWare B2Bi server product line supports large-scale B2B interactions. It provides key functionalities to manage the interaction among the B2B participants in a private and controlled manner.

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All of the validating, logging, securing, and handling of messages is automated and stored in the federated architecture. This ensures non-repudiation in the process. Sophisticated interaction models mirror the existing processes.

3.8 IONA Integration Solutions

Iona's Orbix E2A application server platform provides an e-business platform. Iona is a provider for Web services integration. JBean is a Java 2, Enterprise Edition (J2EE™) compliant adapter that allows seamless and highly scalable access to BEA middleware products.

Web services support a co-existence strategy that integrates existing back-end applications with new Java and EJB technologies. Web services are positioned to leverage the existing infrastructure they have in place for Java and EJB e-business applications.

Iona Web services capabilities are illustrated in Table 3-16.

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Table 3-16
IONA Web Services

Feature	IONA B2B Integrator Product/Component Supporting the Feature
Web Services	CORBA infrastructure, including IIOP, while SOAP provides the mechanism for exporting the enterprise's external view. Recognizes technologies that have gone before Web Services, such as COM, CORBA, MOM, and J2EE Web Services requires a looser coupling and coarser granularity than CORBA or EJB. CORBA objects and EJBs supply the implementations for web services. Without them, users have no web services. Business processes alone do not support B2Bi. Infrastructure and service implementations are where a number of current B2Bi companies fall short. They provide tools that support business processes and XML document creation, but they do not support a full spectrum of services.

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Table 3-16
IONA Web Services

	IONA B2B Integrator
Feature	Product/Component Supporting the Feature
Web Services	CORBA infrastructure, including IIOP, SOAP provides the mechanism for exporting the enterprise's external view. Recognizes technologies that have gone before Web Services, such as COM, CORBA, MOM, and J2EE Web Services requires a looser coupling and coarser granularity than CORBA or EJB. CORBA objects and EJBs supply the implementations for web services. Without them, you have no web services. Business processes alone do not support B2Bi.

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Table 3-16 IONA Web Services (Continued)

	IONA B2B Integrator
SOAP	IONA is a co-submitter of SOAP V1.1 to the World Wide Web Consortium (W3C) and we will be actively contributing to the SOAP standardization activity IONA XMLBus (http://www.xmlbus.com/), that allow users to get started with Web Services by exposing Java objects through SOAP and WSDL interfaces. By themselves, these toolkits are intended to ease users into the Web Services development space by allowing independent application development.

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Table 3-16
IONA Web Services (Continued)

	IONA B2B Integrator
SOAP Servlet	IONA XMLBus
SOAP Template Tool	IONA XMLBus
SOAP Client Proxy Tool	IONA XMLBus
Support for Corba	IONA XMLBus SOAP's object model independent allows CORBA based applications to easily communicate with COM and EJB based applications across the Internet, using existing Internet infrastructure. SOAP is immature compared to CORBA and IIOP

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Table 3-16
IONA Web Services (Continued)

	IONA B2B Integrator
Support for Java	IONA XMLBus any SOAP messages sent by the client to contact the CORBA target object, be it service-oriented or session-oriented, must be able to represent the full range of IDL types used by the target's interface.
Support for EJB	IONA XMLBus CORBA-based EJB (that is, J2EE) continuing to be vital for any enterprise's internal computing infrastructure.
Support for C++	iPortal Suite, which includes Orbix 2000 for C++ and Java, the EJB/J2EE-based iPortal Application Server,
Support for COM	IONA XMLBus
Support for PowerBuilder	not available
GUI for SOAP Administration	IONA XMLBus
Support XML Elements	IONA XMLBus
Support Arrays	not available
Support user-defined datatypes	IONA XMLBus
Support HTTP	IONA XMLBus
Support HTTPS	

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Table 3-16
IONA Web Services (Continued)

	IONA B2B Integrator
WSDL	WSDL spec describes how to map messages and operations to SOAP 1.1, HTTP GET/POST, and MIME. WSDL creates web service definitions by mapping a group of endpoints into a logical sequence of operations on XML messages WSDL also describes the locale of the service location within it. IDL describes an implementation interface, but does not specify anything about where the service actually exists.
GUI to describe services in WSDL format	IONA XMLBus IONA B2B Integrator
GUI-based WSDL generation	IONA XMLBus IONA B2B Integrator
UDDI	
Publish Business/Service info to UDDI repository	IONA XMLBus IONA B2B Integrator
Publish link to WSDL to UDDI repository	IONA XMLBus IONA B2B Integrator
GUI-based UDDI management	IONA XMLBus IONA B2B Integrator
Retrieve Business/Service info from UDDI repository	IONA XMLBus IONA B2B Integrator

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Table 3-16
IONA Web Services (Continued)

	IONA B2B Integrator
Data Integration	Powerful line of adapters provide tight integration with a wide range of business applications from SAP, Oracle, Baan, JD Edwards and other ERP, EAI and EDI systems
XML to Java binding	iPortal Application Server
Support for XML Schema	iPortal Application Server
Support for EDI	IONA XMLBus IONA B2B Integrator
Support for xCBL	Netfish XDI eProcess™ platform
Support for cXML	Netfish XDI eProcess™ platform
Support for SAP	Netfish XDI eProcess™ platform
Support for Seibel	Netfish XDI eProcess™ platform
Support for PeopleSoft	Netfish XDI eProcess™ platform
Support for BroadVision	Netfish XDI eProcess™ platform
Support for JDEdwards	Netfish XDI eProcess™ platform
Support for Oracle Applications	Netfish XDI eProcess™ platform
Support for BizTalk	Netfish XDI eProcess™ platform

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Table 3-16
IONA Web Services (Continued)

	IONA B2B Integrator
Transports Supported with Trading Partners	Many similarities between ebXML and SOAP/WSDL/UDDI, and some level of convergence is already taking place with the recent adoption of SOAP in the ebXML transport specification
HTTP	IONA B2B Integrator
HTTPS	iPortal Application Server
	Orbix Java provides automatic built-in support for Wonderwall
TCP/IP	iPortal Application Server
FTP	iPortal Application Server
SMTP	Orbix Java provides automatic built-in support for Wonderwall
JMS	iPortal Application Server
EDIINT AS1	not supported
EDIINT AS2	*ONA B2B Integrator™ Supports Advanced Business Process Collaboration with Net Market and Trading Network Functionality to Extend Total Business Integration*

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Table 3-16
IONA Web Services (Continued)

	IONA B2B Integrator
Security	
XML DSIG	not available
S/MIME	iPortal Application Server
PKI	iPortal Application Server
RSA	iPortal Application Server
Authentication	not available
Non-repudiation	Orbix E2a
Encrypted data compression	not available
Trading Partner Management	
ebXML CPP/CPA	IONA Search Engine use of C++
Web browser interface for "self service"	not available
ebXML	Many similarities between ebXML and SOAP/WSDL/UDDI, and some level of convergence is already taking place with the recent adoption of SOAP in the ebXML transport specification
	ONA has contributed to all ebXML standards efforts for the past 18 months and is very excited about the rapid evolution of ebXML specifications
	IONA XMLBus
Support for ebXML Messaging and Transport	IONA Suite
Support for posting to an ebXML repository	IONA Suite
Support for TPAs (Trading Partner Agreements)	IONA Suite, Center for Advanced Service Provisioning (CPSA), an environment based on the underlying protocol of CORBA

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Table 3-16
IONA Web Services (Continued)

	IONA B2B Integrator
Business Process Modeling	Not supported
BPSS Deployment	Not supported
Business Process Engine Support	iPortal Application Server™
Business Process Management	Compaq Partner
RosettaNet	
Support for RNIF 1.1	not supported
Support for RNIF 2.0	Netfish Technologies, XDI™ family of products
Support for RNIF Messaging and Transport	Netfish Technologies, XDI™ family of products

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3.8.1 Orbix E2A Product Lines

The Orbix E2A Web services integration platform combines business-to-business, enterprise integration, and application development functionality. It is built on Web services standards and a service-oriented architecture to cut the cost of application integration both inside and outside the firewall.

The Orbix E2A Web services integration platform provides the tools and the management services required for reliable, scalable, and secure dynamic data exchange, business process automation, and composite applications. The Orbix E2A Web services integration platform supports: XML, partner and collaboration versions.

The Orbix E2A application server platform combines the scalability of CORBA and the productivity of J2EE. With Web services, standards and integration adapters are used for the most widely used platforms and applications. The Orbix E2A application server platform provides the management services required for reliable, scalable, and secure applications.

3.8.2 IONA Orbix E2A Web Services Integration Solutions

Iona offers a Web services integration platform that is positioned to dramatically improve business efficiency and ROI. Iona Web services integration solutions enable customers to create, connect and manage solutions that relate to their information assets.

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Iona Orbix E2A allows complex Web services applications to be built because it solves the problem of back-end integration and transaction integrity. It provides a means to construct Web services in the framework of a business process that aligns with key business goals.

Organizations that have mixed IT environments depend on disparate technologies that inhibit operational flexibility. Orbix enables the integration of these technologies and the creation of reusable services and flexible applications, freeing information assets to be used through standard Internet protocols.

Web services are at the heart of Orbix E2A. This enables Orbix E2A customers to deploy Web services integration solutions at the higher-value application and business process levels, as well as the lightweight component level supported by vendors of application servers and toolkits.

Orbix E2A offers comprehensive support for languages, platforms and standards. A choice of platforms is available for Web services based on J2EE, .NET and CORBA technologies. Orbix E2A's broad language support enables organizations to generate return from their existing assets.

The Orbix E2A Application Server platforms pricing starts at $495 per development license and sells for $2,500 per CPU for a deployment license. License pricing varies by edition. IONA Orbix E2A Web services integration platform is positioned for multi-channel applications.

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3.8.3 IONA Web Technologies

IONA Web technologies target consumer applications. Integration speeds the order fulfillment process times. Real-time authorization and order fulfillment are supported. IONA e-business platform is a key component in multi-channel integration. Web services integration platform connect operational systems with Web-based applications.

This integration makes balance information accessible at a .com site, as well as providing customers the opportunity to purchase online. Integration platform lets customers package business processes as Web services that use the Internet as a bridge to connect independent applications.

3.9 WebMethods Web Services Capabilities

webMethods platform combines end-to-end integration capabilities with Web services support. WebMethods Web services solutions are positioned to provide customers with the capability to integrate, manage, and maintain enterprise class e-business services.

This functionality is available in an integration platform. The webMethods platform provides a solution for linking business processes, enterprise systems, legacy systems, databases, and workflow software across applications.

The webMethods Web services address issues associated with enterprise-class deployments. Web services work as part of an enterprise business process management environment. The ability to guarantee compliance with service level obligations between providers and subscribers is supported.

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Support for emerging protocols such as SOAP and WSDL is provided in the context of established data format and commerce standards.

WebMethods Web services are illustrated in Table 3-17 following.

Table 3-17
WebMethods Web Services

	webMethods Integration Server
Feature	Product/Component Supporting the Feature
Web Services	WebMethods is basically an XML company webMethods integration platform provides extensive support for al integration-related components of the J2EE specification including J2EE Connector Architecture (JCA), JMS and EJB.
SOAP	just announced in Sept 01 webMethods worked with industry leaders to define the early specifications for SOAP and was a co-submitter of SOAP 1.1.

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Table 3-17
WebMethods Web Services (Continued)

	webMethods Integration Server	
Feature	Product/Component Supporting the Feature	
SOAP Servlet	Available	
SOAP Template Tool	Available	
SOAP Client Proxy Tool	Available	
Support for Corba	Available	
Support for Java	Available	
Support for EJB	Available	
Support for C++	Available	
Support for COM	Available	
Support for PowerBuilder	Available	
GUI for SOAP Administration	Available	
Support XML Elements	Available	
Support Arrays	Available	Supported as a core platform capability
Support user-defined datatypes	Available	Supported as a core platform capability
Support HTTP	Available	Supported as a core platform capability
Support HTTPS	Available	Supported as a core platform capability
WSDL		
GUI to describe services in WSDL format		User can edit WSDL file using external editors.
GUI-based WSDL generation	Available	Supported as a core platform capability. GUI wizard to generate WSDL file for any integration service.

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Table 3-17
WebMethods Web Services (Continued)

	webMethods Integration Server
Feature	Product/Component Supporting the Feature
UDDI	
Publish Business/Service info to UDDI repository	WebMehtods does not provide UDDI client support directly from webMethods Developer. webMethods users can interact with UDDI registries using the Web browser to import and export WSDL files. The UDDI registry layout is fairly difficult to navigate. The We

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Table 3-17 (Continued)
WebMethods Web Services

	webMethods Integration Server
Feature	Product/Component Supporting the Feature
Publish link to WSDL to UDDI repository	
GUI-based UDDI management	
Retrieve Business/Service info from UDDI repository	
Data Integration	
	webMethods provides an integration platform that leverages the Siebel 7 Smart Web Architecture, enabling customers to link their Siebel eBusiness Applications to back-end ERP applications from vendors such as SAP, i2, Oracle and People Soft,
XML to Java binding	webMethods integration platform
Support for XML Schema	webMethods integration platform
Support for EDI	webMethods integration platform
Support for xCBL	webMethods integration platform
Support for cXML	webMethods integration platform
Support for SAP	webMethods integration platform

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Table 3-17
WebMethods Web Services (Continued)

	webMethods Integration Server
Feature	Product/Component Supporting the Feature
Support for Seibel	webMethods integration platform WebMethods ties into Siebel Smart Web Architecture combines a zero-footprint, browser-based Web client and a user interface with levels of interactivity and usability traditionally available only in Windows applications.
Support for PeopleSoft	webMethods integration platform
Support for BroadVision	webMethods integration platform
Support for JDEdwards	webMethods integration platform
Support for Oracle Applications	webMethods integration platform
Support for BizTalk	webMethods integration platform
	webMethods is the common integration platform for the entire i2 product line, TradeMatrix.

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Table 3-17
WebMethods Web Services (Continued)

	webMethods Integration Server	
Feature	Product/Component Supporting the Feature	
Transports Supported with Trading Partners		
HTTP	webMethods integration platform	
HTTPS	webMethods integration platform	
TCP/IP	webMethods integration platform	
FTP	webMethods integration platform	
SMTP	webMethods integration platform	
JMS	webMethods integration platform	
EDIINT AS1	Available	AS1 uses SMTP as the transport (vs. AS2 uses HTTP/S, a more secure and realtime link).
EDIINT AS2	webMethods integration platform	webMethods is one of the very few companies that have undergone the official interoperability testing on AS2 and is certified.

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Table 3-17
WebMethods Web Services (Continued)

	webMethods Integration Server	
Feature	Product/Component Supporting the Feature	
Security	webMethods co-authored the XKMS web services security standard built upon WSDL and SOAP	
XML DSIG	webMethods integration platform	
S/MIME	webMethods integration platform	
PKI	Available	Capabilities including built-in X.509 certificates and pluggable authentication
RSA	webMethods integration platform	
Authentication	Available	webMethods integration platform using X.509 certificates or username/password
Non-repudiation	Available	
Encrypted data compression	Not available	Encrypted data cannot be compressed.

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Table 3-17
WebMethods Web Services (Continued)

	webMethods Integration Server	
Feature	Product/Component Supporting the Feature	
Trading Partner Management	also supports CIDX	
ebXML CPP/CPA	webMethods integration platform	
Web browser interface for "self service"	webMethods integration platform	
ebXML	Global Business Visibility workbench	
Support for ebXML Messaging and Transport	webMethods integration platform	
Support for posting to an ebXML repository	webMethods integration platform	
Support for TPAs (Trading Partner Agreements)	webMethods integration platform	
Business Process Modeling	webMethods integration platform	
BPSS Deployment		
Business Process Engine Support	webMethods integration platform	webMethods integration platform: UML-based support

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Table 3-17
WebMethods Web Services (Continued)

	webMethods Integration Server	
Feature	Product/Component Supporting the Feature	
Business Process Management	webMethods provides the most complete, centrally managed Business Process Modeling capability.	webMethods provides the most complete, centrally managed Business Process Modeling capability, which combined with Process Monitoring / Analytics Solutions, provide total Business Process Management
RosettaNet	one of the early members of RosettaNet, webMethods more than 40 companies have licensed webMethods' RosettaNet solution	one of the early members of RosettaNet, webMethods solution also support CIDX (Chem standards)
Support for RNIF 1.1	webMethods integration platform	
Support for RNIF 2.0	webMethods integration platform	
Support for RNIF Messaging and Transport	webMethods integration platform	
Support for PIP 1A1	webMethods integration platform	
Support for PIP 1A2	webMethods integration platform	
Support for PIP 1A3	Not published yet by RosettaNet	
Support for PIP 1B1	webMethods integration platform	
Support for PIP 1B2	Not published yet by RosettaNet	
Support for PIP 1B3	Not published yet by RosettaNet	

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Table 3-17
WebMethods Web Services (Continued)

	webMethods Integration Server	
Feature	Product/Component Supporting the Feature	
Support for PIP 2A1	webMethods integration platform	
Support for PIP 2A2	webMethods integration platform	
Support for PIP 2A3	webMethods integration platform	
Support for PIP 2A4	webMethods integration platform	
Support for PIP 2A5	webMethods integration platform	
Support for PIP 2A6	webMethods integration platform	
Support for PIP 2A7	webMethods integration platform	
Support for PIP 2A8	webMethods integration platform	
Support for PIP 2A9	webMethods integration platform	
Support for PIP 2B1	webMethods integration platform	
Support for PIP 2B2	webMethods integration platform	

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Table 3-17
WebMethods Web Services (Continued)

	webMethods Integration Server	
Feature	Product/Component Supporting the Feature	
Support for PIP 2B3	webMethods integration platform	
Support for PIP 2B4	webMethods integration platform	
Support for PIP 2B5	webMethods integration platform	
Support for PIP 2B6	Not published yet by RosettaNet	
Support for PIP 2B7	Not published yet by RosettaNet	
Support for PIP 2B8	Not published yet by RosettaNet	
Support for PIP 2B9	Not published yet by RosettaNet	
Support for PIP 2B10	Not published yet by RosettaNet	
Support for PIP 2B11	Not published yet by RosettaNet	
Support for PIP 2C1	webMethods integration platform	

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Table 3-17
WebMethods Web Services (Continued)

	webMethods Integration Server	
Feature	Product/Component Supporting the Feature	
Support for PIP 2C2	webMethods integration platform	
Support for PIP 2C3	webMethods integration platform	
Support for PIP 2C4	webMethods integration platform	
Support for PIP 2C5	webMethods integration platform	
Support for PIP 2C6	webMethods integration platform	
Support for PIP 3A1	webMethods integration platform	
Support for PIP 3A2	webMethods integration platform	
Support for PIP 3A3	webMethods integration platform	
Support for PIP 3A4	webMethods integration platform	
Support for PIP 3A5	webMethods integration platform	

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WebMethods Web Services (Continued)

	webMethods Integration Server	
Feature	Product/Component Supporting the Feature	
Support for PIP 3A6	webMethods integration platform	
Support for PIP 3A7	webMethods integration platform	
Support for PIP 3A8	webMethods integration platform	
Support for PIP 3A9	webMethods integration platform	
Support for PIP 3B1	webMethods integration platform	
Support for PIP 3B2	webMethods integration platform	
Support for PIP 3B3	webMethods integration platform	

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Table 3-17
WebMethods Web Services (Continued)

	webMethods Integration Server	
Feature	Product/Component Supporting the Feature	
Support for PIP 3B4	webMethods integration platform	
Support for PIP 3B5	webMethods integration platform	
Support for PIP 3B6	webMethods integration platform	
Support for PIP 3B7	Not published yet by RosettaNet	
Support for PIP 3B8	Not published yet by RosettaNet	
Support for PIP 3B9	Not published yet by RosettaNet	
Support for PIP 3B10	Not published yet by RosettaNet	
Support for PIP 3C1	Not published yet by RosettaNet	

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Table 3-17
WebMethods Web Services (Continued)

	webMethods Integration Server	
Feature	Product/Component Supporting the Feature	
Support for PIP 3C2	webMethods integration platform	
Support for PIP 3C3	webMethods integration platform	
Support for PIP 3C4	webMethods integration platform	
Support for PIP 3C5	webMethods integration platform	
Support for PIP 3C6	webMethods integration platform	
Support for PIP 3D1	Not published yet by RosettaNet	
Support for PIP 3D2	Not published yet by RosettaNet	
Support for PIP 3D3	Not published yet by RosettaNet	
Support for PIP 3D4	Not published yet by RosettaNet	
Support for PIP 3D5	Not published yet by RosettaNet	
Support for PIP 3D6	Not published yet by RosettaNet	

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WebMethods Web Services (Continued)

	webMethods Integration Server	
Feature	Product/Component Supporting the Feature	
Support for PIP 3D7	Not published yet by RosettaNet	
Support for PIP 3D8	webMethods integration platform	
Support for PIP 3D9	webMethods integration platform	
Support for PIP 3D10	Not published yet by RosettaNet	
Support for PIP 3D11	Not published yet by RosettaNet	
Support for PIP 3D12	Superceded by 2C2	
Support for PIP 3D13	Superceded by 2C3	
Support for PIP 3D14	Superceded by 2C4	
Support for PIP 3D15	Superceded by 2C5	
Support for PIP 3D16	Superceded by 2C6	
Support for PIP 4A1	webMethods integration platform	
Support for PIP 4A2	webMethods integration platform	
Support for PIP 4A3	webMethods integration platform	
Support for PIP 4A4	webMethods integration platform	
Support for PIP 4A5	webMethods integration platform	
Support for PIP 4B1	Not published yet by RosettaNet	

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Table 3-17
WebMethods Web Services (Continued)

	webMethods Integration Server	
Feature	Product/Component Supporting the Feature	
Support for PIP 4B2	webMethods integration platform	
Support for PIP 4B3	Not published yet by RosettaNet	
Support for PIP 4B4	Not published yet by RosettaNet	
Support for PIP 4C1	webMethods integration platform	
Support for PIP 4C2	Not published yet by RosettaNet	
Support for PIP 4C3	Not published yet by RosettaNet	
Support for PIP 4C4	Not published yet by RosettaNet	
Support for PIP 4D1	Not published yet by RosettaNet	
Support for PIP 4E1	Not published yet by RosettaNet	
Support for PIP 4E2	Not published yet by RosettaNet	
Support for PIP 4E3	Not published yet by RosettaNet	
Support for PIP 4E4	Not published yet by RosettaNet	
Support for PIP 4E5	Not published yet by RosettaNet	

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Table 3-17
WebMethods Web Services (Continued)

	webMethods Integration Server	
Feature	Product/Component Supporting the Feature	
Support for PIP 4E6	Not published yet by RosettaNet	
Support for PIP 4F1	Not published yet by RosettaNet	
Support for PIP 4F2	Not published yet by RosettaNet	
Support for PIP 4F3	Not published yet by RosettaNet	
Support for PIP 4F4	Not published yet by RosettaNet	
Support for PIP 4F5	Not published yet by RosettaNet	
Support for PIP 5A1	Not published yet by RosettaNet	
Support for PIP 5A2	Not published yet by RosettaNet	
Support for PIP 5A3	Not published yet by RosettaNet	
Support for PIP 5B1	Not published yet by RosettaNet	
Support for PIP 5B2	Not published yet by RosettaNet	

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Table 3-17
WebMethods Web Services (Continued)

	webMethods Integration Server	
Feature	Product/Component Supporting the Feature	
Support for PIP 5B3	Not published yet by RosettaNet	
Support for PIP 5B4	Not published yet by RosettaNet	
Support for PIP 5B5	Not published yet by RosettaNet	
Support for PIP 5B6	Not published yet by RosettaNet	
Support for PIP 5C1	webMethods integration platform	
Support for PIP 5C2	webMethods integration platform	
Support for PIP 5C3	webMethods integration platform	
Support for PIP 5C4	webMethods integration platform	
Support for PIP 5C5	webMethods integration platform	
Support for PIP 5D1	webMethods integration platform	

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Table 3-17
WebMethods Web Services (Continued)

	webMethods Integration Server	
Feature	Product/Component Supporting the Feature	
Support for PIP 5D2	webMethods integration platform	
Support for PIP 5D3	webMethods integration platform	
Support for PIP 5D4	webMethods integration platform	
Support for PIP 5D5	webMethods integration platform	
Support for PIP 5D6	webMethods integration platform	
Support for PIP 6A1	Not published yet by RosettaNet	
Support for PIP 6C1	Not published yet by RosettaNet	
Support for PIP 6C2	Not published yet by RosettaNet	

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Table 3-17
WebMethods Web Services (Continued)

	webMethods Integration Server	
Feature	Product/Component Supporting the Feature	
Support for PIP 6C3	Not published yet by RosettaNet	
Support for PIP 6C4	Not published yet by RosettaNet	
Support for PIP 6C5	Not published yet by RosettaNet	
Support for PIP 6C6	Not published yet by RosettaNet	

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3.9.1 webMethods Enhancement Of Web Services

webMethods platform addresses the requirement of combining Web services capabilities with business process management. Organizations can model, execute and manage enterprise business processes as part of a comprehensive integration solution. Connecting applications, customers, and suppliers to provide end-to-end transactional integrity, security and reliability across the enterprise.

webMethods implementation of its Web Services capabilities is influenced by the need to include resources as an element of the overall business process. The webMethods enterprise Web Services business process system provides the ability to track the flow of a business process across the full range of enterprise resources—from packaged applications to legacy systems to databases to Web Services.

The single process context allows webMethods platform to provide transactional integrity across disparate elements. Services guarantee compliance with negotiated service level agreements via the open interface management (OMI) specification. Providers can proactively manage Web Services transactions and processes, tracking performance, quality of service, transaction volume, and a variety of business operation metrics.

Subscribers can audit performance as if it was an internal resource. The OMI standard was co-authored by webMethods and Hewlett Packard. It allows companies to achieve interoperability between systems management and integration software. BMC, Computer Associates and Tivoli have endorsed this standard

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3.9.2 WebMethods Web Service Key Standards

Web Services depends on base support for emerging standards, including SOAP, WSDL and XKMS. webMethods has pioneering leadership in XML. It has support for proven and widely deployed data formatting and commerce standards.

Although many Web Services standards have evolved as pure XML-based solutions, such as SOAP and WSDL, these standards are insufficient by themselves to meet the practical requirements of many enterprises. To ensure that business partners can quickly and successfully access Web Services, regardless of technology infrastructure, webMethods supports these standards.

WebMethods Web Service key standards for customers permit them to leverage EDI, Oracle ERP, SAP, Baan, CORBA IDL, HIPAA, etc. for Web Services transactions. Web Services provide real solutions focus on the reality of the problems businesses are trying to solve. Web services are part of a comprehensive business process. It ensures the performance of that Web service using systems management technology.

3.9.3 Benefits of webMethods Web Services Solution

WebMethods platform enables customers to quickly adapt their existing business applications and processes to Web Services. Development cost and time are minimized. Existing infrastructure is left in place.

The platform provides functionality for customers to connect to Web Services. Web Services are graphically configured, and can be created in minutes.

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Third-party business service providers can be brought into trading networks to facilitate business processes. This approach increases competitive advantage by allowing companies to focus on core competencies. Open systems support evolving Web Services standards by providing a stable, development environment. Regular product upgrades support best practices.

3.10 Microsoft .net

Microsoft .net initiative represents one of the basic driving forces for Web enablement. Java from Sun Microsystems is the competing force. Web services represent a way to bridge the gap between these two systems. However, Microsoft is committed to proprietary solutions. COM users can talk only to Microsoft platforms.

3.10.1 Microsoft BizTalk Web Services

Microsoft BizTalk Web services elements include XML as the message format. BizTalk is completely structured around XML. It uses a SOAP XML message format. The BizTalk XML message is a SOAP XML message with additional biztags to comply with the framework specification.

BizTalk is a framework specification. Any language can be used to implement a server as long as it complies with the framework. A BizTalk message can be received by an Active Server Page or message queue and forwarded to a running BizTalk server via BizTalk messaging manager.

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A message can be sent directly to a compiled orchestration schedule. A complex logic system provides a high-level means of orchestrating a middleware system moving parts. Those moving parts can take the form of a message queue, COM component, BizTalk channel, file, e-mail message, or HTTP-based service. Long-running, loosely coupled business processes may be implemented. COM or Web development can be achieved by using the designer in Visio to lay out the business flow.

3.10.2 Microsoft Support For Creating a Highly Available Web

Web-based applications are used to host applications on a flexible platform that provides scalability, reliability, and availability. Clustering technologies can satisfy these needs, providing a solid infrastructure on which to deploy demanding Web applications.

Microsoft® provides different types of clustering technologies for specific situations. A server cluster running the service provides failover capability for software services.

Network load balancing provides the means to distribute workloads for TCP/IP protocol services such as HTTP and lightweight directory access protocol (LDAP). Multiple servers increase throughput and availability. High availability is implemented with a multi-server Web services hosting site. These features are implemented to permit withstanding hardware or software outages that occur on the site individual servers.

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Outages can be planned or unplanned. A planned outage is taking a server down for maintenance to perform a software update. The rest of the site stays online providing service to users.

An unplanned outage is a catastrophic server failure. The rest of the site stays online providing service to users because the processes that were providing data services for the site failed over to the remaining server clusters during the server failure. The architecture is designed to both protect the data of such a Web site and to keep the site up and running.

3.10.3 Microsoft Component Object Model

The Microsoft component object model (COM) was created as the fundamental technology for document integration technology. COM has several names OLE, OCX, ActiveX, DCOM, or COM+.

COM has many of the same limitations as CORBA. Like CORBA, COM is complex to implement independently. If users commit to COM, they commit to one of the Microsoft platforms. This means that with COM, users can talk only to Microsoft platforms.

3.11 Sun Microsystems Java

Sun Microsystems Java is positioned to support open systems. Java programming language is the most visible part. The Java virtual machine (JVM) is central to this technology.

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JVM is a software-based virtual CPU that executes a special command-set, called bytecode. JVM is designed to be implemented on top of existing platforms. Java programs can be moved between those platforms without changes.

The quality of Java applications depends on the underlying virtual machine and its capabilities. The Java model makes services available to a Java application written in Java.

The software is designed to leverage the power and features of the underlying operating environment, like the high volume transaction capabilities of IBM's OS/390 or the scalability of Sun Solaris platform. Java applications need to make direct calls into the underlying platform using Java's raw native interface bridging technology.

3.12 Cape Clear Software

CapeConnect is positioned to integrate Microsoft .net and Java technologies. By exposing Java and CORBA systems as Web services, they can be accessed from .NET clients. Cape Clear products enable Java clients to access .NET servers. This integration method is designed to work across corporate firewalls, making it a solution for linking ASP-based web sites to Java-based enterprise systems.

CapeConnect is used to deploy Web Services from IBM WebSphere Application Server. SOAP and UDDI are used to build applications that interoperate over the Internet with other Web Services regardless of their platform and language.

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CapeConnect Three is a Web Services platform that provides tools for building Web sites. Services support communication via e-mail, a UDDI registry, and improved ease-of-use in deploying Web Services. CapeConnect Three supports Web services is built on diverse platforms, including leading J2EE application servers, Microsoft .NET, and CORBA.

3.12.1 CapeConnect SOAP

CapeConnect is a scalable XML and SOAP-based distributed computing architecture. The Web service platform enables use of SOAP in a distributed computing environment. Enabling components for SOAP means that they can be published on the Internet and accessed by anyone with the right authorizations. An HTTP-compliant client browser can access the information.

Deploying SOAP depends on developers having expertise in XML, distributed object technology, and HTTP. SOAPDirect provides developers with a solution for traversing firewalls between multiple heterogeneous systems located anywhere.

SOAP does not include any specific security protocols. CapeConnect can be used as the secure central point in a distributed computing environment based on XML and SOAP.

Web Services implement a design center for applications. Web Services use a UDDI registry for management. CapeConnect provides a solution that addresses the challenge of integrating a Microsoft COM-based Web site with a Java-based customer management system.

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Cape Clear Web services platform provides in-built support for WebLogic, WebSphere and iPlanet. The company supports major CORBA products such as WebLogic Enteprise, Visibroker, Orbix, and.NET. CapeConnect is installed pointing to an app server. It provides Web Services interfaces for EJBs and JavaScripts.

It works on a message level, so when a message leaves the app server CapeConnect provides it with a SOAP interface and allows it to communicate directly with other Web Services.

3.12.2 Scalability

CapeConnect is built on stateless or connectionless protocols such as HTTP, HTTPS, and SMTP. CapeConnect can be clustered using existing IP-based load balancing hardware, such as a Cisco local director solution.

CapeConnect invokes EJB or CORBA components by invoking methods on the stubs generated by the specific application server, rather than talking RMI or IIOP directly. The advantage of this approach is that the systemcan leverage smart proxies and automatically get the full benefit of any load-balancing and fail-over features supported by the back-end application server.

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3.12.3 J2EE Integration

CapeConnect can be used to expose EJB components as Web Services. CapeConnect introspects the EJB JAR file and deployment descriptor and generates WSDL for all stateless session beans within that JAR file. At runtime, CapeConnect translates SOAP requests into invocations against the back-end EJB component.

3.12.4 CORBA Integration

CapeConnect can be used to expose new and existing CORBA components as Web Services. CapeConnect takes CORBA IDL as input and generates WSDL for each service. At runtime, CapeConnect translates SOAP requests into invocations against the back-end CORBA component.

3.13 Fujitsu Java and Component Application

Fujitsu has positioned its application server to provide Web services.

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3.13.1 Fujitsu INTERSTAGE Application Server

INTERSTAGE application server is an application platform that can respond to the diverse needs of e-business. It provides a highly productive and reliable environment for the construction of business systems used on the Web.

INTERSTAGE application server is being used in many of the latest business systems such as Internet banking, mobile banking, and online shopping. INTERSTAGE application server is available as Web-J Edition (WJ), Standard Edition (SE), and Enterprise Edition (EE).

It is positioned to access a wide range of electronic commerce solutions, from small-scale systems using Web applications through to mission-critical and financial systems that must operate non-stop and service multiple clients simultaneously. Large systems are designed to operate with a high degree of reliability and performance. The main features of Web edition of INTERSTAGE application server are to enable transactions on the network.

3.13.2 Web-J Edition (WJ)

This product is designed to construct Web application execution environments, and supports the latest Java and Web technologies such as Servlets and Java Server Pages (JSP). It can link to mission-critical systems constructed using INTERSTAGE Application Server on another server.

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3.13.3 Standard Edition (SE)

Standard Edition (SE) is designed to execute OLTP applications created using Java, COBOL, C and C++ to enable operation based on CORBA. It is also provided with WWW server functions that make it possible to construct highly usable systems consisting of back-end systems that use existing resources and OLTP applications developed using COBOL, etc., and front-end systems that use Web applications that link with these back-end systems.

3.13.4 Enterprise Edition (EE)

Enterprise Edition (EE) is a high-end model that possesses all the functions of the standard edition, as well as non-stop operation functions and high-reliability functions that ensure stable operation under high load conditions.

3.13.5 INTERSTAGE Application Server Linux-Compatible

INTERSTAGE application server is Linux-compatible. J2EE brand certification guarantees the portability of customer applications running on INTERSTAGE Application Server. J2EE brand certification is only obtained after a product passes over 5,000 compatibility tests relating to functions designated by the J2EE specification.

With the multi-system function, more than one INTERSTAGE Application Server environment can be constructed on a single server. This makes it possible to create multiple independent applications in a single server for ASP businesses. It is also possible to construct both development and production

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environments on a single server, simplifying the process of transferring applications from the development environment to the production environment.

INTERSTAGE application server asynchronous communication functions support asynchronous communications for a variety of applications, including CORBA applications and EJB applications. Linkage with the existing assets of mainframe and other systems can also be accomplished, and asynchronous communications can be performed with a high level of reliability and performance.

3.13.6 Web Services Technologies

INTERSTAGE Application Server incorporates advanced Internet technologies, such as Java and EJB for the speedy creation of Web applications. CORBA and SOAP allow different languages and platforms to link freely.

3.13.7 Load balancing (EE)

Under load balancing, multiple servers perform processing in parallel as the same system. Processes from clients are distributed among participating servers automatically. If a server malfunctions, the problem server will be disconnected, and its processing will be taken over by the remaining servers.

The client does not need to be aware of which server is being used, as the system distributes tasks among servers automatically. Load distribution policy types make it possible to implement finely controlled load distribution. Linkage with INTERSTAGE Traffic Director enables any errors in a server to be reported to the client promptly.

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4. Web Services Technology

4.1 SOAP

SOAP is positioned to support interoperability between servers. It is a challenge to deliver SOAP-based solutions, which perform well in production environments. Scalability is a significant issue. Open-source utilities may help performance in SOAP-based Web services.

4.1.1 SOAP Framework

SOAP is positioned to facilitate server-to-server communication. It provides the benefits of being able to write server applications that freely communicate with other servers, platforms, and hardware.

Tools using SOAP enable interoperable software. Performance and scalability are potential disadvantages of deploying SOAP-based Web services.

Vendors need to supply a scalable framework for developing Web services, embrace strategies for avoiding performance problems, and offer an open-source set of test objects. New scripting languages are being developed.

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4.1.2 Framework For Developing Web Services

SOAP is a lightweight protocol intended to fit into an existing Web application infrastructure. An emerging framework for developing scalable SOAP-based Web services favors a Web architecture with many small servers that are accessed through a load balancer, providing a front-end to a powerful database server.

The framework for building SOAP-based Web Services in Java uses specific components.

4.1.3 Apache SOAP

Based in part on IBM SOAP, Apache SOAP is positioned as an open-source project. Apache SOAP delivers a full-featured SOAP implementation for Java. Apache SOAP implements most of the SOAP specification, supports SOAP messages, server and client implementations, and comes with full source code under an Apache-style license. This license means users can change the code and deploy proprietary software products with specific changes.

Apache SOAP comes with the Xerces XML parser. Any SAX-compliant XML parser can be used instead. Java developers can use JDOM as an API to use to manipulate SOAP XML documents.

It allows users to change the underlying XML parser without recoding the SOAP application. This flexibility gives choices when trying to solve scalability or performance problems in a particular XML parser. JDOM is also distributed under an Apache-style open-source license.

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SOAP has compatibility issues. The Apache and Microsoft SOAP implementations both include a BigDecimal data type. However, they are not compatible. Then products are needed that map between the platform differences of XML.

4.1.4 Load balancer with SSL support

The SOAP protocol is expected to define encryption and authentication methods. Until SOAP defines an authentication method, the framework depends on writing business logic into a servlet, then using the underlying Web server's SSL support to make an HTTPS request to the Web service.

The load balancer SSL support manages encryption, encrypting and unencrypting requests. It passes requests to a Web service as an unencrypted SOAP call. This frees up the Web service server from the computing overhead of SSL.

4.1.5 Points Of Failure

The load balancer works with cookie-based session tracking. SOAP has yet to define a session management mechanism. In a load-balanced environment, some SOAP requests carry state information that could get lost.

For example, communication with a Web service may require multiple requests and responses in series. The load balancer must have the option to bring a request to the same Web service server during a session. During this process, the series may become disrupted.

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Most load balancers support cookie-based session tracking, but the particularities of the SOAP series requests introduce complexities.

SOAP is a new and untested system. Inside SOAP are many places to harbor performance and scalability problems. Determining production-worthiness requires both unit- and system-level testing.

4.1.6 SOAP Limitations

SOAP was designed to work within existing Web application environments. The protocol may introduce firewall and routing problems. Unlike a normal Web server using HTTP, all SOAP messages are the equivalent of HTTP form submits. The calls move much more data than the average HTTP GET or POST call. Network performance may deteriorate.

Special testing of the firewall and routing equipment relates to SOAP issues. A firewall security policy is needed to make certain it does not monitor SOAP-requests as Web traffic. The firewall shunting away Web traffic that looks like a denial of service (DoS) attack.

SOAP can make call and get a response. Advanced SOAP applications make series of get and response calls until a transaction is finished. Transactional SOAP calls need to identify and cache the state of sessions. Caching mechanisms for SOAP transactions present potential problems for scalability.

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4.1.7 SOAP Protocol Uses Multi-Step Process

The SOAP protocol uses a multi-step process to complete a communication transaction. The SOAP request begins with the business logic of an application learning the method and parameter to call from a Web services description language (WSDL) document.

4.1.8 Framework Benefits

The SOAP framework has benefits. Java engineers can have less complex debugging because fewer threads are running at any time. Many small, inexpensive servers can replace large systems. Small servers can provide some flexibility.

4.1.9 SOAP Test Strategies

Moving a SOAP-based Web service into a production environment requires testing for states, privilege, speed, boundaries, and regression as illustrated in Table 4-1. Assurances of high availability relate to good performance.

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TABLE 4-1

SOAP-BASED WEB SERVICE PRODUCTION ENVIRONMENT TESTING

- State testing
- SOAP sets server value
- Server response issue
- Privilege testing
- Access a control
- Authorization only for administrators
- Speed testing
- Web service response times
- Boundary timing testing
- Web service request time-outs
- Regression testing
- Existing Web service function continuity

Source: WinterGreen Research Inc.

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These are fairly common tests for any software application. Web services are different because the testing arena expands into a matrix. In the past users could test a Web application using a Web browser. This is not true with a SOAP-based Web service. Manually reading the XML documents emitted during a SOAP transaction becomes time consuming very rapidly. Developing and using automated test suites is necessary.

Programming and delivering production-quality Web services depends on testing. Quality of the service needs to be determined under the stress of multiple concurrent requests. The scripting language and test objects in the open-source utility can offer a way to make systems more productive when SOAP-based Web services are implemented.

4.1.10 SOAP Solutions

Single-sign-in between server systems is a good use of SOAP. A sign-in Web service returns a user ID number indicating if a user is authorized to access Web site resources.

Database queries using SOAP are much less buggy than JDBC drivers. The request goes directly to a database server containing an SQL query, the response is an XML document with the rows and fields.

Store-and-forward queue mechanisms sue SOAP for sending email confirmations. When a user registers for a new site the server o sends an e-mail to the new user thanking the user for registering.

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4.2 WSDL

WSDL can be used to implement SOAP communication. Developers embed WSDL definitions into their code to avoid the overhead of getting the WSDL. While this improves performance, it becomes a maintenance issue when the WSDL changes.

To avoid maintenance problems programmers can cache the WSDL in the centralized database and then periodically check the timestamp/version number of the WSDL to see if a newer one is available.

Parameter types in SOAP present a scalability problem when WSDL is used with SOAP. SOAP defines simple data types: String, Int, Float, and NegativeInteger. WSDL may include non-trivial new data types. While reading a response, a validating XML parser will contact the pushtotest.com host to get the XML schema definition for a format. The overhead of this request can make a system unscalable if the validating parser does not cache the schema definitions.

A general performance rule is to stay with the simple SOAP data types unless there is a compelling need to use another data type. This however, limits the usefulness of WSDL.

4.2.1 WSDL Service Descriptions

WSDL service descriptions are used to map to a UDDI registry. Applications are used to publish WSDL service interface descriptions or implementation descriptions.

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Requirements for this type of application relate to publish applications being able to read and understand the contents of a WSDL document. Systems need to send requests to a UDDI registry and then process any responses. Existing Java class libraries provide this functionality. The Web services description language for Java (WSDL4J) and the UDDI Java API (UDDI4J) provide these functions.

WSDL4J provides a standard Java interface, which can be used to parse existing WSDL documents or to programmatically create new WSDL documents. WSDL4J is an open source project located on the IBM developerWorks site.

The publish applications developed can be used to publish WSDL service interfaces and WSDL service implementations.

4.3 UDDI Registry

To run the publish applications users need to select a UDDI registry. Different types of UDDI registries use a class object to access them. There are two types of UDDI registries that can be used to run publish applications. The UDDI test registries are available on the Internet or a private UDDI registry. Users need to register with a UDDI registry. When registering users specify a user ID and password, which are needed to publish data to the registry.

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4.3.1 UDDI Test Registries

There are two public UDDI test registries. IBM hosts one and the other one is provided by Microsoft. Each registry has two interfaces. An inquire interface is used to find information in the registry. The publish interface is used to publish and remove data from the registry.

An example of a private UDDI registry is the IBM WebSphere UDDI registry preview. A private UDDI registry must be installed on a local system. After a private registry is installed on a local system, it is accessible using a set of URLs.

The UDDI proxy class provides the interface to a UDDI registry. Each of the publish applications contains a get method from Java. This method creates the UDDI proxy. The inquiry URL and publish URL are used. It adds the support that is needed to use SSL. All publish messages are sent to the UDDI test registries using an SSL connection.

4.3.2 UDDI Distributed Web Service Discovery

Service discovery defines a process for locating service providers and retrieving service description documents. It is a key component of the overall Web services model. Service discovery does not have one solution that addresses all requirements.

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The Universal Description, Discovery and Integration (UDDI) specification addresses a subset of the overall requirements by using a centralized service discovery model. The WS-Inspection specification provides a method for aggregating different types of service descriptions. Within a WS-Inspection document, a single service can have more than one reference to a service description.

A single Web service might be described using both a WSDL file and within a UDDI registry. References to these two service descriptions are put into a WS-inspection document.

A WS-inspection document provides an aggregation of references to service descriptions. These service descriptions can be defined in any service description format WSDL, UDDI, or HTML. A WS-inspection document is available at the point-of-offering for the services that are referenced within the document.

A WS-inspection document can contain a list of references to service descriptions. A service element contains one or more references to different types of service descriptions for the same Web service. The link element contains references to only one type of service description. Service descriptions do not have to reference the same Web service.

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4.3.3 UDDI Consortium

Universal Description, Discovery and Integration (UDDI) consortium is a cross-industry effort to develop the open, UDDI framework. The framework is designed to describe services that enable businesses to identify and interact with their suppliers and trading partners online.

Businesses of all sizes can benefit from UDDI. The specifications are designed to address problems that limit the growth and synergies of B2B commerce and Web Services. A set of standard Web protocols for application-to-application (A2A) commerce is evolving. Business functions use UDDI to access other business functions over the Internet to share data, business processes, and transactions.

4.3.4 WS-Inspection Document Extensibility

The WS-Inspection specification does not limit the type of service descriptions that can be referenced. Both the <description> and <link> element may contain extensibility elements. Information relates to a specific service description technology.

The WS-Inspection specification defines a set of standard extensibility elements for both WSDL and UDDI. The <description> element is used to reference a single service description. The <link> element is used to reference one or more sets of service descriptions. Extensibility elements defined for these elements need to follow this pattern.

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The WSDL extensibility elements can be used to indicate whether or not the WSDL document contains an endpoint specification. If there is more than one service element in the WSDL document, then an element is used to indicate which one is associated with the entry in the document.

Elements may appear in WSDL service description reference. Particular elements reference a binding that is implemented by the WSDL document.

The Web services inspection language provides a simple, distributed service discovery method for any type of Web service description document. WS-inspection technology is complementary to existing service discovery methods, such as UDDI, because it defines a process for inspecting a Web site for service descriptions.

This technology is useful for developing Web service crawlers. Service crawlers search through Web sites for WS-Inspection documents. The service description references from multiple sites are aggregated.

4.4 Language XSLT

XSLT language is used to transform XML as illustrated in Table 4-2.

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TABLE 4-2

XSLT TRANSFORMATION OF XML

- Transforming XML into HTML
- Transforming XML into SVG
- Transforming XML into PDF
- XML messaging with SOAP

Source: WinterGreen Research Inc.

4.5 OASIS

OASIS is an industry-wide organization and its efforts to ensure open technical standards for the Internet and e-business. The organization is positioned to be a key enabler for e-business.

It supports XML (extensible markup language). Business-to-business (B2B) online trading exchanges depend on XML because it provides an open and flexible message format for exchanging information. XML is a universal standard for structuring data. It enables the transfer of information across the Internet and between organizations. It allows them to communicate in efficient ways.

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The OASIS business transaction protocol (BTP) technical committee is chartered with evaluating the requirements for long-running B2B transactions on the Internet. It is evaluating the suitability of business transaction protocol (BTP) technology to meet B to B requirements.

The BTP specification is an XML-based vocabulary protocol for representing and seamlessly managing complex, multi-step B2B transactions over the Internet.

4.6 ebXML

ebXML is an International Initiative established by UN/CEFACT and OASIS in late 1999. The protocol is being developed under a mandate to research and identify the technical basis upon which the global implementation of XML (Extensible Markup Language) can be standardized.

The goal of ebXML is to facilitate open trade between organizations regardless of size by enabling XML to be used in a consistent manner to exchange electronic business data.

UN/CEFACT is the United Nations body whose mandate covers worldwide policy and technical development in the area of trade facilitation and electronic business, and OASIS is a non-profit, international consortium dedicated solely to product-independent data and content interchange.

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4.6.1 ebXML and Open Applications Group OAGIS Standards

ebXML message transport layer uses the Open Applications Group's OAGIS standards for the XML document payload. A message transport layer is a set of electronic protocols that work like a paper envelope works. It contains information as to who sent it and directs where to deliver the document.

The XML payload, in an electronic sense, is the letter inside the envelope. This approach gives users the ability to exchange Internet-based messages between trading partners wrapped in a standard message framework that is being adopted globally.

ebXML set of specifications is a modular framework. Industries can adopt specific modules of the standard to meet current customer and technological requirements.

The business processes supported by EBXML are expressed as process models and encoded in XML. EBXML developed messages are encoded in XML. EBXML may transport any type of data such as binary content or EDI transactions.

A transport and delivery layer moves the XML information among partners. A formal registry and repository acts as a container for these process definitions, vocabularies, and partner profiles.

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4.6.2 EBXML Standard

EBXML is composed of three infrastructure components. Document creation and business process definition are goals of ebXML services creation. The infrastructure components are orthogonal in design. They may be used together or separately in implementing an infrastructure.

EBXML infrastructure components include collaborative protocol profile (CPP), which defines XML data structures. These describe what each trading partner supports, the components necessary to conduct electronic commerce, data communications, security, processes, document types, and telephone contacts.

Registry and repository defines the access interfaces, security and information storage format for any information that needs to be widely, yet securely shared among trading partners or potential trading partners. Messaging defines the means to move data between trading partners in a secure, reliable manner.

4.7 IP Addressing And Directory Management

Errors in IP addressing and directory management are a major source of downtime in IP networks. As businesses continue to optimize around IP, and begin exploring strategies for policy-enabled networking, the elimination of these errors increases in importance.

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No one wants to run mission-critical applications on a network whose reliability is, at the best of times, unpredictable. Functions of an IP addressing device are illustrated in Table 4-3 following. Table 4-4 illustrates benefits of an IP addressing device.

TABLE 4-3

FUNCTIONS OF AN IP ADDRESSING DEVICE

- Simplifies IP Address Management
- Enables Dynamic DNS Updates
- Offers High Network Availability
- Enables Centralized Control With Distributed Management

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TABLE 4-4

BENEFITS OF AN IP ADDRESSING DEVICE

- Provides Enterprise Wide Addressing
- Provides Open, Scalable, Robust Architecture
- Provides Extensive Platform Support
- Provides Ease of Use
- Offers Comprehensive Management Platform
- Eliminates Custom Solutions

Source: WinterGreen Research, Inc.

Tracking IP addresses, maintaining directory services, automating some configuration, and performing some manual configuration tasks are supported by an IP addressing device. Manual configuration is time consuming and error prone. Automatic configuration is more efficient.

This process underlies the Web services process. It exists at a lower layer. The process is central to providing the transport for Web services. As the transport layers achieve some value added services support, Web services begin to migrate to the transport layer.

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5. Web Services Company Profiles

5.1 BEA

BEA Systems is a leading e-business infrastructure software company specializing in application servers. BEA has 10,000 customers worldwide. The Fortune global 500 comprises a target market.

BEA WebLogic products support e-business. BEA WebLogic e-business platform is positioned as a reliable, highly scalable system. The company works harder than most to be sure that there are no software bugs in a new system when it is shipped. BEA's e-business products are used as a development platform by 2,100 system integrators, independent software vendors (ISVs), and application service providers (ASPs).

BEA has recently m\ade an investment in distribution channels. Expansion of the indirect distribution was network through stronger relationships with systems integrators, ISVs, application service providers, and system platform companies.

BEA application infrastructure software extends investments in existing computer systems and provide the foundation for running an integrated e-business. Products are marketed worldwide through a direct sales force and through systems integrators.

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Independent software vendors and hardware vendors are strategic allies and distributors.

Products have been adopted in the telecommunications, commercial banking, investment banking, securities trading, software, airlines, services, retail, manufacturing, package delivery, insurance, and government market sectors.

5.1.1 BEA WebLogic E-Business Platform

The BEA WebLogic E-Business platform provides application infrastructure for building an integrated e-business, allowing customers to integrate private client/server networks, the Internet, intranets, extranets, and mainframe and legacy systems as system components. Products serve as a platform, integration tool or portal framework for applications such as billing, provisioning, customer service, electronic funds transfers, ATM networks, securities trading, Web-based banking, Internet sales, supply chain management, scheduling and logistics, and hotel, airline and rental car reservations.

Licenses for distributed transaction software products are priced on a per-central processing unit basis. Licenses are also priced on a per-user basis.

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BEA WebLogic e-business platform is designed to address the demand for Internet connectivity and transactions. Systems allow companies to quickly connect business processes, link enterprise partners, and implement e-commerce applications. Systems permit companies to share information across the enterprise and the Internet.

5.1.2 BEA Web Services

The BEA WebLogic e-business platform combines application server, Web services, integration, and portal technologies into a single, integrated, standards-based application infrastructure solution. The BEA WebLogic e-business platform is comprised of BEA WebLogic Server(TM), BEA WebLogic Integration(TM), and BEA WebLogic Portal(TM).

BEA WebLogic web application server provides J2EE services to Web-based applications. It supports Web services. Web Services are implemented as a set of software components that allow companies to share applications, business logic, and syndication services from multiple sources.

WebLogic Server bridges J2EE and Web services by enabling developers to deploy Enterprise JavaBeans (EJBs). BEA WebLogic server supports key Web Services standards. It supports Simple Object Access Protocol (SOA"), Web Services Description Language (WSDL) and Universal Description, Discovery and Integration (UDDI).

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BEA WebLogic Integration supports standards. These include J2EE Connection Architecture (J2EE CA), ebXML, RosettaNet, and Java messaging services.

5.1.3 BEA Core Business

BEA core business has been providing application infrastructure for e-business systems and high-volume transaction systems. Systems include Web-based retail sites, enterprise resource planning systems, inventory systems, telecommunications billing applications, and commercial bank ATM networks. Account management systems, credit card billing systems, and securities trading account management systems are supported. Table 5-1 illustrates BEA core business.

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TABLE 5-1
BEA CORE BUSINESS

- Application infrastructure
- Support for e-business systems
- Support for high-volume transaction systems
- Web-based retail sites
- Enterprise resource planning systems
- Inventory systems
- Telecommunications billing applications
- Commercial bank ATM networks
- Account management systems
- Credit card billing systems
- Securities trading account management systems

Source: WinterGreen Research Inc.

Web-based and distributed systems must be highly available, scale to process high transaction volumes, and accommodate large numbers of users. As the Internet and e-business continue to develop and become more richly integrated, systems that historically had been internal are being extended to the Internet. ERP, inventory, and sales force automation systems are interconnected.

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5.1.4 BEA WebLogic Portal

BEA WebLogic Portal includes portal technologies, user tools, and partner applications. E-business portals are positioned to serve employees, customers, partners and suppliers. The product is a framework technology that makes it possible for an enterprise to deploy applications with a common, personalized interface for customers, partners and employees, simplifying and improving their experience while lowering administrative costs and centralizing customer utilization information.

BEA WebLogic Portal features and enabling technologies include portal configuration tools, a rules-based entitlement engine, reusable presentation software components, and a standards-based framework that supports J2EE CA and Web Services.

5.1.5 BEA Customer Base

BEA customer base is transitioning to mission-critical applications based on Java, EJB, and CORBA programming models. Customers and consultants did not have sufficient numbers of system architects and application developers experienced in building large, reliable systems based on these programming models.

BEA long-term strategy was to partner with SIs to provide these services to customers and to train customer information technology departments.

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SI application development related to BEAvtraining 9,000 developers. The customer base has increased the number of developers skilled in Java, EJB and CORBA technologies.

Recent key customer and partner deals for BEA include BMW, China Construction Bank, Cingular Wireless, Citicorp, Corporate Express, Credit Suisse Private Banking, Edward Jones, Equilend LLC, Financial Times, GE Information Services, McKesson HBOC, Motorola, NCS Pearson, NTT Docomo, Pfizer, Rentenanstalt, Royal Bank of Scotland, SA Telkom, Skandia, Sovereign Bank, Szechuan Mobile Communications Company, Telia Mobile, and UK Inland Revenue.

BEA added more than 770 new customers during the last quarter of 2002. New or expanded relationships were entered into with hardware, systems integrator, ASP, and ISV vendors. Partners include Accenture, Amdocs, AutoDesk, Cap Gemini Ernst & Young, divine, DST Innovis, E.piphany, Frontera, i2 Technologies, Informatica, KPMG, Logical, MRO Software, MSA, Real-Time Center AG, Stellent, and TelesensKSCL AG.

5.1.6 BEA Product Development

BEA product development relates to the areas of integration, portal, Web services, development tools, and new features.

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5.1.7 BEA Revenue

The growth for 2001 (Fiscal year ends in January 2002) is a result of continued increases in sales of WebLogic(R) products. BEA revenue reached $975 million in 2001, achieving 19% growth in a year whne many companies had decreased revenue. Growth for 2000 was a result of significant increases in sales of WebLogic(R) products and growth in customer support revenues. BEA revenue reached $819 million in 2000, achieving 76.5% growth that year.

BEA Fiscal Year Revenue

Fiscal Year Ending January 31

(in thousands)

2002 (E)	2001	% Change	2000	% Change
$975,000 (E)	$ 819,760	19%	$ 464,410	76.5 %

In the quarter ended October 31, 2001 license revenues decreased 1.2 percent to $126.6 million from $128.2 million in the same quarter of the prior fiscal year. License revenues increased 44.8 percent to $460.0 million in the nine months ended October 31, 2001 from $317.6 million in the same period of the prior fiscal year.

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The quarter on quarter decrease is due to the economic downturn and the effects of the terrorist activities. The increase over the nine-month period was due to the continued adoption of BEA WebLogic Server. Expansion of the direct sales force, introduction of new products, introduction of new versions of existing products, and expansion of partner programs were growth factors as well.

License revenues as a percentage of total revenues increased from 57.2 percent in the third quarter of fiscal 2001 to 57.7 percent in the third quarter of fiscal 2002 and increased from 56.3 percent in the nine months ended October 31, 2000 to 61.8 percent in the nine months ended October 31, 2001.

In the quarter a very challenging economic environment was encountered. BEA completed 2,838 deals in the third quarter, roughly the same number as in Q2. Customers continued to invest in new applications, and continued to choose the platform.

BEA Systems Revenue Third Quarter 2001 vs Third Quarter 2000
(in thousands)

	Three months ended October 31,		Nine months ended October 31,	
	2001	2000	2001	2000
Revenues:				
License fees	$126,625	$128,202	$460,029	$317,636
Services	92,998	95,812	284,521	246,081
Total revenues	219,623	224,014	744,550	563,717

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5.2 Bowstreet

Bowstreet provides XML infrastructure for plug-and-play e-commerce. Bowstreet's business Web factory and businessweb.com use change automation technology to create business webs. Fluid, interconnected collections of web services are implemented dynamically over the Internet to create business models.

Bowstreet pioneering solutions enable companies to sell new products and services. Systems create new channels of distribution and develop new business initiatives.

5.3 Borland

Borland is a leading provider of high performance e-business platform solutions designed to increase developer productivity and reduce time to market for enterprise software projects. E-business platform solutions consist of software products that allow businesses to develop, deploy and manage e-business applications.

Products are designed to address phases of the process of implementing solutions: development, deployment, and management. For the development phase, Borland offers JBuilder,™ C++Builder,™ Delphi,™ and Kylix.™. Deployment products include Borland® AppServer,™ InterBase® and VisiBroker.®

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To manage these systems, Borland offers Borland® AppCenter,™ a visual distributed application management solution. Borland® TeamSource,™ is a hosted collaborative development platform for distributed teams.

Borland supports major computing platforms as well as the open standards of the Internet.

BORLAND SOFTWARE CORPORATION REVENUE

(In Thousands)

	Three MonthsEnded		Nine MonthsEnded	
	2001	2000	2001	2000
Licenses revenues	$ 46,985	$ 40,926	$136,931	$120,700

5.4 Cape Clear

Cape Clear Software is a provider of Web Services technology. Web services are implemented as products CapeConnect and CapeStudio. Extensive functionality gives the products wide platform support, enhanced development tools, and full UDDI functionality.

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CapeConnect Three is a Web services platform that provides tools for building Web sites. Services support communication via e-mail, a UDDI registry, and improved ease-of-use in deploying Web services. CapeConnect Three supports Web services built on diverse platforms, including leading J2EE application servers, Microsoft .NET, and CORBA.

CapeConnect Three is supported by an upgraded version of CapeStudio, the rapid Web services development tool. It includes a UDDI browser, support for CORBA, support for security services, and a tight integration with Microsoft .NET. CapeConnect is positioned to integrate Microsoft .net and Java technologies. By exposing Java and CORBA systems as Web Services, they can be accessed from .NET clients. Cape Clear products enable Java clients to access .NET servers. This integration method is designed to work across corporate firewalls, making it a solution for linking ASP-based web sites to Java-based enterprise systems.

Web Services implement a design center for applications. Web Services use a UDDI registry for management. CapeConnect provides a solution that addresses the challenge of integrating a Microsoft COM-based Web site with a Java-based customer management system.

5.4.1 CapeConnect Features

CapeConnect Three includes full support for Web services standards, including SOAP, WSDL, and UDDI. It is also extensively tested for SOAP compatibility with products from other vendors, including Microsoft, BEA, iPlanet, and IBM.

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CapeConnect provides a complete SOAP implementation and UDDI registry, providing all the runtime services required to deploy Web Services. EJB and Java class components can be hosted as Web Services within CapeConnect, without the need for a separate application server. CapeConnect automatically generates WSDL for Web Services.

The CapeConnect UDDI registry is a complete implementation including a full Web interface for publishing and searching for Web Services. The look and feel of the interface can easily be modified through style sheets, allowing companies to host their own personalized UDDI registries on the Internet.

SMTP is supported as a SOAP transport, in addition to HTTP and HTTPS, allowing Web services to communicate via e-mail. Asynchronous Web services open up a world of loosely coupled, peer-to-peer communications.

CapeConnect generates XML schema representations of all parameters and data-types associated with Web Services, even complex object graphs using arrays, collections, and inheritance.

CapeConnect Three includes the ability to generate Web Services from Java classes, EJB components, and CORBA Interface Definition Language (IDL). CapeConnect is fully compatible with Microsoft .NET clients and servers. Supported J2EE platforms include BEA WebLogic Server, IBM WebSphere, and iPlanet. Supported CORBA platforms include WebLogic Enterprise, Orbix, and Visibroker. CapeConnect unites Microsoft, Java, and CORBA around open Web Services standards.

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CapeStudio provides support for CapeConnect Three security and session management facilities.

5.5 Fujitsu

Fujitsu is a leading provider of Internet-focused information technology solutions for the global marketplace. It has positioned with pace-setting technologies, best-in-class computing and telecommunications platforms.

A worldwide corps of systems and services experts are part of the company. It is positioned to leverage the Internet to help its customers succeed. Headquartered in Tokyo, Fujitsu Limited reported consolidated revenues of 5.48 trillion yen for the fiscal year ended March 31, 2001.

5.5.1 Fujitsu PC Corporation

Fujitsu PC Corporation is a wholly owned subsidiary of Fujitsu Limited. It offers a thin and light LifeBook® S Series notebook. An enlarged display is 13.3 inches. The integration of display size, hard drive capacity, operating system options, and a CD-RW/DVD combo drive positions systems for use in healthcare markets.

The flagship Fujitsu notebook offers performance in a lightweight design. Fujitsu is a leading provider of Internet-focused information technology solutions for the global marketplace. Fujitsu Limited (TSE:6702) reported consolidated revenues of 5.48 trillion yen for the fiscal year ended March 31, 2001.

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5.5.2 Fujitsu Software Corporation

Based in San Jose, CA and established in 1991, Fujitsu Software Corporation is a wholly owned subsidiary of Fujitsu Limited. Fujitsu Software Corporation leverages Fujitsu's international scope and expertise in developing and providing information technology solutions.

Fujitsu Software Corporation's products include the INTERSTAGE application server. The application server is part of the INTERSTAGE ebusiness software platform. The platform is built on open standards. The INTERSTAGE application server enables enterprises to build and run mission-critical applications.

i-Flow is a 100% Java workflow engine for automating business processes. QoEtient is a service for monitoring and managing "Quality of Experience" on the Internet. Fujitsu COBOL is a development environment that provides an integrated development environment and a suite of tools to build fast, mission-critical business systems.

5.6 GE Global eXchange Services (GXS)

GE Global eXchange Services (GXS) operates one of the largest B2B e-commerce networks in the world, with more than 100,000 trading partners. The network is used to conduct one billion annual transactions, which account for $1 trillion in goods and services.

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The company has a presence in 58 countries. GXS has engineering teams in the US, Ireland, the UK, India and the Philippines; as well as Electronic Commerce Service Centers in the US, the Netherlands and Hong Kong. GXS applies six sigma quality processes to provide e-commerce solutions that help businesses around the globe remove costs from their supply chains. GE Global eXchange Services is a part of the General Electric Company, U.S.A..

GE Integration Solutions (EAI) provides software that permits any business application to send and receive business information to other business applications in a secure and reliable manner. GE Interchange Solutions (EDI and XML) automate paper, fax, telephone, and email transactions to improve quality and efficiency in a supply chain.

GE marketplace solutions (exchanges) provide the business applications and technology infrastructure to enable the development, integration and service of high-volume, one-to-many and many-to-many B2B electronic marketplaces.

5.6.1 GXS Integration Solutions

GXS integration solutions offer software and services that enable information sharing, including e-procurement data. Systems work across internal applications and support information exchange between external business partners. Systems integrate information into existing ERP, CRM, proprietary, and legacy environments. The company is the market leader in providing information transformation.

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5.6.2 GE Interchange Solutions

GE interchange solutions allow B2B e-commerce implementation. Systems communicate electronically. Connectivity is facilitated with business partners, maximizing liquidity, and improving quality and efficiency in the supply chain.

GXS has positioned to reduce costs through Web-based data management and back-office integration. GE Global eXchange Services has added new capabilities to its data exchange industries. The capabilities include Web-based data management and back-office integration components that enable companies to reduce costs and increase profitability through improved supply chain efficiency.

Exchanges are operated and hosted by GE Global eXchange Services (GXS). It helps companies manage information associated with the shipment and delivery of products. Exchanges handle in excess of 50 million transactions annually.

Capabilities help companies simplify transactions, enhance customer service, and automate labor-intensive processes. Companies use the Web to more efficiently collaborate on the direct exchange of products, thereby reducing time-consuming error corrections and eliminating the need for costly in-house reconciliation systems.

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Products may pass through several suppliers or marketers before reaching the final customer. This Web-based service enables companies to reduce time to market by authorizing the entire chain of recipients in advance.

Back-office integration enable the transfer of data directly to an exchange from enterprise systems using Internet protocols such as file transfer protocol (FTP) and simple object access protocol (SOAP).

5.7 Hewlett Packard

Hewlett Packard is a leading computer server and pernter peripheral company. It has positioned to achieve growth in e-services markets. Hewlett Packard has positioned to expand Netaction e-services middleware and OpenView software network management products.

HP is building its middleware initiative on a base of XML and Java. Technologies from Bluestone Software and Netaction products position HP with application server middleware. The company has a deal with Tibco to address high performance and high availability for integration and Web services.

HP formed the Netaction division to fill its product lines through partnerships. Bluestone application server technology is being expanded. Netaction includes e-speak Web services integration technology, Virtualvault security, and the Changengine business process management and workflow product. These are packaged as HP process manager. Bluestone brought Java-based transaction processing software from Arjuna Solutions, a UK company.

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5.8 International Business Machines (IBM)

IBM is positioning to respond to a major shift underway in customer buying patterns. Customers appear to desire powerful, fully integrated servers, software, and services. IBM is meeting this market shift by strengthening the company's product, services and technology portfolio.

Even though customers have slowed their investment in information technology (IT) in this economic environment, they remain focused on this shift towards integration. This customer shift is helping the company even, in terms of revenue growth in key segments.

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5.8.1 IBM Revenue

(Dollars in millions)

	Three Months Ended September 30,		Nine Months Ended September 30,	
	2001	2000	2001	2000
Global Services	$ 8,682	$ 8,230	$ 25,895	$ 23,966
Hardware	7,479	9,451	24,678	26,314
Software	3,201	2,918	9,155	9,027
Global Financing	822	859	2,499	2,494
Enterprise Investments/Other	244	323	813	979
Total revenue	20,428	21,781	63,040	62,780

The IBM third quarter financial results continued to demonstrate the strong resilience of the company as services, high-end servers and software revenue grew. The company benefited from the strength of its broad portfolio and its business model with its core of annuity-like businesses.

Revenue for the three months ended September 30, 2001 decreased 6.2 percent versus the same period in 2000. Revenue from Global Services grew 5.4 percent.

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Hardware revenue declined 20.9 percent from the third quarter of 2000. Revenue from z900 mainframe servers grew strongly. Revenue from the iSeries mid-market servers increased in all geographies, while pSeries revenue declined. Personal computer revenue declined significantly.

Revenue from IBM high-end storage product family (Shark) increased year over year. Microelectronics revenue decreased substantially due to the cyclical downturn that is affecting the worldwide semiconductor and original equipment manufacturer (OEM) markets.

IBM software revenue grew 9.7 percent compared to the 2000 third quarter. Middleware revenue, which comprises 80 percent of the software revenue, grew 14 percent. Operating systems revenue declined 1 percent year over year.

5.8.2 IBM Fourth-Quarter and Total Year 2001 Revenue

IBM fourth- quarter 2001 revenues totaled $22.8 billion, down 11 percent compared with the fourth quarter of 2000. IBM continued to gain market share in high- priority segments of software, storage and server businesses. Regatta UNIX servers did well. Mainframe revenues grew for the first time since 1989.

The services business had over $15 billion in new signings, although many of these signings also came very late in the quarter, reflecting the business environment.

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In the Americas, fourth-quarter revenues were $9.8 billion, a decrease of 9 percent from the 2000 period. Revenues from Europe/Middle East/Africa were $6.9 billion, down 6 percent. Asia-Pacific revenues declined 10 percent to $4.5 billion. OEM revenues decreased 34 percent to $1.6 billion compared with the fourth quarter of 2000.

Revenues from Global Services declined 1 percent in the fourth quarter to $9.1 billion.

Software revenues increased 6 percent to $3.8 billion compared to the prior year's fourth quarter. Overall, IBM's middleware software revenues grew 10 percent at constant currency. IBM data management and WebSphere products grew 48 percent and 43 percent. Operating system revenues fell 2 percent. The total gross profit margin in software improved 1.8 points, to 85.2 percent.

For the year 2001, IBM revenues from Global Services totaled $35.0 billion, an increase of 5 percent. Hardware revenues in 2001 were $33.4 billion, a decrease of 12 percent. Software revenues totaled $12.9 billion, an increase of 3 percent.

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INTERNATIONAL BUSINESS MACHINES CORPORATION

(Dollars in millions)

	Three Months Ended December 31,			Twelve Months Ended December 31,		
	2001	2000	Change	2001	2000	Change
REVENUE						
Global Services	$9,061	$9,186	-1.4%	$34,956	$33,152	5.4%
Hardware	8,714	11,463	-24.0%	33,392	37,777	-11.6%
Software	3,784	3,571	6.0%	12,939	12,598	2.7%
Global Financing	927	971	4.6%	3,426	3,465	-1.1%
Enterprise Investments/ Other	340	425	-20.0%	1,153	1,404	-17.9%
Total Revenue	22,826	25,616	-10.9%	85,866	88,396	-2.9%

5.8.3 IBM Middleware

Middleware is the sophisticated, complex software that helps various systems and platforms work together. IBM is the largest middleware company.

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IBM defines middleware as a transition layer that allows for interoperability between components of information sservices infrastructure. Socket-like development simplicity, powerful tools, and a realistic way to cut coding time by as much as 80%, middleware is the key to overcoming integration challenges.

Hardware devices or software applications work together using middleware that acts as the interpreter that enables communication. Middleware works for applications on different platforms or from different vendors.

Middleware is a crucial element in the overall success of an integrated e-business.

5.8.4 IBM Middleware Products

IBM middleware solutions are shown in Table 5-2 following.

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TABLE 5-2

IBM MIDDLEWARE SOLUTIONS

- WebSphere® software platform—Used by over 35,000 companies, WebSphere is now the fastest-growing Web software platform. MQSeries, an integral WebSphere application, is a leading middleware solution, allowing applications on over 35 commercially available platforms (such as UNIX, Windows, Linux and Netware to interoperate quickly and seamlessly.

- Tivoli® SANergy®—Tivoli SANergy allows you to leverage new SAN and storage technologies in existing infrastructure, across platforms.

- Lotus® Domino® is standards-based and offers comprehensive support for internet messaging standards, with internet addressing, SMTP routing and MIME content support all native. Plus full support for E/SMTP, S/MIME, SSL, POP3, IMAP4, LDAP, HTTP, HTML, SNMP. Domino delivers interoperability with current tools and systems.

- IBM DB2 Universal Database provides the power to access, manage and analyze data, audio, and video across an enterprise. It supports leading standards such as Java and XML. It works across 23 platforms, including Windows, Unix and Linux and in 14 languages and is robust as a rock. DB2 leverages information by delivering the performance, scalability, reliability and availability needed for e-business applications.

Source: WinterGreen Research Inc.

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E-business interoperability is facilitated by open standards. Open standards are the source code that function as the universal language of integrated e-businesses, bringing disparate systems and platforms together. Open technologies include Linux®, Java®, and XML.

IBM e-business infrastructure supports Linux open source platform. IBM has invested over $1billion in Linux applications, hardware and services to ensure that e-businesses around the world can take advantage of the flexibility, reliability and cost savings that Linux can provide. Linux servers and Linux software help take advantage of open-source flexibility, scalability and security.

Linux and total infrastructure integration is popular. Over 22,000 copies of WebSphere are downloaded from te Web site. Over 35,000 companies are using it now in hundreds of ways. It is the fastest-growing Web software platform.

IBM has 60,000 e-business specialists, with experience on over 20,000 e-business projects.

5.8.5 IBM / Nortel

Nortel contact center is being based on IBM's Web services software. IBM has said that Nortel Networks will build its next generation customer contact center products based on IBM's WebSphere e-business infrastructure software and DB2 database software.

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5.9 IONA

IONA is a leading e-business platform provider for Web Services Integration. The company has 5,000 customers worldwide including a majority of the Global Fortune 500 and leaders in the aerospace, financial, ISV, manufacturing, retail and telecommunications industries.

IONA Orbix E2A™ product consists of a Web services integration platform and application server platform. It enables the flow of information across disparate systems. IONA is headquartered in Dublin, Ireland, with U.S. headquarters in Waltham, Massachusetts. The company had revenues of $153 million in 2000 and employs more than 850 people in 30 offices worldwide.

Iona Technologies has reorganized around Web services integration. Orbix E2A Web services integration platform standards-based product includes business-to-business, enterprise integration, and application development functionality.

Iona partners include Nordstrom.com, Zurich Insurance, BroadVision, HotJobs.com, PricewaterhouseCoopers Consulting, IT integrator Science Applications International (SAIC), Gartner, and Microsoft.

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5.9.1 IONA Revenue

IONA(R) third quarter 2001 revenues were $41.0 million, a 3% increase over the $39.9 million reported in 2000. IONA has 4,500 customers. Iona solutions are open, standards-based, technologically advanced, and comprehensive.

5.9.2 IONA Partnership Agreements

IONA global alliances partnership agreements are with PwC Consulting and SAIC. These companies use the IONA e-business platform in their corporate integration engagements.

5.9.3 IONA Customers

IONA customers include Verizon, Cisco Systems, NTT DoCoMo, Boeing and HotJobs.com.

5.9.4 IONA Products

IONA key products include IONA XMLBus, Orbix/E, Orbix 2000, IONA Enterprise Integrator and IONA Mainframe Integrator.

IONA has a commitment to industry standards. It is a member of the RosettaNet solution provider board which is made up of industry-leading enterprise application and middleware developers, systems integrators and e-service providers. The company also joined the RosettaNet Ready(TM) program.

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An IONA executive is chairman of the ebXML standards committee. The company joined the UCCnet "Partners In Sync" Alliance Program and committed to delivering UCCnet-compliant business applications and services with the IONA e-Business Platform.

IONA Technologies Revenue

(U.S. dollars in thousands)

Sept. 30,

	Three Months Ended		Nine Months Ended	
	2001	2000	2001	2000
Product revenue	$ 25,371	$ 27,236	$ 88,656	$ 72,436
Service revenue	15,672	12,625	46,576	32,761
Total revenue	**41,043**	**39,861**	**135,232**	**105,197**

5.10 Sybase

Sybase provides enterprise-class software solutions that fuel e-Business and enable access to information anytime, anyplace. With its industry leading Enterprise Portal (EP), mobile and wireless, and vertical market solutions, Sybase is one of the largest global independent software companies in the world.

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Sybase products are positioned to provide a platform for delivering the integrated business solutions. Systems leverage existing strengths in enterprise data management and focus on delivering end-to-end solutions.

Mobile and embedded computing, data warehousing, and Web Computing environments are targeted in addition to traditional IT environments. Sybase customers represent the industries leading the global economy, with strong concentrations in financial services, government, telecommunications and media, and health care.

5.10.1 Sybase Third Quarter Revenue

Sybase revenues for the third quarter 2001 were $226.3 million, compared to revenues for the third quarter last year of $239.1 million. The company attributed softer than expected year- over-year revenues to weaker economic conditions, principally in the United States and Europe.

Sybase ended the third quarter with approximately $330.3 million in cash and cash investments, including restricted cash of $9.4 million.

Sybase Revenue

	Three Months Ended September 30		Nine Months Ended September 30	
(In thousands)	2001	2000	2001	2000
License fees	$ 90,613	$114,370	$ 284,146	$335,911
Services	135,700	124,733	405,640	364,012
Total revenues	226,313	239,103	689,786	699,923

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5.10.2 Sybase Customers

Sybase customers include Bank of America, Barings Asset Management, ChinaEagle Securities, China Unicom, Korea Life, Citicorp, Cisco, CNET Networks, E*Trade Bank, Lowe's, NEC Infrontia, Novell, Samsung Insurance, SK Telecom Co., Ltd., Veritas, the states of Michigan and Pennsylvania, and Department of Defense. New customers include companies in Asia, China Unicom, China Eagle Securities, and Korea Life.

5.10.3 Sybase Products

The availability of the New Era of Networks® EDI Server and Adapter for EDI V2.8, a solution that makes it easier and less expensive for customers to integrate their backend systems and middleware to exchange business documents with their partners.

5.11 Tibco Software

Tibco Software is a leading provider of total business integration solutions delivering infrastructure software that enables businesses to seamlessly integrate business systems in real-time. Tibco technology digitizes Wall Street. Financial services, telecommunications, electronic commerce, transportation, logistics, manufacturing, and energy represent target markets.

As a leader in publish-subscribe technology, which is an essential component of the needs of Web services target markets, Tibco struggles with once and only once, guaranteed delivery. The distributed engine that forms the

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base for Tibco publish-subscribe technology is excellent for fast message transport to a lot of ports that subscribe to a topic on the network. This same engine does not support mission critical once and only once, guaranteed delivery functionality as well as some other architectures.

When Tibco goes to scale, the difficulties become apparent. Accurate delivery of messages can be done in a well-controlled environment; it is more difficult as the use grows.

Tibco's great strength is the ability to locate a client, analyze the client integration needs, and deliver a full product suite to that client. The business model relates to having a very broad product suite. The product suite is comprised of modules. Tibco sells an integration solution that promises to adapt different technologies to different integration tasks.

5.11.1 Tibco Software 2001 Revenue

Tibco Software fourth fiscal quarter and year ended November 30, 2001. Total revenues for the fourth quarter were $78 million, an increase of 4 percent over $75 million in the prior quarter. Fiscal year 2001 revenues were $319 million, up from $ 252 million, a 27 percent increase over fiscal 2000.

5.11.2 Tibco Strategic Partners

TIBCO's global customer base includes 1,400 customers. Intel, NEC, Dynegy, BP, eBay, US Bank, The Limited, Delta Air Lines, Philips, AT&T and Pirelli are custromers.

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Tibco added 84 new customers during the last quarter of 2001. New customers include Union Pacific, US Bank, Allstate Insurance, Société Générale, Federated Insurance, American Electric Power, Virgin Mobile, and Novartis.

Tibco has 1,400 customers. eBay, Intel, Delta Air Lines, Siemens, Belgacom, Hutchison 3G, Mirant, BP International, McGraw Hill and FedEx are customers. Tibco leveraged and expanded its relationships with Siemens PTD, Accenture and Parametric Technology. More than 250 companies are now members of the Tibco alliance program.

Tibco has relationships with, HP, KPMG, Deloitte, CG/EY, i2 Technologies, Cisco, and Yahoo!. Tibco is working with partners, such as Accenture and Deloitte, to train consultants and develop vertical market solutions based on the Tibco infrastructure. Tibco Extensibility customers and partners include Arbortext, BroadVision, Commerce One, Microsoft, Pricewaterhouse Coopers, and Software AG.

5.11.3 Tibco Strategic Alliances

Tibco has a strategic alliance with Bowstreet. The technology is based in XML. Bowstreet is a leader in enabling companies to dynamically assemble web services. Bowstreet has positioned with the next generation of intuitive and inter-connective capacities providing customers competitive advantage.

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5.11.4 Tibco Products

Tibco product lines support comprehensive integration solutions. Tibco ActiveEnterpriseTM and TIBCO ActivePortalTM. ActiveEnterprise integration product includes support for J2EE, XML and mainframe integration. ActivePortal includes a range of capabilities.

For the year 2001, Tibco released 66 new products or product enhancements and expanded its offerings. Tibco supports XML standards and EDI. Tibco has a leadership position in supporting RosettaNet standards.

Tibco has an initiative to make business integration more widely accessible. Tibco BusinessWorksTM is a comprehensive, packaged, platform that gives companies the ability to solve integration challenges incremetnally. Tibco BusinessWorks enables comprehensive, cross-platform Web Services for new and legacy systems, including internal application and business process integration. Real-time monitoring and management are supported.

5.11.5 Tibco Revenue

(in thousands)

Ended November 30, 2001

Three Months	Twelve Months
$ 78,244	$ 319,251

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Tibco Revenue

(in thousands)

License Revenue:					
Non-related parties	$ 63,550	$160,700	$ 42,542	$ 45,857	$ 197,334
Related parties	4,496	20,901	5,049	4,717	19,423
Total license revenue	68,046	181,601	47,591	50,574	216,757
Service and maintenance revenue:					
Non-related parties	19,510	66,841	25,092	24,633	93,074
Related parties	1,018	3,355	2,536	3,037	9,420
Total service and maintenance revenue	20,528	70,196	27,628	27,670	102,494
Total revenue	88,574	251,797	75,219	78,244	319,251

5.11.6 Tibco Acquires Talarian

The Talalrian acquisition expands Tibco real-time messaging integration. The Talalrian acquisition extends Tibco's leadership in messaging. Solutions address the business integration market. Real-time data flow supports high transaction volumes. Messaging solutions are positioned to increase productivity and competitiveness.

Talarian brings world-class technology and a blue-chip customer base. Through the acquisition, Tibco gains access to Talarian 300 customers focused in the financial services, telecommunications, and aerospace industries. Talarian customers include VISA, American Stock Exchange, Lockheed Martin, Raytheon, New York Stock Exchange, Nortel Networks, and MicroMuse.

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5.11.7 Hewlett-Packard and Tibco

Hewlett-Packard and Tibco are jointly developing business integration products for the service provider and telecommunications markets. The companies have a three-year agreement. The focus is on supporting high-volume online transactions and improving the speed and reliability of middleware.

Tibco has positioned to expand Netaction e-services middleware and OpenView management products. HP is building on a base of XML and Java. Technologies from Bluestone Software and Netaction products position HP with middleware. The deal with TIBCO addresses high performance and high availability.

When HP formed the Netaction division back in February, it hinted that it intended to fill out its product lines through partnerships. In addition to Bluestone's application server technology, Netaction includes e-speak Web services integration technology, Virtualvault security and the Changengine business process management and workflow product, now known as HP Process Manager. Bluestone brought with it some Java-based transaction processing software from Arjuna Solutions, a UK company it had previously acquired.

HP consulting division will recommend Tibco as the preferred technology for the telecommunications and service provider sectors.

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5.11.8 Talarian

Talarian provides leading infrastructure software solutions that deliver data and content in real-time over any network to any device. Innovative technology is called adaptive multicast. Talarian software can select data delivery mechanisms on-the-fly based on application needs and network capabilities.

Talarian high performance, scalable products are deployed by hundreds of large organizations in demanding applications.

Customers include the American Stock Exchange, Bear, Stearns, Boeing, Cisco, Credit Suisse First Boston, Earthlink, Hewlett Packard, Lockheed Martin, MCI, the New York Stock Exchange, Nortel Networks, Philadelphia Stock Exchange, Raytheon and Southwest Airlines.

5.12 TTM

Total Transaction Management develops, markets, supports, and sells mission-critical messaging and transaction based solutions to organizations that rely on the highest levels of scalability, performance and availability. TTM is focused on providing products and professional services that integrate Java and middleware technologies.

Total Transaction Management is a privately held company with offices in Berlin, London, San Diego, Singapore, Seattle, and Sydney. TTM is a source code license holder for BEA TOP END® middleware. It provides Java and EJB integration products for both BEA Tuxedo and TOP END.

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5.13 Vitria Technology

Vitria Technology is a leading collaboration platform and collaborative applications provider. Vitria BusinessWare integrates applications and automates mission-critical business processes within and across the extended enterprise.

Products are positioned to reduce time to market, shorten lead times, lower operating costs, and increase customer satisfaction. Vitria is a global software company. It has 25 offices in North America plus international offices in Australia, Canada, France, Germany, Italy, Japan, Korea, United Kingdom, Singapore, Spain, Switzerland and Taiwan.

5.13.1 Vitria Technology Revenue

(In thousands)

	Three Months Ended September 30,		Nine Months Ended September 30,	
	2001	2000	2001	2000
License	$ 15,763	$ 32,676	$ 56,566	$ 74,267
Service and other	14,324	8,935	43,260	19,632
Total revenues	30,087	41,611	99,826	93,899
License	52%	79%	57%	79%
Service and other	48%	21%	43%	21%
Total revenues	100%	100%	100%	100%

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Vitria license revenues decreased 52% to $15.8 million in the three months ended September 30, 2001 from $32.7 million in the three months ended September 30, 2000. License revenues decreased 24% to $56.6 million in the nine months ended September 30, 2001 from $74.3 million in the nine months ended September 30, 2000.

These decreases were the result of a decrease in the number of licenses and to an average transaction size on the lower end of the $500,000 to $700,000 range. The sales decline was primarily due to a deterioration in the macroeconomic climate which has resulted in a general slowdown in IT spending in vertical markets.

5.13.2 Vitria BusinessWare Product

Vitria is a leading provider of integration and collaboration solutions. The product is the BusinessWare(TM) integration server. It provides the infrastructure that enables incompatible information technology, or IT, systems to exchange information automatically, without human intervention, over corporate networks and the Internet.

This eliminates manual entry of information into multiple IT systems and eliminates the need to manually exchange information with customers and business partners. Collaborative solutions are provided for organizations in the telecommunications, manufacturing, financial services, energy, insurance and healthcare industries.

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Solutions automate mission critical business processes, integrate existing infrastructure and manage information flow between internal systems and external trading partners.

BusinessWare combines in a single solution the four elements that are essential for ebusiness infrastructure software. These are illustrated in Table 5-3.

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TABLE 5-3

VITRIA EBUSINESS INFRASTRUCTURE SOFTWARE ELEMENTS

- Business Process Management (BPM): BPM provides control and coordination of business processes spanning a wide combination of systems, people and corporate boundaries. It uses graphical process models to seamlessly define, automate and manage transactions and the exchange of information between internal business applications, people and external trading partner systems.

- Business-to-Business Integration (B2Bi): B2Bi enables the secure and reliable completion of transactions and the exchange of business information between customers and partners over the Internet to support collaborative processes. B2Bi helps companies manage their value chain interactions end to end.

- Enterprise Application Integration (EAI): EAI enables secure and reliable movement of information in and out of internal business applications. By enabling internal applications to communicate with each other, EAI helps unify and improve extended enterprise processes.

- Real-Time Analysis (RTA): RTA provides real-time monitoring and analysis of running business processes thereby enabling optimization of operational efficiency. Our two key RTA components - Process Analyzer and Business Cockpit(TM) - continuously gather working business process data, analyze and visualize it in real time, and enable process owners to proactively identify and respond to problems or opportunities as they occur.

Source: WinterGreen Research Inc.

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5.14 webMethods

webMethods is a leading provider of integration software and services for automating business processes across the extended enterprise. The integration platform allows customers to achieve quantifiable return on investment by linking business processes, enterprise and legacy applications, databases and workflows for global business.

By deploying the webMethods integration platform, companies can reduce costs, create new revenue opportunities, strengthen relationships with customers, substantially increase supply chain efficiencies, and streamline internal business processes.

webMethods is a leading provider of integration software with particular expertise in XML and adapters. The webMethods integration platform allows customers to achieve quantifiable R.O.I. by linking business processes, enterprise and legacy applications, databases and workflows both within and across enterprises.

webMethods integration platform is positioned to reduce costs, create new revenue opportunities, strengthen relationships with customers, substantially increase supply chain efficiencies, and streamline internal business processes.

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5.14.1 WebMethods Customers and Strategic Partners

webMethods is headquartered in Fairfax, Va., with offices throughout the U.S., Europe and Asia Pacific. webMethods has more than 750 customers worldwide including global 2000 leaders Citibank, Dell, Eastman Chemical, The Ford Motor Company, Grainger, and Motorola.

webMethods strategic partners include Accenture, AMS, BMC, BroadVision, Cap Gemini Ernst & Young, Deloitte Consulting, EDS, Hewlett-Packard, i2 Technologies, J.D. Edwards, KPMG Consulting, Microsoft, Oracle Corp., SAP AG and Siebel Systems.

Early adopters of webMethods Web services include Dun and Bradstreet and FedEx. These companies are using the integration platform to extend business processes to trading partners over the Internet.

WebMethods Revenue
(in thousands)
September 30

	Three Months Ended		Six Months Ended	
	2001	2000	2001	2000
License	$ 21,742	$ 32,424	$ 58,546	$ 56,410
Professional services	9,401	8,441	19,092	16,184
Maintenance	9,594	4,873	18,496	8,209
Total revenue	**40,737**	**45,738**	**96,134**	**80,803**

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License revenue increased by approximately $2.1 million, or 3.8%, to $58.5 million for the six months ended September 30, 2001 from $56.4 million for the six months ended September 30, 2000. During the three-month period ending September 30, 2001, total license revenue decreased $10.7 million, or 32.9%, to $21.7 million from $32.4 million for the three-month period ending September 30, 2000.

License revenue as a percentage of total revenue was 60.9% and 69.8% for the six months ending September 30, 2001 and 2000. License revenue as a percentage of total revenue was 53.4% and 70.9% for the quarters ended September 30, 2001 and 2000, respectively.

The increase in license revenue for the six months ended September 30, 2001 compared to the six months ended September 30, 2000, was due to increased demand for products in the three months ended June 30, 2001 over the same period in the prior year. The decrease in license revenue for the quarter ended September 30, 2001 compared to the quarter ended September 30, 2000 was primarily attributable to a global economic slowdown, extended sales cycles to prospective customers and a reduction in information technology spending by our customers and prospects.

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WebMethods Regional Revenue

(in thousands)
September 30

	Three Months Ended		Six Months Ended	
	2001	2000	2001	2000
North America	$ 29,946	$ 43,488	$ 70,312	$ 77,305
Europe	7,007	2,139	17,817	3,387
Asia Pacific	3,784	111	8,005	111
Total	$ 40,737	$ 45,738	$ 96,134	$ 80,803

During the second quarter of fiscal 2002, the Company recorded a restructuring charge of $7.2 million, consisting of $2.5 million for headcount reductions, $4.0 million for consolidation of facilities, and $700,000 of other related restructuring charges. These restructuring charges were taken to align the Company's cost structure with changing market conditions.

The restructuring plan resulted in headcount reduction of approximately 150 employees or 15% of the workforce. WebMethods reduced the number of facilities by closing excess field offices and consolidating several California facilities into two locations.

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5.15 WebEx Communications

WebEx Communications is a leader in Internet infrastructure for real-time business communications. WebEx provides Web-based carrier-class communication services using its multimedia-switching platform deployed over a global network.

WebEx services enable end-users to share presentations, documents, applications, voice, and video spontaneously in a seamless environment. WebEx services are used across the enterprise in sales, support, training, marketing, engineering, and various other functions. Modular framework and standards-based APIs are provided. WebEx real-time communications platform is the dial-tone for meetings on the Web.

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