

**Services Oriented Architecture (SOA)
Market Opportunities, Market Forecasts, and
Market Strategies, 2006-2012**

**Services Oriented Architecture (SOA)
Market Assessment**



Picture of fish breath by Susan Eustis

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Lexington, Massachusetts**

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Services Oriented Architecture (SOA) Market Opportunities, Market Forecasts, and Market Strategies, 2006-2012

Service oriented architecture (SOA) components help corporations integrate their existing data and applications into new business systems. SOA software components allow customers to more quickly react to changing market conditions by using process models to design and build more flexible applications.

SOA provides a flexible application framework for managing changing business needs. Services oriented applications are positioned to unlock the business portfolio by providing adapters that connect to output nodes and an engine to manage the adapters. Adapters are reusable pieces of code that implement Web services (SOA) to achieve automated information access. Benefits are achieved by accessing applications in a portfolio with discrete services.

The aim is to streamline IT infrastructure. Services oriented architecture (SOA) is designed to achieve an alignment of IT investments with business goals. Adapters are used to achieve more flexible business response to market changes by providing bits of application functionality that implement business rules in the context of achieving implementation of automated retrieval on designated information.

SOA is comprised of engines and components. Engines are at lower levels of the integration stack providing brokering, integration, business process management, mission critical messaging, and transformation capability. Components are adapters or automated processes that are messages with rules imbedded in them.

SOAs are easy to use because the rules are imbedded in the message using a graphical user interface instead of a programmer. The services oriented architecture is the foundation for higher-level capabilities such as business process management and business activity monitoring. It enables the assembly of composite applications that combine functionality from existing applications to more effectively address the needs of business users.

Major changes in the software industry go beyond technical issues. Customer service, supply chain, IT governance, and procurement innovation is occurring across every industry. A major benefit of these changes is that software comes closer to meeting the agility demands of business environments. Continuing change in tools, technologies, skills, processes, products, and vendor relations pose significant challenges. Strategic positioning is driving adoption of service-oriented architecture (SOA).

Service oriented architecture (SOA) markets at \$450 million in 2005 are expected to reach \$18.4 billion by 2012. Market growth comes because SOA enables the flexible IT architecture that is needed to respond to market shifts brought by speeded product cycles and competitive challenges.



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Services Oriented Architecture (SOA) Executive Summary

Service Oriented Architecture (SOA) Market Driving Forces

TABLE ES-1

SERVICE ORIENTED ARCHITECTURE (SOA) MARKET DRIVING FORCES

- Speed corporate utilization of best-of-breed applications by leveraging value of information
- Support Internet information exchange 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 by providing access to information
- Integrate access to packaged ERP applications, such as PeopleSoft, SAP, Oracle, Siebel, S.W.I.F.T.
- Integrate access to packaged database applications, such as Oracle, Sybase, NT SQL Server, DB2, Informix, and Enscribe

TABLE ES-1 (CONTINUED)

SERVICE ORIENTED ARCHITECTURE (SOA) MARKET DRIVING FORCES

- Build intelligent interfaces to Scopus, Clarify, Vantive information management systems
- Extend investment in legacy applications by permitting access to information
- Enable server and network computing to leverage islands of information
- Support electronic commerce over the Internet by providing access to a range of applications
- Integrate new solutions with legacy applications

Source: WinterGreen Research, Inc.

Service oriented architecture (SOA) components help corporations integrate their existing data and applications into new business systems. SOA software components allow customers to more quickly react to changing market conditions by using process models to design and build more flexible applications. SOA software projects routinely range from \$100,000 to \$2.5 million. IBM has implemented 1,700 SOA projects.

SOA provides a flexible application framework for managing changing business needs. Services oriented applications are positioned to unlock the business portfolio by providing adapters that connect to output nodes and an engine to manage the adapters. Adapters are reusable pieces of code that implement Web services (SOA) to achieve automated information access. Benefits are achieved by accessing applications in a portfolio with discrete services.

The aim is to streamline IT infrastructure. Services oriented architecture (SOA) is designed to achieve an alignment of IT investments with business goals. Adapters are used to achieve more flexible business response to market changes by providing bits of application functionality that implement business rules in the context of achieving implementation of automated retrieval on designated information.

Middleware is different from tools or applications; it is infrastructure that provides access. But, it is not just infrastructure. It is necessary to understand the value of middleware; the value is access. Just as communications systems are just infrastructure, networks, they are extremely valuable and in emergencies when they are no longer available, the value of access is accentuated. So also with middleware, communication is what makes the business systems work in real time.

Real time systems need middleware to move information seamlessly from one place to another, from computers to ordinary people with out writing a program to make the information move.

Middleware means that information can be left where it is and operated on from that place. Tools and databases are used to consolidate information, move it from one place to another. Middleware consists of providing in place access. Middleware is like making a phone call to data, instead of a plane trip to move the information into a data warehouse, where access is still difficult and information becomes out of sync from the original stored information.

SOA is comprised of engines and components. Engines are at lower levels of the integration stack providing brokering, integration, business process management, mission critical messaging, and transformation capability. Components are adapters or automated processes that are messages with rules imbedded in them.

SOAs are easy to use because the rules are imbedded in the message using a graphical user interface instead of a programmer. The services oriented architecture is the foundation for higher-level capabilities such as business process management and business activity monitoring. It enables the assembly of composite applications that combine functionality from existing applications to more effectively address the needs of business users.

Web services infrastructure enterprise services platform is a standards-based business integration software solution for building an industrial-strength service-oriented architecture (SOA). The enterprise services platform combines the enterprise application integration technology with messaging and event-driven capabilities. Service-oriented architecture fabric capabilities create a comprehensive Web services-based integration infrastructure.

SOA stack at the lower levels is a combination of brokers, portals, application servers, mission critical messaging, and adapters. Integration and messaging are significant SOA stack elements. Adapters are the glue that creates a SOA. The SOA engine at the upper level is a stack that is a combination of directory and database. The database functionality is needed because the SOA adapters have header and revision information that is more complex than can be stored in a directory. The SOA engine manages the location of the SOA adapters.

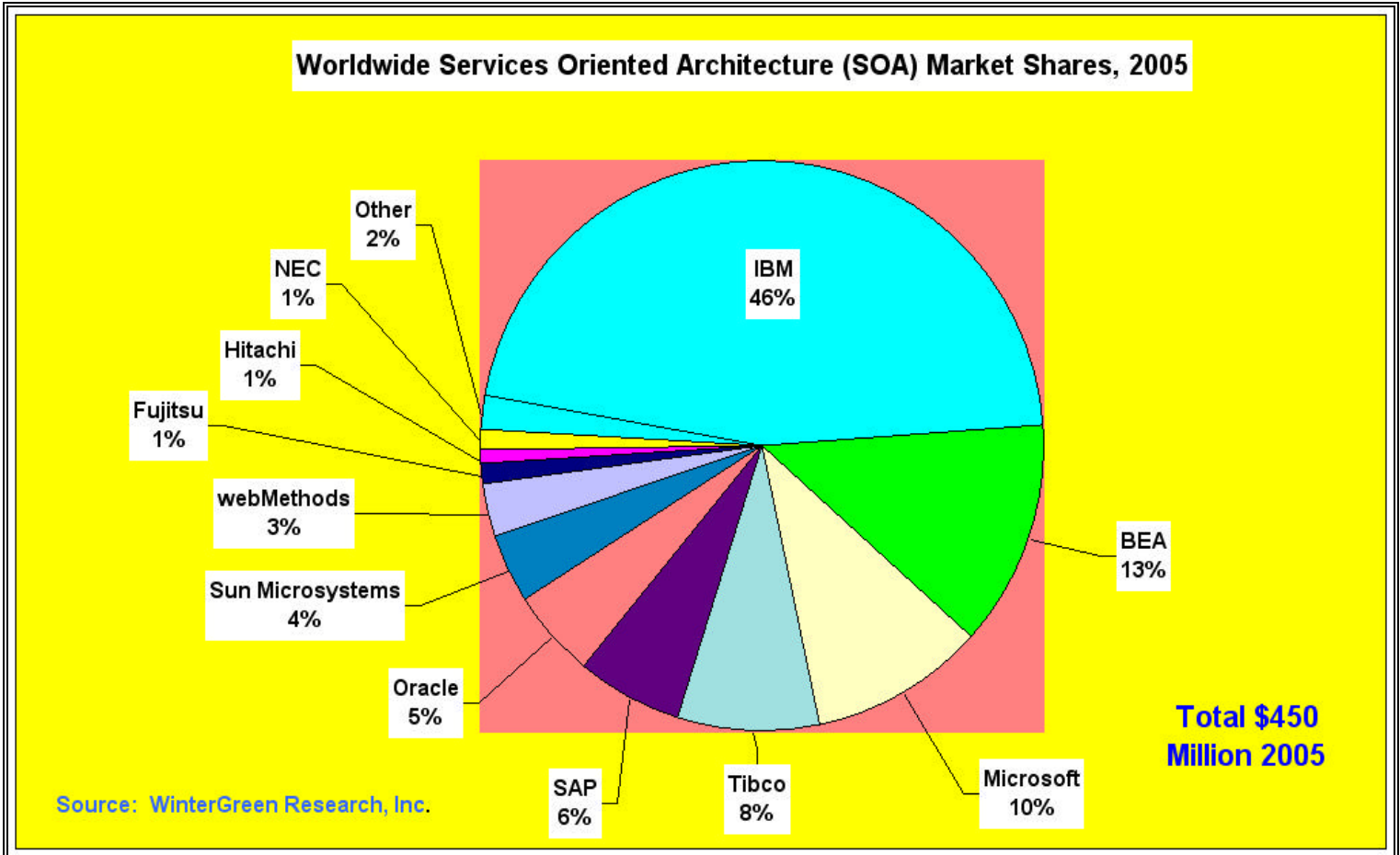
Services Oriented Architecture Market Shares

Business process management promises to take the islands of knowledge, data and business rules that represent the core of enterprise activities and unite them into a business system that is accessible to ordinary business people. Business automation allows companies to rapidly automate and analyze business processes that flow across multiple applications.

Leveraging Intranets and the Internet, application integration business process solutions present new levels of flexibility, customer service, and operational efficiency across an extended enterprise. IBM increased its market share to 46% in 2005, up from 34% in 2004 and 30% in 2003. IBM has SOA business process management (BPM) initiatives that benefit companies by implementing streamlined processes, improved customer service, more effective compliance and risk management, and improved responsiveness to changing business conditions.

BEA participates in the SOA market with 13% share, Microsoft with 10% share, Tibco with 8% share, SAP with 6% share, Oracle with 5% share, and WebMethods with 3% market share in 2005. These are the market leaders in services oriented applications (SOA) markets. Fujitsu, NEC, and Hitachi have measurable SOA market share. (See Figure ES-2.)

FIGURE ES-2
SERVICES ORIENTED ARCHITECTURE (SOA) MARKET SHARE, 2005



Service Oriented Architecture Market Forecasts

Major changes in the software industry go beyond technical issues. Customer service, supply chain, IT governance, and procurement innovation is occurring across every industry. A major benefit of these changes is that software comes closer to meeting the agility demands of business environments.

Continuing change in tools, technologies, skills, processes, products, and vendor relations pose significant challenges. Strategic positioning is driving adoption of service-oriented architecture (SOA).

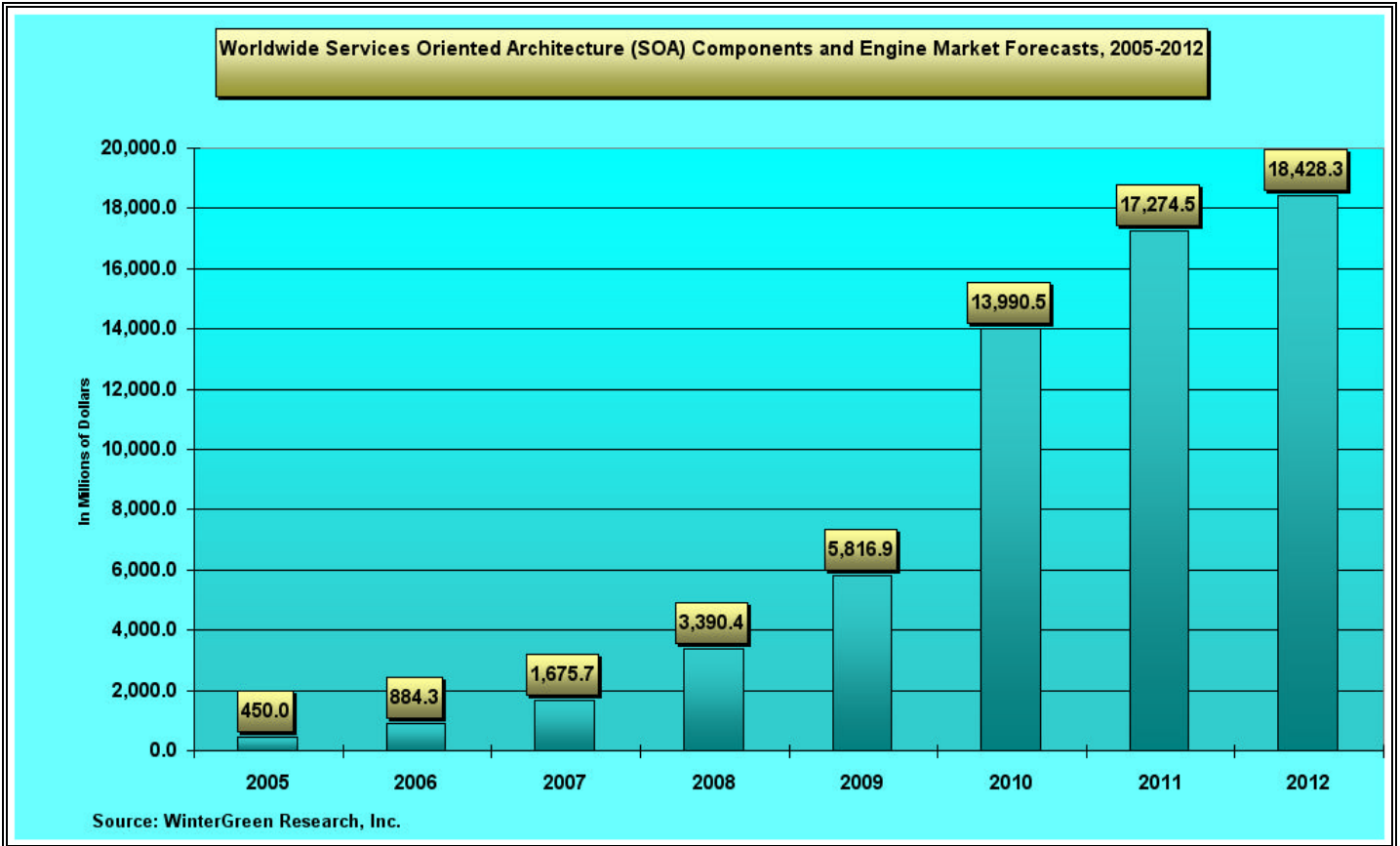
Service oriented architecture (SOA) markets at \$450 million in 2005 are expected to reach \$18.4 billion by 2012. (See Figure ES-3.) Market growth comes because SOA enables the flexible IT architecture that is needed to respond to market shifts brought by speeded product cycles and competitive challenges.

SOA must be harnessed within the right culture. This generation of software represents a major shift in the ability for IT to meet business challenges brought by changing market competitive situations. IT can have impact in systems used to achieve improvement in business agility.

SOA software is flexible once deployed. Changing the nature of software can improve agility. Packaged business applications need to be addressed as small messages that are easy to change. SOA makes it possible to look at software in components that are manageable.

FIGURE ES-3

WORLDWIDE SERVICES ORIENTED ARCHITECTURE (SOA) COMPONENTS AND ENGINE MARKET FORECASTS, 2005-2012



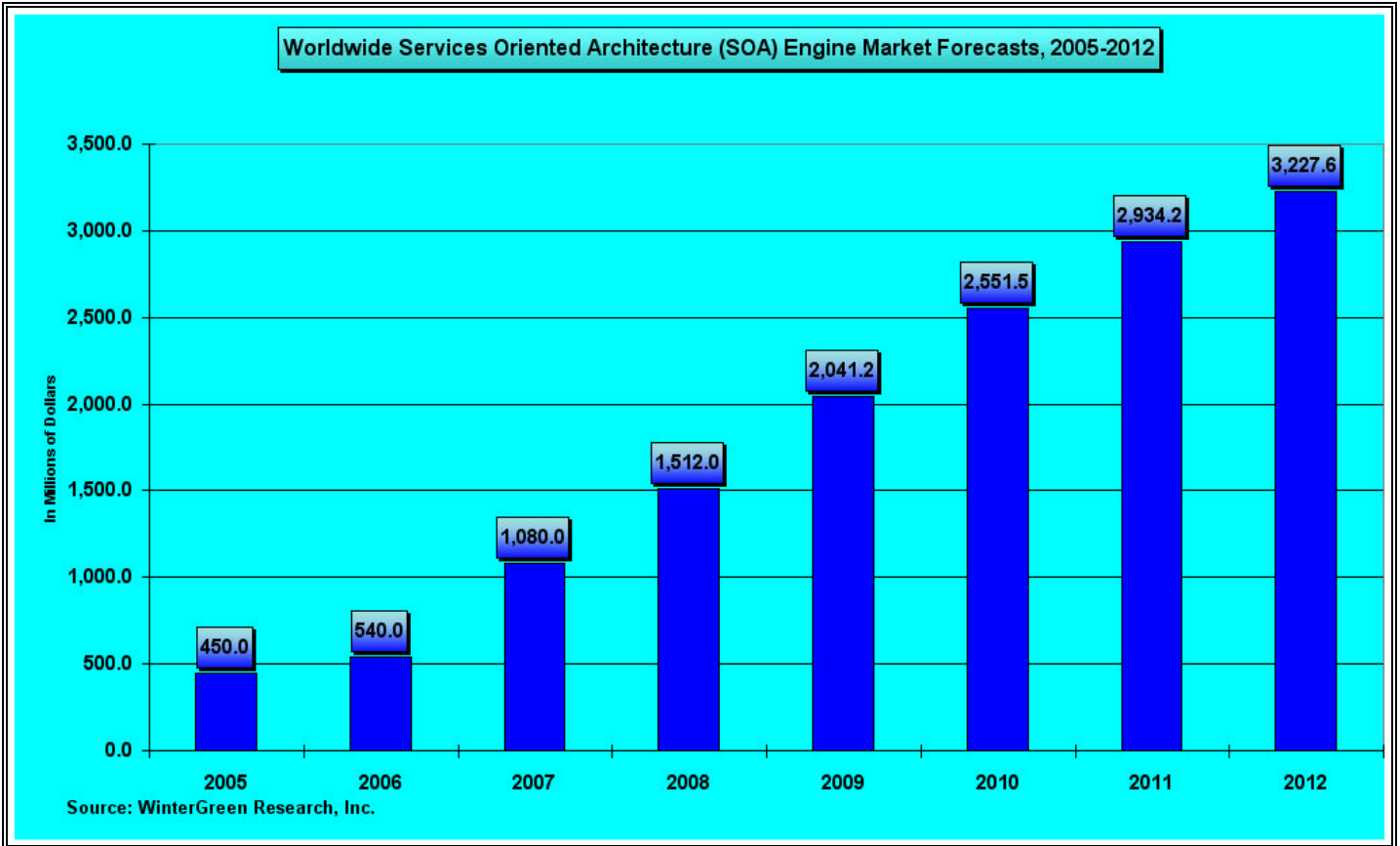
SERVICES ORIENTED ARCHITECTURE (SOA) ENGINE MARKET FORECASTS

Major changes in the software industry go beyond technical issues. Service Oriented Architecture (SOA) engines are evolving from existing integration, mission critical messaging, and business process management technology. Customer service, supply chain, IT governance, and procurement innovation is occurring across every industry. A major benefit of these changes is that software is evolving engines that come closer to meeting the agility demands of business environments.

Service oriented architecture (SOA) engine markets at \$450 million in 2005 are expected to reach \$3.2 billion by 2012. (See Figure ES-4).

FIGURE ES-4

WORLDWIDE SERVICES ORIENTED ARCHITECTURE (SOA) ENGINE MARKET FORECASTS, 2005-2012



SERVICES ORIENTED ARCHITECTURE (SOA) COMPONENT MARKET FORECASTS

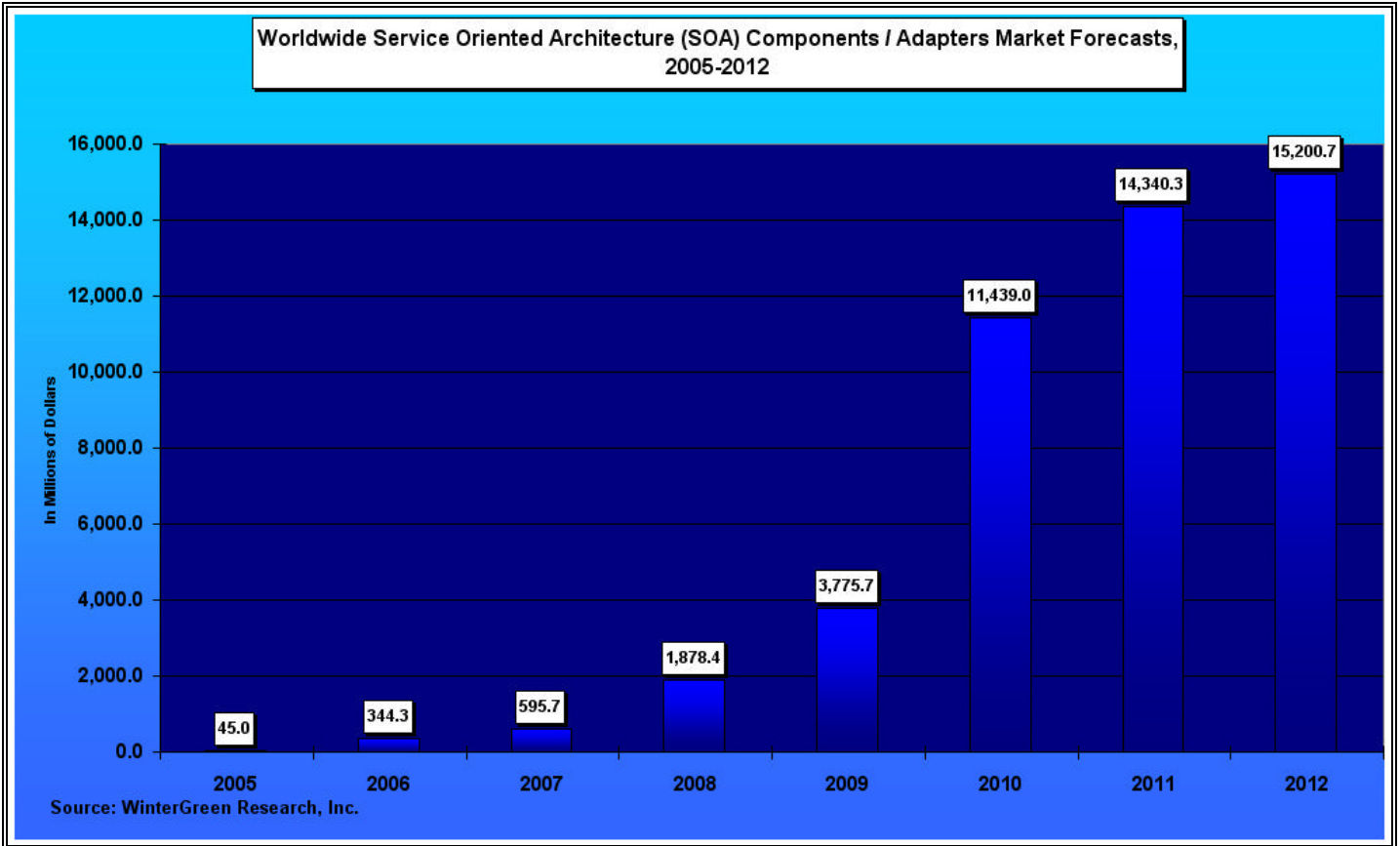
Services Oriented Architecture (SOA) components are evolving in the context of creating the capability to package rules in messages and adapters. Mission critical messaging and business processes become very powerful if they can be changed at the desktop to evolve policy information.

Components can be created with a graphical user interface (GUI). Rules technology is evolving in the context of reusable components. The issue is how reusable components evolve in the context of usability. The trend is that these reusable components get put in place in various situations, and then they get changed in place.

In this instance, components become a commodity. There is a lot of similarity between components, but they have different functions and get stored in a library as components. Customer service, supply chain, IT governance, and procurement innovation depend on industry specific components. Service oriented architecture (SOA) component markets at \$45 million in 2005 are expected to reach \$15.2 billion by 2012. (See Figure ES-5).

FIGURE ES-5

WORLDWIDE SERVICE ORIENTED ARCHITECTURE (SOA) COMPONENTS / ADAPTERS MARKET FORECASTS, 2005-2012



1. Services Oriented Architecture (SOA) Market Description and Market Dynamics

1.1 SOA Engine and Adapters Position Information As A Service

Services oriented applications are evolved from an architecture that is an IT data base engine that functions as a directory to manage scripts with header, date, user, and use information that supports broad enterprise access to information. SOA engines are designed to support reuse of adapters in a number of data centers. Table 1-1 illustrates how access to information is constructed as a service.

TABLE 1-1

SOA ENGINE MANAGES INFORMATION ACCESS TO CREATE A SERVICE

- Create a composite service using
- Infrastructure products that access database
- Infrastructure products that access applications
- Infrastructure products that access document repositories
- Ability to access composite information

TABLE 1-1 (CONTINUED)

INFORMATION ACCESS TO CREATE A SERVICE

- Information freed up from business application
- Middleware for delivering information as a service
- Not tie the information to applications where it can only be accessed from a particular application
- Business reasons to free information to respond quickly to competitive challenges

Source: WinterGreen Research, Inc.

A SOA engine is positioned to permit users to reuse information assets. Information is best left where it is initially put. Table 1-2 illustrates services oriented architecture positioning to achieve flexible infrastructure.

TABLE 1-2

**SERVICES ORIENTED ARCHITECTURE TO ACHIEVE FLEXIBLE
INFRASTRUCTURE**

- Linking information is getting more difficult
- Organization grapple with market shifts
- Organizations address challenges
- Pain points managed
- Accurate view of information that drives efficiency from organizational perspective
- How to do you link information?
- Consolidated systems are needed to deal with complexity issues
- Synopsis of pulling information together
- Information intensive applications do not provide sufficient access
- Business users have been shackled to IT complexity
- Agility to surface information provided by SOA

Source: WinterGreen Research, Inc.

Table 1-3 illustrates services oriented architecture line of business positioning.

TABLE 1-3
SERVICES ORIENTED ARCHITECTURE LINE OF BUSINESS POSITIONING

- Most common complaint: “My people cannot get the information they need to do their jobs properly”
- Fraud detection needed
- Link IT relationships between information needed
- Track information through supply chain
- Address compliance issues
- Need to store information longer
- Provide cohesive view of partner information across supply chain
- Provide cohesive view of employee information across enterprise network
- Communicate in cohesive manner with consultants across supply chain

Source: WinterGreen Research, Inc.

Table 1-4 illustrates services oriented architecture business process efficiency.

TABLE 1-4
SERVICES ORIENTED ARCHITECTURE BUSINESS PROCESS EFFICIENCY

- Increase process efficiencies
- Decrease process times
- Overcome challenges

Source: WinterGreen Research, Inc.

Table 1-5 illustrates services oriented architecture business process challenges.

TABLE 1-5
SERVICES ORIENTED ARCHITECTURE BUSINESS PROCESS CHALLENGES

- Getting worse
- More variety
- More information
- Different formats

TABLE 1-5 (CONTINUED)

SERVICES ORIENTED ARCHITECTURE BUSINESS PROCESS CHALLENGES

- More complexity
- More need to respond quickly
- Different systems aspects
- More implementation of open systems
- Increased types of platforms
- More applications
- More diversity among operating systems
- More variety in the IT systems mix
- Variety of IT brought by acquisitions
- More data centers
- More servers
- Need to scale
- More aspects of competition
- Faster product cycles

Source: WinterGreen Research, Inc.

Table 1-6 illustrates services oriented architecture business process risk management.

TABLE 1-6

SERVICES ORIENTED ARCHITECTURE BUSINESS PROCESS RISK

MANAGEMENT

- Increased risk faced by new regulations
- Address security risks
- Address legal risk
- Address compliance risks
- Rigorous reference management
- Risk management driving up cost of storage because more information has to be stored
- Manage information across life cycle
- Deliver capabilities to attack security risks
- Risk management based on reaction to systems alerts

Source: WinterGreen Research, Inc.

Table 1-7 illustrates services oriented architecture business process improvements.

TABLE 1-7
SERVICES ORIENTED ARCHITECTURE BUSINESS PROCESS IMPROVEMENTS

- Survey attributes and capabilities
- Business challenges
- Streamline process
- Increase productivity
- Understand customer expectations
- Solved by information availability
- Reduce complexity
- Point solutions surface information to people

Source: WinterGreen Research, Inc.

1.2 Services Oriented Applications (SOA) Unlock Business Value

SOA provides a flexible application framework for managing changing business needs. Service-oriented architecture is positioned to unlock the business value of an application portfolio.

Service-oriented architecture (SOA) is about the benefit of breaking down applications in a portfolio into discrete services. The aim is to streamline IT infrastructure. Service-oriented applications (SOA) are built from components that are designed to interconnect to existing applications to achieve an alignment of IT investments with business goals.

Service-oriented architecture (SOA) seeks to optimize IT spending. Business processes depend on the supporting technology aligned for efficiency to be achieved. Deploying applications as Web services in a service-oriented architecture (SOA) allows tight integration of business and technology.

1.2.1 Aligning Business Process And Technology

The problem is that once a business process and technology is aligned, IT infrastructure changes again in response to changing business needs, and then those business needs change again. What has happened is that the IT infrastructure is in a constant state of change.

A top business concern is to create services out of applications. The SOA opportunity is to address business problems in a manner that defines the problem and provides infrastructure that is flexible enough to address the business issue instead of the business issue in the context of the technology.

1.2.2 Business Process Challenges

Companies are faced with business challenges that are a result of pressure from customers to offer more capability for less cost and shareholders to drive top-line growth and more pressure to keep the bottom line in check.

Driving value throughout a business depends on flexible IT systems. To innovate and create business value, SOA architecture is needed. Systems are changing fast. IT departments demand efficiency.

1.2.3 Business Environment

The business environment is one that is constantly changing, and is changing at an ever-increasing rate. In this kind of business environment, windows of opportunity open and close in the blink of an eye. Business managers seek to be able to identify opportunities for growth and seize them. Responsiveness to changing market conditions needs to occur throughout an organization. Responsiveness to changing market conditions has taken a priority position.

Enterprises are working to transform their enterprise to become more responsive, to customer demand. These changes relate to engagement in significant company wide transformation initiatives.

1.3 Services Oriented Architecture (SOA) Ability To Transform Business

Factors that impact the ability to transform a business relate directly to the flexibility of the IT infrastructure. Business models that permit the ability to implement business change depend on services oriented architecture.

Enterprises have been constrained by inflexible IT. For years, the problem has been building an IT infrastructure that is aligned to business needs.

Business needs change. IT investments properly or sufficiently aligned with the business also need flexibility so that business needs are able to change to meet competitive situations.

1.3.1 Services Oriented Architecture Works By Abstracting Business Processes

A service-oriented architecture works by abstracting business processes from the underlying application. IT systems built around SOA are able to create services, such as “check customer credit” or “get account balance.”

This allows the IT department to keep pace with changing business imperatives. It automates these business processes by creating modules of functionality that are universal.

Separating automated processes from any specific application infrastructure or hardware platform creates enormous business flexibility. It allows evolving systems without having to rip and replace hardware or software.

This helps save money and reduce disruption. Infrastructure change can happen as quickly and as often as business needs dictate. It also allows users to take greater control of how business is transacted within enterprise and with partners, suppliers, and customers.

Web services are designed to be modular. SOAs simplify and accelerate the process of building, developing, and deploying business applications. Developers stop worrying about systems infrastructure issues.

IT departments focus on writing innovative applications that directly support core business processes. Applications communicate with one another using open standards. Web services can be recombined and reused when business processes change. This dramatically cuts down on the time it takes to develop applications.

1.3.2 Dynamically Building Application Portfolios

An SOA also allows developers to dynamically build application portfolios. Developers can assemble compound application solutions that use Web services modules both internal and external to the enterprise.

They can change these portfolios when necessary. This enables users to develop new products and enter new markets more quickly and easily. With an SOA built on industry standards, it can quickly locate a Web service that handles functions and creates an application connecting that service to its own systems. The SOA is positioned to create a revenue stream from its existing customer base.

By implementing Web services in an SOA, users can improve communication and collaboration within a business and with key business partners, verifying that the right information gets to the right people at the right time.

Customers and business users can get access to highly personalized applications and information. By enabling a seamless flow of information, businesses can react in real time to relevant information. Flexible service-oriented architecture permits users to react quickly to changes in the marketplace by rapidly modifying business processes. Modular business processes can be interconnected in different ways.

1.3.3 Flexible Application Framework

A flexible application framework is used for changing business needs: Using a service-oriented architecture to unlock the business value of the application portfolio is a central task.

Separating business processes from the underlying technology allows users to build a more responsive organization. It is achieved through rapid application development. The ability to dynamically grow application portfolios or the development of personalized applications that improve communication across the extended enterprise means an SOA allows better alignment of IT investments with business goals.

Flexibility and scalability are central issues. Benefits of an SOA depend on understanding business needs. Consultants can bring to bear vast industry and technological expertise and insight into how technology can drive business value. Hands-on experience implementing SOAs is an asset in implementing systems. End to end systems continue to depend on industry specific components that provide innovation in developing services that provide accurate, timely messages.

1.4 Services Oriented Architecture (SOA) Workflow

Services oriented architecture (SOA) is positioned to provide a flexible application framework for changing business needs: Using a service-oriented architecture unlocks the business value of an application portfolio.

The benefits of breaking down the applications in a portfolio into discrete services are diverse. The potential is to streamline IT infrastructure. A better alignment of IT investments with business goals is made possible by the convergence of IT infrastructure and business process definition in a granular manner.

SOA is positioned to optimize IT spending and keep business processes aligned with changing market conditions. Supporting technology is aligned with needs to address critical services issues. Deploying applications as Web services in a service-oriented architecture (SOA) can allow users to tightly integrate business and technology. By aligning IT infrastructure to business needs, and then those business needs change, the change is easier to manage. Constant change of business process is necessary to adapt to competitive and strategic opportunity.

1.4.1 Infrastructure for Services Oriented Architectures Services-Oriented Architecture (SOA)

IT is structured. Companies are moving to an SOA environment. Web Services is a key enabling standard. SOA enables organizations to respond to change better and faster while providing agility, flexibility, and cost savings.

SOA aligns IT with business. Web Services does not equal SOA. The critical infrastructure for services-oriented architectures shows how to make web services more secure, more robust, and more reusable.

Web Services are used to create SOA-ready components, enabling a company to gain the benefits of business agility. An SOA initiative provides common infrastructure elements, security, monitoring, alerting, and routing.

- Systems securely enable SOA while remaining loosely coupled. XML firewall and SOA enablement solutions are evolving.

1.5 Web Services Standards

A Web service is a standards-based representation of a service. Web services standards use open XML and Internet-based protocols for service description (WSDL: Web Services Description Language), service registration and discovery (UDDI: Universal Description, Discovery, and Integration), and service invocation (SOAP: Simple Object Access Protocol). The increasing awareness and ubiquity of these standards is facilitating the adoption of Web services and in turn the deployment of standards-based SOA.

Traditional programming methodologies do not adequately translate the conceptual model of an application or business process (that is, a design specification) into an executable form.

While development notation systems such as UML allow a business analyst to document functional specifications and use cases using a structured methodology, a programmer still has to interpret this documentation and translate its intent into a different language and structure.

This is a manual and highly interpretive conversion process. It is characterized by inefficiencies—most notably its recursive revision cycles. After the business processes have been accurately translated into procedural code, another issue typically presents itself: the code is less predictable than the business process it models.

This volatility results from procedural code implementations. Bound to a machine execution model, procedural code is an opaque embodiment of processes that encapsulate multiple levels of tightly coupled, interdependent functionality.

Procedural code is prone to program errors that are often difficult and time-consuming to identify and repair. When software is operationally stable, subsequent modifications are discouraged—often to the point of requiring modifications to business processes just to accommodate the limitations of the rigid code.

A BPM / EAI development environment allows the business analyst and the programmer to collaborate in a common workspace on a visual model of the process that combines and correlates their respective contributions. The programmer and analyst create the application by arranging high-level objects representing messages, messaging events, business rules and logic, information flows, activities, operations, transformations, and sub-processes, using a drag-and-drop graphical user interface.

The model itself directly generates an executable run-time assembly of the process. This methodology provides significant development efficiencies and life cycle flexibility by minimizing the ambiguities and recursive revision cycles inherent in traditional methodologies.

The implementation mechanisms for highly complex functions depend on queued messages systems that provide asynchronous capability to protect the integrity of information. Transactions using synchronous messaging systems require two-phase commit, roll-back ACID transaction support, and nested and parallel operations, are built in functions of the objects; thus, eliminating the need to write complicated procedural code to implement these capabilities.

1.6 SOA Development Methodology

SOA development methodology depends on steps describing the procedure for creating an application in a server that adheres to the paradigm of giving information when needed to make an informed business decision.

SOA is used to create the documents involved in the application / process as well as their respective schema definitions. This is accomplished in a schema editor. A server module can be accessed from within the middleware systems.

A schema editor enables users to define the structure and semantic metadata that declares the meaning, functions, and processing requirements of the content of a document. An instance is created from schema.

When the SOA server receives an instance of a document, the process to which the document is associated validates the document content against its schema definition to ensure the document form and content conform to the schema and the application processing requirements. SOA server schema creates a W3C-compliant XSD document as well as a visual tree node reference model of the schema.

The tree node model of the schema and the XML representation of the document schema are typical ways of implementing SOA.

1.7 SOA Creates Transformation Requirements For Document Interchanges

SOA creates transformation requirements for document interchanges. In applications that are composed of loosely coupled interactions between XML objects, document transformation becomes a functionally exposed mapping sub-process.

Sub-processes are created in server mappers. The transformation maps are used to process and convert the content and structure of any source information.

Maps of information are based on schema representations. Target document formats re used to create reports as a central aspect of SOA. Server mappers visually display the source and destination information formats using the schema tree node model.

1.7.1 Information Is Mapped From Nodes In A Source Schema To Nodes In The Destination Schema

Information is mapped from nodes in a source schema to nodes in the destination schema. By drawing links between the nodes, a map is created. Rules embedded in messages provide conversion, processing, and abstraction capabilities.

Rules are used to create looping, cumulative, date and time, and iteration. Linking one or more source nodes to a rule component and then linking the rule component to one or more destination nodes graphically implement these.

2. Services Oriented Architecture (SOA) Market Shares and Market Forecasts

2.1 Services Oriented Architecture Market Aspects

SOA provides a flexible application framework for managing changing business needs. Services oriented applications are positioned to unlock the business portfolio by providing adapters that connect to output nodes and an engine to manage the adapters. Adapters are reusable pieces of code that implement Web services (SOA) to achieve automated information access. Benefits are achieved by accessing applications in a portfolio with discrete services.

The aim is to streamline IT infrastructure. Services oriented architecture (SOA) is designed to achieve an alignment of IT investments with business goals. Adapters are used to achieve more flexible business response to market changes by providing bits of application functionality that implement business rules in the context of achieving implementation of automated retrieval on designated information.

Services oriented architecture (SOA) seeks to optimize IT spending. Business processes depend on the supporting technology aligned for efficiency to be achieved. Deploying applications as Web services in a service-oriented architecture (SOA) allows tight integration of business and technology.

2.1.1 Services Oriented Architecture (SOA) Components

A system or application that accesses a given Web service is a consumer that uses a SOA component. A consumer that uses a component may be a business analyst, manager, or IT developer building a Web services component-based application, which will be made available to end-users.

SOA is comprised of engines and components. Engines are at lower levels of the integration stack providing brokering, integration, business process management, mission critical messaging, and transformation capability. Components are adapters or automated processes that are messages with rules imbedded in them.

SOAs are easy to use because the rules are imbedded in the message using a graphical user interface instead of a programmer. The services oriented architecture is the foundation for higher-level capabilities such as business process management and business activity monitoring. It enables the assembly of composite applications that combine functionality from existing applications to more effectively address the needs of business users.

Web services infrastructure enterprise services platform is a standards-based business integration software solution for building an industrial-strength service-oriented architecture (SOA). The enterprise services platform combines the enterprise application integration technology with messaging and event-driven capabilities. Service-oriented architecture fabric capabilities create a comprehensive Web services-based integration infrastructure.

The enterprise services platform enables customers to achieve a quantifiable return on their infrastructure investment. By linking business processes, seamlessly integrating enterprise and legacy applications and databases, and enabling enterprise-scale Web services deployment the system achieves integration of systems on the network.

The enterprise services platform allows an enterprise to leverage its existing software investments and expose those assets to the enterprise as business services.

Table 2-1 illustrates deterrents to effective interaction of systems. SOA is positioned to address and overcome these deterrents, providing rules based messaging system that is easy to use and easy to change, supporting communication of information.

TABLE 2-1
DETERRENTS TO EFFECTIVE INTERACTION OF WEB SERVICES SYSTEMS

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

Source: WinterGreen Research Inc.

Systems have architectures and platforms designed to do a specific job or manage a particular business process efficiently. Communication is an adjunct to the primary system.

SOA 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.

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

SOA 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.

2.1.2 SOA Middleware Means That Information Can Be Left Where It Is An Operated On From That Place

Middleware is efficient. It can be used to create services around information access. Just as carrier networks have services, middleware offers the opportunity to implement information services. There are all different kinds of middleware: RFID middleware, EAI enterprise application middleware, SOA services oriented architecture middleware to name a few.

WinterGreen Research writes about all kinds of middleware. There are all kinds of middleware services available. The services re used to implement entertainment for consumers. The services re used to implement more efficient supply chains for businesses. Businesses can improve the efficiency of internal processes and implement faster access to particular kinds of information needed to make a decision.

Middleware is different from tools or applications; it is infrastructure that provides access. But, it is not just infrastructure. It is necessary to understand the value of middleware; the value is access. Just as communications systems are just infrastructure, networks, they are extremely valuable and in emergencies when they are no longer available, the value of access is accentuated. So also with middleware, communication is what makes the business systems work in real time.

Real time systems need middleware to move information seamlessly from one place to another, from computers to ordinary people with out writing a program to make the information move.

Middleware means that information can be left where it is and operated on from that place. Tools and databases are used to consolidate information, move it from one place to another. Middleware consists of providing in place access. Middleware is like making a phone call to data, instead of a plane trip to move the information into a data warehouse, where access is still difficult and information becomes out of sync from the original stored information.

Middleware moves information seamlessly, easily from one application to another, from the edge of the network to the core processor, from the distributed processes to the mainframe processes, and from the applications to the databases.

2.2 Services Oriented Architecture (SOA) Market Driving Forces

SOA market driving forces relate to the need for automation of process. Information exchange depends on access to every different type of enterprise resource planning (ERP) system and network connectivity. Supply chains are automated using BPM technology based on integration infrastructure. Electronic commerce needs application servers and integration infrastructure to function.

New customer service systems need SOA in order to be implemented efficiently. Long running processes can be supported in a number of ways, but BPM is most efficient. Indirect factors relate to the migration of existing products from separate market segments. File transfer, CTI, applications development, and workflow illustrate the alternate ways to implement long running processes.

Enterprise application integration is occurring in the context of corporate adoption of best-of-breed SOA strategies. Mergers, acquisitions, and reorganizations are increasing. The driving force is the need to leverage economies of scale brought by the Internet. A desire to develop closer links with customers, suppliers, and partners is also evolving. These events all drive demand for SOA.

Applications, databases, operating systems, and hardware platforms depend on integration infrastructure and middleware messaging. Application servers blend seamlessly into networks supporting mainframes, client/server platforms, and PCs.

Companies trying to merge IT departments following a merger or acquisition need integration infrastructure. Those involved in front office/back office integration and those working to comply with new regulations all face the need to implement integration. SOA is emerging as a layer above integration infrastructure that guides process automation once integration has been put in place. Table 2-2 illustrates SOA market driving forces.

TABLE 2-2

SERVICE ORIENTED ARCHITECTURE (SOA) MARKET DRIVING FORCES

- Speed corporate utilization of best-of-breed applications by leveraging value of information
- Support Internet information exchange 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 by providing access to information
- Integrate access to packaged ERP applications, such as PeopleSoft, SAP, Oracle, Siebel, S.W.I.F.T.
- Integrate access to packaged database applications, such as Oracle, Sybase, NT SQL Server, DB2, Informix, and Enscribe
- Build intelligent interfaces to Scopus, Clarify, Vantive information management systems
- Extend investment in legacy applications by permitting access to information
- Enable server and network computing to leverage islands of information

TABLE 2-2 (CONTINUED)

SERVICE ORIENTED ARCHITECTURE (SOA) MARKET DRIVING FORCES

- Support electronic commerce over the Internet by providing access to a range of applications
- Integrate new solutions with legacy applications

Source: WinterGreen Research, Inc.

Service oriented architecture (SOA) components help corporations integrate their existing data and applications into new business systems. SOA software components allow customers to more quickly react to changing market conditions by using process models to design and build more flexible applications. SOA software projects routinely range from \$100,000 to \$2.5 million. IBM has implemented 1,800 SOA projects, many of them trial installations.

2.3 Services Oriented Architecture Market Shares

Business process management promises to take the islands of knowledge, data and business rules that represent the core of enterprise activities and unite them into a business system that is accessible to ordinary business people. Business automation allows companies to rapidly automate and analyze business processes that flow across multiple applications.

Leveraging Intranets and the Internet, application integration business process solutions present new levels of flexibility, customer service, and operational efficiency across an extended enterprise. IBM increased its market share to 46% in 2005, up from 34% in 2004 and 30% in 2003. IBM has SOA business process management (BPM) initiatives that benefit companies by implementing streamlined processes, improved customer service, more effective compliance and risk management, and improved responsiveness to changing business conditions.

BEA participates in the SOA market with 13% share, Microsoft with 10% share, Tibco with 8% share, SAP with 6% share, Oracle with 5% share, and WebMethods with 3% market share in 2005. These are the market leaders in services oriented applications (SOA) markets. Fujitsu, NEC, and Hitachi have measurable SOA market share. (See Figure 2-3 and Table 2-4.)

FIGURE 2-3
SERVICES ORIENTED ARCHITECTURE (SOA) MARKET SHARE, 2005

Worldwide Services Oriented Architecture (SOA) Market Shares, 2005

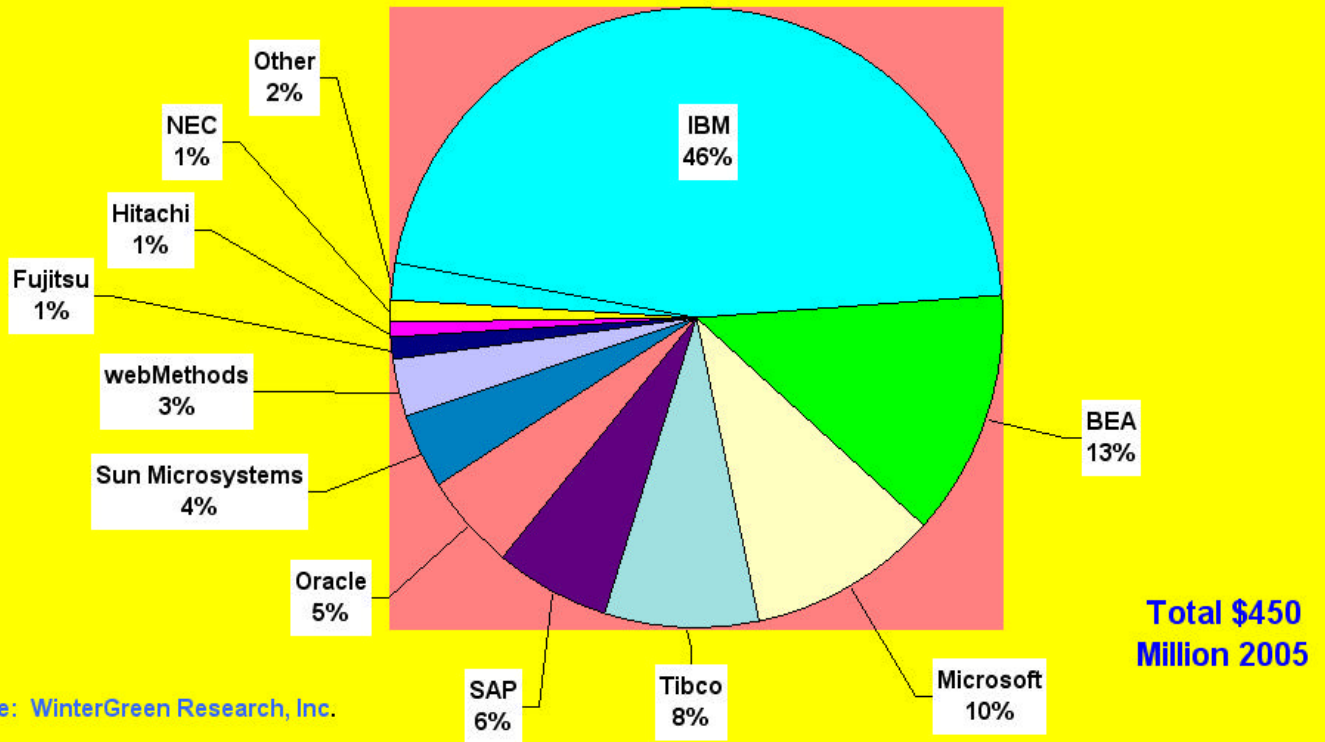


TABLE 2-4
SERVICES ORIENTED ARCHITECTURE (SOA) MARKET SHARE, 2005

Worldwide Services Oriented Architecture (SOA) Market Shares, 2005		
In Millions of Dollars		
	MM\$	%
IBM	207.0	46.0
BEA	58.5	13.0
Microsoft	45.0	10.0
Tibco	36.0	8.0
SAP	27.0	6.0
Oracle	22.5	5.0
Sun Microsystems	18.0	4.0
webMethods	13.5	3.0
Fujitsu	4.5	1.0
Hitachi	4.5	1.0
NEC	4.5	1.0
Other	9.0	2.0
Total	450.0	100.0

Source: WinterGreen Research, Inc.

2.4 SOA Market Description

Over one-third of the Services Oriented Architecture (SOA) market in 2005 is found in application servers. Business process management makes up one-quarter of the market, followed by brokers, portals, adapters and messaging at 15%, 12%, 10%, and 3% respectively (see Figure 2-5 and Table 2-6).

FIGURE 2-5
WORLDWIDE SERVICES ORIENTED ARCHITECTURE (SOA) MARKET DESCRIPTION, 2005

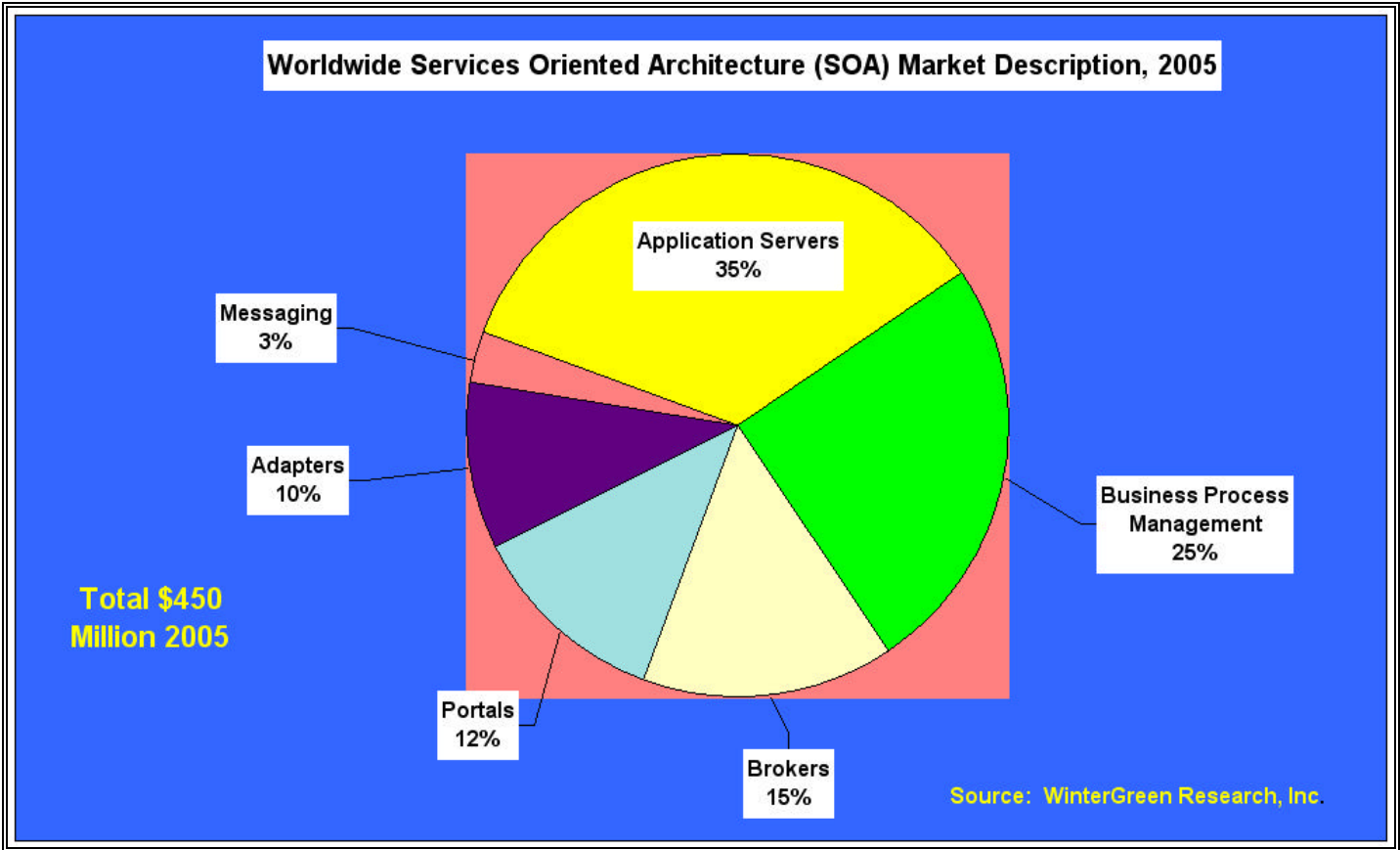


TABLE 2-6
SERVICES ORIENTED ARCHITECTURE (SOA) MARKET SEGMENT ANALYSIS, 2005

Worldwide Services Oriented Architecture (SOA) Market Description, 2005		
In Millions of Dollars		
	MM\$	%
Application Servers	157.5	35.0
Business Process Management	112.5	25.0
Brokers	67.5	15.0
Portals	54.0	12.0
Adapters	45.0	10.0
Messaging	13.5	3.0
Total	450.0	100.0

Source: WinterGreen Research, Inc.

Although accounting for only 10% of the market in 2005, adapters are expected to dramatically increase by 2012 and dominate the market with 90% of its share. The messaging portion of SOA is also expected to show strong growth through 2012, while application servers segment will fall to the third position. Business process management, brokers, and portals will all show slight growth through 2012 (see Table 2-7).

TABLE 2-7

WORLDWIDE SERVICES ORIENTED ARCHITECTURE (SOA) MARKET DESCRIPTION, FORECAST, 2005-2012

Worldwide Services Oriented Architecture (SOA)								
Market Description, Forecast, 2005-2012								
In Millions of Dollars								
	2005	2006	2007	2008	2009	2010	2011	2012
Application Servers	157.5	198.6	249.5	310.6	369.3	435.0	501.1	552.8
% Growth	28.3	26.1	25.6	24.5	18.9	17.8	15.2	10.3
Business Process Management	112.5	119.5	127.6	137.2	147.3	157.9	169.0	180.5
% Growth	6.0	6.2	6.8	7.5	7.4	7.2	7.0	6.8
Brokers	67.5	77.2	90.3	109.5	128.4	148.2	166.9	187.4
% Growth	11.2	14.3	17.1	21.2	17.3	15.4	12.6	12.3
Portals	54.0	62.4	74.7	93.2	114.4	136.0	160.0	184.9
% Growth	13.8	15.6	19.6	24.9	22.7	18.9	17.6	15.6
Adapters	45.0	70.2	125.1	248.4	535.6	1,476.2	4,613.2	16,585.5
% Growth	48.2	56.0	78.2	98.6	115.6	175.6	212.5	259.5
Messaging	13.5	18.2	28.4	47.8	84.7	164.5	327.9	737.1
% Growth	28.6	34.5	56.2	68.5	77.2	94.2	99.4	124.8
Total	450.0	884.3	1,675.7	3,390.4	5,816.9	13,990.5	17,274.5	18,428.3

Source: WinterGreen Research, Inc.

The adapter markets will get very large because they represent reusable modules of code that can be sold at very modest prices, ranging from \$2 to \$500. By the end of the forecasts, 2012, Microsoft and IBM will compete with integration adapters that provide cross-platform, cross-application, and connectivity at every API node within the enterprise, and every end-point of the Internet.

The SOA engine market is comprised of the application servers, business process management, brokers, portals, and messaging software that is used to pull the adapter together in a directory and database infrastructure. The engines have different functions, depending on whether an application server or a portal provides the visual presentation to achieve control of the adapters.

Table 2-8 illustrates services oriented architecture business process benefits.

TABLE 2-8
SERVICES ORIENTED ARCHITECTURE BUSINESS PROCESS BENEFITS

- Survey attributes and capabilities
- Business challenges
- Streamline process
- Increase productivity
- Understand customer expectations
- Solved by information availability
- Reduce complexity
- Point solutions surface information to people

Source: WinterGreen Research, Inc.

2.4.1 IBM SOA Services Architecture Portfolio

IBM software group is the leader in SOA and Web services. Professional services depend on the SOA architecture. IBM offers a combination of industry-specific insight, leading technology and a detailed ability to help unlock and extend existing investments in systems and data. IBM SOA is positioned to drive business growth and business advantage.

IBM global services have a long track record of success with a large portfolio of clients. SOA technology is positioned to drive business value for the existing client base. Hands-on experience with clients implementing SOA solutions is a way to get more value from existing information assets.

SOA is used to drive real, measurable results. IBM broad portfolio of SOA and Web services offerings is growing. IBM continues to learn and innovate with clients. Continuing participation and influence in standards bodies helps ensure that IBM continues to be active in determining the future of SOA.

Developing solutions can be used to create business value. IBM is committed to working with companies to help ensure that SOA is a success.

IBM services oriented architecture is an IT style that supports flexible and timely access to information. It is positioned to permit users to reuse information assets. Information is best left where it is initially put.

Duplicating information creates discontinuities, mistakes, and the need to manually make corrections, a time consuming and inexact science. SOA permits leaving information in one place. Information can be accessed from the original place it is put. Information is transferred using rules.

SOA permits creating rules around the messages so that information can be accessed and managed from where it resides in an application, database, or other storage.

2.4.2 Tibco SOA

Tibco has positioned with real-time enterprise architecture. SOA and EDA are the acronyms. Service-Oriented Architecture (SOA) and Event-Driven Architecture (EDA) are delivered within a unified architectural framework to achieve true business agility.

Tibco infrastructure supports SOA and EDA.

Real-time enterprise SOA and EDA architecture deliver an agile flexible architecture that is the foundation for real-time business. An architecture that combines SOA and EDA provides the ability to scale. It implements a degree of independence between services. It allows companies to create flexible, re-configurable, standards-based services. They can detect, monitor, filter, analyze, and correlate real-time events - both scheduled and unscheduled.

2.4.3 WebMethods Enterprise Services Oriented Architecture

WebMethods integration technology supports the ability to achieve an environment where each enterprise resource is exposed as a service. The aim is to make resources accessible by a service.

Alerts are generated. Subscribers to the alerts receive information in a timely manner. Leveraging the unique, real-time integration of information and business event analysis, Enterprise service-oriented architecture quickly and effectively identifies conditions that require action, creating the ability to impact business operations through continuous process improvement.

Platform independent solutions are provided. The standards-compliant, language and platform-neutral Web services infrastructure is targeted to implementing dynamic coordinated networks of managed services.

2.4.4 BEA Systems Business Process Lifecycle Management Solution

BEA permits businesses to map IT solutions to business demands. BEA Systems infrastructure software business process analysis and business activity monitoring tools help business analysts and developers work together to model and implement processes. Business-level monitoring and alerting capabilities are designed to help businesses better understand their functional and operational processes.

Systems address marketing, sales, fulfillment, and help desk. Business process systems are designed to simulate and optimize those business processes. Complex organizations evolve ways of working that reflect a wide variety of unconnected processes. Vital business processes depend on optimizing and simplifying systems.

SOA based architecture helps lead to increased employee efficiency and productivity and improved customer service by introducing flexibility into business systems. Software can be changed to implement changing business rules. SOA is a rules engine that is accessible to business product managers.

2.4.5 Microsoft SOA BizTalk Server Solution

Microsoft SOA server solution is a process application. Projects that contain components may have them instantiated as schemas, orchestrations, transformation maps, and pipelines. The schemas for the request and request denied documents and the transformation map are combined in a discrete project component that builds a compiled assembly.

The SOA server orchestration details the process workflow. By referencing the schema and map assembly information is encapsulated in a component. Diagrams can incorporate the schemas and map as functional objects. Project component assemblies for a solution are deployed and installed as an executable application under the management of the run-time engine.

2.5 Service Oriented Architecture Market Forecasts

Major changes in the software industry go beyond technical issues. Customer service, supply chain, IT governance, and procurement innovation is occurring across every industry. A major benefit of these changes is that software comes closer to meeting the agility demands of business environments.

Continuing change in tools, technologies, skills, processes, products, and vendor relations pose significant challenges. Strategic positioning is driving adoption of service-oriented architecture (SOA).

Service oriented architecture (SOA) markets at \$450 million in 2005 are expected to reach \$18.4 billion by 2012. (See Figure 2-9 and Table 2-10.) Market growth comes because SOA enables the flexible IT architecture that is needed to respond to market shifts brought by speeded product cycles and competitive challenges.

SOA must be harnessed within the right culture. This generation of software represents a major shift in the ability for IT to meet business challenges brought by changing market competitive situations. IT can have impact in systems used to achieve improvement in business agility.

SOA software is flexible once deployed. Changing the nature of software can improve agility. Packaged business applications need to be addressed as small messages that are easy to change. SOA makes it possible to look at software in components that are manageable.

FIGURE 2-9
WORLDWIDE SERVICES ORIENTED ARCHITECTURE (SOA) COMPONENTS AND ENGINE MARKET FORECASTS, 2005-2012

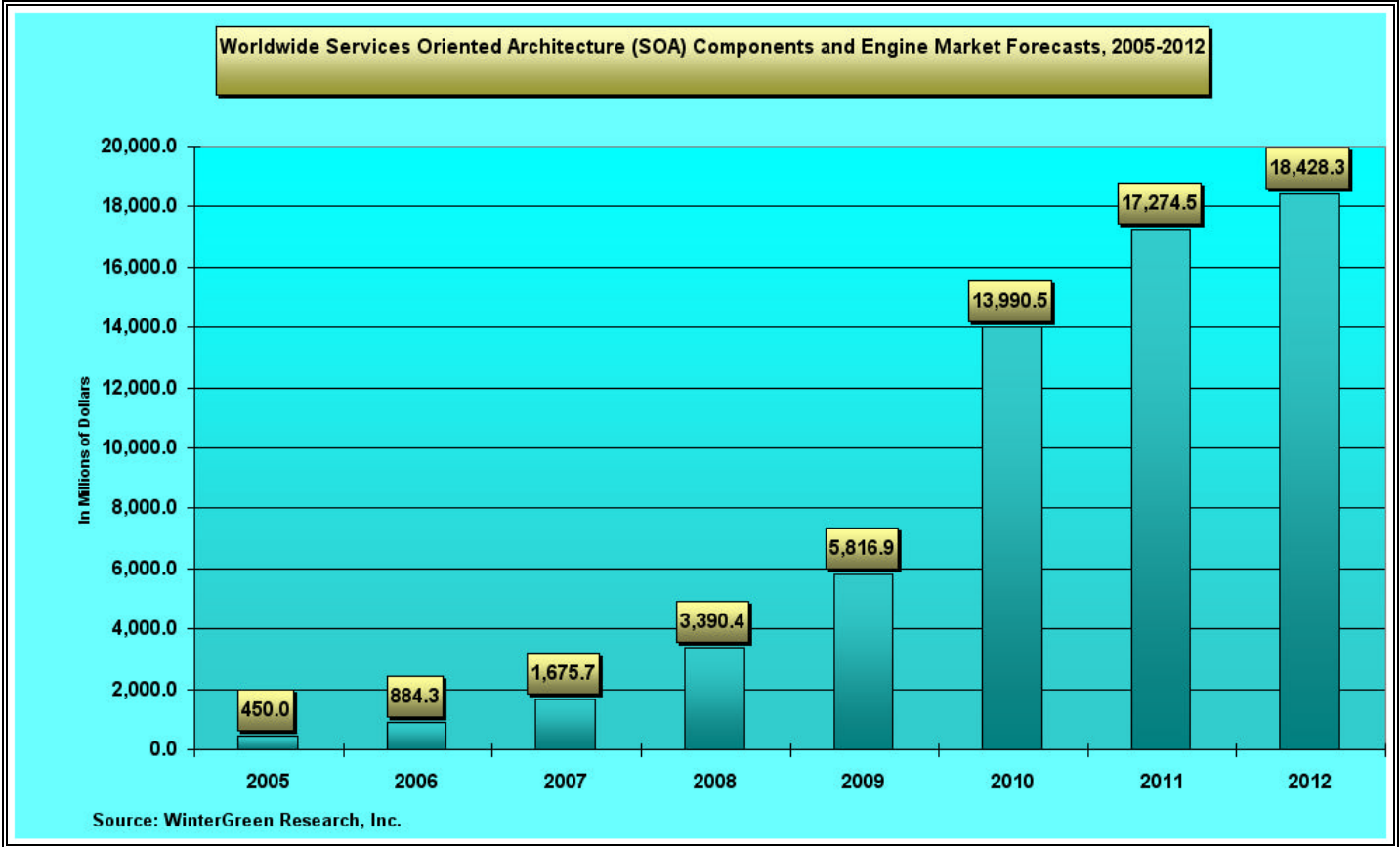


TABLE 2-10

WORLDWIDE SERVICES ORIENTED ARCHITECTURE (SOA) COMPONENTS AND ENGINE MARKET FORECASTS, 2005-2012

Worldwide Services Oriented Architecture (SOA) Components and Engine Market Forecasts, 2005-2012								
In Millions of Dollars								
	2005	2006	2007	2008	2009	2010	2011	2012
Services Oriented Architecture Components and Engines (MM\$)	450.0	884.3	1,675.7	3,390.4	5,816.9	13,990.5	17,274.5	18,428.3
% growth	17.0	26.0	125.0	65.0	55.0	45.0	35.0	26.0

Source: WinterGreen Research, Inc.

2.5.1 Services Oriented Architecture (SOA) Engine Market Forecasts

Major changes in the software industry go beyond technical issues. Service Oriented Architecture (SOA) engines are evolving from existing integration, mission critical messaging, and business process management technology. Customer service, supply chain, IT governance, and procurement innovation is occurring across every industry. A major benefit of these changes is that software is evolving engines that come closer to meeting the agility demands of business environments.

Service oriented architecture (SOA) engine markets at \$450 million in 2005 are expected to reach \$3.2 billion by 2012. (See Figure 2-11, Table 2-12, and Table 2-13.)

FIGURE 2-11
WORLDWIDE SERVICES ORIENTED ARCHITECTURE (SOA) ENGINE MARKET FORECASTS, 2005-2012

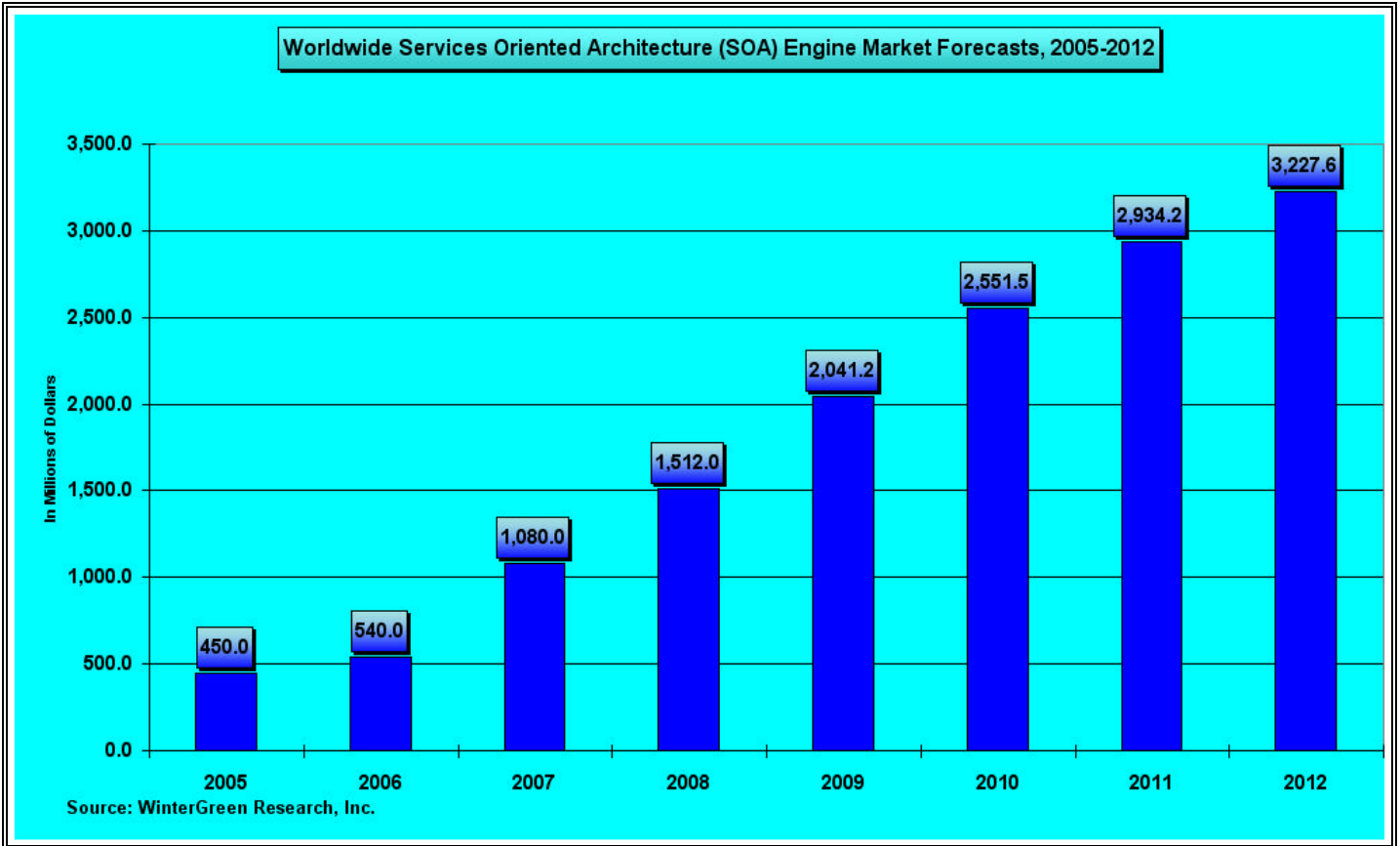


TABLE 2-12

WORLDWIDE SERVICES ORIENTED ARCHITECTURE (SOA) ENGINE MARKET FORECASTS, 2005-2012

Worldwide Services Oriented Architecture (SOA) Engine Market Forecasts, 2005-2012								
In Millions of Dollars								
	2005	2006	2007	2008	2009	2010	2011	2012
Number of Units	841.0	979.8	1,902.5	2,585.9	3,389.2	4,113.1	4,592.4	4,857.3
% Growth	45.0	16.5	94.2	35.9	31.1	21.4	11.7	5.8
Price per SOA Engine (000)\$	535.1	551.2	567.7	584.7	602.3	620.3	638.9	664.5
% Growth	2.0	3.0	3.0	3.0	3.0	3.0	3.0	4.0
Services Oriented Architecture Engines (MM\$)	450.0	540.0	1,080.0	1,512.0	2,041.2	2,551.5	2,934.2	3,227.6
% growth	17.0	20.0	100.0	40.0	35.0	25.0	15.0	10.0

Source: WinterGreen Research, Inc.

TABLE 2-13

**WORLDWIDE SERVICES ORIENTED ARCHITECTURE (SOA) ENGINE
SEGMENT MARKET FORECASTS, 2005-2012**

Worldwide Services Oriented Architecture (SOA) Engine Segment Market Forecasts, 2005-2012								
In Millions of Dollars								
	2005	2006	2007	2008	2009	2010	2011	2012
Industry Specific Component Engine	405.0	432.0	756.0	907.2	1,020.6	1,148.2	1,173.7	1,291.1
Services Component Directory	2.3	10.8	16.2	121.0	244.9	510.3	586.8	645.5
UDDI Manager	6.8	8.1	16.2	22.7	30.6	38.3	44.0	48.4
SOAP Manager	2.3	2.7	5.4	7.6	10.2	12.8	14.7	16.1
Mission Critical Message MQ Manager	13.5	32.4	140.4	257.0	469.5	637.9	792.2	871.5
End to End Configuration Manager	20.2	54.0	145.8	196.6	265.4	204.1	322.8	355.0
Services Oriented Architecture Engines (MM\$)	450.0	540.0	1,080.0	1,512.0	2,041.2	2,551.5	2,934.2	3,227.6
% growth	17.0	26.0	125.0	65.0	55.0	45.0	35.0	26.0

Source: WinterGreen Research, Inc.

2.5.2 Services Oriented Architecture (SOA) Component Market Forecasts

Services Oriented Architecture (SOA) components are evolving in the context of creating the capability to package rules in messages and adapters. Mission critical messaging and business processes become very powerful if they can be changed at the desktop to evolve policy information.

Components can be created with a graphical user interface (GUI). Rules technology is evolving in the context of reusable components. The issue is how reusable components evolve in the context of usability. The trend is that these reusable components get put in place in various situations, and then they get changed in place.

In this instance, components become a commodity. There is a lot of similarity between components, but they have different functions and get stored in a library as components. Customer service, supply chain, IT governance, and procurement innovation depend on industry specific components. Service oriented architecture (SOA) component markets at \$45 million in 2005 are expected to reach \$15.2 billion by 2012. (See Figure 2-14, Figure 2-15, Table 2-16, and Figure 2-17.)

FIGURE 2-14

WORLDWIDE SERVICE ORIENTED ARCHITECTURE (SOA) COMPONENTS / ADAPTERS MARKET FORECASTS, 2005-2012

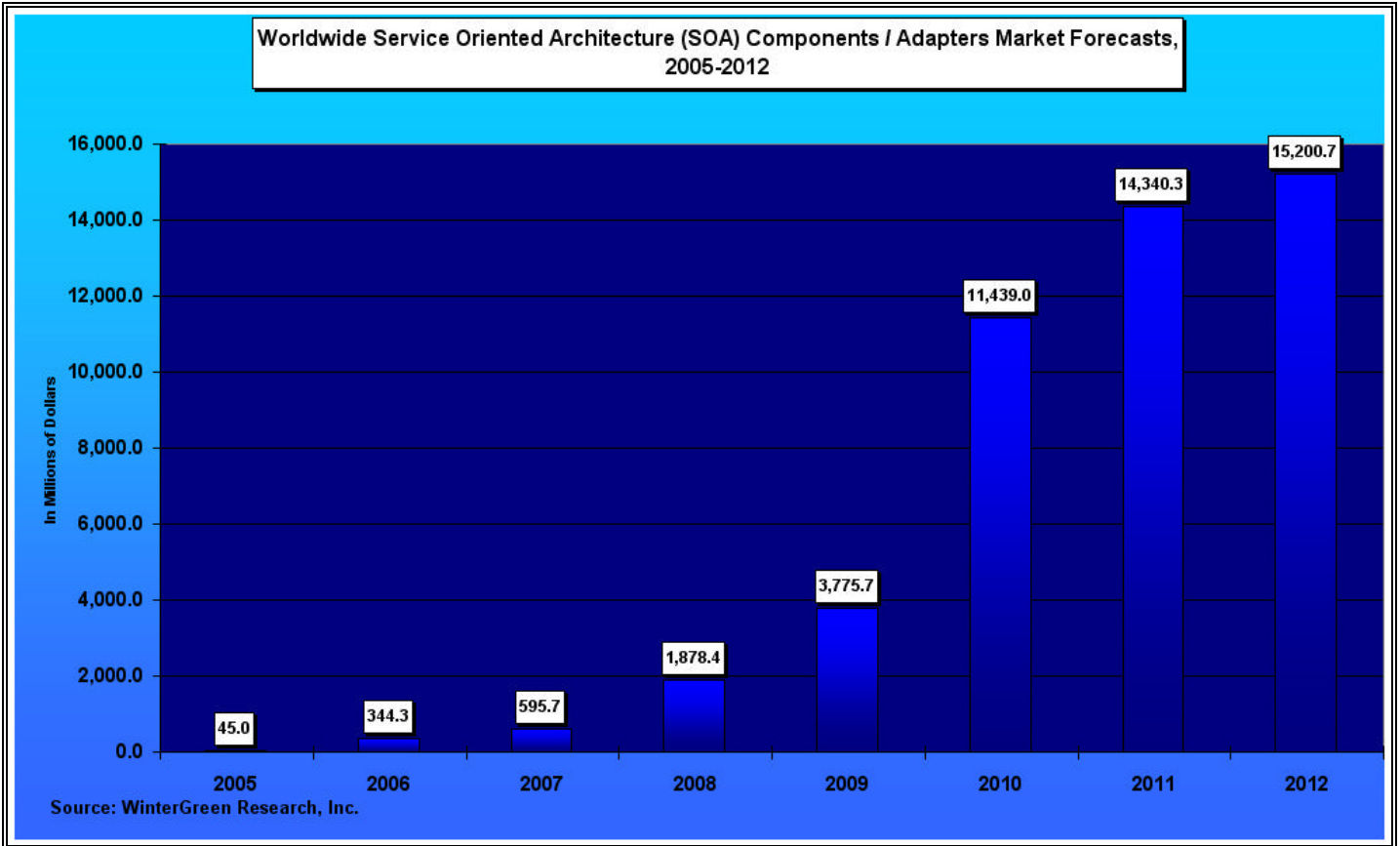


FIGURE 2-15

WORLDWIDE SERVICES ORIENTED ARCHITECTURE (SOA) COMPONENTS
MARKET FORECASTS, 2005-2012

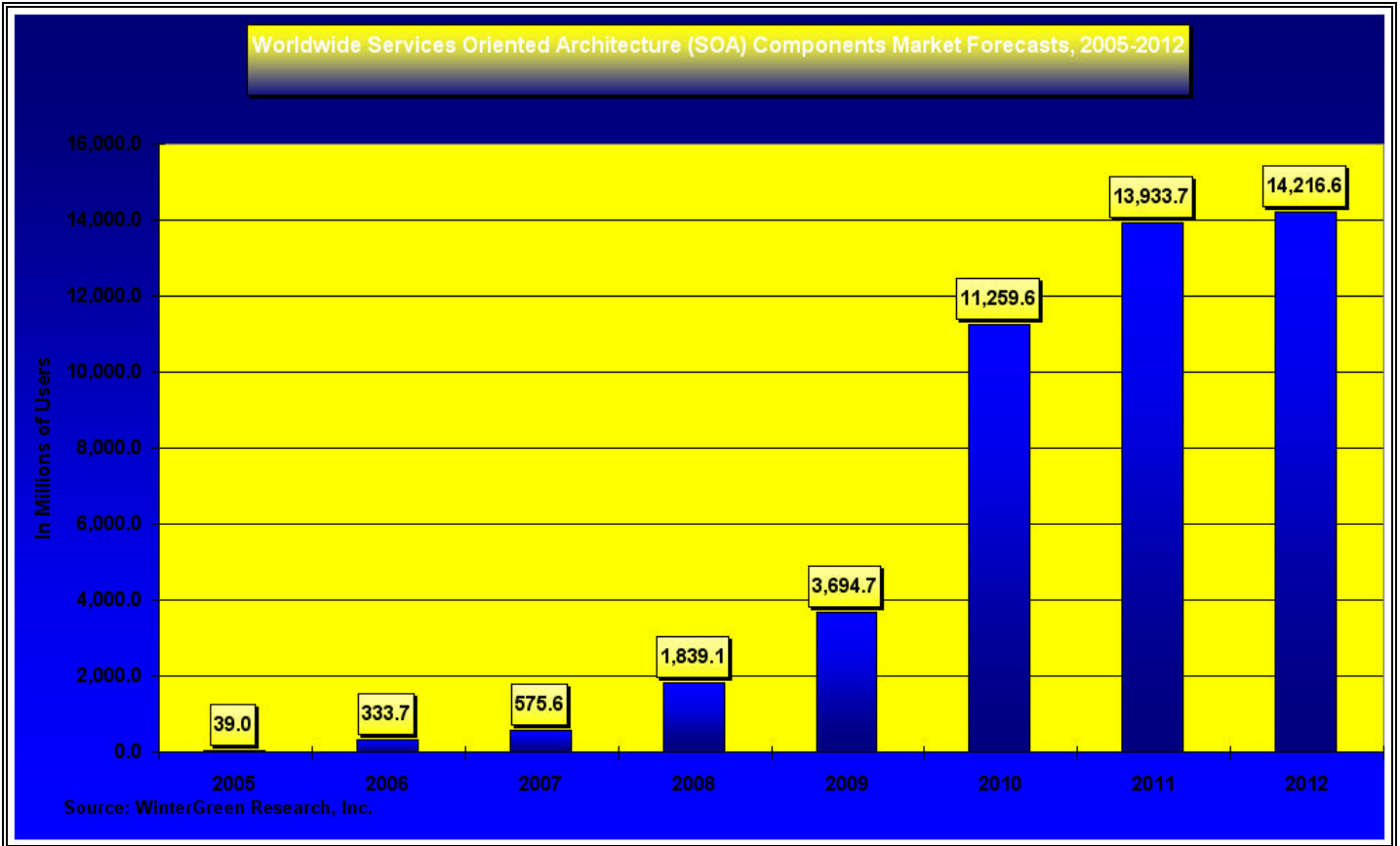


TABLE 2-16

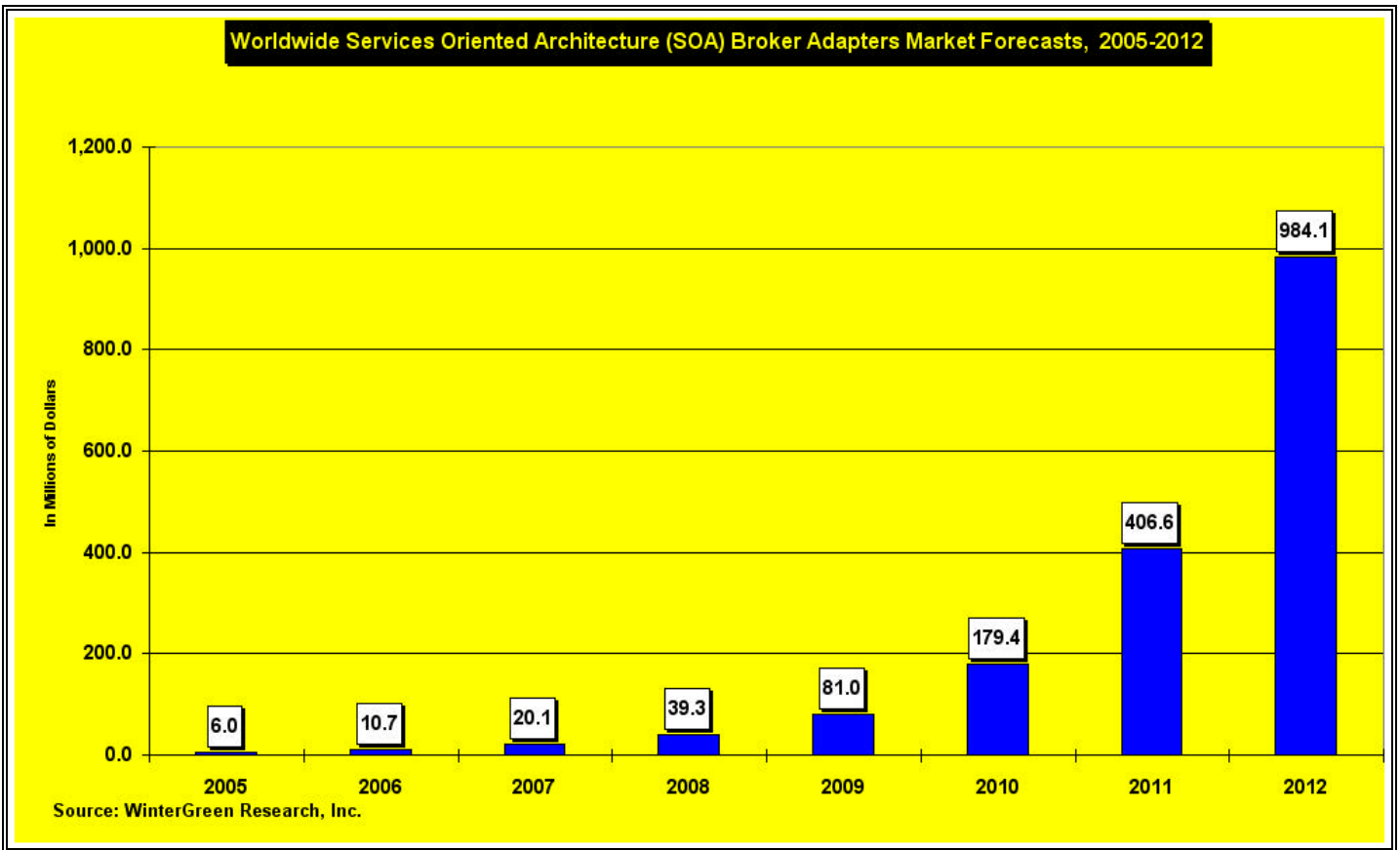
WORLDWIDE SOA COMPONENT ADAPTER / CONNECTOR / XML MARKET FORECASTS, 2005-2012

Worldwide SOA Component Adapter / Connector / XML Market Forecasts, 2005-2012								
In Millions of Dollars								
	2005	2006	2007	2008	2009	2010	2011	2012
Number of Units (000)	2.9	5.1	9.3	17.6	35.3	75.9	166.9	392.3
% Growth	67.0	75.0	83.0	90.0	100.0	115.0	120.0	135.0
With Integration Broker								
Price per Adapter \$	2,039.7	2,100.9	2,163.9	2,228.8	2,295.7	2,364.6	2,435.5	2,508.6
% Growth	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
SOA Broker Adapters (MM\$)	6.0	10.7	20.1	39.3	81.0	179.4	406.6	984.1
Number of Units (MM)	0.1	0.8	9.7	69.1	283.3	1,628.7	3,664.7	6,559.7
% Growth	825.0	825.0	1,050.0	610.0	310.0	475.0	125.0	79.0
SOA Component Messages								
Price per SOA Component \$	480.9	394.4	59.2	26.6	13.0	6.9	3.8	2.2
% Growth	-18.0	-18.0	-85.0	-55.0	-51.0	-47.0	-45.0	-43.0
SOA Components (MM\$)	39.0	333.7	575.6	1,839.1	3,694.7	11,259.6	13,933.7	14,216.6
SOA Components / Adapters	45.0	344.3	595.7	1,878.4	3,775.7	11,439.0	14,340.3	15,200.7
% growth	8.0	665.0	73.0	215.0	101.0	203.0	25.4	6.0

Source: WinterGreen Research, Inc.

SOA broker adapters are similar to EAI integration adapters that provide connectivity between applications, but they have rules and implement policy and process in messages, providing flexible access to information.

FIGURE 2-17
WORLDWIDE SERVICES ORIENTED ARCHITECTURE (SOA) BROKER ADAPTERS MARKET FORECASTS, 2005-2012



SOA components are expected to evolve rapidly as they are so useful. They start out as reusable components, but quickly become simply a library of components that are adaptable to individual situations. As libraries of functionality, they can be glued together to create rules in messages. They represent the largest market opportunity for SOA.

As standards evolve, SOA allows enterprises to mix applications services. In service-oriented architecture, each element in the process or processes becomes a service. This increases the agility of the software because it is easier to re-arrange the process or determine who will perform each step in the process.

Business process is shifting IT projects from large multi-year projects to measured implementations that are structured to improve infrastructure through incremental investment over several years.

Rapid deployment, gap applications, and reconfiguration of existing systems are implemented via process-based tools. The challenge of investments made in established systems is present. Companies must protect existing investment. SOA software is additive rather than a replacement. SOA is a wrapper of established systems.

Enterprises expect to adopt the next-generation SOA application components at a different pace. But, competitive pressures are significant; companies need to address the impact of waiting, if competitive efficiency is compelling.

Leading-edge enterprises adopters move quickly to implement SOA styles. Mainstream enterprises begin to refocus their architectures and rebuild infrastructures in a measured way, waiting for the trial situations to prove the value of SOA.

Wide availability and stability of applications are expected to begin serious implementation in the 2007 timeframe. Conservative enterprises may try to wait until next-generation approaches are proven and mainstream, but they risk losing their business entirely as more nimble competitors achieve market advantage that cannot be regained, market share is forever lost.

IT is moving quickly to adapt their architectures and infrastructures to begin implementing SOA. It has a significant impact on software technology. For software technology, the scale of the shifts has huge implications.

2.6 SOA As A Market Force

Consolidation of software vendors is being achieved across three areas of capability, software technology, business process, and business strategy related to IT. Table 2-18 illustrates ecosystems that shape the SOA environment.

TABLE 2-18

ECOSYSTEMS THAT SHAPE THE SOA ENVIRONMENT

- Consolidation of software vendors
- Areas of capability
- Software technology
- Business process
- Business strategy related to it.

Source: WinterGreen Research, Inc.

The SOA engine and component industry segment market analysis indicates that the early adopter industries for manufacturing, financial services, and retail lead in spending for SOA initially. These will all maintain their lead in the market by 2012. However, telecommunications and healthcare / government will show dramatic growth to over \$1 billion by 2012. Automated tracking and inventory control automation of the supply chain bring need for SOA components that implement policies easily from a desktop. (See Table 2-19.)

TABLE 2-19

WORLDWIDE SERVICES ORIENTED ARCHITECTURE (SOA) ENGINE AND COMPONENT INDUSTRY SEGMENT MARKET FORECASTS, 2005-2012

Worldwide Services Oriented Architecture (SOA) Engine and Component Industry Segment Market Forecasts, 2005-2012

In Millions of Dollars

	2005	2006	2007	2008	2009	2010	2011	2012
Financial Services	90.0	176.9	335.1	678.1	1,163.4	2,798.1	3,454.9	3,685.7
Banking	22.5	44.2	83.8	169.5	290.8	699.5	863.7	921.4
Manufacturing	121.5	238.8	452.4	915.4	1,570.6	3,777.4	4,664.1	4,975.6
Telecommunications	54.0	106.1	201.1	406.8	698.0	1,678.9	2,072.9	2,211.4
Healthcare / Government	33.8	66.3	125.7	254.3	436.3	1,049.3	1,295.6	1,382.1
Retail	94.5	185.7	351.9	712.0	1,221.6	2,938.0	3,627.7	3,869.9
Insurance	13.5	26.5	50.3	101.7	174.5	419.7	518.2	552.8
Other	20.3	39.8	75.4	152.6	261.8	629.6	777.4	829.3
Services Oriented Architecture Components (MM\$)	450.0	884.3	1,675.7	3,390.4	5,816.9	13,990.5	17,274.5	18,428.3
% growth	26.0	125.0	65.0	55.0	45.0	35.0	26.0	26.0

Source: WinterGreen Research, Inc.

Microsoft, IBM, and SAP are creating ecosystems that shape the environment, creating frameworks and standards within which other vendors operate. This consists of large and small vendors who need each other to thrive. Increasingly a company is destined to become part of an ecosystem in order to survive.

Ecosystems lead to a fundamental shift in how users think about software. Rather than making an individual purchasing decision, they are entering into relationships with an ecosystem.

In this environment enterprises need to prioritize carefully where they need the most agility and choose the ecosystem accordingly. Users may need to change vendors and take control of their architecture in business process design.

2.7 Composite Application Platform

A composite application platform gets pieces of data from the various systems of record, precisely and only when needed, to bring data into the composite application for transactions at the time that transactions are taking place. Data that needs to be written is written straight to the system of record. Composite applications eliminate the need for redundant copies of data, as well as the discrepancies that occur because of such copying and storing of data in multiple systems.

Anyone can build business services from the underlying Web services by hand, but that takes time. It is more difficult to manage, and it adds complexity to the integration problem. Providing a visual means to build these business services and then assemble them together into composite applications is a significant step forward in easing integration challenges.

Composite application platforms deliver a means to store and reuse the elements as meta data associated with the end application. Engines enable the reuse of the individual Web services. The relationships among the different services, as well as the composite applications themselves facilitate rapid response to business change, the goal of every organization.

2.8 SOA Regional Analysis

SOA markets at \$450 million had the U.S. as the largest segment with 45% of the total in 2005. Europe was at 38%, Asia Pacific 15%, and Japan had measurable market share. (See Figure 2-20 and Table 2-21.)

FIGURE 2-20
SOA REGIONAL MARKET SHARES, 2005

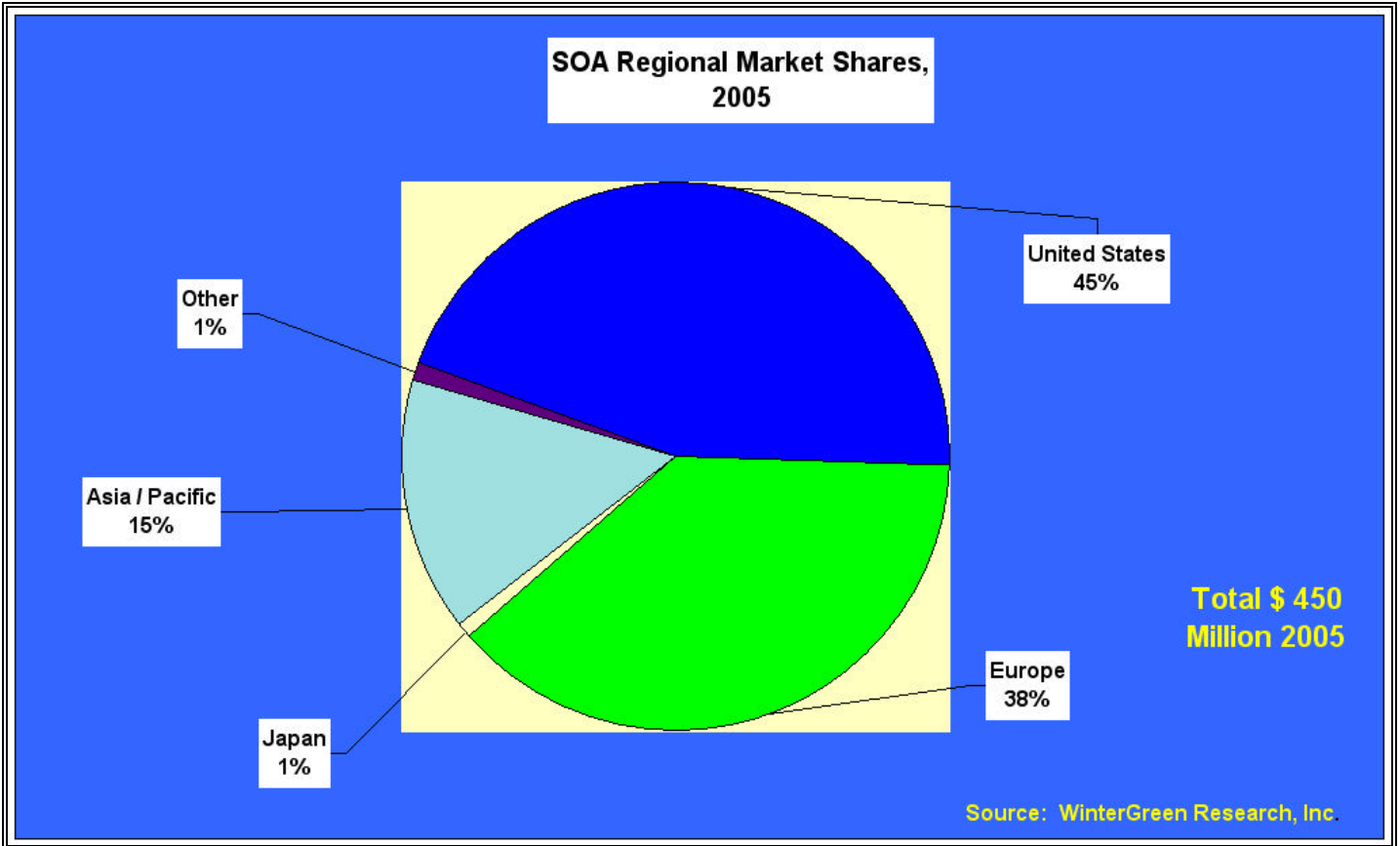


TABLE 2-21
SOA REGIONAL MARKET SHARES, 2005

SOA Regional Market Shares, 2005		
In Millions of Dollars		
	MM\$	%
United States	202.5	45
Europe	171	38
Japan	5.0	1.0
Asia / Pacific	67.5	15.0
Other	4.0	1.0
Total	450.0	100.0

Source: WinterGreen Research, Inc.

3. Services Oriented Architecture (SOA) Services Description

3.1 IBM Services Oriented Architecture

IBM Services Oriented Architecture is an IT style that supports access to information. It is positioned to permit users to reuse information assets. Information is best left where it is initially put. Duplicating information creates discontinuities, mistakes, and the need to manually make corrections, a time consuming and inexact science. SOA permit creating rules around the messages so that information can be accessed and managed from where it resides in an application, database, or other storage.

IBM methodology is used to create services oriented architecture (SOA) that permits access to information wherever it is stored. Business managers can get information that they need to make decisions in a timely manner. IBM WebSphere business integration software is standardized. Reusable components and modeling capabilities transform into a flexible, dynamic environment that supports real time transaction processing and increases resiliency with built-in performance monitoring.

The solutions are very effective in building a business case for IT investment. They reduce time and cost of new releases by 25 percent, make business logic adaptable in real time by business users, and improve tolerance for errors and better performance for faster order fulfillment.

IBM is the leader in SOA and Web services. Professional services depend on the SOA architecture. IBM offers a combination of industry-specific insight, leading technology and a detailed ability to help unlock and extend existing investments in systems and data. IBM SOA is positioned to drive business growth and business advantage.

3.1.1 IBM SOA Customer Order Analysis and Tracking System

IBM customer order analysis and tracking system is a shared order entry system for manufacturing facilities around the globe. It supports a diverse, changing set of fulfillment processes.

The rigid legacy code underlying the system was difficult to modify, slowing IBM incorporation of new requirements. Batch-induced bottlenecks and conflicting data slowed application performance, sometimes delaying shipments. IBM adaptable framework keeps up with changing business conditions.

Financial and organizational investment in service-oriented architecture and Web services helps company's access information directly from applications and databases. Software, autonomic and grid computing, consultant training are part of the IBM SOA offerings. The breadth of these offerings is unmatched in the industry.

This includes the SOA and Web services center of excellence. A virtual CoE is made up of seasoned IT and business professionals from numerous practice areas across IBM Global Services.

Application management innovation, strategy, and change are supported by integrated technology services. 35,000 consultants have expertise in building flexible infrastructures using service-oriented architecture and Web services.

3.1.2 IBM Services Oriented Architecture (SOA) and Workflow

Services oriented architecture (SOA) is positioned to provide a flexible application framework for changing business needs: Using a service-oriented architecture unlocks the business value of an application portfolio.

The benefits of breaking down the applications in a portfolio into discrete services are diverse. The potential is to streamline IT infrastructure. A better alignment of IT investments with business goals is made possible by the convergence of IT infrastructure and business process definition in a granular manner.

SOA is positioned to optimize IT spending and keep business processes aligned with changing market conditions. Supporting technology is aligned with needs to address critical services issues. Deploying applications as Web services in a service-oriented architecture (SOA) can allow users to tightly integrate business and technology. By aligning IT infrastructure to business needs, and then those business needs change; the change is easier to manage. Constant change of business process is necessary to adapt to competitive and strategic opportunity.

3.1.3 Infrastructure for Services Oriented Architectures Services Oriented Architecture (SOA)

IT is structured. Companies are moving to an SOA environment. Web Services is a key enabling standard. SOA enables organizations to respond to change better and faster while providing agility, flexibility, and cost savings.

SOA aligns IT with business. Web Services does not equal SOA. The critical infrastructure for services-oriented architectures shows how to make web services more secure, more robust, and more reusable.

Web Services are used to create SOA-ready components, enabling a company to gain the benefits of business agility. An SOA initiative provides common infrastructure elements, security, monitoring, alerting, and routing.

· Systems securely enable SOA while remaining loosely coupled. XML firewall and SOA enablement solutions are evolving.

3.1.4 IBM Services Oriented Architecture Levels of SOA Adoption

IBM participates in four levels of SOA adoption. On demand operating environment is based on a service-oriented architecture (SOA). Business challenges and IT imperatives result from a constantly changing marketplace.

Benefits of SOA from IBM relate to implementation of real time computing replacing batch processing. Organization moves have been made in the strategic direction of implementing a service-oriented architecture. Benefits accrue from utilization of assets, managing costs, and effective use of resources. An IBM service oriented architecture key component is designed to enable the services lifecycle.

Implementation of a service-oriented architecture may occur at any level of the adoption path. SOA includes of build, deploy, and use within a managed and secure environment.

3.1.5 IBM WebSphere MQ Workflow

IBM WebSphere MQ Workflow coordinates long-lived activities that span multiple systems and workforce groups. Users can avoid bottlenecks by automating and managing task list assignment, rather than ad-hoc e-mails to individuals.

WebSphere MQ Workflow is used to achieve business integration. Table 3-1 illustrates WebSphere MQ workflow is used to achieve business integration.

TABLE 3-1

WEBSHERE MQ WORKFLOW USED TO ACHIEVE BUSINESS INTEGRATION

- Delivers model-driven e-business process automation and tracking
- Manages workflow and processes involving systems or systems and people.
- Spans application and organization boundaries.
- Reduces work hand-off and thus cycle time.
- Supports transactional and universal integration based on MQSeries® and XML: Nothing gets lost nor executed twice.
- Offers ultimate performance and scalability.

Source: WinterGreen Research, Inc.

3.1.6 IBM Global Services Portfolio

IBM global services have a long track record of success with a large portfolio of clients. SOA technology is positioned to drive business value for the existing client base. Hands-on experience with clients implementing SOA solutions is a way to get more value from existing information assets.

SOA is used to drive real, measurable results. IBM broad portfolio of SOA and Web services offerings is growing. IBM continues to learn and innovate with clients. Continuing participation and influence in standards bodies helps ensure that IBM continues to be active in determining the future of SOA.

Developing solutions can be used to create business value. IBM is committed to working with companies to help ensure that SOA is a success.

IBM Global services are positioned to help companies in every stage of planning, implementing, and managing SOA. IBM has created service and management offerings based on extensive real-world experience, industry-leading methods and best practices and proven technologies.

An adoption process can help incrementally implement an SOA solution that can show return on investment at each stage.

3.1.7 IBM Global Services SOA Portfolio Offerings

IBM business enablement services for service-oriented architecture SOA are positioned to help the IT department support meeting business goals. IBM design services for service-oriented architecture help identify the Web services that can increase business flexibility and responsiveness. Table 3-2 illustrates IBM Global Services SOA portfolio benefits.

TABLE 3-2

IBM GLOBAL SERVICES SOA PORTFOLIO BENEFITS

- Are positioned to help companies in every stage of planning, implementing, and managing SOA
- Has created service and management offerings based on extensive real-world experience
- Has industry-leading methods
- Has industry-leading best practices
- Has industry-leading proven technologies
- Can help incrementally implement an SOA solution
- Has incremental adoption process that can show return on investment at each stage of adoption

Source: WinterGreen Research, Inc.

IBM business enablement services for service-oriented architecture SOA are positioned to help the IT department support meeting business goals. IBM design services for service-oriented architecture help identify the Web services that can increase business flexibility and responsiveness.

IBM implementation services for service-oriented architecture are designed to help users create, develop, and implement SOA and Web services. IBM management services for service-oriented architecture ensure that implementation meets performance requirements.

IBM application value optimization services help assess, transform, and manage the application portfolio on a continuous basis. IBM is enabling the business flexibility that companies need to address frequent change in the business environment.

3.1.8 IBM On Demand Real Time Processing Service Oriented Architecture

IBM supports in levels of SOA adoption. On demand operating environment is based on a service-oriented architecture (SOA). Business challenges and IT imperatives result from a constantly changing marketplace.

Benefits of SOA from IBM relate to implementation of real time computing replacing batch processing. Organization moves have been made in the strategic direction of implementing a service-oriented architecture. Benefits accrue from utilization of assets, managing costs, and effective use of resources. An IBM service oriented architecture key component is designed to enable the services lifecycle.

Implementation of a service-oriented architecture may occur at any level of the adoption path. SOA includes of build, deploy, and use within a managed and secure environment.

3.1.9 IBM WebSphere MQ Workflow

IBM WebSphere MQ Workflow coordinates long-lived activities that span multiple systems and workforce groups. Users can avoid bottlenecks by automating and managing task list assignment, rather than ad-hoc e-mails to individuals.

WebSphere MQ Workflow is used to achieve business integration. Table 3-3 illustrates WebSphere MQ workflow is used to achieve business integration.

TABLE 3-3
WEBSHERE MQ WORKFLOW USED TO ACHIEVE BUSINESS INTEGRATION

- Delivers model-driven e-business process automation and tracking
- Manages workflow and processes involving systems or systems and people.
- Spans application and organization boundaries.
- Reduces work hand-off and thus cycle time.
- Supports transactional and universal integration based on MQSeries® and XML: Nothing gets lost nor executed twice.
- Offers ultimate performance and scalability.

Source: WinterGreen Research, Inc.

The IBM programming model for service-oriented architecture (SOA) enables non-programmers to create and reuse IT assets without mastering IT skills. The model includes component types, wiring, templates, application adapters, uniform data representation, and an enterprise service bus.

IBM SOA programming model is required to select, develop, deploy, and recommend programming model elements. Developers come to this model with different skill levels and roles.

3.1.10 IBM SOA Programming Model

Any individual programmer cannot master and apply the proliferation of software technologies, practices, tools, and platforms. Business process transformation depends on non-programmers using existing IT assets to access information needed to make decisions.

IBM SOA is positioned to permit business managers to make decisions. Business managers cannot be expected to implement the excruciating details of the underlying technologies.

Service-oriented architecture (SOA) programming model achieves a separation of concerns so that persons with different skill levels and roles in the enterprise, not necessarily IT professionals, can create and use IT assets throughout every stage of the software development life cycle. The intended result is dramatically improved business agility for the on demand enterprise.

IBM products increasingly implement a SOA and programming model. Programmers build services, use services, and develop solutions that aggregate services. SOA goes beyond programming. A key aspect of the SOA programming model is the expansion of programming to support a broader set of non-traditional developer roles and skills, such as business analysts, and scripting language users.

Web services initially focused on service interfaces. To complement interface standards and best practices, IBM has a message rules capability that is a programming model for implementing services and assembling them into solutions.

Extending the IBM software platform to reach to a broader community of users, including non-traditional programmers is a priority.

The IBM SOA model offers components that match the user role, goals, skills, and conceptual framework. These components enable intuitive development. Another major theme is consumability through progressive disclosure of the programming model features and capabilities.

IBM SOA programming model addresses software development professionals. The programming model elements address these goals. The software is structured as services. The on demand enterprise can be "wired" into a solution by a less skilled developer.

Services are orchestrated into a business process choreography flow to meet rapidly changing business needs. A developer can benefit from structuring SOA software.

SOA is positioned to address the issues of large enterprises or small businesses, an independent software vendor (ISV), an applications provider, or a middleware vendor.

3.1.11 IBM SOA Programming Model

Major features of the SOA programming model include the service data objects (SDOs). These are a fundamental concept in the IBM SOA. SDOs make developers more productive and free users from the technical details of how to access back-end data sources, applications, or services.

They provide a simplifying abstraction that allows programmers to concentrate principally on business logic. SDOs provide a uniform representation for messages that interact with services, replace the confusing labyrinth of technologies for data representation, and access with a single uniform model.

SOA programming model needs a unified paradigm for creating and accessing business logic. A service hides the differences between implementation technologies. A high level of abstraction from existing programming constructs, including Enterprise Java™Beans (EJBs) is offered.

Services can be implemented by components that are assembled into modules. Services can be composed into solutions. Components expose services that can be invoked using addressable interfaces.

Web Services Description Language (WSDL), Java, or other languages describe interfaces. The implementation style can have unresolved references to required services that will be satisfied prior to execution by wiring components together.

The programming model has well-defined component types that model common kinds of artifacts. Developers produce and deploy solutions that are evolving. The enterprise service bus plays a key role as a multi-protocol fabric that weaves service components into a seamless interaction, yet allows enterprise concerns.

Auditing, logging, routing, adaptation of mismatched interfaces, incremental substitution of equivalent componentry, security are functions. Table 3-4 illustrates the enterprise service bus key role.

TABLE 3-4

ENTERPRISE SERVICE BUS KEY ROLE

- Provides multi-protocol fabric
- Weaves service components into a seamless interaction
- Addresses enterprise concerns
- Auditing
- Logging
- Routing
- Adaptation of mismatched interfaces
- Incremental substitution of equivalent componentry
- Security functions
- Component solutions

Source: WinterGreen Research, Inc.

SOA is being implemented enterprise-wide at the backbone level. By inserting mediation components in the path of messages users are able to broker interactions between services without changing existing endpoints.

New process languages reduce the gap between IT concepts and business artifacts. A key one is BPEL. A process can be defined using graphical tools to create an executable program. Processes have a role in on demand business transformation.

An executable long-running process can be created for an extended value chain. By extended value chain, a business arrangement can span multiple suppliers and IT domains. A retailer and its individual suppliers, an insurance company, and its adjusters, create an IT outsourcing situation.

A business state machine is a programming metaphor. A business analyst can create with graphical tools, executes in a process choreography engine. A state machine can represent a business artifact. A purchase order, an insurance claim, and transactions go through transitions with well-defined states in response to specific life cycle events. SOA is used to create a business process without programming.

A reused component can be packaged as a template with points of variability that are intended to be tailored when placing it into a solution. This kind of adaptation becomes a first-class part of the programming model with the addition of a rules language and associated tools, offering customization capabilities to new kinds of users.

3.1.12 IBM SOA Area of Innovation

Another area of innovation is a solution model that lets deployers, administrators, and business users assemble components into solutions. At development time, users can associate a service implementation with the topology that hosts it.

The deployment topology is the system architect model. System requirements and environment assumptions captured by the model are verified against the implementation early, reducing application life cycle costs while greatly improving reliability and accountability.

Late bindings, mediations to transform data, and adapters for existing applications allow service-oriented interactions through an enterprise service bus.

SOA programming model separates development and deployment activities into separate phases. Modules can be implemented at different times. Different individuals, using different skills, can build SOA services.

This yields a true separation of concerns, enabling the repurposing of software components. It also tailors the software experience to an individual user's business role, skill, and task. Finally, it supports a software life cycle to fit the needs of on demand enterprises as they seek increased profitability by reengineering IT processes for business agility.

3.1.13 IBM SOA Programming Model Concept

A programming model is central to IBM SOA. It defines the approach that developers use. Runtime products, such as WebSphere® Application Server, DB2®, and CICS, run or host the programming model artifacts.

Development tools support the modeling and implementation of programming model artifacts. Their assembly into applications is what creates solutions. Deployment into runtimes is frequently implemented as middleware that leave the information in place and create access across applications and across platforms.

Systems management products, agents, and instrumentation support the administration of runtimes and the programming model artifacts they host.

A programming model is a set of part types. Part types encompass the diversity of programming model components: Hypertext Markup Language (HTML) files, database stored procedures, Java classes, Extensible Markup Language (XML) Schema definitions, and C structs defining MQSeries messages are parts of a programming model.

A programming model defines a set of roles that group members with similar skills and knowledge. Categorizing developers helps produce role-appropriate tools that enable non-programmers to implement services and assemble solutions from services.

A business analyst defining business processes and a marketing specialist defining policies that classify customers and compute product discounts can use SOA components to create services.

A user interface developer develops interfaces that present the functional artifacts of the application or solution. This role is assumed to know the application under development and its business goals, to understand the application's users and their tasks sufficiently, to be expert in several user interface design methods, and to be able to create easy-to-use user interfaces by choosing the right kind for each task.

Part types and application interfaces fulfill the role that wraps existing sources of information and applications.

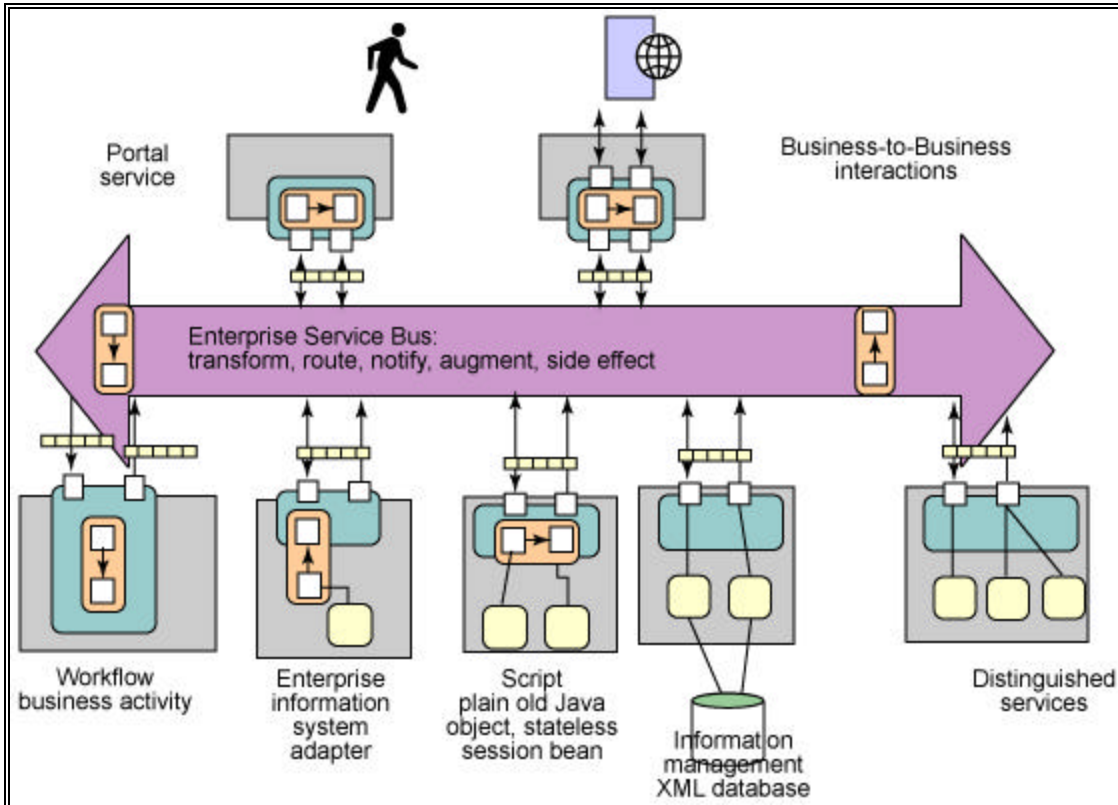
A tool for a Web developing is used for building dynamic pages, using controls associated with HTML and JSP tag libraries, and wiring the controls to EJBs. The key to making Web services easy to implement and use is to achieve incremental extension of existing skills and knowledge, thus making the SOA consumable.

A service in the form of CICS COBOL transaction programs bears little resemblance to one written in BPEL. Calling a service from a database-stored procedure differs from calling it from a JSP. The skills and expectations are different. Consumability is achieved by offering an assortment of tools to adapt the part types to various skills, and to the stages of the development process.

Figure 3-5 illustrates IBM SOA architecture.

FIGURE 3-5

IBM SOA ARCHITECTURE



Source: IBM

The enterprise service bus replaces hard-wired point to point architecture. It is far more flexible. At the core of the IBM SOA architecture is an ESB supplying connectivity among services. The ESB is multi-protocol, supports point-to-point and publish-subscribe styles of communication, and mediation services that process messages in flight.

IBM WebSphere MQ, IBM WebSphere MQ Integrator Broker, and WebSphere have support for Web services and Java Message Services (JMS).

3.1.14 IBM View of a Services Oriented Architecture (SOA)

Products supporting the IBM view of a SOA fall into broad categories: service endpoints and the message transport fabric interconnecting them. Many products, none of which individually is the sole delivery vehicle for the IBM SOA, populate this general architecture.

A service resides in an abstract hosting environment known as a container and provides a specific programming metaphor. The container loads the implementation code of the service, provides connectivity to the ESB, and manages service instances. Different types of services reside in different containers.

The ESB itself is considered a container for mediation services. Table 3-6 illustrates IBM SOA service container functions. Major IBM SOA hosting environments and the kinds of components hosted are illustrated in Table 3-7.

TABLE 3-6

IBM SOA SERVICE CONTAINER FUNCTIONS

- Reside in an abstract hosting environment
- Provide a specific programming metaphor
- Load the implementation code of the service
- Provide connectivity to the ESB
- Manage service instances
- Permit different types of services to reside in different containers
- Permit design recursion where the ESB is considered a container for mediation services
- Permit different kinds of components to be hosted

Source: WinterGreen Research, Inc.

TABLE 3-7

IBM SOA HOSTING ENVIRONMENTS AND THE KINDS OF COMPONENTS HOSTED

- Transaction programs written in COBOL, PL/1, and other languages: CICS or IMS (Information Management System -- an enterprise transaction processing system). Programmers can use SOAP/HTTP, WebSphere MQ, and J2EE J2C connections to access the services.
- Business process choreography: WebSphere Business Integration Server Foundation. This container supports long-lived workflow processes that implement Web service interfaces and invoke operations on other Web services. It also supports long-running business activity transactions.
- Application adapters -- providing a SOA/Web service facade for existing applications and systems: Application adapter container provided by WebSphere Business Integration Server Foundation. An adapter converts between SOA protocols and formats, and those of existing applications and systems. Adapter for SAP converts from SOA-encoded XML-over-Hypertext Transport Protocol to SAP's existing business application programming interface formats and Remote Function Call (RFC).

TABLE 3-7 (CONTINUED)

IBM SOA HOSTING ENVIRONMENTS AND THE KINDS OF COMPONENTS HOSTED

- Service/component type: Container
- Services implemented by pre-defined SQL queries, XML queries, or as database stored procedures: DB2 in conjunction with WebSphere Application Server. Parameters for the query come from a SOA operation's input message and the result provides the output message.
- Services implemented using Java classes and EJBs: WebSphere Application Server.

Source: WinterGreen Research, Inc.

IBM SOA programming model provided an overview of how IBM tools and products fit with the model and how developers can effectively use it in their application development. Table 3-8 illustrates IBM evolution of services oriented architecture.

TABLE 3-8

IBM EVOLUTION OF SERVICES ORIENTED ARCHITECTURE

- Simplified data access using SDOs
- Definition of a service and an introduction to the evolving component model
- Component types to simplify development
- Basic component types
- Service composition and customization
- Process components: BPEL and business state machines
- Customizing services: design patterns, templates, and points of variability
- Service-oriented user interfaces
- SOA approach to management
- Development tools for the SOA software life cycle
- Security in the SOA

Source: WinterGreen Research, Inc.

3.1.15 IBM SOA Resources

IBM SOA resources include Java message service specification in various iterations. J2EE connector architecture provides a Java technology solution to the problem of connectivity between the many application servers and today's enterprise information systems. J2EE connector architecture interfaces to SOA and Web services.

3.1.16 IBM WebSphere Infrastructure Components

The IBM WebSphere application and transaction infrastructure delivers high-volume transaction processing for customers mission-critical applications, through two application environments. Security and Web services are built in with the latest technologies. Table 3-9 illustrates IBM WebSphere components

TABLE 3-9

IBM WEBSPHERE COMPONENTS

- IBM Rational Application Developer for WebSphere Software
- WebSphere Adapters
- WebSphere Application Server
- WebSphere Application Server - Express
- WebSphere Business Integration Adapters
- WebSphere Business Integration Collaborations
- WebSphere Business Integration Connect
- WebSphere Business Integration Connect - Express
- WebSphere Business Integration Connection for JASDEC
- WebSphere Business Integration Event Broker
- WebSphere Business Integration Express and Express Plus for Item Synchronization
- WebSphere Business Integration for Financial Networks for Multi-platforms

TABLE 3-9 (CONTINUED)
IBM WEBSPHERE COMPONENTS

- WebSphere Business Integration for Healthcare Collaborative Network
- WebSphere Business Integration Message Broker
- WebSphere Business Integration Modeler and Monitor
- WebSphere Business Integration Server
- WebSphere Business Integration Server Express
- WebSphere Business Integration Server Foundation
- WebSphere Business Integration Solutions
- IBM WebSphere Information Integrator
- WebSphere Commerce Developer Editions
- WebSphere Commerce - Express
- WebSphere Commerce Professional and Business Editions
- IBM Express Runtime
- WebSphere Edge Server

TABLE 3-9 (CONTINUED)
IBM WEBSPHERE COMPONENTS

- WebSphere Everyplace Access
- WebSphere Everyplace Connection Manager
- WebSphere Everyplace Device Manager
- WebSphere Everyplace Mobile Portal Enable
- WebSphere Everyplace Server for Telecom
- WebSphere Extended Deployment
- WebSphere Host Access Transformation Services
- WebSphere Host Integration Solution
- IBM WebSphere Information Integrator
- IBM WebSphere Information Integrator Content Edition
- IBM WebSphere Information Integrator Event Publisher
- IBM WebSphere Information Integrator OmniFind
- IBM WebSphere Information Integrator Replication
- WebSphere Interchange Server and Business Integration Toolset

TABLE 3-9 (CONTINUED)
IBM WEBSPHERE COMPONENTS

- IBM Library Server for Multi-platforms
- WebSphere MQ
- WebSphere MQ Everyplace
- WebSphere MQ - Express
- WebSphere MQ Workflow
- WebSphere Business Integration Server
- WebSphere Business Integration Collaborations
- WebSphere® Business Integration Server
- WebSphere MQ
- WebSphere Broker
- IBM WebSphere Business Integration Adapters
- IBM WebSphere Business Integration Collaborations
- IBM WebSphere Business Integration Connect Enterprise
- IBM WebSphere Business Integration Event Broker

TABLE 3-9 (CONTINUED)
IBM WEBSphere COMPONENTS

- IBM WebSphere Business Integration Express for Item Synchronization
- IBM WebSphere Business Integration Message Broker
- IBM WebSphere Business Integration Message Broker Java Plugin Node
- IBM WebSphere Business Integration Modeler Advanced
- IBM WebSphere Business Integration Modeler Entry
- IBM WebSphere Business Integration Server Express and Server Express Plus
- IBM WebSphere Business Integration Toolset

Source: WinterGreen Research, Inc.

Transaction-oriented data integration solutions automate the transformation of high-volume, complex transactions without the need for hand coding. Support for EDI, XML, SWIFT, HIPAA, and other standards-based B2B integration is provided. The real-time integration of data from multiple applications, databases, messaging middleware, and communications technologies across an enterprise is provided.

Configuration options of products enable customers to purchase the functionality they need on a project basis. These provide point solutions.

Integration suite deployments work as an enterprise standard, scalable system to meet the largest data integration requirements. The enterprise integration suite and its component products are available in enterprise editions. In an enterprise edition, parallel processing technology automatically reconfigures the relevant product set to take advantage of complex symmetric multiprocessing or massively parallel multiprocessing CPU configurations in order to significantly increase throughput.

SOA editions are service-oriented architecture (SOA)-enabling components of the integration suite, responsible for brokering the benefits,

Capabilities work across a continuum of time constraints, application suites, interface protocols, and integration technologies across an enterprise. The benefits of shorter development cycles, lower costs and greater repeatability are offered.

SOA-enabled data integration services are possible where the same data transformation rules can be applied consistently across analytical, application, portal and business process integration environments. As part of a strategic data governance initiative, SOA enables companies to set thresholds for the required level of data synchronization and data quality performance.

Table 3-10 illustrates IBM data transformation feature positioning.

TABLE 3-10
IBM DATA TRANSFORMATION FEATURE POSITIONING

- Complex symmetric multiprocessing
- Massively parallel multiprocessing CPU configurations
- Architecture that supports significantly increasing throughput
- Use of large data integration systems components to meet changing market requirements in a flexible manner
- Use of parallel processing technology to automatically reconfigure relevant product set
- Take advantage of complex symmetric multiprocessing or massively parallel multiprocessing CPU configurations
- Significantly increase throughput

TABLE 3-10 (CONTINUED)

IBM DATA TRANSFORMATION FEATURE POSITIONING

- Service-oriented architecture (SOA)-enabling components responsible for brokering
- Works across a continuum of time constraints, application suites, interface protocols, and integration technologies
- Works across an enterprise
- Offers shorter development cycles
- Offers lower costs
- Offers greater repeatability
- Leverages SOA-enabled data integration services
- Applies data transformation rules consistently across analytical, application, portal and business process integration environments
- Works as part of a strategic data governance initiative
- Enables companies to set thresholds for the required level of data synchronization and data quality performance

Source: WinterGreen Research, Inc.

IBM is positioning transformation systems integration to provide functionality in key on demand initiatives of business intelligence, business performance management, business transformation, multi-channel commerce, RFID, merger and acquisition consolidation, master data management, and regulatory compliance.

The software technology furthers IBM commitment to open computing through its ability to support both IBM and non-IBM data sources, including those of Oracle, Microsoft and SAP.

3.2 Tibco

3.2.1 Tibco Staffware SOA BPM

Tibco BPM Staffware is positioned to support integrating people, processes and applications. SOA foundation is a service-oriented architecture (SOA) that is a technology that ensures long-term BPM flexibility. Using Tibco SOA platform, users are able to transform monolithic CRM, ERP and legacy applications into discrete reusable services, which then serve as building blocks that can be combined, organized and orchestrated to support complex business processes.

Changes to services can be made independently of processes and vice versa. Running processes is evolved with an execution engine. The BPM suite is the process engine that executes the business process. Tibco Staffware process suite is iProcess engine tracks the state of the process at any given time and ensures that the correct sequences of process steps are followed as defined by the business.

It is able to handle high volume, mission critical processes, including support for in-flight process changes and routing.

3.2.2 Tibco Automating Business Interactions

Automating business interactions between suppliers, customers, and trading partners allows companies to better share information and optimize processes across the value chain from better demand forecasting to streamlined manufacturing to more responsive customer service.

Business-to-business (B2B) integration represents a significant area of opportunity for using technology to drive tangible ROI and fundamentally change the way businesses communicate and interact with each other.

TABLE 3-11

TIBCO B2B INTEGRATION BENEFITS

- Manage the secure execution of transactions over the Internet using industry standards.
- Streamline inter-enterprise processes
- Manage a large and diverse community of trading partners with minimal overhead.
- Business Value
- Reduce large value added network (VAN) fees
- B2B Built for SOA

TABLE 3-11 (CONTINUED)

TIBCO B2B INTEGRATION BENEFITS

- Reduce costs, processing time, and errors through automated processing of invoices, purchase orders, and payments
- Synchronize price, product, and promotion information between trading partners and reduce disputes
- Improve collaboration and visibility across the value chain
- Achieve compliance with government and customer mandates
- Reuse internal services by extending them to trading partners
- Build composite applications that span their back end systems to their partner's back end systems for end-to-end process automation
- Insulate trading partners from the underlying technology framework through a flexible solution that decouples process, protocols, transports and payloads
- Engineer partner processes and services once and reuse across all trading partners

Source: WinterGreen Research, Inc.

3.3 webMethods

webMethods Fabric is built on a platform of standards and a Service-Oriented Architecture (SOA). Table 3-12 shows the benefits of webMethods Fabric.

TABLE 3-12

WEBMETHODS FABRIC BENEFITS

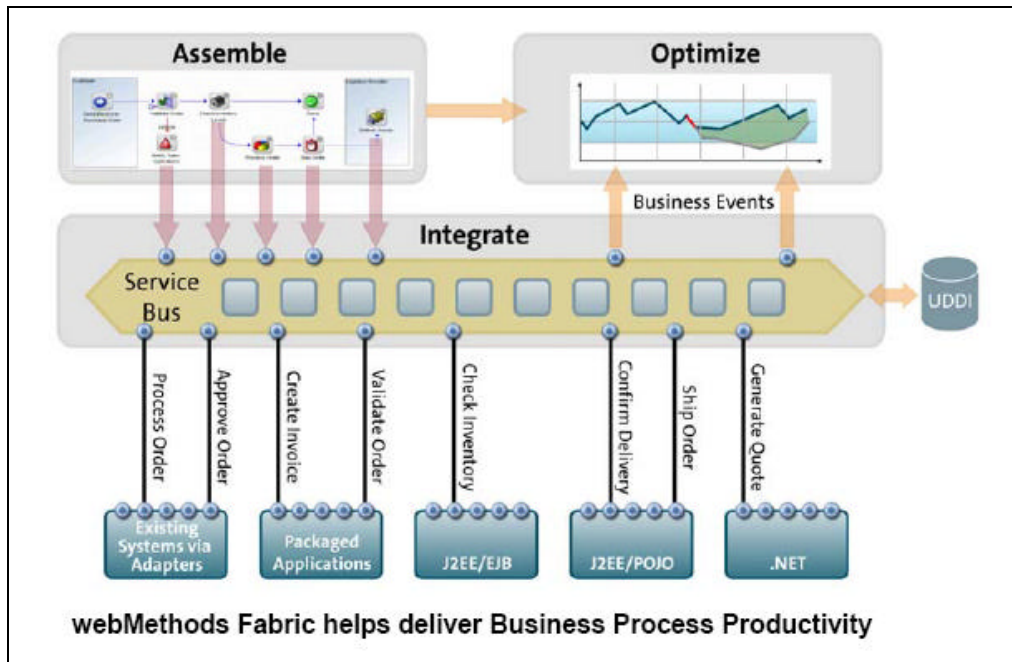
- Increase efficiency, by integrating business processes and applications.
- Connect with trading partners, while creating an inventory of reusable assets (business services) from their existing systems to accelerate subsequent initiatives.
- Increase agility, by enabling the rapid assembly of new business processes
- Modifications to existing processes to support the business as it changes
- Creation of user-centric composite applications allowing endusers to participate productively in the changed business processes.
- Providing real-time information about key business performance indicators

TABLE 3-12 (CONTINUED)
WEBMETHODS FABRIC BENEFITS

- Increase control over their operations
- Optimize business processes and react quickly in response to changes in business activity levels.

Source: WinterGreen Research, Inc.

FIGURE 3-13



Source: webMethods.com

3.3.1 New in webMethods Fabric 6.5

Table 3-14 shows the innovations and benefits of webMethods Fabric 6.5.

TABLE 3-14

NEW IN WEBMETHODS FABRIC 6.5

- Allows business analysts to specify and design business processes
- Non-technical users can play a productive role in the development of new solutions.
- Drag-and-drop assembly of new applications and processes
- Allows business solutions to be delivered faster.
- Codeless development environment means less programming and testing.
- Integrated business performance management environment
- Feedback allows decision makers to make iterative improvements to the company's operations.
- Patent-pending technology automates the monitoring of business process activity.

TABLE 3-14 (CONTINUED)
NEW IN WEBMETHODS FABRIC 6.5

- Users to be proactively alerted to potential issues so they can respond quickly.
- Business and operational metrics are available according to the user's role
- Users are more productive by having the right information at the right time
- Enterprise SOA enablement
- Companies can deploy web services-based solutions on an enterprise scale.

Source: WinterGreen Research, Inc.

Integrate	The ability to connect to a variety of legacy systems and package applications, running on a variety of different computing platforms.
	The ability to make existing application functions available as re-usable components (business services). These services are accessible via standard Web services protocols to promote interoperability.
	Feature to support integration of different business services, such as the ability to transform data from one representation to another, the ability to secure access to services, and so on.
	Capabilities to manage the inventory of business services, such as a directory of available business services.
	Capabilities to monitor and manage the operational health and performance of the system.
	An architecture that fully supports the event-driven nature of business processes within an SOA framework.
Assemble	The ability to easily and quickly link different business services together into new composite business processes and applications.
	The ability to automate and manage both manual workflows and system-to-system interactions.
	Capabilities to effectively incorporate end-users into new composite business processes through the delivery of personalized application functionality.
Optimize	The ability to monitor business process metrics and to link them to key business performance indicators.
	Capabilities to compare historical business activity trends, and to compare them in real-time to current activity levels.
	Capabilities to create a real-time feedback loop to alert end-users proactively to variations in activity that might affect business process service levels.

Source: WinterGreen Research, Inc.

3.3.2 webMethods SOA Fabric Integration

webMethods allows companies to integrate existing applications and establish electronic communications with trading partners. It incorporates resources into Fabric's SOA. Fabric combines the integration of existing IT assets with Web services enablement

TABLE 3-15

WEBMETHODS FABRIC'S INTEGRATION ARCHITECTURE AND CAPABILITIES

- Address traditional enterprise application integration (EAI) and business-to-business
- (B2B) integration requirements using a single, proven, platform.
- Expose reusable business-level services existing applications.
- Build solutions from existing parts versus developing them from scratch
- Achieve faster implementation times.
- Make these assets available within a standards-based framework
- Increasing interoperability across various IT resources.

Source: WinterGreen Research, Inc.

Assembling solutions versus building them from scratch drives two benefits to the business: greater agility and adaptability for a company and the ability to reuse existing IT components to construct the new processes.

Applications require less time to construct than hand coding from scratch. This means that IT can quickly support new initiatives and reduce time to market. These factors can improve ROI on existing IT assets and lower the TCO of the new solution. The maintenance costs of composite processes and applications are lower.

Fabric can assemble different kinds of solutions such as, composite business processes that include system-to-system, human-to-human, and human-to-system interactions. This includes processes with interactions between organizations, using the relevant electronic standards.

Fabric can also assemble composite applications that incorporate functionality from various underlying systems. This can provide an end-user with a set of capabilities that are specifically tailored to his or her job function. A composite application can be considered a user's Graphical User Interface into a composite process.

An important element of a composite process that requires human interaction is providing a visual interface to deliver the composite or aggregated view to the user. Fabric allows this to be done through a browser-based composite application framework. It also allows the applications to be personalized for the user's role, based on the business context and the user's privileges.

Users get the functionality required for their job, rather than having to learn and coordinate between multiple different applications to achieve a given task.

Fabric takes advantage of the underlying SOA to allow the assembly of composite processes and applications more quickly than would be needed to develop them in the traditional way.

TABLE 3-16
FABRIC PROCESS OPTIMIZATION

- Identifying and removing bottlenecks.
- Allowing a quicker reaction to exceptions
- Reducing exceptions by predicting when and where they may occur based on past experiences.

Source: WinterGreen Research, Inc.

webMethods Fabric's business process optimization ability begins with the monitoring capabilities built into its service-based architecture. Smart Services business services that are integrated by Fabric are automatically instrumented for the optimization process. Fabric uses the instrumentation built into these services to collect the necessary metrics to gauge operational performance.

Fabric tracks these metrics in real time. It performs analysis to automatically calculate norms and correlate the results against past patterns. Fabric is able to identify variations in the key performance indicators; sales volume, order cycle time, customer call response time, etc.

Fabric has the ability to call attention to problems (or opportunities) before they occur through a unique feature called fingerprinting. This is essentially comparing what is currently observed with a snapshot of the circumstances that previously led to an exception in business process performance.

This predictive capability gives the business the opportunity to react more quickly to exceptions and slowdowns that can directly affect customer satisfaction and result in lost revenue.

3.4 BEA

BEA has acquired Fuego, Inc. Fuego is recognized as a leader in the business process management (BPM) software industry. The company specializes in providing SOA solutions to help companies orchestrate and continuously improve business processes among people, applications and organizations. The Fuego portfolio will become a part of the fast-growing BEA AquaLogic™ product family and will serve as the foundation of the new BEA AquaLogic™ Business Service Interaction product line. The transaction has already closed for a purchase price of approximately \$87.5 million in cash plus amounts for certain retention and performance bonuses.

Integration requires an open, business-level view of the data and processes in an Enterprise Resource Planning (ERP) system in which the integration points are based on business objects, such as invoice, employee, customer, sales order, and purchase order. Leveraging various interfaces in an integration solution requires complex middleware technology and target application expertise.

3.4.1 The BEA EAI Solution on WebLogic Server

The BEA WebLogic Enterprise Platform delivers a platform for building and integrating applications as end-to-end business processes. IT can focus training and skills on a single platform for all projects, with more flexibility in deploying resources across different projects. This allows IT to focus resources on a single, standards-based, technology stack and better leverage resources across multiple applications and projects, while eliminating costly expenditures on services to simply integrate and maintain the IT infrastructure

The BEA WebLogic Enterprise Platform also provides easier development and integration, on a platform-independent foundation. Making J2EE accessible to a significantly broader developer base allows organizations to fully leverage all IT resources to realize increased productivity. Developers whose skills include Visual Basic, Cobol, PowerBuilder, and other tools, have the ability to use their skills in developing enterprise applications that exploit the full power of J2EE and industry standard Web services. BEA enables more flexible utilization of IT resources, eliminating IT bottlenecks and increasing IT productivity.

BEA's vision of application platform convergence is based on three principles – specifically that the platform be Unified, Simplified, and Extensible. Application of these three principles uniquely differentiates the BEA WebLogic Enterprise Platform.

Unified – A single, unified architecture based on a common programming model and code-base increases productivity, reduces costs and accelerates time to value for enterprise IT projects.

Simplified – Simplified application development, deployment, integration and management for all enterprise applications and business processes increases IT productivity and shortens project cycles.

Extensible – Enables extensible IT infrastructure and ensures interoperability, flexibility and choice, including incremental adoption of all or parts of the platform, integration with point solutions or existing infrastructure standards, and extensibility through ISV applications and solutions.

TABLE 3- 17
BEA WEBLOGIC ENTERPRISE PLATFORM.

- Unified development, runtime, and management environment for all integration, portal, Web services, and application development projects.
- Supports collaboration and coordination between business analysts, application developers, and enterprise developers.

TABLE 3- 17 (CONTINUED)
BEA WEBLOGIC ENTERPRISE PLATFORM.

- Pre-integrated frameworks eliminate functionality overlap and ensure component interoperability to reduce integration time and costs, reduce project risk, and eliminate "serviceware."
- Focused training and expertise on a single architecture and development environment generates greater intellectual property and enables more flexible and efficient resource utilization.
- Single security framework reduces the complexity and cost of securing enterprise IT projects.
- Simplified application development, deployment, integration and management
- Simplify upgrades and deployment with a single product release, upgrade, and maintenance process coupled with a single support number to call for any issues.
- Reduce management complexity with a single management interface for all projects.
- Increases IT productivity and shortens project cycles.

TABLE 3- 17 (CONTINUED)
BEA WEBLOGIC ENTERPRISE PLATFORM.

- Enables extensible IT infrastructure and ensures interoperability, flexibility and choice Adoption of all or parts of the platform, integration with point solutions or existing infrastructure standards, and extensibility through ISV applications and solutions.
- Enables leverage and enforcement of enterprise business practices through asset reuse.
- Open-standards leadership and adoption protects technology investments.
- Support for all leading hardware platforms, operating systems, and databases increases deployment flexibility.
- Over 1600 partners provide best-of-breed solutions, delivering built-in compatibility and interoperability for IT infrastructure decisions.

Source: WinterGreen Research, Inc.

3.4.2 BEA / Fuego SOA Software

BEA BPM software is being implemented with Fuego SOA software. BEA Systems acquired Fuego to improve the business process management (BPM) software. The SOA solutions help companies orchestrate business processes among people, applications and organizations.

The Fuego portfolio is a part of the BEA AquaLogic™ business service interaction product line. The FuegoBPM software suite manages and optimizes the end-to-end process lifecycle.

The FuegoBPM suite delivers the capability needed to automate key functions in the BPM lifecycle. An integrated suite of software modules is designed for every user, spanning business analysts, IT system administrators, process managers, and executives.

Table 3-18 illustrates BEA / Fuego SOA software key functions.

TABLE 3-18

BEA / FUEGO SOA SOFTWARE KEY FUNCTIONS

- Rapidly model process
- Manage scope
- Manage complexity
- Connect to back-end systems
- Connect to applications that support the process

TABLE 3-18 (CONTINUED)

BEA / FUEGO SOA SOFTWARE KEY FUNCTIONS

- Create customized user work environment for easy navigation
- Create customized user task management
- Manage enterprise process execution
- Manage enterprise process escalation
- Manage enterprise process exception management
- Provide a secure, highly scalable process engine
- Monitor and measure real-time process performance
- Implement a tightly integrated business reporting system
- Optimize process performance through advanced technology
- Isolate process breakpoints
- Automatically determines required changes

Source: WinterGreen Research, Inc.

3.4.3 BEA Fuego Business Process Management

Virtual business models change process management. Virtual business models are complex as they span the extended enterprise. End-to-end processes cross multiple departments in a company and the full spectrum of trading partners, including suppliers, regulatory agencies, outsourced manufacturing and fulfillment partners and customers.

Extended processes span organizations and people, supporting IT systems and applications. The digital collaboration with trading partners and customers has an impact on business performance. The challenge is to manage processes that span organizational silos.

Applications designed to manage processes contained within a department of an enterprise, executing within the structure of IT architecture are being challenged by market shifts brought by the Internet. Demand for real time computing creates demand for more integration.

End-to-end processes depend on cross department, cross partner design. Every critical function is covered. Supply chain, order management, financial operations, customer support, service provisioning, or claims management spans customers, trading partners and outsourcing vendors.

Table 3-19 illustrates BEA Fuego business process management functions.

TABLE 3-19

BEA FUEGO BUSINESS PROCESS MANAGEMENT FUNCTIONS

- Applications designed to manage processes
- Contained within a department of an enterprise
- Execution within the structure of IT architecture
- Challenged by market shifts brought by the Internet
- Demand for real time computing
- Creates demand for more integration

Source: WinterGreen Research, Inc.

Table 3-20 illustrates BEA Fuego business process management end-to-end processes.

TABLE 3-20

BEA FUEGO BUSINESS PROCESS MANAGEMENT END-TO-END PROCESSES

- End-to-end processes
- Depend on cross department
- Cross partner design
- Every critical function covered
- Supply chain
- Order management
- Financial operations
- Customer support
- Service provisioning
- Claims management
- Spans customers
- Trading partners
- Outsourcing vendors

Source: WinterGreen Research, Inc.

As the process spans the extended enterprise, the risk of flawed or failed process execution grows exponentially. Silos for each department, different companies, different people, and the diverse array of supporting IT systems creates a point at which processes can be dropped. The result is slow or poor service and high levels of process exceptions, which lead to escalating costs.

The solution lies in creating a process management layer that separates the management of end-to-end processes from the underlying applications, infrastructure and data. This layer serves as both a repository of process rules and the core engine that runs them to ensure flawless execution.

Existing IT systems and applications remain in place. Prior investments continue to deliver value. Process effectiveness is implemented in the context of organizational operation with just a single process. Fuego customers have many core processes that decompose into hundreds of sub-processes.

Table 3-21 illustrates BEA Fuego business process management end-to-end processes.

TABLE 3-21
BEA FUEGO BUSINESS PROCESS MANAGEMENT END-TO-END PROCESSES

- Existing IT systems
- Applications remain in place
- Prior investments continue to deliver value
- Process effectiveness
- Implemented in the context of organizational operation with just a single process.

Source: WinterGreen Research, Inc.

3.4.4 BEA for SOA

BEA provides successful Service-Oriented Architecture (SOA) implementation-via the combination of platform, practices, and people-so businesses can quickly and confidently achieve the benefits of SOA.

Using BEA WebLogic™ platform application infrastructure, a development team can write application-development code on a specific Java platform to inform the initial stages of SOA, which include building and enabling services.

The BEA WebLogic Platform—including BEA WebLogic Server®, BEA WebLogic Portal™, BEA WebLogic Integration™, BEA WebLogic Workshop™, BEA JRockit.

An enterprise can also use BEA AquaLogic™ solutions to orchestrate and manage services, processes, and composite applications—regardless of technology. BEA AquaLogic is designed to enable enterprises to successfully transition to SOA in order to improve IT efficiency and business responsiveness.

The BEA AquaLogic product family—which includes BEA AquaLogic Service Bus™, the BEA AquaLogic Data Services Platform™, BEA AquaLogic Enterprise Security™, and BEA AquaLogic Service Registry™ — provides a comprehensive set of unified products today to deploy, configure, secure, and manage heterogeneous services throughout the SOA lifecycle

3.4.5 BEA WebLogic Server

The most powerful, reliable release of the world's leading J2EE application server is the ideal foundation for building SOAs. BEA WebLogic Server 9.0 is compliant with J2EE 1.4 specs and further extends the latest standards to deliver unparalleled quality-of-service across the enterprise.

BEA WebLogic Server 9.1 includes a new BEA Smart Update tool that helps download, apply and manage maintenance updates, including patches, to BEA WebLogic Servers.

3.4.6 BEA WebLogic Portal

BEA WebLogic Portal 8.1 simplifies the production and management of custom-fit portals, allowing a shared services environment to roll out changes with minimal complexity and effort.

3.4.7 BEA WebLogic Integration

BEA WebLogic Integration 8.1 delivers the ability to converge two otherwise disparate activities, application integration and application development, into one unified business integration solution.

3.4.8 BEA WebLogic RFID Product Family

BEA's WebLogic RFID edge and enterprise products deliver the first end-to-end, standards-based RFID infrastructure platform designed to automate new RFID enabled business processes. The powerful combination of leading RFID infrastructure technology and BEA's Service-Oriented Architecture (SOA) driven platform allow you to turn RFID data into meaningful information for competitive advantage and financial improvement through targeted, cost effective and integrated solutions.

3.4.9 BEA WebLogic Real Time

BEA WebLogic Real Time 1.0 is a new lightweight, low-latency Java-based server that provides response times in the milliseconds for performance-critical real-time applications.

3.4.10 BEA WebLogic Workshop

BEA WebLogic Workshop 8.1 dramatically reduces the complexity of migrating to SOA, while reducing the overall lifetime costs of IT infrastructure.

3.4.11 BEA JRockit 5.0 JDK

Using BEA JRockit 5.0 Java Development Kit (JDK), Java developers are able to deploy applications more quickly and efficiently into production, achieving optimal performance through minimal configuration.

3.4.12 BEA WebLogic Enterprise Liquid Computing SOA Platform

BEA WebLogic enterprise platform is a framework for SOA. Businesses use SOA to efficiently leverage IT assets, speed the delivery of new services, and increase adaptability to ongoing change.

SOA platform depends on Liquid Computing. BEA vision for SOA is to increase business responsiveness by reducing IT complexity. Simplified, fluid enterprise computing depends on IT operating as a partner to the business, helping to drive significant gains in compatibility, adaptability, and productivity.

3.4.13 Fuego Enterprise-Wide Business Process Development Platforms

Fuego BPM product is enhanced by service-oriented architecture (SOA) capability. A strong shift away from departmental solutions towards the adoption of enterprise-wide process development platforms was favorable for the adoption of Fuego BPM.

Fuego BPM is an advanced software platform that enables companies to achieve the benefits of a service-oriented architecture (SOA). Customers can model their business processes, define key performance indicators (KPI's), simulate them, connect those processes to people and systems, run them, manage process exceptions and measure, monitor and optimize their effectiveness, at a fraction of the time, effort and cost of proprietary infrastructure solutions from companies such as IBM, Tibco, BEA Systems and others. Table 3-22 illustrates Fuego business process management BPM functions.

TABLE 3-22

FUEGO BUSINESS PROCESS MANAGEMENT BPM FUNCTIONS

- Is an advanced software platform
- Enables companies to achieve the benefits of a service-oriented architecture (SOA)
- Used to model business processes
- Used to define key performance indicators
- Used to simulate key performance indicators
- Used to connect processes to people and systems
- Used to run key performance indicators
- Used to manage process exceptions

TABLE 3-22 (CONTINUED)

FUEGO BUSINESS PROCESS MANAGEMENT BPM FUNCTIONS

- Used to measure process exceptions
- Used to monitor process exceptions
- Used to optimize the effectiveness of key performance indicators
- Works at a fraction of the time
- Works at a fraction effort
- Works at a fraction cost of proprietary infrastructure solutions

Source: WinterGreen Research, Inc.

Fuego is useful in deploying large-scale BPM platforms to complement their service-oriented architectures (SOA). FuegoBPM has small footprint, standards-based interoperability, enterprise-level performance, and low cost. It delivers an alternative to proprietary solutions.

Ease-of-use, comprehensive capabilities, scalability, reliability, open architecture and value-based pricing are positioning aspects of the product. .NET Assemblies introspection and execution support are provided.

FuegoBPM studio is a comprehensive development platform that allows process designers to model processes, define KPIs, simulate their performance, integrate to applications, systems and people and run them interactively.

3.4.14 Fuego BPM

Fuego has expanded its existing partnership with Deloitte & Touche. Deloitte is supplying implementation services throughout Mexico. Companies can standardize internal business processes on Fuego BPM software.

Deloitte & Touche is implementing FuegoBPM to manage crucial business processes. Sales support, expense management, and client technical support are being managed. The decision to utilize FuegoBPM internally within Deloitte stems from the success that the two companies have had implementing BPM in companies. Chedraui, one of the largest grocery chains in Mexico and PROSA, a large financial services transaction processor has used the Fuego BPM.

3.5 Oracle

Oracle SOA Suite consists of Oracle's most popular technologies including:

Oracle JDeveloper 10g: a comprehensive integrated SOA development environment for creating and composing applications that also acts as a unified toolset for all components in the Oracle SOA Suite.

Oracle BPEL Process Manager: the first native business process execution language (BPEL) engine for Web services orchestration enabling you to design, define and execute business processes.

Oracle Web Services Manager: a single console to secure and manage your Web services.

Oracle Business Rules Engine: enables agile management of business rules.

Oracle Business Activity Monitoring: delivers real-time insight into business operations.

Oracle Enterprise Service Bus: a standards-based product that connects existing IT systems and business partners as a set of services.

Oracle Fusion Middleware offers a comprehensive lineup of next-generation software products and components, based on the principles of Service-Oriented Architecture that drive better integration within IT systems and provide collaboration with your business partners.

Oracle Fusion Middleware is built on the industry's most complete, J2EE and open-standards-based integration infrastructure.

3.5.1 Shift to Service-Oriented Architecture

The foundation of Oracle Fusion Middleware is a Service-Oriented Architecture (SOA) that enables a more adaptable IT environment and facilitates integration. In SOA, IT systems are developed as independent, loosely coupled business service. Each business service can be easily integrated or reused, creating a more flexible IT infrastructure with faster delivery cycles and lower costs.

3.6 Fiorano

Fiorano SOA™ 2006 is built on a standards-based Enterprise Service Bus, enabling the effective coordination and interaction of software assets across the extended enterprise. Fiorano SOA 2006 allows companies to draw on existing business logic and processes residing anywhere within the enterprise to rapidly assemble solutions for particular problems, leading to unmatched flexibility, increased productivity and improved responsiveness to changing business conditions.

3.6.1 Fiorano ESB™ 2006

The Fiorano ESB is a web-services capable middleware infrastructure platform that supports intelligently-directed communication and mediated relationships between loosely coupled (SOA) and decoupled (EDA) business components. Fiorano ESB supports both SOA and EDA over a single technology base, with a single repository, business component model, design, development and deployment tools, together with common tools for security and administration.

3.6.2 FioranoMQ™ 2006

FioranoMQ is a grid-enabled, peer-to-peer JMS messaging platform, with features including dynamic routing, distributed debugging of message flows, dynamic deployment of JMS client applications, unbounded scalability, direct invocation of standards-based JCA components and unparalleled ease-of-management with JMX standards.

3.6.3 Fiorano BPEL™ 2006

Fiorano BPEL is an integrated process orchestration engine built on a Business Component Architecture, enabling quick modeling, and deployment of standards-based business processes. Fully integrated with Fiorano's enterprise services grid architecture,

3.6.4 Fiorano Business Components & Adapters 2006

Fiorano Business Components are ready-to-use JCA-compliant components that include connectors for all popular databases, SMTP, POP3, MQ Series, MSMQ, CSV, XSL, SOAP, EDI and more. In conjunction with Fiorano Visual JMS tools, these standards-based JCA components can be used to rapidly assemble enterprise-class business processes communicating over JMS.

3.6.5 Fiorano Process Orchestration Tools 2006

The Fiorano Process Orchestrator is a set of integrated tools that enable users to orchestrate standards-based Business Components to deploy scalable, easy-to-modify distributed business processes with minimal IT Intervention. The Fiorano Process Orchestrator includes support for the security and deployment management of business components, together with Visual JMS Tools for deploying, debugging and managing JMS applications across the enterprise services grid.

3.6.6 Fiorano BPEL Editor 2006

This is a standalone tool that enables developers to compose, test and deploy standards-based BPEL processes using JCA-compliant Business Components. The editor includes several advanced features including context-aware, visual mapping tools, process lifecycle handling (development, testing, staging, deployment), and the development of JCA-Compliant business components that can be overlaid with JMS event-interfaces. Fiorano BPEL processes support multiple deployment options including over JMS, ESBs and J2EE-compliant Application Servers.

3.6.7 Fiorano Software SOA Integration Backbone Solutions

Fiorano® integration backbone solutions transform delivery of services. SOA solutions permit adopting enabling technology. A key focus is delivering business models whilst maximizing return on existing investment.

Fiorano enterprise service bus (ESB) platform is positioned to achieve flexibility in a variety of conditions.

3.6.8 Fiorano Business Integration Suite™

Fiorano business integration suite is an integrated composite application platform for real-time business built on a standards-based peer-to-peer enterprise service bus, enabling the effective coordination and interaction of software assets across the extended enterprise.

3.6.9 Fiorano XML

Fiorano offers enhanced XML support for complex XSD schemas (both W3C compliant and Microsoft schemas). They are supported. The XSLT editor supports XBRL schemas and translation across multiple namespaces.

3.6.10 Fiorano SOA Convergence of Separate and Individual Approaches

Fiorano convergence of separate and individual approaches is achieved with respect to integrating disparate, heterogeneous information and systems. ESB, BPM, and service oriented integration approaches combines the ESB, BPM, and SOI approaches to solve the needs of event-based, process-driven service-oriented integration that are mission-critical and highly distributed.

Major enhancements in Fiorano ESB include ESB platform enhancements. Compliant web services orchestration is offered. Fiorano ESB supports distributed / parallel execution of web-service orchestration processes defined in the industry standard formats.

3.7 Progress Software / Sonic SOA Suite

Progress Software Sonic SOA Suite™ is a comprehensive, ESB-based distributed services platform, providing business process management (BPM) and operational visibility across the enterprise. Sonic SOA Suite extends Sonic ESB enterprise service bus, with service orchestration, XML-based operational data management, and integrated access to relational data sources.

A cohesive solution is provided for meeting the challenges of broad-scale business event and process management. Sonic SOA Suite lets users dynamically connect, mediate, and control services in a unified SOA framework.

3.7.1 Sonic Software Extends SOA Infrastructure

Progress Software Corporation has completed the acquisition of privately-held Actional Corporation. A leading provider of Web services management (WSM) software for visibility and run-time governance of service-oriented architecture (SOA) environments, Actional will become part of Sonic Software.

This acquisition marks a key milestone for Progress, and its operating unit Sonic, where they are changing the shape of the industry by bringing together two major SOA infrastructure technology segments: Web services management (WSM) and enterprise service bus (ESB). The Actional and Sonic products can be used independently of one another, or combined to support the entire SOA lifecycle from service definition and deployment, to process definition and staging, to runtime visibility and real-time optimization.

3.7.2 Sonic SOA Suite Capabilities

Table 3-23 illustrates Sonic SOA suite functions.

TABLE 3-23

SONIC SOA SUITE FUNCTIONS

- Service communication
- Reliably link services across extended network
- Securely link services across extended network
- Provide service orchestration
- Model business process
- Automate service interactions
- Provide service mediation
- Provide dynamic control of service relationships
- Eliminate inflexible, hard-coded service interdependencies
- Provide service management
- Provide visibility of distributed services environment
- Provide configurable control of distributed services environment
- Provide service deployment

TABLE 3-23 (CONTINUED)
SONIC SOA SUITE FUNCTIONS

- Deploy and update ESB services from any location on the network
- Provide operational data services
- Provide high-performance XML storage and processing services
- Provide flexible operational data caching

Source: WinterGreen Research, Inc.

Table 3-24 illustrates Sonic SOA suite applications.

TABLE 3-24

SONIC SOA SUITE APPLICATIONS

- Flexible operational data caching
- Warehousing
- Business event management
- Auditing
- Non-repudiation applications
- Relational database connectivity
- Easy incorporation of relational data sources

Source: WinterGreen Research, Inc.

3.7.3 Sonic SOA Targets Tibco EAI

Sonic has service-oriented architecture (SOA) conversion programs. Sonic Software offers TIBCO customers a trade-up program aimed at accelerating their transition from integration platforms to a SOA platform based on Sonic ESB®. Sonic SOA Suite™ offers licenses of equivalent EAI capability, for a price equivalent to TIBCO maintenance.

Centralized hub-and-spoke integration technology is addressed by Sonic flexible SOA infrastructure that is helping organizations accelerate their transition to enterprise-wide SOA, and significantly reducing SOA project risk."

SOA presents the opportunity for organizations to achieve broad-scale interoperability of IT systems, while providing the flexibility required to continually adapt these systems to changing business requirements. SOA requires a new type of software infrastructure called the ESB that can connect, mediate and control a wide variety of services in a flexible manner across a distributed environment.

Tibco customers who have purchased an enterprise license for \$1 million are typically paying \$250k for annual maintenance. Sonic delivers SOA Suite licenses to replace Rendezvous, EMS, BusinessWorks, and StaffWare. The Sonic SOA Suite is a bundled product offering that delivers deployment flexibility and simplicity for organizations pursuing SOA projects. The suite includes Sonic ESB, Sonic Orchestration Server™, Sonic XML Server™ and the Sonic Database Service™.

3.8 Vitria SOA Business Process Management

Vitria BusinessWare is business process integration platform. It uses graphically modeled business process and integration logic as the foundation for orchestrating complex interactions among dissimilar software applications, databases, web services, people, and companies over corporate networks and the Internet.

Information technology professionals to support complex business processes like order management and fulfillment, securities trades and insurance claims processing, supply chain management, and customer service typically use the platform. Vitria BusinessWare includes a business process integration server. Products enable connectivity to specific software applications, databases, and protocols.

Capabilities are provided for data transformation, process analysis and visualization, and trading partner management.

Table 3-25 illustrates Vitria BusinessWare business process integration server features.

TABLE 3-25

**VITRIA BUSINESSWARE BUSINESS PROCESS INTEGRATION SERVER
FEATURES**

- Uses graphically modeled business process
- Implements integration logic
- Provides a foundation for orchestrating complex interactions among dissimilar software applications, databases, web services, people, and companies
- Works over corporate networks and the Internet.
- Supports complex business processes

Source: WinterGreen Research, Inc.

3.9 Pervasive Software SOA Application Integration

Pervasive Software offers a value-based solution for application integration. Pervasive Business Integrator™ offers a versatile, value-based solution for application integration supporting enterprise service bus (ESB), service oriented architecture (SOA), and point-to-point integration architectures.

Business integrator is used for connecting customer relationship management (CRM), enterprise resource planning (ERP), and supply chain management (SCM) systems together.

Business Integrator features a real-time, event-driven, and message-based infrastructure for the cost-effective integration of multiple applications, both within and outside the organization. The result is a continuous increase in the return on your investments for data and IT systems, accelerating the time to value. Table 3-26 illustrates Pervasive Software application integration benefits.

TABLE 3-26

PERVASIVE SOFTWARE SOA APPLICATION INTEGRATION BENEFITS

- Flexible integration across hundreds of data formats and applications
- Scalable design and deployment
- Rich data connectivity enabling information flow between a wide range of enterprise applications
- Connectors for Remedy, SAP, IDoc and XML based intermediate interfaces
- Connectors for leading ERP applications
- Direct connectors with options for multi-mode and mass insert to a wide range of enterprise class applications and databases
- Direct connectors for PostgresPSQL, Oracle, DB2, and Sybase
- Process designer infrastructure
- Support for MQ Series, MSMQ, Oracle AQ, and any JMS-compliant queue

TABLE 3-26 (CONTINUED)

PERVASIVE SOFTWARE SOA APPLICATION INTEGRATION BENEFITS

- Ability to align, create, and manage integrations within business-process flow
- Real-time, event-based, and continuous processing
- Distributed integration model
- Allows integration processes to reside at the points of integration
- Creation of a scalable and flexible integration infrastructure for use in service oriented architectures
- High-speed enterprise database connectivity
- Multi-mode
- Mass-insert
- Validation of the accuracy of messages cycling between applications
- Ability for all data objects and messages to be handled in buffered memory for high-performance processing

Source: WinterGreen Research, Inc.

3.9.1 IONA SOA for Telecommunications

IONA has positioned to extend existing telecommunications OSS for SOA and Web services. OSS is made up of multiple generations of standards and customized technologies. Convergence and triple play are issues for communications services providers

SOA is positioned to help with integrating systems and reducing capital and operating expenses. IONA is energizing OSS integration projects with innovative ways to bring projects online faster.

Artix™ is IONA extensible enterprise service bus (ESB). Large service providers and equipment vendors including AT&T, BellSouth, SBC, Marconi, 3 Italy and Sprint use it. Artix facilitates Web services-based service-oriented architectures within OSS infrastructure.

The success of Artix in OSS integration led O2, a leading provider of mobile services across the UK, Germany and Ireland to use Artix to facilitate Web services-based integration across their OSS. O2 UK has deployed Artix in two mission-critical applications.

A help desk system is connected to an existing network management system. A SMS-based support service is supplied for field engineers. With Artix, O2 applied extensible ESB technology reduces its reliance on proprietary systems and has lowered costs through reduced software licensing, greater system flexibility and accelerated service deployment.

3.10 Microsoft SOA BizTalk Server SOA Adapter Solution

A BizTalk server solution (a process application) includes one or more Visual Studio .NET projects that contain BizTalk Server components such as schemas, orchestrations, transformation maps, and pipelines. The schemas for the Request and ReqDenied documents and the transformation map are combined in a discrete BizTalk Server project that builds a compiled assembly.

The BizTalk server orchestration diagram details the process workflow. By referencing (encapsulating) the schema and map assembly, the diagram can incorporate the schemas and map as functional objects. BizTalk Server project assemblies for a solution are then deployed and installed as an executable application under the management of the BizTalk Server run-time engine.

3.10.1 Microsoft SOA—Underlying Technologies

An application is developed and implemented using the high-level tools within BizTalk Server 2004. This development methodology is related to the underlying technologies that facilitate the service-oriented architecture (SOA). The fundamental principles of SOA are exposed functionality, document messaging, loose coupling, and platform independence.

TABLE 3-27

MICROSOFT FUNDAMENTAL PRINCIPLES OF SOA

- Exposed functionality
- Document messaging
- Loose coupling
- Platform independence

Source: WinterGreen Research, Inc.

XML provides the transparency and application independence and uses metatags to declare the meaning and function of data. The premise of XML is to convert program-dependent data into self-describing, program-independent data. This applies not only to content, but also to instructions for processing the content.

The business rule framework within BizTalk Server represents an implementation of the service-oriented architecture (SOA). Functionality has been designed to be exposed, independent, and capable of being loosely coupled.

Any policy component may be expressed as a vocabulary or rule set. It can be viewed or changed at any time, without affecting any other process operation or running instance of the affected process. Policies are compiled into Visual Studio .NET assemblies directly from their semantic and declarative XML definitions.

They eliminate the need for procedural programming. The substantial development and life cycle efficiencies that this individual capability engenders are validation of the service oriented architecture paradigm.

The flexibility that an exposed and componentized rule engine provides for modifying business processes is significant. In application development, business rule logic is embedded in procedural code and cannot be modified without changing the code.

The ability to isolate business rules from procedural code, or any process implementation mechanisms, dramatically improves the efficiencies of managing and adapting business processes in response to new requirements or business conditions.

SOA must be justified by the benefits it provides. Those who have adopted the SOA development model have realized dramatic development efficiencies, accelerated return on investment, and increased resource availability. XML, Web services, and BPM/EAI platforms impose a new conceptual model on business process development. The technologies required to implement and deploy this model are established and proven Microsoft products that have been augmented to support this paradigm.

Table 3-28 illustrates Microsoft SOA benefits.

TABLE 3-28
MICROSOFT SOA BENEFITS

- Dramatic development efficiencies
- Accelerated return on investment
- Increased resource availability
- XML, Web services, and BPM/EAI platforms conceptual business process model

Source: WinterGreen Research, Inc.

3.10.2 Microsoft Web Services

Microsoft Web Services re used for automating and maintaining business processes in a dynamic and cost-effective manner. This has proven to be a difficult endeavor for even the most technically sophisticated organizations.

Application development and integration methodology has evolved that effectively addresses these issues. Service oriented architecture (SOA) is the methodology based on XML and Web services technologies and has been incorporated into Business Process Management and Enterprise Application Integration (BPM/EAI) platforms.

The SOA paradigm has redefined the concept of an application. An application is no longer an opaque, procedural implementation mechanism. It is an orchestrated sequence of messaging, routing, processing, and transformation events capable of processing the exposed declarative properties of rich (XML) documents.

A workflow process, integration scenario, or trading partner interaction are specialized classes of the SOA paradigm distinguished only by the nature of the participants involved, the point of execution, and the participant individual security requirements. BPM/EAI platforms that incorporate the SOA paradigm are compelling because they provide numerous development and operational benefits:

They alleviate significant development inefficiencies and impediments to effective life cycle maintenance. They facilitate the flexible “loose coupling” of components on a highly distributed basis.

They permit the addition, removal, and reconfiguration of any process activity or component without disrupting the process. They are fundamentally oriented to supporting long-running, asynchronous transactions that scale well.

They ensure the applications are well documented and visible because the process activities, components, and functions are exposed and self-describing. They enable the extensibility and reuse of both application components and entire applications. They maximize the network infrastructure of the Internet and the protocol standards of the World Wide Web.

Approaching a development environment based on the SOA paradigm does require a reorientation in the concepts and methodologies of application development. Microsoft has embraced fundamental SOA concepts and development methodologies.

Microsoft® EAI development environment, BizTalk® Server 2004 implements these concepts and methodologies within the contexts of the design, behavior, and functionality of the applications that are created; and the development process itself.

3.10.3 Microsoft BizTalk Server—SOA Implementation

The value of implementing Microsoft BizTalk Server with SOA is that SOA provides the ability to overcome prior inefficiencies of the development process. Each transformation map can be thought of as the referenced source and target schemas.

BizTalk Server project resources are subsequently embedded into an orchestration as a process step and compiled into the orchestration assembly. Maps can be reused and modified as needed to implement any number of transformation requirements and they be deployed within any number of orchestrations. The maps created by BizTalk Server Mapper are based on XSLT, an open standards protocol for transforming XML information.

If the business logic is simple, it can be embedded as an expression directly within a BizTalk Server orchestration decision step. If the business logic is complex, the BizTalk server rules composer can be used to create and process the sophisticated rule sets. Each rule set is implemented as a business policy. It drives a specific activity or function and becomes a resource object embedded into a BizTalk Server orchestration.

Consistent with the overall BizTalk Server architecture, transparency and loose coupling govern the creation and implementation of business rules. A rule set incorporated within a BizTalk server orchestration.

A rule can be viewed, modified, or completely replaced both at design and run time, without affecting any other process operation or interrupting running instances of the affected process. The flexibility that an exposed and componentized rule engine provides for modifying business processes is of fundamental significance.

In conventional application development, business rule logic is embedded in procedural code and is not accessible for modification without changing the code itself. Most modifications to a business process life cycle pertain to changes in business rules.

The ability to isolate business rules entirely from procedural code, or any process implementation mechanisms, dramatically improves the efficiencies of managing and adapting business processes throughout their life cycle.

BizTalk server rules composer supports the creation of domain-specific vocabularies for defining business rules, and its functionality is exposed through public interfaces, making it extremely flexible and extensible.

This is accomplished in the BizTalk Server Pipeline Designer module. Accessed through the BizTalk Server orchestration workspace, the pipeline designer module is used to implement the interchange requirements for encryption, authentication, and data format conversion with external applications and parties.

A pipeline is a sequence of processing operations that take place before a message is received by, or dispatched from a process orchestration or message data store. A “receive pipeline” accepts an incoming message, decrypts or decompresses it as required, disassembles the message into its parts, converts it into an XML document as specified in the BizTalk server schema, validates the message, and authenticates the identity of its sender.

When a message passes through a pipeline, it is transferred to the BizTalk Server MessageBox store. A “send pipeline” performs the same operations as the “receive pipeline,” but in reverse. It assembles, formats, encrypts, compresses, and digitally signs a message as required by the external recipient.

3.11 SOA Adapters

Adapters provide a key to enhanced interoperability with a wide variety of applications and technologies.

3.11.1 IBM WebSphere Infrastructure Components

The IBM WebSphere application and transaction infrastructure delivers high-volume transaction processing for customers mission-critical applications, through two application environments. Security and Web services are built in with the latest technologies. Table 3-29 illustrates IBM WebSphere components

TABLE 3-29

IBM WEBSHERE COMPONENTS

- IBM Rational Application Developer for WebSphere Software
- WebSphere Adapters
- WebSphere Application Server
- WebSphere Application Server - Express
- WebSphere Business Integration Adapters
- WebSphere Business Integration Collaborations

TABLE 3-29 (CONTINUED)

IBM WEBSPHERE COMPONENTS

- WebSphere Business Integration Connect
- WebSphere Business Integration Connect - Express
- WebSphere Business Integration Connection for JASDEC
- WebSphere Business Integration Event Broker
- WebSphere Business Integration Express and Express Plus for Item Synchronization
- WebSphere Business Integration for Financial Networks for Multi-platforms
- WebSphere Business Integration for Healthcare Collaborative Network
- WebSphere Business Integration Message Broker
- WebSphere Business Integration Modeler and Monitor
- WebSphere Business Integration Server
- WebSphere Business Integration Server Express
- WebSphere Business Integration Server Foundation

TABLE 3-29 (CONTINUED)
IBM WEBSHERE COMPONENTS

- WebSphere Business Integration Solutions
- IBM WebSphere Information Integrator
- WebSphere Commerce Developer Editions
- WebSphere Commerce - Express
- WebSphere Commerce Professional and Business Editions
- IBM Express Runtime
- WebSphere Edge Server
- WebSphere Everyplace Access
- WebSphere Everyplace Connection Manager
- WebSphere Everyplace Device Manager
- WebSphere Everyplace Mobile Portal Enable
- WebSphere Everyplace Server for Telecom
- WebSphere Extended Deployment
- WebSphere Host Access Transformation Services

TABLE 3-29 (CONTINUED)
IBM WEBSPHERE COMPONENTS

- WebSphere Host Integration Solution
- IBM WebSphere Information Integrator
- IBM WebSphere Information Integrator Content Edition
- IBM WebSphere Information Integrator Event Publisher
- IBM WebSphere Information Integrator OmniFind
- IBM WebSphere Information Integrator Replication
- WebSphere Interchange Server and Business Integration Toolset
- IBM Library Server for Multi-platforms
- WebSphere MQ
- WebSphere MQ Everyplace
- WebSphere MQ - Express
- WebSphere MQ Workflow
- WebSphere Business Integration Server
- WebSphere Business Integration Collaborations

TABLE 3-29 (CONTINUED)

IBM WEBSPHERE COMPONENTS

- WebSphere® Business Integration Server
- WebSphere MQ
- WebSphere Broker
- IBM WebSphere Business Integration Adapters
- IBM WebSphere Business Integration Collaborations
- IBM WebSphere Business Integration Connect Enterprise
- IBM WebSphere Business Integration Event Broker
- IBM WebSphere Business Integration Express for Item Synchronization
- IBM WebSphere Business Integration Message Broker
- IBM WebSphere Business Integration Message Broker Java Plugin Node
- IBM WebSphere Business Integration Modeler Advanced
- IBM WebSphere Business Integration Modeler Entry

TABLE 3-29 (CONTINUED)**IBM WEBSPHERE COMPONENTS**

- IBM WebSphere Business Integration Server Express and Server Express Plus
- IBM WebSphere Business Integration Toolset

Source: WinterGreen Research, Inc.

3.11.2 IBM WebSphere Business Integration Server

WebSphere Business Integration Server Foundation extends and integrates existing IT assets using a next generation integration platform optimized for building and deploying composite applications.

IBM WebSphere® Business Integration Server Version 4.3 is the IBM business integration solution for process integration, workforce management, and enterprise application connectivity.

IBM WebSphere business integration server helps create and deploy business processes, synchronize business information in multiple business applications on diverse platforms, and transform message formats en-route between applications. Table 3-30 illustrates IBM WebSphere Business Integration Server Advantages.

TABLE 3-30

IBM WEBSHERE BUSINESS INTEGRATION SERVER ADVANTAGES

- Helps create competitive advantages
- Helps deploy business processes
- Helps synchronize business information
- Works in multiple business applications on diverse platforms
- Transforms message formats en-route between applications
- Help organizations take advantage of increased IT agility
- Modifies and improves business processes in response to competitive pressures
- Improves business processes in response to market changes
- Improves business processes in response to economic fluctuations.

Source: WinterGreen Research, Inc.

WebSphere business integration server solution can help organizations take advantage of increased IT agility to modify and improve business processes in response to competitive pressures, market changes, and economic fluctuations.

Systems accelerate the integration of business processes with predefined process templates and adapters.

WebSphere Business Integration Toolset is used to manage, design, test, and deploy business process solutions in a team development environment. WebSphere InterChange server coordinates business process activities that span multiple applications, which may be geographically local or remote, internal or external to an organization.

The webMethods Enterprise Services Platform provides over one hundred adapters for connectivity to information resources and enterprise applications. This includes the ability to connect to a diverse array of applications, ranging from IBM mainframes and older SAP R/3 versions to modern Web services-based applications.

Mainframe Integration

With critical business applications and data residing on mainframe and legacy systems that represent significant investments, Global 2000 companies face the difficult challenge of integrating them into a distributed systems infrastructure. Once technically difficult and often cost-prohibitive, this essential integration can now be achieved reliably, scalably, and cost-effectively with mainframe adapters

3.11.3 WebMethods Adapters

webMethods unlocks the business logic contained in IMS and CICS transactions, turns them into reusable services. It brings the capabilities and benefits of critical business applications running on mainframes to the unified platform of webMethods Mainframe. webMethods' mainframe integration solution delivers few errors and access to critical business applications. The right people get the right data at the right time; streamlined business processes deliver new levels of efficiency, and the business overall further leverages previous investments in mainframe and legacy systems.

3.11.4 TIBCO Adapters

Every business is made up of a complex mix of off-the-shelf and custom applications, databases and network technologies. The integration of these disparate systems requires that their data formats be translated into a common format that can be understood by the other components of the integrated system.

TIBCO Adapter™ software enables packaged applications, databases and networking technologies to become active participants in the enterprise information flow. Adapters provide a configuration-based approach to integration, providing simple, automated mapping of incompatible technologies and data formats.

TABLE 3-31

TIBCO ADAPTER BENEFITS

- Unlocks corporate database assets for active sharing with other enterprise resources
- Improves overall system performance by eliminating repetitive batch requests to packaged application systems
- Lowers cost-of-ownership through general n-way rather than point-to-point integration
- Ensures minimal impact on network performance with efficient information distribution to multiple endpoints
- Simplifies administration with data transparency
- Enhances functionality of networked applications
- Utilizes shared metadata definitions for easy design-time and run-time integration & transformation definition and execution
- Available messaging types include request/reply, publish/subscribe and publish/reply interactions
- Choice of message delivery service levels for optimal resource utilization

TABLE 3-31 (CONTINUED)
TIBCO ADAPTER BENEFITS

- Automated mapping of data types and message or object formats between technologies

Source: WinterGreen Research, Inc.

Adapters for Packaged Applications

TIBCO Adapters are available for a wide range of off-the-shelf applications from leading vendors. Each adapter integrates with at least one, and usually several, of the interfaces exposed by the applications. TIBCO Adapters provide shared XML metadata definitions, standard error handling and reporting, and GUI administration tools.

TIBCO Adapters are available for many applications and platforms including SAP R/3, Siebel, Peoplesoft, Vantive, Clarify, Lotus Notes, Portal Infranet, Kenan and others.

Adapters for Databases

TIBCO Adapters enable an enterprise's databases to become full participants in dynamic business processes, importing and exporting data in real-time for exchange with other databases and applications. Stored procedures can also now be leveraged across the enterprise. TIBCO Adapter for ActiveDatabase(tm) supports the major industry-standard databases, including Oracle, DB2, MS SQL Server, and Sybase.

Adapters for Network Technologies

TIBCO Adapters enable integration with component or object development models as well as with other messaging technologies. In fact, integrating applications based on these network technologies into a TIBCO-enabled e-business infrastructure can expand their functionality to include features such as publish/subscribe messaging and built-in fault tolerance and load-balancing.

TIBCO Adapters for Network Technologies are available for COM, CORBA, and MQSeries.

Development of Custom Adapters

For the integration of custom applications into the e-business infrastructure, TIBCO makes available a comprehensive Software Development Kit that enables enterprises to build their own adapters.

3.12 Business Integration Adapters

3.12.1 Kabira

The Kabira Channel Adapter Factory automatically generates adapters connecting the Kabira Infrastructure System with BSS, OSS and NMS applications or network equipment via XML, Java and CORBA interface definitions. The Kabira Channel Adapter Factory allows companies to auto-generate adapters to standard, customized or homegrown applications and/or a multi-vendor network equipment environment.

An adapter is a Kabira server package or software 'engine' executable that interconnects the Kabira Infrastructure System environment and a third party application or system. The Kabira Channel Adapter Factory automatically generates the adapters for applications or network equipment via common standard protocols such as XML, Java, SNMP and CORBA interfaces. It provides access to 100% of each application's API or XML schema in order to take full advantage of the application's functionality. The Channel Adapter Factory enables the rapid integration of applications in a flexible and straightforward process.

Client adapters: These take third party API definitions as input and generate the matching UML based interface model and client adapter executable.

Server adapters: These adapters use the Kabira Server UML interface package to generate the server adapter executable to expose the interface to third party applications using common technologies such as CORBA or Java.

TABLE 3-32

KABIRA ADAPTER FACTORY COMPONENT GENERATORS

- XML Adapter Generator
- Java Adapter Generator
- CORBA Adapter Generator
- SNMP Adapter Generator
- TIBC
- Adapter Generator
- Database Adapter Generator

Source: WinterGreen Research, Inc.

TABLE 3-33

KABIRA PARTNER ADAPTERS

- Ecosystem Partner Adapters Prebuilt Protocol Adapters
- Protocol Adapters
- Interfacing and Building Custom Adapters
- Custom Adapters

Source: WinterGreen Research, Inc.

3.12.2 Fiorano

Fiorano, along with a number of adapter development partners and application vendor partners, has built a catalog of adapters that serve to reduce the effort required to integrate business processes.

Fiorano Adapters enhance the connectivity support of Fiorano Server to enable installation, deployment, and configuration of "no-code" connectivity solutions.

File Adapters

File Adapters enable the user to read from, write to, and monitor flat files. These adapters can be used to integrate distributed applications that involve accessing the local file system.

DB Adapters

DB Adapters are a set of services that provide connectivity to heterogeneous databases. They are typically used to integrate applications, which involve operations on a database.

Packaged Adapters

Fiorano Packaged Adapters provide the key to enhanced interoperability with a wide variety of applications and technologies. Fiorano by itself and also along with a number of adapter development partners and application vendor partners, has built an impressive catalog of adapters that serve to reduce the effort required to integrate business processes.

Pre-Built Services

Fiorano Enterprise Service Bus™ helps you to rapidly compose and deploy cross enterprise applications with a large number of prebuilt services. These prebuilt services are generic components that meet some of the common requirements of a Fiorano Service, such as distributing load between several component, using an EJB object, transferring files using FTP, directing the flow of information, and so on.

3.12.3 Tibco

Every business is made up of a complex mix of off-the-shelf and custom applications, databases and network technologies. The integration of these disparate systems requires that their data formats be translated into a common format that can be understood by the other components of the integrated system.

TIBCO Adapter™ software enables packaged applications, databases and networking technologies to become active participants in the enterprise information flow. Adapters provide a configuration-based approach to integration, providing simple, automated mapping of incompatible technologies and data formats.

Table 3-34 shows the benefits of Tibco adapters.

TABLE 3-34

TIBCO ADAPTER BENEFITS

- Unlocks corporate database assets for active sharing with other enterprise resources
- Improves overall system performance by eliminating repetitive batch requests to packaged application systems
- Lowers cost-of-ownership through general n-way rather than point-to-point integration
- Ensures minimal impact on network performance with efficient information distribution to multiple endpoints
- Simplifies administration with data transparency
- Provided by subject-based naming
- Enhances functionality of networked applications
- Based on component or object development models
- Like COM, DCOM or CORBA, and other messaging
- Technologies like IBM's MQSeries™

Source: WinterGreen Research, Inc.

Table 3-35 shows the features of Tibco adapters.

TABLE 3-35
TIBCO ADAPTERS FEATURES

Utilizes shared metadata definitions for easy design-time and run-time integration & transformation definition and execution

- Available messaging types include request/reply, publish/subscribe and publish/reply interactions
- Choice of message delivery service levels for optimal resource utilization
- Automated mapping of data types and message or object formats between technologies

Source: WinterGreen Research, Inc.

Adapters for Packaged Applications

TIBCO Adapters are available for a wide range of off-the-shelf applications from leading vendors. Each adapter integrates with at least one, and usually several, of the interfaces exposed by the applications. TIBCO Adapters provide shared XML metadata definitions, standard error handling and reporting, and GUI administration tools.

TIBCO Adapters are available for many applications and platforms including SAP R/3, Siebel, Peoplesoft, Vantive, Clarify, Lotus Notes, Portal Infranet, Kenan and others.

Adapters for Databases

TIBCO Adapters enable an enterprise's databases to become full participants in dynamic business processes, importing and exporting data in real-time for exchange with other databases and applications. Stored procedures can also now be leveraged across the enterprise. TIBCO Adapter for ActiveDatabase(tm) supports the major industry-standard databases, including Oracle, DB2, MS SQL Server, and Sybase.

Adapters for Network Technologies

TIBCO Adapters enable integration with component or object development models as well as with other messaging technologies. In fact, integrating applications based on these network technologies into a TIBCO-enabled e-business infrastructure can expand their functionality to include features such as publish/subscribe messaging and built-in fault tolerance and load-balancing.

TIBCO Adapters for Network Technologies are available for COM, CORBA, and MQSeries.

Development of Custom Adapters

For the integration of custom applications into the e-business infrastructure, TIBCO makes available a comprehensive Software Development Kit that enables enterprises to build their own adapters.

3.12.4 webMethods

Most large organizations rely on numerous enterprise applications, data stores, and business partners to conduct business. Interfacing to such a wide variety of applications and resources has always been a major challenge to achieving real-time business processes execution. Having a core competency in integration, the webMethods Enterprise Services Platform provides over one hundred adapters for seamless connectivity to information resources and enterprise applications. This includes the ability to connect to a diverse array of applications, ranging from IBM mainframes and older SAP R/3 versions to modern Web services-based applications.

Common Adapter Framework

A common adapter framework provides the development framework and runtime infrastructure for all webMethods 6.x adapters. Adapters built using the common adapter framework share common user interfaces and design approaches, and they can take advantage of functionality provided by the Integration Server, such as logging and transaction management.

Standardized User Interfaces

Standardized user interfaces provide common webMethods Administrator user interfaces to manage connections and administrative functions and provide adapter service and notification editors within Developer to standardize the user experience when development tasks are performed.

Adapter Services

Adapter services initiate and perform operations on the adapter's resource. For example, the JDBC Adapter's InsertSQL service performs an Insert operation on a relational database.

Adapter Notifications

Adapter notifications enable adapters to support notifying the Integration Server when specified events occur on the adapter's resource. Polling notifications enable the Integration Server to request data from events on a user-specified interval, and listener notifications enable the Integration Server to monitor (listen for) events that occur on a resource.

Connection and Connection Pooling Management

Connection and connection pooling management capabilities provide connections for the services and notifications used by the adapter and manage those resource connections, including connection pooling.

Logging and Statistics

Logging and statistics capabilities provide journal and audit logging/statistics information through centralized IS logging for WmART and the adapters it hosts.

Transaction Management

Transaction management capabilities support non-transacted operations (auto commit), local transactions (where several actions on a resource are treated as a single unit and are all committed or rolled back together), and XA transactions, which are two-phase commit operations (provided the resource is XA-compliant and the adapter has been built to support XA).

Breadth of Adapters Supported

webMethods provides adapters for over 100 information resources and enterprise applications. This includes the ability to connect to a diverse array of applications, ranging from IBM mainframes and older SAP R/3 versions to modern Web services-based applications.

Adapter Development APIs

webMethods Fabric™ includes the APIs that adapter writers must use to develop adapters supported on WmART. These APIs are documented in the webMethods Adapter Development Kit.

Manageability Using webMethods Manager

Manageability features include the ability to provide management information to the Manager Server and thus to the Manager Console. This information can then be rolled up for root cause analysis.

3.12.5 WebMethods Adapter Web Services

SOA services can use Web services to originate from different technology suppliers. Tightly coupled systems, on the other hand, usually involve a commitment to a specific software environment, which creates interoperability issues when different platforms need to be integrated.

The defining feature of SOA is that services exist as two distinct elements. A well-defined service interface and the service implementation are provided. The service interface describes how to call the service, specifying, where the service is located and the format of input/output parameters.

The service interface is what provides another program with the information it needs to make a request to the service and get a response.

Solutions effectively integrate J2EE, .NET, and legacy systems. The standards-based system is massively scalable. The integration platform is equipped to help build and manage enterprise-class integration networks.

webMethods service-oriented (SOA) is an approach to software architecture where applications are assembled from reusable components. Services are software building blocks that perform a distinct function. Retrieving customer information from a database through a well-defined interface is an electronic description of how to call the service from other programs.

SOA differs from other forms of computing in a few fundamental ways. Software is organized into modular components. SOA components are loosely coupled. Loose coupling is significant because it underlies the flexibility behind SOA.

Loose coupling means services can be linked together dynamically at run-time, with few dependencies on how the services are actually implemented. A company could create a customer lookup service to return information about a customer. With an SOA, any application needing customer information would be able to find, link to, and call the customer lookup service, regardless of whether the service was built using the same or different programming technologies as the calling application.

Loosely coupled services can be linked together easily and quickly as business requirements change. Flexible services can run anywhere on the network and they are not restricted to a specific hardware or software platform or programming language.

3.12.6 BEA

BEA WebLogic Java Adapter for Mainframe (JAM) is a set of software components that provides seamless bidirectional interactions between Java applications running on a WebLogic Server platform and either Customer Information Control System (CICS) applications, or Information Management System (IMS) applications running on a mainframe. With CICS, the Java application request/response operations interact using Distributed Program Links (DPL). With IMS, the Java application request/response operations interact using IMS implicit Application Program-to-Program Communication (APPC) support.

JAM Architecture

BEA WebLogic Java Adapter for Mainframe enables bidirectional connectivity between Java applications running on the WebLogic Application Server and Mainframe COBOL applications running in the CICS or IMS environments.

Development tools

The eGen COBOL Copybook utility translates COBOL copybooks to JAVA source that can be used as the basis for application development and data transformation.

Runtime environment

The Java Communications Resource Manager Gateway (JCRMGW) runs in a WebLogic Server instance and an SNA Communications Resource Manager (SNACRM) can run in the native UNIX/NT environment or distributed to the mainframe as an MVS APPC application. The SNACRM may also be distributed to another UNIX/NT system, separate from the WebLogic Server platform.

In a typical scenario, existing mainframe COBOL applications are exposed to new or existing applications in the WebLogic Server environment. The development tools generate JAVA code from COBOL copybook source. The COBOL copybook contains the structure and size of the data that is passed between the WebLogic Server and mainframe applications. The source code generated from the copybook provides classes that can be extended by the application developer to perform discrete business operations. During runtime, the data passed between applications is stored in a data view object. This object provides set and access methods for all fields in the data buffer. The object also provides a method for converting the object to an XML document. The XML document can be used as input to other applications and, specifically, the WebLogic Process Integrator workflow engine. An XML schema can be generated from the original COBOL copybook for manipulation and transformation of XML documents.

The JAM architecture requires APPC-based communications with mainframe CICS and IMS. The product structure is flexible enough to allow TCP access to the mainframe, if certain product components are installed on the mainframe.

The JCRMGW runs in WebLogic Server and is an eGen client gateway that communicates over TCP/IP to the SNACRM. The SNACRM can run on the same or separate platform other than the JCRMGW. When the SNACRM is running in the UNIX/NT environment, a third party SNA stack is required to enable SNA communications with the mainframe. The SNACRM could alternatively be installed on the mainframe running as a UNIX application under OS/390 UNIX, or as a native MVS APPC application. When the SNACRM is running under OS/390 UNIX or MVS, it does not require a third party SNA stack, but directly accesses VTAM for communications with CICS or IMS. Figure 1-3 illustrates the JAM architecture.

eGen COBOL Code Generator

The eGen COBOL code generator is the utility that generates Java source code from a COBOL copybook. A base Java application is provided on the JAM product CD-ROM so you can modify it to create custom Java applications. The generated code is dependent on the generation model chosen:

Java Class

The generated code provides for data accessors and conversions as well as miscellaneous functions. The generated servlet provides a basic form that matches the copybook. You can use this servlet for testing or proof of concept. For examples of using the eGen COBOL code generator, refer to Developing Java Applications and Programming Scenarios.

Java Communications Resource Manager Gateway

The Java Communications Resource Manager Gateway (JCRMGW) is the Java application that manages sessions providing access into and out of the Java environment. JCRMGW is an EJB component that runs on WebLogic Server Java Virtual Machine (JVM). JCRMGW processes Java-to-mainframe requests and responses in conjunction with the SNACRM. Requests coming from the mainframe are mapped to an EJB that services the request while requests going to the mainframe are mapped to a mainframe program that can be executed using a CICS DPL or started from an IMS queue.

JAM includes a utility that allows system managers to monitor the status of connections to the mainframe and to set traces on connections for diagnostic purposes.

System Network Architecture Communications Resource Manager

The SNACRM runs as a separate native process. It enables APPC conversations and DPL protocols to flow into and out of the Java environment and runs on the same platform as the SNA stack. The SNACRM obtains its configuration from the JCRMGW. If the Java gateway is running on a platform other than the one on which the SNACRM is running, the SNACRM should be started before WebLogic Server is started so it is monitoring the address specified in the JCRMGW configuration.

The SNACRM supports non-transactional IMS programs using the implicit APPC support for IMS. Implicit APPC is similar to the CICS/ESA DPL. Any IMS program that sends and receives messages to and from the IMS message queue can be used without change as either a client or a server.

In order for the SNACRM to properly operate within the JAM environment, the CICS remote domain must be prepared to conduct operations with the local domain. This includes:

Supported Third-Party SNA Stack

A properly configured SNA protocol stack is required for the SNACRM to communicate with a mainframe if your SNACRM is not installed on the mainframe. (Refer to the BEA WebLogic Java Adapter for Mainframe Release Notes for a complete list of supported stacks.) The JCRMGW requires the following parameters from the SNA stack configuration:

3.12.7 Oracle Integration Adapters

Oracle Integration Adapters, a component of Oracle Fusion Middleware, offers organizations a service orientated approach to unlocking the information assets that have evolved in most IT environments. Using standards based on the J2EE platform, these adapters are available to all components of Oracle Fusion Middleware.

Oracle Integration Adapters, a component of Oracle Fusion Middleware, offers organizations a service orientated approach to unlocking the information assets that have evolved in most IT environments. Using standards based on the J2EE platform, these adapters are available to all components of Oracle Fusion Middleware. Oracle Adapters provide an easy-to-use, flexible, standards based SOA platform to enable rapid and real-time access to enterprise applications.

The adapter supports more than one recommended interface to communicate with the enterprise application and translates the application data to standards-compliant XML and back. It offers bi-directional connectivity and can be used to synchronously invoke application transactions and workflows as well as query application data. In addition, it can also asynchronously receive events from the enterprise application.

Oracle Adapters provide an integrated view of data and allow multiple applications to be integrated with each other in a harmonious manner.

OracleAS Integration provides a unique design time experience for easy-to-use and rapid configuration of Adapters. The tool has built-in support for introspecting the EIS application metadata and to automatically generate the metadata for Adapter Services. Users can browse or search for specific EIS interfaces, business objects and operations.

Since this introspection is dynamic, all custom written or extended interfaces are available for use. No coding is necessary leading to rapid development and deployment.

The Oracle AS Adapters is fully standards-based and is compliant with both the J2EE Connector Architecture (JCA) and the Web Services Architecture. The Oracle Adapter SDK is lightweight and enables any JCA-compliant adapter to be rapidly integrated with the Oracle Application Server products.

The Adapter Framework exposes performance metrics to provide visibility into the time spent on each processing step within the Adapter. The performance metrics can be monitored using the Oracle Enterprise Manager.

The Adapter can dynamically scale run-time connections and exploits the underlying OC4J (Oracle AS – J2EE container) connection pooling service for the above.

The Adapters exposes the underlying application specific properties as Header elements and allows the manipulation of these elements within a business process. For example, the AQ Adapter Header element exposes the AQ Header properties such as Correlation ID and Message ID for correlating two AQ messages within a business process.

The Adapter supports batching of messages for increased performance. Multiple messages can be batched together as a single transaction while performing backend invocation operations.

The Adapter is deployable in BPEL and Oracle Application Server clusters leading to a highly scalable architecture.

The Adapter can be completely managed and monitored by the Oracle Application Server Console.

The Adapter SDK is a lightweight tool kit that enables rapid implementation and deployment.

3.13 AmberPoint Services Oriented Architecture (SOA) Management Solutions

AmberPoint is a provider of service-oriented architecture (SOA) management solutions. AmberPoint service-oriented architecture (SOA) management solutions offer comprehensive management capabilities, non-invasive approach to managing service-oriented systems, and native support for .NET and Java platforms.

SOA management capabilities relate to an architectural advantage.

Companies and government organizations implementing SOA are consistently turning to AmberPoint to manage their distributed, loosely coupled systems.

AmberPoint provides the management layer that is critical for realizing the return on investment from distributed, heterogeneous service-oriented systems. AmberPoint solutions provide comprehensive management and security capabilities without requiring any changes to the services themselves. AmberPoint Web services management solutions run natively in both .NET and Java, enabling its software products to fully leverage the advantages of both prevailing Web services platforms.

4. Services Oriented Architecture (SOA) Technology

4.1 Services Oriented Architecture (SOA) Technology Issues

Services oriented architecture (SOA) technology issues relate to a shift in the way the IT departments are structured. Real time computing is based on Web access. This means that all the enterprise applications depend on having access to the information in other applications because business processes share information across applications to implement a coordinated transaction.

Middleware is the glue that lets the IT department keep information in one place and use it for different purposes from its source location. Business processes may go across several applications, to achieve a credit check, post a transaction and ship the order, or create a case. The value of keeping information in one place relates to the keeping it accurate. Duplicated information ends to be out of date, and not consistent with the original information set.

SOA software typically consists of an engine and adapters. The engine is a system designed to support implementation activities. Engines are a sophisticated directory structure, storing the information for an adapter so that the adapter is useful across the enterprise.

Professional services come with the initial deployment of products. They are offered on an ongoing basis to address continuing customer needs. Consulting services range from architectural planning to complete development and deployment.

Services are tailored to meet customer needs. Professional services organizations provide education at state-of-the-art training facilities.

4.1.1 Technology Platforms

Linux, J2EE, IBM WebSphere, BEA Web Logic, Tibco Enterprise, Vitria BusinessWare, and Microsoft-centric .Net BPM platforms are major technology platforms for BPM deployment. J2EE is considered an industry standard implementation platform. The leading application server vendors provide development platforms. Microsoft market strength comes from the large existing client customer base. Most vendors are aiming for deployment on BPM platforms.

BPM solutions support processes of multiple variation and complexity levels. Solutions come from a combination of best-of-breed EAI solutions and Web services vendors. BPM solutions capabilities depend on data transformation, case management, alert notification, and exception handling.

4.1.2 Automated Virtualization Of Existing Enterprise Assets

Automated virtualization of all existing enterprise assets is a significant architectural aspect of BPM technology.

Reusable processes are exposed through a service-oriented architecture that is used to implement business process management. Virtualization represents the most significant BPM trend. This supports distributed business processes.

An end-to-end, top-down approach to business process design is enabled with this architecture. Deployment and lifecycle management leverages process-managed modeling tools. Enterprise portals, EAI middleware, databases, and platforms are all aspects of BPM architecture.

4.1.3 Complexity Of The Underlying IT Technologies

Complexity of the underlying IT technologies is a central issue for both EAI and BPM. Highly skilled software engineers start with defined business requirements and painstakingly translate them into a technology model. Building a data map is a central part of this process. The data map usually looks like a spider web. It maps the movement of information from one process to another

Orders move to invoicing, billing and collections. Orders also move to inventory and manufacturing and shipping. Shipping needs to be interconnected to billing systems. Each company is a little different in how this works across departments.

To implement a BPM system, software engineers pick and choose from the available disjointed EAI technologies. They draw a map of how the systems will be implemented. Reusable components are leveraged as much as possible. Translation of the EAI technology perspective into actual code generally involves a services engagement.

The key point here is the complexity of the underlying technologies. Complexity of the underlying technologies drives significant translation challenges between the business perspective and the technology. Significant hurdles exist for BPM developers. Translation complexity dramatically impacts ongoing changes and management of applications. Applications are expensive to create and deploy and even more costly to maintain. BPM is trying to fit into the application software market.

4.1.4 Impact of Platforms

Complexity is an issue in the BPM market. Platforms are used to address complexity by combining components to create systems. The impact of platforms is significant because applications can be developed using standard specifications. A portion of developer workload is effectively eliminated because of the inherent technology services provided by the platform itself.

J2EE addresses many of the BPM market challenges by introducing a standard application model. In J2EE an application is described as a set of Enterprise Java Beans (EJB), Java Server Pages (JSP), Servlets, Connectors, and Java Foundation Class (JFC) clients.

EAI provides much of the infrastructure plumbing involved in moving transactions across a network. Database connectivity remains an issue for the industry. Transaction services are needed to make BPM systems work across applications.

Application servers are positioned to assist with application development. An application model is like a blueprint providing a common vocabulary and bringing cohesiveness to the underlying technologies.

The J2EE application model is too complex for the average developer. The specifications for J2EE have increased from 400 pages to over 2,000, creating steep learning curves and limiting development to a few, high-priced programming resources within the organization.

Highlighting the BPM challenge is the fact that J2EE is too hard. Platforms are positioned to make J2EE development easier.

4.1.5 Platforms and Disparate Technologies

IDEs, JSP tools, UML generators, de-bugging tools, and workflow engines complement J2EE platforms. The limited scope of these technologies has re-created the same problem developers faced before platforms ever existed. Multiple, disjointed technologies, and no common application model remain as a frustration for developers in the BPM market.

4.2 Services Oriented Applications (SOA) Services

Enterprise software customers typically purchase consulting services to support implementation activities. Professional services come with the initial deployment of products. They are offered on an ongoing basis to address continuing customer needs. Consulting services range from architectural planning to complete development and deployment. Services are tailored to meet customer needs. Professional services organizations provide education at state-of-the-art training facilities.

On-site courses are for customers and partners. Professional services employees have advanced degrees and / or substantial industry experience in systems architecture. Expanding enterprise infrastructure needs of large organizations creates demands for more services.

4.2.1 Application Integration Professional Services Implementation Strategies

Implementation strategies depend on professional services. Middleware is implemented in an organization on a project-by-project basis. Extraordinary changes in business value come from implementation of middleware technology. Investment in strategic infrastructure occurs in the context of specific objectives for costs and benefits.

Making buying decisions on a project-by-project basis leads to extra costs. Systems with different designs and technologies interoperate. Middleware technology addresses integration needs for application connectivity.

Information is unlocked from applications. Enhanced structure and dynamic content selection is achieved through business rules and inference. Portal technology is leveraged. Solutions can be deployed on a project-by-project basis. Functionality, flexibility, and scalability support many projects. They can become a consistent enterprise-wide infrastructure.

4.2.2 Application Connectivity

Application connectivity is an aspect of business process management (BPM) technology. It spans the business and technological gap to create synergy. IT is charged with improving operational efficiency. Increased flexibility and business effectiveness is needed.

Control of IT costs and delivery of business benefits is a priority. Progressively reducing development efforts increases the value of existing assets. Reusable interfaces are a priority. Reducing redundancy in the IT infrastructure by cataloging equivalent function and then progressively eliminating duplication is also an effective method. Users can speed time to systems implementation by minimizing the impact if integration on other systems.

Exploiting application connectivity is achieved by enhancing e-business infrastructure. Management and control of the infrastructure is simpler than a multi-vendor solution. Resolving problems between multiple vendor products can consume a lot of time and energy. It is easier for designers and developers to work with product documentation from a single vendor. A consistent style and approach is the advantage of using a single vendor.

4.2.3 Single Vendor Issues

The single vendor issue is not relevant in an enterprise environment because all systems are heterogeneous. Acquisitions and mergers routinely bring heterogeneous computing environments.

Salary is the largest expense for most IT operations. Building broad employee skills that are reusable in multiple projects can bring significant long-term cost savings. Purchasing software from a single vendor can be more cost-effective with less procurement process than dealing with multiple suppliers.

Cost-effectiveness at every stage of deployment is important because greater ROI in the short term can lead to more profit that can be invested in long-term future enhancements.

4.2.4 Standards Adoption

Standards lead to improved compatibility and interoperation. They offer more choice, which provides greater flexibility and drives down costs. Standards are developed through collaboration by groups of interested parties. They represent a consensus of opinion among industry players.

When vendors adopt a standard, less risk exists for customers that a vendor's technology will radically diverge from the rest of the industry. This means that current investment is better safeguarded against being left tied to a dead-end technology. Solutions that are exclusively standards-focused often bring an unnecessary burden of having to bridge to heritage environments that are not standards compliant.

Solutions are open without being limited to standards. Being able to support fundamental standards like XML, as well as proprietary and legacy approaches is key to providing the flexibility.

Exploiting application connectivity enhances e-business. Solutions support XML and Web services. They make it accessible to architecture. Open standards are Web Services Description Language (WSDL), Universal Description, Discovery and Integration (UDDI) and Simple Object Access Protocol (SOAP).

4.3 SOA Technology Analysis

Companies are implementing BPM solutions in the context of scalability and enterprise wide solution sets are achieving significant competitive advantage and improvements in productivity. Response to competition means adjusting unique enterprise resources to address opportunities and respond to change in markets. Needs and demands are integral to an integration infrastructure systems implementation.

Integration of Internet servers that implement e-business with partners and open a new sales channel depend on BPM systems. Areas of demand within the enterprise include financial services, customer relationship management, e-government and e-business.

Areas of demand outside the enterprise include transmitting information between strategic partners, distributors, agents, and industry exchanges. Supply chain automation utilizes BPM to make outsource manufacturers function as though they are part of the enterprise. Integration solutions are geared to unique demands with industry specific functionality and different engines that provide different functionality.

Business process integration supports achievement of competitive advantage. Enterprises have a fast reaction time. Sales and customer service are improved. Companies are positioned to capitalize on new business opportunities sooner than their competitors. Emerging 'zero-latency enterprise' strategies advances the goal of timeliness. Immediate awareness and appropriate response to events across an entire enterprise are facilitated.

4.4 SOA Business Benefits

SOA leverages mission critical middleware messaging and enterprise application integration EAI to eliminate the need to write or generate programs to interface or integrate applications/systems or convert data. It reduces maintenance of interfaces since no programs are written or generated.

It dramatically accelerates integration projects. What would take traditional integration approaches months of development can be accomplished in a few days. It eliminates the cost of replacing or adding new systems by providing interoperability between existing systems.

It maintains database integrity and audit rules by allowing applications to carry out their important, existing processes. It integrates applications without reprogramming or modifying existing applications. AI quickly adapts to changing business environments. It integrates applications that are 'locked' or have no documentation.

Models of business processes achieve integrated services. Business processes are modeled in software. Systems create a network-centric computing model that mirrors the way a business operates. Scalability and flexibility are supported by systems that allow information resources to be incrementally integrated into the system at any time. Business processes and information requirements drive the system.

4.5 Events

Events are the substance of AI. Events are comprised of information derived from an application for real time systems, or from a database. Events are most often configured as a message. AI manages events that are independent of the application. An event corresponds to a business order, quotation, or transaction.

Events are discovered or created by one resource and are of interest to other resources. Corporations define events to fit their needs and practices. Events may correspond to a quotation sent, order submitted, order shipped, payment received, employee hired, and product manufactured. Because events are grounded in business processes, their meanings are self-evident to everyone familiar with those processes.

Table 4-1 illustrates the types of information that comprise an event. Table 4-2 illustrates event management definition. Each event type contains information particular to it, such as employee number or invoice amount. Well-designed events are self-sufficient, containing all the information pertaining to a business event; such events can be analyzed at any time without reliance on other resources, such as databases, which are subject to change.

TABLE 4-1

TYPE OF EVENT INFORMATION

- Order shipped
- Payment received / sent
- Order submitted
- Order shipped
- Payment received
- Employee hired
- Product manufactured
- Quotation
- Transaction
- Employee number
- Invoice amount

Source: WinterGreen Research, Inc.

TABLE 4-2
EVENT MANAGEMENT DEFINITION

- Information of interest to other resources
- Events that are independent of the application
- Corporations define events
- Grounded in business processes
- Event is discovered or created by one resource
- Each event type contains particular information
- Information pertaining to a business event
- Events can be analyzed at any time without reliance on other resources
- Events are independent of databases, which are subject to change
- Event type can contain semantic or header information
- Event header may be used for routing
- Event flows through the integration system using standard envelope which holds administrative information

Source: WinterGreen Research, Inc.

An event type can contain semantic or header information. An event header may be used for routing. When an event instance flows through the integration system, it has a standard envelope, which holds administrative information that applies to publisher ID, server destination, or Web services.

New event types can be added without disrupting a running integration system. Moreover, because business processes and corporate information needs change, event types support backward-compatible versioning.

4.5.1 Event Transmission

Event-producing resources publish events. Event-consuming resources subscribe to event types and receive events of those types. Some resources publish one set of events and subscribe to another. Because event delivery is brokered on a queue that serves as an intermediary, an unavailable subscriber never delays a publisher, and a subscriber only receives events when it is ready for them. The tasks of event queuing, routing, and delivery-regardless of network status are the responsibility of information brokers. Message oriented middleware systems provide the bulk of queuing services.

The complexity of achieving mission critical, cross platform, once and only once delivery is a central underlying issue for AI systems. Messaging is necessary for AI to exist. For applications to be integrated, it is necessary to have the capability of mission critical messaging between applications. The need for messaging is met by the de facto industry standard messaging product IBM MQ. Though some suppliers expect to bypass existing messaging when implementing AI, this is not a long-term viable alternative.

AI is built on message queuing because the complexity of providing mission critical functionality cannot be bypassed by AI systems that provide connectivity without transport. The core business of AI depends on the ability to provide or adapt to messaging functionality as a base for brokering.

Platform-neutral event description is necessary for event transmission over a network. Publishing an event is the act of transmitting the event. An application publishes an event by creating an event data structure and invoking an adapter.

Information brokers have administrative functions. They maintain registries of events that developers can browse. They provide data on publish and receive rates of resources, lengths of queues exposing network problems and possibly indicating that a hardware upgrade may soon be in order. Events correspond to business processes. Broker data can be used to address business issues.

4.5.2 Business Process Automation

Events form the basis of business process automation. Business process managers are designed to solve key business functions for business analysts. Products take application integration from the level of infrastructure to useable business application tools.

Automation of the integration of multiple platforms is a key design goal. Event messages are transmitted from one kind of machine, operating system, or application to another.

Cross platform-messaging speeds up the process of integrating an organization's business applications with its financial applications. It also protects existing investments by rapidly integrating legacy systems. Event managers can send files or messages across multiple heterogeneous platforms. Systems scale depending on the scope of an organization's information integration needs.

Accounting and reporting rules are defined, viewed, and modified at a single location-so business rules are applied consistently across the enterprise. Businesses can make changes to application code running in multiple places once-quickly and efficiently.

Business logic is maintained using a graphical interface that makes sense to business users. The business side of the organization can accomplish tasks without involving the information technology (IT) organization. The IT organization does not have to interpret the instructions of the business organization and figure out how to implement the change across the enterprise. The people who understand the organization's business information needs make changes quickly and accurately.

Business event managers are evolving as proven, tested solutions based on core functionality developed in the AI system architecture. Business event managers have a rules engine, formatter, and format repository. This allows transformations outside of customer's application code, effectively abstracting the business rules that control how data is shared throughout the enterprise. Business critical integration services include the following shown in Table 4-3.

TABLE 4-3

INTEGRATION SERVICES

- Provide connectivity
- Permit information resources to cooperate across heterogeneous platforms over a network
- Extend standard network protocols
- Leverage middleware multiplexing, queuing, routing, security, ordering, and guaranteed delivery
- Achieve interaction of different departmental systems
- Achieve interaction of different partner and strategic ally systems
- Provide transport flexibility, publish/subscribe, publish/deliver, request/reply, and transactional messaging
- Implement standard interface logic
- Adapt to message transport at the interface level
- Implement flexible formatting
- Achieve description of information at a semantic level
- Represent information by a unique format

TABLE 4-3 (CONTINUED)

INTEGRATION SERVICES

- Support critical path transformation
- Support data flow

Source: WinterGreen Research, Inc.

4.6 Process Oriented Architecture

Process-oriented architecture provides a higher level of abstraction. A process-oriented application model can be based on business process constructs. Integrated services depend on development and run-time services, which are central to process-driven applications.

4.6.1 Business Process Automation

Events form the basis of business process automation. Business process managers are designed to solve key business functions for business analysts. Products take application integration from the level of infrastructure to useable business application tools.

Automation of the integration of multiple platforms is a key design goal. Event messages are transmitted from one kind of machine, operating system, or application to another.

4.6.2 Business Process Management Modular Architecture

Business integration software is based on a modular architecture. Modular architecture meets the requirements of large enterprises and combines standard Internet technologies with proprietary innovations. Solutions consist of connectivity for leading applications, and business process integration modules. Modules extend common business processes across systems. Tools let customers use build integration solutions, extend applications across geographic and time boundaries, and customize pre-built components.

4.6.3 Business Components

Logical business processes relate to analysis of steps at the lowest level of granularity. This granular analysis is achieved by building components that are reusable modules of code. Business components are built to interact with other business components in order to implement a complex process. When business components are chained together, they comprise a business service. Examples could be: “Get Customer Name,” “Calculate Invoice,” “Print Invoice,” or “Update General Ledger.”

Table 4-4 illustrates how business components can be chained together to comprise a business service.

TABLE 4-4
BUSINESS COMPONENTS CHAINED TOGETHER TO COMPRISE A BUSINESS SERVICE

- Get Customer Name
- Calculate Invoice
- Print Invoice
- Update General Ledger

Source: WinterGreen Research, Inc.

Cross platform-messaging speeds up the process of integrating an organization's business applications with its financial applications. It also protects existing investments by rapidly integrating legacy systems.

Event managers can send files or messages across multiple heterogeneous platforms. Systems scale depending on the scope of an organization's information integration needs.

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Business critical integration services include the following shown in Table 4-5.

TABLE 4-5
INTEGRATION SERVICES

- Provide connectivity
- Permit information resources to cooperate across heterogeneous platforms over a network
- Extend standard network protocols
- Achieve interaction of different departmental systems

TABLE 4-5 (CONTINUED)

INTEGRATION SERVICES

- Leverage middleware multiplexing, queuing, routing, security, ordering, and guaranteed delivery
- Achieve interaction of different partner and strategic ally systems
- Provide transport flexibility, publish/subscribe, publish/deliver, request/reply, and transactional messaging
- Implement standard interface logic
- Adapt to message transport at the interface level
- Implement flexible formatting
- Achieve description of information at a semantic level
- Represent information by a unique format
- Support critical path transformation
- Support data flow

Source: WinterGreen Research, Inc.

4.7 Advanced E-Business Infrastructure

Companies use application integration to create an advanced e-business infrastructure. E-business infrastructure is positioned to provide significant benefits to customers, resellers' independent agents, distributors, and the enterprise. Companies have enhanced existing infrastructure and systems with business applications. Applications have been implemented with the desire to increase efficiency and lower costs.

Companies spend upwards of two years researching the optimal architecture and supplier for e-business infrastructure. The key decisions relate to design of a hub-and-spoke, standards-based (XML and Java) approach versus a distributed messaging approach.

The hub and spoke architecture has essential mission critical functionality as the base for information exchange while the distributed messaging system relies on artificial imposition of mission critical protection of data as a separate architecture layer.

Hub and spoke systems are built on rules engines and asynchronous once and only once delivery of messages. Application servers and Java represent basic functionality as well. Distributed message architecture represents a publish-subscribe format that is similar to IP packet switching. Packets are sent around the network looking for nodes that recognize a header or subject content of the message.

Hub-and-spoke architecture is useful for putting intelligence in the network. Intelligence that resides at both the hub and at the spokes means application servers can carry out specific application services. New packaged software communicates with the hub using messaging protocols.

The e-business infrastructure once live and solid serves as the basis for a dozen business-critical applications that benefit both the end customers and independent distributors. It is highly integrated with internal and external applications. Seamless XML-based integration with financial portals allows partners to transact business across financial providers from a single point.

4.7.1 Application Integration Technical Advantages

Technical advantages relate to increased flexibility of deploying development resources that the common infrastructure has enabled. The technology helps partners connect to multiple vendors using the same integration tools.

Application integration is positioned to permit users to continue to evolve business processes to meet the increasingly complex business environment. As change in product cycles is accelerated to as soon as every six months, companies need to be able to adjust internal business processes at the same pace.

4.7.2 Integration System Architecture

Integration systems architecture is infrastructure aimed at permitting existing systems to exchange information. Network computing places a primary emphasis on exchanging information between applications, replacing a previous emphasis on storage and processing application data. This change to network computing is evolving enterprise application integration engines and platforms that introduce a new way of managing the enterprise.

Change is the environment of corporate IT. Business cannot be controlled or predicted by the IT system. The integration system architecture is designed to accommodate change by introducing flexibility as a systems element. Scalable distributed computing solutions are inherently complex. AI is positioned to introduce an element of simplicity and manageability.

The integration system architecture absorbs the complexity and hides it so developers and administrators can focus on business problems, not networking problems.

Productivity tools save developer and administrator time. The integration system architecture provides the regularity and control points needed to build effective tools for integrating resources and managing the resulting system.

Design of the integration system architecture relates to fundamental aspects of enterprise computing systems. Table 4-6 illustrates design of the integration system architecture.

TABLE 4-6

DESIGN CONCERNS FOR INTEGRATION SYSTEM ARCHITECTURE

- Flexibility
- Change
- Encapsulation
- Scalability
- Distributed computing
- Focus on business problems
- Productivity
- Integrating resources
- Managing systems

Source: WinterGreen Research, Inc.

4.8 Open Systems

Open systems support heterogeneous computing platforms. Efficient and affordable personal computers further enable this trend. Line and staff departments run large parts of their operations on personal computers and workstations whose hardware, software, and development tools are all different. But open systems represent a headache for IT departments.

The presence of many open systems platform types drains development resources. Instead of creating solutions to new problems, too many developers spend time and resources porting old solutions and building interface logic.

Compounding the problem of heterogeneous platforms is the sheer number of computers in many enterprises. Distributing and installing software on thousands of machines around the world is a formidable task. AI is positioned to provide solutions by automating software distribution.

4.8.1 Adapters

Adapters provide a basis of business process management. Process tools leverage a repository of sample adapters and templates. These allow customers to gain time-to-market advantage over companies that have integration solutions with fewer pre-built components, a messaging approach, or a less comprehensive toolset.

E-business support and trading partner management capabilities depend on a repository of adapters to support tightly and loosely coupled trading relationships. These capabilities provide the backbone for online marketplaces, application service providers, customer supply chains and inter-divisional business processes.

With open architecture, customers have the flexibility to conduct business with partners using any common Internet data and messaging standard, which allows them to quickly link up to partners and trading communities using their preferred trading standard. Different partners have different trading standards. Reducing integration time and cost by providing pre-built solutions for business process automation is possible using business process management packaged software modules.

Trading partner interchange portals need business process management systems. Trading partner interchange depends on an open e-business solution. Solutions allow customers to manage tightly and loosely coupled trading relationships. Trading partner portals include partner management tools, out-of-the-box support for a wide variety of data standards, protocols, and document-level security.

Application-independent business process modules graphically define end-to-end processes and encapsulate business rules and underlying code for common business processes. Systems support many common processes required for enterprise and e-business functions. Data models are based on widely deployed packaged enterprise resource planning (ERP) applications.

Pre-defined repositories for industry standards are part of the application-specific business models, sample maps, and systems designed to speed integration implementation. Sophisticated relationship and cross-referencing modules provide packaged functionality where other vendor solutions may require custom coding. Pre-built solutions enable faster implementation of integration solutions and greatly reduce the risks associated with complex integration requirements.

Application and technology connectors offer pre-built connectivity to the most common systems within and beyond an enterprise. Cross application access to existing packaged, legacy and custom applications is achieved by offering non-intrusive connectivity in addition to deep business event-level, two-way connectivity. Connectors provide extensive functionality and communication, including event detection, full support for applications' programming interfaces or APIs wherever possible, and asynchronous messaging. Transaction support is central to business process management.

4.9 Development Toolset

Intuitive, visual, and easy-to-use tools are used for system management, application connectivity and business process modeling. Modeling modules are used for business process management. Graphical interfaces enable users to visualize cross-application business processes and automatically generate code.

Toolsets include business process tools. Process design tools are used to create business objects, design business process flows, and automatically generate Java code. Relationship design tools are used for maintaining cross-references between data residing in disparate applications.

Tools include mapping and transformation using a map designer function. Uniform frameworks are used for easily modifying and enhancing existing integration systems or building custom integration systems.

4.9.1 Infrastructure And System Management

Middleware transport, messaging, data transformation and other services underlie business process automation. One centralized, common view of enterprise-wide data is an essential aspect of integration systems.

System management capabilities are a critical requirement for business integration solutions. System managers address this with a visual interface for monitoring, controlling and analyzing as well as configuring business process management systems.

4.10 BPM Software Process Design

Business Process Management (BPM) enables the design, analysis, optimization, and automation of business processes. It does this by separating process logic from the applications that run them; managing relationships among process participants; integrating internal and external process resources; and monitoring process performance.

A mix of several components defines BPM software applications. Solutions have components. Specialized offerings depend on one or two components. Other solutions are more comprehensive.

Components implement process design, process monitoring, process operation, automation, integration, and technology platforms.

The ability for the business analyst to design processes without needing to have any programming is a promise of BPM solutions. Graphical user interfaces with drag-and drop technology are being positioned to make process design intuitive. Graphical user interfaces make systems possible for the business user to implement.

A robust process design module supports process assets. Information, sub-processes, parallel processes, business rules, and exception handling are systems that need to be accommodated.

4.10.1 Process Monitoring

One of the major goals of BPM is to realize continuous process improvement. This makes process monitoring a central BPM technology. BPM vendors are offering more and more capabilities in this area.

Administrative consoles come with metrics and reporting capabilities. Vendors specialize in particular aspects of process monitoring. Enhanced analysis functionality is evolving industry specificity.

Reports and analysis depend on process optimization.

4.10.2 Messaging as Part of Process Operation

The actual operation of a process is implemented with first-generation JMS (Java Message Service). This is an API that supports messaging between computers in a network. JMS is a specification that defines the Java language interface to a messaging service.

JMS is a means for exchanging XML-based transactions. Message-Oriented Middleware (MOM) is a generic message router utilizing asynchronous one-way communication to deliver messages in a format known to both the client and the server.

JMS is more complex than an RPC system, but less complex than a CORBA/RMI system. SOAP (Simple Object Access Protocol) is a protocol for exchange of information in a decentralized, distributed environment. It is an XML-based protocol that consists of three parts.

4.11 BPM / Web Services

SOAP is an envelope that defines a framework for describing what is in a message and how to process it. Sets of encoding rules are used for expressing instances of application-defined data types. There is a convention for representing remote procedure calls and responses.

A Web service is an XML object comprised of content, application code, process logic, or any combination of these. Web services can be accessed over any TCP/IP network using the SOAP standard for integration. The WSDL is a standard for self-description. The UDDI is a standard for registry and discovery within a public or private directory.

Web Services are business information modules that can be shared, combined, used, and reused by heterogeneous computing resources. Web services work within an organization or between firms. The information may be passed to a user or a computer.

4.11.1 Common Object Request Broker Architecture (CORBA)

Common object request broker architecture is a non-language-dependent integration technology for distributed applications. The technology depends on objects at both ends of the pipe to achieve integration. It is being supplemented with Web services technology. Cobra allows the applications to communicate with each other. The Object Management Group (OMG) maintains cobra.

4.11.2 Enterprise Application Servers

Enterprise application servers supported by application integration (EAI) implement the unrestricted sharing of data throughout the network. Applications and database information sources are linked in an enterprise.

Java plays a significant role in the evolving architecture of application integration. Java plays several key roles. It is the choice for an application server because of its portability and the number of product suppliers that support Java. To leverage existing internal skills, Enterprise Java Beans (EJB) is the preferred programming model, and Java is a preferred programming language.

4.11.3 Advantages Of Java In Context Of Application Integration

Java Web application servers provide flexible functionality. The large number of early Java adopters means that there is a large number of Java developers with a good skills base.

Java provides platform portability that enhances application integration. Reusable software can be built using Java. The reusable modules are provided to development teams in the form of style sheets. JavaScript, and Java frameworks are more modern programming techniques used by students and newer programmers.

Java is available for every platform, including mainframes. System testing, maintenance, and production environments are implemented in Java. Java on S/390 can be used for building new Internet applications that make the mainframe act as an application server.

4.11.4 EAI Technology Heritage

BPM's technology heritage comes from enterprise application integration and from mission critical messaging. BPM technology can be applied in scenarios where process sequencing and state management are required.

Application integration is the most common BPM technology in use in 2001. Web services are used to implement flow composition, services-oriented development of applications. Flow needs to be supplemented by rules to make any interesting services applications. Services segmentation and distributed BPM represent technical opportunities to implement applications.

The segmentation of flow gives users more discrete control over the modules that comprise the elements of a process. The ability to implement a process in a granular manner gives users new capabilities. Rules operate as a powerful new development model that gives the user the ability to manage a process with intelligence, choices.

Web services and XML represent significant aspects of BPM infrastructure. The complexity of processes is not addressed by either XML or Web services. These are enabling technologies similar to adapters that do not provide the management capabilities provided by an integration broker.

Web services development extends BPM's popularity in the same way that application integration redefined the workflow market's influence. As Web services are deployed, BPM can be used to manage their execution, serving as the glue to string a series of independent processing steps into a composite flow. A standard for BPM flow composition (e.g., how the BPM tool interacts with Web services) will be established, making BPM more accessible to the mass of systems developers who have never been exposed to process management.

A new model of application logic segregation treats rules, flow and services as separate elements, each possibly supported by dedicated runtime environments (e.g., rules engines, BPM tools and Web-services-enabled middleware).

4.12 Web Services

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. Web services automate integration between programming languages – C+, Java, and others. In the same manner that application integration integrates applications, and mission critical messaging integrates platforms and operating systems, Web services automates programming languages.

4.12.1 Promise Of Web Services

Web services represent the technology for implementing BPM. Much of the potential promise of Web services lies in taking business process components and tying them together into new applications. This allows companies to quickly adapt applications to customers while allowing IT managers to dynamically modify application behavior based on changes to business processes.

An enterprise can take any business process and define, compose, wrap, call, and register it as an internal or external Web service. That makes the process accessible to trading partners, regardless of what internal systems the partners use. Functionality allows a Web service with multiple steps - such as applying for a loan application - to hold data that is retrieved in real time until data that may take longer to retrieve in subsequent steps is received.

Web services frameworks fall into two major camps: Sun's Java and Microsoft's .Net. Oracle is part of a growing number of companies that have chosen to embrace Java as the foundation for their Web services strategies. BEA is focusing on Web services with the release of its WebLogic application server and associated products.

4.12.2 Microsoft .Net Framework

Microsoft .Net framework offers the common language runtime, which fundamentally does the same job as Sun's Java Virtual Machine. It runs on top of the operating system, shielding it from the application code, which can be written in any language supported by .Net.

The .Net framework does away with Dynamic Link Libraries (DLLs). DLLs were an inherent part of Windows and were heavily utilized in developing Windows software. This led to huge problems, because each program needed its own specific code to run, and programs would often find that different libraries would clash with each other.

Developers creating applications using .Net can output components wrapped in an XML communications mechanism called the simple object access protocol (SOAP) that allows them to communicate with other components. Programmers can develop a description of the component using an XML description mechanism called the Web services description language (WSDL). This makes it possible to list components in a registry of other software items, developed to a specification known as the Universal Description, Discovery, and Integration (UDDI) registry.

Both soap and UDDI are standards that have been ratified by consortia rather than a single company, bringing them in line with the multivendor Web services approach.

4.12.3 Java

Java is used to provide a single application development and deployment paradigm across multiple platforms. The J2EE standards provide the technology specifications for connecting to external applications and data. Integration is achieved using enterprise application integration (AI) software.

Native Java access to integration software is evolving. Application integration is well within the reach of a Java developer. Vendors are working on J2EE integration. Solutions are positioned to do J2EE integration for legacy applications, data, and popular application packages, while retaining the scalability of the architecture.

J2EE solutions leverage adapters. Adapters incorporate technical and business level capabilities, so the Java developer needs to know very little about how to interface with a software package. Vendors seek to deliver benefit without requiring the developer to learn new technology.

Java connectors are being integrated into suites of products. Vendors can facilitate application server-based Java development and deployment. The connectors provide Enterprise Java Bean (EJB) components connect to adapters, creating the ability to seamlessly interact with applications and data inside the enterprise.

A Java developer may be able to create, retrieve or update a purchase order in an SAP R/3 application by appropriately invoking an EJB in the application server. When combined with other integration product offerings, such as open business interchange, integration can take place outside the enterprise as well inside.

4.12.4 Java Technology

Java programming technology is a market driver for business process management. Access to the API interfaces is a central technology concern when building a business process management system. APIs are used for communication between external software products and packaged application software.

The providers of applications control access to APIs. If the application provider denies access to APIs, business process management cannot take place. As application providers become competitors with business process management vendors, the access to APIs sometimes is impacted. Access to APIs is a central concern. Technology related to the connectivity may be licensed to third-party database and other applications providers.

4.12.5 J2EE

Java 2 platform, enterprise edition (J2EE) is a single-language, multi-platform development framework for delivering enterprise applications. The J2EE platform is a collection of related technology specifications that describe required APIs and policies.

JCA is J2EE connector architecture. It defines a way for enterprise applications to communicate with enterprise information systems. The main components are the resource adapters, system contracts, and the common client interface, or CCI.

4.12.6 Soap

Soap is a key standard for delivering Web Services. Web Services business assets can be shared, combined, used, and reused by heterogeneous computing resources within an organization or between firms. Technically, a Web service is an XML object comprised of content, application code, process logic, or any combination.

A Web service can be accessed over a TCP/IP network using the SOAP standard for integration. WSDL is the standard for self-description. UDDI is the standard for registry and discovery within a public or private directory.

APIs are application program interfaces. APIs are the interface by which an application program accesses an operating system and other services and applications. B2Bi, business-to-business integration depends on the availability of APIs at the edge of applications to gather information from the application.

Automated exchange of information between different organizations is enabled with APIs.

Typically APIs and Web services are needed to do the integration of information systems between an enterprise and its partners, customers, distributors, suppliers, and business exchanges that implement automated supply chain systems.

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.

4.12.7 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.

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.

4.12.8 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 un-encrypting 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.

4.12.9 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.

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

Most load balancers support cookie-based session tracking, but the particularities of the Soap 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.

4.12.10 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 a 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.

Moving a Soap-based Web service into a production environment requires testing for states, privilege, speed, boundaries, and regression as illustrated in Table 4-7. Assurances of high availability relate to good performance.

TABLE 4-7

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.

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.

4.12.11 WSDL

WSDL is a web services definition language. It is in an XML format. It is used for describing network services as a set of endpoints operating on messages containing either document-oriented or procedure-oriented information.

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 un-scalable 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.

4.12.12 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.

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.

4.12.13 UDDI

UDDI is the universal description, discovery, and integration portion of Web Services. UDDI provides a platform-independent, open framework for describing services, discovering businesses, and integrating business services using the Internet.

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.

4.12.14 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.

4.12.15 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.

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.

4.12.16 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.

4.12.17 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.

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.

4.12.18 XML

XML plays two major roles in application topology. It is the prime method for communications between internal applications. All messages flying through a hub can be XML until they are transformed for the mainframe. All new services under the new architecture interface via XML.

XML has a role of in external integration. Marketplaces are being integrated via XML. Electronic market places are being designed to act as the custodian and facilitator for the XML standards for any marketplace model.

As companies constantly address new business processes, XML is a protocol for formatting information in a standard manner so that the messages are consistent. Changes in business processes are continuing to evolve across product lines, customer service functions, and in keeping with XML directions. The evolution of XML and Web Services supporting technology is a challenge.

XML is extensible, meaning over 200 different languages with new vocabularies are being used simultaneously. Systems of words and meanings evolve without standards. That has caused confusion, creating the need to integrate even more than before.

XML is an extensible markup language. It is a form of self-describing data that creates common information formats to share both the format and the data across the Internet, Intranets and enterprise networks are supported by XML. XML frees network content from the browser, making it available to real applications.

4.12.19 XSLT

XSLT language is used to transform XML as illustrated in Table 4-8.

TABLE 4-8

XSLT TRANSFORMATION OF XML

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

Source: WinterGreen Research Inc.

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.

4.12.20 Metadata Repository

A metadata repository is used for recording all business service and business component definitions, rules associated with them, technical information, and trading partner information. Table 4-9 illustrates uses of a metadata repository.

TABLE 4-9
METADATA REPOSITORY

- Used for recording business service definitions
- Used for recording business component definitions
- Used for recording rules associated with component definitions
- Used for recording technical information
- Used for recording trading partner information

Source: WinterGreen Research, Inc.

The repository is a key resource that holds all information required. Business intelligence, technical intelligence, and external partner information are essential components of the e-services platform.

A challenge in implementing an e-services platform is providing adequate repository functionality. A repository is a critical resource. Users take care to avoid the repository becoming a performance bottleneck or single point of failure.

Business services span many locations. Repository information needs to be accessible in some local form at each location rather than via a central database.

Redundancy is needed to prevent the repository being a single point of failure. Security is a further problem. The repository holds sensitive information and its processes require a certain amount of privacy, particularly from trading partners. Unauthorized alteration of the repository could have drastic effects.

4.12.21 **Wrapping**

The basic concept that makes an evolution to e-services possible is called wrapping. An existing business process can be wrapped with a new model to impose new rules on the old system, without changing the old system.

Because the business analyst can clearly see the business flows and rules using specially designed tools, there is less likely to be a gap in understanding between what the business wants and what the IT personnel perceive these needs to be. This results in a more accurate implementation that truly reflects the business intent.

Users can monitor the business flows and rules. It is easier to resolve problems since both technical and business analysts can analyze and work on them. Because they can clearly see the business flow, business analysts can iteratively tune business processes to ensure optimal performance.

These benefits are greatly enhanced in an e-business scenario. When a business service needs to cross company boundaries, it is important to have a clear understanding of what is happening at each business step.

What happens in a trading partner system is invisible to the local systems. The ability to have clearly defined business services and reusable business components, coupled with the ability to link all these together on different systems and monitor the business flow across them, delivers major benefits.

It makes it much easier and quicker to create, implement, and improve extended enterprise processes successfully. The e-services revolution gives the business control over IT.

4.12.22 Workflow Management Coalition

The WfMC is a non-profit, international organization of workflow vendors, users, analysts and university/research groups. The coalition's mission is to promote and develop the use of workflow through the establishment of standards for software terminology, interoperability and connectivity between workflow products.

Comprising over 300 members throughout the world, the coalition is the primary standards body for this significant software market. The creation of the WfMC standards reference model has proved its importance in other areas of technology, most notably the ISO Seven Layer reference model for computer communications.

4.13 Service Level Challenges

Service level agreements become a significant aspect of BPM as companies look for high availability systems. Application integration provides connectivity between distributed computing centers. Operating in real time is creating the need to have all systems available in real time, 24 x 7.

Operating system outages cause system downtime. E-business platforms are built on the premise of service level management (SLM). Customers are paid rebates because vendors do not fulfill service-level agreements.

Human error is a factor in system outages. Human error prevents users from upgrading. Performance of a Web site suffers when large numbers of visitors come to a site. Database reorganizations are time consuming. Industry best practices have emerged to provide service level management.

4.13.1 Quality Of Service (QoS) Functions

While some customers require ATM services, some IP services, and others Ethernet Transparent LAN Services, all require some degree of quality of service (QoS). QoS evolved from the combination of voice and data over the same lines. Voice has more stringent requirements for continuity of signal because it occurs in real time. Data on the other hand can be sent in spurts and reconfigured at the other end of the transmission path.

Quality of service (QoS) permits network managers to configure networks for voice that goes in real time, and data that travels in between the voice transmission, coming into the network in the empty space between voice packets.

QoS has been insignificant as a network issue now that there is so much over capacity in the network. With a lot of overcapacity, different bandwidths can be allocated to different uses. Voice and data can be assigned separate wavelengths, eliminating the need for intelligence in the network.

OSN equipment offers the intelligence to look into the services being transported within a wavelength and recognize and maintain service classes. Traffic flows tagged with ATM QoS levels or labels are transported around the ring to their proper destinations within each data flows class of service parameters.

Quality of service provides different levels of service for different levels of communications need. Optical switches implement high-speed networks that provide the means for a geographically extended business to operate globally. The application of memory intensive applications has been a growing burden for the network manager.

The wide bandwidth nature of optical core networks, with broadband access technologies, effectively allows the concept of a global LAN. GAN is a Global Access Network. To become a reality as a global access network a network needs quality of service capability. Optical systems give price advantage to customers depending on distance or type of traffic communicated.

4.13.2 Network Efficiency

The implementation of business process management depends on the ability to switch individual services on and off wavelengths at different add/drop points represents increased network efficiency. Metro DWDM equipment throws wavelengths at the problem. Requiring as many wavelengths as drop points, this solution soon becomes costly and operationally challenging.

Other solutions offer the ability to switch services between wavelengths and add/drop the services at multiple nodes. This requires fewer overall wavelengths for each ring, and allows increased spacing between wavelengths. The use of lower-cost, more readily available components makes optical networks possible. Newly added services can be switched onto wavelengths with available bandwidth.

As the systems are put in place, business process management will take advantage of the increased efficient, inexpensive band-width to implement value added services. Modifications to existing services consume the bandwidth of the originally provisioned wavelength. New services can be switched to an available wavelength. OSN equipment closes the metro gap through a powerful set of features that address service provider requirements.

4.13.3 RosettaNet Standardizing Supply Chain Processes

RosettaNet is a high technology industry leading e-business process standards consortium. RosettaNet is a leading e-business consortium. Activities in North America relate to standardizing supply chain processes and supporting members from leading information technology (IT), electronic component (EC) and semiconductor manufacturing (SM) companies.

Key areas include partner implementations, recruitment, and regional marketing. RosettaNet has a partner relationship team charged with accelerating successful implementation of RosettaNet standards in a production environment. Working with the member companies, RosettaNet addresses partner requirements and opportunities.

Partners provide input into the standards development and maintenance processes. Recruitment activities support the expansion of RosettaNet's existing membership base.

Standards are moving quickly, and with great success, because of the ongoing collaboration and support of RosettaNet's member companies. The commitments demonstrated by partners who have elected to participate in the on-loan resource program provide users with an opportunity.

RosettaNet offers process messages. The growth of the industry depends on system-to-system automation. RosettaNet standards allow for better service, better decision-making, quicker response to changes in consumption or supply, and contribute to better financial performance.

B2B software solution products, standards, and implementations for the electronics industry are a focus for RosettaNet. RosettaNet is an independent, non-profit consortium dedicated to the collaborative development and rapid deployment of open Internet-based business standards that align processes within the global high-technology trading network.

More than 350 companies representing over \$1 trillion in annual information technology, electronic components and semi-conductor manufacturing revenues participate in RosettaNet's standards development, strategy, and implementation activities.

B2B software platforms offer flexible B2B platform to power and manage the entire spectrum of interactions and collaborative processes among businesses and marketplaces over the Internet. Global 2000 companies and B2B net markets can seamlessly integrate diverse information systems into effective, real-time trading networks by automating and synchronizing the flow of information and execution of processes. B2B software platforms help businesses improve operational efficiencies, realize new revenue opportunities and achieve competitive differentiation.

Applications for secure data transfer between members of online trading communities, into its products. Systems automate efforts to link trading partners that have disparate computing, security, and electronic transport protocols.

4.14 Business Need

Massive investments in packaged applications and infrastructure (ERP, CRM, J2EE Application Servers) have not yielded the anticipated improvements in process performance, competitive positioning, or return on investment. J2EE application servers have emerged as the focal point in the enterprise computing landscape.

4.14.1 Business Process Management Packaged Solutions for Rapid Deployment

Healthcare resource optimization is a central aspect of BPM deployments. Emergency center monitoring is used to quickly identify patient bottlenecks, perform short-term trending and identify process improvement and problem areas.

Daily productivity and revenue cycle visibility allows healthcare administrators and doctors to monitor operational efficiency by region, hospital, department and doctor. Appointment counts, patient visits, service provided, missing encounter data, and insurance reimbursement timeframes are provided.

BPM can be configured to achieve global hot spot identification for sales, forecast and inventory discrepancies across the enterprise. Users visually perform historical comparisons and correlations with other activities including marketing, strategic initiatives and news.

Real-time monitoring of plant floor configurations and activity can be achieved. Accurate identification of products is supported so product recalls and quality problems can be handled by correlating information.

Homeland defense can be managed with BPM. Monitoring real-time activity and gathering intelligence about potentially hazardous situations going on in shipping ports, around airports or anywhere in the world can be managed. Integration with satellite imagery and biometric capability is provided.

4.14.2 Quality Of Service Control

Continuous monitoring of service level agreements and operational targets includes call center activities and service delivery performance. Easy identification of emerging trends and proactive notification to prevent shortfalls and overruns is supported.

Lifecycle of integration relates to design, deployment, and management of events. BPM is leveraging intuitive user interfaces that enable the presentation of current conditions and historical data in whatever format best meets the needs of a business.

4.15 BPMI.org

BPMI.org is developing BPM standards. BPMI.org is a non-profit corporation whose goal is to empower companies to develop and operate business processes that span multiple BPM and Web Services.

BPML.org is a business process management initiative. Applications and business partners are behind BPML initiative to move information outside the firewall and over the Internet. The BPML initiative relates to developing mission critical BPM standards. The use of business process management (BPM) through The establishment of standards for process design is expected to stimulate use of BPM.

BPML.org has received the contribution of more than 200 members and delivered key standards to the BPM market, including the business process modeling language (BPML), a meta-language for modeling business processes and the business process-modeling notation (BPMN), a graphical notation for designing executable business processes.

BPM depends on deployment, execution, maintenance, and optimization of granular business processes. BPML.org develops open specifications, assists IT vendors with marketing their implementations, and supports businesses with using business process management technologies.

Technology integration standards on the back-end include XML schema, SOAP, and J2EE. Technology integration standards enable the convergence of legacy infrastructures toward process-oriented enterprise computing. On the front-end, emerging protocols include ebXML, RosettaNet, and BizTalk support the process-level collaboration among business partners.

BPML.org leverages those converging trends by driving the development of technologies that help companies to develop and operate business processes that span multiple applications and business partners, behind the firewall and over the Internet.

4.15.1 Bpmi.Org Defines Open Specifications

BPML.org defines open specifications, such as the business process modeling language (BPML), business process query language (BPQL), and business process modeling notation (BPMN) that enable the standards-based management of e-business processes.

BPML.org and ebXML are addressing complementary aspects of e-business process management. ebXML provides a standard way to describe the public interface of e-business processes, BPML.org provides a standard way to describe their private implementation.

BPML.org is driving the creation of BPML for the private implementation part (proprietary to each business partner) of a process. The business process modeling language (BPML) is a meta-language for the modeling of business processes.

4.15.2 BPM Transactional Finite-State Machines

XML is a meta-language for the modeling of business data. BPML provides an abstracted execution model for collaborative and transactional business processes. BPML is based on the concept of a transactional finite-state machine.

BPML considers e-business processes as made of a common public interface and as many private implementations as process participants. This enables the public interface of BPML processes to be described as ebXML business processes.

RosettaNet partner interface processes are independent of private implementations. XML documents are described in a specific XML schema. Specific XML schema are layered on top of the eXtensible Markup Language,

BPML processes can be described in a specific business process modeling language layered on top of the extensible BPML XML schema. BPML represents business processes as the interleaving of control flow, data flow, and event flow. Orthogonal design capabilities are used for business rules, security roles, and transaction contexts.

Table 4-10 illustrates BPML e-business processes.

<p style="text-align: center;">TABLE 4-10</p> <p style="text-align: center;">BPML E-BUSINESS PROCESSES</p>
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- Made of a common public interface
- Can be described in a specific business process modeling language
- Business process modeling layered on top of the XML schema
- Schema leverage extensible BPML
- Interleaving of control flow, data flow, and event flow
- Has orthogonal design capabilities
- Used for business rules

TABLE 4-10 (CONTINUED)
BPML E-BUSINESS PROCESSES

- Used for security roles
- Used for transaction contexts

Source: WinterGreen Research, Inc.

BPM is defined as a medium for the convergence of existing applications toward process-oriented enterprise computing. BPML offers support for synchronous and asynchronous distributed transactions. It can be used as an execution model for embedding existing applications within e-business processes as process components.

4.15.3 BPQL

BPMI.org is driving the creation of BPQL to be a standard management interface for the deployment and execution of e-business processes. The business process query language (BPQL) is a management interface to a business process management infrastructure. BPQL includes a process execution facility that performs process server functions. A process deployment facility acts as a process repository.

BPMN is a notation for the development of BPML processes at the business level. BPML is used to carry process semantics among computer systems and software applications.

BPMN is positioned to assist in the communication of business processes among business and technical users.

The challenge for vendors is to develop support for all process types. Vendors that focus on EAI need capabilities for managing more complex and longer-lived processes. Vendors that focus on BPM need a solid infrastructure base.

Web services depend in part on a Web service choreography interface (WSCI). The XML-based WSCI orchestrates atomic Web services. Process components depend on defined interfaces between multiple processes. Processes are defined in different languages. BPML and business process execution language for Web Services (BPEL4WS).

WSCI takes Web service interoperability beyond basic messaging. It provides open, automated application-to-application collaboration. WSCI bridges the gap between BPM and Web services by describing how a collection of Web services can be used as part of a larger, more complex business process. WSCI resides within a single company or spans across multiple organizations. WSCI provides a standards-based approach to interoperability between BPML and BPEL4WS processes

Systems foster a convergence path for the two leading business process-modeling languages. Work within BPMI.org and on WSCI is positioned to strengthen the BPM market. It strengthens providing business process management system (BPMS).

BPM standards-based, platform-neutral BPMS supports the design, deployment, execution, maintenance, and optimization of business processes. They involve distributed transactions with packaged applications, databases, and heritage systems, as well as complex workflow interactions with end-users.

Benefits for architecture relate to BPMS support for block-structured process modeling languages. BPML and BPEL4WS is being deployed on J2EE application server and integration broker. BEA WebLogic, IBM WebSphere, and Tibco Rendezvous are among products used as applications servers in the BPM markets. These products have a significant EAI infrastructure component.

4.15.4 XML Standards

XML is used to enable internal and external communications with other systems. Application integration is used to address the challenges of keeping the applications independent, loosely coupled, but able to be well integrated. IT departments need to maintain independence of underlying infrastructure, allowing change to the infrastructure without rewriting the applications.

XML.ORG is the OASIS community for advancing XML industry standardization. AI companies are participating in the electronic business XML (ebXML) initiative.

ebXML was formed by the United Nations CEFAC and OASIS to develop a technical framework to enable the use of XML in a consistent manner across all business data in application-to-application, application-to-person, and person-to-application environments.

In particular, ebXML lowers the barrier-of-entry to electronic business. It is designed to facilitate trade, particularly with respect to small- and medium-sized enterprises (SMEs) and developing nations. All companies are taking an active role in developing ebXML.

4.16 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.

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.

4.17 Services Oriented Architecture (SOA)

Businesses are faced with unique sets of business challenges that impact directly their IT strategy. Revenue growth needs to be balanced by keeping costs in check. Responsiveness is a high priority. Changing market conditions are the norm. The business environment is adapting to manage change.

Intense competition is evolving in an increasingly regulated and constantly changing global marketplace. Enterprise application integration (EAI) is driving revenue growth. Service oriented architectures (SOA) are evolving in the context of EAI integration to facilitate the introduction of new products, services, and markets.

An SOA is designed to provide the flexibility to achieve granular access to elements of the business processes. Underlying IT infrastructure is evolving as secure, standardized components. Components are being positioned as services. Services can be reused and combined to address changing business priorities. Table 4-11 illustrates service oriented architecture (SOA) functions.

TABLE 4-11

SERVICE ORIENTED ARCHITECTURE (SOA) FUNCTIONS

- Support ability to meet business challenges that impact IT strategy
- Support revenue growth
- Balance growth by keeping costs in check

TABLE 4-11 (CONTINUED)

SERVICE ORIENTED ARCHITECTURE (SOA) FUNCTIONS

- Support responsiveness as a high priority
- Address changing market conditions
- Provide way to build business applications in environment that is adapting to manage change
- Support adaptation to intense competition
- Evolve in an increasingly regulated and constantly changing global marketplace
- Support service oriented architectures (SOA) evolving in the context of EAI integration to facilitate the introduction of new products, services, and markets
- Support design flexibility to achieve granular access to elements of the business processes
- Support underlying IT infrastructure
- Support secure, standardized components
- Support positioning components as services
- Permit services to be reused and combined to address changing business priorities

Source: WinterGreen Research, Inc.

4.17.1 IBM Service Oriented Architecture (SOA)

IBM technology and standards address components of a SOA architecture. IBM is positioned as a long-term collaborator to develop and support SOA solutions tailored to meet the needs of business.

4.17.2 SOA Business Challenge IT Imperative

Increasing the speed of business changes depends on the ability to implement SOA architecture. Systems become responsive IT organization needs to quickly adapt to changing business priorities when they have an SOA fabric that speeds the implementation of services from years or months to hours or minutes.

SOA applications can be built using GUI interfaces so that business analysts do not need to learn how to implement executable code. Systems improve business efficiency and performance. The enterprise can align IT more tightly with business strategies in a cost effective manner.

Systems protect critical business assets. They provide a secure and managed integration environment. Services are the building blocks of business process integration. Packaging business functions from new and existing applications in a simple and standardized way creates services that are available for use.

Services are used to help get the right information to the right people at the right time. Services can be reused and combined to deploy composite applications to address new opportunities. Increasing use of Web services is based on open standards that complement existing services technology.

Many companies are using Web services standards to improve interoperability between disparate systems.

4.17.3 Services Oriented Architecture And Relevant Standards

The service-oriented architecture (SOA) approach is software engineering try to foster the reuse of software components. The concept is for program functions broken down into smaller programs through functional decomposition. Central to the concept is the idea of application programming interface (API).

The use of object as building block combines data and functions into an encapsulated unit. Classes, inheritance, and polymorphism allow the construction of class lattices. Specification of signatures is sufficient to provide adequate security. The community knew semantics of individual classes.

Programming changed dramatically with the concept of making services available on the Web. Web services are used to implement SOAs. A Web service could be as simple as running a check on a credit number. Complex services relate to handling a mortgage application. Services can be described and published in a way that anyone can locate and invoke them. This mandates the use of taxonomies and ontologies to capture syntax and semantics of the offered services.

An architecture that supports Web services is known as a service-oriented architecture. It covers the aspects of dynamic discovery of registered services. This includes searching for services that meet criteria. Business criteria are delivery time and price.

The organization of services is such that one can easily understand what a service offers. The description of services is so that a service can be properly invoked. This includes formats and protocols for invoking the Web service.

Service-oriented architecture is different from a service-based architecture. Service-based architectures are RosettaNet¹⁷ or OBI¹⁸ (Open Buying on the Internet). It focuses solely on the formats and protocols between services. It represents the pieces of the service-oriented architecture.

4.17.4 XML

XML is a family of standards that includes not just the XML data format, but also standards for Data Semantics, Transport, Service Description, Service Discovery, Service Orchestration, and Business Processes. XML provides the foundation for Web Services, and many vertically- and horizontally-aligned organizations are extending the XML standards to meet specific requirements. TIBCO is active in many of these efforts through participation in organizations such as W3C, XML Schema, ebXML, WSDL, Schema Adjunct Framework, and RosettaNet.

4.17.5 Integration Engines Leverage XML Processing

Integration engines leverage XML processing by using XML to move information from one application to another. XML is needed to drive business process electronically end-to-end. Table 4-12 illustrates integration engine XML processing functions that drive business process electronically end-to-end.

TABLE 4-12

**INTEGRATION ENGINE XML PROCESSING FUNCTIONS THAT DRIVE
BUSINESS PROCESS ELECTRONICALLY END-TO-END**

- Check customer credit
- Generate sales quote
- Send quote
- Process order
- Validate order
- Check inventory
- Approve order
- Process order
- Generate shipment
- Create invoice
- Send invoice
- Alert shipping manager
- Process payment
- Create ASN

TABLE 4-12 (CONTINUED)

**INTEGRATION ENGINE XML PROCESSING FUNCTIONS THAT DRIVE
BUSINESS PROCESS ELECTRONICALLY END-TO-END**

- Ship order
- Confirm goods receipt
- Notify sales operations
- Check work in progress status
- Hold order for approval
- Check delivery status
- Confirm delivery
- Replenish inventory
- Send order for parts for more component manufacture
- Reconcile payment
- Send ASN

Source: WinterGreen Research, Inc.

4.17.6 XML Standards

XML is used to enable internal and external communications with other systems. Application integration is used to address the challenges of keeping the applications independent, loosely coupled, but able to be well integrated. IT departments need to maintain independence of underlying infrastructure, allowing change to the infrastructure without rewriting the applications.

XML.ORG is the OASIS community for advancing XML industry standardization. EAI companies are participating in the electronic business XML (ebXML) initiative.

ebXML was formed by the United Nations CEFAC and OASIS to develop a technical framework to enable the use of XML in a consistent manner across all business data in application-to-application, application-to-person, and person-to-application environments.

In particular, ebXML lowers the barrier-of-entry to electronic business. It is designed to facilitate trade, particularly with respect to small- and medium-sized enterprises (SMEs) and developing nations. EAI companies are taking an active role in developing ebXML.

4.17.7 XML Role In Application Topology

XML plays two major roles in application topology. It is the prime method for communications between internal applications. All messages flying through a hub can be XML until they are transformed for the mainframe. All new services under the new architecture interface via XML.

XML has a role of in external integration. Marketplaces are being integrated via XML. Electronic market places are being designed to act as the custodian and facilitator for the XML standards for any marketplace model.

As companies constantly address new business processes, XML is a protocol for formatting information in a standard manner so that the messages are consistent. Changes in business processes are continuing to evolve across product lines, customer service functions, and in keeping with XML directions. The evolution of XML and Web Services supporting technology is a challenge.

4.17.8 XML Meets The Integration Challenge

XML is extensible, meaning over 200 different languages with new vocabularies are being used simultaneously. Systems of words and meanings evolve without standards. That has caused confusion, creating the need to integrate even more than before.

4.17.9 XML Standard Communication Language

XML has emerged as a standard communication language for e-business data representations. The XML data type has been added to databases to support operations on XML data. Message queuing supports XML data type payloads but allow definitions of subscriptions based on the contents of XML messages.

This is a very powerful functionality for online market places. Multiple vendors can define their subscriptions based on the contents of orders. Business actions can be communicated in the XML-format over the Internet. A partner can pick up outstanding orders from an e-business over the Internet using XML-based messages.

4.17.10 Web Services Protocols

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. Web services automate integration between programming languages – C+, Java, and others. In the same manner that application integration integrates applications, and mission critical messaging integrates platforms and operating systems, Web services automates programming languages.

4.17.11 Web Services Input And Output Formats

Table 4-13 illustrates Web services input formats.

TABLE 4-13
WEB SERVICES INPUT FORMATS

- CIS Swift
- SWIFT ISO7775
- SWIFT ISO15022
- Excel
- Tagged CSV
- Fixed Width
- CSV
- Multi-Line Fixed Width
- True CSV
- XML

Source: WinterGreen Research, Inc.

Table 4-14 illustrates Web services output formats.

TABLE 4-14

WEB SERVICES OUTPUT FORMATS

- Chase CTE
- SWIFT ISO7775
- SWIFT ISO15022
- HTML output template
- Excel
- CSV
- True CSV
- XML
- HTML

Source: WinterGreen Research, Inc.

4.17.12 Web Services Coupling Versus Cohesion

People are leveraging services as a point of integration. In looking at the source and target systems that make up the application integration problem domain, users consider integration alternatives. Coupling and cohesion are central issues in this context. Leveraging information exchange when services interfaces are indicated depends on SOAs.

Architects analyze problem domains before they use service-oriented solutions. Enabling technology is useful in the context of the ability to apply solution patterns. Understanding the requirements and applying the logical solution is a central issue.

4.17.13 Web Services Coupling

In the context of application integration, coupling is the binding of applications together in such a way that they are dependent on each other, sharing the same methods, interfaces, and perhaps data. This is the core notion of service-oriented application integration. Applications are bound by shared services, versus the simple exchange of information.

Coupling requires the tight binding of one application domain to the next. As a consequence of this requirement, coupled source and target systems have to be extensively changed to couple them.

As events and circumstances evolve over time, any change to any source or target system demands a corresponding change to the coupled systems. Coupling creates one system out of many, with each tightly dependent upon the other. Service-oriented application integration leverages coupling in making applications bound together.

The degree of coupling is dependent on the SOA architect. Binding source and target systems together is the central issue. Tightly coupled systems means they are dependent on each other. Loosely coupled systems are more independent. Web services mechanisms have to make coupling architectural tradeoffs.

The ability to bind systems by sharing behavior and bound data, versus simply sharing information provides the integration solution set with the ability to share services that could be redundant to the integrated systems, thus reducing development costs. This is the reason to leverage SOAs.

The ability to tightly couple processes as well as shared behavior means that process integration engines, layered on top of service-oriented integration solutions, have a better ability to bind functions versus just simply moving information from place to place.

The source and target systems coupled services adds cost because development and testing time is involved. Coupled systems could cease to function if one or more of the coupled systems go down: This means that a single system failure could bring down all coupled systems, thus creating vulnerability.

Coupling, or service-oriented integration, provides the greatest flexibility as the application integration solution moves into the future. The notion of leveraging services makes the application integration solution much more valuable than simple information movement.

4.17.14 Web Services Cohesion

Cohesion is the state of sticking together. Cohesively integrated source and target systems are independent from one another. Changes to any source or target system do not affect the others directly. Information can be shared between systems without worrying about changes to the applications or databases, leveraging some type of loosely coupled middleware layer to move information between applications and make adjustments for differences in application semantics.

The advantages of using cohesion include the ability to avoid changing source and target systems just to facilitate integration: Changes to the systems come because the points of integration are less invasive. A single system failure does not bring down all connected systems: Systems are not dependent. A failure typically does not affect the integrated systems.

The inability to provide visibility into the services layer, and gain value from encapsulated business services and tactical functions of services access is a disadvantage. Remote applications can only see information. They cannot reuse services. Cohesion has its advantages. Systems can be added to, changed, or removed from a cohesive application integration solution without typically requiring changes to any of the other systems in the problem domain.

Integration brokers provide the technology infrastructure of most cohesive application integration solutions. They are able to account for the differences between systems, accommodating differences in application semantics within a middle-tier process. Web Services

The major platforms for the development of Web Services are J2EE™ and Microsoft® .Net. Web Services is created as wrappers or integrations of existing applications or services. Integration tools and technologies play a role in driving the evolution of Web Services by helping to convert existing assets into Web Services and to integrate Web Services into existing business processes.

Table 4-15 illustrates Web Services protocols.

TABLE 4-15

WEB SERVICES PROTOCOLS

- XML (cXML, ebXML, XSLT, XPATH)
- Web Services (SOAP, UDDI, WSDL, ebXML)
- J2EE (JMS, EJB, JCA)
- RosettaNet
- EDI (EDHINT, AS1/AS2, ANSI X.12, EDIFACT)
- Mainframe Technologies (IMS, CICS, OS/390, AS/400, DB2)
- Legacy Transport Technologies (COM, CORBA, MQSeries)
- Process Management Standards (UML, WSFL, BPML, BPEL4WS)

Source: WinterGreen Research, Inc.

4.18 Open Systems

Open systems support heterogeneous computing platforms. Efficient and affordable personal computers further enable this trend. Line and staff departments run large parts of their operations on personal computers and workstations whose hardware, software, and development tools are all different. But open systems represent a headache for IT departments.

The presence of many open systems platform types drains development resources. Instead of creating solutions to new problems, too many developers spend time and resources porting old solutions and building interface logic.

Compounding the problem of heterogeneous platforms is the sheer number of computers in many enterprises. Distributing and installing software on thousands of machines around the world is a formidable task. AI is positioned to provide solutions by automating software distribution.

4.19 Java

Java is used to provide a single application development and deployment paradigm across multiple platforms. The J2EE standards provide the technology specifications for connecting to external applications and data. Integration is achieved using enterprise application integration (AI) software.

Native Java access to integration software is evolving. Application integration is well within the reach of a Java developer. Vendors are working on J2EE integration. Solutions are positioned to do J2EE integration for legacy applications, data, and popular application packages, while retaining the scalability of the architecture.

J2EE solutions leverage adapters. Adapters incorporate technical and business level capabilities, so the Java developer needs to know very little about how to interface with a software package. Vendors seek to deliver benefit without requiring the developer to learn new technology.

Java connectors are being integrated into suites of products. Vendors can facilitate application server-based Java development and deployment. The connectors provide Enterprise Java Bean (EJB) components connect to adapters, creating the ability to seamlessly interact with applications and data inside the enterprise.

A Java developer may be able to create, retrieve or update a purchase order in an SAP R/3 application by appropriately invoking an EJB in the application server. When combined with other integration product offerings, such as open business interchange, integration can take place outside the enterprise as well inside.

4.19.1 AI Vendor Commitment To Java

Java plays a significant role in the evolving architecture of application integration. Java plays several key roles. It is the choice for an application server because of its portability and the number of product suppliers that support Java. To leverage existing internal skills, Enterprise Java Beans (EJB) is the preferred programming model, and Java is a preferred programming language.

4.19.2 Advantages Of Java In Context Of Application Integration

Java Web application servers provide flexible functionality. The large number of early Java adopters means that there is a large number of Java developers with a good skills base.

Java provides platform portability that enhances application integration. Reusable software can be built using Java. The reusable modules are provided to development teams in the form of style sheets. JavaScript, and Java frameworks are more modern programming techniques used by students and newer programmers.

Java is available for every platform, including mainframes. System testing, maintenance, and production environments are implemented in Java. Java on S/390 can be used for building new Internet applications that make the mainframe act as an application server.

4.20 Web Services

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. Web services automate integration between programming languages – C+, Java, and others. In the same manner that application integration integrates applications, and mission critical messaging integrates platforms and operating systems, Web services automates programming languages.

4.21 WS-Transaction and BPEL4WS specifications

IBM, BEA, Tibco, and Microsoft have developed WS-Transaction and BPEL4WS Web services specifications. Reliable messaging is central to Web services. Microsoft reliable Web services messaging are part of the GXA initiative. IBM put forward endorsement of transport level protocols, in the form of HTTPR. Table 4-16 illustrates companies driving the web services WS-Transaction and BPEL4WS

TABLE 4-16

**COMPANIES DRIVING WEB SERVICES
WS-TRANSACTION AND BPEL4WS**

- IBM
- BEA
- Microsoft
- Tibco

Source: WinterGreen Research, Inc.

WS-reliable messaging and WS-addressing is an evolving aspect of Web services architecture. Specifications enable organizations to build reliable and interoperable Web services applications. The high-level road map authored by IBM and Microsoft titled "Reliable Message Delivery in a Web Services World: A Proposed Architecture and Roadmap," is available. It describes a common architecture comprising the necessary protocols, message formats and interfaces to enable reliable message delivery for Web services.

4.21.1 WS-Reliable Messaging

Ensuring the delivery of a message is a critical component of Web services. WS-reliable messaging and WS-addressing provide a standard mechanism for exchanging secure, reliable messages in a Web services environment. Organizations can address reliability by developing solutions that interoperate across platforms. Protocols are independent of the underlying transport layer. Each specification defines a SOAP binding for interoperability across platforms.

WS-reliable messaging is published by IBM, Microsoft, BEA and TIBCO. It provides the protocol for ensuring un-received and duplicate message management. Messages can be detected. Received messages can be processed in the order in which they were sent. Messages can be exchanged with varying levels of delivery assurances. Once, at least once, in order, or exactly once are supported.

4.21.2 WS-Addressing

WS-addressing was published by IBM, Microsoft and BEA. It provides mechanisms to identify and exchange references to Web services end points. It defines a set of commonly used message information headers. These elements enable transport-neutral, bi-directional, synchronous, asynchronous and stateful service interactions. Systems go across networks that include end point managers, firewalls, and gateways.

4.21.3 Architecture for Reliable Messaging Delivery

Key requirements are addressed in advanced Web services architecture. Core reliable messaging protocols are leveraged. Web services specifications include WS-policy and WS-security families. Messaging requirements increase the number of customer scenarios supported. Flow control and metadata exchange are provided.

4.22 Universal Description, Discovery, and Integration (UDDI)

Universal description, discovery, and integration (UDDI) provides a standardized method for publishing and discovering information about web services. The UDDI project is an industry initiative. Web services create a platform-independent, open framework for describing services, discovering businesses, and integrating business services. UDDI focuses on the process of discovery in the service-oriented architecture.

4.23 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.

4.23.1 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.

4.23.2 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.

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.

4.23.3 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.

The UDDI community runs the UDDI Project. The community consists of working group members who develop the specifications and advisory group members who provide requirements and review the specifications. The working group is an invitation-based group and the advisory group is open to everyone.

Companies invoke the services of other companies to accomplish a business transaction. As the number of partner companies grows, along with the number and types of interfaces they export, SOAP and UDDI are needed.

Business partners use UDDI as a single conceptual registry distributed among many nodes. Nodes access data from a common UDDI registry of services.

4.23.4 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.

4.23.5 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.

4.23.6 SOAP 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.

4.23.7 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.

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.

4.23.8 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 un-encrypting 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.

4.23.9 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.

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.

4.23.10 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.

4.23.11 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.

4.23.12 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.

4.23.13 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 4-17. Assurances of high availability relate to good performance.

TABLE 4-17

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.

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.

4.23.14 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 use SOAP for sending email confirmations. When a user registers for a new site the server sends an e-mail to the new user thanking the user for registering.

4.24 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 un-scalable 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.

4.24.1 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.

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.

4.24.2 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.

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.

4.25 Language XSLT

XSLT language is used to transform XML as illustrated in Table 4-18.

TABLE 4-18

XSLT TRANSFORMATION OF XML

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

Source: WinterGreen Research Inc.

4.26 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.

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.

4.27 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.

4.27.1 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.

4.27.2 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.

4.28 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.

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 4-19 following. Table 4-20 illustrates benefits of an IP addressing device.

TABLE 4-19
FUNCTIONS OF AN IP ADDRESSING DEVICE

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

Source: WinterGreen Research, Inc.

TABLE 4-20

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.

4.28.1 Web Services Security Specification

Microsoft, IBM, and VeriSign offer a Web services security specification. Secure, broadly interoperable Web services applications are supported. Three companies developed the WS-Security specification.

WS-Security is the foundation for a broader road map and additional set of proposed Web services security capabilities outlined by IBM and Microsoft. Consistent support of more secure Web services is targeted.

The Web services interactions WS-Security specification have been submitted to a technical committee at the organization for structured information standards (OASIS). They are expected to produce a formal Web services standard based on this specification. The application sends SOAP attachments according to the WS-Attachments specification, jointly authored by IBM and Microsoft. This specification is being used as one source of input for the W3C XML Protocol working group's efforts to standardize SOAP attachments.

The IBM version of the application runs on WebSphere application server. Web services security technology provides support for WS-attachments. It is available in the IBM Web services toolkit. The client application issues a SOAP request over HTTPS. The SOAP header contains the user name and password of the client. The Web service becomes a requester and sends a SOAP message.

The SOAP header (WS-Security) contains a binary security token (an X509 V3 certificate). The SOAP body is signed and encrypted using the public key in the X.509v3 certificate.

The body of the SOAP response is signed and encrypted using the public key in the X.509v3 certificate. This certificate is carried in the SOAP header. WS-Security supports, integrates and unifies security models. A variety of systems interoperate in a platform- neutral manner in a Web services context. WS-Security defines a standard set of simple object access protocol (SOAP) extensions. Message headers can be used to implement integrity and confidentiality in Web services applications.

SOAP is an XML-based industry protocol for accessing Web services in a platform- and language-independent manner. WS-Security provides standard mechanisms to exchange secure, signed messages in a Web services environment, and provides an important foundation layer that will help developers build more secure and broadly interoperable Web services.

4.28.2 Components for Secure Web Services

WS-Policy defines how to express the capabilities and constraints of security policies. WS-Trust describes the model for establishing direct and brokered trust relationships. Third parties and intermediaries are supported. WS-Privacy defines how Web services state and implement privacy practices.

WS-secure conversation describes how to manage and authenticate message exchanges between parties. Security context exchange is used to establish session keys. WS-Federation describes how to manage and broker trust relationships in a heterogeneous federated environment.

A modular approach to Web services security is due to the variety of systems that make up IT environments. Collaborating organizations use different security approaches. Security and trust models provide a flexible framework in which organizations can interconnect.

The interoperable approach enables both the security technology and its business use to evolve. Organizations can choose credentials. Incremental process adoption and deployment is supported.

4.29 Web Services Reliability Specification

Fujitsu Limited, Hitachi, Ltd., NEC Corporation Oracle Corp., Sonic Software, and Sun Microsystems have collaborated on the Web services reliability (WS-Reliability) specification. Web services reliability is a fundamentally more reliable transport infrastructure. WS-reliability helps accelerate adoption of Web services, making them relevant for a range of enterprise application and integration challenges.

Table 4-21 illustrates companies driving the web services reliability specification.

TABLE 4-21

COMPANIES DRIVING WEB SERVICES RELIABILITY SPECIFICATION

- Fujitsu Limited
- Hitachi, Ltd.
- NEC Corporation
- Oracle Corp.
- Sonic Software
- Sun Microsystems

Source: WinterGreen Research, Inc.

WS-Reliability is a specification for open, reliable Web services messaging-including guaranteed delivery, duplicate message elimination, and message ordering-enabling. Reliable communication between Web services is envisioned.

The reliability features are based on extensions to the Simple Object Access Protocol (SOAP). They are not tied to the underlying transport protocol. The specification allows a variety of systems to interoperate reliably in a platform in a vendor-neutral manner.

WS-Reliability uses an identified, time stamped message model that is acknowledged on receipt. The SOAP header extensions make it an extension of SOAP. These increase the overhead of using Web Services.

4.29.1 B2B Commerce Technology As A Working Reality

Making collaborative B2B commerce a working reality is no easy task. The technologies have a great impact on the actual benefits derived. Crucial aspects of application server technology include the following illustrated in Table 4-22.

TABLE 4-22
ASPECTS OF APPLICATION SERVER TECHNOLOGY

- Managing unique complexities of different trading partners
- Managing differences between a strategic supplier versus a spot-supplier
- Scaling solution to meet large volumes of business transactions that may span long periods of time
- Achieving a critical mass of trading partners
- Ownership of relationship with the e-market and my trading partners

Source: WinterGreen Research, Inc.

4.29.2 Application Server Strategy

Application server strategy relates to responding to changing customer requirements. Enhancement of existing products relates to building platforms that permit leveraging an Internet market presence.

Web server products and Web Services features are evolving in the context of application servers. Portals, application integration, and business process management products support existing product lines. Systems need to keep pace with technological and market developments and emerging industry standards.

Application server vendors are working with a single core platform that provides the underlying infrastructure required to integrate existing systems. Systems implement new business flows, and dynamically link applications across the virtual enterprise.

Application servers decrease application development time and costs because developers can concentrate on creating applications. Web services give a company a competitive advantage, rather than concentrating on providing the underlying infrastructure required to run a 24*7 e-Businesses.

Mainstream application servers provide the infrastructure required to implement using the Internet as a sales and partner channel. Highly scalable Web servers, transaction management facilities, J2EE services and industry standard APIs, security, systems management, load balancing and failover.

Table 4-23 illustrates mainstream application server strategic positioning.

TABLE 4-23

MAINSTREAM APPLICATION SERVERS STRATEGIC POSITIONING

- Provide the infrastructure required to implement using the Internet as a sales and partner channel
- Implement load balancing
- Implement failover
- Are highly scalable Web servers
- Provide transaction management facilities
- Implement J2EE services
- Implement industry standard APIs
- Implement security
- Implement systems management

Source: WinterGreen Research, Inc.

4.29.3 Communities Of Partners

To increase integration-related business opportunities for its partners, solutions are designed to foster communities of partners and help them create end-to-end, open integration solutions. Tools needed to develop and deploy standards-based adapters and packaged processes use components. Integration software simplifies the adoption, and speed the deployment, of e-business initiatives.

4.29.4 Common Development Environment Across Windows And Linux

WebSphere Studio tools enable developers to create applications and test them on middleware. IBM WebSphere infrastructure software and DB2 universal database can be used within the same environment. IBM has the strategy of providing a common development environment across Windows and Linux.

Linux developers can create enterprise-ready applications directly on top of Linux, without having to port them to Windows. This saves time and creates higher-quality applications.

Developers have a single, well-integrated tool platform. Aspects of e-business development managed include Java, XML, and Web services. Extensive use of wizards speeds up the development process.

WebSphere studio application developer is a tool to integrate Java and Web development in a single environment. It is for developers of Java and J2EE applications. Integrated Web, JSP, XML, and Web services support is achieved.

Visual modeling and composition of applications relate to building of sophisticated Java and Web adapters. Web services and advanced Java applications extend access capabilities beyond J2EE.

WebSphere has a homepage builder that is targeted to individual Web site developers at home or in the office. It delivers tools for developing sites with rich media content including animation, audio, and video.

The WebSphere Studio family of tools represents a new era in IBM's application development strategy. WebSphere middleware focuses on open standards, multi-vendor tool integration, and integration with middleware. IBM is partnering with dozens of vendors who are developing on Eclipse-based tools to deliver a clear market advantage.

4.30 Web Services Technology

Web services technology is positioned to address issues that arise because of the need to leverage the Internet productively.

4.30.1 Java Application Server

Java application server and J2EE connector architecture frameworks create solutions that bridge application barriers within enterprises. Data and business processes move freely among applications and systems.

Integration provides the infrastructure for business Web Services, which are multi-party, transactional, highly automated, Web-based interactions between B2B applications. Systems make supply chains faster, more efficient and more agile. Customers can focus on their core business and add value.

4.30.2 Enterprise JavaBeans (EJBs)

Enterprise JavaBeans (EJBs) provide the primary server-side enterprise Java component architecture. They enable developers to design and develop customizable, reusable business logic. EJBs provide scalable, portable, server-side components for interacting with any kind of client.

Developers can focus on the business purpose of the objects and methods contained in the EJBs, while server built-in EJB container handles the underlying infrastructure services. Multi-threading, load balancing, clustering, object life cycle, transactions, security, messaging, and persistence are provided.

Table 4-24 illustrates application server underlying infrastructure services.

TABLE 4-24

APPLICATION SERVER UNDERLYING INFRASTRUCTURE SERVICES

- Developer focus on the business purpose of the objects
- Developer focus on methods contained in the EJBs
- Server built-in EJB container handles the underlying infrastructure services
- Multi-threading
- Load balancing
- Clustering
- Object life cycle
- Transactions
- Security
- Messaging
- Persistence

Source: WinterGreen Research, Inc.

Table 4-25 illustrates major types of enterprise beans.

TABLE 4-25

MAJOR TYPES OF ENTERPRISE BEANS

- Session beans are business process objects that act as verbs
- Session beans perform actions
- Session beans transfer funds between two bank accounts
- Session beans perform purchase order approval routing
- Session beans calculate the price of an order
- Entity beans are data objects
- Entity beans act as nouns
- Entity beans represent real-life objects
- Entity beans bank accounts, purchase orders, employees, companies, and vendors
- Entity beans physically map to data stored in underlying relational databases
- Entity beans are in-memory objects
- Entity beans physically map to legacy systems

TABLE 4-25 (CONTINUED)**MAJOR TYPES OF ENTERPRISE BEANS**

- Persistence can be manually performed by the developer
- Bean-managed persistence is supported
- Container-managed persistence is supported
- Session beans call entity beans to achieve their desired actions
- A purchase order approval router (session bean) deals with purchase orders (entity beans)
- Message-driven beans are messaging objects
- Message-driven beans are designed to receive and route messages from clients to other Enterprise Java beans
- A logging service can receive logging messages and call a session bean to perform the actual logging

Source: WinterGreen Research, Inc.

The portability of the J2EE architecture enables EJBs written in Java to be deployed on any platform and operating system supporting Java. There are three major types of enterprise beans.

4.30.3 Autonomic Computing Technologies

Autonomic computing has four core value propositions. Autonomic computing leverages application server technology to make built-to-integrate EJBs in a network of servlets. Higher-level abstract applications can be integrated using autonomic computing technology.

The integrated development model is about development productivity. Integrated servers improve productivity. The agility of a system is based on administration, which is supported by autonomic computing. Self-protecting, self-administering capabilities are developed.

Incremental protections are implemented. Autonomic computing systems are used to implement configuration. Intelligent, end-to-end optimization of the applications is provided. Performance, reliability, advanced clustering, and failover support are central aspects of autonomic computing.

Autonomic computing technologies improve availability, performance. Autonomic features enable on-demand e-businesses to lower the cost of administration and improve response time by creating a reliable and self-managed infrastructure.

The software delivers scalability, performance, and security. It reduces the need for human intervention. Autonomic features lay the foundation for grid computing. Companies improve operating efficiencies, increase availability, and maximize computing resources by sharing computing power across heterogeneous networked systems.

Table 4-26 illustrates autonomic features. Table 4-27 illustrates autonomic functions.

TABLE 4-26
AUTONOMIC FEATURES

- Self-configuring features to boost responsiveness
- Automatically tune WebSphere for performance
- Tune specific applications based on how they are being used
- Interact with other software
- Make the overall system run better, and cuts the cost of database administration
- Automatically detect, diagnose and resolve problems related to data.
- Self-healing, to build resiliency
- WebSphere intelligently analyzes problematic patterns
- Future glitches are detected while applications are running
- Customers can troubleshoot problems
- Repair components while handling workload

TABLE 4-26 (CONTINUED)

AUTONOMIC FEATURES

- Real-time diagnostics build hooks into the system to capture information when a problem occurs the first time around
- Interrupt or restart the application without human intervention
- Applications or server clusters can be updated without having to stop the system
- Self-protecting
- Single sign-on

Source: WinterGreen Research, Inc.

TABLE 4-27

AUTONOMIC FUNCTIONS

- Self-optimizing
- Anticipate customer demand
- Enable customers to give prioritized levels of service
- Enable customers to provide faster service to large-deposit customers
- Self-protects the system by restricting the amount of bandwidth a particular application or request can utilize
- Provides built-in safeguard for system resources
- Guarantees security
- In event of intrusion attempts, autonomic system acts like a circuit breaker
- Stops single point of failure
- Protects applications that require high availability
- Protects servers by screening out faulty requests
- Analyzes vulnerability
- Assesses damage that may

TABLE 4-27 (CONTINUED)

AUTONOMIC FUNCTIONS

- Builds in deep security
- Provides centralized, site-wide authentication and access control

Source: WinterGreen Research, Inc.

Autonomic computing is comprised of a set of capabilities within products that reflect consistent operation. Autonomic computing is about configuration. It is about self-diagnosis. It is about taking corrective action. Self-healing capabilities are needed when there is a problem.

IBM has put together taxonomy for describing the autonomic computing capabilities. The industry appears to be headed toward systematically, over time, making more and more capabilities appear in products. More autonomic computing modules make more autonomic-like functionality.

4.30.4 Grid Protocol Topology

The problem with networked systems, given the connective nature of systems, is that the events cascade through the layers of a system stack. Then they cascade horizontally or across multiple servers. Users can use grid technology to start to develop a collection of data that allows creation of probes and first-failure data capture. Once the patterns become clear, administrators can start the scripting corrective action that works on the fly whenever that event occurs.

Grid is a topology for deployment. To deploy products in a grid environment, log schemas have to be consistent. The attributes of products are designed to permit signals to move across to the topology.

Grids are not topology unique. Grids are a statement of function. By making log schemas consistent across IBM users have common tracing and common debugging. Common log schemas provide a basis for beginning to understand the interaction between products that causes failures.

Grid topology is a very complicated problem. IBM, and by extension the industry, is dealing with grid computing through industry standards bodies. The problems are being solved in the same manner that the problems were solved with mainframes.

Clustered systems provide the need for stability that is similar to the need for stability within the mainframe. Grids are solving problems in the same manner manufacturers dealt with the need for stable systems in the mainframe. There is a systematic building up of a consistent environment.

The consistent environment allows users to apply the proper techniques to be able to understand what is going on in any part of the system and where a failure occurred. Consistent logging is needed to tell the origin point of a failure. To drive consistency down through the operating system grid computing is positioned at the point of deployment. Value is derived from getting consistency at the operating system layer for those capabilities.

The operating system carries quality-of-service function that the rest of the system inherits. The more the operating system can inherit from the lowest level of the product, the more reliable the system is going to be. If the hardware has built-in features for dealing with bit errors and other kinds of related errors at the hardware level everything running on the product logically inherits those recovery features.

Recovery features are moved to the OS. With open systems it is more challenging to move features to the OS because not everybody can agree on what to move to the OS.

Linking autonomic capabilities enables a level of interaction between elements. Linking begins around log schemas. As the industry moves to a standard XML log schema correlation between products can be accomplished in a heterogeneous environment.

Consistency, correlation tools, and debugging tools are offered. Standard structures are being implemented that permit being able to run traces across multiple systems. Probe architectures do consistent event tracking across systems. A focus on schema leverages the use of XML as a description mechanism for schemas.

4.30.5 Open Grid Services Architecture (OGSA)

The open grid services architecture (OGSA) a set of grid services. Grid services are a set of modules that comprise a virtualized scheduler. The modules sit above operating systems, controlling work on each individual server. Multiple operating systems can be controlled.

The scheduler is aware of available resources on servers.

Some grids are simple. Computational grids are flat; there is very little running. The OS is not significant when running floating-point calculations at the maximum capacity of the machine.

There are very complex transaction environments with lots and lots of scheduling activity that the operating system is doing. The transaction-based operating systems are not built to take external interrupts. For this reason, grids are not for everyone.

Scheduling is the basic grid reference. Scheduling work onto systems is a control aspect. Dynamic provisioning capability is needed because virtual scheduling services are intrusive. Systems let the grid find the resources for a particular piece of work. Work is scheduled on a network. The grid is overlying what users are trying to run.

Recovery, mirroring, data movement, and other background activities are secondary to solving the scheduling problem. Systems depend on building an operating system that controls the grid. Security and quality of service are needed to be built into the network operating systems that implement the grid.

A built in scheduling system raises many network issues. Security is fundamental. A local OS deals with issues of thread control and thread services. Security is based on process, procedure, and layering. Heterogeneous and layered environments raise security issues. The most secure systems in the world are totally independent at each level of the system.

4.30.6 Eclipse Open-Source Tools Framework

Eclipse open-source tools framework is evolving as a standard for using multiple development tools. Eclipse is an industry-standard platform to support multiple development tools.

IBM launched Eclipse with several vendors including Borland, Rational Software, Red Hat and SuSE in November 2001. Borland, Macromedia and Merant support Eclipse. The framework aims to enable developers to use different IDEs seamlessly without having to toggle between different tools.

The Eclipse open-source tools framework is rapidly evolving as a standard for using multiple development tools. Eclipse is positioned as an industry-standard platform to support multiple development tools. A drive in the industry is evolving to start consolidating development tools on Eclipse.

The Eclipse community has 175 supporters. There have been 3.8 million downloads of the free technology.

Eclipse started out as a Java-based environment. It has become a more viable platform for other programming languages, including C++ and C#. There is support for multiple language development. The flexibility of Eclipse is the main reason it is becoming adopted.

Eclipse is designed to be an open, extensible environment. Permitting users to switch modes supports designing an application and alternative variations in different environments.

4.30.7 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.

4.30.8 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.

4.30.9 Asynchronous Communications

Distributed transactions across the Internet are not real time. They are asynchronous, meaning the initiator can start the transaction and then go about other business while the transaction proceeds, without regard to time passed, network outages. Companies are moving to make the application server asynchronous.

Strategic positioning with application servers to make them asynchronous is replacing synchronous systems. These systems provide support for network computing where the connections may be unstable or a disconnection may occur at any time.

Distributed transaction management means that the transaction can succeed despite delays and disruptions. Transaction and application servers coordinate complex transactions across multiple resources, guaranteeing transactional integrity in an environment with multiple users and systems accessing the distributed transaction resources. The servers coordinate commerce. Table 4-28 illustrates distributed transaction functions.

TABLE 4-28

DISTRIBUTED TRANSACTION FUNCTIONS

- Work across the Internet
- Are not real time
- Are asynchronous
- Start the transaction and then go about other business while the transaction proceeds, without regard to time passed, network outages
- Means transaction can succeed despite delays and disruptions
- Coordinate complex transactions across multiple resources
- Guarantee transactional integrity
- Function in an environment with multiple users
- Access systems to get distributed transaction resources
- Coordinate commerce

Source: WinterGreen Research, Inc.

4.31 Stateless Session Bean

A stateless session bean utilizes a free pool for its cache. When a client creates an instance, it receives a reference to a bean in the pool. When the response is received, the bean is returned to the pool. Unlike stateful session or entity beans, each method call may reference a different instance in memory.

No stateful EJB instances exist in some application servers at startup time. As clients look up and obtain references to individual beans servers initialize new instances of the EJB class and stores them in the cache. If max-beans-in-cache signal is reached and there are EJBs in cache that are not being used, a server may make the state logic passive for some of those beans with active states. This occurs even if the unused beans have not reached their limit.

Entity bean performs a load and store for each method call. This may be extreme depending on the bean. To optimize reads and writes from the database, several properties may be set.

4.32 Cluster

In an application server cluster, a cluster-aware stub can replace the server-side representation of the home object. The cluster-aware home stub has knowledge of EJB home objects on servers in the cluster. The clustered home stub provides load balancing by distributing EJB lookup requests to available servers. It can also support failover support for lookup requests, it routes those requests to available servers when other servers have failed.

EJB types include stateless session, stateful session, and entity EJBs have cluster-aware home stubs. Whether or not a cluster-aware home is created is determined by the home-is-clusterable deployment property. If this property is set to true the default compiler has options to generate a cluster-aware EJB.

If a failure occurs between method calls failover is automatically supported. If there is a failure after a method completes, or if the method fails to connect to a server clustering is invoked. When failures occur while an EJB method is in progress, an application server does not automatically failover from one server to another.

A cluster of two AIX systems can be used to build a high availability database environment. One AIX system is used as the primary DB2 database server. The second system is used as the backup DB2 server system providing standby failover support for when the first system has a failure.

The cluster can be comprised of a two-node Hot Standby configuration. A cascading scenario means resources move to the second hot standby node if the primary node fails. An application server is a cluster resource made highly available by software. An application server has a start script and a stop script. The start script starts the application server. The stop script stops the application server so that the application resource can be released, allowing the second node to take it over and restart the application.

4.33 Location Transparency

Location transparency is designed to promote flexibility by ensuring that clients and servers that are clients do not know about where a service is located. The location of the service is effectively transparent from the client perspective.

Location transparency applies to EJB implementation, network, and database transparency. The issues are the same, remove dependencies between clients and services that would ordinarily impede the ability for changes.

If a client depends upon a service being located in a particular place, or depends on the schema of a service's database, no changes can be made to the server environment without seriously disrupting the client. Hard-coding knowledge about the server into the client only serves to enforce a static architecture. Then services cannot be clustered, database schemas could not be updated, and the system lacks flexibility.

4.34 Smart Proxy

A proxy is a software component that provides access to a resource, typically a service of some sort. The idea is to de-couple the caller of a service the client from the service itself. A proxy intercepts the client call and directs it to the target service, according to some rules.

Replica-aware stubs enable clustering. The reason these stubs are smart is because they provide all the necessary information for failover and load balancing across multiple server environments.

A smart stub has a replica handler that determines the specific algorithms that it must use for load balancing and failover.

When the invocation of a method fails, the replica handler determines if a retry should be attempted. Retries are not always necessary but when it is possible, the replica handler chooses a new server offering that specific service to handle the request.

4.35 Load Balancing

Load balancing occurs by choosing a new server offering that specific service to handle the request. Immediately before invoking any method, the replica handler chooses a server to handle the request. The handler will not always select another server as it prefers to use what is called the cheapest invocation. It will try to use existing sockets or choose the server where the objects related to this invocation live.

4.36 Process-Entity Design Pattern

The process-entity design pattern enables a high degree of scalability by providing proxy access to back-end services. Client access to account data for either read or update reasons uses an application server to take care of processing requests to the required data.

Within the context of J2EE, the process entity pattern is realized by implementing a stateless session bean. This bean then coordinates access to account information implemented as an entity beans. Clients do not access the information directly, significantly reducing network connections and server resources, ultimately improving scalability.

Direct access increases network traffic, compromises server performance, and promotes architectural inflexibility.

4.37 Command Objects / Control Flow

Command objects are used in control flow. This allows the encapsulation of communication protocol for different back-end systems. This use enables a transparent modification of the protocol or a switch to a different target system.

A command accessing a relational database system (RDBS) may use static structured query language (SQL) instead of dynamic SQL as a means to improve performance. It may switch to using EJB instead of the RDBS to take advantage of the object-oriented infrastructure that is associated with EJB.

If the command object is designed correctly, internal changes do not impact the code that uses the command to retrieve a result from the back-end system. The use of EJB as an abstraction layer on top of a database or on top of a legacy system fosters encapsulation.

Modularized code provides direct access from the presentation layer to the back-end system.

The role of the EJB is to decouple the presentation layer and the database layer by adding a business logic layer in the middle, increasing the possibilities of code reuse in all tiers. Object-oriented analysis and design methodology has to be employed for defining a domain-specific object model of EJB. Session beans represent task-oriented components that drive interactions.

4.38 Authorization Checks

Authorization checks determine whether a principal has the permission to invoke a specific method on a resource. Each principal may be granted several permissions. If at least one of these permissions allows the invocation, the invocation succeeds; otherwise it fails with a security exception.

Failures are logged in the system log files to help uncover attacks on a Web site. Authorization is based on a capability model or access control lists (ACLs). The difference between these two approaches is that the capability model associates permissions with principals. ACLs associate permissions with resources.

The capability model is often easier to administer than ACLs because principals change their set of permissions more often than resources do. This kind of modification translates more naturally into the capability model than into an ACL.

4.39 Delegation

Delegation ensures that the appropriate security information is propagated with method calls. The details of propagated security information are determined by a delegation policy; they can be based on the identity of the client, the server, or the system.

Security architecture is supported through the administration console. It includes a graphical user interface that guides the user through all tasks that are required for security administration.

Single sign-on to the domain is configured to run on top of an LDAP repository. The mechanism uses HTTP cookies to communicate the security information between HTTP requests. The cookie contains an encrypted and digitally signed credential that authenticates the associated principal to different servers in the domain.

Programmatic access to the security architecture is also possible. It allows the developer to implement a custom log-in mechanism and to query the information that has been obtained from a system-driven log-in. Failed authentication and authorization attempts in are subject to auditing by default. Auditing can be configured to establish accountability for individual actions on the site. Performance can be achieved by disabling the auditing functionality.

4.40 Collaborative Filtering

Collaborative filtering is a special kind of filtering. General usage patterns in the behavior of all users of a site are analyzed, and typical users are distinguished as mentors. Users can then be classified in groups that are associated with these mentors. This classification allows personalization recommendations to be made based on the preferences of the mentor.

Rule-based matching technology in personalization uses the accessible business rules engine. Rules are more flexible than filters. They can be defined explicitly, allowing for the incorporation of existing business rules into the personalization logic.

Rule-based matching allows good customers to be distinguished from normal customers according to existing business criteria. Businesses can respond to requests based on the current date and time.

Rules trigger actions that go beyond simple content selection. Sorting results or sending e-mail can be accomplished. A high-level formulation of rules, enables a business analyst to define and modify the behavior of rules.

4.41 Site Analysis

Understanding the behavior of a visitor to the site is a key factor for improving usability, acceptance, and responsiveness. Impacting the profitability of the site relates to an advertisement-based business model. Users strive to maximize their revenues by identifying and classifying their users and offering a targeted advertising campaign to interested parties.

4.42 Portals

Portals typically address some or all of the following issues illustrated in Table 4-29.

TABLE 4-29
PORTAL FUNCTIONS

- Data aggregation from different sources
- Content management
- Intelligent search and data mining
- Access to Web applications
- Personalization
- Membership administration with anonymous user support
- Access control with single sign-on
- Transcoding support
- Configurable notification mechanisms (agents)
- Integrated desktops with support for instant messaging

Source: WinterGreen Research, Inc.

Different kinds of portals have developed over time. Personal portals provide individuals with general information and productivity tools. Community portals offer information to a particular group of people. Corporate portals provide a community for the employees of a company.

Application service provider portals concentrate on access to hosted applications, augmented by some value-added services. Inter-enterprise portals give other companies access to the goods and services offered by the company that runs the portal.

The common service that all these portals provide to their users is an integrated, personalized view of the information available in a specific domain. This view is usually accessible over the Internet from anywhere in the world.

A portal application requires support in all tiers. In the data management tier, advanced search and categorization are required to provide an integrated view over a wide range of data types, typically available from a variety of sources. In the middle tier, customizable business logic must implement support for personalization, security, notification, and other portal services.

In the presentation tier, different navigational styles as well as several output devices need to be supported, depending on the preferences of the user. Support for portals cannot be limited to one tier. It must span the entire software stack involved in the implementation.

4.42.1 Real-Time Processing

B2B initiatives provide quantifiable business benefit. They provide rapid time to market, cost savings, market transparency, and new customer opportunities.

Trading exchanges and corporate exchanges align a company suppliers and distributors in a real-time, efficient trading partner network. B2B implements collaborative commerce business models.

To stay competitive, companies can no longer rely solely on the strength of their distribution channels or their ability to develop new products. Enterprise efficiencies are the result of integrated e-markets. They provide the ability to automate strategic purchasing processes, reduce operating costs, and link companies to trading partners.

Market transparency is the result of increased visibility into prices and delivery tables. It enables trading partners to negotiate the lowest prices and guarantee product availability.

New markets and opportunities are achieved by eliminating the constraints of physical space. Companies can effectively compete for deals and markets around the globe.

Reduced barriers to entry are achieved as trading partner relationships are no longer constrained by monolithic, rigid technologies such as EDI, or by the high costs of entry that they require. Table 4-30 illustrates B2B application server quantifiable business benefits.

TABLE 4-30

B2B APPLICATION SERVER QUANTIFIABLE BUSINESS BENEFIT

- Provide rapid time to market
- Provide cost savings
- Provide market transparency
- Provide customer opportunities

Source: WinterGreen Research, Inc.

Table 4-31 illustrates trading exchange positioning.

TABLE 4-31

TRADING EXCHANGE POSITIONING

- Align a company suppliers and distributors
- Support communication in a real-time
- Build efficient trading partner network
- Implement collaborative commerce business models
- Complement existing distribution channel
- Increase their ability to develop new products
- Turn new product cycles to 18 month cycles

Source: WinterGreen Research, Inc.

Table 4-32 illustrates integrated e-market benefits.

TABLE 4-32

INTEGRATED E-MARKET BENEFITS

- Enterprise efficiencies the result of Integrated e-markets
- Provide the ability to automate strategic purchasing processes
- Reduce operating costs
- Link companies to trading partners
- Market transparency is the result of increased visibility into prices and delivery tables
- Enables trading partners to negotiate the lowest prices
- Guarantees product availability
- Eliminates constraints of physical space
- Enables effectively competing for deals and markets around the globe
- Reduces barriers to market entry
- Means trading partner relationships are no longer constrained by monolithic, rigid technologies

Source: WinterGreen Research, Inc.

5. Services Oriented Architecture (SOA) Company Profiles

5.1 International Business Machines (IBM)

IBM is a leader in the development and manufacture of information technologies, including computer systems, software, storage systems and microelectronics.

IBM is the one of the largest information technology companies. They have upwards of 90 years of experience in helping businesses innovate. Between IBM and their business partners, a number of services, financing, solutions and technologies are offered.

IBM is one of the largest information technology companies, business and technology services companies, consulting services organizations, information technology research organizations, financiers of information technology.

Businesses are interested in accessing, managing and delivering information efficiently, which drives change in the IT marketplace. IBM has an information on demand approach. The approach combines business insight with open standards, storage systems, and software to manage and secure information as a service to create information infrastructures. IBM aids companies in transforming their data into figures that can enable information on demand.

5.1.1 Description of Business

IBM is a company that serves the needs of organizations. IBM looks to help their clients by enabling their own capacity to innovate, so that they may differentiate their organizations. IBM uses systems, software and services capabilities to turn enterprises into on demand businesses. An on demand business is a corporation that is fully integrated and can manage an extended network to respond to changes in demand or threats to its business.

5.1.2 IBM's Strategy

IBM's strategy is to find an agenda with its clients, partners, continuing to refine its portfolio to reach a higher value. Through understanding where technology, client requirements and global business are headed, IBM can make decisions to maintain its leadership of the business by concentrating on solutions and services. IBM has broad abilities to enable enterprise innovation. These capabilities are used along with assumptions of how certain trends will have effects on business, government, education, healthcare, transportation as well as other segments. These changes consist of the spread of capabilities, skills, and markets; the interconnecting of companies, industries or markets; the influence of open standards and open source software; as well as some additional developments.

IBM reviews its businesses, choosing to invest in ones that have strategic growth opportunities. The company acquires businesses that contribute to its portfolio, seeking to improve productivity and drive efficiencies by integrating its global operations.

IBM's has a number of strategic priorities for 2006. They would like to work towards capitalizing on technological, business and social movements while remaining a leader in systems, middleware software and services. The company also is focusing investment and resources on growth and countries. Furthering the worldwide integration and expanding leadership in innovation initiatives is also a priority for IBM.

5.1.3 Products and Services

IBM's software offerings include the product lines of the DB2 Information Management Software, Lotus Software, Rational Software, Tivoli Software and WebSphere Software. They have services in for Business Performance Transformation, Business Transformation Outsourcing, Engineering and Technology, Business Consulting, Business Performance Management, Center for Business Optimization, On Demand Innovation, Strategic Outsourcing, Integrated Technology, Application Management and e-Business Hosting.

5.1.4 IBM WebSphere

IBM EAI WebSphere offers process integration, directory integration, and business process modeling. IBM WebSphere business integration has vertically focused components. WebSphere business integration provides a full range of capabilities.

A complete strategy for e-business architecture requires more than connectivity using industry standards.

Applications need to be able to connect and exchange information as part of normal operation, which requires flexibility to handle continual change. These Robust applications are needed to exploit connectivity opportunities.

Systems handle incoming events by routing them to the appropriate application or process. Applications involved in a process to communicate in a request / response manner. Messages represent the completion of a process. Applications depend on message transport that reconciles the data difference between connecting applications. Message transport, event brokering, and message brokering are key capabilities for information exchange.

WebSphere offers a number of products in different categories. Table 5-1 lists the WebSphere product categories.

TABLE 5-1
WEBSHERE PRODUCT CATEGORIES

- Application Servers
- Business Integration
- Commerce
- Data & Information Management
- Networking
- Organizational Productivity, Portals and Collaboration
- Software Development
- Systems Management
- Wireless - Voice - Pervasive

Source: WinterGreen Research, Inc.

Application servers offer a platform that runs interoperable applications. Business Integration servers offer an infrastructure for application integration and business process automation. Commerce products provide basic marketing, sales and order processing functionality in an integrated package. Data and Information Management software supplies storage, access and analysis of data. Networking software provides integrated directory, connectivity and security between users and applications. Productivity software can offer instant messaging, Web conferencing, collaborative portals and roles-based environments. Software development tools design and build applications and aid in the development and deployment process. Systems management software is used to monitor, control, and optimize computing resources. Wireless, pervasive and voice software supports data exchange and voice interaction between wireless and mobile devices.

5.1.5 IBM and SAP

IBM and SAP have teamed in a global agreement to deliver integrated database and business management offerings for midsize enterprises. The clients can acquire integration between mySAP™ All-in-One solutions and the DB2 9 "Viper." SAP and IBM together will help midsize enterprises utilize the capabilities of IT investments while also integrating new technologies.

The DB2 Viper for mySAP All-in-One solutions will be released in 2006. It is intended to help midsize enterprises work towards configuration, high performance and increased solution availability. DB2's functionality coupled with SAP and its partners provide customers with return on investment.

IBM also works with SAP to incorporate optimizations and performance enhancements into DB2 to extend DB2's ability to utilize SAP application functionality. It also delivers on SAP and IBM's goal of streamlined integration for DB2.

5.1.6 IBM Acquires DataPower

IBM acquired DataPower in October 2005. DataPower provides products that work to enhance the security and speed of computer transactions. The acquisition will improve security and speed processing of IBM's business application software offerings.

IBM made the acquisition of DataPower in order to help companies enhance their performance, security and management of business processes that work separately from the applications and computing platforms they run on. This SOA approach couples business operations with information technology. It is projected that SOA will encompass a majority of software development projects in the near future. IBM has introduced family of SOA appliances based upon DataPower's technologies.

DataPower is a provider of SOA appliance products that enable integration while helping provide security at the Web services message level. DataPower offers products that streamline SOA infrastructures, offload XML processing, and help provide message-level Web services security. XML Web services are an integral mechanism for connecting systems. IBM has integrated DataPower's complementary products and solutions into their WebSphere product lines.

5.1.7 DataPower

DataPower provides enterprise intelligent XML-aware network infrastructure. Performance, security, and manageability of next-generation applications and XML Web services are supported. DataPower XML Generation Three technology powers wirespeed XML acceleration devices.

DataPower was formed in 1999 with a vision for intelligent network equipment to secure, rationalize, accelerate and integrate applications. These XML-aware networks are a part of the transition from packet-oriented networks to application-oriented networks.

5.1.8 DataPower's strategy

DataPower's strategy is held up by the predictions that XML would become the dominant protocol for connecting disparate systems, and that only true network devices would be able to support the security, performance and simplicity required for wide adoption.

DataPower developed their XG3™ XML processing technology. XG3™ technology was designed to protect against XML vulnerabilities. It also delivers wirespeed performance with security and flexibility.

DataPower is one of the leading providers of XML-aware network devices. XML-aware networking operates on entire messages. DataPower's three enterprise products are the XA35 XML Accelerator for up to 100-fold XML performance improvement; XS40 XML Security Gateway, for instantly securing Web services; and XI50 Integration Appliance, for enabling high speed connectivity among legacy, binary and XML systems.

5.1.9 DataPower XG3 Product Family

DataPower provides enterprises with intelligent XML-Aware network infrastructure. DataPower has three major end-user products, which are the XS40, the XA35 and the XI50, all of which are built on DataPower's XG3™ XML engine XML processing technology.

The XS40 XML Security Gateway is a solution for securing XML Web Services. The XA35 XML Accelerator is an XML processing engine. The XA35 provides XML offload for servers and networks. The XI50 XML Integration Appliance is an application-oriented networking solution for secure XML enablement, enterprise message buses, and mainframe connectivity. The XML Integration device transforms binary, flat text and other non-XML messages.

5.1.10 IBM Acquires Ascential Software

IBM acquired Ascential Software in a transaction priced at approximately \$1.1 billion in March of 2005. Ascential Software is a leader in providing enterprise data integration software. The acquisition extends IBM's leadership in helping customers integrate, structure and manage information.

IBM acquired Ascential Software to extend their offering for standards-based business integration across heterogeneous environments. Ascential Software is a leader in enterprise data integration, with more than 3,000 customers and partners.

The acquisition complements IBM's fast-growing information integration business. The integration business more than doubled in growth in the year prior to the acquisition. Ascential Software also grew in 2004 increasing total revenue 46 percent to \$271.9 million.

Ascential Software's products can to gather, move and enhance the quality of large amounts of data. This characteristic will work with IBM's WebSphere Information Integrator product portfolio. WebSphere Information Integrator software allows customers to manage and access data that is stored across structured and unstructured sources. The result of IBM's acquisition of Ascential is that customers should be able to solve numerous integration problems more easily.

IBM has established Ascential Software's operations as a business unit within IBM's Information Management software division and incorporated their technology and solutions into the Information Management and Software Group offerings. Before the acquisition, Ascential Software already integrated with IBM WebSphere Business Integration software through a service-oriented architecture.

5.1.11 Ascential

Ascential Software is a leader in enterprise data integration. Customers and partners use the Ascential Software Enterprise Integration Suite to change data into business information to improve operational performance and decision-making. Their end-to-end solutions offer on demand data integration

Ascential Software was headquartered in Westboro, Massachusetts. They have approximately 3,000 customers and partners in a number of industries.

5.1.12 IBM / Micromuse Inc.

IBM has completed the acquisition of Micromuse Inc. which was a publicly held company based in San Francisco, Calif. Micromuse's operations will be included in IBM's Tivoli software business. The agreement is an all-cash transaction at a price of about \$865 million.

Micromuse is a provider of network management software. Their customers included banks, telecommunications carriers, governments, retailers as well as other enterprises in order to monitor and manage technology infrastructures. Micromuse's software aids in the management of IT systems that support the proliferation of voice, data and video traffic. Micromuse's software will be used in collaboration with IBM's IT service management technology to help clients minimize the complexity of their IT environments and address compliance standards.

The delivery of network-based services over the Internet in real time is creating new opportunities for content. For example, it can allow employees with mobile devices to access their company's network in order to make a number of different business communications.

Micromuse has upwards of 1,800 customers, including America Online, British Telecom, Cox Communications, Deutsche Telecom, eTrade, Fidelity Investments Services Ltd., Invesco Asset Management Plc., KeyBank, NCR Corporation, NTT, Orbitz, Shanghai Telecom, State of Michigan, Swisscom Mobile, Telecom Italia, U.S. Securities and Exchange Commission, Verizon, and Virgin Atlantic.

The acquisition should enhance IT service management capabilities of IBM's Tivoli software. Micromuse grew rapidly in the past year, ended September 2005, reporting a 10 percent to \$160.8 million.

IBM intends to establish Micromuse's operations and integrate their software technology and solutions into the Tivoli software division into IBM's Tivoli software offerings, as well as IBM hardware and services. IBM will also market and sell Micromuse software products through IBM's and Micromuse's existing sales channels and business partners.

5.1.13 IBM Acquires Bowstreet, Inc.

The acquisition will help customers create portals that integrate business applications. Bowstreet, Inc. is a Massachusetts-based provider of portal tools and technology that help companies amalgamate corporate applications, documents, databases and other enterprise information into an integrated portal application. Businesses can share and connect their data with customers, partners and suppliers by incorporating data and information into a single application. The integration increases collaboration and can lead to higher organizational productivity.

Bowstreet should further IBM's strategy around SOA. Bowstreet will allow clients to combine pre-existing data and enterprise applications with WebSphere Portal environments and utilize the benefits of an SOA architecture.

Demand for customizable software has increased. With Bowstreet's technology, IBM customers can develop adapted, integrated portal solutions intended to meet needs of their market or industry.

5.1.14 IBM 2006 First-Quarter Results

Income from continuing operations was \$1.7 billion, a 21 percent increase from first-quarter 2005. Total revenues were \$20.7 billion, down 10 percent as reported, but 7 percent when adjusted for currency from the first quarter of 2005, which contains revenue from divested PC businesses. Without the PC revenue, revenues were up 4 percent adjusted for currency when compared with the first quarter of 2005.

Revenues from the Americas in the first-quarter were \$9.0 billion, which marked a decrease of 3 percent from the 2005 period. Europe/Middle East/Africa revenues were \$6.7 billion, down 14 percent. Asia-Pacific made \$4.1 billion in revenues, a decrease of 21 percent. OEM revenues were \$873 million, up 26 percent compared with the 2005 first quarter.

There was a 32 percent decrease in hardware revenues to \$4.6 billion in the first-quarter 2006 compared to \$6.8 billion in the 2005 period, including the divested PC business. Hardware revenues without the PC business increased 3 percent.

Revenues from Software were \$3.9 billion, an increase of 2 percent compared with the first quarter of 2005. Revenues from IBM's middleware brands, which include WebSphere, DB2, Tivoli, Lotus and Rational products, were \$3.0 billion, up 6 percent compared to the first quarter of 2005. Operating systems revenues decreased 12 percent to \$520 million compared with the first quarter 2005 quarter.

Revenues increased 26 percent for the WebSphere product family. Information Management software revenue increased 6 percent. Tivoli software saw an increase of 24 percent, while revenues for Lotus software were the same over the year. Revenues from Rational software fell 8 percent compared with the year-ago quarter. IBM Revenue 2005

(Dollars in millions except per share amounts)	Three Months Ended March 31,	
	2006	2005*
Revenue:		
Global Services	\$ 11,567	\$ 11,709
Hardware	4,574	6,754
Software	3,907	3,814
Global Financing	583	580
Other	28	51
Total revenue	20,659	22,908

(Dollars in millions)

FOR THE YEAR ENDED DECEMBER 31:			YR TO YR PERCENT CHANGE	YR TO YR PERCENT CHANGE CONSTANT CURRENCY
	2005	2004		
Statement of Earnings				
Revenue Presentation				
Global Services	47,357	46,213	2.5 %	2.1 %
Hardware	24,314	31,154	(22.0)	(22.2)
Software	15,753	15,094	4.4	3.7
Global Financing	2,407	2,608	(7.7)	(8.4)
Enterprise Investments/Other	1,303	1,224	6.5	7
Total	91,134	96,293	(5.4)%	(5.8)%

(Dollars in millions)

FOR THE YEAR ENDED DECEMBER 31:	2005	2004*	YR TO YR PERCENT CHANGE	YR TO YR PERCENT CHANGE CONSTANT CURRENCY
Industry Sector:				
Financial Services	24,059	24,479	(1.7)%	(1.8 %)
Public	14,020	14,769	(5.1)	(5.5)
Industrial	11,666	12,610	(7.5)	(7.7)
Distribution	8,844	8,831	0.1	(0.2)
Communications	8,589	8,888	(3.4)	(3.8)
Small & Medium	17,969	20,793	(13.6)	(13.7)
OEM	3,271	2,885	13.4	13.4
Other	2,716	3,038	(10.6)	(16.8)
Total	91,134	96,293	(5.4)%	(5.8)%

(Dollars in millions)

FOR THE YEAR ENDED DECEMBER 31:	2005	2004	YR TO YR PERCENT CHANGE	YR TO YR PERCENT CHANGE CONSTANT CURRENCY
Geographies:				
Americas	38,817	40,064	(3.1)%	(4.4)%
Europe/Middle				
East/Africa	30,428	32,068	(5.1)	(4.1)
Asia Pacific	18,618	21,276	(12.5)	(12.7)
OEM	3,271	2,885	13.4	13.4
Total	91,134	96,293	(5.4)%	(5.8)%

Revenues across all industry sectors declined, except for a flat Distribution sector. This was due to the sale of the Personal Computing business. The Financial Services revenue decrease was a result of the Financial Markets, but was partially offset by increases in Insurance and Banking. The Public sector revenue decline was due to Education, Life Sciences and Government, but was partially offset by increased revenue in Healthcare. The increase in the Distribution sector revenue was a result of Travel and Transportation and Consumer Products, and was partially offset by lower revenue in Retail Industry. The decrease in Communications sector revenue was caused by Media and Entertainment, Utilities and Telecommunications.

IBM invested in growth initiatives in emerging countries. Revenue growth in these emerging countries was a result of client investment to build out infrastructures, especially in the Financial Services sector.

OEM revenue increased in 2005 versus 2004, mostly due to improved manufacturing yields for game processors. E&TS revenue also showed strong revenue growth.

5.2 Microsoft

Microsoft works to allow people and businesses to realize their full potential through technology that modifies the way people work and communicate. Microsoft is a leader in this use of technologies to transform organizations. They develop and sell software, services and solutions to reach clients ends.

5.2.1 Business

Microsoft has three core business divisions. Table 5-2 shows the divisions.

TABLE 5-2
MICROSOFT BUSINESS DIVISIONS

- Platform Products and Services
- Business
- Entertainment and Devices

Source: WinterGreen Research, Inc.

The platform products and services division includes Windows Client Group, Server and Tools Group, and MSN Group. The business division consists of the Information Worker Group and Microsoft Business Solutions Group. The entertainment and devices division contains the Home and Entertainment Group and the Mobile and Embedded Devices Group.

5.2.2 Product Information

Microsoft's product segments make up a framework for strategies and objectives across the development, sales, marketing, and services of organizations. The products also help concentrate strategic planning efforts of objectives and initiatives across businesses.

Microsoft has seven product segments. The segments are Client, Server and Tools, Information Worker, Microsoft Business Solutions, MSN, Mobile and Embedded Devices, and Home and Entertainment.

Client is a Microsoft Windows operating system that integrates a wide range of applications, services and hardware. The Client segment includes Windows XP and other standard Windows operating systems. The Server and Tools segment develops Windows Server System products and Windows Server operating systems. The Information Worker segment develops and delivers software solutions that enable organizations to meet objectives. The solutions are a piece of the application architecture puzzle, enabling them to respond to new opportunities and challenges.

The Microsoft Business Solutions segment encompasses Microsoft's offerings to manage financial, customer relationship and supply chain management functions. These business solutions are integrated with Microsoft software to help processes across a business. The segment consists of Line of Business Solutions such as Microsoft Great Plains, Microsoft Navision, Microsoft Solomon, Microsoft Axapta and Microsoft CRM

MSN provides personal communications services, such as e-mail and instant messaging, and information services

The products in the Mobile and Embedded Devices extend the Windows platform to many types of devices, including mobile devices that incorporate voice, personal information management, and media capabilities, and a wide variety of other devices. The segment includes the Windows Mobile software platform, the Windows Embedded device operating system family, MapPoint, and Windows Automotive.

The Home and Entertainment segment is responsible for the Xbox video game system, including hardware, games, Xbox and Xbox Live operations, marketing, research, and sales and support. The segment also includes the Microsoft's Home Products Division. It also follows all retail sales and marketing for Microsoft Office, the Windows operating systems, Xbox, PC games, and HPD products.

5.2.3 Microsoft BizTalk Server

BizTalk is a business process management server that allows companies to automate business processes. Microsoft BizTalk Server has been used by almost 6,000 organizations to connect their people, partners, processes, and information. Table 5-3 displays the industries in which the BizTalk Server has been utilized.

TABLE 5-3
BIZTALK SERVER INDUSTRIES

- Automotive
- Oil and Gas
- Chemical
- Manufacturing
- High Technology

Source: WinterGreen Research, Inc.

BizTalk Server 2006 is Microsoft's server that creates solutions for business process and integration. BizTalk Server 2006 is the fourth version of the product, building on the previous three versions: BizTalk Server versions 2000, 2002, and 2004.

The 2006 version includes new capabilities and improvements that help a developer build more flexible solutions for integrated business processes. BizTalk 2006 also empowers and enables administrators and business users to monitor business processes.

5.2.4 Customers

Microsoft's customers include clients of a number of different sizes. Individual consumers, small and medium-sized organizations, enterprises, governmental institutions, educational institutions, Internet Service Providers, application developers, and OEMs all utilize Microsoft's products and services. Consumers and smaller organizations often get products from resellers and OEMs. For example, sales to Dell and its subsidiaries accounted for approximately 10% of 2005 revenue.

5.2.5 Microsoft and GXS Form Strategic Alliance

Microsoft formed a strategic alliance with GXS, naming the GXS Trading Grid the recommended global B2B network for the BizTalk Server. GXS is a leading global provider of B2B e-commerce solutions for business process integration and collaboration. A number of companies use the GXS Trading Grid. The alliance will lead to marketing of solutions for integration between trading partners. In addition, the alliance should enable B2B integration initiatives across supply chains using both software and services. Microsoft® BizTalk® Server 2006, SQL Server™ 2005, the 2007 Microsoft Office system and GXS Trading GridSM are all included in the integration. The two companies will market their leading B2B solutions jointly.

As part of the agreement, GXS will employ Microsoft technology in their GXS Trading Grid. This allows customers to extend internal investments on Microsoft .NET Framework-based technologies outside their enterprise through integration with business partners.

Microsoft and GXS also plan to work together in order to enable and improve integration between the desktop and the supply chain. GXS intends to alter integration of standards and protocols, which allows 2007 Microsoft Office system and Microsoft Dynamics™ users to automate their business processes with their customers and suppliers.

The GXS Trading Grid is an integration platform that is designed for cross-enterprise business processes. It is one of the world's largest electronic business communities. It is used by upwards of 40,000 customers who exchange goods and services.

5.2.6 SAP and Microsoft

SAP and Microsoft collaborated to produce a joint product that enables customers to interact with SAP business processes and data through Microsoft Office applications, named Duet software for Microsoft Office and SAP. SAP and Microsoft also have plans to increase the capabilities of Duet and to release business scenarios in the second half of 2006. Duet enables workers using Microsoft Office environment to reach selected SAP business processes and data.

5.2.7 Microsoft, SOFTBANK BB and Japan Telecom

Japan Telecom and SOFTBANK BB have entered a strategic relationship with Microsoft to provide integrated voice, e-mail, groupware, instant messaging and desktop services. The joint companies are developing an integrated communications service within a network infrastructure.

There will be an integration of Microsoft's Solution for Enhanced VoIP Services with the SOFTBANK BB's IP phone solutions. The combination results in a platform that has high security and offers rich messaging and collaboration functions and voice services. Japan Telecom will connect the communication service with its networking infrastructure and managed network operation in order to provide an information communication technologies platform.

SOFTBANK BB is one of Japan's largest carriers of IP phone services. They engage in the provision of broadband infrastructure and technical development, marketing, sales and support. SOFTBANK provides IT-related distribution and services for broadband and e-commerce companies.

Japan Telecom is one of the largest Information & Communications Technology solution service providers in Japan. Japan Telecom provides voice and data communications services. The company is a subsidiary of SOFTBANK BB.

5.2.8 Microsoft Reports Third-Quarter Results

Microsoft reported a third-quarter revenue of \$10.90 billion for the three months ended March 31, 2006. This marked a 13% increase over the same quarter of 2005. Operating income was \$3.89 billion for the quarter. The income had a 17% increase from 2005, when there were \$3.33 billion in operating income.

Demand for Microsoft's newer products drove the performance during the quarter in the most of their product groups. Home and Entertainment revenue increased 80% due to demand for the Xbox 360 system. Microsoft Business Solutions saw revenue grow 21% due to interest in the Microsoft Dynamics business management solution line.

(in millions)	Three Months Ended		Nine Months Ended	
	March 31,		March 31,	
	2006	2005	2006	2005
Revenue:				
Client	\$ 3,168	\$ 2,919	\$ 9,624	\$ 8,904
Server & Tools	2,657	2,323	7,616	6,680
Information Worker	3,110	3,026	9,045	8,561
Microsoft Business				
Solutions	214	177	629	536
MSN	623	623	1,858	1,840
Mobile & Embedded				
Devices	89	63	252	180
Home & Entertainment	1,037	561	3,094	2,521
Reconciling Amounts	2	(72)	360	405
Consolidated	10,900	9,620	32,478	29,627

5.2.9 Microsoft Revenue 2005

(in millions)	Year Ended		
	June 30,		
	2003	2004	2006
Revenue:			
Client	\$ 10,304	\$ 11,283	\$ 12,048
Server & Tools	6,786	8,007	9,143
Information Worker	9,636	10,895	11,523
Microsoft Business			
Solutions	641	753	793
MSN	2,396	2,444	2,411
Mobile & Embedded			
Devices	153	239	334
Home & Entertainment	2,779	2,870	3,211
Reconciling Amounts	(508)	344	325
Consolidated	32,187	36,835	39,788

Microsoft's revenue growth for the fiscal year of 2005 was a result of the growth in licensing of Windows Server™ operating systems and other server applications, licensing of Windows® Client operating systems through OEMs, and increased licensing of Office and other Information Worker products. The license revenue growth was due to growth in server hardware and PC shipments, fluctuations in foreign currency exchange rates, and improvements in IT spending. Worldwide PC shipments from all sources grew about 11% to 13% and total server hardware shipments grew about 13% to 14% during fiscal year 2005 as compared to fiscal year 2004. Partially offsetting the revenue growth rates was a \$1.1 billion decline in earned revenue from Upgrade Advantage. The Upgrade Advantage contract value expired in the first quarter of fiscal year 2005.

5.3 Oracle

Oracle's business is how to manage, use, share, and protect information. Oracle is one of largest enterprise software companies. They offer solutions for business-database, middleware, business intelligence, business applications, and collaboration. Oracle's Fusion, a computing platform, is designed to allow for adoption of IT infrastructure. This portfolio is built on Fusion design principles, standardizing the priorities and practices of an enterprise computing strategy.

5.3.1 Business

Oracle is one of the largest enterprise software companies. They develop, manufacture, market, distribute, and service database and middleware software and offer applications software designed for customers to manage and grow business operations.

They ultimately intend to provide customers with integrated database and middleware and applications software. Oracle concentrated on maintaining their market position and increasing their product and service portfolio in the fiscal year of 2005.

Oracle's worldwide operations are made up of two separate businesses, which consist of five operating segments based upon their software and service offerings.

5.3.2 Recent Acquisitions

In early 2005 Oracle acquired PeopleSoft, Inc. for approximately \$11.1 billion. PeopleSoft is a provider of enterprise application software products. The integration of PeopleSoft's operations is expected to be finalized by the end of 2006.

Oracle acquired Retek, Inc., which is a provider of software solutions and services to the retail industry. They also have made smaller acquisitions in the last several years and should acquire or make investments in complementary companies, products, services and technologies in the future.

5.3.3 Products and Services

Oracle has two major businesses, which are software and services. In addition, their software business is split into two segments. The two segments are new software licenses; and software license updates and product support. Oracle's services business is also segmented. The three operating segments are consulting, advanced product services and education.

In the past three fiscal years the software business represented between 76 and 80% of total revenues and services business took up between 20 and 24% of total revenues

The new software licenses in the software business include the licensing of database and middleware software. Included in that is Oracle Database and Oracle Fusion Middleware, as well as other applications software. New software license revenues come from fees from giving customers licenses to use Oracle's software products. New software license revenues comprised 35% of total revenues in the last three fiscal years.

Database and Middleware Software is comprised of Oracle's grid software. The grid software offers a platform for running and managing business application. New software license revenues from database and middleware products made up 81%, 82% and 81% of new software license revenues in the fiscal years of 2005, 2004 and 2003, respectively.

Oracle Fusion Middleware is Oracle's brand family of middleware products. The brand includes Oracle Application Server, Oracle Collaboration Suite, Oracle Developer Suite and Oracle Data Hub. Oracle Fusion Middleware enables customers to integrate heterogeneous business applications and automate business processes.

Oracle Fusion Middleware forms the foundations of Oracle Application Server 10g. Oracle Application Server 10g integrates clustering and caching technology.

Oracle's applications couple business functionality with innovative technologies by providing customers, suppliers and employees with self-service Internet access. New software license revenues from applications software made up about 19% of new software license revenues in each of the last three fiscal years.

Software license updates offer clients with rights to software the upgrades, maintenance and patches released during the support period. Software license updates and product support revenues have represented 41%, 44% and 45%, increasing each year, from 2003 to 2005. The renewal rate for the software license updates and product support are high.

Oracle has consulting services that aid their customers in the consolidation of their information technology operations, integrate systems and increase the security of their data assets. Consulting revenues made up 15% of total revenues in 2005.

Oracle's advanced product services include On Demand and advanced product support services. Their revenues have been between 2 and 3% of the total in each of the last three years.

Education and training is also offered to customers, partners and employees. Revenues represented 2% of total revenues in 2005.

5.3.4 Oracle Acquires Oblix

Oracle acquired Oblix, Inc., which is a private developer of identity-based security solutions for computing environments. Oblix is a leader in developing identity management software that allows web access control.

Oblix has many companies around the world such as American Airlines, British Airways, CEMEX, Chicago Board of Trade, Cisco Systems, Flextronics, General Dynamics, General Motors, Hitachi, Ingersoll-Rand, Norsk Hydro and the United States Postal Service.

The Oblix products will continue to be available on a stand-alone basis. Oracle will also include the best features and capabilities of Oblix into its larger density infrastructure.

5.3.5 Oblix Products and Services

Oracle's identity management enables an organization to provide a complete identity within their application development and deployment environment. The solution is comprised of: Oracle COREid Access and Identity, Oracle COREid Federation, and Oracle COREid Provisioning

The Oracle web services manager is a solution for adding the best possible practices to all existing, or new web services. Also, it provides the key security and management capabilities necessary to use service-oriented architectures across business applications.

5.3.6 Oracle Buys Open Source Software Company Sleepycat

Oracle added Berkeley DB to its embedded database product line, improving the depth of the product line. Berkeley DB is Sleepycat Software's signature product and will be integrated into Oracle's product offerings following the purchase of Sleepycat Software.

Sleepycat Software's Berkeley DB is a widely used open source database with over 200 million deployments. A number of familiar open source projects or operating systems utilize Berkeley DB' technology.

5.3.7 Oracle's Third Quarter Results

Oracle's reported Generally Accepted Accounting Principles (GAAP) earnings per share for their third quarter of 2006 went to \$0.14, up 40% from the same quarter last year. Non-GAAP earnings per share went up 21%. GAAP revenues increased 18% to \$3.5 billion for the quarter. Software revenues grew 20% to \$2.8 billion with database and middleware new license revenues up 5% and applications new license revenues up 77%. Services revenues increased to \$671 million, a growth of 9% from last year.

(in millions except per share data)	Three Months Ended November 30,		Six Months Ended November 30,	
	2005*	2004	2005	2004
Revenue:				
New Software Licenses	\$ 1,058	\$ 971	\$ 1,687	\$ 1,534
Software License Updates & Product Support	1,559	1,252	3,061	2,427
Software Revenues	2,617	2,223	4,748	3,961
Services	675	533	1,312	1,010
Total Revenues	3,292	2,756	6,060	4,971

5.3.8 Oracle Revenue 2005

(Dollars in millions)

FOR THE YEAR ENDED MAY 31:	ACTUAL PERCENT CHANGE			ACTUAL PERCENT CHANGE			2003
	2005	PERCENT CHANGE	CONSTANT CURRENCY	2004	PERCENT CHANGE	CONSTANT CURRENCY	
Total Revenues by Business							
Software	9,421	17 %	13 %	8,070	12 %	6 %	7,199
Services	2,378	14	10	2,086	(8)	(13)	2,276
Total	11,799	16 %	12 %	10,156	7 %	2 %	9,475

The increase in total revenues is due to incremental PeopleSoft revenues and an increase in sales of products and services. These increases are due to improved sales execution from product specialization, a strengthening in competitive position and a stronger economy. The Americas contributed 61% to the increase in total revenues, EMEA contributed 27% and Asia Pacific contributed 12%. International operations will continue to provide a significant portion of total revenues.

5.4 SAP

SAP is one of the leaders in offering collaborative business solutions for industries and markets. SAP serves more than 33,200 customers and is the one of the largest business software companies and independent software providers.

5.4.1 Partners

SAP's partners are Accenture, Atos Origin, BearingPoint, Capgemini, CSC, Deloitte, HP Consulting, IBM, Business Consulting Services, IDS Scheer, itelligence, LogicaCMG, Siemens Business Services, Tata Consultancy Services, IBM, AMD, Bull, Citrix, Dell, EMC, Egenera, Enterasys Networks, Fujitsu, Fujitsu Siemens, Hewlett-Packard, IBM, Intel, Lexmark, Microsoft, MySQL, Network Appliance, Novell, O2, Oracle, Palm, Realtech, RedHat, RIM, SGI, Sharp, Siemens Communications, StorageTek, Sun, Teradata, Unisys, Atos, Origin, HP Outsourcing Services, T-Systems, HP, and Realtech.

5.4.2 Services

SAP offers a number of services. The SAP active global support service provides services for planning, implementation, and operations. The SAP consulting service offers consulting, implementation, and optimization services. SAP custom development incorporates SAP development strategies to deliver solutions that meet unique business goals. SAP Education transfers knowledge and skills to SAP customers, partners, and employees. SAP financing provides an all-inclusive, predictable, and affordable financing option for SAP solutions to companies of all sizes. SAP managed services operates, manages, and maintains SAP solutions for any company. The SAP ramp-up service introduces solutions to the market. Support for business process outsourcing, delivers the solutions, services, and partnerships.

5.4.3 Solutions and Products

SAP's applications consist of mySAP Business Suite, Business Benefits, mySAP CRM, mySAP, ERP mySAP Business Suite, mySAP Customer Relationship Management, mySAP ERP, mySAP Product Lifecycle Management, mySAP Supply Chain Management, mySAP Supplier Relationship Management, Duet, SAP xApps, Composite Applications, SAP xApp Analytics, SAP xApps for Governance, Risk, and Compliance, mySAP PLM, mySAP SCM, mySAP SRM, SAP xApp Cost and Quotation Management (SAP xCQM), SAP xApp Integrated, Exploration and Production (SAP xIEP), SAP xApp Manufacturing Integration and, Intelligence (SAP xMII), SAP xApp Product Definition (SAP xPD), SAP xApp Resource, Portfolio Management (SAP xRPM), SAP xApps composite applications for analytics, Services (SAP GTS) composite application for global trade, SAP xApps composite applications for mobile business.

SAP has three platforms. They are the Enterprise SOA, SAP NetWeaver, and Ecosystem. The Enterprise service-oriented architecture changes business applications. The SAP NetWeaver platform allows business process change. The platform integrates business functionality and process components. With the last platform, the Ecosystem, customers and partners can work together through communities and programs.

5.4.4 SAP Acquires Frictionless Commerce

SAP acquired Frictionless Commerce. Frictionless Commerce is a privately held, provider of supplier relationship management software. By acquiring Frictionless Commerce, the company's strategy is to offer the global purchasing platform.

Frictionless Commerce serves large and midsize enterprises across markets including banking, insurance, professional services, consumer products, discrete manufacturing, life sciences, telecommunications and utilities. Frictionless Commerce is a leading Supplier Relationship Management software provider. Frictionless SRM software enables enterprises to perform spend analysis, supplier profiling and performance management, sourcing and contract management.

5.4.5 SAP Acquires Virsa

SAP is acquiring Virsa Systems, Inc., a privately held, leading supplier of cross-enterprise compliance solutions. The acquisition provides compliance solutions that work across mixed IT environments to reduce risk and cost and provide improved business control.

Virsa is one of the leading providers of compliance solutions that monitor and enforce business controls in real time across enterprise systems and legacy applications.

Virsa solutions are designed on the SAP NetWeaver platform, making Virsa one of the many software vendors (ISVs) who have committed to build and market solutions on SAP's leading platform. SAP and Virsa have been closely united in joint marketing and sales and product development activities.

Virsa Systems, Inc is involved in the cross-enterprise solutions for governance, risk, and compliance management. Virsa provides solutions that simplify compliance with regulations such as Sarbanes-Oxley, by enabling customers to use automated control design, testing, and enforcement directly into their business processes.

5.4.6 SAP Revenue 2005

Years ended December 31,

	2005	2004	2003
	€(000)	€(000)	€(000)
Software revenue	2,782,751	2,361,012	2,147,591
Maintenance revenue	3,175,642	2,823,189	2,568,807
Product revenue	5,958,393	5,184,201	4,716,398
Consulting revenue	2,138,941	1,970,606	1,953,459
Training revenue	342,466	302,443	299,331
Service revenue	2,481,407	2,273,049	2,252,790
Other revenue	72,629	57,243	55,418
Total revenue	8,512,429	7,514,493	7,024,606

5.5 BEA

BEA is a leader in enterprise application and service infrastructure software. Application infrastructure provides a part of the foundational software necessary for enterprise applications to run reliably and securely. To meet a broader set of customers' application infrastructure needs, BEA has expanded into product categories that take advantage of the performance and features provided by the underlying application server.

Customers are migrating away from systems where users directly interface with a specific application. This style of development is often referred to as Service-Oriented Architecture. This migration created the need for a new category of software, which served as the platform for portals and composite applications. This category of software is referred to as service infrastructure. BEA has developed significant features or product lines to address particular markets and is in the process of developing and adding additional features and products.

5.5.1 Partners

BEA's partners are the following: Alcatel HQ, AmberPoint Atos, AttachmateWRQ, Avinci, BMC Software, Global Management Alliance, Ceon Corporation, CGI, Computer Associates International, ComputerLand, Convergys, Crealogix, Enterpulse, Fujitsu, Fundtech Corporation, GFI Informatica, Hitachi Consulting, Hyperion, Indra Sistemas, Infovide, Intec Billing, Intervoice, Inc., Interwoven, IQSYS, iRise, iWay Software, Jacada, JacobsRimell, Kapow Technologies, Inc, LANIT, Lockheed Martin Corporation, Mercury Interactive, MobileAware, msg systems, Northrop Grumman Information Technology, Primavera Systems, Inc., Primitive Logic, Inc, ProActivity Inc., PROKOM SOFTWARE, RSA Security Inc., SAS, Siemens Business Services, GmbH & Co., OHG Softbank, Symantec, SysOpen Digia Plc T-Systems International GmbH, Tata Consultancy Services, TietoEnator Corporation, Turnberry Solutions, Inc., Unilog, Unisys, VeriSign, Inc. WellFound Decade Corporation Wily Technology, Inc., WM-data, xwave

5.5.2 Customers

BEA has the following customers: AT&T, BellSouth, British Telecom, BT Global Services, Cablecom, China Telecom, ChungHwa Telecom, Cingular, Comindico, Covad, Dacom, Deutsche Telekom, Dish Networks, France Telecom, KDDI Corporation, Nextel, NTT, Orange, OZ, Telecom Personal, Telicom Italia, Telecom Italia Mobile, Telenor Mobile, Telstra, TIM Peru, Verizon, Virgin Mobile USA, Vodafone, and WilTel Communications. Abbey National, ABN AMRO, Accredited Home Lenders, Allstate, AXA, Banc of America, Bank of China, Bank of New York, Bank One, Bank of Shanghai, Barclays, Bear Stearns, BNP Paribas, China Construction Bank, Citigroup, Credit Agricole, Credit Suisse, E*Trade, Emirates Bank, Erste Bank, Fannie Mae, First Franklin, Freddie Mac,

HVB Systems, JPMorgan Chase, Lehman Brothers, Merrill Lynch, Metlife, New York Board of Trade, Nordea, Northern Trust, OppenheimerFunds, Prudential UK, Robeco Direct, SanPaolo IMI, SBAB, S.W.I.F.T., Samsung Securities, TeleCash, TrueCredit, TrueLink, and Wells Fargo. Amazon.com, Anheuser-Busch, Archer Daniels Midland, AutoNation, Barnes & Noble, Beer.com, Best Buy, Bestfoods, BonusPrint, Circuit City Group, Coca-Cola, Fuji PhotoFilm, Hijos de Rivera, Interbrew, J Sainsbury, Japan Tobacco, Kellogg, Kohl's, L'Oreal, Nestle, Nike, Office Depot, OfficeMax, PepsiCo, Philip Morris, Priceline.com, Procter & Gamble, Rubric, R.J. Reynolds Tobacco, Saks, Staples, Suntory, Target Corporation, Ticketmaster Online-CitySearch, Tricon Global Restaurants, Tyson Foods, Unilever, Walgreen and Winn-Dixie Stores, BMW Group, Boeing, DaimlerChrysler, Daewoong Pharmaceutical, Hewlett-Packard, Network Appliance, Oncology Therapeutics Network, Pfizer, Sun Chemical, StorageTek, Toshiba American Business Solutions, Toyota Australia, Amadeus, APL, Asiana Airlines, Avis, British Airways, DHL Deutsche Post World Net, FedEx, Hotelzon, Jeppessen, Lufthansa Technik, Marriott, National Car Rentals, Northwest Airlines, Schiphol Airport, SNCF, Star Alliance, Starwood Hotels & Resorts, Toll Holdings, Turkish Airlines, Union Pacific, UPS, United Airlines, and USF

5.5.3 Products

Table 5-4 Shows BEA's product categories.

TABLE 5-4

BEA PRODUCT CATEGORIES

- BEA Tuxedo
- BEA WebLogic Enterprise Platform
- BEA WebLogic Communications platform
- BEA WebLogic RFID
- BEA AquaLogic

Source: WinterGreen Research, Inc.

The BEA Tuxedo product is BEA's main infrastructure platform. The BEA WebLogic Enterprise Platform consists of BEA WebLogic Server, BEA WebLogic Portal, BEA WebLogic Integration, and BEA Workshop. The BEA WebLogic Communications Platform is composed of the BEA WebLogic SIP Server, and the BEA WebLogic Network Gatekeeper. The BEA WebLogic RFID family is the BEA WebLogic RFID Edge Server, and the BEA WebLogic RFID Enterprise Server and the BEA JRockit. The BEA AquaLogic product line is the BEA AquaLogic Messaging, BEA AquaLogic Data, the BEA AquaLogic Security, BEA AquaLogic User Interaction, and the BEA AquaLogic Business Service Interaction.

5.5.4 BEA Acquires Fuego

BEA Systems acquired the company Fuego in 2006. Fuego is recognized as a leader in the business process management software industry. The company's focus is in providing SOA solutions to help companies improve business processes among people, applications and organizations. BEA acquired Fuego for approximately \$87.5 million.

Fuego's customers include Southwest Airlines, United Healthcare, JPMorganChase and British Petroleum. FuegoBPM is a comprehensive, advanced software platform for business process management. The FuegoBPM suite has been used in over 170 production BPM implementations.

5.5.5 BEA Acquires Plumtree Software

BEA acquired Plumtree Software. Plumtree Software provides enterprise portal solutions to connect different work groups, IT systems and business processes. By combining the Plumtree and BEA portal portfolios, BEA will be providing solutions for customers to incorporate portal technologies as part of their Service-Oriented Architecture.

The combined portal portfolios will offer portal, collaboration and composite application capabilities across multiple platforms and application servers. The acquisition creates a Multi-platform Portal Leader.

For approximately \$204 million, BEA acquired all of the outstanding common stock and options of Plumtree. Also all outstanding options to purchase Plumtree common stock were converted into options to purchase approximately 1.8 million shares of BEA common stock.

5.5.6 Plumtree software products

The BEA resources are now running Plumtree's products. The BEA AquaLogic User Interaction is a new series of AquaLogic products used to create enterprise portals, shared communities and complex applications, all built on a service infrastructure. The AquaLogic User Interaction provides a solution that makes assorted information and applications more accessible.

5.5.7 BEA First Quarter Results

BEA reported their financial results for the fiscal first quarter, which ended April 30, 2006. BEA reported first quarter total revenues of \$323.2 million, up 15% from last year's first quarter. BEA reported first quarter license fees of \$132.4 million, up 14% from a year ago, and services revenue of \$190.8 million, up 15% from a year ago. BEA generated first quarter cash flow from operations of \$102.4 million, up 33% from \$76.9 million a year ago.

For the first quarter, BEA reported operating profit of \$33.6 million, compared to \$48.5 million a year ago. BEA reported GAAP first quarter net income of \$35.3 million, compared to \$34.1 million a year ago, and net income per share of \$0.09 compared to \$0.08 a year ago.

	Three Months Ended April 30,	
	2006	2005
Revenue:		
License Fees	\$ 132,404	\$ 116,055
Services	190,832	165,668
Total revenue	323,236	281,723

5.5.8 BEA Revenue 2005

(Dollars in thousands)

FISCAL YEAR ENDED JANUARY 31:				Percent Change Fiscal 2006 vs. Fiscal 2005	Percent Change Fiscal 2005 vs. Fiscal 2004
	2006	2005	2004		
Revenues					
License Fees	511,549	483,138	521,047	5.9 %	(7.3) %
Consulting & Education Revenues	145,572	134,371	117,283	8.3	14.6
Customer Support Revenues	542,724	462,585	374,162	17.3	23.6
Total Service Revenues	688,296	596,956	491,445	15.3	21.5
Total Revenues	1,199,845	1,080,094	1,012,492	11.1 %	6.7 %

5.6 Sun Microsystems

Sun's business provides network computing products and services. Network computing has been their core since the beginning of the company. The company is based on the fact that the power of a single computer system can be increased when interconnected with other computer systems.

Customers use the Sun Microsystems' products and services to build mission-critical network computing environments to operate elements of their businesses. Their network computing infrastructure solutions are used in scientific, business and engineering applications. Typical applications which customers operate Sun Microsystems' solutions can consist of webserving, high-performance technical computing, enterprise-wide Resource Planning and Customer Relationship Management.

Over the past few years, Sun Microsystems has also made significant acquisition. Sun has been making significant gains in performance for the power consumption, leveraging technology acquired through the purchase of Afara Websystems, Inc. in 2003. The new services technology that provides remote diagnostics and preventive services for customers is now enhanced. Now, it includes multi-platform support, through the acquisition of SevenSpace, Inc. in 2005.

5.6.1 Business Strategy

The business strategy for Sun Microsystems is built around the main focus on network computing infrastructure and the community that which it creates. The Computer Systems, Network Storage Systems, Support Services, and also Client solutions are designed to enable network solutions that attack cost and complexity, accelerate network service deployment and enable mobility with security. Microsystems most important policies are: On-going innovation in systems design, networking integration, microprocessor architecture, operating systems and software to ensure continuing technology leadership and resulting price-performance advantage.

5.6.2 Products

Sun Microsystems produces multiple products that can be broken down into a number of categories. Table 5-5 lists the categories.

TABLE 5-5

SUN'S PRODUCT CATEGORIES

- Servers Data Center servers
- Desktops and Workstations
- Processor and Network Products
- Software
- Platforms
- Java technology
- Sun Java Desktop System
- Storage Systems
- Carrier Grade Servers
- Prime Power Servers
- Sun Grid Rack System

Source: WinterGreen Research, Inc.

The servers data center servers are Sun Fire E25K, Sun Fire E20K. The enterprise servers are Sun Fire E6900, Sun Fire E4900, Sun Fire E2900 and Sun Fire V1280. The entry server systems are the SPARC and x64. Entry SPARC-based systems are the Sun Fire V240, Sun Fire V210 and Sun Fire V440 servers, Sun Fire V890, Sun Fire V490 servers, AMD Opteron processors, Netra systems. The desktops and workstations are the Sun Blade 2500, Sun Blade 1500, Sun Blade W1100z, and the Sun Blade W2200z. The processor and network products are Sun N2000 Series, UltraSPARC IV, and Solaris 10 OS.m. The software consists of the Solaris 10 and the Solaris 8 OS. The platforms are the SPARC and the x64 platform. The Java technology is Java 2 Platform, Standard Edition, Enterprise Edition, Micro Edition, and the Java Card. The sun java desktop system product is StarOffice. The storage systems are: Sun StorEdge, 9980, Sun StorEdge 9970, Sun StorEdge 9990, Sun StorEdge 6320, Sun StorEdge 6120, Sun StorEdge 6130, Sun StorEdge A5200, Sun StorEdge 6920 system, Sun StorEdge 3510, StorEdge 3511, and Sun StorEdge 3310. The carrier grade servers are the Netra 210 Server, Netra 240 Server, Netra 440 Server, Netra CT900 ATCA Server, Netra 1290 Server, Netra 1280 Server, Netra CT 410 Server, Netra CT 810 Server, Netra CT 820 Server, Netra CP2300 Blade, Netra CP2160 Blad Netra CP2140 Blade, Netra CP3010 Blade, and the Netra CP3020 Blade. The prime power servers are the PRIMEPOWER 250, PRIMEPOWER 450, PRIMEPOWER 650, PRIMEPOWER 850, PRIMEPOWER 900, PRIMEPOWER 1500, PRIMEPOWER 2500. Lastly, there is the sun grid rack system.

5.6.3 Solutions

The solutions-based selling model offers a set of end-to-end networking architecture solutions. This set of solutions brings together a combination of servers, software, storage and services to help customers address problems. Sun Microsystems' has organized their resources, technical understanding and business expertise into six categories. The first category, the data center, is focused on enabling enterprises to leverage systems products, architectures and practices. The second, the storage and data management, focuses on information life cycle management and the products and processes necessary to manage business continuity, legislative compliance, storage consolidation, and content repositories at the heart of the global storage industry. The third, the desktop and mobility, leverages open-source products to drive cost savings in desktop deployments with SunRay, Java Desktop System, and StarOffice. The fourth, the Identity management, focuses on securing the enterprise, and automating the provisioning processes. The fifth category, enterprise web services, focuses on enabling enterprises to leverage Java 2 Enterprise Edition web services platform, and evolving service oriented architectures and service delivery platforms). The last category, manageability services, focuses on Sun Microsystems' global service offerings, which enables increased system service levels.

5.6.4 Sun / Aduva

Sun Microsystems, Inc will acquire Aduva. Aduva technology allows enterprises to automate the processes associated with patch and dependency management. This provides a solution that scales from individual servers to large-scale data centers. Aduva currently runs an active dependency service for Solaris and Linux servers, Aduva's multi-platform services will be available for operation by individual customers behind their own firewalls, or as an automated service from Sun's Grid.

Aduva has mission critical production systems. Aduva provides a solution that helps the management of source server stacks. Aduva OnStage is a life-cycle management application.

5.6.5 Third Quarter Fiscal Year 2006 Results

The revenues for the third quarter of fiscal 2006 were \$3.177 billion, an increase of 21 percent as compared with \$2.627 billion for the third quarter of fiscal 2005. The year over year revenue increase was driven by recent acquisitions and by growth in products. Total gross margin as a percent of revenues was 43.0 percent, an increase of 1.6 percentage points, as compared with the third quarter of fiscal 2005.

Cash generated from operations for the third quarter was \$197 million and cash and marketable debt securities balance at the end of the quarter was \$4.429 billion.

(in millions)	Three Months Ended		Nine Months Ended	
	March 26 - 27,		March 26 - 27,	
	2006	2005	2006	2005
Net Revenues:				
Products	\$ 2,035	\$ 1,683	\$ 5,847	\$ 5,199
Services	1,142	944	3,393	2,897
Total Net Revenues	3,177	2,627	9,240	8,096

5.6.6 Sun Microsystems Revenue 2005

(Dollars in millions)

FOR THE FISCAL YEAR ENDED JUNE 30:					
	2005	ACTUAL PERCENT CHANGE	2004	ACTUAL PERCENT CHANGE	2003
Net Revenues:					
Computer Systems Products	5,826	(0.5)%	5,854	(6.2)%	6,243
Network Storage Products	1,300	(13.4)%	1,501	(3.2)%	1,550
Products Net Revenue	7,126	(3.1)%	7,355	(5.6)%	7,793
Percentage of Total Net Revenues	64.4%	(1.4) pts.	65.8%	(2.4) pts.	68.2%
Support Services	3,031	1.1%	2,999	5.5%	2,844
Client Solutions & Educational Services	913	9.9%	831	4.3%	797
Services Net Revenue	3,944	3.0%	3,830	5.2%	3,641
Percentage of Total Net Revenues	35.6%	1.4 pts.	34.2%	2.4 pts.	31.8%
Total	11,070	(1.0)%	11,185	(2.2)%	11,434

Products net revenue consists of revenue generated from the sale of Computer Systems and Network Storage products. As compared to fiscal 2004, during fiscal 2005, Computer Systems revenue decreased. This was a result of reduced sales of the data center servers from competition and a continuing market shift in overall computer system demand towards the usage of lower-priced entry-level servers. The decrease in Computer Systems revenue was partially offset by increased unit sales of entry-level servers, which included servers running on SPARC and AMD's Opteron processors. During fiscal 2005, as compared with fiscal 2004, Network Storage revenue decreased. This was a result of competition and reduced sales of entry level and data center storage systems and low-end storage components. This was partially offset by increased unit sales of mid-range storage systems.

Services net revenue consists of revenue generated from Support services, Client solutions and Educational services. Support services revenue consists primarily of maintenance contract revenue. During fiscal 2005, as compared with fiscal 2004, Support services net revenue increased. This was a result of the benefit of foreign exchange and an increase in the number of systems under a Support services contract. Competitive pricing pressures substantially offset these increases. The 8.4 percentage point increase in the services contract penetration rate is due to a continued increase in the systems under contract and a decrease in the estimate of the number of active systems that comprise the installed base.

Client solutions and Educational services revenue consists primarily of revenue generated from professional services. These include technical consulting that helps customers plan, implement, and manage distributed network computing environments. The overall increase in Client solutions and Educational services revenues during fiscal 2005, as compared with fiscal 2004, was largely due to revenue recognized on a significant solution sale in the United Kingdom and the solution-based selling strategy internationally, particularly in EMEA.

5.7 AmberPoint

AmberPoint was founded in 2001. AmberPoint creates new technologies for distributed systems, databases, development tools and management frameworks. Their newest project is in the field of open standards of Service Oriented Architecture (SOA), which deliver solutions for making services-based systems production-ready, business-ready and manageable. AmberPoint is a market leader in some software licenses, paid customers and customers in production. AmberPoint software is used in 63 countries spanning six continents around the globe. AmberPoint's major customers are British Telecommunications, H&R Block, Motorola and the U.S. Department of Defense.

Table 5-6 shows AmberPoint's partners.

TABLE 5-6

AMBERPOINT'S PARTNERS

- British Telecommunications Plc
- DreamSoft
- Goodwin Solutions
- IBM Global Services
- Japara Solutions
- Kuvera
- Merlin
- MphasiS
- Ness
- Parcs
- Relational Options
- Reply
- Sharpe Consulting
- ThoughtWorks

Source: WinterGreen Research, Inc.

5.7.1 AmberPoint/Software AG

Software AG and AmberPoint offer an SOA design to run-time governance. The integration of AmberPoint's run-time SOA management with Software AG's SOA crossvision suite creates an enterprise-class service-based system. Software AG and AmberPoint will provide solutions, from initial design through to run-time management. This product will automatically update. The crossvision suite includes application composition, business process management, legacy system integration and service orchestration. By integrating AmberPoint, run-time management is provided with the rest of the crossvision SOA lifecycle.

5.7.2 AmberPoint/IONA

IONA Technologies and AmberPoint are integrating IONA's Artix with AmberPoint's SOA Management System. This partnership gives customers the means to implement, manage and govern highly distributed SOA, deployed across an organizations' IT environments.

The integration of IONA's Artix and AmberPoint's SOA Management System enables customers to pass data collected by the instrumentation in Artix endpoints to the AmberPoint management console. Customers can monitor the health and status of their Artix endpoints and the services. The integration of Artix and AmberPoint gives enterprises control over service level management, exception management, security, logging and auditing.

5.8 AttachmateWRQ

AttachmateWRQ has offices in 25 North American cities and 20 countries. AttachmateWRQ serves 80% of Fortune 500 and Global 2000 companies. AttachmateWRQ's industries include finance, insurance, healthcare, technology, manufacturing, retail, hospitality, government agencies, commercial airlines and transportation. They are partners with Microsoft, BEA, Unisys, and Sun. AttachmateWRQ is a privately held company with more than twenty years of profitability and was founded in 1981. Attachmate has more than 40,000 customers, representing over 16 million desktops worldwide. AttachmateWRQ products and services help to extend, manage and secure their enterprise assets.

AttachmateWRQ delivers products and services that extend your host resources swiftly and securely, while positioning customers to take advantage of new platforms. AttachmateWRQ is focused on supporting new industry platforms to ensure our customers are ready. Their customers use them for their management capabilities to handle desktop connections and network performance across host and non-host environments. AttachmateWRQ safeguards business-critical data with standards-based security solutions that protect organization's information assets.

5.8.1 Legacy Integration

Legacy Integration offers a number of integration products. Verastream Host Integrator enables mainframe data and logic for reuse with newer technologies. Verastream Bridge Integrator provides reliable, high-performance integration of CICS applications. Verastream Transaction Integrator gives developers direct access to CICS and IMS transactions for building new services. Verastream Data Integrator provides drivers for direct access to host-based VSAM, DB2, IMS/DB, and Adabas data. DATABridge securely integrates Unisys MCP DMSII and non-DMSII data to a secondary system. Verastream Web Integrator which enables reuse of web-based data and logic via the screen interface. Verastream Desktop Integrator helps to integrate corporate desktop applications, regardless of their ownership or origin.

5.8.2 AttachmateWRQ/OpenSpan

AttachmateWRQ and OpenSpan Inc. created a partnership enabling AttachmateWRQ to distribute OpenSpan's desktop integration technology. AttachmateWRQ will bring OpenSpan's Composite Studio to AttachmateWRQ customers worldwide, extending Verastream's legacy integration breadth and providing organizations with the approach to the reuse of any application functionality.

This partnership further fulfills the AttachmateWRQ™ integration strategy of extending legacy assets via service-oriented architecture (SOA) through non-invasive service enablement. By combining AttachmateWRQ Verastream® mainframe and Web integration expertise with OpenSpan's desktop application integration capabilities, customers can integrate Windows, Java, green screen, and packaged applications.

With the combined offering, organizations can work with a single vendor, no matter what their legacy integration needs. Verastream's SOA-compliant services can be consumed by Composite Studio, so that each customer solution can use mainframe, Web and desktop applications without having to modify the existing applications.

5.8.3 AttachmateWRQ/NetIQ

AttachmateWRQ has acquired NetIQ Corporation. NetIQ will operate as an AttachmateWRQ business unit and will no longer be publicly traded. AttachmateWRQ and NetIQ comprise a \$400 million company, serving over 40,000 customers in over 60 countries, with near complete market penetration of the Global 10,000. AttachmateWRQ, with NetIQ, will provide mission-critical enterprise software that enables customers to extend, manage and secure their IT infrastructures. NetIQ provides integrated systems and security management solutions that empower IT organizations with the knowledge and ability to assure IT service. AttachmateWRQ provides multi-host access, integration, security and desktop management.

5.8.4 NetIQ

NetIQ is a provider of integrated systems and security management solutions. Their systems and security management software solutions enable organizations to assure the performance, availability and security of the services delivered by their information technology infrastructures. They have expanded their core business to include cross-platform systems and security management solutions that include the following product areas: Performance and Availability Management, Security Management, Configuration and Vulnerability Management, and Operational Change Control.

They were founded in California in 1995. They acquired Mission Critical Software, Inc. in 2000, WebTrends Corporation in 2001, and both PentaSafe Security Technologies, Inc. and Marshal Software, Ltd., in 2002. NetIQ sold WebTrends in 2005.

During fiscal 2005, they released to the public publicly the Knowledge-Based Service Assurance product strategy. The key elements of this strategy are Operational Integrity, Service Management, Policy Compliance, and Risk Management. NetIQ has begun directing their principal product investments to key areas of this strategy while lessening investment in other areas.

5.8.4.1 Performance & Availability Management

Performance & availability management software is designed to promptly identify and provide notification and an automated response to system problems such as application failures, system software crashes, hardware failures, slow response times and insufficient resource capacity. NetIQ's software continually monitors the performance, responsiveness and availability of systems and applications, and evaluates the capabilities of network services. These functions enable systems administrators to respond to performance degradation.

AppManager Suite is a set of programs for managing, diagnosing, and analyzing the performance and availability of distributed Windows, UNIX, and Linux-based operating systems, including monitoring of service level metrics. AppManager also supports server applications, including Exchange, SQL, Oracle, SAP R/3, Lotus Domino and BlackBerry, and web servers such as IBM WebSphere and BEA WebLogic.

Extended Management Pack Modules for Microsoft Operations Manager provide value-added management capabilities that enable Microsoft Operations Manager to manage Windows NT applications and non-Microsoft platforms and applications.

5.8.4.2 Operational Change Control

NetIQ provides operational change control solutions that allow organizations to securely delegate administrative tasks, automate user account provisioning, implement end-user self-service, and enable auditing and policy enforcement.

Migration Suite is a suite of configuration, consolidation, and migration tools that accelerate the transition to Windows 2000/2003 or Exchange 2000/2003 or between platforms, while minimizing the impact on IT resources and end-users.

5.9 BMC Software

BMC Software is an independent software vendor. Delivering Business Service Management, they provide software solutions that enable companies to manage their information technology (IT) infrastructure from a business perspective. Their software solutions include enterprise systems, applications, databases and service management. They offer products in the following categories: Mainframe Management, Distributed Systems Management, Service Management and Identity Management. Founded in 1980, BMC Software has offices worldwide and fiscal 2005 revenues of more than \$1.46 billion.

5.9.1 BMC's Strategy

BMC Software's strategy is to provide software solutions that drive business value through better management of technology and IT processes. Their focus is on helping customers better serve their customers. They consider business service management (BSM) to be the most effective approach for managing IT. They try to keep their suite of solutions more comprehensive to help customers manage their diverse IT, and be more innovative as to lead their customers ahead of the competition.

BMC focuses on eight solution areas that are paths for BSM implementation. BSM Routes to Value include Incident and Problem Management, Asset Management and Discovery, Identity Management, Service Impact and Event Management, Service Level Management, Capacity Management and Provisioning, Infrastructure and Application Management and Change and Configuration Management. BMC Atrium provides a shared view of how IT supports business priorities that underlies these solutions. The BMC Atrium CMDB

An element of their strategy is to provide the best practices for each of our key solution areas. They have increased investment in delivering thought leadership and consultative services, including education. One key area of focus is providing best practices consistent with the IT Infrastructure Library (ITIL). BMC Software has broadly trained customer-facing organizations on ITIL best practices and provides education and certification to customers and partners through the BMC Business School. In response to customer needs, they are investing in, developing and marketing solutions that address the challenges of audit and regulatory compliance affecting the IT organization. BSM Routes to Value supports IT Infrastructure Library best practices and assist in addressing issues around compliance.

BMC Software's competitive strength is its ability to offer a set of solutions that deliver IT and business alignment. They strengthen their BSM offerings through acquisitions and internal development. In August 2005, they acquired KMXperts. This acquisition boosts the market share leadership position in service desk software held by BMC Software. KMXperts strengthens BMC Software offerings with a full-featured knowledge management solution for internal and external service desks. BMC Software introduced BMC Transaction Management solutions. BMC Transaction Management is a family of solutions that empowers IT to deliver improved business services by profiling the performance of business transactions across the enterprise. They finalized the acquisition of Identify Software Ltd. The addition of Identify's solutions to BMC's transaction management strategy provides customers with deep application and problem resolution capabilities, enabling them to find the cause of transaction breakdowns. Through these acquisitions and development efforts, BMC provides customers solutions that lessen their integration and support costs and accelerate time to value.

5.9.2 Mainframe Management

The Mainframe Management segment includes our MAINVIEW® solutions, which manage, automate and optimize the depth and breadth of z/OS, DB2, CICS, IMS, Linux, middleware, the Web and storage. This segment also includes SmartDBA® solutions that manage and recover DB2 and IMS databases. Mainframe Management solutions contributed 39%, 35% and 34% of license revenues in fiscal 2004, 2005 and 2006, respectively.

5.9.3 Distributed Systems Management

BMC Performance Manager and PATROL® solutions that manage IT infrastructure in distributed computing environments; SmartDBA solutions manage Oracle, DB2 UDB, MS SQL Server and Sybase databases. Distributed Systems Management solutions contributed 37%, 33% and 30% of license revenues in fiscal 2004, 2005 and 2006, respectively.

5.9.4 BMC/IDS Scheer

The integration of ARIS Business Architect from IDS Scheer with the BMC Atrium CMDB from BMC Software enables customers to understand how IT supports and impacts their business processes and accelerates their implementation of business service management (BSM). BMC Discovery for ARIS, developed by BMC in partnership with IDS Scheer, enables IT departments to discover business process models from ARIS Business Architect and map them with information on IT services and infrastructure stored in the BMC Atrium CMDB.

The ARIS Enterprise Architecture Solution from IDS Scheer enables companies to build, maintain and optimize organizational architectures. The integration of ARIS with the BMC Atrium CMDB enables customers to define relationships between the technology infrastructure, applications, and IT services.

The integration of Business Process models into the CMDB also helps IT departments fully realize the impact of changes in the IT infrastructure on a business process, or the change a business process might have upon the IT infrastructure. This integrated offering helps out with disaster recovery planning and risk management because all of the elements which comprise a critical service in support of a business process are now known so customers can identify single points of failure in their IT environment.

5.9.5 BMC/Identify

BMC Software acquires Identify. Identify Software Ltd. is a provider of application problem resolution (APR) software. BMC will continue to integrate Identify solutions into its transaction management offering, a high-growth area that is part of BMC's Business Service Management (BSM) strategy. BSM is a way to manage IT from the perspective of the business, an approach that analysts indicate is now going mainstream as companies and other organizations seek to reduce their IT costs and improve the quality and efficiency of IT services.

A leader in application problem resolution software, Identify's AppSight Application Problem Resolution System leverages patented Black Box technology solutions that enable hundreds of enterprises and software vendors to increase the speed of application delivery, increase application quality, performance, and availability, and reduce application support costs.

5.9.6 BMC Financial Data

BMC Software posted a nearly 500 percent year-over-year increase in operating income. BMC Software's non-GAAP net earnings for the fourth quarter of fiscal 2006 were \$76 million, representing a 775 percent increase over the year-ago quarter. Fiscal 2006 fourth quarter net earnings on a GAAP basis were \$66 million representing an over 300 percent increase over the year ago quarter.

Total revenues for the fourth quarter of fiscal 2006 were \$408 million, compared to \$395 million a year ago. Non-GAAP operating expenses declined by \$46 million (12%) to \$337 million. Non-GAAP operating income increased by \$59 million (500%) to \$71 million, and non-GAAP operating margin for the quarter increased from 3% in the prior year to 17%. BMC has \$1.34 billion in cash and marketable securities.

During the fourth fiscal quarter they continued their accelerated stock buy-back program, spending \$125 million to re-purchase 5.7 million outstanding shares. For fiscal 2006 the Company re-purchased a total of 20.5 million shares for \$411 million.

License bookings in the fourth quarter of fiscal 2006 were \$173 million, a decline of 11% from the year-ago quarter.

For fiscal 2007, the Company expects revenues will increase in the low to mid single digits. The Company expects fiscal 2007 cash flow from operations to range between \$400 million to \$450 million. For the first quarter of fiscal 2007, the Company expects revenues to be in the range of \$355 million to \$370 million.

(Dollars in millions)

YEARS ENDED MARCH 31:	2004	2005	2006	Percent Change 2005 vs. 2004	Percent Change 2006 vs. 2005
Product Line License & Maintenance Revenue					
<i>Mainframe Management</i>					
Mainframe Data Management	388.1	370.2	375.5	(4.6)%	1.4 %
MAINVIEW	143.7	125.4	123.7	(12.7)	(1.4)
	531.8	495.6	499.2	(6.8)	0.7
<i>Distributed Systems Management</i>					
PATROL	270.0	239.1	225.8	(11.4)	(5.6)
<i>Distributed Systems Data Management</i>					
Management	72.6	79.2	63.8	9.1	(19.4)
<i>Scheduling & Output Management</i>					
Management	139.0	144.6	150.0	4.0	3.7
	481.6	462.9	439.6	(3.9)	(5.0)
Service Management	291.6	387.5	439.1	32.9	13.3
Identity Management	28.8	24.8	27.9	(13.9)	12.5
Total Revenues	1,333.8	1,370.8	1,405.8	2.8 %	2.6 %

5.10 Cape Clear

Cape Clear Software provides a way to implement a Service Oriented Architecture. Cape Clear Software provides ESB. Based completely on Web services and open standards, and designed to work with your existing infrastructure. Cape Clear Software is a provider of ESB software, with over 200 customers. Founded in 1999, Cape Clear Software is a privately held firm with headquarters in Waltham, Massachusetts and offices in Dublin, London, and San Mateo.

Cape Clear Studio designs, develops, and deploys business services

Table 5-7 shows Cape Clear's Products.

TABLE 5-7

CAPE CLEAR PRODUCT

- Cape Clear ESB
- Cape Clear ESB for WebSphere
- Studio
- Server
- Data Transformer
- Orchestrator Manager

Source: WinterGreen Research, Inc.

Table 5-8 shows Cape Clear's Customers.

TABLE 5-8
CAPE CLEAR CUSTOMERS

- America Online
- Appium
- AT&T
- BNP Paribas
- British Sky Broadcasting
- DSL.net
- Halton Borough Council
- IMP, Inc.
- JPMorgan Chase & Co.
- Northrop Grumman Corporation
- Pearson Education
- Santa Clara County
- Sony

TABLE 5-8 (CONTINUED)

CAPE CLEAR CUSTOMERS

- Stratus Technologies
- Swisscom
- Vodafone
- Wolverine World Wide

Source: WinterGreen Research, Inc.

5.10.1 Partners

Cape Clear Solutions has the following partners: AE Business Solutions, Bearing Point, Booz Allen Hamilton, Ciber, Compuware, EDS, Ericsson, Escala Informática Ltda., Etnoteam, Fujitsu, Hewlett-Packard, Haverstick Consulting, Interlink Group, Japara Solutions, Kainos, Lockheed Martin, LogicaCMG, Northrop, and Grumman SAIC

5.10.2 Cape Clear Solutions

Cape Clear provides standards-based integration technology. They also have built-in support for telecommunications applications. This includes support for different data formats. Cape Clear is partners with other telecommunications vendors and solutions providers

Cape Clear Software provides the secure, standards-based integration technology to aid government organizations. Cape Clear has Enterprise Service Bus software, which is a standards-based platform for integrating existing data and applications, and for creating new services from these applications for government-to-government, government-to-business, and government-to-citizen programs.

Cape Clear's ESB provides support for financial services such as ACORD, SWIFT, and FIX. The ESB allows organizations to access to their applications, to have interoperability among different systems, and deliver products and services to customers, partners, and employees.

The ESB is an integration architecture that draws on the Service-Oriented Architecture and Web services standards to change both the technology and the economics of application integration and the development of business services.

5.10.3 Cape Clear/MrTed

MrTed Ltd selected Cape Clear 6.5 Enterprise Service Bus (ESB) to embed into their Talent Management Solution, MrTedTalentLink. The MrTed Software as a Service delivery model helps organizations acquire and deploy Talent on a local and worldwide scale.

Cape Clear will power MrTed's external and internal integration requirements globally. MrTedTalentLink provides clients with an end-to-end collaborative Talent Management Solution. This Solution manages talent through the entire HR workflow process and business applications. This enables the exchange of information between external HR service providers and internal business application software

Cape Clear is infrastructure agnostic it is easier to integrate any legacy or proprietary system. Cape Clear is fully integrated into the Eclipse-based IDE (Integrated Development Environment), which provides a unified and consistent view across the entire platform.

5.11 CAPE Systems

CAPE Systems is a leader in the packaging industry and is known for its technology in packaging design and palletization software. The CAPE Systems organization provides a full range of supply chain software solutions. The packaging programs optimize pallet patterns, create new case sizes and product packaging, and create bundles of ridged flat packs. CAPE also has RFID capability.

5.11.1 Services

CAPE offers a variety of services Systems integration, RFID compliance testing, packaging consulting, warehouse management consulting, warehouse layout and design, and various types of training.

5.11.2 Solutions

CAPE Systems offers solutions that help a product develop from concepts through different distribution centers. The CAPE products contain features that enable customers to configure solutions across many different industries. CAPE provides with the following industries: automotive/automotive aftermarket, consumer goods, corrugated and packaging, cosmetics and fragrances, food and beverage, high tech/electronics, pharmaceutical, postal services, retail, third party logistics wholesale, and wholesale.

5.11.3 Partners

Table 5-9 Shows CAPE Systems' partners.

TABLE 5-9
CAPE SYSTEM'S PARTNERS

- Novell
- Open
- Terra
- Intel
- Alien
- HP

Source: WinterGreen Research, Inc.

5.11.4 Products

CAPE's products are CAPE pack, Truckfill, CAPE eWMS, CAPE OFS, and the RFID Tag Locater.

5.12 EMC Documentum

EMC is a company that provides open, information infrastructures, which offer a wide range of systems, software, services and solutions. These services help organizations obtain greater value from their information.

EMC provides specialized virtual infrastructure and resource management software. Virtual infrastructure helps organizations respond to changing IT requirements by changing their computing and storage environments.

5.12.1 Products

EMC's produces the following products: EMC CLARiiON AX100 system, EMC Symmetrix DMX-3 3000, DMX-3, CLARiiON CX300, CX500, CX700, CLARiiON AX100i, CX300i, CX500i, EMC CLARiiON Disk Library, CLARiiON storage systems, Celerra NSX NAS gateway, Celerra NAS family of solutions, EMC Centera Content Addressed Storage, EMC PowerPath, EMC ControlCenter, EMC Visual families, EMC Smarts product family, EMC Invista, EMC RainStorage platforms, EMC NetWorker, EMC Replication Manager, EMC RecoverPoint, EMC Dantz Retrospect, EMC AlphaStor, EMC BackupAdvisor families, EMC AVALONidm, EMC ArchiveXtender, EMC DiskXtender families, EMC DatabaseXtender, EMC EmailXtender software families, EMC Captiva family, EMC RecoverPoint, EMC Backup Advisor , EMC Smarts MPLS Manager, Multi-Protocol Label Switching (MPLS), EMC ControlCenter SAN Advisor, and EMC Invista network storage virtualization platform.

5.12.2 Services

EMC's services segment includes their technology solutions, customer service and customer education. These services help customers plan, build and manage integrated IT infrastructures to run their business while protecting their information. EMC provides consulting, assessments, implementations, integration, operations management, day-to-day support, maintenance, education and training to its customers.

5.12.3 Solutions

The technology solutions group of EMC gives customers a range of consulting, design and implementation services to further aid their integration of ILM solutions. The technology solutions group provides experience in a few business practices. The first practice is consulting to help customers manage their multi-platform storage environments. The second practice is products and technologies for business continuity services, consolidation and migration services, network optimization services, performance services and integration services that help customers in building their information storage. The third practice is the managed services, which includes storage management services and support services.

5.12.4 EMC Acquires nLayers

The EMC Corporation acquired privately held nLayers. nLayers is a leader in application discovery and mapping software. The acquisition is not expected to have a material impact on revenues for 2006.

nLayers provides an appliance that identifies, maps and models the relationships and interdependencies between applications, servers and devices in a time. The technology is based on Application Behavior Modeling, a technology that discovers application components, resource dependencies, service levels and usage within data centers.

EMC would expect that nLayers, in the future, would enable EMC storage management software to determine a plan of action for critical problems across the entire IT infrastructure.

nLayers' Israel-based R&D operation will contribute to the overall efforts of EMC's recently created Israel Software Development Center.

5.12.5 EMC acquires Interlink

The EMC Corporation acquired Interlink Group, Inc. Interlink is an IT professional services firm. Interlink specializes in application development, IT infrastructure, enterprise integration, enterprise content management and customer relationship management. The acquisition contributes to the Microsoft-focused services that EMC created. The acquisition is not going to impact revenues for 2006.

5.12.6 EMC First Quarter Results

The total revenue for the first quarter of 2006 was \$2.55 billion, which is 14% higher than the \$2.24 billion reported for the first quarter of 2005. Net income for the quarter was \$272.5 million.

Net income for the first quarter of 2006, grew 28% to \$380.3 million compared with non-GAAP first-quarter 2005 net income of \$296.6 million. Systems revenue in the first quarter was \$1.23 billion, a 20% increase over the year-ago quarter.

EMC's multi-platform software revenue growth was led by sales of enterprise content management software. Excluding acquisition impact, enterprise content management software license revenue grew approximately 30%.

Revenues for the second quarter of 2006 are expected to be at least \$2.66 billion. Consolidated revenues for 2006 are expected to be between \$11.1 billion and \$11.3 billion. Current expectations are for revenues to be at the lower end of that range.

(in thousands)	Three Months Ended	
	March 31,	
	2006	2005
Revenues:		
Product Sales	\$ 1,848,530	\$ 1,620,503
Services	702,157	622,628
Total revenue	2,550,687	2,243,131

5.12.7 EMC Documentum 2005 Revenue

(Dollars in millions)

YEARS ENDED MARCH 31:				Percent Change 2005 vs. 2004	Percent Change 2004 vs. 2003
	2005	2004	2003	2004	2003
Revenues					
EMC Information Storage Products	5,702.1	4,979.9	4,206.4	15 %	18 %
EMC Multi-Platform Software	1,694.9	1,437.4	668.4	18	115
EMC Services	1,846.7	1,530.4	1,262.5	21	21
VMware	387.5	218.2	0.0	78	0
Other Businesses	32.8	63.6	99.5	(48)	(36)
Total Revenues	9,664.0	8,229.5	6,236.8	17 %	32 %

5.13 Envoy Technologies

Envoy Technologies provides connectivity software solutions for business plans that involve integration of business processes within various projects. Envoy's technology works with the connectivity needs of its customers.

5.13.1 Products

Table 5-10 Shows Envoy's products.

TABLE 5-10
ENVOY'S PRODUCTS

- Envoy Connect
- Envoy MQ
- Envoy XIPC
- Microsoft's MSMQ
- Biz Talk Server
- Message Connectors

Source: WinterGreen Research, Inc.

5.13.2 Partners

Envoy's Partners consist of HP Invent, Microsoft, Eforce, NCS Technologies, Fujitsu, Steria, Ness, Compucom, Catalyst, Diogenes, Faspac Systems, Inc., FMC Financial Models, FRI Technologies, Hypercom, Jones, Logica CMG, Naztec, and Passport.

5.13.3 Customers

Envoy's Customers are the following: Allstate, Bank of America, Canadian Pacific Railway, Carnival, Cosco, CSX Lines, CVS Pharmacy, DUPONT, Essilor, Henry Schein, Honeywell, IMS Health, Lockheed Martin, Merrill Lynch, Miller, Northrop Grumman, Occl, Sabre, SBS Southwestern Bell, Sprint, Telcordia Technologies, Wacker.

5.14 FileNet

FileNet manages organizations' content and processes that drive their business. Enterprise Content Management solutions enable customers gain a competitive advantage through managing information throughout the organization. FileNet has upwards of 4,000 customers, who have taken advantage of their solutions for managing their mission-critical content and processes.

FileNet invests significantly in product development in order to improve their content and process management abilities.

FileNet offers FileNet P8. FileNet P8 is a software platform and application development framework for Enterprise Content Management and Business Process Management. FileNet's software allows customers to capture, store, manage, secure and process information. FileNet software is designed to aid in the management and processing of all forms of content.

5.14.1 Strategies

FileNet is focused on platform abilities and feature improvements in its technology strategies in order to improve customers' ECM and BPM solutions capabilities. Marketing resources are concentrated to meet driving forces of customer demand: The categories of the customer demand are the drive for operational efficiency and cost reduction; improvement of end customer service; compliance with regulatory or legal requirements; and ECM platform standardization.

FileNet enhances their development efforts with technology acquisitions, including email management and eforms technology and integrated third-party technology. FileNet works to improve the delivery of their unified platform strategy. Additionally, they will continue their strategy of investing in product enhancements, new product development, new partnerships, and strategic acquisitions.

5.14.2 Customers and Markets

Enterprises address a content and process management needs organization. FileNet P8 architecture provides customers with the ability to control their ECM and BPM solutions. FileNet's customers are enterprises and government agencies that have complex business processes that capture, manage, store and share large volumes of electronic content. Software had been licensed to more than 4,000 customers around the world by the end of 2005.

Products are marketed all around the world through a direct sales force as well as through the ValueNet business partner program. The ValueNet program includes value-added resellers, independent software vendors, system integrators, consultants and service providers. Strategic alliances with industry leaders contribute to product development, solution delivery, customer satisfaction, and worldwide market penetration. The ValueNet program included approximately 300 firms

5.14.3 FileNet P8 Platform

The FileNet P8 architecture provides FileNet's customers with enterprise-level scalability and flexibility for content, business processes, integration, and analysis of content. The FileNet P8 architecture includes eight pre-packaged suites. Each of the suites emphasizes a different aspect of the ECM/BPM solution set. Solutions that are created on FileNet P8 are designed to manage content and business processes.

The FileNet P8 platform is the foundation for the family of ECM suites that include Business Process Manager, Content Manager, Email Manager, Forms Manager, Image Manager Active Edition, Records Manager, Team Collaboration Manager and Web Site Manager. All of the FileNet P8 suites are compatible so that each of the capabilities can be expanded by adding more suites. The suites can be integrated, and have the ability to run on a variety of operating systems, databases and applications servers.

5.14.4 Products

Table 5-11 illustrates the eight ECM suites that utilize the FileNet P8 platform.

TABLE 5-11

FILENET'S ECM SUITES

- FileNet Suites
- Business Process Manager
- Content Manager
- Email Manager
- Forms Manager
- Image Manager Active Edition
- Records Manager
- Team Collaboration Manager
- Web Site Manager

Source: WinterGreen Research, Inc.

The FileNet P8 architecture includes the technology for aiding in the development of ECM and BPM solutions. Table 5-12 lists the technologies that use the FileNet P8 for these ends.

TABLE 5-12

FILENET P8 TECHNOLOGIES

- Content Engine
- Process Engine
- FileNet P8 Workplace
- Java2 Platform Enterprise Edition (“J2EE”) Support
- Web Application Toolkit
- Image Services Resource Adapter (“ISRA”)
- Portal Integrations

Source: WinterGreen Research, Inc.

In addition to the FileNet P8 product suites and development tools FileNet offers software products that are available as stand-alone products. The stand-alone products include FileNet eProcess Services, FileNet Web Services/Open Client, FileNet Content Services, FileNet WorkFlo Services, FileNet Integrated Document Management Desktop, FileNet Image Services, FileNet Report Manager, FileNet Capture, FileNet Application Connector for SAP R/3, FileNet Application Connector for Siebel 7, FileNet System Monitor, FileNet Business Activity Monitor, FileNet Business Process Framework, FileNet Content Federation Services, FileNet Document Publisher, FileNet Site Publisher, and FileNet Records .

5.14.5 FileNet First Quarter 2006 Results

FileNet reported total revenues for the first quarter of 2006 were \$108.9 million, up nearly nine million dollars from the total revenues of \$100.0 million for the same period in 2005. Software revenues grew 17 percent from the same period in 2005. Software revenue was \$44.9 million this quarter compared to \$38.5 million for last year's first quarter.

Net income was \$7.6 million in the first quarter of 2006 as opposed to the first quarter of 2005 was \$8.3 million. Earnings per basic and diluted share were \$0.18 for the first quarter of 2006. Non-GAAP net income for the first quarter of 2006 was \$10.1 million, compared to \$8.5 million in the first quarter of 2005.

(in thousands, except per share amounts)	Three Months Ended	
	March 31,	
	2006	2005
Revenue:		
Software	\$ 44,853	\$ 38,451
Customer Support	48,988	48,333
Professional Services & Education	15,015	13,233
Total revenue	108,856	100,017

5.14.6 FileNet Revenue 2005

<i>(Dollars in thousands)</i>					
Fiscal Years Ended					
December 31:	2005	2004	2003	2002	2001
<i>Consolidated Statements of Operations Data</i>					
Revenues					
Software	167,223	154,279	149,214	132,508	119,014
Customer Support	196,926	188,011	167,230	157,550	146,410
Professional Services & Education	57,694	55,268	48,061	56,959	69,186
Total Revenues	421,843	397,558	364,505	347,017	334,610

Software revenue consists of fees earned from the licensing of software products to customers and partners. Software revenue increased by 8.4% in 2005 compared to 2004. The growth in software revenue was due to a stable climate for IT spending, continued market acceptance of FileNet P8 products and growth in product offerings.

Since the announcement of FileNet P8 products in 2003, they have expanded the FileNet P8 platform and offerings through acquisitions, licensing of third-party products and development of added features and functionality. For the years presented, approximately 90% of software revenue came from the installed base.

Customer support revenue consists of revenue from software maintenance contracts and time and material billings for services outside the terms of maintenance contracts. Support contracts entitle customers to receive technical support, bug fixes and upgrades to new versions of software releases when and if available. Customer support revenue is generated from maintenance contracts for current year software sales and from the renewal of existing maintenance contracts for previously sold software licenses on installed systems. Customer support revenue increased by 4.7% in 2005 compared to 2004. These increases in customer support revenue reflect an increase in overall customer-installed base from new sales combined with a high rate of renewal in the existing customer base. As the installed base grows, the renewal rate has a larger influence on customer support revenue growth than current software revenue growth.

Professional services and education revenue is earned by providing consulting services to customers for the design, implementation, deployment, upgrade and migration of software products, technical consulting services provided to resellers, and training services. No modifications are made to the standard base product code once the software has been sold. Professional services are usually performed on a time and material basis and are also generated from short-term fixed price packaged services. Professional services and education revenue increased by 4.4% in 2005 compared to 2004. Professional services and education revenue is dependent on the level and the nature of software sales, particularly new customer sales. Software sales that are characterized by repeat purchases for additional software licenses generate smaller engagements, fewer implementations and a lesser need for customer training classes. Customers continued to transition to FileNet P8 in 2005 resulting in comparable revenue to that of 2004.

FileNet has placed more emphasis on growing partner business to provide large-scale professional services to customers rather than expanding internal resources.

5.15 Fiorano

Fiorano is a leading provider of enterprise class business integration and messaging infrastructure technology. Fiorano products are used to develop real-time competencies and deploy business processes reaching multiple applications, platforms and partners.

Fiorano products offer an integration solution stack, which enables customers to utilize integration projects incrementally. Fiorano products are compatible with each other. Fiorano's offers service-oriented architecture.

5.15.1 Products

Fiorano provides an SOA platform with a Business Component Architecture. Customers of Fiorano can design solutions for problems using business components that use business logic, processes and data. Table 5-13 lists Fiorano's products.

TABLE 5-13

FIORANO'S PRODUCTS

- Fiorano SOA™ 2006 Platform
- Fiorano ESB™ 2006
- FioranoMQ™ 2006
- Fiorano BPEL™ 2006
- Fiorano Business Components & Adapters 2006
- Fiorano Process Orchestration Tools 2006
- Fiorano BPEL Editor 2006

Source: WinterGreen Research, Inc.

Fiorano SOA 2006 is an SOA platform for real-time business built on a Business Component Architecture. The Fiorano ESB is a web-services capable middleware infrastructure platform that supports intelligently-directed communication between SOA and EDA business components. FioranoMQ is a grid-enabled, peer-to-peer JMS messaging platform. Fiorano BPEL is an integrated process orchestration engine built on a Business Component Architecture. Fiorano Business Components are ready-to-use JCA-compliant components that include connectors for popular databases that can be used to put together an enterprise-class business processes communicating over JMS. The Fiorano Process Orchestrators are integrated tools that allow clients to orchestrate standards-based Business Components to deploy distributed business processes. The Fiorano BPEL Editor is a standalone tool that allows developers to work on BPEL processes using Business Components.

5.15.2 Customers

Fiorano's customers include a number of the respected companies such as AT&T Wireless, American Express, Motorola, Federal Express, Boeing, Qwest Communications, KPMG, JP Morgan, and Pohang Steel Company (POSCO). Fiorano's infrastructure solutions have been used in the manufacturing, healthcare, financial services, communications, electronic commerce, transportation, government, automotive, energy and defense industries.

5.15.3 Partners

Fiorano has corporate affiliations in five partnership categories. Table 5-14 lists those categories.

TABLE 5-14

FIORANO PARTNER CATEGORIES

- Value Added Resellers (VARs)
- System Integrators & Consultants
- Technology Partners
- OEM Partners
- Volume Distributors & Resellers

Source: WinterGreen Research, Inc.

5.15.4 Fiorano / Improvise Technologies

Fiorano has a strategic partnership with Information Technology support and services specialist Improvise Technologies Inc. The partnership addresses growing demand for SOA based solutions.

The partnership combines Fiorano's ESB-based integration technology with Improvise Technologies consultants' knowledge about SOA based solutions. Improvise has customers in the Fortune 500 as well as government agencies such as the Department of Defense, Department of Justice, National Security Agency, Defense Information Systems Agency, NASA, State Department and Defense Security Service.

Fiorano's service oriented architecture is compatible with Improvise's desired integration requirement.

Improvisive Technologies is a corporation headquartered in Annapolis Junction, M D. The company specializes in information technology services to the U.S. Government and Commercial industries. Improvisive's areas of expertise are Operations Support, Systems Integration, Information and Engineering Services, Strategic Business Consulting, e-Learning and Training Services, as well as other services.

5.15.5 Fiorano / IntegraSolv

Fiorano and IntegraSolv made a technology partnership to deliver end-to-end service network visibility across SOA deployment. IntegraSolv is a provider of Owl Service Op-Center management software for management of networked services. The coupling of each of the companies' technologies provides companies with the ability to automate their operational.

Enterprises can benefit from IntegraSolv's product Owl's service network visibility and run-time governance in conjunction with Fiorano SOA 2006 platform. The combination enhances the monitoring and analysis of business with only minimal impact on system performance.

IntegraSolv is a private corporation based in New Jersey. IntegraSolv offers its customers real-time monitoring and control of business-critical services and applications to global financial firms. IntegraSolv has a list of customers that includes securities firms worldwide.

5.15.6 Fiorano / Asidua

Fiorano and Asidua Ltd, an Application and Data Integration specialist, have joined in a strategic relationship. Fiorano will be able to market its ESB Technology throughout the United Kingdom and Republic of Ireland.

Asidua Ltd is based in Belfast and guides large public and private organizations through business process management and application integration programs using integration hubs and brokers.

Fiorano and Asidua will collaborate to address the growing demand for SOA based solutions. The functionality of Fiorano's SOA 2006 Platform is complemented by Asidua's consultants who work in application and data integration. Asidua has experience in a number of industries including telecom, criminal justice, and health.

5.16 Fujitsu

Fujitsu is a provider of customer-focused information technology and communications solutions for the world market. Fujitsu uses new technologies, computing and communications products. By using its resources, Fujitsu is able to provide solutions to help their customers' problems.

5.16.1 Services

Fujitsu offers three main services. The first service is consulting. Fujitsu consultants help transform businesses and undertake business change programs that address people, processes and technology. The second service is systems integration, which enables a business to spend more time on business strategy and less on the management, support and troubleshooting of applications. The last service is IT infrastructure management. This service helps individual business to understand how their IT infrastructure can be developed and managed to support the transformation of their business.

5.16.2 Products

Table 5-15 Shows Fujitsu's product categories.

TABLE 5-15

FUJITSU'S PRODUCTS CATEGORIES

- Computing Products
- Software
- Telecommunications
- Microelectronics and Electronic Devices

Source: WinterGreen Research, Inc.

The following are the computing products: personal computers, servers, storage, and peripherals. The software products are middleware application infrastructure, middleware systems and network management, middleware databases, and middleware certification program. The Telecommunications products are mobile and wireless networks, optical networks, switching, and submarine networks. The electronic devices are ASICs, MPU/MCU, ASSP's, system memory, electromechanical components, and optical components.

5.16.3 Fujitsu Acquires Rapidigm

Fujitsu acquired Rapidigm, Inc, an information technology consulting and integration firm focused on application development, deployment and management.

5.16.4 Fujitsu 2005 Revenue

Fujitsu reported net sales of 4,791.4 billion yen (approximately US\$40,605 million) for 2005, which is a slight increase over the net sales recorded in the previous year. The business results outside of Japan include sales of optical transmission systems in North America, outsourcing services in the UK, and hard disk drives in their overseas market. All of these sales helped to offset a decline in sales in servers and PCs in Japan.

The increase in operating income, together with improvement in other income and a lower income tax burden, enabled Fujitsu's net income to more than double, to 68.5 billion yen (US\$581 million), compared to 31.9 billion yen in 2004.

The net sales in the technology solutions segment, which includes system and network products and services, increased 1.7% over 2004, to 2,983.9 billion yen (US\$25,288 million) in 2005. The operating income for the Technology solutions segment was 164.2 billion yen (US\$1,392 million), an increase of 22.1 billion yen over the previous year. Net sales in PCs, mobile phones, hard disk drives, and various other products, were 1,059.9 billion yen (US\$8,982 million), an increase of 2.8% over 2004.

The net sales of device solutions were 707.5 billion yen (US\$5,996 million), a decrease of 11.0% compared to 2004. Excluding the impact of the transfer Fujitsu's flat panel display businesses last fiscal year, results on a continuing operations basis increased by 0.5%. In the LSI Devices sub-segment, memory sales decreased as a result of intensifying competition, but the market for logic chips strengthened. Operating income for Device Solutions was 33.3 billion yen (US\$282 million), an increase of 0.7 billion yen compared to the previous year.

<i>(Yen in millions)</i>			
	FY 2005	FY 2004	Percent
	(4/1/05 - 3/31/06)	(4/1/04 - 3/31/05)	Change
Technology Solutions	2,983,942	2,934,418	1.7 %
Ubiquitous Product Solutions	1,059,923	1,031,415	2.8
Device Solutions	707,537	794,797	(11.0)
Other Operations	447,356	377,227	18.6
Elimination	(407,342)	(375,098)	-
Total Y	4,791,416	4,762,759	0.6 %

5.17 GoAhead

GoAhead Software builds middleware for a variety of systems. GoAhead sells to industries that want to develop reliable systems. The markets that GoAhead gears its products towards are primarily communications, military/aerospace and industrial controls.

5.17.1 Customers

GoAhead's customers are Motorola, Honeywell, Alcatel, Samsung, UT Starcom, NRI, Kineto Wireless, Lucent Technologies, NTT Comware, Italtel, Blueslice Networks, Sonim Technologies, Inc. Sandial, NASA, SIRF, Lockheed Martin, BridgePort Networks, NAVY, ANDREW, OKI, and Welltech.

5.17.2 Partners

Montavista, TimesTen, Ultico, Wind River, Ulticom, Solid, Motorola, Kontron, HP, and RadiSys.

5.17.3 Products

GoAhead's main line of products is their GoAhead SelfReliant software. These products are the SelfReliant Basic Availability Management, and the SelfReliant Advanced Suite. Another of GoAhead's products is GoAhead WebServer 2.1

5.18 GXS

GXS is a provider of business-to-business EDI and supply chain integration, synchronization and collaboration solutions. They operate global a network services platform allowing customers to conduct business together in real time.

GXS offers a range of outsourced EDI and supply chain management solutions to aid companies in connections worldwide with their business partners, synchronizations of product and price information, optimization of inventory control management and demand forecasts, and speed the overall performance of their global supply chains.

GXS provides supply chain management and business-to-business EDI technologies and solutions. GXS offers a global network services set up which is used by 40,000 to perform daily business initiatives. GXS EDI and supply chain integration allows companies to interact globally with partners. These same technologies also manage product and price information, while supervising inventory and making predictions on the movements needed for effective outsourcing. GXS was acquired by the Francisco Partners of General Electric Company in June 2002 and is an independent business. A small portion of GXS is still maintained by GE.

5.18.1 Industry

GXS work in the supply chain integration industry. Supply chain management lets information discussing the exchange of products and services between partners. Electronic data interchange (EDI) enables electronic exchange of information heterogeneous applications, data formats and communications systems. GXS is moving from EDI to more recent integration technologies.

Traditional Value-Added Networks let communities connect by providing solutions that offer greater automation in business procedures. Partner relations are important because it helps businesses in inventory supervision, order management, price, payment and sales management. Companies like GXS are creating solutions that allow clients to automate business processes with trading partners. GXS provides integration services with EDI and even data transfer, partner administration, and integration and application services that permit data and business processes sharing with their business partners. Companies use GXS interact with global trading partners, manage integration functions, and send and receive data to and from partners. Business integration services provider let companies offer customers data quality.

5.18.2 Products

GXS offers products and solutions such as Global Messaging, B2B Gateways, B2B Accelerators, Visibility solutions, Data Integration applications, and B2B Outsourcing solutions. GXS extensive list of products includes their Accounting Package Accelerator, Data Pool Accelerator, Desktop EDI, Edisoft Merchant, Edisoft Merchant Express, Intelligent Web Forms, Network Based Translation, RFID Accelerator, Service Bureau, Application Integrator, BizTalk Server, Enterprise Gateway, Partner Gateway, AS2, Solution Portfolio, Interchange Services, Network-Based Translation, Tradanet, Managed Services, Community Link, 1SYNC Onboard Support, Data Pool Manager, Data Sync Consulting Services, Product Information Manager Express, Product Information Manager Retailer Edition, Product Information Manager Supplier Edition, Data Pool Accelerator, RFID Accelerator, Inventory Visibility, Logistics Visibility, and their Order Lifecycle Visibility.

5.18.3 Discussion of Strategy

GXS wishes to expand business with making a profit offering information integration management systems and services to customers while being a leader in the supply chain integration industry. GXS' business strategy includes expand their market presence, increase their customer penetration, convert their customers to multi-year contracts, pursue strategic cost transformation opportunities, and broaden their suite of innovative solutions.

5.18.4 Acquisitions

GXS acquired G International in January of 2005. G International Inc. was set up to manage IBM Corporation's Business Exchange Services and EDI technologies. The acquisition of G International is aimed to widen GXS customer base, offer more business solutions, improve position in some industries and reduce business costs.

5.18.5 Partners

Table 5-16 lists GXS' partners.

TABLE 5-16
GXS' PARTNERS

- ACT Data Services
- Agentrics LLC
- Autonomy
- Cleo Communications
- Covast
- eBRIDGE Software
- ektron
- epcSolutions
- SilkRoad
- Symbol Technologies
- VeriSign
- Welocalize
- Zebra Technologies

Source: WinterGreen Research, Inc.

5.18.6 Customers

GXS has customers in industries such as automotive, manufacturing, consumer products, and retail. GXS clients combined with G International's customers make up a majority of the Fortune 500. Most GXS customers have multi-year contracts to maintain revenue consistency.

5.18.7 Microsoft / GXS

Microsoft names the GXS Trading Grid the recommended global B2B network for BizTalk Server

Microsoft Corp. and GXS created a strategic alliance to market innovative solutions for integration between trading partners. The alliance concentrates on allowing B2B integration initiatives across global supply chains. The solution uses a combination of software and services that includes Microsoft BizTalk Server 2006, SQL Server 2005, the 2007 Microsoft Office system and GXS Trading GridSM. Both of the companies will market their leading B2B solutions to help organizations build B2B networks that connect their trading partners across supply chains.

GXS will use Microsoft's technology in its GXS Trading Grid for the speed and simplicity it brings to integration between businesses.

GXS has developed a Grid-Ready solution using BizTalk Server 2006. The use of Microsoft BizTalk Server 2006 with the GXS Trading Grid provides businesses with a platform spanning the desktop, server and services software. A BizTalk Server 2006-based Grid Ready solution provides customers with a way to integrate simultaneously.

Microsoft also named the GXS Trading Grid the recommended global B2B network for BizTalk Server 2006. Microsoft and GXS will work together on integration between the desktop and the supply chain as well.

5.19 HP

HP is a provider of products, technologies, solutions and services to individual consumers, small and medium sized businesses and large enterprises. They offer the following product lines: enterprise storage and servers, multi-vendor services, including technology support and maintenance, consulting and integration and managed services, personal computing and other access devices, and imaging and printing-related products and services. HP revenue totaled \$88.9 billion.

HP was incorporated in 1947. In 2002 HP acquired Compaq Computer Corporation, which significantly expanded their product offerings, increased overall scale and reach, drove substantial improvements in cost structure and generally improved competitive position.

5.19.1 Products

Their operations are organized into seven business segments: Enterprise Storage and Servers, HP Services, Software, the Personal Systems Group, the Imaging and Printing Group, HP Financial Services, and Corporate Investments. In each of the past three fiscal years, desktops, printing supplies and technology services each accounted for more than 10% of consolidated net revenue. In fiscal 2004 and 2005 industry standard servers and notebooks each accounted for more than 10% of our consolidated net revenue.

5.19.2 Consulting and Integration

HPS provides consulting and integration services that help customers measure, assess and maintain the link between business and IT, and design and integrate the customers' infrastructure. HP helps customers align, extend and manage applications and business processes. HP has solutions that benefit supply chain, business portals, messaging and security.

HP offers IT management services. These services include comprehensive outsourcing, transformational infrastructure services, client computing managed services, managed web services, application services, business process outsourcing, business continuity and recovery services.

5.19.3 HP Financial Data

HP's GAAP net income for the quarter was \$1.9 billion. Non-GAAP net income was \$2.0 billion. HP utilized \$1.3 billion of cash during the second quarter to repurchase approximately 40 million shares of common stock. HP received 7 million shares of common stock under the company's prepaid variable share purchase program. HP exited the quarter with \$14.1 billion in gross cash, which includes cash and cash equivalents of \$14.0 billion, short-term investments of \$12 million, and certain long-term investments of \$18 million. Inventory ended the quarter at \$6.8 billion. GAAP operating profit of \$1.7 billion, or \$0.51 earnings per share, up from \$0.33 in the prior year period. Non-GAAP operating profit was \$1.8 billion. Cash flow from operations of \$3.6 billion. HP had a net revenue of \$22.6 billion, representing growth of 5% year-over-year.

For FY06, GAAP diluted EPS is expected to be in the range of \$2.02 to \$2.06, and non-GAAP diluted EPS is expected to be in the range of \$2.19 to \$2.23.

5.19.3.1 Revenue by Geographic Region

During the quarter, on a year-over-year basis, revenue in the Americas grew 10% to \$9.7 billion, revenue in Europe, the Middle East and Africa declined 2% to \$9.0 billion, and revenue in Asia Pacific grew 7% to \$3.9 billion.

5.19.3.2 Personal Systems Group

Personal Systems Group revenue grew 10% year-over-year to \$7.0 billion, with unit shipments up 16%. Desktop revenue increased 1% and notebook revenue grew 27%. Commercial client revenue grew 3% year-over-year, while Consumer client revenue increased 24%. Operating profit was \$248 million up from a profit of \$147 million in the prior year period.

5.19.3.3 Imaging and Printing Group

Imaging and Printing Group (IPG) revenue grew 5% year-over-year to \$6.7 billion. Supplies revenue grew 10%, commercial hardware revenue grew 4% and consumer hardware revenue declined 8%. Operating profit was \$1.0 billion up from a profit of \$814 million.

5.19.3.4 Enterprise Storage and Servers

Enterprise Storage and Servers reported revenue of \$4.3 billion, up 2% over the prior year period. Industry-standard server revenue increased 4%, with blade revenue growth of 60%. Networked storage revenue grew 8%. Business critical systems revenue declined 7%. Operating profit was \$322 million up from a profit of \$180 million.

5.19.3.5 HP Services

HP Services revenue declined 2% year-over-year to \$3.9 billion. On a year-over-year basis, revenue in Technology Services declined 4%, Consulting and Integration revenue declined 2% and Managed Services revenue grew 2%. HPS revenue grew 2% year-over-year. Operating profit was \$345 million, up from a profit of \$292 million.

5.19.3.6 Software

Software revenue was \$330 million, an increase of 20% year-over-year, with revenue in HP OpenView and HP OpenCall increasing 25% and 11%, respectively. Operating profit was \$3 million compared with a loss of \$2 million in the prior year period.

5.19.3.7 Financial Services

HP Financial Services reported revenue of \$518 million, a decrease of 5% year-over-year. Finance volume decreased 14% over the prior year period, and net portfolio assets grew 1%. Operating profit was \$39 million down from a profit of \$58 million.

5.19.4 HP 2005 Revenue

<i>(Dollars in millions)</i>			
Fiscal Years Ended			
October 31:	2005	2004	2003
Net Revenue			
Products	68,945	64,046	58,779
Services	17,380	15,470	13,815
Financing Income	371	389	467
Total Net Revenues	86,696	79,905	73,061

5.19.5 HP/TIBCO

HP and TIBCO Software, Inc. having integrated HP's HP-UX 11i operating system on the UNIX platforms for TIBCO global customers. The relationship extends the market reach of HP Integrity servers running HP-UX 11i. It will help enterprises optimize IT operations for business process management and service-oriented architecture deployments.

TIBCO's leading SOA and BPM solutions will port to HP Integrity servers. Initial efforts to port TIBCO Staffware Process Suite and the upcoming "Project Matrix" SOA offering are currently underway, while TIBCO Businessworks, TIBCO Rendezvous, and a number of TIBCO Adapters already support HP Integrity servers running HP-UX 11i.

5.20 i2

i2 is a provider of multi-enterprise supply chain management solutions, supply chain software and service offerings. The goals of their solutions are increasing supply chain efficiency, managing variability, reducing complexity, improving operational visibility, increasing operating velocity and integrating planning and execution. They offer data management technology, which is designed to collect, synthesize and distribute critical reference data by leveraging a service oriented architecture. They have more than 500 customers. However, no customer has accounted for more than 10% of total revenues during 2005, 2004 or 2003. i2 was founded in 1988. i2 provides an integration framework utilizing service-oriented architecture, the Agile Business Process Platform.

5.20.1 Distributed Fulfillment and Revenue Management.

i2's distributed order execution technology has developed integrated, closed-loop planning and execution solutions. This technology provides a framework for creating new solutions and is used by customers transaction processing, visibility and event management capabilities. It also helps customers optimize merchandising, revenue and pricing.

5.20.2 Supply and Demand Synchronization

i2's supply chain management solutions focus on the multi-echelon value chain. The next-generation solutions are designed to enable businesses to manage and tune their supply chains simultaneously to meet their business needs. These solutions are built on the i2 Agile Business Process Platform, a service-oriented architecture that includes a layer of technology services for integration and data management, user interface development and a visual business process workflow engine. The platform is business process management compliant and is designed to interoperate with legacy, ERP and other enterprise architectures.

5.20.3 Products

i2's primary products are focused on optimizing the following business processes: supply and demand management, execution and collaboration, transportation and distribution management, supplier relationship management, and management and analytics.

5.20.3.1 Execution and Collaboration

i2's solutions to optimize, plan, execution and collaboration help businesses integrate the planning and execution processes, creating a closed-loop environment. These solutions have tools designed to stage inventory, plan replenishment, manage orders and provide visibility. The i2 Collaborative Supply Execution solution is made to, provide inventory and plan collaboration, transaction processing, visibility, event management, integration and workflow capabilities. Other solutions in this category include i2 Supply Chain Visibility, i2 Customer Order Fulfilment, i2 Collaborative Replenishment and i2 Configurator.

5.20.3.2 Data Management and Analytics

They offer a data management solution that provides customers with the ability to manage data from multiple sources including legacy, ERP and other applications. i2 Master Data Management can be deployed to create and maintain application-specific data, to consolidate data from multiple disparate sources; to cleanse, transform, synchronize and validate data, and to filter unwanted data.

5.20.4 i2's Financial Data

Total revenue for the first quarter of 2006 was \$64.0 million, as compared to \$81.9 million in the first quarter of 2005. i2 had total first quarter software solutions revenue of \$16.9 million. Services revenue in the first quarter was \$23.9 million, compared to first quarter 2005 services revenue of \$27.6 million. First quarter maintenance revenue was \$23.2 million, a decrease of about \$2 million from 2005. Total costs and expenses for the first quarter of 2006 were \$59.8 million. This compares favorably to \$101.3 million in the first quarter of 2005. The company reported first quarter 2006 net income of \$1.8 million.

On March 31, 2006, i2's total cash totaled \$115.1 million. Total debt at the end of the first quarter was \$107.2 million. The company experienced negative cash flow from operations of \$8.0 million in first quarter 2006.

i2 expects operating revenue in 2006 to be below the 2005 amount. Software solutions revenue is expected to be lower than previous expectations. Services revenue has not increased as quickly as anticipated. Earnings per share are still expected in the range of \$1.00 to \$1.20 because operating expenses have greatly decreased due to last years restructuring.

(in thousands, except per share amounts)	Three Months Ended	
	March 31,	
	2006	2005
	(unaudited)	(unaudited)
Revenue:		
Software Solutions	\$ 16,922	\$ 25,409
Services	23,874	27,627
Maintenance	23,214	25,818
Contract	33	3,057
Total revenue	64,043	81,911

5.20.5 i2 Revenue 2005

(Dollars in thousands)

Fiscal Years Ended	2005	2004	2003	2002	2001
December 31:					
Revenues					
Software Solutions	89,937	54,155	61,115	68,034	166,032
Services	103,792	118,731	141,953	146,770	222,820
Maintenance	100,612	116,765	136,097	144,718	151,943
Contract	42,526	72,877	126,488	514,602	300,916
Total Revenues	336,867	362,528	465,653	874,124	841,711

5.20.6 i2/RiverOne

i2 has acquired the assets of RiverOne, Inc. RiverOne's software helps high-tech companies manage and control partner-based business operations. RiverOne's customers, focused in electronics, ranged across all supply chain roles and sizes from small subsystem OEMs to the largest EMS providers.

The next generation of supply chain solutions must address multi-enterprise business processes and the acquisition of RiverOne's software enables i2 to add a multi-enterprise execution platform that extends their supply chain collaboration capabilities. This also helped to boost i2's market share in electronics manufacturing.

RiverOne's INTERACTIVE software solution is designed to enable business processes at the supply chain level, delivering integrated execution, multi-tier planning, and shared metrics through a single, multi-company business application. RiverOne's Multi-Enterprise Control Systems establish shared processes, metrics and data among trading partners to plan and execute supply chain programs to achieve a single version of the truth.

5.21 Infravio

Infravio is The SOA Governance Company. Infravio's product, X-Registry Platform enables organizations to deliver Software as a Service and Business Services both internally and to customers, suppliers and partners. The X-Registry Platform consists of a UDDI version 3 Registry, an SOA Policy Repository and powerful SOA Lifecycle Governance features.

Infravio was founded in 1999. The company began with the patents for Contract-Based Enterprise Software Delivery, the technology underlying Service Delivery Contracts. The company is headquartered in Cupertino, California. Its primary development center is in Chennai India.

Infravio works on mission critical projects enterprise Service-Oriented Architectures. Infravio created Intentional SOA to get the best business value out of SOA. A key aspect of Infravio's solutions is the Service Delivery Contract, an X-Registry Platform that controls Services across the lifecycle while managing Service availability and performance. Service Delivery Contract, a X-Registry Platform that controls services across the lifecycle while managing service availability and performance.

Table 5-17 shows Infravio's products.

TABLE 5-17

INFRAVIO'S PRODUCTS

- Infravio X-Registry Platform Catalog Edition
- Infravio X-Registry Platform Governance Edition
- Infravio X-Registry Platform Partner Edition
- Management Console
- NetIQ's AppManager for Web Services (.NET)

Source: WinterGreen Research, Inc.

5.21.1 Partners

Infravio has partnered with the following companies: NetiQ, AmberPoint, Layer7, SOA Software, hp, Forum Systems, SAP NetWeaver, IBM, SRA, ipt, Lockheed Martin, AgilePath, LogicBlaze, and Netegrity.

5.22 Inovis

Inovis is a provider of integrated B2B solutions and services that manage e-commerce information for global trading communities. Inovis has been present in the B2B and EDI marketplace for 20 years. Inovis addresses industry tasks such as global data synchronization, mandate compliance, transaction management and global trade management. Inovis has a portfolio of data transformation and synchronization, B2B trading partner and connectivity, integration and real-time business activity monitoring solutions. With the integration of B2B, Inovis aids in the synchronization of services.

Inovis utilizes EDI as well as newer technology such as XML, Internet EDI and web services. Specialized offerings for the automotive, financial services, petrochemicals, retail/consumer goods and technology manufacturing markets, are also available.

The summer following its debut, Inovis acquired IPNet Solutions, a provider of Internet-based EDI integration and supply chain connectivity software. IPNet's BizManager products expanded the Inovis' existing B2B solution offerings, adding support for AS2 and other Internet EDI protocols.

5.22.1 Products

Table 5-18 describes Inovis' products.

TABLE 5-18
INOVIS' PRODUCTS

- TrustedLink
- TrustedLink iSeries
- TrustedLink Windows
- BizManager
- BizLink
- MailLink
- BizWeb
- BizConnect
- BizManager4000
- SecureLink

Source: WinterGreen Research, Inc.

5.22.2 Inovis Acquires QRS Corporation

In November 2004, Inovis completed its acquisition of QRS Corporation, a provider of commerce solutions with approximately 9,800 retail and manufacturing customers.

Inovis, a provider of business-to-business solutions and services, announced that it has finished its acquisition of QRS Corporation.

The combined company, which will continue under the Inovis name, serves around 20,000 customers and provides software, managed services, a valued-added network (VAN), an electronic catalogue, professional services and secure Internet-based transactions.

5.22.3 Partners

Inovis' partners are as follows: BEA, DataDirect, Hewlett Packard, IBM, Install Shield, RSA Security, Seagull Software, UCCNet, IFS, Infor, Mapics, Microsoft, Oracle, PeopleSoft, SSA, and Tourtellotte Solutions.

5.23 Interwoven

Interwoven, Inc. provides enterprise content management software and services that enable businesses to create, review, manage, distribute and archive critical business content. Interwoven's products can be used to improve customer experience, streamline information technology processes, and manage compliance mandates. More than 3,400 enterprises have licensed their software solutions and products. Interwoven was founded in California in 1995.

Table 5-19 shows Interwoven's solutions

TABLE 5-19

INTERWOVEN'S SOLUTIONS

- Content Provisioning Solution
- Deal Management
- Electronic Content Management for Accounting Firms
- Matter-Centric Collaboration for Law Firms
- Over-the-Counter Derivatives Documentation Automation
- SalesSite

Source: WinterGreen Research, Inc.

5.23.1 Products

Customers deploy Interwoven products for enterprise initiatives such as brand management, document management, collaboration, enterprise portals, intranet and extranet management, global Web content management, content distribution, corporate governance and online self-service. Interwoven's ECM platform is developed on a service-oriented architecture, enabling customers to integrate products with existing infrastructures.

5.23.1.1 Document Management

Interwoven's WorkSite Collaboration and Document Server allow customers to capture, develop, manage, review, approve and archive documents. The goal of WorkSite is to make document management more efficient by providing access to specific data and also providing context such as additional documents, tasks, calendar items and team e-mail.

5.23.1.2 Web Content Management

Interwoven TeamSite is a web content management software for the enterprise. TeamSite underlies the enterprise applications of intranets, internal portals, public Web sites, dealer portals and extranets.

5.23.1.3 Digital Asset Management

MediaBin Asset Server provides businesses with a central library for digital assets. MediaBin can catalog, manage, transform and deploy digital assets.

5.23.1.4 Content Intelligence

Interwoven MetaTagger Content Intelligence Server drives content relevance for portals, enterprise search and business applications. The MetaTagger Content Intelligence Server provides enterprises with a metadata management system that is designed deliver the right content to the right user at the right time in the right context.

5.23.1.5 Content Distribution

Interwoven OpenDeploy Distribution Server provides aggregation and distribution of any type of content to any application within a network.

5.23.1.6 Content Integration

Interwoven Content Integration Server gives enterprises the ability to leverage and re-purpose content stored in repositories and file systems throughout the enterprise within content-rich applications. The Content Integration Server can leverage content from other applications including IBM Content Management, Lotus Notes and FileNet.

5.23.2 Customers

Interwoven's software products and services are for a broad range of industries. They have more than 3,400 companies licensing their software products. No single customer accounted for ten percent or more of total revenues in 2005, 2004 or 2003. Revenues from customers in the United States of America accounted for 68%, 66% and 65% of total revenues in 2005, 2004 and 2003. The following is a list of some of Interwoven's customers: 3M, Allstate, Avaya, Avon, Bank of America, BellSouth, Blue Cross Blue Shield of Mississippi, BT, Capital One, Heidelberger Druckmaschinen, Iron Mountain, NEC Electronics America, Novartis, Principal Life Insurance, Sky Italia, Sony, Symantec, Tesco, Toyota Financial Services, Cetrulo & Capone, Fitzpatrick Cella Harper & Scint, Halloran & Sage, John L. Wortham & Son, Littler Mendelson, Minter Ellison, Powell Goldstein, and Wilmer Cutler & Pickering Hale.

5.23.3 Interwoven's Acquisitions

In 2005, Interwoven acquired Scrittura, Inc. a provider of document automation software for the non-exchange-based trading operations of financial services companies. The aggregate purchase price of this acquisition was \$18.1 million. In 2004, Interwoven acquired certain assets and assumed certain liabilities of Software Intelligence, Inc. a provider of records management systems. The aggregate purchase price of this acquisition was \$1.6 million. In 2003, they merged with iManage, Inc. a provider of collaborative document management software. The aggregate purchase price of the acquisition was \$181.7 million. In 2003, Interwoven acquired MediaBin, Inc. MediaBin develops standards-based enterprise brand management solutions to help companies manage, produce, share and deliver volumes of digital assets. The aggregate purchase price of the acquisition was \$12.9 million.

5.23.4 Interwoven's Financial Data

Interwoven had total revenues of \$46.5 million for the first quarter of 2006. GAAP net loss for the first quarter of 2006 was \$1.4 million. Non-GAAP net income was \$3.6 million for the first quarter of 2006. At the end of the first quarter of 2006, Interwoven had cash and investments of \$143.1 million.

(in thousands, except per share amounts)	Three Months Ended March 31,	
	2006	2005
Revenues:		
License	\$ 17,569	\$ 16,417
Support & Service	28,889	26,068
Total revenues	46,458	42,485

5.23.5 Interwoven 2005 Revenue

<i>(Dollars in thousands)</i>					
YEARS ENDED DECEMBER 31:				Percent Change 2004 to 2005	Percent Change 2003 to 2004
	2005	2004	2003		
Revenues					
License	67,754	67,341	45,936	1 %	47 %
Percentage of Total Revenues	39%	42%	41%	-	-
Support & Service	107,283	93,047	65,576	15	42
Percentage of Total Revenues	61%	58%	59%	-	-
Total Revenues	175,037	160,388	111,512	9 %	44 %

Total revenues increased 9% from \$160.4 million in 2004 to \$175.0 million in 2005. The increase in total revenues was due to an increase in customer support revenues from larger installed base of customers purchasing support contacts and an increase in consulting revenues. Sales outside of the United States represented 32% of total revenues in 2005.

License revenues increased 1% from \$67.3 million in 2004 to \$67.8 million in 2005. The increase in license revenues for 2005 over 2004 was due to sales of software solutions, offset by reduced license revenues from European operations. The average license transaction size for sales in excess of \$50,000 was \$165,000 in 2005. In 2005, they had four individual license transactions in excess of \$1.0 million. License revenues represented 39% of total revenues in 2005.

Support and service revenues increased 15% from \$93.0 million in 2004 to \$107.3 million in 2005. This increase was due to higher support revenue from larger installed base of customers purchasing support contracts and higher consulting revenues.

5.23.6 Interwoven / Data Builder

Interwoven, Inc. a provider of Enterprise Content Management solutions for business and Data Builder Inc. a leader in document management software and services for general contractors and building owners, entered a partnership under which Data Builder is using Interwoven WorkSite Document Management as the basis for a new electronic project control system for the construction industry. This control system helps general contractors to manage documents and workflow from pre-construction through post construction. Data Builder e-PCS leverages Interwoven Document Management to meet business specific needs of the construction industry, enabling general contractors and building owners to provide an enhanced customer experience through operational efficiency. The advantage of the e-PCS is that all authorized project team members can view complete project documentation via a Web-based interface at any time, from any location.

5.24 IONA

For more than a decade, IONA Technologies (NASDAQ: IONA) has been a provider of integration solutions for Global 2000 IT environments. IONA aided in the advancement of standards-based integration with its CORBA-based Orbix products. Artix, IONA's Enterprise Service Bus, allows existing enterprise systems to be integrated with an organization's common infrastructure components. IONA's support of the ObjectWeb Celtix open source ESB helps solve integration problems by leveraging open standards and distributed architectures.

5.24.1 Products

IONA has been a part of the Java community since 1995. In that year, IONA released OrbixWeb, the first commercial Java CORBA ORB. The majority of IONA's CORBA customers use the Java version of the enterprise CORBA product, Orbix.

IONA has also helped the Java community through participation in various standards bodies, including the Object Management Group (OMG) and the Java Community Process (JCP). IONA has extended its support and services to enterprise users of JBoss.

5.24.2 Partners

IONA's partners are as follows: AmberPoint, BearingPoint, CGI, CSC, Industria, MetaSecure, NEC, Perficient, Satyam, Active Endpoints, BEA, Computer Associates, Eclipse, Hewlett Packard, IBM, Intalio, Microsoft, Oracle, Red Hat, and Sun Microsystems.

5.24.3 IONA And Industria Form Strategic Partnership

IONA Technologies and Industria have agreed upon a strategic technology and business alliance. The agreement makes provision for Artix, IONA's extensible Enterprise Service Bus (ESB) technology, to provide the Service Oriented Architecture (SOA) integration engine for Industria's multi-play support offerings, including its IMS Universal operational support system (OSS). Based on the TeleManagement Forum's NGOSS architecture, IMS Universal is designed to provide connectivity with CRM, OSS, NMS and BSS systems.

5.24.4 IONA and Wipro Technologies Partner for SOA

IONA Technologies and Wipro Technologies announced that the two companies have entered into partnership. Wipro will utilize IONA's Artix extensible Enterprise Service Bus (ESB) to deliver Service Oriented Architecture (SOA) deployments that can extend existing enterprise IT assets to new process automation applications.

5.24.5 IONA And Amberpoint Announce Integrated SOA Infrastructure Capabilities

IONA Technologies and AmberPoint, announced a broad technology partnership designed to offer customers the integrated software necessary to create and manage successful enterprise applications based on SOA. The relationship pairs Artix, IONA's extensible Enterprise Service Bus (ESB), with AmberPoint's SOA Management System, giving customers the means to implement, manage and govern distributed SOA.

5.24.6 IONA First Quarter 2006 Revenue

IONA Technologies announced first quarter revenue of \$16.9 million. On a U.S. GAAP basis, IONA reported a net loss of \$0.6 million, (\$0.02) per share on a diluted basis, encompassing stock-based compensation of \$1.4 million.

Net income and earnings per share on a diluted basis, excluding \$1.4 million of SFAS 123R stock-based compensation expense, in the first quarter of fiscal 2006 was \$0.8 million, or \$0.02 per share, compared with \$0.1 million or \$0.00 per share on a diluted GAAP basis for the first fiscal quarter of 2005. A complete reconciliation between net income on a GAAP basis and net income on a non-GAAP basis is provided in the accompanying financial tables.

(in thousands, except per share amounts)	Three Months Ended March 31,	
	2006	2005
Revenues:		
Product	\$ 8,205	\$ 7,688
Service	8,664	8,630
Total revenues	16,869	16,318

5.24.7 IONA 2005 Revenue

(in thousands, except per share amounts)	Twelve Months Ended December 31,	
	2005	2004
Revenues:		
Product	\$ 33,360	\$ 30,735
Service	33,176	37,284
Total revenues	66,806	68,019

5.25 ItemField

ItemField was founded in 2000 with a focus on middleware and advanced technology. Its flagship product, ContentMaster, has more than 100 enterprise customers, including thirteen of the Fortune 50. ContentMaster enables application integration infrastructure usability, while enabling new classes of enterprise solutions that integrate documents, transaction data, proprietary content and legacy data formats. Itemfield partners with software companies who account for 75 percent of the middleware sold worldwide.

With Itemfield, many forms of enterprise data: including structured, semi-structured and unstructured data can be transformed via XML within a single environment.

5.25.1 Products

ItemField ContentMaster is next-generation data transformation software. ContentMaster allows any form of data, including structured, semi-structured and unstructured data, to be transformed in real-time via XML from within a single comprehensive design and embeddable execution environment. ContentMaster features an intuitive graphical design environment, ContentMaster Studio, which shields IT developers from dealing directly with data transformation of any document class, message or file specification. ContentMaster also features a scalable small-footprint transformation engine component, ContentMaster Engine, that is embeddable into a wide range of infrastructure software platforms and applications, including integration brokers, content and document management systems, enterprise portals, XML databases, integration adapters and applications built on J2EE, Microsoft® .NET and native OS environments.

5.25.2 Partners

Itemfield's partners include: IBM, Informatica, Microsoft, Oracle, SAP, webMethods, Dell Professional Services, MidTech Partners, Ness Technologies, C&M Medical, G2 Speech, Ideal Systems, Magic Software, Softchoice, Softlink, Software AG, SPL, HP, and Sun.

5.25.3 Customers

ItemField's financial customers are: American Express Company, Bank Leumi (Israel), BNP, Paribas, CitiFinancial, Covarity, Credit Suisse, Daiwa Securities America, Deutsche Bank, EFG Eurobank SA, GMAC Residential Funding Corporation, Grupo Santander, INKA GmbH, Luxembourg Stock Exchange, Lydian Data Services, Merrill Lynch, Mizrahi Bank (Israel), Morgan Stanley, Natexis Banques Populaires, OpenPages, Quadriga Asset Management, SunTrust Banks, Transaction Auditing Group, US Internal Revenue Service, and Wells Fargo

Itemfield's insurance customers are: AIG American General, American International Group, Fireman's Fund Insurance Company, Genworth Financial, Menora Insurance, Michigan Millers Mutual Insurance Company, Migdal Insurance (Subsidiary of Generali), Phoenix Insurance (Israel), Providence Washington Insurance Company, Prudential Financial, Inc., Republic Mortgage Insurance Company, Talbot Underwriting Holdings Ltd., and The Phoenix Companies, Inc.

ItemField's healthcare customers are: Amstelland Hospital (The Netherlands), Wolfson Medical Center, BJC HealthCare, Bronovo Hospital (The Netherlands), C&M Medical Services, Clalit Health Services (Israel), Contec Medical, Eldan Electronic Instruments Co. Ltd, Excellus BlueCross BlueShield, G2 Speech, General Hospital St-Augustinus (Belgium), Gooi-Noord Hospital (The Netherlands), Health Service Executive (Ireland), McKesson Corporation, Northumbria Health Care NHS Trust (UK), Per-Se Technologies, Philips Medical Systems, Physicians Reference Laboratory, Pierre-Le Gardeur Hospital, Shaarei Tzedek Hospital (Israel), Southern Ohio Medical Center, St. Elizabeth Medical Center, St. Pöelten Hospital (Austria), St. Vincentius Hospital (Belgium), State of New Mexico, Human Services Department, State of Ohio, Department of Health, State of Washington, Department of Health, Tel Hashomer Hospital (Israel), The Health Care Group LLC, UK NHS, University of Amsterdam Medical Center (The Netherlands), Velindre NHS Trust (Wales), Weill Medical College of Cornell University, and WellPoint.

Itemfield's telecommunications customers are: AT&T, Cellcom (Israel), Telestet SA (Greece), Tellas SA (Greece), and Verizon Wireless.

Itemfield's transportation customers are: American Airlines, EL AL Israel Airlines, ELOG AB, FMG Support Ltd., GE SeaCo, Israeli Airports Authority, Maersk, Maman, Schenker, TDG Plc., and Yellowworld (Switzerland).

5.26 Kabira

Kabira provides transaction processing software for global enterprises. Kabira's Transaction Platform and Accelerator products provide solutions for organizations confronting today's market demand for real-time transaction processing. Kabira supports real-time data, transactions, applications, and connectivity in high-speed memory.

5.26.1 Products

Kabira's Transaction Platform and Kabira Accelerator products provide solutions for organizations confronting market demand for high-volume, real-time transaction processing. A 64-bit memory-resident platform, Kabira can execute more than 50,000 transactions per second running on standard commodity hardware.

5.26.2 Customers

Kabira systems have been installed and widely adopted by more than 100 organizations in 30 countries. Customers include: VISA, AT&T, France Telecom, Bank of America, Orange, Vodafone, Cingular, Hutch, NTT Data, Veraz, E*Trade Information Services and Alcatel.

5.26.3 Partners

Kabira's partners include: Hitachi, HP, Motorola, Sun Microsystems, Alcatel-Lucent, AtosOrigin, Bull, CapGemini, NextCom, NTT Data, Siemens, Steria, Unisys, DataDirect, Ensemble, Exadel, Red Hat, SNMP Research Inc.

5.27 MQ Software

MQSoftware provides a line of business transaction assurance, middleware management and enterprise application integration products. Transaction-centric industries such as banking/financial services, healthcare, insurance, manufacturing retail distribution and government, commonly utilize MQ Software products and services

5.27.1 Products

Table 5-20 describes MQ Software's products.

TABLE 5-20

MQ SOFTWARE'S PRODUCTS

- Q Nami
- Q Pasa
- StarWatch
- AppWatch
- DataFlow Studio

Source: WinterGreen Research

5.27.2 Partners

MQSoftware is a premier IBM Business Partner with co-marketing programs to market key product and service offerings to leading organizations worldwide. MQSoftware also has a close and mutually beneficial R&D relationship with IBM's WebSphere MQ development labs in Hurlsey, U.K. and Boeblingen, Germany. MQSoftware also has reseller agreements with over 30 partners in North America and Europe to market its products and services.

MQSoftware has joined the new Wily Integration Network. By joining the WIN Network, MQSoftware will be able to integrate with Wily Introscope, the industry's leading application performance management solution. MQSoftware AppWatch configuration tool and StatWatch transaction tracking and auditing tool will integrate with Introscope.

5.27.3 Customers

MQSoftware has over 600 customers worldwide for its products, training and services offerings. Key customers include BlueCross BlueShield, Deluxe Corporation, Hartford Financial Services Group, Royal Caribbean Cruises Ltd., Société Générale, Virgin Atlantic and USDA.

5.27.4 Acquisitions

MQSoftware, Inc. has acquired privately-held Reconda International Corporation, a provider of Web-based, WebSphere MQ-focused middleware support products. Reconda products include QN-AppWatch, a Web-based WebSphere MQ administration product designed primarily to enhance WebSphere MQ application development, and QN-StatWatch, a Web-based WebSphere MQ business transaction management product. QN-StatWatch also provides chargeback reporting capability designed to transform MQ support cost centers into self-sustaining business units, and reporting for regulatory and SLA compliance. Reconda products are used in numerous WebSphere MQ sites, including Bank of America and Merrill Lynch.

5.28 Open Text

Open Text is an independent software vendor that provides ECM solutions. Open Text develops, markets, licenses and supports its software for use on intranets, extranets and the Internet. The Company's software enables organizations to address a range of business needs including the ability to. These needs include complying with increasing and changing regulatory requirements, classifying and organizing information, managing the retention and archiving of information volumes, unifying business teams located throughout the world, accelerating product cycles, improving customer and partner relationships, and also changing business strategies.

Open Text provides solutions that enable people to use information and technology at departmental levels and across businesses. Open Text offers complete solutions that are easily incorporated into existing enterprise business systems.

5.28.1 Partners

Open Text's partners are Accenture, Bearing Point, Cap Gemini Ernst and Young, Convera, CSC, Deloitte, EDS, EMC, Hitachi, HP Invent, Inktomi, Microsoft, Network Appliance, Oracle, Read Soft, SAP Software, Siemens, Siebel, Software AG, StorageTek, Sun Microsystems, T Systems, Verity.

5.28.2 Products and Solutions

Open Text's flagship product is Livelink ECM 9.5. The Livelink ECM 9.5 works on Open Text's solutions.

Table 5-21 Shows Open Text's solutions categories.

TABLE 5-21

OPEN TEXT'S SOLUTION'S CATEGORIES

- Solutions that extend enterprise email and groupware using Livelink ECM
- Solutions that extend enterprise applications based on Livelink ECM
- Enterprise-wide solutions based on Livelink ECM
- Business solutions based on Livelink ECM
- Industry specific solutions based on Livelink ECM

Source: WinterGreen Research, Inc.

5.28.3 Open Text Third Quarter 2006 Financial Results

Total revenue for the third quarter of fiscal 2006 was \$100.9 million, compared to \$105.2 million for the same period last year. License revenue in the third quarter of 2006 was \$28.4 million, compared to \$33.0 million for the same period last year. Revenue in the quarter was up 1% from the same period last year. Revenue in the third quarter was broadly based with 46% from North America, 49% from Europe and 5% from the Middle East and Asia.

Net income in the third quarter of 2006 was \$13.7 million compared to \$10.7 million. Net income for the third quarter of 2006 was \$7.3 million, compared to net income of \$5.3 million in the same period last year.

In the third quarter of 2006, operating cash flow was \$33.4 million. This compares to operating cash flow of \$29.9 million in the same period last year. Deferred revenue was \$81.3 million as of March 31, 2006. At the end of the third quarter of fiscal 2006, they had \$114.2 million in cash, cash equivalents, and short-term investments.

(in thousands)	Three Months Ended March 31,		Nine Months Ended March 31,	
	2006	2005	2006	2005
Revenue:				
License	\$ 28,415	\$ 33,033	\$ 90,489	\$ 99,559
Customer Support	47,588	46,902	140,710	132,236
Service	24,923	25,232	73,128	73,660
Total Revenues	100,926	105,167	304,327	305,455

5.28.4 Open Text 2005 Revenue

<i>(Dollars in thousands)</i>					
Fiscal Years Ended					
June 30:	2005	2004	2003	2002	2001
Revenues					
License	136,522	121,642	75,991	65,984	73,752
Customer Support	179,178	108,812	63,091	48,707	40,316
Service	99,128	60,604	38,643	39,681	35,709
Total Revenues	414,828	291,058	177,725	154,732	149,777

5.29 Pegasystems

Pegasystems' develops, markets, licenses and supports software to manage changing business processes. Pegasystems' business process management software is used by companies to computerize various types of business processes.

Pegasystems' provides implementation, consulting, training and technical support services which could help many different types of business.

5.29.1 Partners

Pegasystems' partners include Cognizant Technology Solutions, IBM Corp., Kanbay International, Inc., Pinkerton Computer Consultants, Inc., Satyam Computer Services Ltd., Steria Group and Virtusa Corporation.

5.29.2 Customers

Pegasystems' has the following customers: Bank of America Corporation, Barclays Bank PLC, Citigroup Inc., Credit Suisse Group, HSBC Holdings Plc, JPMorgan Chase & Co., National Australia Bank Limited, Rabobank Group, Société Générale Group, TD Bank Financial Group, Aetna Inc., Wellpoint Inc., Blue Cross Blue Shield of Massachusetts, Inc., Blue Cross & Blue Shield of Rhode Island, Computer Sciences Corporation, Group Health Cooperative, HealthNow New York Inc., Hospitals Contribution Fund of Australia Ltd., ViPS/WebMD Corporation, American National Insurance Company, American International Group (AIG), Amgen, The Allstate Corporation, Advanced Micro Devices (AMD), General Electric Company, RS Medical Corporation, Starwood Hotels & Resorts Worldwide Inc., VetCentric, Inc. and Vodafone Group, Plc.

5.29.3 Products and Solutions

Pegasystems' products are PegaRULES, PegaRULES Process Commander, Pegasystems SmartBPM Suite and Solution Frameworks,

Pegasystems has a variety of solutions. They are PegaCARD Customer Process Manager, PegaHEALTH Customer Service Manager, Pega Customer Process Manager, PegaCARD Smart Dispute, Smart Investigate for Payments, Smart Investigate for Securities, Smart Adjust, and PegaHEALTH Claims Automation Suite.

5.29.4 Pegasystems 2005 Revenue

(in millions)	Year Ended December 31,	
	2005	2004
<i>License Revenues:</i>		
Perpetual License	\$ 20.0	\$ 22.9
Term License	20.8	18.7
Total License Revenue	40.8	41.6
<i>Services Revenues:</i>		
Professional Services & Training	40.8	39.0
Maintenance	20.4	15.9
Total Services Revenue	61.2	54.9
Total Revenues	102.0	96.5

Total license revenue for 2005 decreased to \$40.8 million from \$41.6 million in 2004. The decrease in total license revenue was due to a \$2.9 million decrease in perpetual licenses, partially offset by a \$2.1 million increase in term licenses. The increase in term license revenue reflected a new term license transaction with an existing customer in the third quarter of 2005. The decrease in perpetual license revenue reflected the strategy of selling smaller initial perpetual licenses to target accounts, with the potential of larger follow-on sales.

Maintenance revenue increased 28% to \$20.4 million in 2005 from \$15.9 million in 2004. The increase in maintenance revenue for 2005 was a result of a larger installed base of software and a higher proportion of perpetual licenses in the installed base. These yield greater maintenance revenue than term licenses. The \$1.8 million increase in professional services and training revenue in 2005 reflects an increased demand from customers for these services. Typically, substantial revenue is gained from services provided in connection with the implementation of software licensed by new customers.

International revenue increased to 35% of total revenue for 2005 from 32% for 2004. This increase was related to a large international license transaction in the third quarter of 2005. International revenue may fluctuate in the future because such revenue is generally dependent upon a small number of license transactions during a given period.

5.30 Progress Software

The Progress Software Corporation develops, markets and distributes application infrastructure software to integrate and manage business applications software. Progress uses its technology to alleviate its customer's business application problems. Lots of Progress's revenue is through indirect channel partners, principally application partners and original equipment manufacturers.

5.30.1 Products

Table 5-22 Shows Progress Software's product categories.

TABLE 5-22

PROGRESS SOFTWARE'S PRODUCT CATEGORIES

- Development Products
- Deployment Products
- Enterprise SOA Infrastructure Products
- Management Products

Source: WinterGreen Research, Inc.

The development products are OpenEdge Studio, WebSpeed Workshop, Stylus Studio, DataDirect Xquery. The deployment products consist of the OpenEdge RDBMS, OpenEdge Application Server, OpenEdge DataServers, ObjectStore, DataXtend CE, DataDirect Connect, DataXtend RE. The enterprise SOA infrastructure products are the Sonic ESB, SonicMQ, Sonic Orchestration Server, Sonic XML Server, Progress Apama Algorithmic Trading Platform, and Progress Apama ESP. The management product is the Progress Fathom.

5.30.2 Partners and Customers

Some significant new partners and customers of Progress Software include: American Financial Group, Angoss Software, Bare Escentuals, Baton Rouge Area Foundation, Carrot Communications ASA, Charles River Development Center, Conglobal Industries, Department of the Army, Exelon Corporation, First Health, Fox Broadcasting, GHIS Comercio de Veiculos, GXS, Lan Airlines, Lincoln Financial, Matria Healthcare, Photoworks, Phytel, Puerto Rico Telephone, Savista Corporation, Southwest Florida Water Management, Spokane School Districts, Springfield Public Schools, Tedesco, United Wisconsin Insurance, USinternetwork, Verimatrix, Wayport and Zions Bancorp.

Some of Progress's significant existing partner and customers are: Alcoa Global Fasteners, American Airlines, AT&T, ATOS Origin, Bank of New York, Bayer Healthcare, Casa de Moneda de Mexico, Cendant, Conseco, Cooperativa Mista Agraria, D&H Distribution, Dietrich Industries, Duke University Medical Center, Embarq Communications, Fidelity Investments, Financiera Compartamos, Fujitsu Transaction Solutions, GE Healthcare, Kronos, Marks and Spencer, MD Management, Microstrategy, New Jersey Manufacturers, QVC, SeeBeyond, Sempra, Severn Trent and Water, Sonus, State of Idaho, State of South Carolina, TRW Automotive, University of Arizona and Wear Me Apparel Corporation.

5.30.3 Progress Software/ NEON Systems

Progress Software Corporation has announced that it has purchased all of the outstanding shares of common stock of NEON Systems, Inc., a leader in mainframe integration. Buying the remaining NEON Systems' stock signified the completion of the acquisition.

Upon the end of the acquisition, NEON will become part of DataDirect Technologies, a leader in standards-based data connectivity and an operating unit of Progress Software Corporation.

5.30.4 Progress Software Reports First Quarter Financial Results

Progress Software Corporation announced financial information for its first quarter, which ended Feb 28, 2006. Revenue for the quarter was \$103.9 million, up from \$97.7 million in the first quarter of 2005. Software license revenue increased to \$42.8 million from \$37.6 million in the same quarter last year.

(in thousands, except per share amounts)	Three Months Ended February 28,	
	2006	2005
Revenues:		
Software License	\$ 42,780	\$ 37,555
Maintenance & Services	61,141	60,167
Total revenues	103,921	97,722

5.30.5 Progress Software 2005 Revenue

<i>(Dollars in thousands)</i>			
Years Ended November 30:	2005	2004	2003
Revenue			
Software License	156,846	140,462	109,666
Maintenance & Services	248,530	222,200	199,394
Total Revenues	405,376	362,662	309,060

5.31 Savvion

Savvion develops business process management software that allows businesses to adopt BPM. Savvion provides an interface for business people and the enterprise-class deployment and management capabilities required by corporate IT. Savvion invests in research and development, designing products and tools that have applications for organizations.

5.31.1 Partners

Some of Savvion's partners are Adaptive Business Consulting, BearingPoint, Blackstone, Business Edge Solutionsm CSC, Fathom Solutions, Hitachi Consulting, Peritus Corporation, Risetime Technologies, UISOL, Wipro Technologies, Compliance11, Borland, IBM, BEA, Software AG, Oraclen Pramati, Sun Microsystems, HP,

5.31.2 Products

Savvion's product line consists of the Process Modeler, Process Asset Manager, BPM Studio, BPM Server, Business Rules, BPM Portal, Web Services, MS .Net Certification, Professional Services.

5.31.3 Solutions

Table 5-23 Shows Savvion's solutions categories.

TABLE 5-23
SAVVION'S SOLUTIONS CATEGORIES

- Marketing and Sales
- Industry Specific processes
- Finance
- Operations
- Customer Management
- Human Resource
- Product Development

Source: WinterGreen Research, Inc.

The marketing & sales solutions are capital expenditure, customer help desk, global product doc mgmt, order management, product launch management, product promotions, revenue optimization, system enhancement mgmt. The finance solutions are, customer account mgmt, materials expense management, regulatory document mgmt, claims liquidation processing, capital expenditures, asset & knowledge management. The customer management solutions are field service management, professional service mgmt, repairing planning mgmt. The product development solutions are collaborative design, and product lifecycle management.

The industry specific processes solutions are mobile phone service mgmt, broadband service provisioning, volunteer recruitment, collaborative commerce mgmt, supply chain management, global website content mgmt, order management & fulfillment, and satellite tasking management. The operations solutions are procurement, supplier relations mgmt, shipping logistics, station repair mgmt, hosted process mgmt, RFQ & contract mgmt, lab process mgmt, product lifecycle mgmt, supply chain management, returns management, and part number creation. The human resources solutions are employee on-off boarding, employee move process, employee self services, and new hire management.

5.32 SOA Software

SOA Software is a leading provider of enterprise class SOA management, security, and governance solutions. SOA is a specialist vendor of SOA solutions and offers a complete SOA infrastructure solution.

5.32.1 Customers

SOA's customers are Verizon, Merrill Lynch, Becton Dickinson and Company, Farmers Insurance, Jet Blue, Amvescape, Hewlett-Packard, Staples, 24 Hour Fitness, Charles Schwab, Mercury Insurance, Zenith Insurance.

5.32.2 Partners

SOA's partners are IBM, Microsoft, HP, Logic Library, Infravio, Oracle, Computer Associates, BEA, and Forum Systems.

5.32.3 Products

SOA's products consist of the Service Manager, Network Director, SOLA, Partner Manager, Register for Datasheets, SOA Self-Assessment.

5.32.4 Solutions

SOA has the following industry solutions: financial services, manufacturing, telecommunications, retail. The technology solutions are, interoperability, web services management, monitoring, HP OpenView Integration, IBM Tivoli Enterprise Console, Identity Management, IBM Tivoli, Netegrity, Provisioning, Web Services Security, Standards, SOA Fabric, Partner Manager. The professional services solutions are the Training SOA Assessment.

5.32.5 SOA Software Acquires Blue Titan

SOA Software has acquired the web services networking company Blue Titan. Blue Titan's technology and team has been immediately added to SOA Software. Blue Titan is a provider of software to build web services networks. Blue Titan's products focus on providing message management, and policy-based mediation between various standards, protocols, messaging implementations and programming models.

Blue Titan provides multiple implementations of messaging standards allow consumers using different platforms to communicate with a wide variety of back-end service platforms. Blue Titan provides compatibility between the many different enterprise service bus implementations and deployments common in most large enterprises.

5.32.6 Blue Titan Products

Blue Titan's flagship product is the Blue Titan Network Director. The Blue Titan Network Director is infrastructure software that enterprises use to create services networks that allow IT to empower businesses by enabling the sharing and mass consumption of services.

5.32.7 Blue Titan Customers

Blue Titan's Customers are Accredited Home Lenders, British American Tobacco, and Pfizer.

5.32.8 Blue Titan Partners

Blue Titan's partners are BEA, IBM, Intel, SAP, Sun Microsystems, Aptsi, e-brilliance, Momentum, Wipro, Client soft, Composite Software, Intersperse, Logic Library, Service Integrity, and Skyway Software.

5.32.9 SOA Software 2005 Revenue

SOA Software, a provider of SOA and Web services management, security and governance solutions, delivered revenues of \$29.9 million in 2005. This showed more than 450 percent growth over 2004. During 2005, SOA Software added 74 new customers. 2005 also saw SOA Software expand its product portfolio when it acquired the X4ML mainframe Web services platform from Merrill Lynch. It was renamed SOLA (Service Oriented Legacy Architecture), and was introduced in December 2005 and will be shipping in the first quarter of 2006.

5.33 Sybase

Sybase enables unwired enterprise through enterprise, mobile and wireless software solutions. These solutions are for information management, development and data integration. Sybase solutions provide customers with integrating platforms, databases, and applications, and extending those applications by moving information from data centers to mobile workers. Sybase provides products and solutions to a variety of markets that include commerce, communications, finance, government, defense, manufacturing, transportation and healthcare.

5.33.1 Products and Solutions

Sybase's products and solutions can be placed into two categories, Infrastructure Platform Group and iAnywhere Solutions. The Infrastructure Platform Group products and solutions are the Sybase IQ, Sybase Adaptive Server Enterprise, Sybase Replication Server, Sybase Avaki EII, Sybase Real-Time Data Services, Sybase Mirror Activator, Sybase Unwire Accelerator, Sybase Unwired Orchestrator, Sybase PowerDesigner, Sybase WorkSpace, Sybase PowerBuilder, Sybase DataWindow.Net, Sybase EA Server, and Financial Fusion Banking Solutions. The iAnywhere Solutions consist of SQL Anywhere, Afaria, OneBridge, AvantGo.com, Answers Anywhere, Pylon, RemoteWare, RFID Anywhere, Sales Anywhere, Standa-based SDKs, and XTND ConnectPC.

5.33.2 Services

Sybase has three main services. The first service is technical support, which is made up of the basic support, extended support, and enterprise support. The other two services are consulting and education.

5.33.3 Sybase / Solonde

Sybase acquired Solonde, a privately held provider of solutions for data integration and interface management needs, in an all cash transaction.

Solonde's extract, transform and load capabilities help Sybase's unwired enterprise strategy. Solonde would provide a range of data integration solutions to its customers. These solutions enable enterprises to make decisions based on a view of data from multiple sources.

Acquiring Solonde contributes to Sybase's data integration capability. Customers are able to use the ETL functionality to populate data warehouses with historical and operational data. Solonde also provides Sybase with SAP integration technology.

5.33.4 Sybase Reports First Quarter Results

Sybase reported financial results for the first quarter ended March 31, 2006. For the 2006 first quarter, total license revenue increased 7% to \$66.9 million from \$62.7 million in the first quarter of 2005. Total revenues for the 2006 first quarter increased 2% to \$195.0 million from \$191.9 million for the first quarter of 2005.

Operating income calculated for the first quarter of 2006 was \$18.9 million, compared with operating income of \$20.3 million for the last year's quarter. Results for the 2006 first quarter include the impact of \$3.5 million associated with implementation of FAS 123R. Net income for the 2006 first quarter increased 30% to \$17.3 million, compared with net income of \$13.3 million, for the 2005 first quarter.

Pro forma operating income was \$28.4 million, compared with pro forma operating income of \$28.1 million in the first quarter of 2005. Pro forma net income for the first quarter increased 10% to \$22.7 million. This compares with pro forma net income of \$20.6 million for the 2005 first quarter.

(Dollars in thousands)	Three Months Ended March 31,	
	2006	2005
Revenues:		
License Fees	\$ 66,888	\$ 62,708
Services	128,120	129,203
Total revenues	195,008	191,911

5.33.5 Sybase 2005 Revenue

<i>(Dollars in thousands)</i>					
	2005	2004	2003	2002	2001
Revenues					
License Fees	291,695	275,872	274,817	325,916	389,038
Services	527,000	512,664	503,245	503,945	538,885
Total Revenues	818,695	788,536	778,062	829,861	927,923

5.34 Synergy Financial Systems

Synergy Financial Systems Ltd was founded in 1992. Synergy Financial Systems operates exclusively in the financial sector and specifically in the SWIFT domain. The company operates through software product licenses and SWIFT system support and management services. It provides systems support services and financial messaging applications to financial institutions within the SWIFT community. Synergy provides high availability and cost-effective hosted recovery services.

Their application offerings include 'MessageMaker' for SWIFT message creation and 'Clarity Info' for on-line investigations, analysis and reporting. Software Products. Synergy's software products, bundled as ClaritySuite, are deliver web-based financial message management solutions for SWIFT. The software is flexible and scalable.

ClaritySuite is designed to interface with host applications and all the main SWIFT Interface Systems: SWIFTAlliance, IntraNet, Merva, BankServ, Fastwire and MINT.

SWIFTCare includes an SNL Hosting Service for SWIFTNet connectivity. This a DR Bureau service offering a high availability Alliance recovery environment for remote customer access via VPN and ADSL connectivity, laptop recovery, business analysis, project management, and systems integration and training.

5.34.1 Synergy's Partners

Synergy Financial Systems has partnered with several companies to mutually enhance services provided. The companies they have partnered with are TietoEnator, LogicaCMG, FircoSoft, and ICM Computer Group.

5.34.2 Synergy's Customers

Synergy financial has licensed its product to the following customers: RBC Royal Bank, Citigroup, Bank of Ireland, Fimat, Banca Popolare di Milano, Leumi, HVB Ireland, AIG, Emporiki Bank, SMBC, Lehman Brothers, ING, Bank of India, The Royal Bank of Scotland, RZB Austria, Bank of Baroda, United National Bank, Morgan Stanley, BNI, and Ansbacher.

5.34.3 Synergy and TietoEnator

Synergy and TietoEnator (TE) formalized a partnership agreement that will enable TE to use elements of Synergy's technology to complement its Payments Suite. Synergy's benefits economically from this partnership due to TE's market share and established sales channel. TietoEnator has built an information society and is one of the largest IT services companies in Europe. TietoEnator specializes in consulting, developing and hosting its customers' business operations in the digital economy.

5.35 TIBCO

TIBCO offers a suite of business integration, process management and business optimization software solutions. Their products allow companies to have current information to execute their critical business processes and make smarter decisions. TIBCO provides software that enables interoperability between applications and information sources, coordinates processes that span systems and people, and helps companies sense and respond to events and opportunities.

Their software can link applications and databases together with a common framework and make them coordinated. TIBCO's products give the information they needed to identify and understand both the strengths and weaknesses of business. TIBCO has over 2,500 customers around the world and in a wide variety of industries. Their products are used by a variety of industries including: financial services, telecommunications, retail, healthcare, manufacturing, energy, transportation, logistics, government and insurance.

TIBCO's goal is to become the world's leading provider of business integration and process management software. Their strategy to achieve this is to offer customers a comprehensive suite of products and services, promoting the widespread adoption of their technology, and also through acquisitions that expand and strengthen their offerings. They are trying to expand vertically to support their products interoperability. TIBCO has its roots from Teknekron, which was founded in 1985. TIBCO was officially created in 1996 and became an independent company in 1997.

5.35.1 TIBCO Products

TIBCO's products are focused in three main areas of organization: Service-Oriented Architecture (SOA), Business Process Management ("BPM") and Business Optimization.

5.35.1.1 SOA

TIBCO's software enables organizations to change their IT infrastructure to SOA. This is done by turning information and functions into distinct and reusable components that can be accessed from across the business and aggregated with other such services to create other applications. This helps expand the information across technological, organizational, and geographical boundaries.

5.35.1.2 BPM

TIBCO's software enables the automation and coordination of the assets and tasks of business processes. This software coordinates the human and electronic resources internally and externally. Their software enables organizations to provide customer service, retain customers, and maximize partnerships.

5.35.1.3 Business Optimization

Their software can be programmed to route information to appropriate recipients, which allows users access up-to-date information and provides users the ability to analyze and act on information. This helps managers identify and analyze problems and opportunities.

5.35.2 Professional Services

TIBCO offers a broad range of consulting services such as systems planning and design, installation and systems integration. They have professional services staff located throughout the Americas, Europe, Africa and the Pacific Rim. They have expertise in financial services, telecommunications, manufacturing, energy, logistics, healthcare and other industries.

5.35.3 Partners

TIBCO is partners with many resellers, professional service organizations and system integrators including Accenture, Cap Gemini, Deloitte Consulting, Atos Origin and BearingPoint. TIBCO uses these partnerships to promote their products and to gain technical expertise to help expand their product range.

5.35.4 HP/TIBCO

HP and TIBCO Software, Inc. having integrated HP's HP-UX 11i operating system on the UNIX platforms for TIBCO global customers. The relationship extends the market reach of HP Integrity servers running HP-UX 11i. It will help enterprises optimize IT operations for business process management and service-oriented architecture deployments.

TIBCO's leading SOA and BPM solutions will port to HP Integrity servers. Initial efforts to port TIBCO Staffware Process Suite and the upcoming "Project Matrix" SOA offering are currently underway, while TIBCO Businessworks, TIBCO Rendezvous, and a number of TIBCO Adapters already support HP Integrity servers running HP-UX 11i.

5.35.5 TIBCO / IDS Scheer

TIBCO Software Inc. formed a technological partnership with IDS Scheer. This partnership has led to a significant increase in the demand for TIBCO iProcess Analytics offering. This is a part of TIBCO Business Process Management software, which is used to facilitate communication and collaboration across systems and improve access.

TIBCO iProcess Analytics, a component of the TIBCO Staffware Process Suite, enables customers to measure process performance against key performance indicators. This product can be used to track the quality of responses to inquiries, and to create reports on application handling.

5.35.6 TIBCO Financial Data

TIBCO Software Inc. had total revenues for the first quarter of \$114.6 million. License revenues for the first quarter were \$48.1 million. Net income for the first quarter of fiscal 2006, on GAAP standards was \$5.6 million. Non-GAAP net income for the first quarter of fiscal 2006 was \$12.6 million compared with \$12.7 million for the first quarter of fiscal 2005.

During the first quarter, TIBCO added 56 new customers and made significant sales to customers, including Telecom Italia, Qwest, Devon Canada, Smart & Final, Merrill Lynch and Merck.

(in thousands, except per share amounts)	Three Months Ended February 28,	
	2006	2005
Revenues:		
<i>License Revenue</i>		
Non-Related Parties	\$ 48,149	\$ 36,650
Related Parties	-	14,370
Total License Revenue	48,149	51,020
<i>Service & Maintenance Revenue</i>		
Non-Related Parties	64,630	49,138
Related Parties	-	2,780
Billed Expenses	1,801	1,208
Total Services & Maintenance Revenue	66,431	53,126
Total revenues	114,580	104,146

5.35.7 Tibco 2005 Revenue

<i>(Dollars in thousands)</i>					
YEARS ENDED NOVEMBER 30:				Percent Change 2004 to 2005	Percent Change 2003 to 2004
	2005	2004	2003		
Revenues					
License Revenue	203,888	214,086	140,509	(5)%	52 %
Service & Maintenance Revenue	242,022	173,134	123,701	40	40
Total Revenues	445,910	387,220	264,210	15 %	47 %

5.36 Vitria

Vitria provides business process integration software and services for corporations in telecommunications, manufacturing, healthcare, insurance, and finance. Their products are in the areas of business process applications and business process integration platform.

Vitria's software products orchestrate interactions between software systems, automate process steps, facilitate resolution of process exceptions, and manage data exchanges between companies.

Vitria's strategy is to help customers manage complex business processes. They focus on systems that require enterprise-class reliability from their core software infrastructure. This is usually required in companies in the following industries: telecommunications, manufacturing, healthcare and insurance, and finance.

Vitria has two ways to execute their strategy. One, is that they offer a software platform for business process integration. Customers use this platform to create and deploy process and integrate content. The second is to offer pre-built process applications with a platform to support selected business processes.

Vitria's solutions are built on BusinessWare Enterprise Business Process Management suite. Vitria's customers includes AT&T, Bell Canada, BellSouth, Blue Cross Blue Shield Association, BP, BT, DaimlerChrysler Leasing, Generali, Nissan, Reynolds & Reynolds, RBC Financial Group, Sprint, U.S. Department of Defense and Veterans Health Administration..

5.36.1 Products

BusinessWare is a business process integration platform and is Vitria's signature product. It uses graphically modeled business process and integration logic as the foundation for creating complex interactions among dissimilar software applications, databases, web services, people, and companies over networks.

Table 5-24 shows some of BusinessWare's capabilities

TABLE 5-24

BUSINESSWARE'S CAPABILITIES

- Process automation
- Management of human workflow
- Message transport and routing
- Data transformation and vocabulary management
- Web services integration and orchestration
- Compatibility with specific data transport protocols
- Tools for building custom connectors
- Various pre-built services for business process integration
- Modeling environment for development
- Solution life cycle management

Source: WinterGreen Research, Inc.

5.36.1.1 Order Accelerator

This process application automates business processes across a telecommunications service provider's existing systems. Order Accelerator includes pre-built business processes and other content based on the Telemanagement Forum's eTOM standard.

5.36.1.2 Resolution Accelerator

This process application manages the resolution of business process exceptions. Resolution Accelerator provides capabilities to automatically fix many problems, guide manual resolution of other problems, and reinsert affected transactions back into the normal process flow.

5.36.1.3 Smart Claims

This process application was created for health insurance payers. Smart Claims augments existing claims processing systems by applying automated business rules to reduce off-line manual processing, by intelligently routing claims between different systems, and by providing a unified view of the claims processing lifecycle.

5.36.1.4 Smart Gateway for Healthcare

This process application manages the intake, splitting, validation, transformation, aggregation, and routing of health insurance claims. This product consolidates multiple document exchange processes into a single electronic document gateway. This product automates business logic governing these processes to implement, manage and modify.

5.36.2 Vitria's Partners

Vitria has created strategic alliances to gain assistance in creating its solutions. They have two distinct sets of partners, system integrators and technology vendors. The system integrator partners are Accenture, Capgemini, and Deloitte Consulting. The technology vendor's partners are BEA, IBM, ILOG, Microsoft, Sybase, Oracle, Portal Software, Red Hat, Siebel Systems and Sun Microsystems.

5.36.3 Vitria / Volante

Vitria has created a partnership with Volanté Technologies, Inc., a provider of data-centric solutions to the financial services industry.

The partnership is for the integration of Vitria's BusinessWare business process integration platform with Volanté's data management software. This solution is targeted towards the financial services industry. The mission of Vitria Financial Services is to deliver Straight-Through Processing efficiencies within financial institutions.

Volante brings to the relationship solutions in financial services focused on data management. The combined offering has already been deployed at several financial institutions. Volanté's technology enables the rapid identification of errors at the source, enhancing BusinessWare's capacity to manage the entire transaction lifecycle.

5.36.4 Vitria Financial Data

For the first quarter of 2006, total revenue was \$10.7 million, compared with \$11.3 million for the fourth quarter of 2005 and \$16.5 million for the first quarter of 2005. License revenue for the first quarter of 2006 was \$2.5 million, compared with \$1.8 million for the fourth quarter of 2005 and \$5.4 million for the first quarter of 2005. Service and other revenue for the first quarter of 2006 was \$8.2 million, compared with \$9.5 million for the fourth quarter of 2005 and \$11.1 million for the first quarter of 2005. Gross profit was \$6.6 million for the first quarter of 2006, compared to \$6.7 million for the fourth quarter of 2005 and \$10.7 million for the first quarter of 2005.

Total operating expenses were \$11.6 million for the first quarter of 2006, compared with \$9.0 million for the fourth quarter of 2005, and \$13.4 million for the first quarter of 2005. Total operating expenses were \$10.9 million for the first quarter of 2006, compared with \$13.1 million for the same period in 2005 and \$8.7 million for the fourth quarter of 2005. The net loss for the first quarter of 2006 was \$4.2 million, compared with a net loss of \$1.8 million, for the fourth quarter of 2005 and a net loss of \$2.4 million for the first quarter of 2005. Total cash and short term investment balances as of March 31, 2006, were \$55.1 million, compared to \$61.5 million as of December 31, 2005.

(Dollars in thousands)	Three Months Ended March 31,	
	2006	2005
Revenues:		
License	\$ 2,521	\$ 5,422
Service & Other	8,193	11,123
Total revenues	10,714	16,545

5.36.5 7751Vitria 2005 Revenue

<i>(Dollars in thousands)</i>					
Year Ended					
Demember 31	2005	2004	2003	2002	2001
Revenues					
License	13,261	14,947	30,089	36,009	77,518
Service & Other	40,423	46,938	50,630	61,318	57,466
Total Revenues	53,684	61,885	80,719	97,327	134,984

5.37 webMethods

webMethods is a leading provider of business integration and optimization software. webMethods provides solutions that enable organizations to deliver applications to the business while allowing them to understand what is happening with their business in real-time. webMethods gives customers the ability to integrate, assemble, and optimize their business processes. webMethods has products that help organizations link their enterprise software applications and databases, connect electronically with their trading partners.

5.37.1 Products

webMethod's products are the following: webMethods Fabric, The webMethods Enterprise Services Platform, webMethods' BPM, webMethods' BAM, and Composite application Framework.

5.37.2 Solutions

webMethod's solutions are webMethods for SOA, webmethods for B2B, webmethods for SAP, and webMethods for Compliance.

5.37.3 webMethods / Vinculum Japan

webMethods K.K., which is a wholly owned subsidiary of webMethods, Inc., and Vinculum Japan Corporation have joined together in a strategic partnership. Vinculum Japan is a solution provider for the Japanese retail and wholesale industry. The partnership is intended to help Japanese retailers and wholesalers streamline operations and responsiveness in order to become demand-driven enterprises. Enterprises that are demand driven are able to detect real-time changes in demand and are prepared to respond in a profitable way.

Vinculum Japan will take advantage of the functionality of webMethods' business activity monitoring capabilities. This will allow them to deliver real-time monitoring of business performance. Retailers and wholesalers will have the ability to reach higher efficiency and predictability from their operations, resulting in improved customer service, faster time-to-market, and asset utilization.

webMethods Fabric is based in service-oriented architecture, and the Fabric delivers an array of tools for integrating systems, managing business processes and proactively monitoring service levels from both an IT and business perspective. The business activity monitoring capabilities of webMethods Fabric are crucial to the Japanese retail market due to the amount of change that regularly occurs.

Vinculum Japan has system development and IT consulting experience in Japanese retail sectors such as supermarkets, department stores, restaurants as well as in other retail businesses. Because of their wide reach, Vinculum Japan can offer webMethods and its customers domain knowledge for customizing webMethods Fabric to address the requirements of the Japanese market.

5.37.4 webMethods / Blue Agave Software

webMethods and Blue Agave Software created a new partnership to help enterprises become more demand-driven. Blue Agave is a provider of software solutions for improving replenishment, demand management and fulfillment execution. The partnership brings the sales and operations planning monitoring capabilities of the webMethods for the Demand Driven Enterprise solutions together with Blue Agave's Retail Channel Execution suite of demand-driven business applications. The combination will allow retailers and consumer-packaged goods companies to increase speed and ability to sense and respond to changes in demand.

Most retailers and CPG companies lack constant visibility into sales data information as updates become available. These enterprises need to convert data into information, and information into knowledge that can be to guide decision-making.

The partnership between webMethods and Blue Agave allows clients to convert customer demand signals into actionable data. Table 5-25 illustrates the areas in which users can more readily address demand-based challenges as a result of the partnership.

TABLE 5-25

WEBMETHODS AND BLUE AGAVE PARTNERSHIP USER BENEFITS

- Gain access to actionable POS information
- Enable rapid organizational response to avoid out-of-stock and overstock situations
- Maintain targeted in-stock levels at stores, warehouses and distribution
- Maximize promotion effectiveness
- Expose incorrect retailer settings used to calculate sales forecast
- Divert inventory to most appropriate locations
- Identify and manage the impact of canceled orders

Source: WinterGreen Research, Inc.

Blue Agave Software is a privately held company headquartered in Cambridge, Mass. that allows consumer products companies to improve replenishment, demand management, and fulfillment execution with their retail customers. Its Retail Channel Execution suite of integrated applications delivers real-time, store/SKU-level insight into demand-driven operating issues.

5.37.5 webMethods 2005 Revenue

<i>(Dollars in thousands)</i>					
Year Ended					
March 31	2006	2005	2004	2003	2002
Revenues					
License	87,449	86,800	92,740	117,066	121,803
Professional Services	47,183	49,218	43,634	33,378	35,800
Maintenance	74,186	64,583	53,167	46,310	38,393
Total Revenues	208,818	200,601	189,541	196,754	195,996

Total revenue for fiscal year 2006 increased by about \$8.2 million, or 4%, compared to fiscal year 2005. The increase in total revenue was a result of increases of \$9.6 million in maintenance revenue and \$649,000 in license revenue. These were partially offset by a \$2.0 million decrease in professional services revenue. Total revenue for fiscal year 2005 increased by \$11.1 million, or 6%, compared to fiscal year 2004. The increase in total revenue was a result of increases of \$11.4 million in maintenance revenue and \$5.6 million in professional services revenue. These were partially offset by a \$5.9 million decrease in license revenue.

Total revenue from the Americas for fiscal year 2006 increased by \$11.8 million, or 10%, compared to fiscal year 2005. Total international revenue for fiscal year 2006 from Europe, the Middle East and Africa, Asia Pacific and Japan decreased by \$3.6 million, or 4%, compared to fiscal year 2005. The decrease in total international revenue for fiscal year 2006 is a result of a \$6.1 million, or 40%, decline in revenue from Japan.

License revenue for fiscal year 2006 increased by \$649,000, or 1%, compared to fiscal year 2005. License revenue for fiscal year 2005 decreased by \$5.9 million, or 6%, in fiscal year 2005 compared to fiscal year 2004. The decrease in license revenue in fiscal year 2005 was a result of a decrease in license revenue in the first fiscal quarter of 2005 as many enterprises became more cautious in their enterprise software spending. The decrease in license revenue was also due to lower license revenue from Japan due to the disruption associated with the internal investigation of Japanese operations and related management changes.

Professional services revenue for fiscal year 2006 decreased by \$2.0 million, or 4%, compared to fiscal year 2005. The decrease was a result of lower professional services revenue from subcontractors because of a shift of a portion of the lower margin integration services to the systems integration partners. Professional services revenue for fiscal year 2005 increased by \$5.6 million, or 13%, compared to fiscal year 2004. The increase was a result of an increase in the volume and size of customer engagements.

Maintenance revenue for fiscal year 2006 increased by \$9.6 million, or 15%, compared to fiscal year 2005. Maintenance revenue for fiscal year 2005 increased by \$11.4 million, or 21%, compared to fiscal year 2004. The increases in maintenance revenue in fiscal years 2006 and 2005 were a result of the increase in the total number of copies of software licensed to customers, the cumulative effect of agreements for post-contract maintenance and support, which are recognized as revenue ratably over the term of the agreement, and the increased number of customers subscribing for 24 x 7 support plans, which involve somewhat higher prices than standard support plans.

5.38 Zebra Technologies

Zebra Technologies designs, manufactures and distributes specialty printing devices that print variable information on demand at the point of issuance. Zebra has been a public company since 1991. These devices are used by manufacturers, service organizations and governments. The devices aid companies through automatic identification, data collection and personal identification in applications. Zebra's product range consists of direct thermal and thermal transfer label and receipt printers, RFID printer/encoders, dye sublimation card printers, digital photo printers, self-adhesive labels, thermal transfer ribbons, thermal printheads, and batteries.

Zebra's products for barcoding and personal identification are used for routing and tracking, transactions processing, and identification and authentication. Zebra's products are used in the following industries: inventory control, small package delivery, baggage handling, automated warehousing, JIT manufacturing, employee time and attendance records, file management systems, hospital information systems, medical specimen labeling, shop floor control, in-store product labeling, employee ID cards, driver's licenses, and access control systems.

5.38.1 Zebra's Products

Zebra's printers are used to produce bar code labels, RFID "smart" labels, receipts and tags, plastic cards, and photographs. They sell related specialty labeling materials, thermal ink ribbons, and bar code label design and network management software. These products are used to provide bar code labeling, personal identification, and specialty printing solutions.

Table 5-26 shows the type of Zebra's printers

TABLE 5-26
ZEBRA'S PRINTERS

- Label and Receipt Printers
- Card Printers
- Digital Photo Printers

Source: WinterGreen Research, Inc.

Zebra produces the industry's broadest range of on-demand thermal transfer and direct thermal label printers that allow for a variety of printing applications. Zebra makes 11 card printer models for printing national identity cards, driver's licenses, employee identification badges, smart cards, on-demand access control cards, gift cards and customer loyalty cards. Photo Printers. Digital photo printing is an extension of our core thermal printing technology. The digital photo printers that are offered are Kodak Professional ML-500 Digital Photo Print and the ML-500, which is designed for professionals.

5.38.2 Customers

Zebra has sold 5,000,000 bar code label and card printers to customers in about 100 countries. ScanSource, Inc., a distributor of automatic identification products, is the only customer to account for 10% or more of total net sales from 2003-2005.

5.38.3 Zebra Financial Data

Zebra Technologies Corporation had net sales, for the quarter ended April 1, 2006, of \$175,814,000, an increase over the \$170,727,000 recorded for the first quarter of 2005. Quarterly net income was \$26,091,000, compared with \$25,819,000 for the same period a year ago.

All three of the company's international territories experienced sales growth. Sales of supplies increased 14.6% for the quarter. Gross profit margin declined to 47.0% from 51.0%. As of April 1, 2006, Zebra had \$569,523,000 in cash and investments. Inventories totaled \$66,605,000. Accounts receivable increased to \$116,415,000 from \$111,551,000. Net sales are expected within a range of \$180,000,000 and \$190,000,000 for the second quarter.

(Dollars in thousands)	Three Months Ended	
	April 1 2006	April 2 2005 (restated)
Net Sales	175,814	170,727

5.38.4 Zebra Technologies 2005 Revenue

<i>(Dollars in thousands)</i>			
YEARS ENDED			
DECEMBER 31:	2005	2004	2003
Revenues			
Hardware	540,679	518,556	409,144
Percent of Sales	77.0%	78.2%	76.3%
Supplies	129,183	116,877	98,556
Percent of Sales	18.4%	17.6%	18.4%

5.38.5 Zebra/IBM

Zebra Technologies Corporation has partnered with IBM Global Technology Services that incorporates Zebra's mobility, bar code labeling and RFID printing/encoding solutions into the IBM Global Technology Services solution portfolio. This solutions portfolio includes solutions for route accounting, logistics, warehouse management and in-store retail applications. IBM and Zebra are offering label and receipt printing with Zebra's RW series and QL series printers.

IBM and Zebra will leverage the Xi series performance line of printers to deliver bar code labeling applications. IBM's Express RFID Services supports Zebra's R110Xi multi-protocol printer/encoder. The IBM Express RFID Services offering hosts RFID applications software to manage data and tagging capabilities.