Services Oriented Architecture (SOA) Infrastructure Market Shares, Market Strategy, and Market Forecasts, 2008-2014

SOA Engines Support SOA Infrastructure

Picture by Susie Eustis

WinterGreen Research, Inc.
Lexington, Massachusetts

www.wintergreenresearch.com

WINTERGREEN RESEARCH

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Lexington Massachusetts

WinterGreen Research, Inc.
6 Raymond Street,
Lexington, MA 02421

Tel (781) 863-5078
Fax (781) 863-1235
www.wintergreenresearch.com
info@wintergreenresearch.com

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Services Oriented Architecture (SOA) Infrastructure Market Strategies, Market Shares, and Market Forecasts 2008-2014

IBM is the defacto industry standard market leader in SOA. IBM dominates SOA with 64% of the market, the rest of market is divided between 12 other participants with measurable market share, none of whom have even been able to garner as much as 8% of the market. IBM dominates the SOA infrastructure markets with more than half of the market because it has the infrastructure offering that can be used to achieve integration in a heterogeneous IT environment and solid services support to permit the large enterprises to change their business model.

IBM stands alone as a leader in SOA, inventing the concept of refining reusable solutions that have been around for a long time, adding a unique component and SOA manner, by making the SOA components work to create a worldwide integrated enterprise. While the IBM SOA is able to be used as a solution that works across a global enterprise, the SOA services as implemented in a middleware infrastructure are flexible enough to provide for local variation.

Services oriented architecture (SOA) represents a fundamental change in the way automated process is delivered to replace manual process. Service enabling offerings are a response to the fundamental change in IT, where enterprise competitive advantage is gained from having IT flexibility. Software infrastructure companies have 'service enabled' their offerings in response to demand for the flexibility needed to operate a global enterprise. This service enabling of offerings represents a promise that the software vendor has the ability to build solutions that can be modified and updated in response to changing market conditions.

Enterprise IT departments use SOA to tie together the various assets and get more from the existing investment. To accomplish this, systems integration is needed to create ever changing solutions. Software infrastructure vendors need a strong middleware infrastructure as a fundamental underpinning to creating SOA that works. The ability to create and support service enabled offerings depends on having a strong middleware offering.

Many software companies do not have the basic application integration and messaging core middleware infrastructure needed to run the IT departments efficiently; thus there is a flurry of SOA activity as enterprises companies seek to acquire the right middleware technology that reduces the cost of running the IT department.

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Process is sequence. Information is stored in databases, but it is used as process, a sequence of events tied together with calculations and movement of information from one location to another, form one application to another. Process and sequence depend on integration.

Significant acquisition activity has occurred as all the major computer software and hardware players seek to adjust to the new architectures offered by SOA. Oracle bought BEA, Software AG bought webMethods to mention only a few of the most significant acquisitions.

SOA depends on transport of messages from one service to another. SOA is a way of implementing services that decouple application logic components and thereby facilitate rearrangement and reuse of software modules or objects. Once the software components have been decoupled, they need to be reconnected using messaging that passes transactions between the SOA components. The IBM mission critical WebSphereMQ is significant because it provides once and only once delivery of transaction messages in a secure manner. This provides the foundation of SOA.

SOA is a way of exposing information from a software module through an API, through an application interface. Once a service has a way of sending information to and from the services, the decoupled components can be re-coupled in different ways. In this manner, the messaging component is significant. There is no longer a single optimized stack, but rather independent components of a stack that may be re-coupled in any order using messaging.

Physical proximity of the components of the stack is no longer a necessity; the components can interact in different ways. Web services have a messaging capability called SOAP. Java has a messaging service called JMS. Both JMS and SOAP typically use IBM MQ messaging wrappers to provide assured delivery of information from one SOA service to another.

SOA engine markets depend on mature infrastructure middleware that provides the ability to consolidate integration modules with foundation architecture. IBM SOA is the software used most often in creating business integration foundation systems.

SOA creates a way to organize automated process supporting modules. SOA systems are evolving to support business flexibility by enabling integration of systems dynamically. Applications are being interconnected using integration to create cross-departmental processes. Processes are implemented in real time.

Process is sequence. Information is stored in databases, but it is used as process, process imposes sequence and flow. A sequence of events tied together with calculations and movement of information from one location to another, form an application. The ability to form a SOA collaboration from component repositories and move information from one siloed application to another is implemented as process flow. Process and sequence depend on integration and SOA systems in an engine, evolved to achieve the reuse of existing software code components.

SOA engines and SOA adapters and integration broker components comprise the SOA foundation product. The engine is implemented as a directory or database to control header and use of body information including date, updates, and location of scripts. The components are what are used to implement Web enabled applications.

Services Oriented Architecture (SOA) market license forecasts relate to the middleware infrastructure. Markets are expected to reach t $4.3 billion by 2014 creating a way to improve the cost of running an IT department by creating more automated process from software.

Tel (781) 863-5078
Fax (781) 863-1235
www.wintergreenresearch.com
info@wintergreenresearch.com

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www.wintergreenresearch.com
Telephone 781-863-5078
Email: info@wintergreenresearch.com
Lexington, Massachusetts

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Telephone 781-863-5078
Email: info@wintergreenresearch.com
Lexington, Massachusetts

www.wintergreenresearch.com
Telephone 781-863-5078
Email: info@wintergreenresearch.com
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Telephone 781-863-5078
Email: info@wintergreenresearch.com
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Telephone 781-863-5078
Email: info@wintergreenresearch.com
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Telephone 781-863-5078
Email: info@wintergreenresearch.com
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Telephone 781-863-5078
Email: info@wintergreenresearch.com
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Email: info@wintergreenresearch.com
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Telephone 781-863-5078
Email: info@wintergreenresearch.com
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Telephone 781-863-5078
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Telephone 781-863-5078
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List of Tables and Figures

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Telephone 781-863-5078
Email: info@wintergreenresearch.com
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Email: info@wintergreenresearch.com
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Email: info@wintergreenresearch.com
Lexington, Massachusetts

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Telephone 781-863-5078
Email: info@wintergreenresearch.com
Lexington, Massachusetts

Services Oriented Architecture (SOA) Infrastructure Executive Summary

IBM Sets Defacto Industry Standard For SOA

SOA creates a way to organize automated process supporting modules. SOA systems are evolving to support business flexibility by enabling integration of systems dynamically. Applications are being interconnected using integration to create cross-departmental processes. Processes are implemented in real time. IBM is the defacto industry standard market leader in SOA infrastructure markets

IBM has achieved a defacto industry standard market position in SOA infrastructure markets by virtue of its infrastructure middleware that provides the ability to consolidate integration modules with foundation architecture. IBM SOA is the software used in creating business integration foundation systems.

IBM increased its market share to 63% of the SOA infrastructure market in 2007, up from 53% in 2006, and up from 46% in 2005. IBM grew its portion of this market by 17% in 2007. IBM has SOA portal, broker, ESB, business process management (BPM), and mission critical messaging initiatives that benefit companies. IBM SOA is in a leadership position in the market because it is better at supporting streamlined processes, improved customer service, more effective compliance and risk management, and improved responsiveness to changing business conditions.

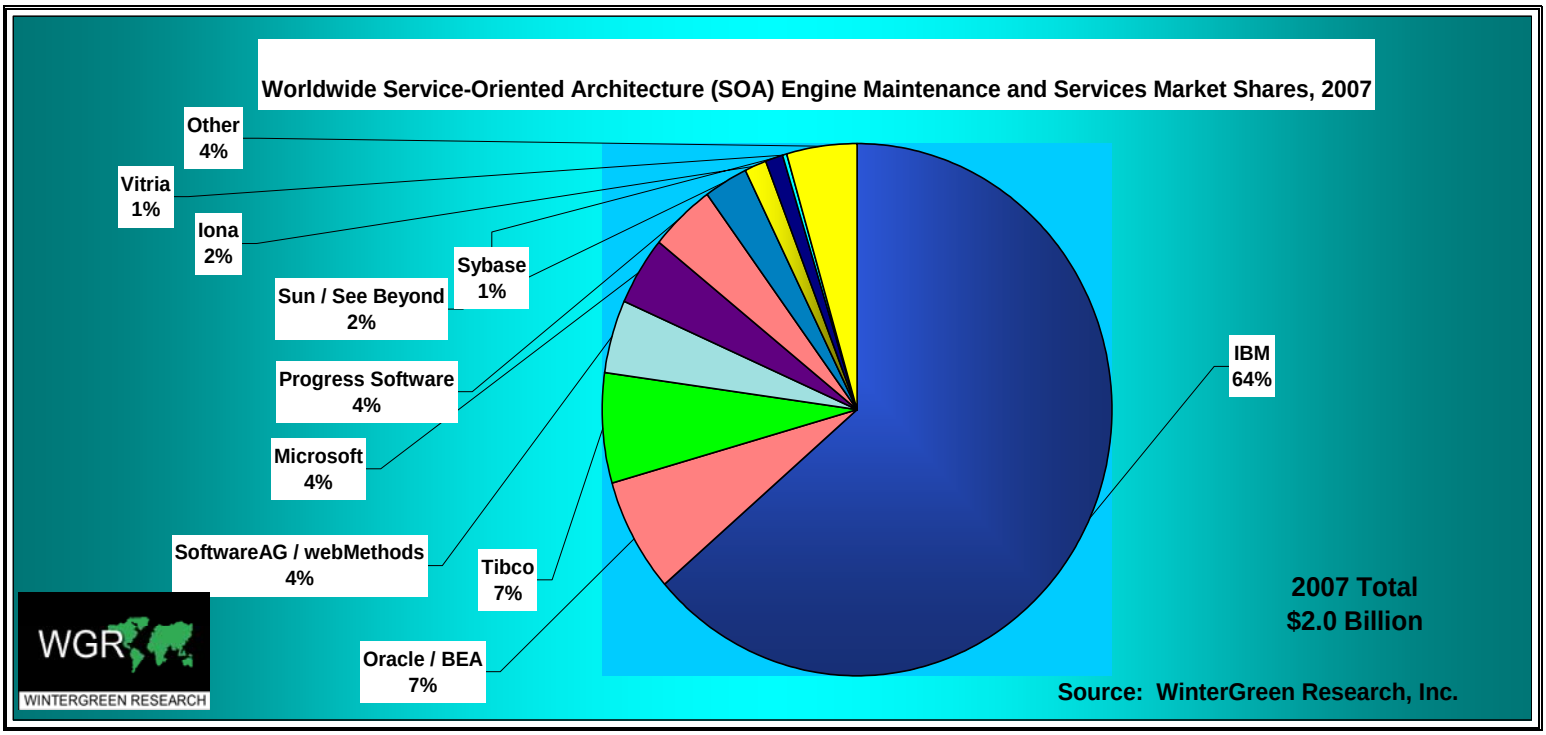
www.wintergreenresearch.com
Telephone 781-863-5078
Email: info@wintergreenresearch.com
Lexington, Massachusetts

SOA Market Shares

IBM is the leader in SOA markets with 64% share. No other vendor has above 7% market share and software vendors are merging and making acquisitions at a rapid pace seeking to achieve SOA product sets that are credible. .

Table ES-1

SOA Market Shares, 2007



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Email: info@wintergreenresearch.com
Lexington, Massachusetts

Business Integration Positioned As SOA Middleware

Business integration is positioned as SOA middleware useful in the transformation of business process to make it more flexible and adaptive to change. It is used to leverage making legacy applications more flexible. SOA extends existing technology investment by providing tools and middleware for interconnecting systems.

Mission critical messaging provides the base for application integration. Web services and Java based messaging do not manage the complexity of data structures that are encountered in even modest integration projects. The broker management of data structures is what integration is all about.

IBM WebSphereMQ and Tibco Rendezvous become core processes for SOA in this context. Oracle / BEA has a strong broker capability.

WebSphereMQ and Tibco Transport Layer Achieve Mission Critical Functionality

The mature transport technologies have a strong customer base that supports and funds product enhancements. The newer transport technologies MSMQ, .Net, SOAP, and JMS are generally utilized as modules that are wrapped in the mature WebSphereMQ or Tibco transport layer to achieve mission critical functionality.

Rules infrastructures permit systems to be developed that look at the content of a message to determine the basis of a route. A routing decision is made after the application process rules are addressed.

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Telephone 781-863-5078
Email: info@wintergreenresearch.com
Lexington, Massachusetts

SOA Industry Consolidation

Services oriented architecture (SOA) represents a fundamental change in the way automated process is delivered to replace manual process. Service enabling offerings are a response to the fundamental change in IT, where enterprise competitive advantage is gained from having IT flexibility. Software infrastructure companies have 'service enabled' their offerings in response to demand for the flexibility needed to operate a global enterprise. This service enabling of offerings represents a promise that the software vendor has the ability to build solutions that can be modified and updated in response to changing market conditions.

Enterprise IT departments use SOA to tie together the various assets and get more from the existing investment. To accomplish this, systems integration is needed to create ever changing solutions. Software infrastructure vendors need a strong middleware infrastructure as a fundamental underpinning to creating SOA that works. The ability to create and support service enabled offerings depends on having a strong middleware offering.

Many software companies do not have this basic application integration and messaging core middleware infrastructure, thus there is a flurry of SOA industry consolidation as companies seek to acquire the right middleware technology. Significant acquisition activity has occurred as all the major computer software and hardware players seek to adjust to the new architectures offered by SOA. Oracle bought BEA, Software AG bought webMethods to mention only a few of the most significant acquisitions. Chapter 5 has a much longer list.

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Telephone 781-863-5078
Email: info@wintergreenresearch.com
Lexington, Massachusetts

IBM stands alone as a leader in SOA, inventing the concept of refining reusable solutions that have been around for a long time, adding a unique component and SOA manner, by making the SOA components work to create a worldwide integrated enterprise. While the IBM SOA is able to be used as a solution that works across a global enterprise, the SOA services as implemented in a middleware infrastructure are flexible enough to provide for local variation.

IBM Dominates SOA with 64% of the Market, Rest of Market Divided Between 12 Other Participants With Measurable Market Share

IBM dominates SOA with 64% share of the market; the rest of market is divided between 12 other participants none of whom have even been able to garner as much as 8% of the market. IBM dominates the SOA infrastructure markets with more than half of the market because it has the right infrastructure offering and solid services support to permit the large enterprises to change their business model.

IBM's SOA dominance comes from its control of the application server middleware and application integration technology that is the underpinning of SOA. IBM invented the term middleware. It has a broad middleware product offering that supports application integration across existing IT assets. IBM participates in the SOA market with strength because the WebSphere MQ messaging product is such a significant aspect of SOA.

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Telephone 781-863-5078
Email: info@wintergreenresearch.com
Lexington, Massachusetts

SOA depends on transport of messages from one service to another. SOA is a way of implementing services that decouple application logic components and thereby facilitate rearrangement and reuse of software modules or objects. Once the software components have been decoupled, they need to be reconnected using messaging that passes transactions between the SOA components. The IBM mission critical WebSphereMQ is significant because it provides once and only once delivery of transaction messages in a secure manner. This provides the foundation of SOA.

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Physical proximity of the components of the stack is no longer a necessity; the components can interact in different ways. Web services have a messaging capability called SOAP. Java has a messaging service called JMS. Both JMS and SOAP typically use IBM MQ messaging wrappers to provide assured delivery of information from one SOA service to another.

In this manner IBM has achieved a dominant position in SOA. There are literally quadrillions of IBM MQ mission critical messages sent every day.

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Telephone 781-863-5078
Email: info@wintergreenresearch.com
Lexington, Massachusetts

MQ has become such a dominant messaging technology because it is not proprietary; it sends messages to and from any operating system, platform, or application. Most IT departments have enabled all their APIs with MQ connectivity.

SOA As A Mainframe Technology

SOA is a mainframe technology because it leverages shared workload. The mainframe is a green machine. It uses far less power than a large data center. The differences are quantum. A small refrigerator size box, vs. a warehouse full of servers that use twice as much electricity for air conditioning as they do for processor power, there is not any choice when a realistic analysis is done.

ROI return on investment analysis shows advantage mainframe because of the efficiencies provided by shared workload, the security, reliability, and infrastructure. Analyst assumptions show how to measure one application at a time to build an assessment of what systems are more efficient.

The WinterGreen Research ROI analysis is available online using a promotional or other special code to create a user name and password. The online tool permits users to insert their own assumptions and calculate the ROI based on a particular situation. It shows that for a particular application the mainframe is far more than 10 times less expensive than distributed servers.

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Telephone 781-863-5078
Email: info@wintergreenresearch.com
Lexington, Massachusetts

Advantage mainframe leverages SOA. The total cost advantage of the mainframe for one application is over $2 million per year, for every year. Every category of IT usage analysis provides better ROI from using the shared workload environment of the mainframe.

Security, scalability, and reliability are significant features of the mainframe giving it competitive advantage. For large data centers with shared workload environments, the mainframe has a significant cost advantage.

Reimbursement to the Line of Business (LoB) for Initial SOA Development

As organizations develop a robust service portfolio the proportion of inter-domain interactions increases. As services are used in composite applications in other business units the enterprise needs to develop policies that reward the department that pays for the initial development of the services that are most useful in a SOA environment.

Reimbursement of initial development, once the service is reused is a key aspect of SOA implementation. Services originally developed in one line of business automate business processes that ultimately span organizational boundaries.

Multiple requirements arise as service use increases. Performance is am issue. QoS assurance is significant. Service level-agreements need to be protects. Organizations must ensure that they effectively manage a rapidly growing portfolio of diverse assets.

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Telephone 781-863-5078
Email: info@wintergreenresearch.com
Lexington, Massachusetts

Services, policies, and business processes and publicize the availability of these assets organizations to effectively manage a portfolio of diverse assets (e.g., services, policies, business processes) and publicize the availability of these assets. Moreover, as the use of and dependence on services grows so do the requirements for dependable service level agreements and effective governance.

Service-Oriented Architecture (SOA) Automates Key Business Processes Replacing Manual Process

Service-Oriented Architecture (SOA) automates key business processes, and implements a virtual environment for employees, customers and other users. Service-Oriented Architecture (SOA) is an approach to organizing IT resources as business services, increasing the agility of the organization while obtaining increased value out of existing IT assets.

Process is sequence. Information is stored in databases, but it is used as process, a sequence of events tied together with calculations and movement of information from one location to another, form one application to another. Process and sequence depend on integration.

Business process improvement drives SOA initiatives. Automation of manual business processes is a central concern. SOA business processes targeted are manual, paper-based processes that consume resources and limit flexibility. As paper-based processes are implemented, IT needs to implement automated controls.

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Telephone 781-863-5078
Email: info@wintergreenresearch.com
Lexington, Massachusetts

Manual processes offer a poor user experience: processes take too long, are too complicated, and cost too much to manage. SOA is used for standards-based, loosely coupled distributed computing.

TABLE ES-2

SOA VALUE OF AUTOMATED PROCESS

- Automates key business processes
- Implements a virtual environment
- Useful for employees, customers, suppliers, distributors, and partners
- Is an approach to organizing IT resources as business services
- Increases the agility of the organization
- Obtains increased value out of existing IT assets
- drives business process improvement
- Automates manual business processes
- Replaces manual, paper-based processes
- Automates manual, paper-based processes that consume resources and limit flexibility
- Implements automated controls
- Replaces manual, paper-based processes that offer a poor user experience
- Replaces manual, paper-based processes that take too long

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Email: info@wintergreenresearch.com
Lexington, Massachusetts

TABLE ES-2 (CONTINUED)

SOA VALUE OF AUTOMATED PROCESS

- Replaces manual, paper-based processes that are too complicated
- Replaces manual, paper-based processes that cost too much to manage
- Is used for standards-based, loosely coupled distributed computing functional implementation
- Works best in the shared workload mainframe environment

Source: WinterGreen Research, Inc.

SOA Market Forecasts

SOA stacks of decoupled services are purpose built for the enterprise environment that is continuously shifting because of mergers and acquisitions. With decoupled software solutions, the web services and the SOA components can be portable. SOA markets at $2 billion in 2007 are anticipated to grow 20% per year to $9.1 billion by 2014. Growth is a result of IT departments to reduce spending on run time efforts and to spend a higher proportion of their budgets on growing the business.

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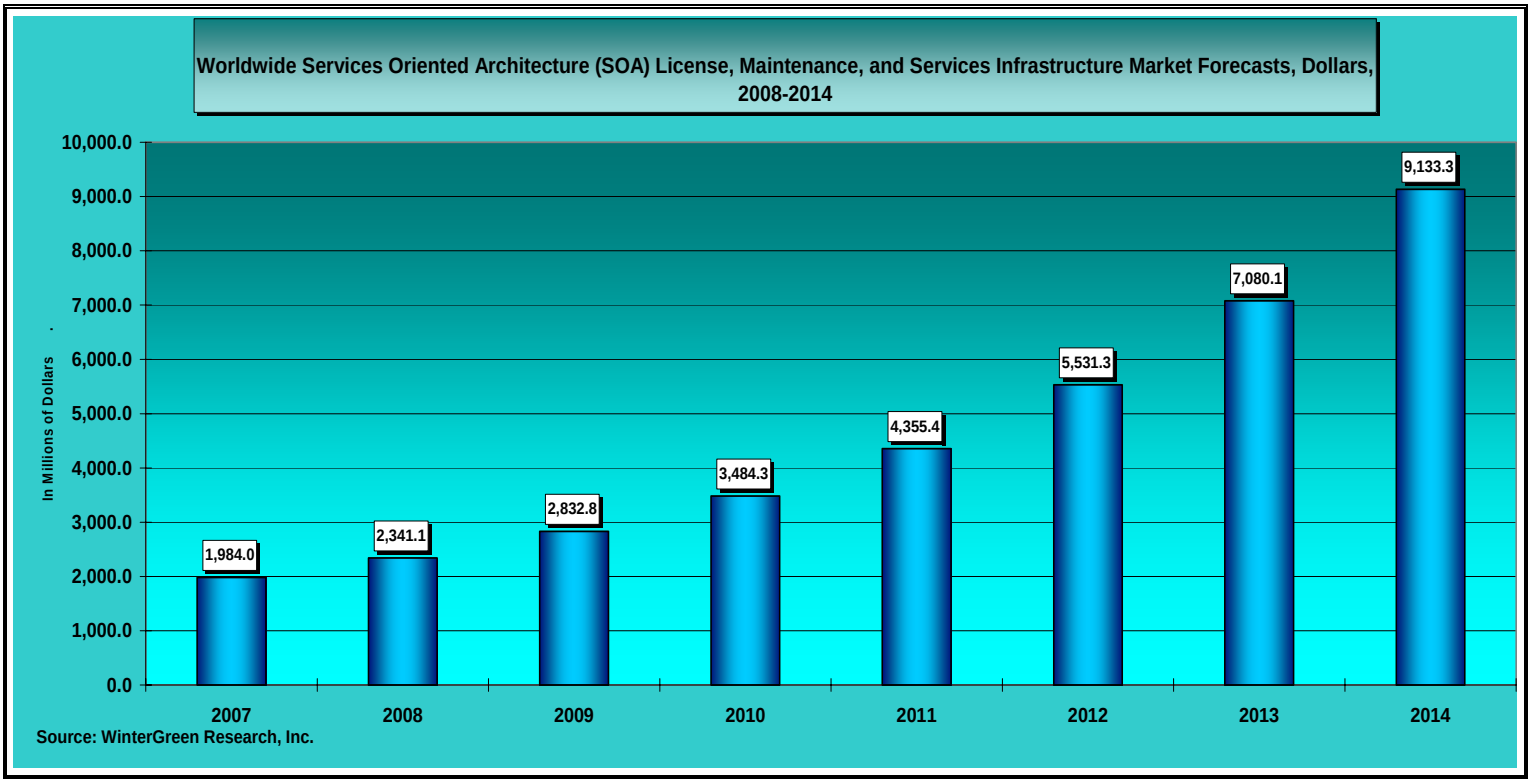
Table ES-3

SOA Market Forecasts, 2008-2014



SOA provides automated process. Automated process is more efficient than manual process. Any small business can operate with manual process, but to get big, the processes need to be repetitive and accurate. SOA provides a way to achieve this automation in a flexible manner so that processes can be changed as needed.

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Email: info@wintergreenresearch.com
Lexington, Massachusetts

SOA Infrastructure Market Driving Forces

SOA is another name for API. SOA gives access to modules of code through the APIs that expose inputs and outputs to the programmer. SOA is comprised of a stack of decoupled web services and plain vanilla standalone applications that implement some software. SOA is used with decoupled stand alone solutions services. A set of different services like currency conversion, bank loan credit checks, and simplified web page billing can be stitched together using SOA to form another application.

SOA is supported by mission critical messaging systems because the ability to take decoupled services and form applications in response to changing business conditions gives significant competitive advantage.

Building a Robust Data Integration Layer

A service that provides access to customer information does not have to read-write against multiple underlying systems and hence is not forced to understand the format, structure and relationships of how customer data is stored. A SOA services application solution is used to create a data integration layer that insulates the consumers of data from where and how it is stored.

This requires IT to define the standard data model for customers, products, and employees. Regardless of how data is stored within the organization they must determine the logical structure of the data that makes business sense and satisfies all the stakeholders that depend on that data to perform their business functions.

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Email: info@wintergreenresearch.com
Lexington, Massachusetts

IT might determine that the customer data object should have ten attributes including name, address, phone number, and account number. In this manner, the data structure has a significant impact on the construction of applications using SOA.

SOA Market Segment

SOA addresses the fact that market conditions are constantly changing. The ability to respond quickly and effectively can mean the difference between business success and failure. Responsive IT infrastructure accurately aligns capabilities with evolving business requirements and unpredictable markets.

To achieve business agility, companies use SOA, which deploys critical business processes as reusable services. Services need infrastructure to achieve shared development capabilities across the company. SOA reduces software delivery complexity. Application development cycles are compressed because reused code segments are more efficient to code by a factor of five than generation of new code.

SOA delivers a framework for creating software. SOA basically implements APIs that are used to access information contained in other applications. The APIs provide inputs and outputs from the reusable code segments that are services. Many enterprise SOA portfolios have framework infrastructure as an integral component of their business process platform.

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Email: info@wintergreenresearch.com
Lexington, Massachusetts

SOA Market Driving Forces

BPM on SOA has been delivered by workflow vendors. SOA functional requirements are implemented with the goal of meeting the requirements that are presented by challenges of competitive response to changing market conditions. SOA frameworks are used for building an IT infrastructure. SOA products permit IT to deliver business functionality as shared, reusable services. Business processes drive the definition, creation and execution of these services. Reuse of services is facilitated by creating APIs that use mission critical messaging to support sharing of information between services located on a stack.

The SOA services components are optimized in a decoupled manner on the stack, permitting developers to quickly create new services to respond to changing business needs. SOA software infrastructure products permit the use of loosely coupled software services to support the changing requirements of business processes. Software resources re located on a network in an SOA environment. SOA independent services can be accessed without changing the underlying platform implementation.

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TABLE ES-4

SERVICES ORIENTED ARCHITECTURE (SOA) BENEFITS

- **Align business and IT**
- **Accelerate revenue-creation opportunities**
- **Simplify and standardize application integration**
- **Use API message connection points to gain access to siloed information in applications**
- **Reduce overall integration costs**
- **Reduce the long-term maintenance cost**
- **Facilitate internet application development**
- **Ensure that applications support industry standards**
- **Achieve software solution component re-usability across the portfolio of applications**

Source: WinterGreen Research, Inc.

SOA varies from customer to customer because each customer has a different stack of software application components. SOA provides a way for each customer to put software into a stack and optimize it for the unique enterprise computing environment. Table 2-5 illustrates enterprise services oriented architecture market driving forces.

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TABLE ES-5

SERVICES ORIENTED ARCHITECTURE SOA MARKET DRIVING FORCES

- Services used for applications useful at department level
- On demand data access
- Meta data solutions
- Integration demands of e-Business
- Major technical challenges
- Need to address business challenges
- Need to adapt to market changes
- ERP enterprise applications handle the core processes
- e-Business IT process applications initiatives
- Need to leverage Internet market channels
- Need to interconnect distributed islands of computing
- Real time network communication of information
- Computing application resources interconnected
- Application solutions have limitations in terms of time-to-market, cost, performance or flexibility

Source: WinterGreen Research, Inc.

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Email: info@wintergreenresearch.com
Lexington, Massachusetts

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

1.1 Benefits of SOA

SOA enterprise benefits relate to achieving reuse of code and flexible response to changing market conditions. Extending the benefits of SOA beyond the enterprise relates to providing the ability to exchange data between partners, suppliers, distributors, and customers. SOA facilitates integration beyond the enterprise—between a company and its partners and customers. A business-to-business (B2B) infrastructure based on a SOA approach lowers development costs. It delivers value chain economies and reduces project risks.

SOA relates to developing flexible IT infrastructures based on reusable components of code that are accessed from APIs, application interfaces. The reusable components of code are more like a solution than an object or a subroutine. The SOA code is reusable because it is a service-oriented architecture (SOA) approach to building enterprise automated process.

SOA has gained widespread acceptance within the IT community. Compelling benefits accrue from achieving the ability to do rapid deployment of applications. SOA functionality permits reuse of existing code with the effect of

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lowering development costs. SOA provides application development flexibility that results in improving responsiveness to business needs and reducing maintenance costs thus freeing teams to work on innovative initiatives. SOA initiatives support applications within an enterprise.

1.1.1 SOA Facilitates Integration Beyond The Enterprise Network

SOA can leverage the Internet and Internet-based standards. A business-to-business infrastructure based on a SOA approach has the potential to dramatically increase automated process between partners. SOA can simplify the way companies communicate with partners and customers.

SOA deployed within the firewall integrates enterprise applications. The SOA approach goes beyond the enterprise to facilitate integration between a company and its partners and customers. SOA works outside the firewall too. SOA has the potential to apply to partners. Many of the benefits of SOA relate to more effective integration with business partners, better supply chain collaboration, increased global sourcing and more effective use of external service providers.

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TABLE 1-1

USING SOA TO FACILITATE INTEGRATION BEYOND THE ENTERPRISE NETWORK

- Extend existing SOA initiatives deployed within the firewall
- Integrate enterprise applications
- Apply to partners
- Facilitate integration between a company and its partners
- Facilitate integration between a company and its customers
- Achieve better supply chain collaboration
- Increase global sourcing
- Achieve more effective use of external service providers

Source: WinterGreen Research, Inc.

These are business-to-business benefits. Realizing the potential of a SOA approach involves extending its use beyond the firewall to facilitate the end-to-end automation of business processes throughout the entire ecosystem of partners and customers surrounding a company.

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1.2 SOA Data Integration

Data for services depend on accurate, available, and understandable access to IT assets. Even if the data is accessible through adapters and code there is no clarity on the semantic meaning of data spread out over multiple systems. SOA impacts the ability to aggregate data into a format that makes business sense.

1.2.1 Encapsulating Business Logic As Services

Different consumers of services access the same sets of data in a point-to-point manner and do not follow consistent rules for formatting, cleansing and interpreting the data leading to inaccuracies. The adoption hurdle relates to identification of limitations of current IT implementations. Current integration solutions include SOA initiatives that have a focus on encapsulating the business logic of applications as services. Developers of business services are seeking to understand how to reuse existing services by making them flexible enough to apply to many, many different situations.

1.2.2 Composite Applications

Composite applications relate to business logic exposed as re-usable services. The business logic may be hidden in code and referred to as black box functionality. But, a black box is a lot of different things to a lot fo different people. The issue is to define the services solution with descriptive language.

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Clearly defined interface services are able to provide black box access to the underlying data via a data integration layer. Interaction between service providers and consumers might be loosely coupled based on a messaging backbone, or an enterprise service bus (ESB).

The interaction between services and the underlying data remains point to point. A bank may provide customer service representatives with information to enable them to provide better customer service. SOA is positioned to permit companies to take advantage of up-sell and cross-sell opportunities.

Access to customer information is spread out across multiple systems. SOA is an integration technology. They need to build services that return customer information. Purchase history, address, and billing information needs to be shared across disparate systems.

1.3 SOA Creates The Agile Business

The agile business provides a strong data integration layer as the infrastructure. A SOA implementation of web services provides benefits in the ability to manage volumes of data and system complexities within organizations. This can be daunting. Technical benefits directly translate into business benefits.

A CEO, CFO or line-of-business manager can implement a SOA data integration layer. SOA leverages existing data assets. A SOA unlocks existing data trapped within siloed applications and data stores. SOA extends the life of existing IT investments and reduces the need for costly investments every time new functionality is required.

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Lower development and maintenance costs are achieved through the reuse of existing assets, such as data integration services and metadata.

TABLE 1-2

SOA AGILE BUSINESS FUNCTIONS

- Provides a strong data integration layer
- Creates flexible infrastructure
- Provides implementation of web services
- Provides benefits in the ability to manage volumes of data
- Manages system complexities
- Permits technical benefits to directly translate into business benefits
- Can be implemented in model driven architecture with input and model building by CEO, CFO or line-of-business manager
- Permits implementation of a SOA data integration layer

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TABLE 1-3

SOA AGILE BUSINESS BENEFITS

- Leverages existing data assets
- Unlocks existing data
- Provides access to data trapped within siloed applications
- Provides access to data trapped within data stores
- Extends the life of existing it investments
- Reduces the need for costly investments
- Supports evolution of new functionality
- Lowers development costs
- Lowers maintenance costs
- Supports reuse of existing assets
- Supports reuse of data integration services
- Supports reuse of metadata.

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TABLE 1-4

KEY SOA DATA AND METADATA COMPONENTS

- Enterprise metadata management
- Metadata assets
- Logical data model
- Location
- Transformation logic
- Cleansing rules
- Map of the common data model to the actual system architecture
- Cross-referencing engine
- Way to support management of the same data identified in different ways within different applications
- Views of similar data from different data stores
- Views of similar data in different data stores
- Aggregation of similar and related data as a single entity

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Key capabilities required for a SOA solution are provided by the integration platform: Enterprise metadata management include the logical data model as well as the location, transformation logic, and cleansing rules that map the common data model to the actual system architecture. A cross-referencing engine is an essential aspect of SOA. Cross referencing ensures that the same data identified in different ways within different applications is viewed and aggregated as a single entity.

Developers can increase their productivity when deploying functionality. SOA permits developers to build inter-operable services if each adheres to an established common semantic data model. The result is that IT can substantially reduce the risk and costs associated with functionality development.

SOA reduces the costs that go into the upkeep and maintenance of existing functionality. Flexibility to change is built into SOA systems. A SOA infrastructure requires consumers and producers of services to be loosely coupled to the extent that they may not even have knowledge of each other.

A data integration layer with data integration processes that are metadata driven allows for the loose coupling between services and the data they depend on. This handshake between data and functionality allows for business logic to be rapidly modified as business needs dictate, making the IT organization adaptive and flexible to change.

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1.3.1 SOA Return on Investment (ROI)

SOA provides infrastructure for reuse and productivity improvements. New business process functionality can be deployed quickly using SOA. At the business level SOA translates into an increased ability to leverage market opportunities by being able to offer customers new products and services in increasingly shortened timeframes.

Better, faster decision making is a central aspect of SOA. The data integration infrastructure is deployed in a manner that supports the principles of SOA. It allows companies to access, share, and understand information throughout the organization faster. Decision makers view information in a manner that supports acting on it.

Lower costs can evolve from component reuse, productivity improvement , interoperability of software systems, and faster development times. ROI delivered by SOA translates into lower IT costs to support existing business processes. SOA is used to develop new functionality. The results are in direct bottom line savings for a company. The benefits around SOA relate to automation of process in every aspect of the business, but particularly in leveraging the Internet as a channel.

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TABLE 1-5

SOA RETURN ON INVESTMENT (ROI)

- Lower costs can evolve from the soa benefits
- Reuse
- Productivity gains
- Interoperability
- Faster development times
- Support for existing business processes
- Ability to develop new business process functionality
- Direct bottom line savings for company

Source: WinterGreen Research, Inc.

Service Oriented Architecture (SOA) is a business-centric IT architecture. It supports integrating the enterprise as integrated, reusable business processes or services. Service-oriented architecture Web services based SOA is designed to leverage the Internet as a premier communication vehicle providing presence. IT departments see a SOA infrastructure as a way to speed up the application development process and make their enterprise and application infrastructure more secure, agile and adaptable to changing business needs.

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SOA is a mechanism for IT to deliver business agility. Visibility to information and processes across the enterprise is provided by SOA. SOA infrastructure providers align the technology with business goals. The technology is designed to support flexible automated process.

Software architecture of business application infrastructure support incremental replacement of rigid business systems. Change-resistant processes are being replaced by flexible processes. SOA supports the timely execution of business decisions. Agile businesses respond quickly to market changes and customer demands. SOA permits adjustment of business practices to achieve the delivery of products and services faster than the competition.

SOA offers real time information access. Integration and interoperability are dependent on modular systems that support scalable SOA adoption. SOA is the foundation for managing loosely coupled business processes. These processes can seamlessly bridge computing, organizational, geographic, and semantic boundaries. Companies can deploy SOA for existing systems to scale over time with the growth of businesses:

1.3.2 Service-Oriented Architecture (SOA) Layers

A service-oriented architecture (SOA) depends on a high level of application development layering. SOA enables IT to focus on business processes, rather than the underlying IT infrastructure, to achieve competitive advantage.

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But the process of SOA implementation depends on n-dimensional interaction of layers that define transport, process, presentation, calculation, and API adapters. In this manner, SOA moves beyond linear processing to n-dimensional processing.

TABLE 1-6

PROCESS OF SOA IMPLEMENTATION DEPENDS ON N-DIMENSIONAL INTERACTION OF LAYERS THAT CAN BE MODELED BY BUSINESS ANALYST

- Define transport
- Message
- Process
- Presentation
- Calculation
- API adapters

Source: WinterGreen Research, Inc.

As these layers are processed simultaneously and independently, n-dimensional processing is implemented presaging a new type of processor that has multiple program counters going simultaneously and in a synchronized manner, but doing different types of task dictated by the SOA. The model for this is the syntax described by n-dimensional calculus.

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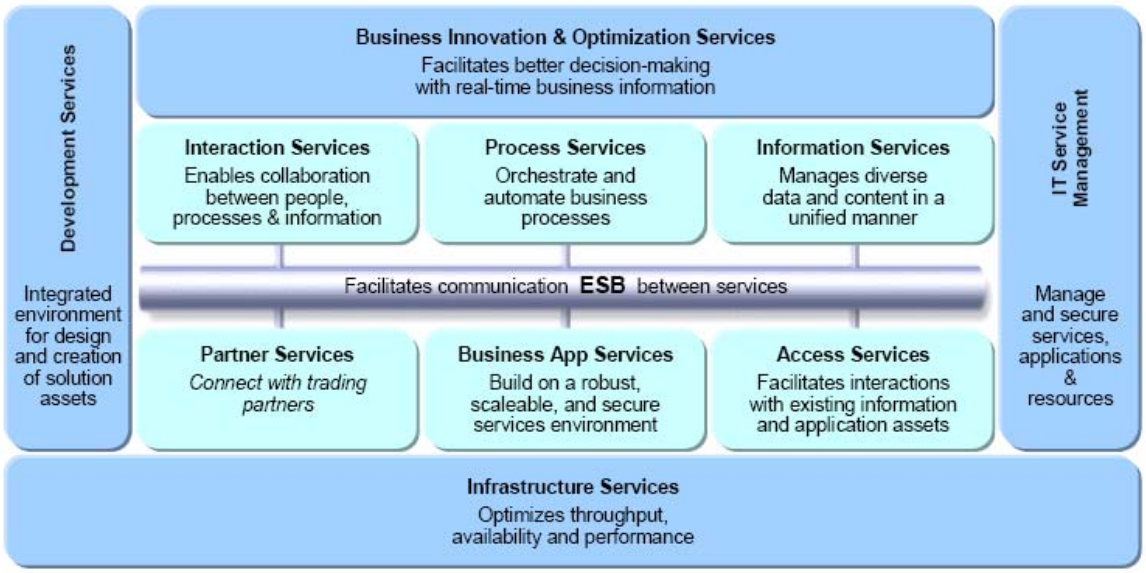
TABLE 1-7

IBM SOA BUSINESS I SERVICES LAYERS



Source: IBM.

SOA is valuable to enterprises that need to solve business-critical problems using information technology, including enterprises that want to minimize redundant infrastructure and create a common business interface across customer and employee systems. Businesses can personalize information to users based on roles and workflows. Organizations can use the Internet to boost revenue per customer through cross-selling, up-selling and access via mobile devices.

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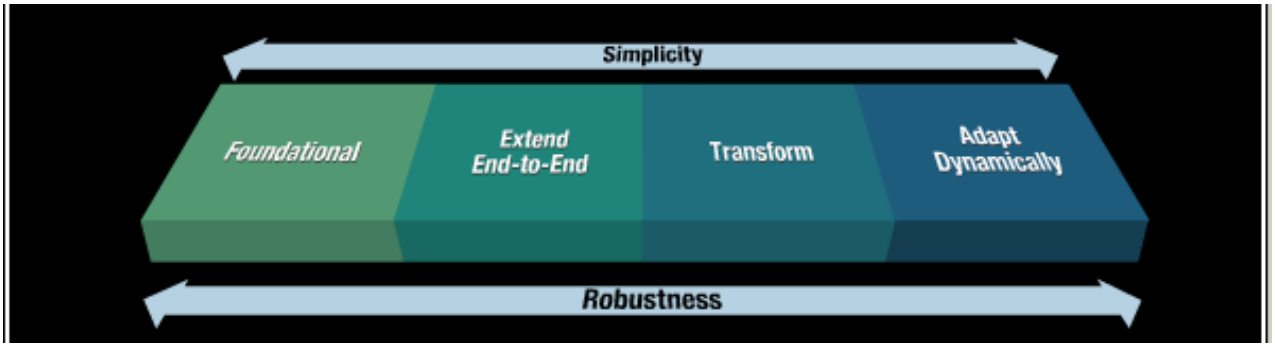
Services and business processes are then detailed into service components. Service components include a detailed set of definition meta data used to describe the service to the information system. Services can be aggregated into atomic service composite service registry.

1.3.3 Service-Oriented Architecture Business Benefits

The SOA vision is for application modernization to be implemented through component architectures. SOA leverages the benefits of modular systems, provides modeling tools to develop a roadmap, provide integration tools to implement the steps that are necessary to develop a modularization strategy. SOA product sets describe successful techniques for implementation of a SOA architecture.

FIGURE 1-8

IBM SMART SOA CONTINUUM



Source: IBM.

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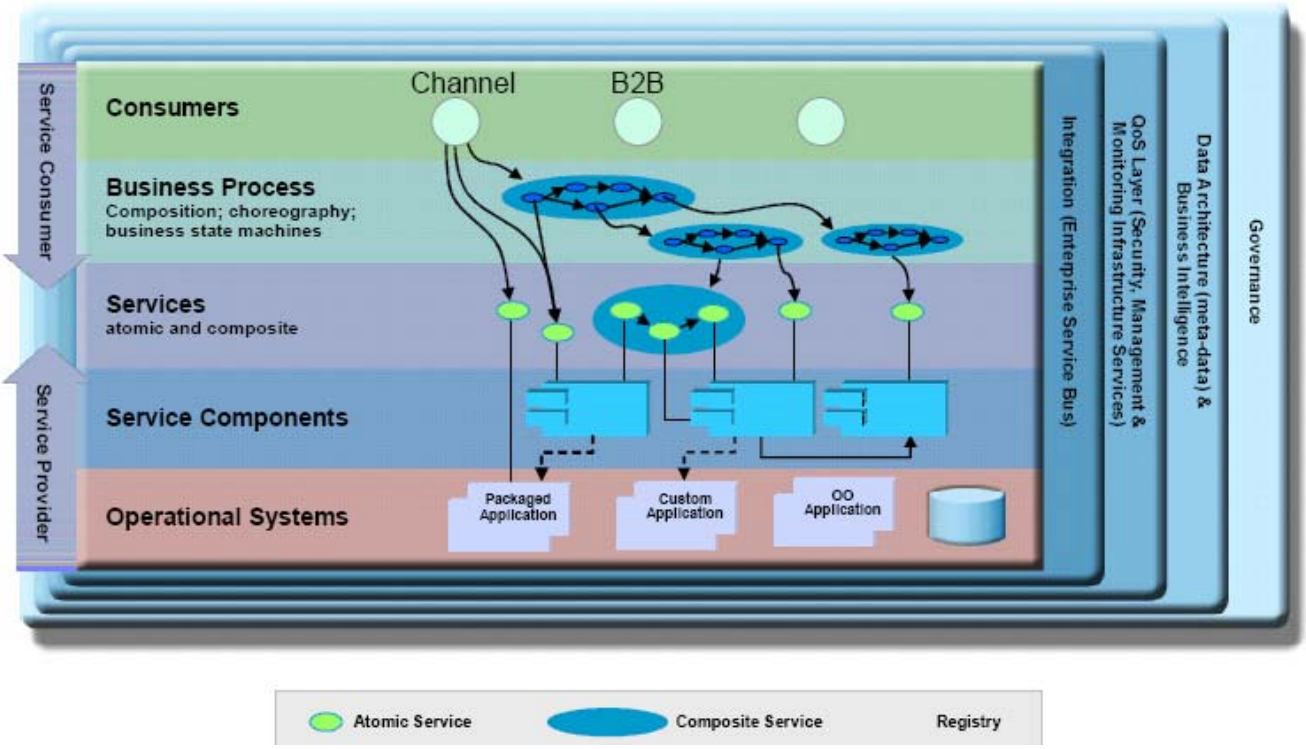
These charts illustrate the multi dimensional aspects of SOA. IBM is a leader in this capability with its cell hardware architecture that is mimicked by SOA software architecture.

1.3.4 IBM WebSphere Integration Workflow Support

TABLE 1-9

IBM SOA FOUNDATION REFERENCE ARCHITECTURE



Source: IBM.

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IBM WebSphere business integration human workflow support expands the reach of to SOA to encompass automation of activities that require human interaction. Workflow is implemented as steps in an automated business process. Business processes involve human interaction.

1.4 Business Benefits of Service-Oriented Architecture

SOA is set to transform business processes from siloed, replicated objects into highly leveraged, shared services that cost less to maintain. Business benefits of service-oriented architecture relate to efficiency, responsiveness, and rapid adaptation.

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TABLE 1-10

BUSINESS BENEFITS OF SERVICE-ORIENTED ARCHITECTURE

- Efficiency
- Responsiveness
- Rapid adaptation
- Delivery of key business services
- Meet market demands for increased service levels
- Improve services to customers
- Improve services to employees
- Improve services to partners
- Adaptability
- More effectively rollout changes throughout the business
- Achieve change with minimal complexity
- Make change with less effort

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1.4.1 Service-Oriented Architecture IT Benefits

IT benefits of service-oriented architecture relate to the ability to transform business processes from siloed, replicated processes into highly leveraged, shared services that cost less to maintain.

TABLE 1-11

IT BENEFITS OF SERVICE-ORIENTED ARCHITECTURE

- Efficiency:
- Transform business processes from siloed, replicated processes into highly leveraged, shared services that cost less to maintain.
- Responsiveness:
- Rapid adaptation and delivery of key business services to meet market demands for increased service levels to customers, employees, and partners
- Adaptability:
- More effectively rollout changes across the IT environment
- Achieve change with minimal complexity
- Make change with less effort

Source: WinterGreen Research, Inc.

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1.4.2 SOA Self-Assessment

SOA self-assessment creates a baseline for systematic evaluation. SOA is an IT strategy that is highly efficient. While investment in IT run time is not very valuable, investment in SOA pays huge returns by creating more efficient automated process.

Thousands of SOA customers have started to transition from client-server and Internet architectures to SOA. Early adopters have had multiple successful pilot projects proving that SOA pays dividends of 20 times return on investment in the first year because of the business efficiencies achieved.

Early advantage is achieved in moving to SOA. SOA is very real, driven by business and IT motivations, typically managed by an emerging group of "architects," and requiring new service-oriented software to fully deliver on the vision. Comprehensive assessments of business SOA readiness indicate that the returns are significant.

1.4.3 Service Infrastructure

Customers are moving to SOA because of its modularity and flexibility. SOA allows the mix of different hardware and software IT resources in a virtual infrastructure. SOA is integrated. No one has a single vendor IT stack. The move from managing IT in an application context to managing IT as a services delivery business depends on SOA adoption.

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SOA services enable IT departments to create, assemble, and deliver services as solutions. Solutions for use by employees, customers, partners and suppliers can be implemented as different applications based on the same services infrastructure. Services represent optimized components of code that provide a set of APIs, inputs and outputs that are reused multiple times with different applications built by business analysts instead of programmers.

SOA is an approach to enterprise IT implementation and application development. SOA breaks down business applications and features into services. Specific pieces of functionality can be efficiently built, combined, adapted, and reused.

1.4.4 Infrastructure Implementations Using SOA Products

Enterprises start SOA implementations with trials in a department. The development of code that can be reused depends on exposing APIs so that messaging can provide transport in and out of the service transparently. the enterprise organization can implement successful projects that begin with fewer than 10 services, integrating just a handful of systems, and are completed in under 6 months. After the initial success, these projects typically grow incrementally.

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1.4.5 SOA Technology Principles

SOA is not a technology defined by a single standard, it is based on Web services and XML in combination with mission critical messaging to support transport on information from one application to another. The messaging is an effective decoupled capability. A soon as applications are separate, the need to be interconnected with messaging that is mission critical. IT needs to be able to interconnect applications using messages; in this manner SOA is set to achieve IT efficiency and flexibility.

SOA depends on a set of principles that guide how organizations design their architecture and how they use technology of any vintage to facilitate reuse. Focus on establishing reuse, and integration come in the context of implementing integration software.

IT managers alone cannot dissect business processes to improve efficiency any more than business managers can re-architect systems for a better bottom line. The analysis and planning has to be done in collaboration or the results are not able to achieve efficient business process implementation.

SOA is used to extend the life of existing assets. Most organizations are closer to achieving a SOA than they think, and can work with and leverage what they've got create a network of services. Rather than replace old stacks with new stacks, open existing stacks to new technology.

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1.4.6 Decoupled Services Value

Tightly coupled services are rarely used beyond the initial application, decoupling components creates the possibility of having flexible systems. Services that require a specific language, protocol, or platform challenge reusability, and reusability is one of the most sought after benefits of SOA.

Building SOA infrastructure depends on adopting best of breed software. Openness is a primary principle of SOA.

1.4.7 Security

SOA projects begin behind the firewall. Adding business-to-business connectivity is an extension and often a core benefit. To ensure that an environment includes enterprise qualities of service, SOA needs management

Security depends on management. Security is a critical enterprise quality of service that is crucial as the SOA network of services grows. Security management system works across a variety of platforms to support growth. Mission critical messaging is a central aspect of security.

Different applications require different messaging - synchronous and asynchronous, XML and binary. Different departments within an organization may have different messaging systems installed. Restricting architects to one messaging scheme limits growth. One of the great value propositions of SOA is to provide flexibility to huge, monolithic applications.

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Business processes created from a string of loosely coupled services provide modeled enhancements to existing automated process. SOA implementations centralized services erode the return on investment of SOA initiatives. Architecture is key to implementing flexible systems. SOA that is model driven and can be changed by the business analyst building of models is central to flexible SOA implementations.

1.5 Service-Oriented Architecture (SOA) Automates Key Business Processes

Service-Oriented Architecture (SOA) automates key business processes, and implements a virtual environment for employees, customers and other users. Service-Oriented Architecture (SOA) is an approach to organizing IT resources as business services, increasing the agility of the organization while obtaining increased value out of existing IT assets.

Business process improvement drives SOA initiatives. Automation of manual business processes is a central concern. SOA business processes targeted are manual, paper-based processes that consume resources and limit flexibility. As paper-based processes are implemented, IT needs to implement automated controls.

Manual processes offer a poor user experience: processes take too long, are too complicated, and cost too much to manage. SOA is used for standards-based, loosely coupled distributed computing.

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Automation of inefficient processes is not enough, SOA depends on enabling improvement, building more flexible processes, and increasing the reuse of existing IT assets. Reusable code libraries have been around for a long time but not particularly useful in the manner SOA is. Model driven architecture makes SOA useful. Business analysts can create models for code based on SOA reusable modules. SOA depends on implementing reuse of services.

SOA depends on abstracting business logic into a business process layer. Accessing and leveraging legacy business logic is an essential part of the SOA plan. SOA depends on the ability to create new business logic through the power of composing services using many modules combined together to create composite applications that implement business processes in flexible ways.

1.5.1 SOA Virtual Experience

Improving and automating previously manual processes is a tactical benefit of SOA. In the longer term, a more strategic goal of SOA initiatives is to provide a virtual experience for the IT users, making the physical location irrelevant during the entire enterprise work process experience.

SOA aims to automate the business strategy of a virtual experience. When the entire business process is remote, people can function more efficiently. People can work from home, sales and services people can spend more time on the road, and managers can spend more time with customers supporting sales teams. Educational processes can work remotely, permitting students to work and learn at the same time.

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Enabling online interactions permits people to work more efficiently. Implementing a digital workflow concept within the SOA environment integrates all assets, from transaction systems to iPods to calendars. The virtual experience is improving the user experience, they see the virtual experience as the core differentiator.

1.5.2 SOA Building a Channel

SOA efforts help to build the channel by improving the experience their channel partners can offer. Web Services are in demand by third parties, and as a result, enterprises are building a significant business providing solutions for other enterprises based on the SOA capabilities.

Channel partners include Cisco Systems, which provides a Cisco Academy Training Center. Instructors can be trained around the world on all eight levels of Cisco instruction.

SOA enables improvements in processes, building more flexible processes, and increasing the reuse of existing IT assets.

1.5.3 SOA Integration Platform

A SOA integration platform is designed to connect, mediate and manage interactions between heterogeneous services, transaction applications, and multiple ESB instances across an enterprise-wide service network.

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Heterogeneous applications cause the need to organize SOA initiatives into different domains. A typical business unit implements SOA interactions within a single domain.

As organizations develop a robust service portfolio the proportion of inter-domain interactions increases. As services are used in composite applications in other business units the enterprise needs to develop policies that reward the department that pays for the initial development of the services that are most useful in a SOA environment.

Reimbursement of initial development, once the service is reused is a key aspect of SOA implementation. Services originally developed in one line of business automate business processes that ultimately span organizational boundaries.

Multiple requirements arise as service use increases. Performance continues to need to meet expectations, QoS must be assured and appropriate service level-agreements, established. Organizations need to ensure that they effectively manage a rapidly growing portfolio of diverse assets. Assets include services, policies, business processes. The ability to publicize the availability of these assets is a central issue.

This requires organizations to effectively manage a portfolio of diverse assets. The use of and dependence on services grows. Requirements for dependable service level agreements and effective governance are compelling.

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Organizations that adopted SOA use it to align IT initiatives with business strategies to compete better. ESB technology acts as the essential link between business processes and services to help enterprises rapidly change with ever-evolving business needs.

TABLE 1-12

DRAMATIC INCREASE IN BUSINESS ACTIVITY SPEED DRIVES SOA

- Trading analytics
- Document transfer
- Call center inquiries
- Airline operations
- Track financial position
- Supply chain updates
- Phone activation
- Trade settlement
- Build-to-order PC
- Refresh data warehouse
- Infrastructure operations

Source: WinterGreen Research, Inc.

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Solutions are designed to be comprehensive, light-weight SOA backbones. SOA helps IT organizations create configuration-driven and reusable service components, service enable legacy applications and quickly build SOA-based applications for enabling enterprise agility.

TABLE 1-13

BUSINESS ASPECTS OF CHANGE RESPONSE CREATING NEED FOR SOA

- Excess capacity in vertical silos provisioned for peak demand
- Manual effort
- Diagnose
- Configure
- Provision
- Train
- Support IT initiatives
- Automation:
- Streamlined Bus & IT processes
- Automated process efficiencies
- Faster response

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TABLE 1-13 (CONTINUED)

BUSINESS ASPECTS OF CHANGE RESPONSE CREATING NEED FOR SOA

- Reduced costs
- Infrastructure optimized
- Flexible infrastructure
- Infrastructure with high utilization
- Infrastructure transformation
- Operations People/Process transformation
- New IT initiatives
- New initiatives to create more value to the business

Source: WinterGreen Research, Inc.

1.5.4 SOA Infrastructure Supports Delivery of Information As A Service

Services oriented applications are evolved from an architecture that is a middleware engine. IT data base engines functions in concert with a directory to manage SOA collaboration scripts with header, date, user, and use information that supports broad enterprise access to information. SOA engines are designed to support reuse code. Table 1-14 illustrates how access to information is constructed as a service.

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TABLE 1-14

SOA ENGINE MANAGES INFORMATION ACCESS TO CREATE A SERVICE

- Create a composite service using portal, application server, content management, mission critical messaging and ESB broker engines
- Infrastructure products that access database
- Infrastructure products that access applications
- Infrastructure products that access document repositories
- Ability to access composite information
- 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.

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A SOA engine is positioned to permit users to reuse information assets. Information is best left where it is initially put. Table 1-15 illustrates services oriented architecture positioning to achieve flexible infrastructure.

TABLE 1-15

SERVICES ORIENTED ARCHITECTURE ACHIEVES 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

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TABLE 1-15 (CONTINUED)

SERVICES ORIENTED ARCHITECTURE ACHIEVE FLEXIBLE INFRASTRUCTURE

- Business users have been shackled to IT complexity
- Agility to surface information provided by SOA

Source: WinterGreen Research, Inc.

Table 1-16 illustrates services oriented architecture line of business positioning.

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TABLE 1-16

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.

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Table 1-17 illustrates services oriented architecture business process efficiency.

TABLE 1-17

SERVICES ORIENTED ARCHITECTURE BUSINESS PROCESS EFFICIENCY

- Increase process efficiencies
- Decrease process times
- Overcome challenges

Source: WinterGreen Research, Inc.

Table 1-17 illustrates services oriented architecture business process challenges.

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TABLE 1-18

SERVICES ORIENTED ARCHITECTURE BUSINESS PROCESS CHALLENGES

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

- 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

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TABLE 1-18 (CONTINUED)

SERVICES ORIENTED ARCHITECTURE BUSINESS PROCESS CHALLENGES

- Need to scale
- More aspects of competition
- Faster product cycles

Source: WinterGreen Research, Inc.

Table 1-18 illustrates services oriented architecture business process risk management.

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TABLE 1-19

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.

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Table 1-20 illustrates services oriented architecture business process improvements.

TABLE 1-20

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.

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1.6 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.

1.6.1 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.

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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.

1.6.2 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.

1.6.3 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.

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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.

1.7 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.

1.7.1 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.”

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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 reduces 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.

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1.7.2 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.

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1.7.3 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.

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1.8 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.

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1.8.1 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.

1.9 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.

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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.

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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.

1.10 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.

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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.

1.11 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.

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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.

1.11.1 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.

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

2.1 SOA Infrastructure Market Driving Forces

SOA is another name for API. SOA gives access to modules of code through the APIs that expose inputs and outputs to the programmer. SOA is comprised of a stack of decoupled web services and plain vanilla standalone applications that implement some software. SOA is used with decoupled stand alone solutions services. A set of different services like currency conversion, bank loan credit checks, and simplified web page billing can be stitched together using SOA to form another application.

SOA is supported by mission critical messaging systems because the ability to take decoupled services and form applications in response to changing business conditions gives significant competitive advantage.

2.1.1 Building a Robust Data Integration Layer

A service that provides access to customer information does not have to read-write against multiple underlying systems and hence is not forced to understand the format, structure and relationships of how customer data is stored. A SOA services application solution is used to create a data integration layer that insulates the consumers of data from where and how it is stored.

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This requires IT to define the standard data model for customers, products, and employees. Regardless of how data is stored within the organization they must determine the logical structure of the data that makes business sense and satisfies all the stakeholders that depend on that data to perform their business functions. IT might determine that the customer data object should have ten attributes including name, address, phone number, and account number. In this manner, the data structure has a significant impact on the construction of applications using SOA.

2.1.2 SOA Market Segment

SOA addresses the fact that market conditions are constantly changing. The ability to respond quickly and effectively can mean the difference between business success and failure. Responsive IT infrastructure accurately aligns capabilities with evolving business requirements and unpredictable markets.

To achieve business agility, companies use SOA, which deploys critical business processes as reusable services. Services need infrastructure to achieve shared development capabilities across the company. SOA reduces software delivery complexity. Application development cycles are compressed because reused code segments are more efficient to code by a factor of five than generation of new code.

SOA delivers a framework for creating software. SOA basically implements APIs that are used to access information contained in other applications. The APIs provide inputs and outputs from the reusable code

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segments that are services. Many enterprise SOA portfolios have framework infrastructure as an integral component of their business process platform.

2.1.3 SOA Market Driving Forces

BPM on SOA has been delivered by workflow vendors. SOA functional requirements are implemented with the goal of meeting the requirements that are presented by challenges of competitive response to changing market conditions. SOA frameworks are used for building an IT infrastructure. SOA products permit IT to deliver business functionality as shared, reusable services. Business processes drive the definition, creation and execution of these services. Reuse of services is facilitated by creating APIs that use mission critical messaging to support sharing of information between services located on a stack.

The SOA services components are optimized in a decoupled manner on the stack, permitting developers to quickly create new services to respond to changing business needs. SOA software infrastructure products permit the use of loosely coupled software services to support the changing requirements of business processes. Software resources re located on a network in an SOA environment. SOA independent services can be accessed without changing the underlying platform implementation.

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TABLE 2-1

SERVICES ORIENTED ARCHITECTURE (SOA) BENEFITS

- Align business and IT
- Accelerate revenue-creation opportunities
- Simplify and standardize application integration
- Use API message connection points to gain access to siloed information in applications
- Reduce overall integration costs
- Reduce the long-term maintenance cost
- Facilitate internet application development
- Ensure that applications support industry standards
- Achieve software solution component re-usability across the portfolio of applications

Source: WinterGreen Research, Inc.

SOA varies from customer to customer because each customer has a different stack of software application components. SOA provides a way for each customer to put software into a stack and optimize it for the unique enterprise computing environment.

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TABLE 2-2

SERVICES ORIENTED ARCHITECTURE SOA MARKET DRIVING FORCES

- Services used for applications useful at department level
- On demand data access
- Meta data solutions
- Integration demands of e-Business
- Major technical challenges
- Need to address business challenges
- Need to adapt to market changes
- ERP enterprise applications handle the core processes
- e-Business IT process applications initiatives
- Need to leverage Internet market channels
- Need to interconnect distributed islands of computing
- Real time network communication of information
- Computing application resources interconnected
- Application solutions have limitations in terms of time-to-market, cost, performance or flexibility

Source: WinterGreen Research, Inc.

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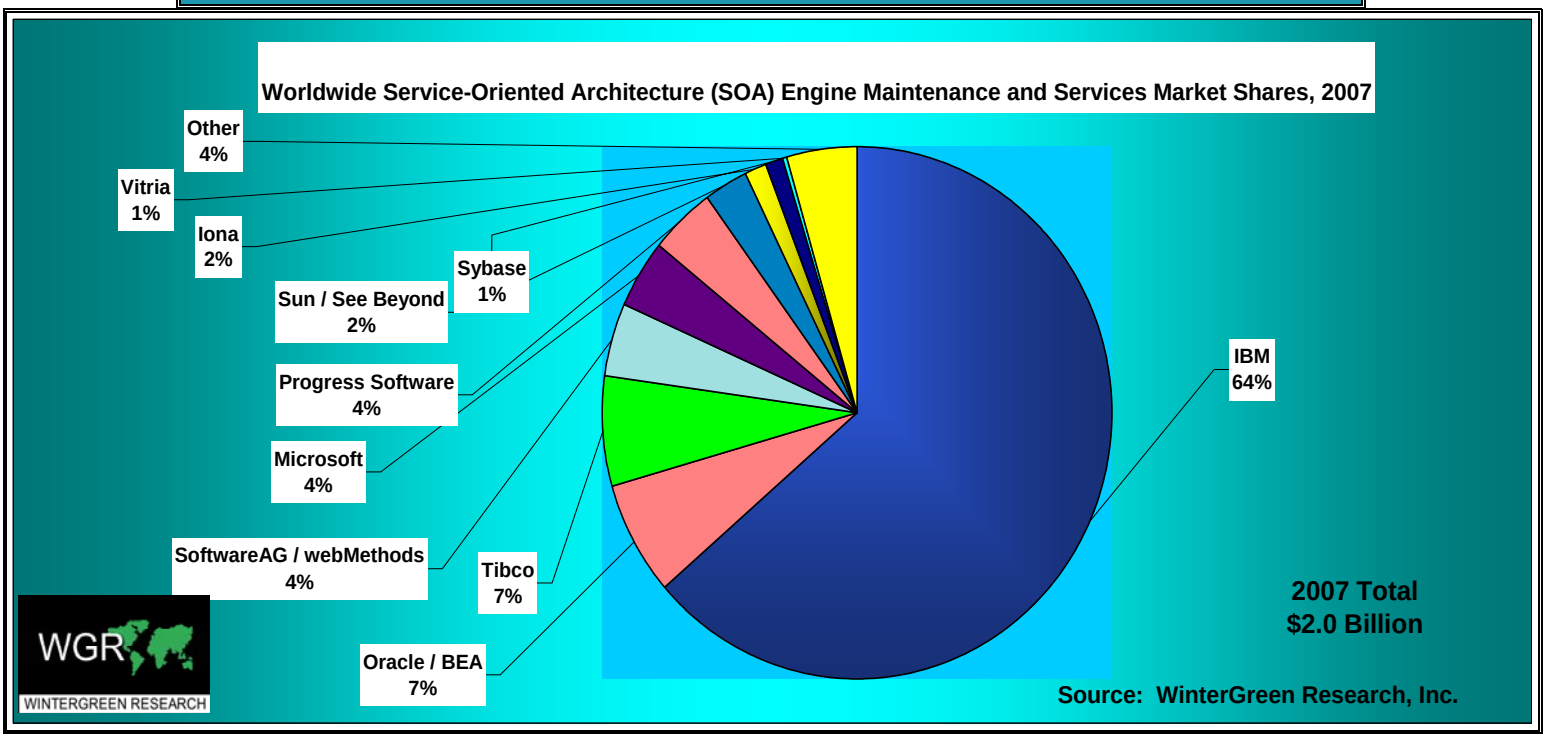
2.2 SOA Market Shares

IBM is the leader in SOA markets with 64% share. No other vendor has above 7% market share and software vendors are merging and making acquisitions at a rapid pace seeking to achieve SOA product sets that are credible. .

TABLE 2-3

SOA MARKET SHARES, 2007



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The market is evolving rapidly. Smaller vendors may find it difficult to maintain competitive position against current and potential competitors. Market participants with significantly greater resources have competitive advantage.

TABLE 2-4

SOA MARKET SHARES, 2007

Worldwide Services Oriented Architecture (SOA) Shipments
Market Shares, Dollars, 2007
(In Millions of Dollars)

Company	MM$ 2007 Licensing Fees	% 2007 Market Share
IBM	1,262.4	63.6
Oracle / BEA	137.8	6.9
Tibco	134.2	6.8
SoftwareAG / webMethods	87.4	4.4
Microsoft	83.0	4.2
Progress Software	83.0	4.2
Sun / SeeBeyond	51.0	2.6
Iona	31.0	1.6
Sybase	19.7	1.0
Vitria	8.0	0.4
Other	86.5	4.4
Total	1,984.0	100.0

Source: WinterGreen Research, Inc.

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Automated integration solutions are significantly better and provide return on investment than solutions that require a lot of human input. Penetration is at 7%, most integration is accomplished by roll your own hand coded systems, but this is defiantly not efficient and does not provide efficient solutions System z is significantly more efficient than the server farms. As new applications are moved onto System z, the integration solutions will be implemented as automated solutions.

2.3 SOA Market Forecasts

SOA stacks of decoupled services are purpose built for the enterprise environment that is continuously shifting because of mergers and acquisitions. With decoupled software solutions, the web services and the SOA components can be portable. SOA markets at $2 billion in 2007 are anticipated to grow 23% per year to $9.1 billion by 2014. Growth is a result of IT departments to reduce spending on run time efforts and to spend a higher proportion of their budgets on growing the business.

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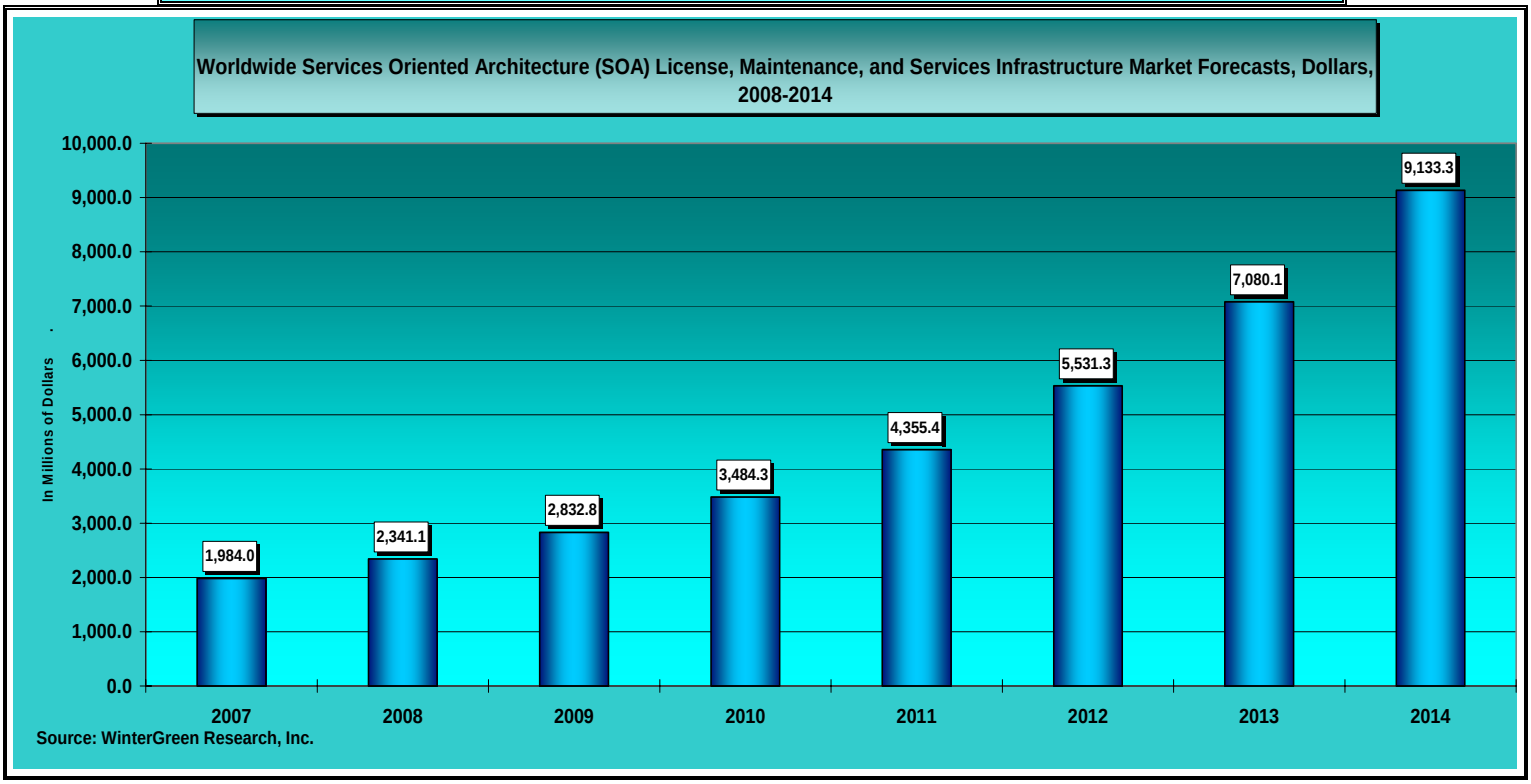
FIGURE 2-5

SOA MARKET FORECASTS, 2008-2014



SOA provides automated process. Automated process is more efficient than manual process. Any small business can operate with manual process, but to get big, the processes need to be repetitive and accurate. SOA provides a way to achieve this automation in a flexible manner so that processes can be changed as needed.

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TABLE 2-5

SOA MARKET FORECASTS, 2008-2014

Worldwide SOA Infrastructure Market Forecasts, Dollars, 2008-2014 In Millions of Dollars	2007	2008	2009	2010	2011	2012	2013	2014
Number of Dollars (MM$)								
SOA Infrastructure Licenses Shipments (MM$)	932.5	1,076.9	1,274.7	1,533.1	1,872.8	2,323.1	2,902.8	3,653.3
% growth	14.0	15.5	18.4	20.3	22.2	24.0	25.0	25.9
Average Price (000$)	717.8	725.0	739.5	761.7	784.5	808.0	832.3	857.3
% growth	3.0	1.0	2.0	3.0	3.0	3.0	3.0	3.0
Units Shipped	1,299.1	1,485.4	1,723.8	2,012.8	2,387.2	2,875.0	3,487.8	4,261.6
% growth	7.0	14.3	16.0	16.8	18.6	20.4	21.3	22.2
Total SOA (MM$) Licenses and Services (MM$)	1,984.0	2,341.1	2,832.8	3,484.3	4,355.4	5,531.3	7,080.1	9,133.3
% growth	15.0	18.0	21.0	23.0	25.0	27.0	28.0	29.0
Source: WinterGreen Research, Inc.								

2.3.1 Services Oriented Architecture (SOA) Infrastructure Core Process

IBM is the defacto industry standard market leader in SOA engine markets by virtue of its infrastructure middleware that provides the ability to consolidate integration modules with foundation architecture. IBM SOA is the software used in creating business integration foundation systems.

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SOA creates a way to organize automated process supporting modules. SOA systems are evolving to support business flexibility by enabling integration of systems dynamically. Applications are being interconnected using integration to create cross-departmental processes. Processes are implemented in real time.

Business integration is positioned as middleware useful in the transformation of business process to make it more flexible and adaptive to change. It is used to leverage making transaction applications more flexible. SOA extends existing technology investment by providing tools and middleware for interconnecting systems.

Mission critical messaging provides the base for application integration. Web services and Java based messaging do not manage the complexity of data structures that are encountered in even modest integration projects.

The broker management of data structures is what integration is all about. WebSphereMQ and Tibco Rendezvous become the core processes for SOA in this context. BEA has a strong broker capability.

2.3.2 WebSphereMQ and Tibco Transport Layer Achieve Mission Critical Functionality

The mature transport technologies WebSphereMQ and Tibco Transport have a strong customer base that supports and funds product enhancements. The newer transport technologies MSMQ, .Net, SOAP, and JMS are generally utilized as modules that are wrapped in the mature WebSphereMQ or Tibco transport layer to achieve mission critical functionality.

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Rules engines permit systems to be developed that look at the content of a message to determine the basis of a route. A routing decision is made after the application process rules are addressed.

The improved systems capability and proven return on investment for Services Oriented Architecture markets represent the most compelling market driving forces. Companies that achieve faster time to market receive significant competitive advantage. Achieving competitive advantage is a central and compelling issue driving every enterprise to look at the advantages of enterprise application integration.

Enterprise networks represent the core business capability. Enterprise application connectivity is significant for internal IT departments. It supports connectivity to distributors, suppliers, partners, and customers. The ability to send information between disparate applications in real-time is relevant to every aspect of network computing. SOA refers to integration projects inside the enterprise network with employees and over the Internet with partners.

Services oriented architecture is the base for business process integration, the integration of information relevant to projects inside and beyond the borders of the enterprise.

Integration products support broad initiatives to integrate heterogeneous IT departments. Departments comprised of discrete target point solutions need to be interconnected in the broader IT management of information. Integration products are becoming more highly developed and less expensive. Portals shift the focus of integration to include integration initiatives beyond the enterprise.

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Vendors provide the overall architecture and individual workplace integration software for the enterprise, replacing internal hand coded solutions. Supply chain solutions that go across corporate boundaries relate to providing integration software that the technical capabilities needed to help clients to integrate different back-end distributed systems with a web-enabled front-end.

2.3.3 SOA Integration Of E-Business

The integration of e-business presents major technical challenges. Organizations have implemented various ERP enterprise applications to handle the core processes.

In an attempt to address business challenges, e-business integration provides transport and connectivity between disparate core business processes, e.g. order entry and shipping. Integration complicates IT process applications implementation by managing the processes that are implemented as users create response to the market opportunity presented by the Internet market channels.

Services Oriented Architecture (SOA) technologies provide the ability to interconnect distributed islands of computing using mission critical transport to achieve master data management that gives a single view of data.

A metadata application server gives access based on transport. Leverage the value of information using SOA and information servers is able to access and make sense of data. Real time network communication of information implies that computing application resources are interconnected. Solutions have limitations in terms of time-to-market, cost, performance or flexibility.

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No one SOA approach fully addresses the entire e-Business integration challenge. IBM has the most complete integration solution. IBM addresses the integration task with a WebSphere product set that includes an application server, a portal, an integration engine, brokers, and messaging capability. WebMethodsMQ is the foundation transport technology for this task implementation of integration.

Tibco is positioned with an integration broker that is fully functional. Tibco leverages its Rendezvous publish subscribe messaging suite.

Application server functionality is enhanced by integration capabilities from BEA. webMethods has developed services oriented architecture to complement its strong XML schema integration capabilities. Thus the market continues to be fragmented, with IBM and Tibco the only players dominating the market because they are SOA providers with compete product sets.

The SOA companies coming together with a common theme and marketing effort create an atmosphere of optimism about the opportunities for using the network to build new ways of doing business.

Implementation of systems automation depends on SOA. Integration projects permit businesses to achieve more attractive returns on existing investments. Point solutions are being replaced with modular integration projects that are implemented in stages. Services are evolving in the context of integration solutions.

SOA work frequently relates to integration of ERP. SAP, Siebel, Oracle / Peoplesoft, i2, and Ariba integrations are basic to SOA projects. Best-of-breed

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SOA vendors seek to control the ERP back-end of an enterprise. SOA vendors are positioning to assume more responsibility for the overall enterprise business process management. Heterogeneous application connectivity provides a primary market driving force.

Business infrastructure issues achieve market momentum because of the competitive advantage provided by integration projects. SOA integration investment is proved to provide competitive advantage. If coke implements a major SOA initiative, Pepsi is sure to follow. This is the driving force for SOA projects. Businesses run more efficiently when systems are interconnected.

The innovators and early adopters have achieved real competitive advantage by streamlining operations. Other companies in the same market segment need to change to achieve competitive advantage.

2.3.4 Market Driving Forces For Real Time Exchange of Information

Market driving forces for SOA are comprised of a number of direct and indirect factors impacting markets as companies seek to achieve the benefits of using the network to exchange information electronically. Supply chain and logistics systems have already been automated.

Product cycles that were ten years, have shrunk to one year or six months. This has brought massive changes. The conversion from analog to digital telecommunications switches took ten years. The conversion to all optical networks is being accomplished far more rapidly. This is in part due to the ability of partners to work together to coordinate ordering processes.

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A network carrier can place an order and have the consequences of that order flow back to the manufacturer of optical components within hours.

Just in time inventory control takes on new meaning in this context. Direct factors relate to the need for Services Oriented Architecture between every different type of enterprise resource planning (ERP) system.

Supply chains are automated using SOA technology.

Electronic commerce needs SOA to function.

Business processes are automated

Partners can be interconnected

New customer service systems need SOA in order to be implemented. Indirect factors relate to the migration of existing products from separate market segments to being subsumed by SOA. File transfer, CTI, applications development, and workflow illustrate these segments.

Services Oriented Architecture is implemented as best-of-breed SOA infrastructure integration to support enterprise application strategies. Mergers, acquisitions, reorganizations are increasing as integration software vendors seek to put together a credible integration software product set. The driving force for providing SOA infrastructure is to provide integration technologies that support the need to leverage economies of scale brought by the Internet.

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A desire to develop closer links with customers, suppliers and partners is evolving. These events drive demand for SOA. Dynamically growing businesses must meld applications, databases, operating systems, and hardware platforms. Vendors fold applications seamlessly into networks supporting system zs, client/server platforms, and PCs.

Companies trying to pick up the IT pieces following a merger or acquisition need SOA. Those involved in front office/back office integration and those working to comply with new regulations all face the need to implement integration. Table 2-6 illustrates SOA market driving forces.

This is the major driving force for SOA, the ability to communicate in real time depends on having the end points able to talk to each other. Networks are heterogeneous. Applications are heterogeneous. There is nothing homogeneous about the networks and IT centers.

Everyone has every kind of platform and application imaginable. Transaction systems are complemented by open systems with a lot of other stuff mixed in. This situation will never change in a global economy with healthy competitive markets. This evolution of real time computing is the primary market driver for SOA and ensures that markets will not go away.

Systems need to be able to be put in place more easily and at less cost for services for markets to further evolve. Systems need to evolve services oriented architectures in the context of a framework, an architecture for those capabilities to take hold in the markets. IT departments need to have control of the services that are developed by business analysts.

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TABLE 2-6

SOA MARKET DRIVING FORCES FOR REAL TIME COMPUTING

- Speed corporate adoption of web enabled applications
- Support Internet strategies
- Manage mergers, acquisitions and reorganizations
- Develop seamless links with customers, suppliers, distributors, and partners
- Fold applications seamlessly into networks
- Support system zs, client/server platforms, and PCs

- Integrate packaged ERP applications, such as Oracle/PeopleSoft, SAP, S.W.I.F.T.

- Meld applications, databases, operating systems, and hardware platforms

- Integrate packaged database applications, such as Oracle, DB2, Sybase, and Microsoft SQL Server
- Build interfaces to information management systems

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- **TABLE 2-6 (CONTINUED)**
- **SOA MARKET DRIVING FORCES FOR REAL TIME COMPUTING**

- Extend investment in transaction applications
- Enable client/server and network computing
- Provide electronic commerce over the Internet
- Integrate open systems solutions with transaction applications

Source: WinterGreen Research, Inc.

2.3.5 Typical SOA Integration Projects

Companies are still defining what their overall network business architecture is. SOA is poised to play a key role in the implementation of a well-developed network architecture strategy. Users seek an established player in the SOA market that has a firm handle on the process on integrating applications. An adapter strategy is not enough, integration depends on a strong broker to achieve meaningful integration.

Table 2-7 illustrates typical SOA integration projects.

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TABLE 2-7

TYPICAL SOA INTEGRATION PROJECTS

- Inside the enterprise network
- Over the Internet or other IP network with partners, suppliers, distributors, and customers
- Service oriented architecture that provides a framework for network computing
- Publish subscribe messaging systems that interconnect thousands of nodes
- Supply chain solutions
- Point SAP integration to other ERP solutions with SAP architecture
- Workplace workflow portal for clients
- Provide overall business process management e-business architecture

Source: WinterGreen Research, Inc.

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2.3.6 SOA Business Environment Market Drivers

The ability to reuse components of code provides an efficiency that is five times more cost effective than writing code from scratch. IBM, the market leader has the biggest base of code that can be reused and this is sued in combination with the SOA middleware infrastructure that is being built out.

Business environments present organizations with a wide range of challenges. Competitive pressures, macroeconomic volatility, corporate mergers and acquisitions, the ubiquity of the Internet, shortened development and production cycles, shifting supplier relationships and diverse customer demands are forcing organizations to adapt in numerous ways to lower costs.

2.4 Services Oriented Architecture (SOA) Company Market Segment Analysis

Enterprise services oriented architecture SOA market segment analysis indicates that IBM is the only market participant with a substantial participation in all segments of the SOA market. IBM continues to invest $1 billion per year in improving the integration product set, more than the total revenue of any competitor. Systems are simple to use and useful in providing customers with significant competitive advantage.

Tibco participates with measurable share in the SOA business process management, broker, adapter, and services oriented architecture (SOA) segments, but at a much lower level than IBM.

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2.4.1 SOA Process Component Segments By Vendor

SOA is a very significant, growing market. IBM is the market leader in all SOA segments by a wide margin in 2006. (See Table 2-8 and Table 2-9.) By 2007, the consolidation in the industry makes it impossible to do a similar analysis because the smaller companies have become part of much larger organizations, making the analysis different in quality. The 2006 analysis makes it apparent that this SOA market is one of evolution of integration product sets into SOA infrastructure. Thus the EAI market segments are to some extent independent of SOA, though the trend is for all products to support SOA.

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TABLE 2-8

SERVICES ORIENTED ARCHITECTURE MARKET SEGMENTS BY COMPANY, DOLLARS, 2006

Application Integration (EAI) Company Analysis of Market Segments, Software License and Maintenance, Dollars, 2006
In Millions of Dollars

	MM$ Total	Brokers	SOA Compon-ents	Process (BPM)	WS SOA Engines	Enterprise Service Bus
IBM	2,748.6	1,226.3	278.5	947.8	58.4	237.5
Tibco	491.0	103.1	14.7	275.0	39.3	58.9
webMethods	134.6	9.4	36.3	53.8	20.2	14.8
BEA	292.0	0.0	35.0	186.9	38.0	32.1
GXS	42.1	0.0	42.1	0.0	0.0	0.0
Microsoft	132.4	0.0	90.0	0.0	0.0	42.4
Sun / SeeBeyond	105.2	35.0	16.1	35.1	18.9	0.0
Sybase	30.2	13.6	10.0	5.4	1.2	0.0
Vitria	52.2	0.0	0.0	52.2	0.0	0.0
Other	654.3	65.4	359.9	183.2	32.7	13.1
Total	4,682.6	1,452.9	882.7	1,739.5	208.7	398.8

Note: Most web services SOA engines are composite of other markets including application servers, mission critical messaging, brokers, BPM, and portal engines.

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TABLE 2-9

SERVICES ORIENTED ARCHITECTURE MARKET SEGMENTS BY COMPANY, PERCENT, 2006

Application Integration (EAI) Company Analysis of Market Segments, Software License and Maintenance, Percent, 2006
In Percent

	Total License MM$	Brokers	SOA Compon-ents	Process (BPM)	WS SOA Engines	Enterprise Service Bus
IBM	2,748.6	44.6	10.1	34.5	2.1	8.6
Tibco	491.0	21.0	3.0	56.0	8.0	12.0
webMethods	134.6	7.0	27.0	40.0	15.0	11.0
BEA	292.0	0.0	12.0	64.0	13.0	11.0
GXS	42.1	0.0	100.0	0.0	0.0	0.0
Microsoft	132.4	0.0	68.0	0.0	0.0	32.0
Sun / SeeBeyond	105.2	33.3	15.3	33.4	18.0	0.0
Sybase	30.2	45.0	33.0	18.0	4.0	0.0
Vitria	52.2	0.0	0.0	100.0	0.0	0.0
Other	654.3	10.0	55.0	28.0	5.0	2.0
Total	4,682.6	31.0	18.9	37.1	4.5	8.5

Note: Most web services SOA engines are composite of other markets including application servers, mission critical messaging, brokers, BPM, and portal engines.

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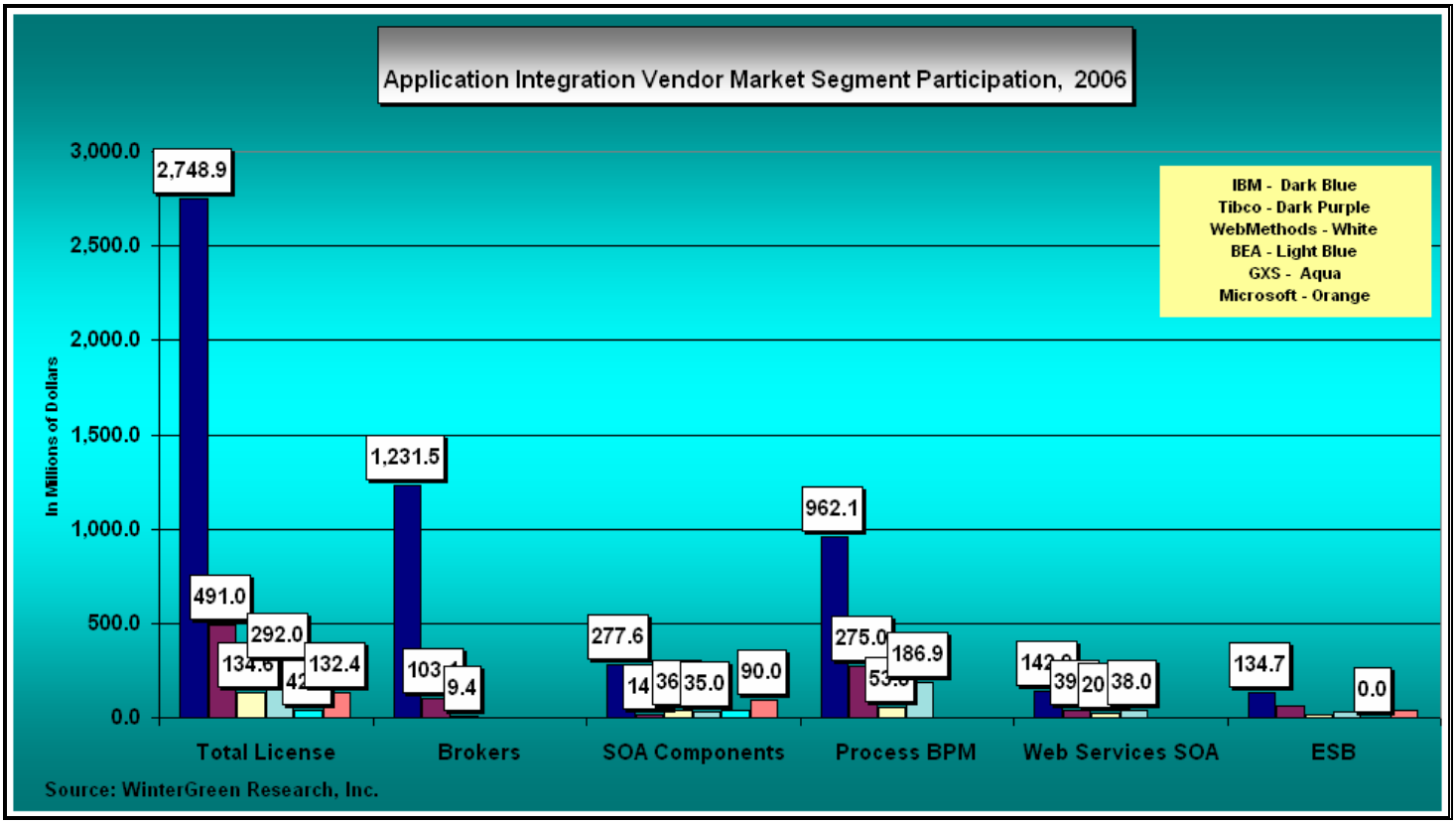
Microsoft only participates in the adapter portion of the market. Other companies have isolated participation in selected segments. (See Figure 2-10.)

FIGURE 2-10

SERVICES ORIENTED ARCHITECTURE VENDOR MARKET SEGMENT PARTICIPATION, 2006



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2.5 Web Services and Service Oriented Architecture Forecasts

SOA is expected to grow dramatically and place demands on the existing technical infrastructure within enterprises and organizations. The worldwide software market for integration, SOA, SOA components, Web Services, and Web 2.0 at $5.25 billion in 2007 is anticipated to grow to $152 billion by 2014.

Web Services and SOA include the Internet generated services that represent reusable code. SOA governance technology sets of a service-oriented architecture are becoming a core competency.

Worldwide services oriented architecture software are part of the integration markets at $5.3 billion in 2007 grew substantially as vendors were able to leverage the SOA expertise to provide competitive advantage from middleware infrastructure. Markets are anticipated to reach $11.5 billion by 2013. (See Figure 2-11 and Table 2-12.)

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TABLE 2-11
WORLDWIDE EAI APPLICATION INTEGRATION ENGINE AND COMPONENT MARKET FORECASTS, 2007-2013

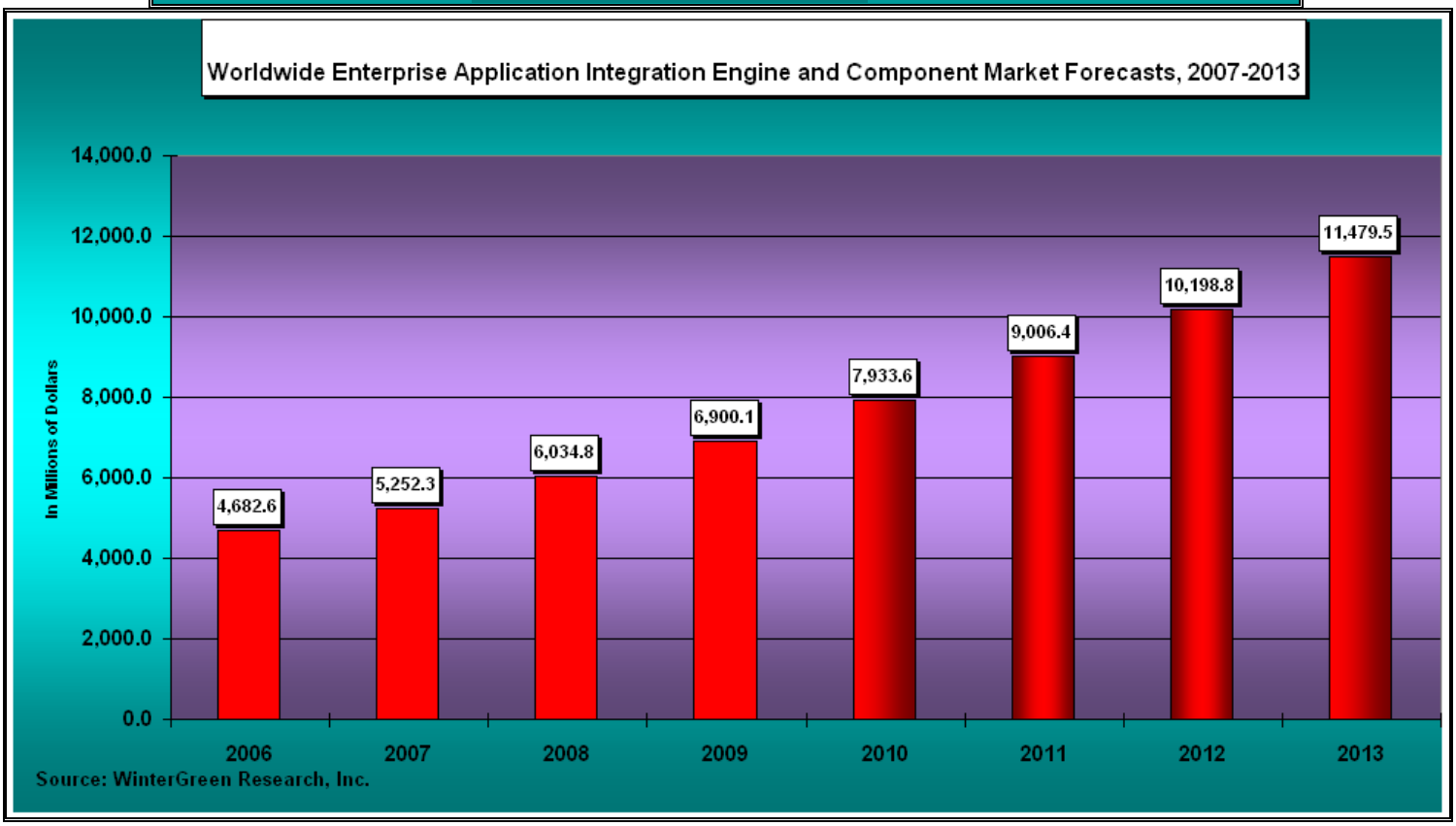

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TABLE 2-12
WORLDWIDE SERVICES ORIENTED ARCHITECTUREMARKET SEGMENTS, 2007-2013

Worldwide Application Integration Business Process Management (BPM), Dedicated SOA Engines, Dedicated SOA Components, Broker / Routing / Rules Engine Engine Market Forecasts, Dollars, 2007-2013
In Millions of Dollars

	2006	2007	2008	2009	2010	2011	2012	2013
Number of Dollars (MM$)								
Broker Engines License Maintenance and Services (MM$)	1,452.9	1,561.8	1,686.8	1,838.6	2,040.9	2,244.9	2,447.0	2,642.7
% Growth	4.5	7.5	8.0	9.0	11.0	10.0	9.0	8.0
BPM Engines License Maintenance and Services (MM$)	1,739.5	1,869.9	2,019.5	2,201.3	2,443.4	2,687.8	2,929.7	3,164.1
% growth	4.5	7.5	8.0	9.0	11.0	10.0	9.0	8.0
Dedicated SOA Engine Licenses Maintenance and Services (MM$)	417.0	529.6	651.4	749.1	853.9	964.9	1,119.3	1,287.2
% growth	87.0	27.0	23.0	15.0	14.0	13.0	16.0	15.0
Dedicated SOA Components License, Maintenance and Services (MM$)	882.7	1,085.7	1,454.9	1,862.3	2,309.2	2,771.0	3,297.5	3,891.1
% growth	57.0	23.0	34.0	28.0	24.0	20.0	19.0	18.0
ESB License, Maintenance, and Services (MM$)	190.5	205.2	222.2	248.8	286.2	337.7	405.2	494.4
% growth	7.0	7.5	8.0	9.0	11.0	10.0	9.0	8.0
Total EAI License, Maintenance, and Services (MM$)	4,682.6	5,252.3	6,034.8	6,900.1	7,933.6	9,006.4	10,198.8	11,479.5
% growth	11.0	12.2	14.9	14.3	15.0	13.5	13.2	12.6

Source: WinterGreen Research, Inc.

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The services oriented architecture markets have migrated to a level of functionality that is readily available as icons on a desktop. SOA is synonymous with the infrastructure for business integration (BI). As the application vendors begin to support connectivity across applications and across platforms, the integration markets are moving to another level of functionality providing business automation.

2.6 SOA Company Competitive Analysis

2.6.1 Top Competitors IBM, Tibco, Software AG / WebMethods, and Oracle / BEA SOA Platforms

The top competitors IBM, Tibco, WebMethods, and BEA SOA platforms simplify the flow of information, decrease the costs of managing applications, and make an enterprise more agile, productive, and connected. 2,600 systems integrators (SIs), independent software vendors (ISVs), and application service providers (ASPs) use SOA platforms. Partners work with customers of SOA vendors to achieve deployment of solutions. The SOA engines are middleware infrastructure components.

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2.6.2 Value of WebSphereMQ, DataPower, and WebSphereMQ Broker to SOA

The value of the WebSphereMQ broker product line is that the decoupled middleware layered on a transport MQ can be used to implement flexible infrastructure. WebSphere is able to provide once and only once delivery of data messages asynchronously, creating a queue.

WebSphereMQ is the core technology for application integration. The value of the IBM WebSphreMQ middleware is that it is not a stack. WebSphere MQ is at the center, at the core of the IBM SOA software product line.

WebSphereMQ broker is one of three ESBs used to achieve the flexibility promised by SOA. Customers need mission critical message transport that is complemented by a range of different types of services, including application services. The three ESBs are Datapower, WebSphere ESB, and WebSphereMQ Broker. Datapower and WebSphereMQ Broker leverage WebSphereMQ. WebSphere ESB leverages WebSphere application server stack.

In this context, the strength of the IBM software line is that it provides middleware infrastructure that enables application services, message transport, rules, integration, business process, and SOA. Customers have so many different ways of implementing automated process in heterogeneous environments and the value of SOA is that it moves away from a stack and into a services bus-computing environment that relies on transport.

Integration broker markets represent a response to the Internet, broadband networks, and the evolution of the real time exchange of information

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that is replacing batch processing. The ability to construct business processes from information drives demand for integration. SOA systems that are used on private networks are a response to IP technology. As companies seek to exchange information across departments, to integrate acquisitions, and to share information with strategic partners, infrastructure systems are being integrated.

Integration brokers can be used to implement point solutions that are very strategic. They include brokers that perform specific functions. Services Oriented Architecture(SOA) infrastructure rests on a base of messaging that supplements the information provided by brokers and provides mission critical secure transmission support.

IBM has a very broad product line that addresses all aspects of the market with leading presence in virtually every module segments, brokers, adapters, workflow, and business process management. But other companies, most notably Tibco have a broad integration suite.

The reason IBM grew in an otherwise very difficult market was the investment in brand and infrastructure advertising. The advertising bolstered a very timely and significant product suite.

Tibco has a broad broker capability that leverages its publish subscribe messaging used on a network to send messages once and have them received by thousands of nodes even though the message has been sent once. webMethods is leveraging its strength in XML to implement table driven integration that works without programming. webMethods has positioned to

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provide the operating system for the Internet. BEA and IBM have strategic advantage because of the application server market capability.

Many of the SOA market participants achieved growth 2007, but were purchased by other companies so that the .

2.6.3 IBM SOA Model

IBM WebSphereMQ decouples information from the application and provides a core transport layer that is mission critical. The mission critical message transport is the defacto industry standard transport. It is easy to use, works as advertised, and has an elaborate function set based on years of funding from the large installed base.

IBM WebSphereMQ decouples information from the application and delivers messages to the DataPower enterprise service bus or the WebSphere broker. IBM SOA modeling is the process of capturing the business design from an understanding of business requirements and objectives. The business requirements are translated into a specification of business processes, goals and assumptions for creating a model of the business.

Businesses may not go through a formal modeling exercise to implement automated process. Modeling can use primitive techniques of design in Visio® or using text documents. Capturing the business design using a sophisticated approach that includes the use of specialized tooling lets users perform what-if scenarios with various parameters the business may experience.

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The process can then be simulated using those parameters to predict the effect that process has on the business and IT systems. If the achieved results do not match the business objectives, then the process definition can be refined.

Models capture business metric key performance indicators (KPIs). This could include a measure of the new accounts that have been opened. Key performance indicators are input to the assembly of the application. Indicators can be monitored in production to capture the critical data to measure if the objectives are being met.

The business design is used to communicate the business objectives to the IT organization that will assemble the information system artifacts that implement the design. The enterprise architect works closely with the business analyst to convert the business design into a set of business process definitions, as well activities used to derive the required services from the activity definitions.

The enterprise architect and business analyst work with the software architect to flesh out the design of the services. During the process of resolving the design and implementation of the modeled business processes and services, a search should be performed of existing artifacts and applications in an effort to find components that meet the needs of the design.

Some applications fit; some have to be re-factored; and some have to be augmented to meet the requirements of the design. Existing assets are described as SOA services. SOA services are process from the desktop. They represent use of existing components of code from vendors including most significantly from IBM.

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2.6.4 SOA Components Use IBM WebSphereMQ

SOA is an evolution of SOA that uses WebSphereMQ message components. SOA uses WebSphereMQ for transport and WebSphere broker for assembly into composite applications. Composite applications are created from the desktop by a click on a group of icons. IBM has a virtually unlimited set of software components that uses internally to create automated process.

SOA is an effort to productize those components stored in a repository and Any new services required by the business design have to be created. Software developers should use the SOA programming model to create these new services.

The assemble phase includes applying a set of policies and conditions to control how applications operate in the production runtime environment. These policies and conditions include business and government regulations.

The assemble phase includes critical operational characteristics such as packaging deployment artifacts, localization constraints, resource dependency, integrity control, and access protection.

2.6.5 IBM WebSphere Application Server Leverages Java Technology as a Stack

IBM offers operating system software and hardware in combination with a broad range of SOA integration modules that address a complete solution in the context of Java based application servers. IBM can bundle its Services Oriented

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Architecture product set with the server and services offerings to give customers a complete solution.

IBM complete set of products for services oriented architecture market leadership implement process integration. IBM is the market leader in the complementary application server market and is expected to create a superset of products that provide market thrust. The IBM WebSphere application server leverages Java technology as a stack meaning that for customers who want the advantages of SOA in a stack, the Java technology is ready for use.

2.6.6 IBM SOA Fabric Across The Enterprise To Reuse IT Assets

IBM WebSphere business services fabric companies in health care, insurance, banking, and telecommunications automate processes using SOA. IBM SOA products are for integrating software applications and improving business processes. SOA consists of a fabric of services that work across the enterprise to permit reuse of IT assets.

IBM is encouraging businesses to create discrete, loosely coupled processes that can be monitored individually and fine tuned for better performance. Building an architecture based on industry best practice is integral

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to SOA, resulting in a flexible and competitive business. The SOA permits implementation of enterprise wide best practices that are specific to that enterprise.

IBM SOA is a set of independent services implemented as a stack. SOA works generally on a mainframe because this provides the most efficient computing platform with shared workload. The stack is needed to make the services able to launch across the different departments, giving departments access to the APIs independently of each other. Each department may use different aspects of the SOA service differently, but the service runs the same in the stack.

2.6.7 WebSphere Adapters

WebSphere Application Server

WebSphere Business Modeler

WebSphere Business Monitor

WebSphere Business Services Fabric

WebSphere Enterprise Service Bus

WebSphere Extended Deployment

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WebSphere Integration Developer

WebSphere Message Broker

WebSphere MQ

WebSphere Portal Server

WebSphere Portlet Factory

WebSphere Process Server

WebSphere Service Registry and Repository

WebSphere Application Server, WebSphere MQ & WebSphere Portal Server.

Revenue from the WebSphere family of products increased 10.3 percent (6 percent adjusted for currency) and 17.0 percent (13 percent adjusted for currency) in the third quarter and first nine months of 2007, respectively. The WebSphere family of products provides the foundation for Web-enabled applications and is a key product set in deploying a client's Services Oriented Architecture (SOA).

Information Management revenue increased 9.4 percent and 16.3 percent (5 percent and 12 percent adjusted for currency) in the third quarter and first nine months of 2007, respectively, versus the third quarter and first nine months of 2006. Information management software is increasingly digital. With the growth

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in Web-based applications, the ability to collect, analyze and act on data is critical to the success of t clients.

The company completed the acquisitions of DataMirror Corporation and Princeton Softech Inc. These acquisitions enhance the company's Information on demand initiative, which is aimed at the growing market opportunity around helping clients use information as a competitive and strategic business asset.

Lotus revenue increased 9.5 percent (5 percent adjusted for currency) and 9.6 percent (6 percent adjusted for currency) in the third quarter and first nine months of 2007, respectively, versus the same periods in 2006. Third-quarter revenue performance was led by double-digit growth in the Lotus Notes Domino product family. Lotus software is well established as a tool for providing improved workplace collaboration and productivity. The latest version of Lotus Notes, Lotus Notes 8.0, was delivered this quarter.

The company completed the acquisition of WebDialogs, a provider of web conferencing and communications services, in the third quarter.

Tivoli revenue increased 5.3 percent and 17.4 percent (1 percent and 13 percent adjusted for currency) in the third quarter and first nine months of 2007 versus the third quarter and first nine months of 2006. Storage virtualization software performed well in the quarter (increased 16 percent) as customers are benefiting from significant storage efficiency improvements. Tivoli's portfolio includes products which help clients manage networks and data centers.

Rational revenue increased 3.1 percent (decreased 1 percent adjusted for currency) and 9.4 percent (6 percent adjusted for currency) in the third quarter

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and first nine months of 2007, versus the comparable prior year periods. performance and functional testing software performed well in the quarter. Rational software provides the tools necessary to build advanced applications and systems software. The company completed the acquisition of Watchfire Corporation in the third quarter. Watchfire provides web application security software that pinpoints critical vulnerabilities and helps manage the process of correcting them.

Product life cycle management (PLM) revenue decreased 3.8 percent and 7.5 percent (8 percent and 11 percent adjusted for currency) in the third quarter and first nine months of 2007 versus the same periods in 2006. PLM software helps companies improve their product development processes and their ability to use product-related information across their businesses.

2.6.8 Tibco

Tibco has strong market participation in Services Oriented Architecture software license markets. Tibco is good at selling a large contract to an enterprise and letting the client use all the modules to solve the integration problem. An integration solution is evolved. Tibco has significant business process management capability.

Tibco has portal, middleware messaging management, and separate publish subscribe product revenue that complement its SOA market participation. Tibco has a top line integration broker that is complemented with a set of 36 integration modules. Customers typically pick and choose which modules to use to address a broad integration solution. Contracts tend to be large and address

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the need for comprehensive solutions. Tibco is leveraging its publish subscribe messaging base to achieve broad useful solutions.

2.6.9 Tibco Business Process Management on A SOA Foundation

Tibco has elaborated an elegant SOA approach based on its strong enterprise application integration (EAI) integration infrastructure. Business analysts can create models that run and SOA manages the technical underpinnings of the service. Business analysts can focus attention on the business process.

When that process requires a service, they just need to select the correct service and the inputs and outputs between the process and service.

At the same time, augmentations made to the service by IT developers should not have any impact on existing processes that use the service. As IT increases the depth and breadth of service assets, business processes require less and less complex development, and business analysts gain greater control over the end-to-end process; each group can work in an independent but collaborative manner to quickly and economically implement process management. Deploying BPM on an SOA results in a more agile and efficient enterprise. While almost everyone would agree that this is how BPM should be implemented on a SOA platform, delivering on the promise has been elusive for many of the competitors in the market.

Tibco has been able to leverage its position in EAi integration technology to make SOA work, while many other participants without strong middleware

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integration technology in the SOA markets have failed to build projects that work. Until now, BPM on an SOA has been delivered as BPM with limited connectivity (by vendors with a workflow background), or as an SOA with limited BPM functionality

The market for products and services is extremely competitive and subject to rapid change. A comprehensive suite of integration solutions among infrastructure software companies. Providers of infrastructure software include BEA, IBM, Microsoft, Oracle, SAP and Software AG.

2.6.10 Software AG

Software AG has 4,000 global customers that use the integration products to achieve measurable business results by modernizing and automating IT systems. Systems are used to rapidly build systems to meet growing business demands. The company's industry-leading product portfolio includes best-in-class solutions for managing data, enabling service oriented architecture, and improving business processes.

By combining proven technology with industry expertise and best practices, customers improve and differentiate their businesses. Software AG has 37 years of global IT experience and over 3,800 employees serving customers in 70 countries.

2.6.11 Software AG Solution For SOA Governance

The Software AG's solution for SOA governance is CentraSite™. Jointly developed by Software AG and Fujitsu, and bolstered by the patented Infravio

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technology acquired with webMethods, CentraSite from Software AG is a comprehensive, standards-based platform for managing and governing the services, processes, policies and business rules associated with SOA. It accelerates and simplifies sustainable SOA adoption through inclusion of such features as fully-extensible metadata modeling, out-of-the-box support for federation, and predefined, automated governance processes that incorporate Active Policy™ technology.

2.6.12 Software AG / webMethods

webMethods is driving the SOA market in a direction of providing a framework for network exchange of information. With a strong adapter product suite, XML elaboration, a broker, and a services oriented architecture webMethods can provide an operating system for the network.

webMethods has market participation of significant measurable SOA market share and was the number four-market participant in terms of revenue. WebMethods has had market strength due to the ability to execute implementations in a timely manner and to Web enable servers.

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webMethods is an Services Oriented Architecture provider with significant XML expertise. The strengthened broker product is complemented by a services oriented architecture (SOA) initiative to create a framework for moving information across the networks. This framework does not exist as a separate category yet, but it is expected to be a significant part of enterprise infrastructure going forward.

2.6.13 Microsoft SOA Positioned To Support Building A SOA Application

Microsoft SOA is positioned to support building an application. Much of the revenue generated by Microsoft is for the development tools rather than from SOA products. Microsoft has been more attentive to the development tools than to the mission critical aspects of SOA initiatives.

Developers use Microsoft SOA development tools. Businesses create a service instead of applications. An accounting application ends up as several accounting services. The services may include sub-services, such as an accounting presentation service completely built on Microsoft's next-generation Windows Presentation Foundation. Services facilitate a role.

2.6.14 Oracle / BEA

BEA is leveraging its application server technology to double as SOA capability, with a lot of custom coding required to get systems work. BEA participated in the 2006 SOA market leveraging the application server based on Java complemented by custom coding of connectors. BEA leveraged its strong

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application server market participation to package SOA integration capability with the several infrastructure and development modules.

Oracle / BEA participates in SOA by leveraging its strength in Java application server technology for portals. BEA Systems has its integration software sales. Much of the revenue to BEA is a bundled sale of application server software and the integration server portion is available. The BEA approach of using Java technology to solve integration problems appears to most observers that the product set consists more of an application server than it does an integration broker.

Bundles from BEA frequently mean the application server products are used extensively, while integration technologies acquired may get less usage.

2.6.15 Sun

Sun has positioned to provide a combined portal, broker, and adapter package. Specialized e-business connectivity companies include a range of competitors.

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2.6.16 Sybase

Sybase has a mobile computing initiative to leverage enterprise infrastructure for portable devices. The Sybase rules engine and database combination provide this company with strategic advantage in a market segments that promises to have significant growth.

2.7 Enterprise Services Oriented Architecture (SOA) Market Segment Analysis

The market for application server and integration software, and related software infrastructure products and services is comprised of several discrete segments.

TABLE 2-13

WORLDWIDE SERVICES ORIENTED ARCHITECTURE MARKET SEGMENTS, 2007

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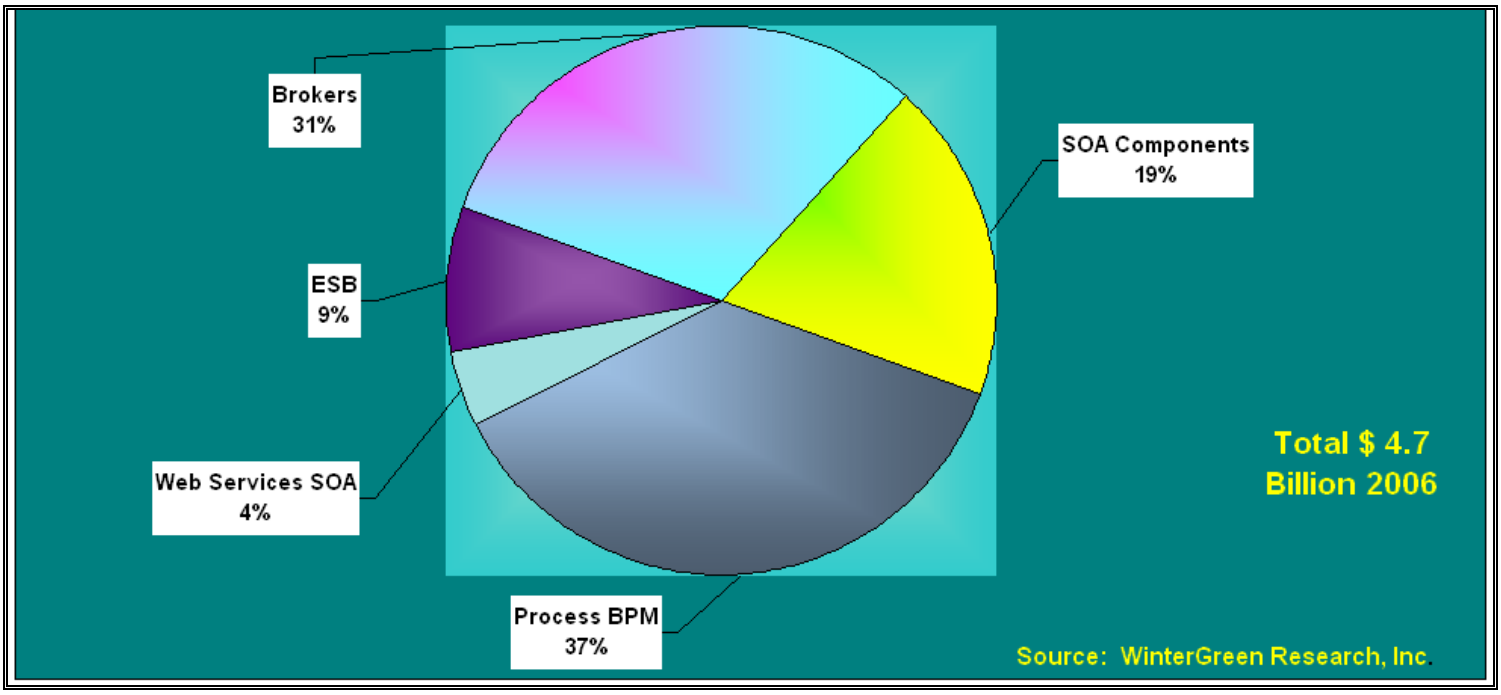

Solutions are directed at broker, enterprise service bus (ESB), SOA components, web services SOA, and business process management (BPM) segments of this marketplace.

2.7.1 Services Oriented Architecture (SOA) Engine Segments Market Forecasts

Services oriented architecture (SOA) market total engine segment forecasts relate to the components of middleware infrastructure that make up SOA. Markets at $3.25 billion in 2007 are growing in line with the license markets, reaching $7.3 billion by 2013.

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These markets are evolving in the context of multiple separate segments including application servers, mission critical messaging, portals, business process management (BPM), and content management.

TABLE 2-14
WORLDWIDE SERVICES ORIENTED ARCHITECTURE (SOA) ENGINE WEB SERVICES SEGMENT MARKET FORECASTS, DOLLARS, 2007-2013

Worldwide Services Oriented Architecture (SOA) Engine Web Services Segment Market Forecasts, Dollars, 2007-2013
In Millions of Dollars

	2006	2007	2008	2009	2010	2011	2012	2013
Application Server Engine	297.8	348.1	406.6	479.3	570.2	684.6	829.4	1,013.8
Application Server ESB	68.7	78.7	90.1	104.2	121.5	143.0	169.8	203.4
Portal Engine	412.3	462.9	519.2	587.9	671.7	774.5	901.1	1,057.9
Mission Critical Messaging Engine	458.2	546.1	650.5	782.0	948.8	1,161.7	1,435.3	1,789.1
Messaging ESB Broker	114.5	135.2	159.5	189.9	228.1	276.6	338.4	417.8
Portal Engine	343.6	389.7	441.7	505.2	583.2	679.4	798.6	947.2
Content Manager Engine	252.0	285.8	323.9	370.5	427.7	498.2	585.6	694.6
Business Process Manager Engine	343.6	404.6	474.3	559.5	663.9	792.6	951.9	1,150.0
Services Oriented Architecture SOA Engines (MM$)	2,290.8	2,651.1	3,065.8	3,578.3	4,215.2	5,010.7	6,010.2	7,273.7
% growth	8.0	15.7	15.6	16.7	17.8	18.9	19.9	21.0

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TABLE 2-15
WORLDWIDE SERVICES ORIENTED ARCHITECTURE (SOA) ENGINE WEB SERVICES SEGMENT MARKET FORECASTS, PERCENT, 2007-2013

Worldwide Services Oriented Architecture (SOA) Engine Web Services Segment Market Forecasts, Percent, 2007-2013
In Millions of Dollars

	2006	2007	2008	2009	2010	2011	2012	2013
Application Server Engine	13.0	13.1	13.3	13.4	13.5	13.7	13.8	13.9
% Growth	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Application Server ESB	3.0	3.0	2.9	2.9	2.9	2.9	2.8	2.8
% Growth	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Portal Engine	18.0	17.5	16.9	16.4	15.9	15.5	15.0	14.5
% Growth	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
Mission Critical Messaging Engine	20.0	20.6	21.2	21.9	22.5	23.2	23.9	24.6
% Growth	14.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Messaging ESB Broker	5.0	5.1	5.2	5.3	5.4	5.5	5.6	5.7
% Growth	11.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Portal Engine	15.0	14.7	14.4	14.1	13.8	13.6	13.3	13.0
% Growth	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
Content Manager Engine	11.0	10.8	10.6	10.4	10.1	9.9	9.7	9.5
% Growth	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
Business Process Manager Engine	15.0	15.3	15.5	15.6	15.8	15.8	15.8	15.8
% Growth	-1.0	1.7	1.4	1.1	0.7	0.4	0.1	-0.2
Services Oriented Architecture SOA Engines (%)	100.0	15.7	15.6	16.7	17.8	18.9	19.9	21.0
% growth	8.0	-84.3	-0.5	6.9	6.4	6.0	5.7	5.4

Source: WinterGreen Research, Inc.

TABLE 2-16
WORLDWIDE SERVICES ORIENTED ARCHITECTURE (SOA) COMPONENT MARKET FORECASTS, DOLLARS, 2007-2013

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Worldwide Services Oriented Architecture (SOA) Component Market Forecasts, 2007-2013
In Millions of Dollars

	2006	2007	2008	2009	2010	2011	2012	2013
Services Oriented Architecture High End Components (MM$)	**759.1**	**912.0**	**1,329.3**	**2,152.0**	**3,158.6**	**3,051.7**	**3,604.8**	**3,257.2**
Number of Units (000)	136.9	159.7	226.0	355.2	506.1	474.7	544.4	473.0
% Growth	145.0	16.6	41.5	57.2	42.5	-6.2	14.7	-13.1
Price per SOA Component $	5,545.1	5,711.5	5,882.8	6,059.3	6,241.1	6,428.3	6,621.1	6,886.0
% Growth	2.0	3.0	3.0	3.0	3.0	3.0	3.0	4.0
Services Oriented Architecture Mid Range Components (MM$)	**61.8**	**111.2**	**332.3**	**798.3**	**1,275.6**	**2,384.2**	**1,931.2**	**1,628.6**
Number of Units (000)	**66.1**	**115.5**	**335.0**	**781.4**	**1,212.1**	**2,199.6**	**1,729.8**	**1,402.7**
% Growth	**45.0**	**74.8**	**190.1**	**133.2**	**55.1**	**81.5**	**-21.4**	**-18.9**
Price per SOA Component $	**935.0**	**963.1**	**991.9**	**1,021.7**	**1,052.4**	**1,083.9**	**1,116.4**	**1,161.1**
% Growth	**2.0**	**3.0**	**3.0**	**3.0**	**3.0**	**3.0**	**3.0**	**4.0**
Services Oriented Architecture Low End Components (MM$)	**44.1**	**55.6**	**92.3**	**208.3**	**911.1**	**2,384.2**	**4,506.0**	**5,626.1**
Number of Units (000)	**160.5**	**196.3**	**316.4**	**693.0**	**2,943.8**	**7,478.5**	**13,722.7**	**16,474.8**
% Growth	**45.0**	**22.3**	**61.2**	**119.0**	**324.8**	**154.0**	**83.5**	**20.1**
Price per SOA Component $	**275.0**	**283.3**	**291.7**	**300.5**	**309.5**	**318.8**	**328.4**	**341.5**
% Growth	**2.0**	**3.0**	**3.0**	**3.0**	**3.0**	**3.0**	**3.0**	**4.0**
Services Oriented Architecture Very Small Components (MM$)	**17.7**	**33.4**	**92.3**	**312.4**	**728.9**	**1,716.6**	**2,832.4**	**4,293.6**
Number of Units (000)	**706.2**	**1,295.8**	**3,480.6**	**11,435.3**	**25,905.2**	**59,229.8**	**94,882.7**	**138,301.5**
% Growth	**45.0**	**83.5**	**168.6**	**228.5**	**126.5**	**128.6**	**60.2**	**45.8**
Price per SOA Component $	**25.0**	**25.8**	**26.5**	**27.3**	**28.1**	**29.0**	**29.9**	**31.0**
% Growth	**2.0**	**3.0**	**3.0**	**3.0**	**3.0**	**3.0**	**3.0**	**4.0**
Services Oriented Architecture Total Components (MM$)	**882.7**	**1,112.2**	**1,846.3**	**3,471.0**	**6,074.3**	**9,536.6**	**12,874.4**	**14,805.6**
% growth	17.0	26.0	66.0	88.0	75.0	57.0	35.0	15.0

Note: Most web services SOA components are sold as services,
The component code may be low cost and the revenue from the support provided.

Source: WinterGreen Research, Inc.

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The value of Services Oriented Architecture has been proved; markets have achieved strong growth as SOA begins to take hold. Process from the desktop is significant. It makes computing more relevant to ordinary business people.

Penetration levels are beginning to rise above the single digits, as early adopters use SOA integration to replace hand rolled middleware code. The ability to improve software by spreading the cost of improvement over a large installed base makes packaged infrastructure relevant in every market.

The market is set to evolve to a more mature status with the dominant players offering a range of product suites that address the need for significant interconnectivity of disparate applications. Companies are seeking to interconnect portable devices and databases.

Markets are growing in line with e-commerce adoption. Supply chain automation is a market driving force. Integration of financial services continues apace. Companies in every industry are achieving competitive advantage from the use of SOA technology. It is used to replace batch processing with real time exchange of information. This is a significant market driver that will not go away.

Process is sequence. Information is stored in databases, but it is used as process, a sequence of events tied together with calculations and movement of information from one location to another, form one application to another. Process and sequence depend on integration.

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2.8 Competitive Factors Affecting The SOA Market

Large companies with resources, broader customer relationships, and more established brands have been growing the most rapidly in the SOA markets. Extensive knowledge of the integration industry is a significant aspect of SOA market participation.

Cooperative relationships offer a single solution and increase the ability of their products to address customer needs is an emerging market trend. Table 2-17 illustrates SOA competitive market factors.

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TABLE 2-17

SOA COMPETITIVE MARKET FACTORS

- Product functionality
- Product features
- Product price
- Product performance
- Ease of implementation
- Market awareness
- Quality of professional services offerings
- Acceptance of product or vendor by leading system integrators
- Quality of customer support services
- Quality of training
- Documentation
- Vendor reputation
- Product reputation
- Product brand

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Source: WinterGreen Research, Inc.

Competitive factors affecting the SOA market for its products include product functionality and features, product price and performance, ease of implementation, market awareness, quality of professional services offerings, acceptance of product or vendor by leading system integrators, quality of customer support services, quality of training and documentation and vendor and product reputation.

SOA software license markets are growing as the Internet dominates e-commerce channel adoption. E-commerce depends on the ability to tie applications together in a flexible manner. Supply chain automation is a market driving force. Integration of applications by the financial services industry has not been dented.

Most integration is still achieved with custom coding. SOA will change this dynamic rapidly with process delivered from the desktop. SOA licenses impact the banking and insurance industries. Companies in every industry are achieving competitive advantage from the use of SOA technology. It is used to replace batch processing with real time exchange of information. This is a significant market driver.

2.8.1 Services Oriented Architecture Market Trends

IT managers in the enterprise use SOA improve the efficiency of internal network communication and implement external B2B and Internet exchange

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operations using application integration. Vendors are implementing return on investment tools that operate in the background to gather metrics that prove the efficiency of the integration systems.

Networks have made the integration systems an essential aspect of doing business.

Businesses rely on significant integration of servers to address the business needs of division, partners, distributors, and other affiliated groups to achieve efficient information access, enterprise-wide communication, and business process systems automation. Services Oriented Architecture(SOA) permits businesses to achieve a level of integration that improves business efficiency.

Table 2-18 illustrates networked business systems integration.

TABLE 2-18

NETWORK BUSINESS INTEGRATION (BI)

- Integration of servers
- Implementation of clustered and grid systems
- Means to leverage blade technology
- Address business needs of workers and partners
- Achieve efficient information access for management

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- Implement enterprise-wide communication
- Leverage virtual private network technology (VPN) for communication over the Internet

TABLE 2-18 (CONTINUED)

NETWORK BUSINESS INTEGRATION (BI)

- Tie together back end systems
- Tie back end systems to front end systems
- Leverage efficiency of front-end systems
- Create greater access to computer telephony integration and call center help desk systems
- Support business process systems automation
- Implement business exchanges
- Implement B2B systems
- Permit businesses to achieve a level of integration that improves business efficiency.

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2.8.2 System z Significantly Less Expensive than Distributed Computing Environments

Information systems of many large organizations have evolved from traditional system z-based systems to include distributed computing environments.

This evolution has been driven by the purported benefits offered by distributed computing, but when all the factors impacting IT cost are considered, the system z is considerably less expensive, generally by a factor of 10.

Lower incremental technology costs, better scalability, higher reliability, better security, faster application development and deployment, increased flexibility, and improved access to business information are the benefits of system z computing.

Large-scale mission-critical applications enable and support fundamental business processes. Airline reservations, credit card processing, and customer billing and support systems, have largely remained in system z environments. Now, application server applications are moving to the system z because of the competitive advantage offered by using the system z as a server.

The high levels of reliability, scalability, security, manageability and control required for this complex, transaction-intensive systems have been provided by application server functionality included in the system z operating system. System z environments offer flexibility, better development environments, and improved maintenance cycles. The previously limited, character-based user interfaces are being improved for the Nintendo generation.

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The coexistence of distributed and system z computing creates a need for enterprise application integration. Shortcomings of each type of system have forced organizations to seek SOA solutions. These enable overcoming the limitations of distributed computing for mission-critical applications, while providing access to the robust computing infrastructure from outside the system z environment.

2.8.3 Internet Impact

The Internet is an element of enterprise infrastructure. Businesses use the Internet as a channel to move product and partner. The Internet provides a means of selling products to consumers and distributors, buying components, or whole products from suppliers, opening new customer accounts, scheduling service installation, providing account information and customer care, enabling reservations, funds transfers, bill payments and securities trading, and gathering information about customers and their buying habits.

Table 2-19 illustrates the Internet impact on SOA.

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TABLE 2-19

INTERNET IMPACT ON SOA

- Element of enterprise infrastructure
- Channel to move product
- Channel to partner
- Provides a means of selling products to consumers
- Provides a means of reaching distributors
- Provides a means of buying components
- Provides a means of buying whole products from suppliers
- Provides a means of opening new customer accounts
- Provides a means of scheduling service installation
- Provides a means of providing account information
- Provides a means of providing customer care
- Provides a means of enabling reservations

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• Provides a means of funds transfers • Provides a means of bill payments

TABLE 2-19 (CONTINUED)

INTERNET IMPACT ON SOA

• Provides a means of securities trading • Provides a means of gathering information about customers and their buying habits

Source: WinterGreen Research, Inc.

Businesses use intranets, extranets, or virtual private networks. Functions include inventory control, decision support, logistics, reservations, customer care, and provisioning. They support internal users and to make information and applications available to their suppliers or distributors.

2.8.4 IT Department Need For SOA

As a result of investment in different technologies, all enterprise IT organizations are characterized by complexity, heterogeneous environments, incompatible technologies, and high cost of operation manual processes. Enterprises must manage the effects of these realities and implement automated business processes.

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Heightened investment in technology has significantly increased IT complexity. The Internet has altered users expectations of availability, cost, service and functionality. Economic and IT spending climates depend on leveraging existing assets and improving the return on investment.

Achieving the full benefits of distributed computing and Web services requires integrating external facing Web-based applications with existing enterprise applications. Shipping, financial systems, inventory control, billing, payroll, and general ledger need to be integrated using SOA. 95% of this integration is a result of hand built interface logic. As systems are being rebuilt using SOA, packaged integration solutions are more robust.

2.8.5 SOA Represents The Implementation Of Process From The Desktop

SOA represents the implementation of process from the desktop. As new architectures replace existing code bases, the applications stay in place, but the APIs are exposed from WebSphereMQ and the information is exposed to other process implementations.

Internal facing applications need to be integrated onto Web-based systems. To fully integrate internal applications with Web-based systems, the internal applications must be electronically linked to each other and must be built on a flexible, reliable, scalable, secure infrastructure that can run on, or connect to, the Web and support the demanding loads that result from heavy Internet traffic.

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The development of standards Java 2 Enterprise Edition (J2EE), enabled the application development and deployment market to flourish, since individual developers, application companies and infrastructure companies could build compatible systems. Standards-based approaches, such as those supported by IBM and BEA have been more widely adopted than proprietary approaches in Web application development and deployment. Still, this has not resulted in the implementation of SOA systems on a broad scale.

2.8.6 Stack Based vs. Decoupled WebSphereMQ Mission Critical Messaging Approaches to SOA Solutions

Standards in the market are for integrating existing applications using applications servers. Standards include the J2EE Connector Architecture (JCA) and Java Messaging Services (JMS) and for providing Web services. The Web Services Interoperability Organization (WS-I) provides significant market thrust to SOA and Web services markets.

The stack designs inherent in applications servers are very inadequate to the task of completing a complex IT integration that provides connectivity to a range of computing platforms across a range of applications using a decoupled architecture. WebSphereMQ and the MQ broker or DataPower ESBs have been more successful architectures for integration that needs significant flexibility.

2.8.7 Cost, Time And Resources Required To Create And Maintain Integration In A Rapidly Changing Environment

Organizations bridge disparate systems and applications through in-house or third-party custom development of point-to-point interfaces. This approach is

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no longer viable for many organizations given the large and growing number of applications. The cost, time and resources required to create and maintain integration in a rapidly changing environment are expanding exponentially.

2.8.8 Application Connectivity Infrastructure Enhances E-Business

Application connectivity enhances e-business. The shift to a global economy has had an impact on business and how it is conducted. Technology has become a crucial factor for business.

Web presence is at the core of e-business. Technology enables a user with a Web-enabled mobile phone, personal digital assistant (PDA), or Internet browser to access information and services from millions of Web sites. e-business taps connectivity creates opportunities to improve company performance.

Improved operational efficiency is achieved by gaining a larger return on investment in employees, business operations, applications, and existing information technology (IT) infrastructure.

Integration infrastructure is an essential aspect of business consolidation. Execute mergers and acquisitions, while reducing the risk and cost involved through effective integration of separate systems and business processes. This lets you improve the benefits of synergy by eliminating redundant or duplicate functions.

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Improved customer service can be achieved in the context of reducing costs. Interaction with customers promotes loyalty and repeat business. Integration infrastructure allows integration of fragmented customer information.

Collaboration with trading partners improves the efficiency of the supply chain. Integration infrastructure is needed to help reduce costs and match supply with demand. Systems automate procurement. They help reduce purchase-order processing cost and time while improving business flexibility and agility. Table 2-20 illustrates the impact of application connectivity on e-business.

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TABLE 2-20

IMPACT OF APPLICATION CONNECTIVITY ON E-BUSINESS

- Supports shift to a global economy
- Implements Web presence as the core of e-business
- Enables Web-enabled mobile phone, personal digital assistant (PDA), or Internet browser to access information and services from millions of Web sites
- Taps connectivity
- Creates opportunities to improve company performance
- Improves operational efficiency
- Improves return on investment in employees, business operations, applications, and existing information technology(IT) infrastructure
- Implements an essential aspect of business consolidation

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- Supports mergers and acquisitions
- Reduces the risk and cost involved through effective integration of separate systems and business processes
- Improves the benefits of synergy

TABLE 2-20 (CONTINUED)

IMPACT OF APPLICATION CONNECTIVITY ON E-BUSINESS

- Eliminates redundant or duplicate functions
- Improves customer service
- Reduces costs
- Interacts with customers
- Promotes loyalty and repeat business
- Allows integration of fragmented customer information
- Supports collaboration with trading partners
- Improves the efficiency of the supply chain
- Reduces costs
- Matches supply with demand

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- Supports systems that automate procurement
- Helps reduce purchase-order processing cost and time
- Improves business flexibility and agility

Source: WinterGreen Research, Inc.

2.9 Sarbanes-Oxley Solutions Position IT For Flexible Systems

Business process management solutions allow companies to effectively monitor changes made to data in real-time. Systems connect systems and applications that house financial and corporate data. They ensure the ongoing operational resilience of financial systems. Solutions once in place permit corporate officers to gain a 360-degree view of all operations. This can shorten reporting cycles for financial reports.

Table 2-21 illustrates Sarbanes-Oxley issues.

TABLE 2-21

SARBANES-OXLEY SOLUTIONS POSITION IT FOR FLEXIBLE SYSTEMS

- Sweeping legislation affecting corporate governance, disclosure and financial accounting

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- Sections 302 and 404 require that CEO's, CFO's and independent auditors and committees have content documented for the real time operations
- Certify the accuracy of financial statements and disclosures
- Indicate in each periodic report whether or not there were significant changes in internal controls or related factors since their most recent evaluation

TABLE 2-21 (CONTINUED)

SARBANES-OXLEY SOLUTIONS POSITION IT FOR FLEXIBLE SYSTEMS

- Disclose all deficiencies in the design or operation of internal controls
- Provide auditor's attestation to, and report on, management's assessment of the internal controls and procedures for financial reporting
- Report that controls and procedures for financial reporting and disclosure have been evaluated for effectiveness within the past 90 days
- Section 404 requires an annual evaluation of internal controls and procedures for financial reporting

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- A corporation must document its existing controls that have a bearing on financial reporting, test them for efficacy, and report on gaps and deficiencies

Source: WinterGreen Research, Inc.

Table 2-22 illustrates Sarbanes-Oxley functions required.

TABLE 2-22

SARBANES-OXLEY FUNCTIONS REQUIRED

- Independent auditors must issue a report, to be included in the company's annual report, that attests to management's assertion on the effectiveness of internal controls and procedures and financial reporting
- Promote proactive oversight
- Have a best practices document
- Perform this without adding complexity
- Use centralized management dashboards
- Internal controls management system that empowers CEO's, CFO's and financial management officers to

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enforce internal controls as defined by the SEC by supporting content management

- Project Management
- Controls Documentation
- Collaborative Task Management
- Issues Management
- Reporting and Monitoring

Source: WinterGreen Research, Inc.

Table 2-23 illustrates Sarbanes-Oxley features.

TABLE 2-23

SARBANES-OXLEY FEATURES

- COSO-based Process
- Controls Repository
- Leading Audit Firm Methodology and Best Practices Support
- Management Dashboards - Centralized and secure electronic 'workspaces' provided to facilitate effective review of financial reports, documents and disclosures

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- Automated Reporting Processes - Repeatable knowledge processes such as quarterly financial submission, review and approval are automated in dynamic, definable workflows
- Documents and associated versions are stored in a centralized, secure repository for safekeeping and auditability
- Complete audit trails of financial reporting workflows, archives of all reports, disclosures and their inter-relationships are provided

Source: WinterGreen Research, Inc.

Certification enforcement is part of the content management requires. Sarbanes-Oxley provides the demand for controlled environments where certification procedures can be monitored and facilitated within the corporate structure and with third parties such as auditing firms. Real time access to all material information assists in fulfilling requirements that auditing firms attest to management's assessment of their internal controls and procedures.

Business process management markets depend on compliance and on productivity improvement. Compliance is anticipated to increase as a proposition of business process management markets by 2012.

Auditing standards are established. The board would be required to cooperate on an on-going basis with designated professional groups of

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accountants and any advisory groups convened in connection with standard setting. The board can adopt standards proposed by those groups. The board has authority to amend, modify, repeal, and reject any standards suggested by the groups. The board must report on its standard-setting activity to the Commission on an annual basis.

Logical functions are used to create analytical sheets. The formats permit capture and manipulation of messages, events, database information, and real time data.

2.9.1 SOA Service Oriented Architecture Markets

SOA service oriented architecture (SOA) markets are a combination of discrete SOA functional modules complemented by web services capabilities that are implemented as part of a broker, a portal, and application server, or adapter. SOA service oriented architecture markets drive integration across a broad spectrum of systems.

There is inevitability to SOAs, just as there was to PCs and desktop computing. SOAs implement change efficiently at the desktop level. The prospect of process from the desktop is compelling.

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The SOA components permit rapid response to markets shifts by the managers that are closest to the competitive situations. Instead of sending a programming desire to IT and waiting 3 months to 3 years to get the desired shift, the SOA permits the business manager to implement the change immediately by clicking on a selected group of icons. This provides immediate competitive advantage in companies.

2.9.2 E-Business

Utilizing the Internet to do B to B exchange represents the opportunity to achieve efficiencies of process. E-business is dramatically altering business-to-business (B2B), business-to-consumer (B2C), and business-to-employee interactions.

Business models take advantage of the e-Business opportunity by challenging inefficiency at every level. SOA is at the center of the technology used to implement e-business.

TABLE 2-24

SOA BUSINESS ENVIRONMENT MARKET DRIVERS

- Range of challenges
- Competitive pressures
- Macroeconomic volatility

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- Corporate mergers
- Acquisitions
- Ubiquity of the Internet
- Shortened development production cycles
- Shifting supplier relationships
- Diverse customer demands
- Need to adapt in numerous ways to lower costs

Source: WinterGreen Research, Inc.

As SOA systems become easier to implement and less expensive, they will be utilized more. SOA permits distributors to interface electronically to large enterprises. SOA is extending to small and medium size markets. SOA is useful because it implements real time network electronic processing. SOA delivers on the promise of electronic data transfer, creating the paperless office.

Aggressive e-business initiatives have become central to competitive positioning. E-business is business. Electronic communication of information means business transactions and relationships are conducted electronically

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among enterprises. e-Business initiatives have been adopted to help the enterprise operate efficiently. Communication with suppliers, customers, and partners is a priority. To this end, organizations have made significant investment in a range of custom and packaged software applications.

Enterprise resource planning (ERP), supply chain management (SCM), customer relationship management (CRM), decision support, and e-Commerce technologies are different types of enterprise applications. Applications generally were not designed to interact with each other.

The proliferation of diverse technologies has resulted in highly disconnected and disparate information technology infrastructures. These diverse systems and applications often reside on different hardware platforms. Varying and incompatible data formats and communication methods have been implemented. Information trapped within isolated systems is virtually useless. No one is willing to reenter information once it has been captured in electronic format. To enable automated business processes, isolated systems must be seamlessly integrated.

2.10 SOA Regional Analysis

As organizations position to achieve enhanced profitability, integration solutions are evolving that enable dynamic and real-time connections in every part of the world. (See Figure 2-25 and Table 2-26.)

FIGURE 2-25

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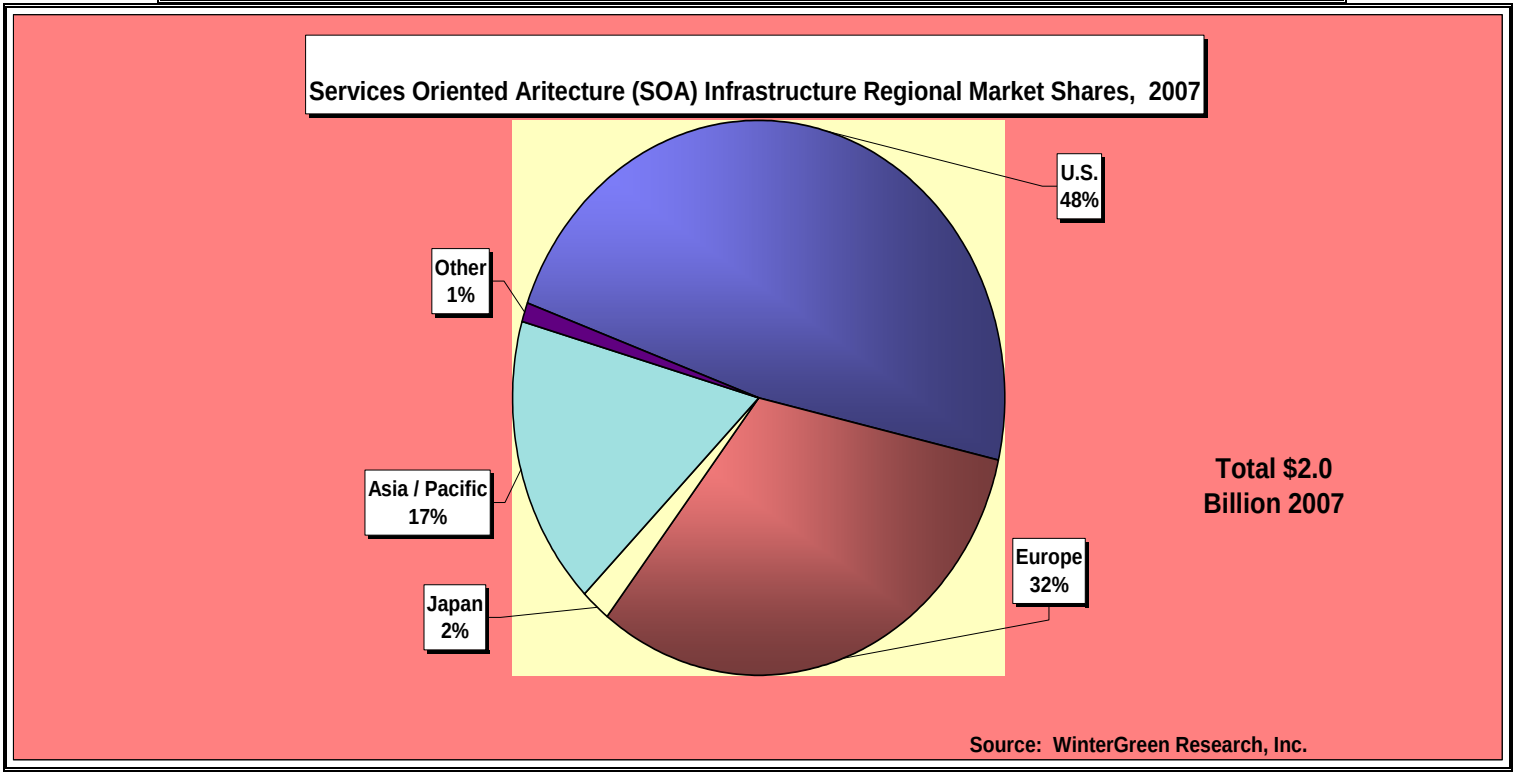
WORLDWIDE SERVICES ORIENTED ARCHITECTURE (SOA) REGIONAL MARKET SHARES, 2007



SOA markets at $2 billion had the US which represented the largest regional segment with 48% of the total in 2007. European markets were at 32%. Asia Pacific markets representing 17% of the total were dominated by China. Japan had measurable market share.

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TABLE 2-26
SERVICES ORIENTED ARCHITECTURE (SOA) REGIONAL MARKET SHARES, 2007

Services Oriented Architectrure SOA Regional Market Shares, 2007
In Millions of Dollars

	MM$ 2007	%
U.S.	952.3	48
Europe	634.9	32
Japan	39.7	2
Asia / Pacific	337.3	17
Other	19.8	1
Total	**1,984.0**	**100**

Source: WinterGreen Research, Inc.

European SOA markets at $635 million had Germany as the leading user of SOA. (See Figure 2-27 and Table 2-28.)

FIGURE 2-27
SERVICES ORIENTED ARCHITECTURE (SOA) REGIONAL MARKET SHARES IN EUROPE, 2007

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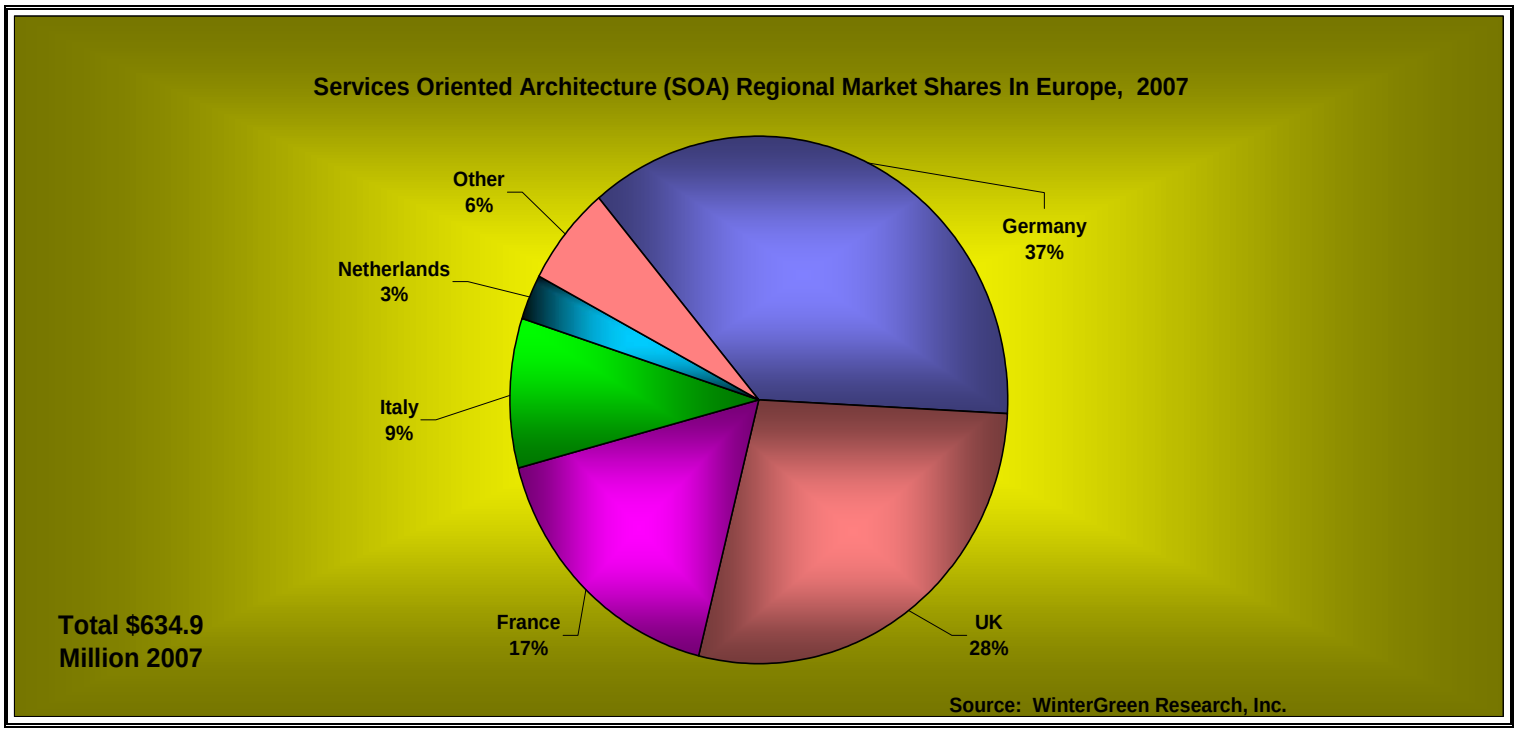

TABLE 2-28

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SERVICES ORIENTED ARCHITECTURE (SOA) EUROPEAN REGIONAL MARKET SHARES, 2007

Services Oriented Architecture (SOA) Regional Market Shares, Europe, 2007 In Millions of Dollars		
	2007	%
Germany	234.9	37
UK	177.8	28
France	107.9	17
Italy	57.1	9
Netherlands	19.0	3
Other	38.1	6
Total	634.9	100
Source: WinterGreen Research, Inc.		

2.11 Enterprise Services Oriented Architecture (SOA) For Back End Systems

Table 2-29 illustrates business benefits of SOA.

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TABLE 2-29

BUSINESS BENEFITS OF SOA

- Eliminates the need for writing or generating custom interface programs
- Facilitates packaged applications systems to transport, route, and convert information between applications
- Gives business analysts direct access to application information outside the application
- Reduces maintenance of custom interfaces
- Dramatically accelerates integration projects
- Replaces months of development with integration implementation in a few days
- Eliminates the cost of replacing or adding new systems
- Provides interoperability between existing systems

Source: WinterGreen Research, Inc.

Emerging real time enterprise strategies advance the goal of timeliness in the management of information. SOA facilitates immediate awareness and appropriate response to events across an entire enterprise.

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2.11.1 SOA Industry Segments

SOA industry segments are varied. Financial services represent the largest segment, followed by banking, manufacturing, telecommunications, healthcare / government, retail, and insurance in that order.

TABLE 2-30

ENTERPRISE BACK END SYSTEM ADVANTAGES FROM SOA

- Maintain application integrity
- Maintain database integrity
- Allow applications to carry out existing processes by referencing other applications data
- Integrate applications without reprogramming
- Integrate applications without modifying existing applications

Source: WinterGreen Research, Inc.

This industry segmentation is expected to shift by the end of the forecast period. Financial services, banking and insurance have been early adopters. As

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the supply chain and retail adopt integration systems, the rest of the industries are expected to drive market growth.

2.11.2 Enterprise Services Oriented Architecture (SOA) For Front End Systems

Companies using enterprise Services Oriented Architecture(SOA) for front-end systems are positioned to capitalize on new business opportunities sooner than their competitors. Table 2-31 illustrates enterprise market advantages from SOA.

TABLE 2-31

ENTERPRISE MARKET ADVANTAGES FROM SOA

- Position front end systems to be more automated
- Capitalize on new business opportunities sooner than competitors.
- Permit quick adaptation to changing business environment
- Integrate applications that are 'locked'
- Integrate applications that have no documentation

Source: WinterGreen Research, Inc.

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2.11.3 Customer Service

AI growth will be fueled by the need for every enterprise to offer a high level of customer service in order to remain competitive in markets. Customers expect a higher level of accessibility and support than was possible before the advent of the Internet.

Internet purchases drive usage of SOA. The ability to connect to the customer service representative over the Internet stimulates purchases and provides competitive advantage. SOA permits customer service representatives to access information needed to provide a high level of customer support.

PC-based telemarketing/call center systems perform automated call distribution, assigning incoming calls to the next available agent, and minimizing customer-waiting time. Systems provide audiotex menus, fax-on-demand, and information or music on hold.

On the outbound side, PC systems place calls automatically from phone-number lists. SOA is expected to continue to support CTI evolving more sophisticated systems integration.

2.11.4 Partner Business Drivers

Table 2-32 illustrates integration targeted to B2B and exchanges.

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TABLE 2-32

INTEGRATION TARGETED TO B2B AND EXCHANGES

- Ability to exchange information efficiently
- Ability to exchange information automatically
- Integration systems linked to the businesses
- In the context of supply chain
- In the context of value chain
- In the context of distribution, channel strategy
- In the context of strategic partnering

Source: WinterGreen Research, Inc.

The need for enterprises to work together is the B2B and exchange aspect of SOA. The ability to exchange information efficiently and automatically with other organizations represents a strategic initiative for every enterprise. Integration systems linked to the business applications arise in the context of supply chain, value chain, distribution, channel strategy, and strategic partnering considerations.

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2.11.5 Business Process Integration

Connectivity solutions for leading applications, and business process integration modules called collaborations extend common business processes across systems. Vendors are developing tools that can be used to build integration solutions, or to extend and customize pre-built components.

Business process integration supports achievement of competitive advantage. Enterprises with a fast reaction time have a competitive advantage. Improved sales and customer service provide strategic advantages. Models of business processes implemented using SOA achieve integrated services outside existing applications.

Business processes are modeled in software systems and implemented using SOA tools. Table 2-33 illustrates business process integration advantages.

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TABLE 2-33

BUSINESS PROCESS INTEGRATION ADVANTAGES

- Supports achievement of competitive advantage
- Gives enterprises with a fast reaction time
- Improves sales and customer service
- Provides strategic advantage
- Permits modeling of business processes
- Implements integrated services outside existing applications
- Creates a network-centric computing model
- Mirrors the way a business operates
- Allows information resources to be incrementally integrated into the system at any time
- Supports scalability and flexibility

Source: WinterGreen Research, Inc.

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Systems create a network-centric computing model that mirrors the way a business operates. Allowing information resources to be incrementally integrated into the system at any time supports scalability and flexibility. Business processes and information requirements drive systems.

2.11.6 Integration Of Business Processes

AI is positioned to help companies manage business processes across applications. SOA has evolved in response to the Internet and network computing. With secure cross platform exchange of information SOA depends on VPN and firewall technology to achieve information transfer.

AI continues to support a broad spectrum of products from system zs to minicomputers to personal computers. Client PCs promise to use SOA to get information from multiple applications located in multiple servers. Internet and Intranet SOA systems permit corporations to add new, often incompatible, hardware and software to existing information infrastructures.

2.11.7 Impact Of Mergers And Acquisitions

As companies merge with and acquire other entities, their computing systems dramatically increase in complexity, potentially spanning many local and wide area networks and multiple system zs. The trend to blend information into systems illustrates the complexity of managing separate sets of information in different systems. The recent explosion of the Internet and the increasing usage

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of Intranets have led to the emergence of another class of enterprise applications, adding yet another dimension of complexity to the enterprise.

Within these disparate enterprise-computing environments, which comprise numerous applications, databases, operating systems, hardware platforms, and communication protocols, companies are realizing competitive advantage by providing access to data and information across the organization. Companies cannot effectively compete in today's marketplace without bringing their desktop-bound users, work groups, departments, dynamic data warehouses, and information processing elements together.

To better leverage existing information systems, companies are integrating previously independent systems and databases; each component of the enterprise is being combined into a cohesive computing environment that compiles and delivers information efficiently and quickly.

Corporations maximize return on technology investment by retaining transaction systems and integrating them into distributed computing environments while continuing to design, develop, and add new applications and systems to the network.

Exchange of information from applications depends on use of SOA message broker modules, which are interface logic. System modules need to be interconnected via interfaces. Interfaces are needed to achieve SOA.

AI interfaces are comprised of mission critical messaging, formatting, routing, transformation, adapter logic, connector logic, and systems management. Systems represent sophisticated switching mechanisms that

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support communications with a sub structure. Messages carry information in a header, or the message itself can be decoded to determine appropriate routing. Table 2-34 illustrates enterprise Services Oriented Architecture processes.

TABLE 2-34

ENTERPRISE SERVICES ORIENTED ARCHITECTURE (SOA) PROCESSES

- Supports management of business environment characterized by change
- Supports management need to look at information from different applications
- Supports management of complexity
- Supports management of geographical distance

Source: WinterGreen Research, Inc.

Enterprise Services Oriented Architecture (SOA) relates to the need to manage market changes using automated business process tools. The enterprise business environment is characterized by change. Market changes are driving the need to look at disparate applications as a cohesive whole.

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2.11.8 Expand Strategic Partnerships

Vendors intend to continue to develop and extend our strategic partnerships to promote adoption of our business integration solutions. Strategic partnerships provide a competitive advantage.

Partnerships are being negotiated with systems integrators; enterprise application, and other technology vendors provide sales and marketing support and access to required technology and expertise.

Systems integrator partners increasingly provide the resources needed to implement our products and include solutions in their bundled service and product offerings.

2.11.9 Electronic Commerce

E-Business describes the range of automated, electronically meditated, information exchange between organizations that do business with one another. Electronic commerce requires a company's business and operational infrastructure to be integrated. Security is essential for doing business on the Internet. By using SOA to enable E-commerce, companies are able to get products and services to market faster, while increasing customer satisfaction.

AI supports Internet commerce and EDI. In the banking and finance industry, straight through processing (STP) offers significant advantages in cost and speed. Some level of integration with existing applications is required for straight through processing.

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Most enterprises have computing systems that have evolved over many years. These systems have grown and changed through multiple generations of hardware and software.

Batch, transactional and client/server systems coexist and interact to meet the processing needs of a business. Most software systems are modified to meet short-term, tactical goals, with little regard for the longer-term consequences. These tactical changes result in short-term business gains, but often restrict the ability of the business to react in the future.

Table 2-35 illustrates e-business objectives. Table 2-36 illustrates electronic commerce infrastructure requirements. Table 2-37 illustrates how SOA functions enable e-commerce. Table 2-38 illustrates SOA support for Internet commerce and EDI.

TABLE 2-35

E-BUSINESS OBJECTIVES

- Implement a range of automated transactions
- Electronically meditate transactions and orders
- Implement information exchange between organizations that do business with one another

Source: WinterGreen Research, Inc.

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TABLE 2-36

ELECTRONIC COMMERCE INFRASTRUCTURE REQUIREMENTS

- Integration infrastructure offer range of brokers
- Integration brokers provide best in class capabilities
- Integration brokers integrate with each other
- Integrated business and operational infrastructure
- Security essential for doing business on the Internet

Source: WinterGreen Research, Inc.

TABLE 2-37

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SOA Functions Enable E-commerce

- Get products to market faster
- Get services to market faster
- Increase customer satisfaction
- Automate supply chain

Source: WinterGreen Research, Inc.

Table 2-38

SOA Support For Internet Commerce And EDI

- Support straight through processing (STP) in the banking and finance
- Support some level of integration with existing applications as required for straight through processing
- Offer significant advantage in cost and speed
- Support enterprise computing systems that have evolved over many years
- Support systems that have grown and changed through multiple generations of hardware and software

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- Support coexisting batch, transactional and client/server systems
- Accommodate tactical changes that result in short-term business gains, without restricting the ability of the business to react in the future

Source: WinterGreen Research, Inc.

2.11.10 Vendors With A Broad Suite Of Products

The increase in market awareness is accompanied by a growing market acceptance of integration products. Expansion of international sales resources, the continued growth of an installed base, more service attention to accounts helped grow the markets. Companies are seeking to use reference accounts that serve as guides for customers, provide repeat business from existing customers, and advise on expanded functionality of the suite of vendor products.

2.11.11 Total Segments By Vendor

E-business supports in-house and trading partner systems integration and business management capabilities. Existing SOA systems by and large support tightly and loosely coupled applications relationships. These capabilities provide integration to link with partners and leverage access to new customer bases more efficiently. Business process management is emerging as the backbone for enterprise ERP applications integration.

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Market directions relate to using adapters for B2B transactions. Services Oriented Architecture supports trading relationships in the online marketplaces. Application service providers, customer supply chains, and inter-divisional business processes need integration software.

Software integration architecture permits customers to 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.

2.11.12 SOA Integration Broker Segment Market Analysis

Segments are not discrete, rather overlapping. Segment analysis is an attempt to show that there are different flavors of integration with different emphases. Markets for business process and workflow dominate SOA segments. Rules engines represent a significant aspect of application integration, providing base functionality that is difficult to implement in any other way. Rules engines shift from routing to business process management.

Trends relate to bringing the cost of custom programming under control and to shifting the expense to purchase of packaged software. Packaged software spreads the cost of upgrading functionality over an increasingly large user base.

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Companies continue to insist on implementing point solutions that solve particular problems. These point solutions are justified by continuing return on investment analysis.

Workflow represents exception management and long running business processes. Business process management relates to gathering information that permits more efficient management of the organization. These segments grow faster than the total market. By 2014 they represent an increased proportion of the total Services Oriented Architecture market. While workflow and business process management have been different markets in the past, they are converging to be the SOA market by 2009.

Adapters represent a large market segment. Transformation engines are used to transmit information outside the firewall to partners, distributors, and agencies. This market is expected to grow faster than other segments of the market.

Going forward, SOA markets are dominated by business process analysis / workflow products. The fact that budgets are in place that pay for existing integration functionality, drives market growth for SOA. Functionality provided by SOA automates processes in a manner not accomplished by custom coding. SOA offers improved efficiency and significantly lowers costs of integrating systems and implementing supply chain efficiencies, providing a market driving force.

IBM and Tibco are vendors with the broadest enterprise integration product market participation. IBM, Tibco, WebMethods, and SeeBeyond are

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expected to leverage their position in routing and rules brokers to encompass the full functionality of integration broker suites in the marketplace. Rules engines provide the core of SOA, making it possible to make decisions about information as it is transferred from one application to another.

Oracle / BEA has achieved a strong market push with its application server Java enablement of integration systems. Microsoft has evolved a strong adapter technology for SOA integration that leverages its strength in providing development tools for SOA.

2.12 Services Oriented Architecture Challenges

Key challenges for Services Oriented Architecture (SOA) projects relate to developing point solutions that will scale. Fast systems operation is a significant aspect of project implementation. Point solutions implemented in a departmental environment may not scale to the entire enterprise. Speed is a significant factor in system evaluation. SOA system challenges are illustrated in Table 2-39. Achievement of business agility and flexibility is a primary SOA system integration goal.

TABLE 2-39

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KEY CHALLENGES OF APPLICATION INTEGRATION

- Need to maintain business agility
- Need to accommodate the continuing shortage of IT skills
- Need to contain project risks
- Need to protect existing IT investment

Source: WinterGreen Research, Inc.

Accommodation of the continuing shortage of IT skills is solved by SOA, because packaged interface logic is substituted for the need to use programmers to build custom interface logic. Many SOA systems need services that cost ten times as much as the packaged software to implement the system. This situation is changing as new SOA software is easier to install and to use.

AI facilitates containment of project risks because it implements known packaged code to provide solutions to problems in a range of different enterprise environments. Packaged code represents a way to spread the cost of developing software over a range of users rather than forcing each IT department to absorb the costs of building custom interface logic.

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Software requirements relate to implementation of connecting a range of discrete computing centers. This trend for multiple centers to co-exist in an enterprise is further evolving. Integrated applications permit departments to function autonomously while contributing data to the central processing and information center of the IT facility. SOA systems design derives from market forces that relate to the Internet. E-business platforms are implemented in the context of SOA infrastructure challenges.

2.13 Services Oriented Architecture (SOA) Business Benefits

Products and integration architecture provide strategic advantage to customers. Architecture is evolving to provide a focus on business process automation across the enterprise and across trading partners, distributors, suppliers and customers.

The integration modular architecture allows customers to isolate business processes from their applications, which gives the flexibility to add, upgrade, or replace applications in their information technology environment. People use systems that work without redefining all of their process interfaces.

By reusing integration products and processes, customers gain the ability to respond quickly to new market initiatives, such as e-business initiatives or company mergers, thereby achieving a competitive advantage. Cost of maintenance is lower because customers need to support and maintain fewer interfaces than companies who implement messaging-based integration solutions or point-to-point integration.

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To accelerate integration implementation, customers use pre-built adapters. Connectors, transformation, connectivity, and business process tools are positioned too support network communication between applications. Vendors have a repository of sample components and templates.

These allow customers to gain time-to-market advantage over companies that have chosen integration solutions with fewer pre-built components, a messaging approach, or a less comprehensive toolset.

Table 2-40 illustrates integration modular architecture impact.

TABLE 2-40

INTEGRATION MODULAR ARCHITECTURE IMPACT

- Allows customers to isolate business processes from their applications
- Gives flexibility to add, upgrade, or replace applications in their information technology environment
- Permits people to use systems that work without redefining process interfaces

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- Provides the ability to respond quickly to new market initiatives
- Provides the ability to respond to e-business initiatives or company mergers
- Supports achieving competitive advantage
- Lowers cost of maintenance because customers support fewer interfaces than messaging-based integration solutions or point-to-point integration
- Faster implementation achieved by use of pre-built adapters, connectors, transformation engines

Source: WinterGreen Research, Inc.

2.13.1 Network Services

Competition for EDI Services and business to business solutions ranges from large corporations to integration suites offered by software vendors and smaller technology consulting firms. Paper-based communications, direct leased-line communications, fax-based solutions, public exchanges, and home grown systems are used extensively. They will be replaced by electronic automated processes.

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3. Services Oriented Architecture (SOA) Infrastructure Product Description

3.1 SOA Business Integration Foundation Systems

IBM has consolidated its leadership position in SOA by providing integration software that is useful in reusing code. The ability to consolidate integration modules that perform useful platform capabilities provides a foundation architecture for building applications from existing modules of code. IBM SOA is the defacto industry standard software used in creating business integration foundation systems.

SOA creates a way to organize supporting modules. SOA systems are evolving to support business flexibility by enabling integration of systems dynamically. Applications are being interconnected using integration to create cross-departmental processes. Processes are implemented in real time.

Business integration is positioned as infrastructure useful in the transformation of business process to make it more flexible and adaptive to change. It is used to leverage making legacy applications more flexible. SOA extends existing technology investment by providing tools and infrastructure for interconnecting systems.

Information used in business processes needs to be able to be transmitted over networks. Table 3-1 illustrates business integration system functions.

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TABLE 3-1

SOA LEVERAGING OF BUSINESS INTEGRATION SYSTEMS

- Synchronization
- Validation
- Aggregation
- Error handling
- Storage
- Retrieval
- State management
- Reconciliation
- Routing
- Filtering
- Compound update / compensation

Source: WinterGreen Research, Inc.

SOA solutions are positioned to let applications, databases, and mainframes communicate and interact with each other. Automatic routing and transforming of information is achieved. Table 3-2 illustrates SOA segments.

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TABLE 3-2

SOA ENGINE SEGMENTS

- SOA
- B2B Integration
- Adapters
- Business Process Management
- Business Activity Monitoring
- Transformation
- Mainframe
- Messaging
- Monitoring

Source: WinterGreen Research, Inc.

3.2 IBM SOA Infrastructure

IBM SOA is used to design and implement reuse of code within complex IT systems in the context of implementing high security in business processes. Infrastructure provided by SOA permits large clients aiming to reduce IT costs for Web-based systems achieve use of the mainframe through server consolidation and the deployment of Linux®-based systems.

The key challenge addressed by SOA infrastructure is to support the implementation of a robust, flexible, platform to support requirements.

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IBM SOA infrastructure is used to support flexible Web software implementations in a manner that optimizes existing investment in IT infrastructure. SOA is a move to an environment that includes a repository that can offer very high availability, reliability, and security. Clients reduce costs and increase flexibility. From an internal perspective, the aim is to reduce the complexity of IT environments by consolidating to a smaller number of physical servers generally a mainframe in the context of generating processes from icon based process.

Efficient process consolidation is supported by SOA infrastructure. SOA software solutions are used to support software developed in-house to enable the rapid construction of Web portals and other Web-based systems. Typical implementations are related to systems running on a mixed group of servers, under different operating systems.

3.2.1 IBM WebSphere SOA Business Integration Foundation

IBM WebSphere SOA business integration provides organization for software modules. Transaction management and integration are intertwined. Features and benefits relate to runtime support for business process automation based on desktop icon access to processes that evolve from combinations of existing process modules.

IBM WebSphere® business integration server foundation is used in conjunction with studio application developer integration. Development

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automation is needed delivers a next generation integration platform. Systems are optimized for building and deploying composite applications that extend and integrate existing IT assets.

Business Process Execution Language for Web Services (BPEL4WS) defines a model and a grammar for describing the behavior of a business process based on interactions between the process and its partners. Support for BPEL4WS includes:

Table 3-3 illustrates IBM WebSphere business integration server foundation functions.

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TABLE 3-3

IBM WEBSPHERE SOA BUSINESS INTEGRATION SERVER FUNCTIONS

- Application assembly to permit flexible response to market changes
- Application deployment
- Application runtime support
- Support based business processes
- Intuitive drag-and-drop tools
- Compensation support to provide transaction "rollback" like support for loosely coupled business processes that cannot be undone automatically by the application server
- Flexibility to develop processes using a top-down, bottom-up, or meet-in-the-middle approach
- A standards-based XML Path Language
- Extensible Stylesheet Transformation (XSLT) transformation wizard to map data between nodes in a process
- Support for including Java snippets
- Support for including artifacts as part of a business process

Source: WinterGreen Research, Inc.

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Table 3-4 illustrates IBM WebSphere foundation business integration server visual functions.

TABLE 3-4

IBM WEBSPHERE BUSINESS INTEGRATION FOUNDATION SERVER VISUAL FUNCTIONS

- Visual definition of the sequence of business processes
- Visual definition of the s flow of business processes
- A visual business process debugger
- Permits step through
- Permits debugging business processes
- Integrated fault handling
- Provides an easy and integrated means of performing in-flow exception handling
- A visual condition builder
- Allow direct the execution of processes

Source: WinterGreen Research, Inc.

3.2.2 IBM Service Oriented Architecture Smart SOA Continuum

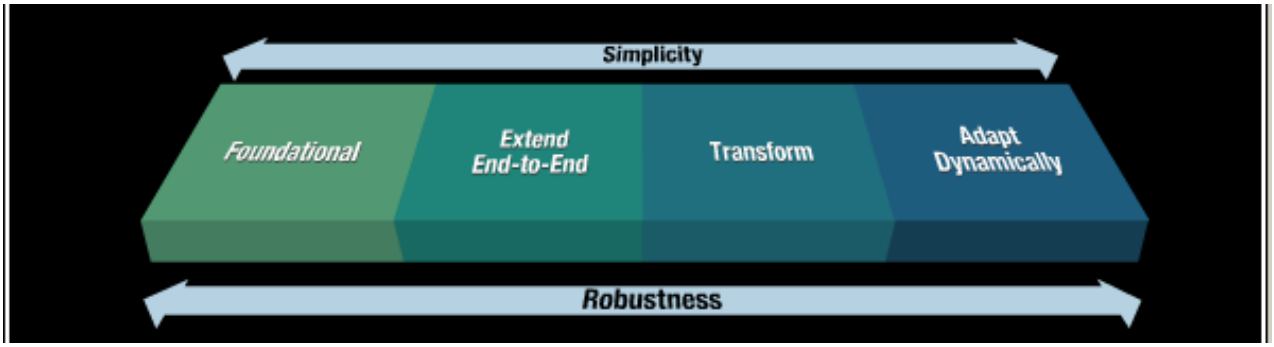
IBM service oriented architecture (SOA) business-centric IT architecture is based on a suite of integration products that support integrating business

hardware and software systems. Flexible response to changing market conditions is facilitated as linked, repeatable business tasks, or services. With the IBM Smart SOA approach, users can find value at every stage of the SOA continuum, from departmental projects to enterprise-wide initiatives.

The IBM vision is for application modernization to be implemented through SOA. It leverages the benefits of modular systems, provides modeling tools to develop a roadmap, provides integration tools to implement the steps that are necessary to develop a modularization strategy. IBM product sets describe successful techniques for i8mplementation of a SOA architecture.

FIGURE 3-5

IBM SMART SOA CONTINUUM



Source: IBM.

IBM Smart SOA continuum is extending applications within the enterprise by permitting them to share information end to end over the network. SOA provides integration technology that permits business systems to adapt dynamically to changing market conditions. Users can transform information inside the enterprise to make the same types of information congruent.

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SOA is used to make billing systems work together. As a result of acquisitions, frequently the enterprise ends up with applications that do not work together. SOA is used to make them work together. SOA solutions provide a robust foundation to help applications extend end-to-end over the IT network. IBM SOA offers business-centric and IT-centric SOA entry points. Businesses can get started with an approach that begins with the fundamental assets of the enterprise—people, information and processes.

Technical groundwork for integration is achieved by leveraging the entry points of connectivity and reuse. SOA entry points can help businesses pursue SOA at a pace that is appropriate for the organization.

3.2.3 IBM SOA Facilitates Collaboration

SOA enables interaction and collaboration. Users can help people become more efficient. Tools support employee and partner productivity. Automation of collaboration is used to respond to changing markets. An easy-to-use, role-based SOA workplace improves business insight. Online self-assessment permits users to encourage innovation.

SOA enabled collaboration fosters interaction between people. SOA helps define operational benefits and provide targeted recommendations to improve value from SOA. It provides information for current operations. Systems are used to analyze the evolution of SOA at a controlled pace.

Core business systems improve responsiveness for global companies. Inflexible business systems hamper growth. Inflexible technologies are a

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deterrent to growth. Leading companies rely on flexible systems to run their businesses.

Many of the core information technology (IT) systems have been in service for years — even decades. Developed on and optimized for legacy platforms, these systems are difficult to link to new technologies. Web services and service-oriented architecture (SOA) are used to build new applications for departments.

SOA provides mainframe systems with the flexibility to adapt quickly to changing business requirements. The convergence of SOA and mainframe technologies can help enterprises liberate core business assets by making it easier to enrich, modernize, extend and reuse them. Existing code is being given additional functionality by SOA well beyond the original scope of design.

TABLE 3-6

IBM SOA BUSINESS INTEGRATION FUNCTIONS

- Leverage existing investments
- Leverage existing assets
- Employ an incremental approach to integrating applications and databases that lowers risk
- Maximize flexibility to align application transformation with business priorities

Source: WinterGreen Research, Inc.

3.2.4 IBM SOA Governance Method

IBM governance and management method (SGMM) is an approach for performing SOA governance. SGMM is supports the four phases of the SOA governance lifecycle of plan, define, enable, and measure.

Service lifecycle management uses Rational application developer and Rational asset manager tool to support SOA governance activities during the development part of the SOA lifecycle and controlling of assets to service registries and repositories. This is achieved through: - Providing a common repository for access to assets that will include services, documents for processes and designs, as well as other artifacts. - Integration to Rational ClearQuest for the provision of defects and changes against assets allowing traceability and control of the assets.

Provision of a review process is used to ensure that assets are released for use only after key stakeholders have identified that they are of sufficient

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quality, satisfy requirements and meet standards prior to public use in the organization. - Control of access to assets via access privileges and based on the role of the user accessing the resource. - Integration to WebSphere Services Registry and Repository to ensure the deployment of services is performed in a controlled manner based on the roles of the user. 1) Architect defines asset types, categorization and review boards in RAM for service or asset reuse 2)Search is performed in RAM/WSRR for a service or asset to reuse.

IBM SOA governance method is centered on helping enterprise organizations plan, define, enable, and measure integration projects based on component technology. SOA implements reusable code components that are reconfigured as needed to build new applications. The ability to build component models is the precursor to building applications that work.

SOA governance is fundamental because the risk posed by component availability is that the components will not work as expected, the components will become a bottleneck because people try to use them without having enough resource to make them work, and components are not available in the place they are expected to be.

SOA dramatically improves the flexibility and adaptability of an IT organization by accelerating time-to-market for new applications. SOA helps drive down IT costs by making services highly reusable and enabling business processes that are built for change.

Benefits come with new risks. If not properly implemented, SOA can disrupt the business, instead of becoming more agile, business can become more fragile.

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IBM SOA includes the essential elements for governance and management that needs to be made to be sure that architecture will scale from pilot to full production. SOA essential elements relate to increasing SOA adoption and service reuse by managing the increased complexity that SOA introduces to IT.

The ability to capture, catalog and describe all service-specific artifacts within the underlying repository is essential to establishing an integration point for a configuration management database. IBM governance interoperability framework depends on the integration software that IBM offers in its WebSphere product.

FIGURE 3-7

IBM SOA RISKS MANAGED BY GOVERNANCE

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- Component availability not determined
- Components not work as expected
- Components become a bottleneck
- People try to use components without having enough resource to make them work
- Components are not available in the place they are expected to be
- Flexibility overused
- Adaptability not as expected

Source: WinterGreen Research, Inc.

SOA is useful because it provides the ability to accelerate time-to-market for new applications. SOA helps drive down IT costs by making services highly reusable and enabling business processes that are built for change.

FIGURE 3-8

IBM SOA GOVERNANCE METHOD

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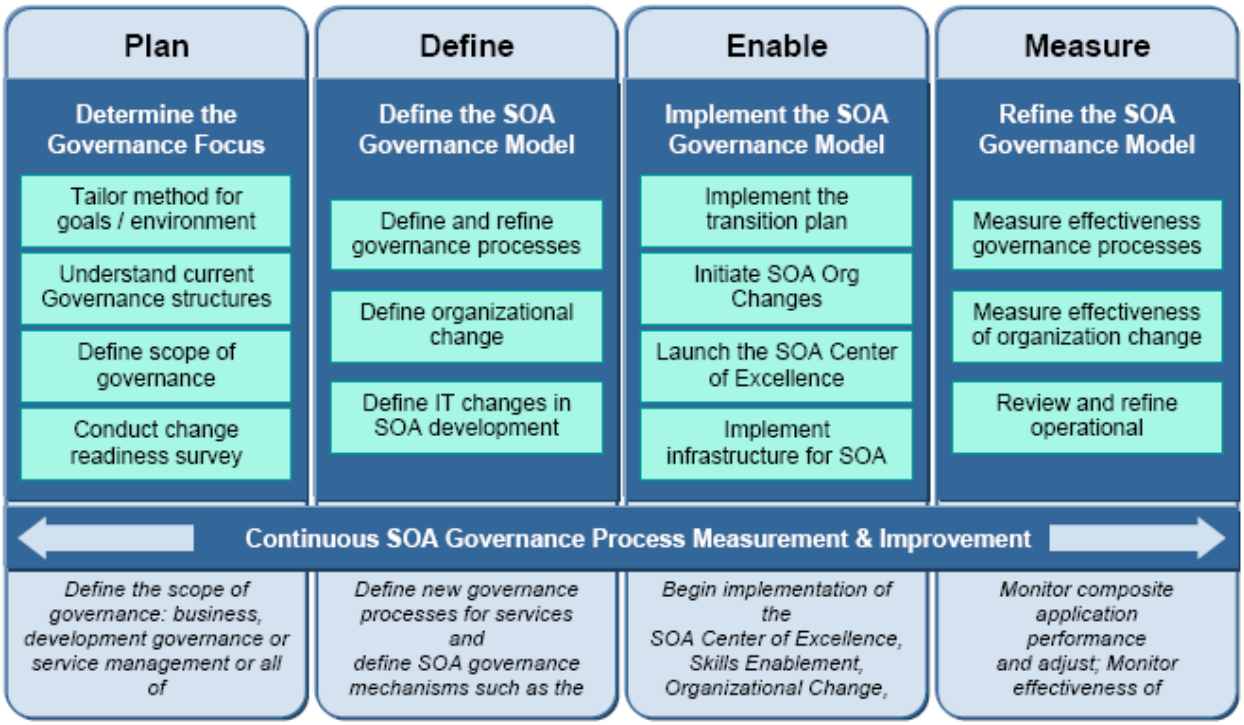

Source: IBM.

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3.2.5 IBM SOA Builds Case For Application Modernization

Aging IT systems impose serious roadblocks to business agility. If a business process is going to adapt rapidly as the environment changes, so too must the underlying systems that support it. Legacy system value and challenges is reported that over five billion lines of COBOL code are added annually on a base of over 200 billion lines of code.

Legacy systems support core business processes and provide crucial information for day-to-day operations. They contain business logic that provides competitive differentiation and institutional knowledge in the form of customer, product, supply chain and channel partner data. They are optimized for performance and scale and embody many of the competitive advantages that enterprises need to succeed. They are costly to maintain, rigid and difficult to use in new ways without unpredictable or even negative results.

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TABLE 3-9

IBM SOA IMPLEMENTS APPLICATION MODERNIZATION

- Aging IT systems impose serious roadblocks to business agility
- Business process is going to adapt rapidly as the environment changes
- Underlying systems that support business agility
- Legacy system value
- Challenges exist in upgrading COBOL code
- Over five billion lines of COBOL code are added annually
- A base of over 200 billion lines of code exists

Source: WinterGreen Research, Inc.

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TABLE 3-10

IBM SOA TRANSACTION SYSTEMS SUPPORT

- Transaction systems support core business processes
- SOA provides collaboration information for day-to-day operations
- SOA provides code reuse support
- Business logic provides competitive
- Institutional knowledge sustained by SOA
- Customer, product, supply chain and channel partner data modularized by SOA
- Code base optimized for performance
- SOA supports scale

Source: WinterGreen Research, Inc.

3.2.6 IBM SOA Customers Business Partners / Suppliers

Custom interfaces are a central aspect of SOA. Tightly coupled, complex legacy systems work with many point-to-point interfaces. What is needed is a prescriptive approach to modernizing this style of system engineering to one that fosters agility. The SOA approach provides the value required by businesses today.

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There are options available to the IT executive for making legacy systems more responsive to business needs. The legacy applications can be rewritten, and the cost and business disruption of aged systems to be replaced or retired is prohibitive. These options can involve significant investment in capital and implementation and training time.

The business may want to retain complex, custom functions that the older systems provide.

3.2.7 IBM SOA Self-Assessment

SOA is positioned to let departments cultivate interaction and collaboration by designing SOA projects based on o needs assessment. In-depth analysis relates to identifying all the resources in the IT organization and rationalizing them. Targeted recommendations relate to identification of information exposed in APIs that can be reused in multiple applications. The ability to expose information through an API and then get at it from different departments for different applications is a significant aspect of SOA

3.2.8 IBM SOA Integration Infrastructure

IBM SOA infrastructure is used to design and implement reuse of code within complex IT systems in the context of implementing high security in business processes. Large clients are aiming to reduce IT costs for Web-based systems through server consolidation and the deployment of Linux®-based systems. The key challenge addressed by SOA infrastructure is to support the implementation of a robust, flexible, platform to support requirements.

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Efficient process consolidation is supported by SOA infrastructure. SOA software solutions are used to support software developed in-house to enable the rapid construction of Web portals and other Web-based systems. Typical implementations are related to systems running on a mixed group of servers, under different operating systems.

3.2.9 IBM SOA Foundation Reference Architecture

SOA foundation reference architecture includes the components and infrastructure services used by applications in the runtime environment. SOA foundation reference architecture includes the components and infrastructure services used by applications in the runtime environment.

SOA foundation reference architecture solution view used to decompose an SOA design. SOA puts a premium on the role of the enterprise architect is responsible for spanning between the business design and the information system that codifies that design.

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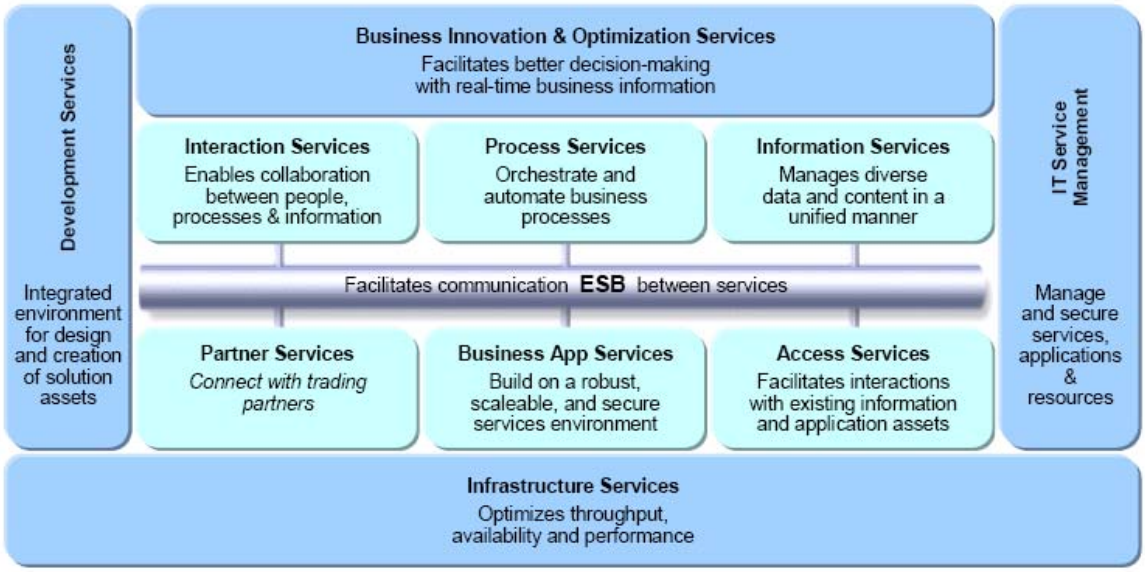
When taking a top-down approach, the enterprise architect starts by identifying the business processes and business services used by the business users. The business users are consumers of the processes and services. Business processes are compositions of other business processes and services, and therefore should be decomposed into their subordinate sub-processes and services.

Services and business processes are then detailed into service components. Service components include a detailed set of definition meta data used to describe the service to the information system. Services can be aggregated into atomic service composite service registry.

TABLE 3-11

IBM SOA BUSINESS INNOVATION & OPTIMIZATION SERVICES



Source: WinterGreen Research, Inc.

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TABLE 3-12

IBM SOA SERVICES ATOMIC AND COMPOSITE ARCHITECTURE

- Operational Systems
- Service Components
- Consumers
- Business Process
- Composition; choreography; business state machines
- Service Provide
- Service Consumer
- Integration (Enterprise Service Bus)
- QoS Layer (Security, Management & Monitoring Infrastructure Services)
- Data Architecture (meta-data) & Business Intelligence
- Governance
- Channel B2B
- Packaged Application
- Custom Application
- OO Application

Source: Wintergreen Research, Inc.

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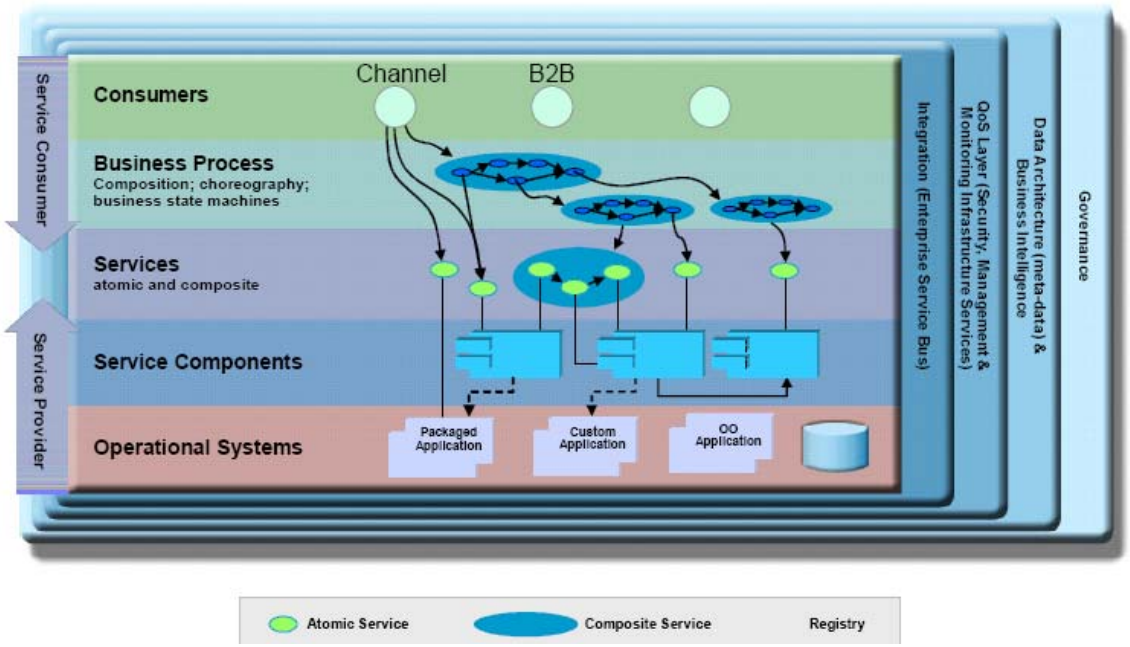
TABLE 3-13

SOA FOUNDATION REFERENCE ARCHITECTURE



Source: IBM.

IBM WebSphere Business Integration Human Workflow Support

IBM WebSphere business integration human workflow support expands the reach of to SOA to encompass automation of activities that require human interaction. Workflow is implemented as steps in an automated business process. Business processes involve human interaction.

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3.2.10 AptSoft

IBM expands WebSphere with AptSoft portfolio. IBM AptSoft provides business event processing SOA business process management software. IBM AptSoft technology is used to identify patterns within large volumes of transactional data. Stock trades, credit card transactions, and healthcare billing can be controlled in response to patterns.

The software can help companies reduce transaction-processing time and costs, improve customer service, manage risk, detect fraud, and comply with service level agreements and government regulations. IBM AptSoft technology works in SOA-based business process management applications. WebSphere AptSoft has 19 customers, including Georgia-Pacific, Vent-Axia and New Plan Excel Realty Trust, for complex event processing.

3.2.11 IBM Open Infrastructure

IBM open infrastructure is designed to support clients running Windows, UNIX, Linux and operating systems for wireless and embedded devices such as Symbian. IBM model for managing clients is inclusive as it fully supports a wide range of applications running on desktops running productivity applications clients.

IBM is committed to protecting customer investment in existing resources. IBM collaborative software environment includes: Lotus Workplace software. Products help customers collaborate productively using integrated, server-managed productivity functions. E-mail, instant messaging, document management, and team collaboration are supported.

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Tivoli software can be used to centrally administer thousands of clients, including client access, setup, and updates.

Provisioning computing resources is an aspect of infrastructure and systems management. WebSphere portal software provides a single point of personalized interaction with people, applications and content; and built-in, server-managed security, workflow, and application and data management capabilities.

3.3 Oracle / BEA SOA

Oracle / BEA SOA is positioned to provide enterprise agility, productivity, efficiency, and business process alignment. Attributes of the enterprise are central to the initiation of appropriate steps to plan and execute the transformation to service-oriented architecture.

The metamorphosis from a rigid, monolithic infrastructure to a highly flexible matrix of discrete, reusable services requires the careful coordination of people, process, and technology. The resources presented offer insight and expertise that help organizations get SOA to deliver business value.

Enterprises effectively align technology with business goals to achieve competitive advantage. BEA is helping enterprises achieve faster time to value. By driving compatibility across the application infrastructure through open standards and service-oriented architecture (SOA), business systems are made responsive to actual market conditions.

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3.3.1 Oracle / BEA / Lab49

BEA Systems offers enterprise infrastructure software. BEA framework approach utilizes a Java application server designed for event-driven applications. Complex event processing depends on an application infrastructure designed to integrate analytics and data without introducing latency.

In partnership with Lab49 and Intel, the BEA Systems framework is designed to address key challenges in capital markets. Scalability, low latency, high-throughput, flexibility, resiliency and high performance are fundamental aspects of SOA. BEA WebLogic event server implements a micro-architecture for SOA. Lab49 reference architecture can model and process large volumes of complex events and perform pricing and risk computations using the proprietary analytics.

Algorithmic trading is supported by Lab49. Lab49 offers end to end solutions for the front office. Next generation technology can help financial services organizations adapt to changing market conditions.

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TABLE 3-14

CORE COMPONENTS OF BEA-LAB49 FRAMEWORK

- Integration techniques
- Thick client
- Rich internet application applications
- WPF, Silverlight, Flex, Java
- Integration techniques to proprietary C/C++ analytic libraries
- Modeling front office applications
- Flexible complex event processing networks
- Design pattern for building flexible trading applications
- Systems that react to changes in the market during the day

Source: WinterGreen Research, Inc.

3.3.2 Oracle / BEA WebLogic One Million Events Per Second At Microsecond Latencies

The framework quad-core Intel® Xeon® 5400 series processors achieve results of one million events per second at microsecond latencies, performance previously unachievable with standard Java. The core components of the framework are based on the technology jointly developed and optimized by Intel and BEA.

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Low latency and high rates of streaming data support event driven applications. BEA and Intel have achieved a framework for the real-time front office. Financial services depend on IT to support complex event processing that helps ease data proliferation in the enterprise. BEA SOA is used to increase predictability of business drivers. SOA is positioned to provide agile and competitive solutions in the context of efficient automated process.

BEA WebLogic event server is a Java application server for high-performance event-driven applications. Built-in complex event processing engine BEA WebLogic event server is designed to process complex, streaming events.

3.3.3 Oracle / BEA WebLogic Server Service Component Architecture Supports Next Generation SOA

BEA SOA services WebLogic Server is designed to simplify integration of service components constructed with heterogeneous technologies and languages in support of composite application. SCA supports BEA's Genesis initiative, which promotes the convergence of business process management (BPM), Service Oriented Architecture (SOA) and enterprise social computing to simplify delivery of dynamic business applications.

BEA Systems enterprise infrastructure software WebLogic Server® includes a set of open standards that can help enable developers to leverage SOA to assemble composite applications from heterogeneous components. BEA helps the Java EE development of enterprise-grade SOA projects.

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BEA tooling is implemented through BEA Workshop™ . The ability to store components in an enterprise repository is central to having the ability to reuse code as services. An enterprise repository is designed to facilitate highly adaptable IT. By wrapping and standardizing heterogeneous components, SOA is able to make them more easily discovered and connected.

It can be deployed as part of BEA WebLogic Server. Allowing organizations to draw upon the server management, reliability and scalability achieves SOA benefits. BEA has taken the industry a huge leap forward by making application composition viable. SOA efforts are focused on enabling reusable code.

BEA is a dynamic business application platform initiative that promotes the convergence of SOA. Business process management (BPM) and enterprise social computing provide the ability to compose applications by assembling components without writing code. SCA is a fundamental enabling technology. Wrapping and standardizing heterogeneous components make them more easily discovered and connected.

3.3.4 Oracle / BEA SCA Enable Organizations To Assemble SOA Services

BEA SCA is designed to enable organizations to rapidly assemble SOA services. SCA can help enable organizations that have invested in SOA to take full advantage of the architecture. With application composition, building SOA services is faster, easier and more reliable; a process manageable not only by developers but business users as well.

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Reduced complexity is evolving to support distributed service networks using Java objects. The complexities of transport level APIs are handled by SCA metadata and wire-up facilities.

BEA Workshop offers tooling support for users to find, create, submit, view, and configure SCA components. Eclipse plug-ins allow access to BEA AquaLogic Enterprise Repository from within the environment. Eclipse allows users to work with SCA artifacts. BEA AquaLogic enterprise repository capabilities promote access to SCA components for quick assembly.

TABLE 3-15

BEA WORKSHOP SCA COMPONENT TOOLING FUNCTIONS

- Find
- Create
- Submit
- View
- Configure
- Eclipse plug-ins
- Allow access to BEA AquaLogic Enterprise Repository from within the environment
- Eclipse allows users to work with SCA artifacts
- Repository capabilities promote access to SCA components for quick assembly

Source: WinterGreen Research, Inc.

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3.3.5 BEA Service-Oriented Architecture for Enterprise Resource Planning Integration

BEA SmartConnect is designed to reduce total cost of ownership and time-to-market for ERP Connectivity. BEA SmartConnect is designed to work by increasing performance, scalability and ease of management. BEA SmartConnect is a proven, scalable and complete connectivity solution. It is designed to allow service-enabling enterprise resource planning (ERP) applications tobe a base for building service-oriented architecture (SOA)-based applications.

Next-generation connectivity solutions provide key service integration. BEA WebLogic® and BEA AquaLogic® product families serve as a backbone for a scalable, flexible and comprehensive SOA. Organizations start with a small SOA-based integration or ERP connectivity initiative and to move to a larger enterprise-wide, multi-domain project.

BEA SmartConnect can provide organizations with the ability to start with a small SOA-based integration or ERP connectivity initiative. The move to a larger enterprise-wide, multi-domain project depends on having trials that work effectively. Solutions are designed to offer mission-critical reliability, performance and security without the need for dedicated hardware unlike traditional adapters.

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TABLE 3-16

BEA SMARTCONNECT, BEA AQUALOGIC SERVICE BUS FUNCTIONS

- Next-generation connectivity
- Higher scalability
- BEA SmartConnect uses fine-grained connection pooling that optimizes the number of connections needed for better scalability.
- Flexible deployments – BEA SmartConnect 3.0 insulates the business logic within ERP applications from higher-level business processes, enabling significantly more flexible deployments.
- Ubiquitous service-oriented solution to connectivity – BEA SmartConnect 3.0 extends the benefits of service orientation last-mile ERP connectivity by exposing ERP business logic as shared services for use within the enterprise.
- Minimal downtime and ease of upgrades – Dynamic routing allows for easy switchover between ERP application versions.
- Reduction in cost of ownership – BEA SmartConnect 3.0 is designed to help reduce the need for dedicated hardware to support traditional adapters.
- High performance – BEA SmartConnect 3.0 is optimized for high performance because of the ability to do throttling and message prioritization.

``Source: WinterGreen Research, Inc.

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3.3.6 BEA AquaLogic Service Bus Enables Enterprise-Wide SOA Deployments

BEA AquaLogic service bus helps achieve code-free and configuration-based service integration; designed to scale to enterprise-wide SOA. Deployments involve building composite, cross-domain applications. Faster ROI are achieved with easy-to-use systems.

BEA AquaLogic® comprehensive enterprise service bus (ESB) that is designed to improve the integration process. A light-weight SOA backbone is designed to help IT organizations create configuration-driven and reusable service components, service enable existing legacy applications and quickly build new SOA-based applications for enabling enterprise agility.

BEA AquaLogic benefits relate to comprising multiple SOA domains, enhanced embedded management and quality of service, optimized native transports for leading enterprise resource planning and packaged applications, integrated unified design environment for SOA and business process management and seamless integration with the governance solution.

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TABLE 3-17

BEA AQUALOGIC ENTERPRISE AGILITY BENEFITS

- Comprising multiple SOA domains
- Enhancing embedded management
- Enhancing quality of service
- Optimizing native transports
- Leading enterprise resource planning flexibility
- Optimizing packaged applications
- Integrating unified design environments
- Optimizing SOA
- Optimizing business process management
- Providing seamless integration with the governance solutions

Source: WinterGreen Research, Inc.

Oracle / BEA AquaLogic supports multiple SOA domains. Key customer benefits include a bus to provide enterprise-wide connectivity of the service network. Enterprise-wide service network is comprised of a service bus that mediates and provides location-independent access to services. The bus works across an enterprise-wide service network spanning multiple SOA domains. BEA AquaLogic Service Bus leverages services distributed across multiple SOA domains to build high-value composite applications.

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Enhanced embedded management and quality of service (QoS) are offered. BEA AquaLogic service bus offers optimized runtime, optimized connectivity to other BEA AquaLogic products and embedded management capabilities to provide policy-based load balancing, throttling and service pooling. These capabilities may enhance the performance, scalability and QoS for the SOA.

BEA SmartConnect and BEA AquaLogic service bus provides optimized native transports for leading ERP and packaged applications. Connectivity to WebsphereMQ and WebSphere application server-based applications enables IT to build composite applications by leveraging the SOA-enabled assets.

3.3.7 BEA SOA Service Infrastructure Positioning

BEA application infrastructure is positioned to deliver independent platforms. Service infrastructure depends on platforms to provide a foundation for solutions building. Platforms help make SOA a reality.

SOA depends on providing expert consultation, helping develop and deploy services, and building out the capabilities required for service infrastructure. Vendors have a vested interest in their database. Application and operating system platforms provide a base for SOA. Solutions depend on flexible

BEA platforms are supported by broad integration software capability that supplements the SOA platforms. The integration is needed by the SOA because it needs to knit together diverse technology environments.

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Service-Oriented Architecture is an IT strategy that organizes the discrete functions contained in enterprise applications into interoperable, standards-based services that can be combined and reused quickly to meet business needs. By organizing enterprise IT around services instead of applications, SOA provides key benefits:

TABLE 3-18

BEA SOA ORGANIZES ENTERPRISE IT AROUND SERVICES INSTEAD OF APPLICATIONS

- * Improves productivity, agility and speed for both Business and IT
- * Allows IT to deliver services faster and align closer with business
- * Allows the business to respond quicker and deliver optimal user experience
- * Masks the underlying technical complexity of the IT environment

Source: WinterGreen Research, Inc.

This results in rapid development and reliable delivery of enhanced business services. Organizations have adopted service-oriented environments based on BEA's enterprise software foundation. Dramatic results include increased revenues, increased customer satisfaction, lower operational costs, and higher returns on their existing technology investments.

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3.3.8 BEA SOA Meeting Business Challenges

The pace of business is moving fast. Customers, partners, and employees expect high-quality service-twenty four hours a day, seven days a week. BEA SOA is positioned to permit enterprises to address the needs of Internet channel demands. IT staff has been tasked with meeting the business challenges in a manner that keeps the organization competitive.

TABLE 3-19

BUSINESS CHALLENGES ADDRESSED BY BEA SOA

- * Improving Operational Efficiency
- * Improving Customer Responsiveness
- * Improving Business Agility

Source: WinterGreen Research, Inc.

Improving operational efficiency is central to modern business responsive to competitive challenges. Making existing investments achieve higher productivity is a central task of SOA. Improving the way business is conducted is an ongoing aspect of evolving services that represent reusable modules of code. Services promise to make overall business processes implementation more efficient because of the reuse of existing code.

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Preserving and expanding strategic development efforts are central to BEA SOA implementation. SOA is being implemented amidst shrinking budgets and expensive, ongoing maintenance costs, and trying to achieve increased automation of business process.

Improving customer responsiveness is central to implementing systems in the era of Internet channel strategy. IT departments need to be responsive to stakeholders that support the business. SOA rests largely on IT including gathering and using the information flowing through the business. Making it available to the people who need it to do their jobs depends on SOA.

Improving business agility depends on needing to rapidly adapt the business, including internal and external touch points. As the business changes, and avoiding having to begin from scratch with new applications and infrastructure as business requirements change is a central aspect of SOA.

IT can meet faster time to value in developing and deploying a service-oriented architecture (SOA). A SOA approach better aligns IT with business goals. SOA enables IT organizations to re-use assets, deliver value, faster, to the business, and more easily supports ongoing requirements for change.

3.3.9 BEA SOA Application Development

A service-oriented architecture (SOA) depends on a higher level of application development. SOA enables IT to focus on business processes, rather than the underlying IT infrastructure, to achieve competitive advantage.

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SOA is valuable to enterprises that need to solve business-critical problems using information technology, including enterprises that want to minimize redundant infrastructure and create a common business interface across customer and employee systems. Businesses can personalize information to users based on roles and workflows. Organizations can use the Internet to boost revenue per customer through cross-selling, up-selling and access via mobile devices.

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TABLE 3-20

BEA SOA APPLICATION DEVELOPMENT BENEFITS

- Depends on a higher level of application development
- Enables IT to focus on business processes
- Leverages underlying IT infrastructure
- Used to achieve competitive advantage
- Minimizes redundant infrastructure
- Creates a common business interface across customer and employee systems
- Personalizes information to users
- Based on roles
- Based on workflows
- Uses the Internet to boost revenue per customer
- Up-selling
- Access via mobile devices

Source: WinterGreen Research, Inc.

Enterprises that adopt a service-driven approach experience business and IT benefits.

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TABLE 3-21

BEA SERVICE-DRIVEN APPROACH EXPERIENCE BUSINESS AND IT BENEFITS

- Business Benefits of Service-Oriented Architecture
- * Efficiency:
- Transform business processes from siloed, replicated processes into highly leveraged, shared services that cost less to maintain.
- * Responsiveness:
- Rapid adaptation and delivery of key business services to meet market demands for increased service levels to customers, employees, and partners.
- * Adaptability:
- More effectively rollout changes throughout the business with minimal complexity and effort, saving time and money.

Source: WinterGreen Research, Inc.

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TABLE 3-22

BEA IT BENEFITS OF SERVICE-ORIENTED ARCHITECTURE

- * Reduced Complexity: Standards-based compatibility versus point-to-point integration reduces complexity
- * Increased Reuse: More efficient application/project development and delivery through the reuse of shared services, previously developed and deployed
- * Legacy Integration: Legacy applications, leveraged as re-usable services, lowers the cost of maintenance and integration

Source: WinterGreen Research, Inc.

Service-driven enterprises benefits are achieved as they leverage IT in the rapid development and reliable delivery of services in order to maximize business opportunities.

3.3.10 BEA SOA Enterprise Positioning

The service-driven enterprise is optimized around services. Services provide solutions efficiently. Servicing customers, partners and employees with intelligent automated process is an essential task of IT. Automated process is able to accelerate the service response time of the business. Achieving a service-driven enterprise requires more than just deploying products.

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Organizations interested in implementing a service-driven foundation can engage an experienced SOA provider to create an IT environment that is flexible. The services engagement comes with services that are preexisting modules of code that can help both business and IT stakeholders.

3.3.11 BEA SOA Enterprise Considerations

TABLE 3-23

BEA SOA ENTERPRISE CONSIDERATIONS

- * Business Strategy & Process –
- Does the current business and IT strategy include a framework for SOA
- Once articulated in an aligned business and IT strategy, business problems can be defined and solutions can be implemented, in a coherent, repeatable way
- * Architecture –
- Enterprises must develop an architectural framework that allows the assembly of components and services for the rapid and dynamic delivery of solutions.
- The architecture focuses on reuse and leverage, and avoids stovepipe applications and islands of IT resources.
-
-

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TABLE 3-23 (CONTINUED)

BEA SOA ENTERPRISE CONSIDERATIONS

-
- * Costs & Benefits –
- In an SOA, responsiveness is improved with development and maintenance costs significantly reduced
- Provides compelling cost-benefit analysis.
- * Projects & Applications –
- SOA enables a new way of building applications within a more powerful and flexible programming model.
- Organization needs to identify existing and "in flight" applications that will be incorporated into the SOA architecture.
- * Building Blocks –
- Both an architecture and a programming model, SOA is a way of thinking about building software.
- Enterprise needs to identify the building blocks-code, services, applications and components-that can be used and reused in a SOA implementation.
- * Organization & Governance –
- Roles and responsibilities need to be identified for new service-oriented IT organizations and optimize skill sets for success
-

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TABLE 3-23 (CONTINUED)

BEA SOA ENTERPRISE CONSIDERATIONS

-
- Organizing an effective design "Reuse Factory,"
- Helping to define governance models
- Ultimately ensuring customer self-sufficiency in running the governance office

Source: WinterGreen Research, Inc.

SOA for executives suite of services is the set of professional services built for executives from the ground up based on BEA's experience with SOA at Global 2400 companies.

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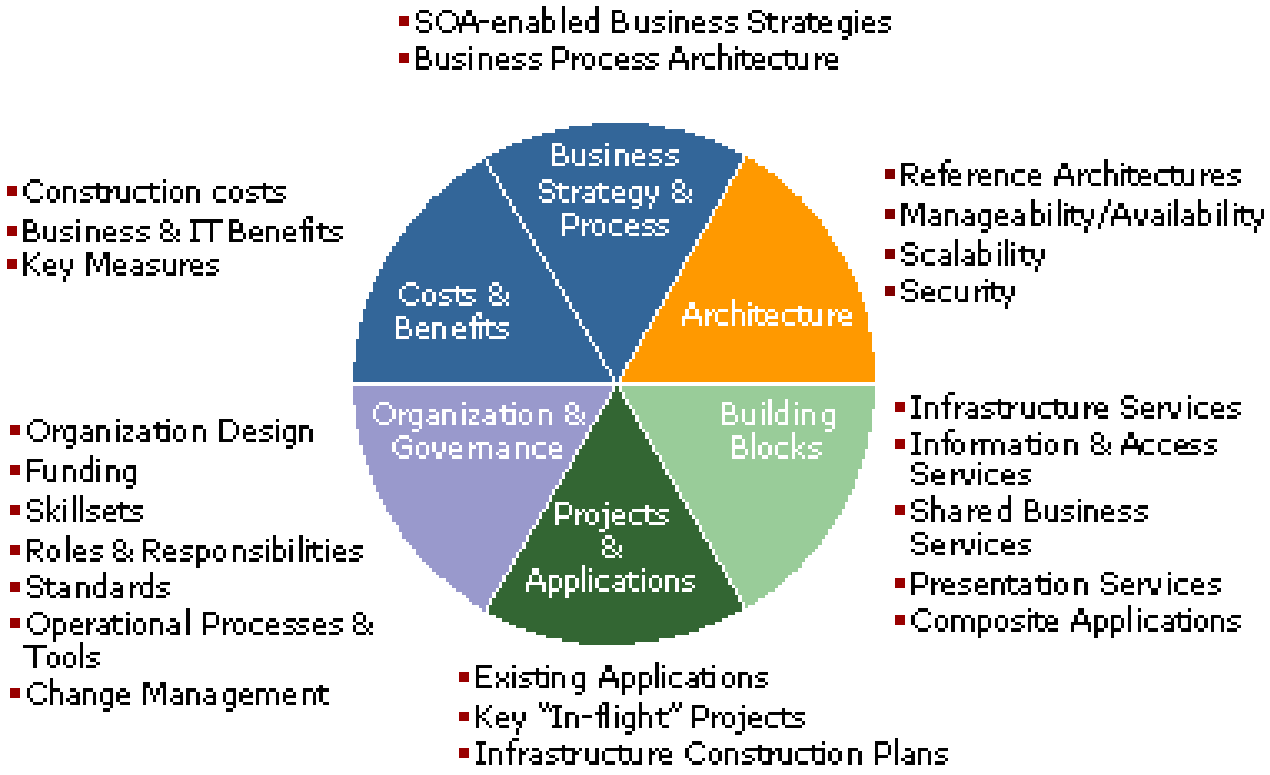
FIGURE 3-24

BEA SOA BUSINESS ENABLED STRATEGIES



Source: BEA

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3.3.12 BEA SOA for Architects

BEA offers a suite of services for architects to scale SOA to enterprise-wide. These are useful in moving SOA from pilot to production. The transition to "Service Oriented Architecture (SOA)" is on a scale of these two previous waves of technological innovation. Software categories are merging that use standards-based platforms and enterprise-wide architectures to provide a common technology infrastructure for business. Many of those categories are still early in the development phase

BEA is relying on day-to-day experience and in-depth research with thousands of customers when it developed the idea of service infrastructure. This is the concept of a framework comprised of several independent SOA platforms. The frameworks enable the free flow of business processes, information, and services across and between businesses.

3.3.13 BEA SOA Self-Assessment

BEA SOA self-assessment creates a baseline for pursuing SOA as an IT strategy. Thousands of BEA Systems customers have started to transition from client-server and Internet architectures to SOA. Early adopters have had to do heavy lifting through multiple pilot projects.

Early advantage is achieved in moving to SOA, but BEA has learned that SOA is driven by business and IT motivations, typically managed by an emerging group of "architects". It will require new service-oriented software to fully deliver on the vision. BEA has released its findings from 1,000 "readiness tests" and 500+ customer surveys worldwide.

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These represent a comprehensive assessment of business SOA readiness and point ot the types of software being evolved.

TABLE 3-25

BEA KEY SOA FINDINGS

- * 27% of customers are in the process of adopting SOA, 33% of those enterprise-wide.
- * 63% rank SOA as a critical/high priority for their business over the next 3 years.
- * Despite high adoption rates and plans, "familiarity" with SOA rated 1.76 on a scale of 1 to 4, reflecting "basic understanding" rather than "very advanced" knowledge of SOA.
- * SOA is viewed as critical to solving long-term pains for both business and IT.
- * 90% cited business drivers
- * 88% cited IT drivers

Source: BEA.

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TABLE 3-26

BEA KEY SOA BUSINESS DRIVERS

- Improved service to customers, partners and employees
- Greater operational efficiency
- Reduced complexity

Source: WinterGreen Research, Inc.

TABLE 3-27

BEA KEY SOA IT DRIVERS

- Lower maintenance and integration costs
- More efficient application and project development, management and re-use
- More flexible/adaptable infrastructure

Source: WinterGreen Research, Inc.

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3.3.14 BEA SOA Service Infrastructure

Application infrastructure software includes application servers, integration servers, development tools and portal software. These are to build and deploy SOA projects. As SOA moves from pilot to production, BEA is implementing a new type of software infrastructure that allows them to quickly compose, deliver, configure and manage these services.

They have built and deployed 50 services. These can result in a services sprawl that requires constant integration and can be difficult to scale. They have a set of composition tools that are positioned as an assembly line in addition to the traditional coding tools they have used for "building car parts."

BEA is evolving a new category of service infrastructure software that enables the free flow of processes, information and services across and between businesses. Based on a service-oriented architecture, it will include all the products and tools to enable services that can be composed once and leveraged anywhere. Used by IT and business architects, the software helps IT overcome its long-standing $200 billion integration problem and respond faster to the rhythm of business.

3.3.15 BEA Service Infrastructure

Service infrastructure combines existing software tools and component products that reflect the growing movement to SOA and Web services. BEA believes the service infrastructure includes the capabilities for full operation and lifecycle management of business and IT services across heterogeneous environments.

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SOA is based on the messaging backbone; data integration services; user interface services; security framework; business process management; web services management; services repository and integrated configuration environment.

TABLE 3-28

BEA SOA SERVICE INFRASTRUCTURE

- Messaging backbone
- Data integration services
- User interface services
- Security framework
- Business process management
- Web services management
- Services repository
- Integrated configuration environment

Source: WinterGreen Research, Inc.

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3.3.16 BEA SOA Framework

Centered on the deployment of reusable and network-aware applications, the BEA SOA framework leverages key business assets within and beyond enterprise boundaries, with interoperability, independent of platforms, languages and protocols. The framework benefits enterprise organizations across various industry verticals including media & entertainment, insurance, banking, retail, financial services and manufacturing.

The SOA framework has helped link disparate IT and business components. Infrastructure is more agile, adaptable and resilient**.** TCS joint solutions bring efficiencies. SOA approach enables enterprise organizations to streamline business processes and benefit from a reduction in development time and maintenance effort Services accessibility is an "always-on" infrastructure. SOA is positioned to improve data integrity and delivery capabilities.

SOA adoption is a key enabler for helping clients implement state-of-the-art solutions. SOA activities leverage web services processes, methodologies and skills.

3.3.17 BEA AquaLogic BPM, Data Services, And Service Bus Platforms

BEA AquaLogic has BPM, data services, and service bus platforms. The enterprise SOA framework helps accelerate modeling, testing and deployment of business processes and applications, while assisting with the transformation of existing legacy software assets to SOA.

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TABLE 3-29

BEA PERCEPTION OF IT BUSINESS CHALLENGES DRIVING SOA

- Bottom line benefits / Product innovation
- Value chain pressures / Business & IT alignment
- Customer service
- Products slow to market
- Product integration hard
- Product innovation rare
- New entrant disintermediation
- New distribution channel constraints
- High value customers being cherry-picked
- Business frustrated with IT delivery
- IT driving a technical not business agenda
- Expensive business processes
- Poor IT project ROI
- Excessive IT Expense/Income ratio
- No single view of customer
- Processes not customer centric
- Poor customer service image

Source: WinterGreen Research, Inc.

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TABLE 3-30

BEA SOA BUSINESS CHALLENGE

- Mitigate IT risk:
- Ensure security and continuity of business operations
- Implement major change safely
- Minimize exposure to external risk factors
- Maximize return
- Improve business results
- Grow revenue, earnings, cash flow, and margins
- Reduce cost of operations
- Reduce expense to income ratio
- Improve performance:
- Improve business operations performance
- Enhance customer service and experience end-to-end
- Increase customer and employee satisfaction
- Increase agility
- Enable the business to rapidly adapt to changing business needs
- Achieve product and service innovation / Achieve speed to market

Source: WinterGreen Research, Inc.

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IT organizations are challenged by managing within a dynamic and thoroughly unpredictable business environment. The only constant is change.

3.4 Tibco SOA

Tibco SOA is used for instituting an enterprise IT solution that is flexible. SOA can appear to be a daunting task. Basic understanding of the SOA fundamentals concerns putting issues around organizational governance. Establishing an SOA steering committee and program management office, need to be addressed.

3.4.1 Tibco SOA Deployment Managing The Entire Service Lifecycle

Managing the entire service lifecycle includes implementing policies that define service level agreements. Security is a significant requirement. Addressing these issues early in the planning process ensures a successful SOA deployment. The SOA resource center assets provide the foundation for advanced materials.

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TABLE 3-31

TIBCO SOA FUNDAMENTALS

- * ActiveMatrix for BusinessWorks Customers
- * Event-Driven SOA
- * End-to-End Governance
- * Service Virtualization
- * SOA Integration modules

Source: WinterGreen Research, Inc.

3.4.2 Tibco Business Process Management on an SOA Foundation

Tibco business process management on an SOA foundation implements a unified framework for process design and deployment. The advantage of a unified framework is that it provides the basis for building an effective SOA and integration program. Architected solution delivery provides the way to move towards a better SOA process. SOA and complexity relate to discovering the new business value in providing flexible systems that can be implemented by business analysts instead of programmers.

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Accurate data is a critical success factor for SOA. SOA demands more than just technical change. It depends on clear definition of business process in the context of modular components that can be rearranged in different ways to responds to changing market conditions.

3.4.3 Tibco SOA Business Process

Tibco SOA strategy is to offer the line of business a foundation for management of applications that are built out to implement the Internet as a channel. In this context, SOA depends on a unified framework for process design and deployment.

Tibco has been honing business process management on a SOA architecture. Organizations seeking to deliver business process management (BPM) on a service-oriented architecture (SOA) have traditionally been faced with compromise solutions: a workflow approach with limited connectivity or an integration approach with limited BPM functionality.

A unified architecture for BPM in an SOA environment from TIBCO overcomes these limitations. Using a unified approach depends on having an independent process layer and independent service layer. Changes can be made to processes without affecting the underlying services and the line-of-business applications with which they interact. Similarly, changes can be made to the technical underpinnings of the service without impacting those business processes using the service.

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This flexible design approach significantly increases process agility, isolates the impact of change, and allows the specialized skills of business analysts and IT developers to be harnessed.

3.4.4 Tibco SOA Breaks Down Key Applications And Data Into Components

The independent process and service layers provide a SOA architecture that operates with discrete, independent components or services. The ability to decouple information from an application means that it can be transported as messages. The ability to decouple applications from each other means that the information generated by the application can be accessed through application APIs that are fundamental information sharing ports.

Tibco SOA breaks down key applications and data into components that mean workflow can be executed in a highly distributed manner. An architecture is needed to implement SOA. This SOA architecture increases business agility by enabling IT departments to reuse services.

The virtues of reuse have been known for a long time, reuse of code means that known scalability and quality of service characteristics are preserved. Such reuse can help reduce time to market as well as development costs.

3.4.5 Tibco BPM Reusable Services

The IT organization supports initiatives by building reusable services. Services may have descriptive names like get customer items purchased and get customer credit information. Both services deliver different views of customer data and are loosely coupled from the calling application.

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Purchase history data is not stored in one single place. They may need to be aggregated across multiple order systems.

Services are developed in a service composition tool, Tibco BusinessWorks™. A standards-based service container .Net or Java EE means the developer of each service needs to understand the structure and relationships of how customer data is stored in the underlying systems. To be able to aggregate and cross-reference the data to produce the specific view of information required each developer of a service needs to understand the structure and relationships of customer data.

Developers of services reference data architecture documentation maintained by the IT department as to the schemas and APIs of the underlying systems. Documentation needs to be available and up to date. The bulk of the data integration development works twice, even though the services are going after the same superset of information. If there were a change to the structure of the underlying system, those changes would need to be affected in each service.

This increases development time, complexity, and maintenance costs of the services and hampers the ability to rapidly reconfigure and assemble services into composite applications. SOA services provide access to customer purchase history and customer address.

Services deliver that information, and the business as a whole benefits. If the time and cost for the development and maintenance of such services does not decrease with each additional service then the larger SOA initiative can become cost prohibitive and the benefits and promises of an SOA are lost.

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3.4.6 Tibco BPM Deployed On SOA

When BPM is deployed on SOA, services are used as building blocks that can be orchestrated via BPM to model complex business processes. SOA is used for creating new services. A key design principle of SOA is the ability to wrap components of existing legacy applications, and then expose those components as services that can be called by different business processes. These reusable services can also be assembled to form new composite services and applications that make information accessible through APIs of a SOA architecture.

This reduces time and costs; it avoids having to build and test new code. It also mitigates risk of process failure since SOA leverages services that have already been proven through production use.

3.4.7 Tibco Business Process Management on A SOA Foundation

Tibco has elaborated an elegant SOA approach based on its strong enterprise application integration (EAI) infrastructure. Business analysts can create models that run and SOA manages the technical underpinnings of the service. Business analysts can focus attention on the business process.

When that process requires a service, they just need to select the correct service and the inputs and outputs between the process and service. At the same time, augmentations made to the service by IT developers should not have any impact on existing processes that use the service.

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As IT increases the depth and breadth of service assets, business processes require less and less complex development, and business analysts gain greater control over the end-to-end process; each group can work in an independent but collaborative manner to quickly and economically implement process management. Deploying BPM on an SOA results in a more agile and efficient enterprise. While almost everyone would agree that this is how BPM should be implemented on a SOA platform, delivering on the promise has been elusive for many of the competitors in the market.

Tibco has been able to leverage its position in EAi integration technology to make SOA work, while many other participants without strong infrastructure integration technology in the SOA markets have failed to build projects that work.

3.4.8 Tibco Delivers Full Benefits of BPM on SOA Foundation

Tibco iProcess is a suite of application modules built on an open architecture that provides end-to-end process management. It allows creation of an IT infrastructure that is based on business process. Process represents a unique way of doing business. By separating the application logic away from the process layer, it allows the creation of a layer that provides a process abstraction, and removes the processes from the control of applications. This 'process abstraction' layer, the independent process layer, is the key to process flexibility and agility.

Tibco delivers the full benefits of BPM on an SOA foundation because the EAI integration technology permits the support of an architecture that is flexible.

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From an architectural point of view, Tibco is positioned to deploy effective and efficient BPM. The strengths of both the BPM-oriented and EAI-oriented approaches must be combined and built to operate in a SOA IT implementation. The Tibco products deliver this functionality:

Tibco IProcess™ Suite Process Suite™ software allows organizations to create a process-centric infrastructure based on their business processes. This suite is composed of multiple modules, including TIBCO iProcess™ Modeler software and TIBCO iProcess Engine. TIBCO BusinessWorks™ software provides an enterprise service bus and integration backbone that enables IProcess™ Suite process suite business processes to connect with and use data from hundreds of different service providers. IProcess™ Suite business process suite spans the entire enterprise including Web services and non-Web services. The combination of IProcess™ Suite Process Suite and BusinessWorks provides a foundation for a BPM solution in an SOA environment.

The combination is enhanced with a business process management on a SOA foundation. Activity monitoring and system monitoring are able to leverage the strengths of the others. They are integrated at key points. This unified architecture provides unparalleled visibility into all the workings of a business.

Process comes from design through deployment to production. Business analysts can perform each of the SOA activities with vastly reduced development resource requirements and greater control over the business process. Integration between IProcess™ Suite process suite, Tibco BusinessWorks, and other monitoring tools improves results throughout BPM projects.

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Tibco SOA is leveraging services to accelerate process design. Many BPM vendors provide the functionality required for business analysts to design complete and effective processes. The Tibco SOA toolbox provides the means to access prebuilt integration services for incorporation into business processes, facilitating the retrieval, update and synchronization of information from line-of-business applications. The integration between IProcess™ Suite Process Suite and BusinessWorks delivers a solution to this requirement.

IT developers, using BusinessWorks as their SOA platform, develop a series of coarse-grained integration services: The Tibco BPM solution retrieves customer profiles, updates addresses, calculates credit scores, or updates inventory. The business analyst, using iProcess modeler for business process design, can inspect the registry of available services, choose the correct one, drop it into the process flow and then map the relevant inputs and outputs.

With this approach, business analysts need not concern themselves with the technical underpinnings of the service. They can focus on the selection of the correct service and the mapping of data models between process and service. The iProcess Modeler includes key design-time features such as field validation between the process and the service to ensure accurate processing of data types, as well as the ability to test the process and service end-to-end without having to deploy either one.

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3.4.9 Tibco SOA Process Layer And Services Layer, Each Independent Of The Other

Use of this approach implements a process layer and a services layer, each independent of the other. Changes can be made to processes without affecting the underlying services and the line-of-business applications with which they interact: Repository introspection facilitates rapid process definition and design.

Business process management on a SOA foundation means the two layers, analyst models and services at the level of IT infrastructure interact seamlessly without programming. Similarly, changes can be made to the technical underpinnings of the service without impacting those business processes using the service. This flexible design approach significantly increases process agility, isolates the impact of change and allows the specialized skills of business analysts and IT developers To be properly harnessed, BPM implemented on SOA utilizes enhanced process monitoring. One of the principal benefits of SOA is the ability to monitor and analyze processes from end to end—and to do it in real time. The unified BPM and SOA architecture, coupled with Tibco "event enabling" of business processes, expands the scope and efficacy of this monitoring.

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TABLE 3-32

TIBCO SOA PROCESS LAYER AND SERVICES LAYER FUNCTIONS

- Process layer and services layer independent of each other
- Repository introspection
- Business process management on a SOA foundation
- Two layers, analyst models and services at the level of IT infrastructure
- Layers interact seamlessly without programming
- Properly harnessed BPM
- Implemented on SOA
- Utilizes enhanced process monitoring

Source: WinterGreen Research, Inc.

One of the principal benefits of SOA is the ability to monitor and analyze processes from end to end—and to do it in real time. The unified BPM and SOA architecture, coupled with Tibco "event enabling" of business processes, expands the scope and efficacy of this monitoring.

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TABLE 3-33

TIBCO SOA PROCESS LAYER AND SERVICES LAYER BENEFITS

- Permits changes to be made to processes without affecting the underlying services
- Permits changes to be made to processes without affecting the line-of-business applications
- Permits changes to be made to processes without affecting interactions with services or application
- Facilitates rapid process definition
- Facilitates rapid process design
- Permits changes to be made to the technical underpinnings of the service without impacting those business processes using the service
- Permits flexible design approach
- Increases process agility
- Isolates the impact of change
- Allows the specialized skills of business analysts and IT developers to be leveraged independently of each other
- Supports the ability to monitor and analyze processes from end to end
- Supports the ability to monitor and analyze processes in real time.

Source: WinterGreen Research, Inc.

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iProcess engine and business works are “event-enabled.” Each publishes messages at multiple points throughout a business process. As jobs progress through a business process, all associated events can be collated, aggregated and displayed in real time through the business activity monitoring dashboard of TIBCO BusinessFactor™ software.

The events are displayed in the exact context of the business process, incorporating precise data from both low-level integration tasks and high-level human tasks. Because BusinessFactor can incorporate messages from multiple sources, including external sources such as a data warehouse, organizations can get a complete, real-time view of business processes.

3.4.10 Tibco SOA Real-Time Process Monitoring

Tibco provides this all-encompassing real-time process monitoring capability. The iProcess Engine publishes Java Message Service (JMS) messages at key state changes. A message is generated each time an instruction in the iProcess engine produces an audit trail entry—such as case started, work item released, work item overdue, work item reassigned and others. The selection and granularity of each message is configurable.

3.4.11 Tibco Hawk SOA Management Console

Tibco end-to-end self-correcting system management capabilities are integrated with the execution engines. The foundation of these management capabilities is Tibco Hawk® software. Hawk is a sophisticated tool for monitoring and managing distributed applications and systems. Hawk can be used to manage all aspects of the BPM and SOA deployment.

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Hawk has the ability to start and stop engines on specific machines, report diagnostic messages, monitor error logs, and issue various automated alerts. Hawk allows system administrators to proactively manage the day-to-day operation of their systems infrastructure. Hawk uses rules to automatically modify engine configurations based on predefined thresholds. CPU utilization on a particular machine that exceeds a specified threshold, can be automatically managed by starting up a copy of the engine on a second machine. Hawk enables system administrators to monitor application parameters, behavior and loading activities for all nodes in a local- or wide-area network.

Tibco Hawk console controls and monitors components from a single point.

Hawk can take action when predefined conditions occur. By fully monitoring IProcess™ Suite Process Suite and iProcess events, Hawk allows operations personnel to watch interactions of components.

3.4.12 TIBCO SOA Governance Best Practices

TIBCO is implementing SOA in the context of project organization and staffing. SOA is used to analyze and implement funding strategies based on best practices for project organization and staffing.

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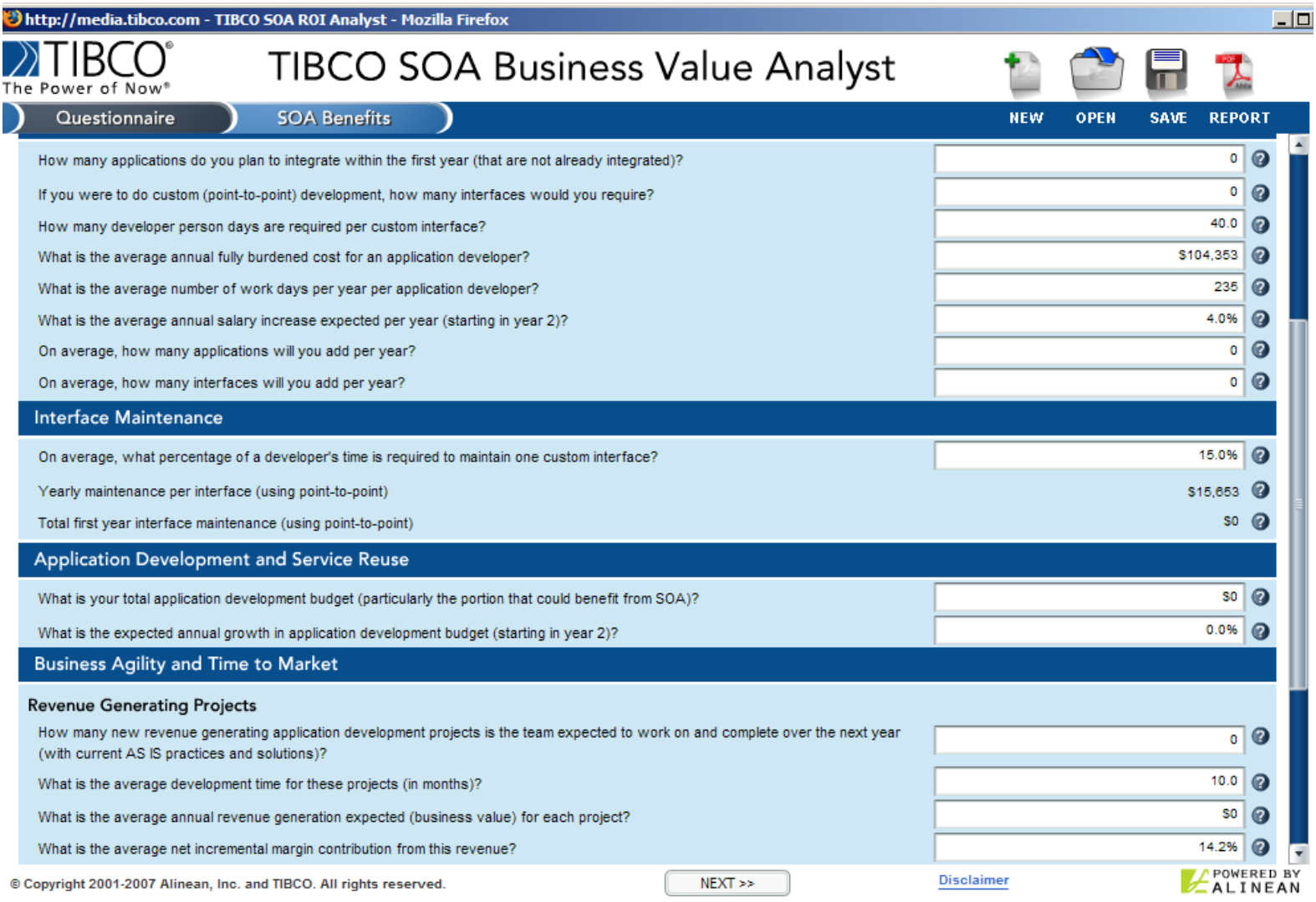
3.4.13 Tibco SOA ROI

FIGURE 3-34

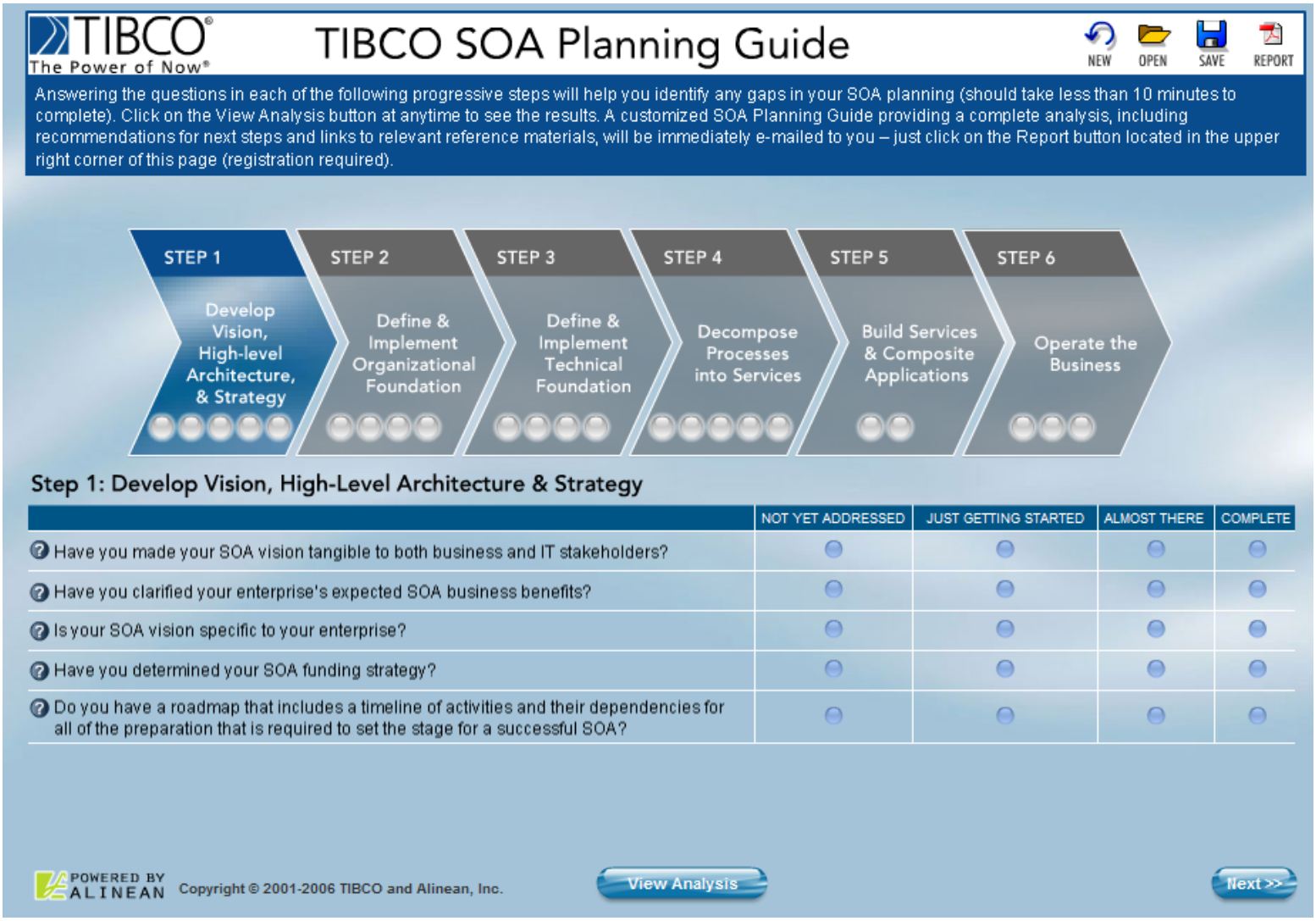
TIBCO SOA BUSINESS VALUE ROI



Source: Alinean and Tibco.

FIGURE 3-35

TIBCO SOA IMPLEMENTATION ROI



Source: Alinean and Tibco.

3.5 Software AG / WebMethods SOA

Software AG WebMethods provides asset and meta-data management facilitates. It provides intuitive management of SOA assets. To realize ROI from Software AG WebMethods SOA, users need to scale to include enterprise-wide deployment. it requires that services are catalogued, searchable, and leveraged between developers and projects.

Software AG WebMethods is built on a powerful, open and standards-based next generation SOA registry / repository. CentraSite achieves control and transparency across all SOA assets like services, processes, policy documentation, business rules and tutorials.

The SOA methodology implemented by Software AG addresses the need for a business process manager, application composer, integration integrator, and service orchestrator.

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TABLE 3-36

SOFTWARE AG SOA METHODOLOGY

Source: Software AG.

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TABLE 3-37

SOFTWARE AG WEBMETHODS SOA POSITIONING

- Built on a powerful platform
- Is open
- Is standards-based
- Utilizes next generation SOA registry / repository
- Has CentraSite
- Achieves control and transparency across SOA assets

Source: WinterGreen Research, Inc.

TABLE 3-38

TYPES OF SOFTWARE AG WEBMETHODS SOA ASSETS

- Services
- Processes
- Policy documentation
- Business rules
- Tutorials

Source: WinterGreen Research, Inc.

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3.5.1 Software AG webMethods SOA Suite

Software AG webMethods SOA suite provides tools to automate processes, connect to existing applications and legacy enable existing applications. Software AG webMethods SOA Suite is built on a foundation of SOA governance. These tools give SOA. The webMethods ESB Platform allows you to create a more agile enterprise while maximizing existing IT investments.

Based on a Service-Oriented Architecture (SOA), the webMethods ESB platform enables businesses to move quickly to address changing market needs. SOA provides your application developers a single standards-based platform to quickly and efficiently develop new applications while maximizing existing investments. The webMethods ESB includes all of the tools you need to integrate your existing applications and partners.

At its core, is an advanced ESB (Enterprise Service Bus) that provides the foundation for your SOA with enterprise-class features you need, ensuring success. It uniquely combines proven application integration capabilities, high-speed messaging, support for B2B, legacy applications and event-driven technologies to create the most complete integration infrastructure available.

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3.5.2 Software AG WebMethods CentraSite

Software AG WebMethods CentraSite gives architects and developers a holistic view of SOA assets. An extensible meta-data model and adaptable architecture makes it easier to discover, import, and govern SOA assets like processes, services and policies in context. The context may be with each other.

TABLE 3-39

SOFTWARE AG CENTRASITE MEANS TO ACHIEVE BUSINESS RESULTS USING SOA

- * View IT assets, services, policies and processes holistically.
- * Respond quickly to changing business needs
- * Implement intuitive registry/repository that adapts to your organization.
- * Get metrics to measure SOA adoption.
- * Adapt the solution to organization, rather than the reverse
- * Catalogue and document any SOA asset
- * Analyze dependencies
- * Improve reuse
- * Enjoy intuitive Web 2.0-style collaboration between service providers and consumers

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TABLE 3-39 (CONTINUED)

SOFTWARE AG CENTRASITE MEANS TO ACHIEVE BUSINESS RESULTS USING SOA

- * Open, standards-based Registry/Repository accelerates implementations in heterogeneous IT environments.
- * Adapts to your enterprise giving you the flexibility to instantiate your governance process using a platform that conforms to your requirements.
- * Customize taxonomies
- * Align IT assets to match your organizational requirements and processes

Source: WinterGreen Research, Inc.

The registry repository is part of the Software AG Business Infrastructure Suite, enabling companies to achieve business results – faster. Software AG processes and access to the data they need, when they need it. Customers and employees benefit from streamlined SOA software.

SOA for strategic positioning relates to comprehensive SOA and lifecycle management platforms. IT architects achieve visibility and control over their development and deployment using SOA. CentraSite brings structure, scale, and speed to adoption by guiding reuse, automating processes, and simplifying complexities and interdependencies.

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CentraSite governance provides an automated end-to-end lifecycle governance platform. It facilitates SOA adoption. Users need to locate, understand, and trust available services. Service re-use is central to SOA adoption. SOA stakeholders need to see, track, enforce, control or automate policies and processes.

CentraSite provides registry, repository and policy management components. It automates SOA processes to control delivery, support, and . Teams leverage SOA throughout the entire IT lifecycle. webMethods X-Broker permits CentraSite to offer a feature-rich, industry-proven, and fully integrated end-to-end SOA platform. This is used to manage and control how an SOA is delivered and supported across the enterprise.

Key benefits relate to supporting developing an organized extensible metadata model. This aligns IT assets as processes, services and policies to match business requirements. SOA systems provide a single logical view on metadata across heterogeneous landscapes. Design-time governance covers artifact lifecycle management from conception to delivery.

A pluggable AJAX user interface enables customers to add third-party components. SOA testing and security give a holistic view of SOA. All IT assets, Web services, business rules, processes, and documentation are needed to be accessed by SOA. Open architecture fully supports UDDI, WebDAV, XQuery and other relevant standards. Key SOA metrics aspects are speed, faster time-to-value, flexible and customizable reporting capabilities. Reuse is central to implementation of SOA.

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Graphical interfaces reduce development and integration costs, resulting in a higher return on investment. Predefined service lifecycle patterns, templates, and reports are used to jump start SOA deployments

3.5.3 Software AG / webMethods Open API and Open Standards

Software AG WebMethods SOA extends access and policy enforcement control to third-party products. Exposing SOA-based interactions with partners, customers and suppliers is a key aspect of SOA. A SOA registry/repository is used to catalog services and assets and facilitate re-use. By allowing stakeholders to see what services are available, access critical metadata about those services, and add new services to the registry in a structured way the system leverages policies.

SOA systems arew used to register, catalog, publish, locate, demo, and approve services. easy and efficient reuse of services depends on creating a system-to-record and access SOA metadata, policies, schema, documentation, performance criteria, and contracts. Systems interoperate with UDDI V2 and V3, JAX-R, and ebXML standards.

Repositories depend on the ability to create a federated system-of-record for SOA services, policies, processes, identities, attributes, and schemas. SOA lifecycle systems apply configurations to SLAs for run-time, security, routing, monitoring, and managing services. They manage the governance rules engine and policy manager. They store digital documents and related service definitions. They capture an audit trail of all registry activities.

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Policy ManagementCentraSite Governance Edition provides a way to automate policy enforcement across design-time, run-time, and change-time.

3.5.4 Software AG / webMethods SOA

Software AG / webMethods SOA is able to support policies by role-based access control, rules engine, notifications, authorization, authentication, security, approvals, and verification from a single business view. Policies designed and administered in CentraSite are enforced in production by webMethods X-Broker and can interoperate with third-party run-time management tools.

3.5.5 Software AG / webMethods: X-Broker

Service Orchestrator provides the infrastructure foundation for services, enabling the use of crossvision BPM for business process composition, CentraSite for SOA governance, and Service Composer for supporting user interfaces.

The product portfolio includes solutions for managing data, enabling service oriented architecture, and improving business processes. By combining proven technology with industry expertise and best practices, customers improve and differentiate their businesses

Software AG webMethods X-Broker identifies the consumer application to prevent unauthorized applications from accessing the Web Service. webMethods X-Broker identifies the consuming application using request header patterns, user group (as identified by the security authentication server), IP

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address range, or digital certificate. Flexible end-user authentication and authorizationre provided.

TABLE 3-40

SOFTWARE AG WEBMETHODS X-BROKER SOA SECURITY FUNCTIONS

- Identifies the consumer application
- Prevents unauthorized applications from accessing the Web Service
- Identifies the consuming application
- Uses request header patterns
- Uses user group
- Identification by the security authentication server
- Identification by IP address range
- Identification by digital certificate
- Provides flexible end-user authentication
- Provides flexible end-user authorization

Source: WinterGreen Research, Inc.

Software AG webMethods X-Broker allows the consuming application to specify the security method. End-user authentication and authorization can be done by invoking third-party systems.

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A broad range of security features are offered in addition to consumer application and end-user authentication. Authorization provided by webMethods X-Broker for SOA offers encryption and decryption for message confidentiality, digital signatures for message integrity and non-repudiation, and logging for tracing and tracking.

3.5.6 Software AG Standards Compliance

Software AG is committed to standards compliance. Software AG supports Web services standards. Consistent with that commitment, webMethods X-Broker security features are compliant with the current standards for WS-Security, XML encryption and XML-signatures.

3.5.7 Software AG SOA Operations

Software AG operations functions include logging, monitoring, and alerts. webMethods X-Broker allows rules definition for logging. Monitoring and alerts are based on service parameters. Service-level data is collected at run-time by webMethods X-Broker and is available at two levels: Transaction-level data includes information about every request/response message sequence relevant to the consuming service, service provider, and the contract that governs their relationship. Aggregate data is relevant to the overall performance of the service.

Logging and monitoring rules can be established based on aggregate counters for performance, errors, response times, and SLA violation events. Performance management permits routing to be used to equalize or prioritize the request load among multiple back-end services.

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Templates configure this 'load balancing' capability. SLA management enforces priorities at run-time to match the response times of an SLA and send alerts if the SLA is not met.

3.5.8 Software AG SOA Availability Management

Software AG webMethods X-Broker can automatically route a request to a backup service in case of failure in the primary service. A template is available to configure 'failover' routing.

3.5.9 Software AG SOA Business Content-Based Routing

Business content-based routing means a SOAP message can be examined to validate a specific business rule. Based on the rule, the message can be routed to different back-end services. Business alerts can be set and triggered based on any business rule or an SLA set by the service consumer or by a specific response by the provider. Preferential QoS is based on business priorities and defined service levels.

Consuming applications can be assigned different processing priority. By defining QoS business rules, specific applications can receive expedited response, lower priority response, or even the initiation of a different service version. Version-based routing means the broker automatically decides between different versions of a service for a consuming application.

If multiple service versions are available, the product can determine the correct version based on the header identification or the context of the service request. Deprecation support allows a service to be scheduled for replacement.

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IT implements SOA to provide strategic competitive differentiation via reuse of existing computer hardware and software installed components. In addition, SOA permits implementation of more efficient shared workload on the mainframe that is in most cases 10x less expensive than use of distributed computing environments.

Commoditized markets depend on SOA to provide a flexible way of building business value. Through the implementation of SOA, automating manual business processes is achieved by building out a large number of componenets interconnected as solutions to meet the goal of flexible software implementation. Initially there is a focus on business processes. SOA efforts are concentrated on the business processes and how people interact with them on the Web.

The first step is to graphically map the target business processes in flowchart form to delineate the business process logic n a flexible, declarative manner. Creation of a business model is a significant aspect of creating a SOA solution.

A service abstraction allows separating users from the underlying heterogeneous implementation, providing flexible, seamless experiences for their users as well as enabling infrastructure design. A collaborative rich Internet interface based on Ajax technology is a central aspect of turning the model into a real SOA system.

Enterprise Web 2.0 is poised to extend the life of legacy applications, along with the business logic and rules that the enterprises wish to preserve. Service composition and rich user interface capabilities, provide the benefits of a

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Web-based portal without the limitations that traditional Web-based applications impose.

Web 2.0 capabilities to front-end legacy applications, to leverage virtual gaming experience presentation capabilities. Avatar-based interactivity models similar to a video game are positioned as a model for portals, where users take on personas that move through a virtual environment.

Web wrappers on legacy screens are achieved by displaying 80 columns by 24 rows from a mainframe screen in a Web page. Service-based functionality for the Web is being achieved in a declarative fashion.

Software AG Adabas database and the Natural programming environment are used for queries on the database. They use Natural in a limited way in their core business application logic layer, yet they plan to gradually decrease their use of Natural in the future, since SOA makes it easier to abstract the source of underlying business logic.

Software AG is offering a heterogeneous database and programming environment. SOA implementation has little dependency on either Natural or Adabas. The heterogeneous environment includes technology from Sun Microsystems Java, Microsoft .NET and .NET portal functionality.

Software AG Legacy Integrator, ApplinX, SQL Gateway, and EntireX (Crossvision Service Orchestrator) are used to gain access to mainframe applications in multiple ways. Legacy integrator provides adapters to the mainframe environment by integrating existing assets and exposing existing systems as services.

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Legacy integrator encapsulates functionality and extends usability and maximizes leverage of IT assets. ApplinX provides for low priority data display. It is process-based. They use this capability for administrative screens.

SQL Gateway provides direct access to data. Service Orchestrator provides the infrastructure foundation for their Services, enabling the use of crossvision BPM for business process composition, CentraSite for SOA governance, and Application Composer for supporting user interfaces. Crossvision Service Orchestrator creates new business Services from existing technical systems by transforming existing Services and messages via composition and orchestration.

3.5.10 Software AG SOA Infrastructure

Software AG works for flexibility. SOA permits taking a best-of-breed approach, where they select the best tool, but they avoid becoming wedded to any particular technology. SOA tools are “plug and play” because they are replaceable tools. This replaceability is a feature that implies modularity and open standards support.

Managing and integrating SOA services is accomplished using EntireX, service orchestrator, and CentraSite to manage and catalog the services that are in production. The SOA initiative creates a service aggregation. The SOA initiative is designed to get automated process to replace manual process via implementation of services.

Service aggregation is going to prioritize the creation and integration of services. Software AG Crossvision acts as a service orchestrator and

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Crossvision BPM is powered by Fujitsu. Service Orchestrator enables reuse of existing code as part of the Webification process. SOA leverages Crossvision Information Integrator to resolve issues with heterogeneous data sources that support the Services. Crossvision Information Integrator combines data from different systems into a single view. It enables the management and consolidation of data, the definition of dependencies, and the publication of business services based on semantic approaches.

SOA implementation represents a combination of core systems, applications, and components. Integrated communication facilities include messaging, enterprise calendaring, customer relationship management, and other business applications. Relationships are instantiated among enterprise content management and enterprise resource planning (ERP) applications.

3.5.11 Software AG Application Composer

Software AG Application Composer takes a model-driven approach to Ajax, simplifying its implementation and maintenance. Application Composer provides rich Web 2.0 user interfaces to enable business processes. It integrates with existing application and portal servers, and provides collaborative tools for business analysts and system architects.

Application Composer enables the composition of functionality from both legacy and new applications. Use of Ajax technology, applications and user interfaces means the system can generate run time code without modification in browsers and Java-based clients. Application Composer decouples user interface definitions from the interface technologies, resulting in flexible applications, independent of the execution environment.

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The vision for the technical architecture relates to the core characteristic of this architecture, the SOA Layer. The SOA layer is a services abstraction. Application Composer is used for the next generation portal and legacy integration with the ERP system.

3.6 Progress Software Services Oriented Architecture (SOA)

Progress Software enterprise services oriented architecture SOA positioned to support application infrastructure software that can be used to develop, deploy, integrate and manage business applications.

3.6.1 Progress Software Sonic Product Family

The Sonic product family is built from the ground up for SOA. The product family consists of the Sonic ESB. A comprehensive set of compatible products provides a cohesive, standards-based solution. The challenge is to support broad-scale business integration. The Sonic ESB is robust SOA infrastructure software that integrates large, physically distributed deployments.

Complex service orchestration, operational data management, and seamless interoperability works with third-party relational data sources, packaged applications, and technologies. Sonic family products simplify application integration within an SOA infrastructure.

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Modular and service-oriented functionality SOA provides business benefits. The Actional product family provides a comprehensive management solution that enforces a single set of compliance and business policies across all enterprise activities and processes to ensure that IT supports business goals.

Actional controls actual business process flows, automatically adjusts to changes, and visually traces the root causes of policy violations. Actional can detect the activities of uncontrolled, rogue services, thereby eliminating the security and compliance risks of unexpected service use and deployment. Key features of Actional include managing SOA operations, optimizing service delivery, and active policy management of Web services.

3.6.2 Progress® DataXtend™ Data Integration Software

Progress® DataXtend™ Data Integration is used for connecting services from diverse applications. The DataXtend product line provides data integration for distributed applications. It is delivering real-time views of shared data. DataXtend product line offers applications that support real-time data management. Systems are employing a common semantic data model to create sophisticated data transformations, enabling organizations to integrate heterogeneous data sources with no disruption to existing applications.

Progress DataXtend semantic integrator addresses data integration challenges in SOA. It uses models to manage validating and transforming data. Data can be shared between applications requiring different information or formats. DataXtend semantic integrator addresses the semantic data integration challenges in SOA.

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SOA infrastructure relates to business agility. To deliver the business agility with SOA infrastructure requires connecting distributed organizations with heterogeneous systems. SOA is used to quickly, seamlessly, and reliably interconnect systems. Platform vendors can use SOA to leverage their existing integration systems.

3.6.3 Progress Software SOA Product Positioning

TABLE 3-41

PROGRESS SOFTWARE PRODUCT POSITIONING

- IT evolution addressed with SOA detect and respond to real time events
- Business activity monitoring / Event driven analysis to connect systems together
- Optimization of process and services
- Application infrastructure software
- Develop, deploy, integrate and manage business applications
- Host-centric client-server Web SOA
- SOA implementation through the evolution of IT Paradigms
- Optimized integration approach

Source: WinterGreen Research, Inc.

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3.6.4 Progress Software Products

TABLE 3-42

PROGRESS SOFTWARE PRODUCTS

- DataXtend Data Integration
- EasyAsk Natural Language Search and Query
- DataDirect Data Connectivity
- ObjectStore / OpenEdge
- Apama
- Actional
- Shadow
- Sonic
- Object Data Management
- Business Application Platform
- Event Processing
- Enterprise Service Bus
- SOA Model-driven semantic data integration
- Unified mainframe integration platform
- ESB
- Web Services Management

Source: WinterGreen Research, Inc.

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TABLE 3-43

PROGRESS SOFTWARE SOA PLATFORMS SUPPORTED

- Mainframe Integration
- Application Platforms
- Data Infrastructure
- Services Infrastructure
- Market leading event processing platform
- First and leading natural language query
- Market leader in data connectivity
- Integrated platform optimized for business
- Leading enterprise-class SOA management
- Market leading object database

Source: WinterGreen Research, Inc.

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3.6.5 Progress Software Key Transformation Supplier For Operational Intelligence

Progress Software DataDirect Shadow is positioned as ISV to leverage IBM mainframe specialty engines. Progress Software offers an integrated supply network that is able to streamline throughput and improve harvest yield. Progress Software messaging platform supports 1.2 million contracts per day. It had a 38% increase in volume.

SaaS-enabled ERP opens new markets and leads to 20% growth. CEP technology monitors, analyzes, and enables real-time fraud detection. Real-time shop-floor visibility and analysis is provided. This stops waste, increases profits. Data connectivity improves speed and reliability of critical applications for the global media network.

TABLE 3-44

PROGRESS SOFTWARE SOA TECHNOLOGIES BENEFITS

- First item-level RFID and SOA deployment
- Provides a consistent view of product data across the company
- Enables the free flow of valuable information across the company stores
- Back and Front Office Application (Nobis)
- Reconciles ASN with customer and order information
- Manages all physical inventory operations
- Provides front/back office application

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TABLE 3-44 (CONTINUED)

PROGRESS SOFTWARE SOA TECHNOLOGIES BENEFITS

- Reconciles ASN and RFID data in real-time
- Transforms RFID events into real-time business updates
- Identifies and addresses reconciliation errors immediately
- Generates labor savings in unpacking and sorting
- Customer kiosk Interface
- Easier search using everyday language in local language
- Multiple search techniques
- Advanced merchandising
- Embedded Integration engine
- Scalable connectivity
- Highly reliable connectivity
- Local and remote services dynamically managed
- Reconfiguration 'on-the-fly' as business demands dictate

Source: WinterGreen Research, Inc.

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TABLE 3-45

PROGRESS SOFTWARE SOA POSITIONING

- Clear vision and strategy for SOA businesses
- Seeks to maintain double digit growth from SOA
- SOA has increasing impact on overall growth
- Opportunities in emerging markets for Apama and DataXtend SI
- Durable and very profitable franchises with OpenEdge and DataDirect
- Solid track record of consistent growth and profitability

Source: WinterGreen Research, Inc.

3.6.6 Progress Software Services Oriented Architecture SOA Products

Using an SOA approach, information systems are built from shared software code components called "services" which automate discrete business functions. A services infrastructure connects, mediates, controls and monitors these services and their communications to support and optimize business processes. Specialized integration capabilities of the services infrastructure enable legacy systems to take part in an SOA environment.

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TABLE 3-46

PROGRESS SOFTWARE SERVICES ORIENTED ARCHITECTURE PRODUCTS

- Sonic™ product line
- Sonic ESB® messaging-based Enterprise Service Bus provides integration of new and existing business applications across organizational boundaries and to remote sites with low latency, high reliability and continuous availability
- Progress® Actional® product line offers Web services and SOA management including monitoring, analysis, security and policy control
- DataDirect® Shadow® RTE enables mainframe and legacy applications to be participants in SOA and Web services production and consumption

Source: WinterGreen Research, Inc.

3.6.7 Progress Software Application Platform Products

Progress application platforms permit end-users and independent software vendors to rapidly develop, deploy and manage the applications.

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TABLE 3-47

PROGRESS SOFTWARE APPLICATION PLATFORM PRODUCTS

- OpenEdge® platform provides rapid development and deployment of business applications that are standards-based, service-oriented and have a lower total cost of ownership.
- Apama® event processing platform can monitor rapidly moving event streams, detect sophisticated patterns, and take action - all within milliseconds. The Apama® product provides the foundation for event-driven applications, including business activity monitoring, algorithmic trading, transaction monitoring, market abuse detection and RFID applications.
- EasyAsk® product line provides business users and consumers the ability to find the information they need using natural language search and navigation, supporting a wide variety of applications ranging from customer facing e-commerce Web sites to ad-hoc query.

Source: WinterGreen Research, Inc.

3.6.8 Progress Software Services Oriented Architecture for Enterprise Open Consensual Structure

Progress Software critical success factors for SOA relate to creating enterprise systems to create federated communities among diverse SOA participants in order to create richer, dynamic user experiences.

SOA is positioned to enable organizations to create interactions between communities. SOA is used to deliver a rich customer experience. Organizations have to rethink the centralized, top-down approach to running a company. SOA governance is shifting to support a cross-organizational service-oriented architecture. Organizations use systems to develop a consensual form of corporate governance that supports a socially oriented architecture.

Partnerships created by a service-oriented architecture are supported by online interactions that create a collaboration of a team set to undertake any task. Teams are responsible for the real value that an enterprise delivers. End-users are seeing successful service-oriented architecture deployments. The formation of a value chain, with each partner adding incremental value by broadening the overall user experience depends on a elaborate SOA infrastructure that is characterized by a flexible approach to every software configuration.

People working in an ERP find the need to re-key information a disruptive interruption. SOA is targeted to lending or other applications. Leaving an application to access a business credit report and subsequently return to the ERP have less productivity than if there was more automated process. SOA holds the potential to permit the keyboard operator business analyst to create configurations that automate the flow of information.

SOA permits the interconnection of applications via a configuration package. SOA permits sharing of information between systems. The SOA supports users to specify the application and a Web service API for the credit

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information. This SOA construct is driving technology and management changes. SOA defines how technology is delivered and governed.

SOA is able to facilitate an online experience. It has the ability to integrate heterogeneous systems in a way that enables users to have a seamless experience. SOA can permit organizations to abandon the traditional, top-down approach to IT governance in favor of a federated approach.

Critical factors determine the success of a SOA initiative: free connection of interactions; active mediation of policy; and precise control of semantics. The technical challenges relate to managing semantics in a manner that lets IT users to participate in revising services themselves.

In a service-oriented architecture heterogeneous systems work with independent security domains. Integration software permits interconnection of systems. This creates a seamless end-user experience. The challenge is to get these independent domains to collaborate as a virtual team and share a common vocabulary, optimizing run-time performance while enforcing SOA-wide security.

3.6.9 Progress® Actional SOA Performance Monitoring & Alerting

The global competitive environment has initiated demand for effective SOA performance monitoring and alerting. These are necessary to ensure reliable SOA operations. SOA operations must be cost-effective. Loosely coupled SOA services are components of the process to execute across heterogeneous computing resources.

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Traditional applications depend on SOA to implement performance and availability issues. Progress® Actional® products have a cost-effective SOA performance monitoring and alerting solution. This enables companies to operate their SOA reliably and meet SLAs:

TABLE 3-48

PROGRESS® ACTIONAL SOA PERFORMANCE MONITORING & ALERTING FUNCTIONS

- Monitoring
- Flow Mapping
- Auto-discovers
- Maps of the process flow of all services
- Support for a SOA transaction end-to-end
- Service dependencies
- Unprecedented visibility
- Coding
- Manual configuration replaced by end-to-end monitoring
- Alerting on service levels
- Easy-to-use wizards
- Tools for creating policies
- Tools that track a variety of behaviors

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TABLE 3-48 (CONTINUED)

PROGRESS® ACTIONAL SOA PERFORMANCE MONITORING & ALERTING FUNCTIONS

- Optimized services that support rapid response times
- Optimized services that support data throughput
- Optimized services that support frequency of faults
- Optimized services that support messages on a per-transaction level
- Optimized services that support messages on an aggregate level

Source: WinterGreen Research, Inc.

SOA performance is a huge issue. Policy-based alerts depend on development of thresholds. Actional generates an alert and provides a flow map of the end-to-end violating transaction. This can be used to quickly trace back the developing problem to the system that is the root cause, to resolve issues quickly.

3.6.10 Progress Software SOA Implementation of Compliance

Organizations use SOA to achieve security and compliance. Progress Software SOA is used to protect the reputation of the enterprise, the brand.

Companies tightly couple policies to the services to which they apply, putting the various IT teams responsible for the different services in charge of the related policies. This can lead to inconsistencies in policies and gaps in coverage, as well as high IT costs resulting from re-coding policies as services change.

Centralized management, distributed enforcement of SOA security and compliance are central to creating flexible response to changing market conditions. Progress® Actional® is used for active policy enforcement. Progress SOA separates the policy lifecycle and service lifecycle. It provides centralized creation and management of policies. SOA security and compliance ensures distributed policy enforcement.

3.6.11 Progress Software SOA Security

Progress® Actional® is used for active policy enforcement. It allows companies to put policy in the hands of security and compliance experts and empowers the experts to author policies once and apply them across the enterprise. SOA ensures consistent policy enforcement while reducing risk and cost. Alternative approaches apply policies to services and operations.

Progress Software Actional applies policies to end-to-end processes wherever they flow. Once policies are applied, they dynamically adapt to changes in services. Processes and schema and are seamlessly enforced without the time and cost of being re-coded or re-applied. Progress Software Actional policy enforcement is designed to handle the variety of SOA security and compliance requirements present in the extended enterprise.

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It provides flexible, standards-based support for authentication and authorization. It integrates with a broad range of identify management and single sign-on (SSO) technologies. It records audit data to a relational database, where it is available to any audit tool.

Progress Software Actional applies policy to abstract information types. Personal identity or credit card details are managed, providing consistent control over sensitive information, wherever it appears in messages. Actional permits organizations to enforce last-mile security by creating "trust zones" that prevent message traffic from reaching a service endpoint if it has not passed through a designated security enforcement point.

Actional can help merchants and other companies that deal with credit card information comply with the Payment Card Industry Data Security Standard (PCI DSS) for providing a secure, traceable, and audit-ready environment. Specifically:

3.6.12 Progress Actional SOA Protects Stored Cardholder Data

To protect stored cardholder data, Actional can selectively audit specific message fields. The entire credit card number is not stored. This provides control over the persistence of sensitive data, mitigating risk, while keeping required, comprehensive audit trails.

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To restrict access to cardholder data by business need-to-know, Actional enables control of who has access (via the user interface or programmatic APIs) to what data. This capability can be tied to existing user roles in the organization, allowing administrators to restrict access to audit logs, message fields, and other critical information.

3.6.13 Progress Actional SOA Management / Lockheed Martin Defense SOA

Progress Actional was selected for SOA management by Lockheed Martin. Actional(R) is used to manage an internal service oriented architecture (SOA) initiative within its enterprise information services (EIS) unit.

Actional for web services and SOA management provides best-in-class monitoring, analysis, security and policy control, including system and process-level visibility, and policy enforcement across an SOA. Actional enables customers to gain end-to-end visibility into SOA operations with comprehensive runtime SOA governance capabilities. Actional delivers policy-based alerting to support early detection and root cause analysis of performance and availability issues. SOA enables customers to eliminate time and resources spent on IT diagnostics.

Deploying a service-oriented architecture is an incremental process. Actional is built with integration, interoperability, and scalability. As SOA projects evolve and scale, systems enable effective aligning SOA operations with business goals.

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3.6.14 Progress Software DataDirect Technologies Product Lines

Data Connectivity – DataDirect's data connectivity products provide high-performance, standards-based (ODBC, JDBC, ADO.NET, OLE DB) access to all major relational databases. DataDirect products are production-proven in countless mission-critical environments. And hundreds of leading software companies embed DataDirect technology in their software products.

Mainframe Integration – DataDirect's Shadow product line helps you address the challenges associated with integrating mainframe assets with modern Java and .NET applications or into service-oriented architectures. With Shadow, you can transparently integrate mainframe artifacts into new business applications.

XML Data Integration – All DataDirect products support the processing of XML in critical business applications. In particular, DataDirect XQuery is exclusively designed to integrate XML with relational and legacy data sources, and DataDirect XML Converters enable streaming access to EDI and flat files.

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TABLE 3-49

PROGRESS SOFTWARE DATADIRECT TECHNOLOGIES PRODUCT LINES

- Data Connectivity
- High-performance
- Standards-based (ODBC, JDBC, ADO.NET, OLE DB)
- Access to major relational databases
- Mission-critical
- Leading software companies OEM embed datadirect technology in their software products
- Mainframe Integration
- Datadirect Shadow
- Helps address challenges associated with integrating mainframe assets into Java and .NET applications
- Helps address challenges associated with integrating mainframe assets with into service-oriented architectures
- Shadow can transparently integrate mainframe artifacts into business applications
- XML Data Integration – All datadirect products support the processing of XML in critical business applications. In particular, datadirect xquery is exclusively designed to integrate XML with relational and legacy data sources, and datadirect XML Converters enable streaming access to EDI and flat files.

Source: WinterGreen Research, Inc.

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DataDirect Technologies has a proven, 20-year history, strong technical leadership and robust product line. Software architects worldwide depend on DataDirect products to connect their applications to a range of data sources using standard-based interfaces such as ODBC, JDBC, ADO.NET, XQuery and SOAP. 300 leading independent software vendors embed DataDirect components in over 400 commercial products. DataDirect Technologies simplify and streamline data connectivity for distributed systems and to reduce the complexity of mainframe integration.

3.6.15 Progress Service-Oriented Architecture (SOA) Deployments

Progress supports service-oriented architecture (SOA) deployments with products that easily create, connect, mediate and control interactions among business services. Progress provides technologies that provide solutions for such emerging areas as real-time event processing, SOA governance, and federated data service management.

Progress products are standards-based. They interface with a wide variety of business applications in heterogeneous business environment

3.6.16 Progress Sonic Messaging-Based Enterprise Service Bus ESB® SOA Products

Using a SOA approach, information systems are built from shared components called "services" which automate discrete business functions. A services infrastructure connects, mediates, controls and monitors these services and their communications to support and optimize business processes.

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Specialized integration capabilities of the services infrastructure enable legacy systems to take part in an SOA environment.

TABLE 3-50

PROGRESS SOFTWARE SERVICES INFRASTRUCTURE FUNCTIONS

- Sonic Messaging-Based Enterprise Service Bus ESB®
- Services Oriented Architecture separates code into components
- Uses an SOA approach / Information systems built from shared components
- Services automate discrete business functions
- Connects
- Mediates / Controls
- Monitors services
- Monitors communications
- Supports business processes
- Optimizes business processes
- Has specialized integration capabilities of the services infrastructure
- Enables legacy systems to take part in an soa environment

Source: WinterGreen Research, Inc.

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3.6.17 Progress® Sonic™ Leverages the Sonic ESB® Messaging-Based Enterprise Service Bus

The Progress® Sonic™ product line leverages the Sonic ESB® messaging-based enterprise service bus provides integration of existing business applications across organizational boundaries. Remote sites work with low latency, high reliability, and continuous availability.

TABLE 3-51

PROGRESS SOFTWARE PRODUCTS

- Progress® Sonic™
- Leverages the Sonic ESB® messaging-based enterprise service bus
- Provides integration of existing business applications across organizational boundaries
- Has remote sites
- Works with low latency, high reliability, and continuous availability.
- Progress® Actional® product line offers Web services and SOA management including monitoring, analysis, security and policy control.
- DataDirect® Shadow® RTE
- Enables mainframe and legacy applications to be full participants in SOA and Web services production and consumption
- Application platform products

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TABLE 3-51 (CONTINUED)

PROGRESS SOFTWARE PRODUCTS

- Progress Application Platform products
- Empowers both end-user organizations and independent software vendors and developers
- Rapidly develops, deploys, and manages the sophisticated applications
- Includes Progress® OpenEdge® platform
- Provides rapid development and deployment of business applications that are standards-based, service-oriented and have a lower total cost of ownership
- Progress® Apama® event processing platform
- Can monitor rapidly moving event streams
- Detect sophisticated patterns
- Take action - within milliseconds
- Provides the foundation for event-driven applications
- Includes business activity monitoring
- Includes algorithmic trading
- Includes transaction monitoring
- Includes market abuse detection
- Includes RFID applications
- Progress® EasyAsk® product line

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TABLE 3-51 (CONTINUED)

PROGRESS SOFTWARE PRODUCTS

- Provides business users and consumers the ability to find the information they need
- Uses natural language search and navigation
- Supports a wide variety of applications
- Ranges from customer facing e-commerce Web sites
- Ad-hoc query.

Source: WinterGreen Research, Inc.

3.6.18 Progress Software Data Infrastructure Products

Progress data infrastructure capabilities provide data management, integration, replication, caching, access, and security spanning multiple data stores which can be multi-vendor and in multiple locations including disconnected and mobile data. Data infrastructure enables both database level integration as well as data services support for distributed application services.

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TABLE 3-52

PROGRESS® DATAXTEND AND DATADIRECT TECHNOLOGIES PRODUCT FUNCTIONS

- Provides data integration for distributed applications
- Delivers real-time views of shared data
- Delivers data in the form that applications need
- Has a semantic Integrator
- Employs a common semantic data model
- Creates sophisticated data transformations
- Enables organizations to share and integrate heterogeneous data
- Works without disruption to existing applications

Source: WinterGreen Research, Inc.

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TABLE 3-53

PROGRESS SOFTWARE DATADIRECT TECHNOLOGIES POSITIONING

- Comprehensive software platform
- Used for connecting business applications to data and services
- Runs on any platform
- Uses proven and emerging industry standards
- Connects applications to a range of data sources
- Uses standards-based interfaces
- Supports ODBC, JDBC™, ADO.NET, XQuery and SOAP

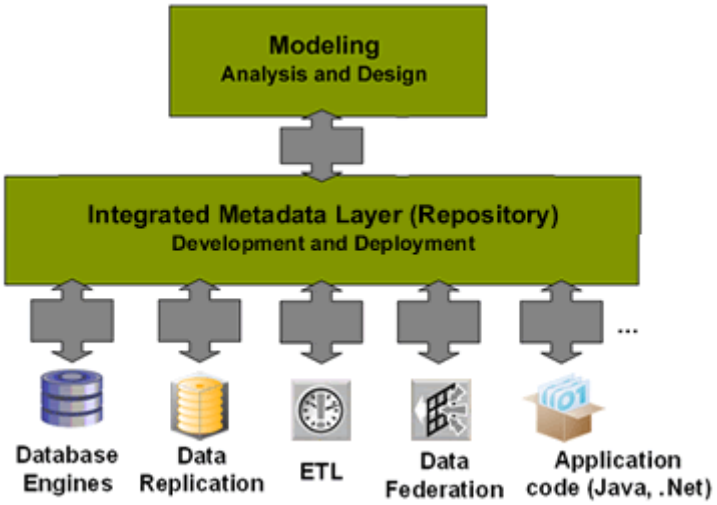
Source: WinterGreen Research, Inc.

3.6.19 Sybase SOA Modeling & Metadata

Sybase modeling and metadata implement SOA by leveraging services to implement business strategies flexibly. Sybase introduces the unwired enterprise to ensure consistency across IT systems and deliver solutions quickly. Agility is key to dealing with business change. Sybase metadata-driven solution that gives companies control over their existing data systems.

FIGURE 3-54

SYBASE SOA MODELING & METADATA LAYERS



Source: Sybase

Sybase's flagship enterprise data modeling solution, PowerDesigner, allows corporations to collect, integrate and leverage metadata. PowerDesigner is based on standard techniques such as data modeling, business process modeling and UML (unified modeling language). This foundation offers unique management and impact analysis capabilities. In addition, companies can leverage metadata to automatically produce code for industry-leading database engines as well as application development and deployment platforms. PowerDesigner is a data modeling tool. Used by tens of thousands of enterprises, PowerDesigner implements modeling techniques used to achieve an integrated metadata management of information derived from applications.

3.7 Sun Java Application Platform Suite

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Sun Java application platform suite is part of the Java enterprise system. Sophisticated infrastructure software is used to align IT business objectives. Value is achieved by providing for quick assembly of communities and data sharing through a service-oriented architecture.

Sun Java responds to decentralization challenges by enabling process-driven horizontal portals that access and aggregate information from across the enterprise. Web-oriented solutions are based on an individual's role in an organization. Employees, partners and customers can access data and resources by using workflow and leveraging centralized business applications.

3.7.1 Sun Web Services Interoperability SOA Technology (WSIT)

Sun Java system application server enterprise edition provides a high-performance, robust J2EE platform for delivering enterprise-class application services.

TABLE 3-55

SUN WEB SERVICES INTEROPERABILITY SOA TECHNOLOGY (WSIT) FUNCTIONS

• High-performance • Robust J2EE platform • Delivers enterprise-class application services • Java System Web Server • Java System Web Proxy Server • Delivers secure, interoperable, and highly reliable HTTP and proxy services for web and application server environments • Java System Portal Server • Provides a new level of enterprise productivity, enabling users and groups to work together easily and securely within the requirements of a dynamic organizational structure • Java System Message Queue • A high performance messaging system for integrating disparate applications, designed for large-scale enterprise deployments. • Java System Directory Server • Provides a secure, central repository for storing, managing, and protecting identity profiles, access privileges, and application and network resource information

TABLE 3-55 (CONTINUED)

SUN WEB SERVICES INTEROPERABILITY SOA TECHNOLOGY (WSIT) FUNCTIONS

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- Java System Access Manager (Limited License)
- Open, standards-based access control, single sign-on and federation services that help control costs and minimize the security risks of conducting business more openly.
- Sun's Service Registry
- Provides the means for registering and discovering web services, and managing associated metadata and artifacts securely and reliably

Source: WinterGreen Research, Inc.

3.7.2 Sun Java Studio Development Tools

Sun Java Studio Enterprise and Java Studio Creator are positioned to improve developer productivity with intuitive, easy to use tools and technologies that enable developers to rapidly innovate applications and Web services across multiple platforms and environments.

Services and support include software maintenance support and software technical support.

TABLE 3-56

SUN JAVA STUDIO DEVELOPMENT TOOLS BENEFITS

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- * Simple $50 USD/employee/year pricing subscription model
- * Truly flexible IT architecture through open, standards-based systems
- * Secure platform supporting both remote and mobile access
- * Ease of integration with 3rd party components

Source: WinterGreen Research, Inc.

3.8 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.

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3.8.1 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 3-57

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.

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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

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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 SOA/SOA 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 3-58 illustrates Microsoft SOA benefits.

TABLE 3-58

MICROSOFT SOA BENEFITS

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

Source: WinterGreen Research, Inc.

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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 SOA (SOA/SOA) 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. SOA/SOA 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.

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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® SOA 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.

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.

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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.

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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.

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Microsoft BizTalk Integration Core Architecture

Microsoft BizTalk integration core architecture provides adapters that use industry standards for automating and managing business processes. The core benefits include simpler setup, comprehensive management, and deployment capabilities, seamless upgrading, richer business user and developer experiences, and faster SOA.

Microsoft BizTalk Capabilities

Microsoft BizTalk has simpler setup, comprehensive management, and deployment capabilities.

BizTalk Server 2006 helps you get started faster with a simplified installation wizard, a component updater, and a one-click configuration. These tools enable you to install and configure BizTalk Server 2006 in a more straightforward and efficient way. In addition, BizTalk Server 2006 provides new capabilities that enable the IT administrator to be more productive in managing and operating an enterprise deployment, such as the ability to modify all configuration information. BizTalk Server 2006 offers a new management console that delivers enhanced monitoring and deployment capabilities. Included in those capabilities is the ability for your administrator to package complete applications into .msi files by using Microsoft Windows Installer.

Table 3-59 illustrates Microsoft BizTalk functions.

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TABLE 3-59

MICROSOFT BIZTALK FUNCTIONS

- Has integration core architecture
- Utilizes industry standards
- Automates business processes
- Manages business processes

Source: WinterGreen Research, Inc.

Table 3-64 illustrates Microsoft BizTalk core benefits.

TABLE 3-60

MICROSOFT BIZTALK CORE BENEFITS

- Simpler setup
- Comprehensive management
- Deployment capabilities
- Seamless upgrading
- Richer business user and developer experiences

Source: WinterGreen Research, Inc.

BizTalk setup and configuration capabilities are used to maintain core architecture that supports business user and developer experiences. BizTalk Server 2006 extends business activity monitoring (BAM) features. These deliver

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real-time support for business activity subscriptions and alerts. BizTalk Server has customizable BAM portal capabilities built on Microsoft ASP.NET 2.0 technology.

BizTalk Server 2006 supports developer productivity in building and optimizing business processes. Flat file schema creation wizard is implemented in Microsoft Windows SharePoint services adapter. A post office protocol 3 (POP3) adapter is offered. Systems are tightly integrated within Microsoft Visual Studio 2005 and built on the Microsoft .NET Framework 2.0.

Microsoft BizTalk SOA

BizTalk Server adapters have been implemented for enterprise applications. Siebel, PeopleSoft, and JD Edwards adapters support interconnectivity for applications and infrastructure.

BizTalk Server provides support for deploying, monitoring, and managing applications. Simpler installation is provided. Systems have improved capabilities for business activity monitoring (BAM).

For storage, the product can use SQL. BizTalk server can run on 64-bit Windows, taking advantage of the larger memory and other benefits this generation of hardware. The heart of the product is the BizTalk engine. The engine has two main parts.

A messaging component provides the ability to communicate with a range of software. Pluggable adapters are used for different kinds of communication. The engine can support a variety of protocols and data formats, including Web services. Support for creating and running graphically defined processes called

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orchestrations is provided. Orchestrations implement the logic that drives all or part of a business process. These are built on top of the engine's messaging components.

Several other technologies can be used in concert with the engine. A business rules engine allows evaluating complex sets of rules.

Table 3-61 illustrates Microsoft BizTalk SOA orchestrations.

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TABLE 3-61

MICROSOFT BIZTALK SOA ORCHESTRATIONS

- Orchestrations implement the logic that drives all or part of a business process
- Orchestrations are built on top of the engine messaging components
- Technologies can be used in concert with the engine
- A business rules engine allows evaluating complex sets of rules
- A health and activity tracking tool
- Lets developers and administrators monitor and manage the engine and the orchestrations it runs
- Enterprise single sign-on facility
- Provides the ability to map authentication information between Windows and non-Windows systems
- Provides a group of technologies that address business needs of information workers

Source: WinterGreen Research, Inc.

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Table 3-62 illustrates Microsoft BizTalk SOA technology.

TABLE 3-62

MICROSOFT BIZTALK SOA TECHNOLOGY

- Business activity monitoring
- Allow information workers to monitor a running business process
- Information is displayed in business rather than technical terms
- What gets displayed can be controlled directly by business people
- Business activity services
- Allow information workers to set up and manage interactions with trading partners
- Technologies are focused on solving the problems inherent in using a diverse set of software to support automated business processes

Source: WinterGreen Research, Inc.

Microsoft BizTalk Connecting Systems

Effectively exchanging messages across different software on different machines is an absolute requirement for integration. Given the diversity of communication styles that exist, the BizTalk Server 2006 engine must support a variety of protocols and message formats.

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As described next, a significant portion of the engine is devoted to making this communication work. One important fact to keep in mind, however, is that the engine works only with XML documents internally. Whatever format a message arrives in, it's always converted to an XML document after it's received. Similarly, if the recipient of a document can't accept that document as XML, the engine converts it into the format expected by the target.

Microsoft BizTalk Adapters For Sending and Receiving Messages

Microsoft BizTalk server engine talks to a variety of software. It relies on adapters to make this possible. An adapter is an implementation of a communication mechanism, such as a particular protocol. A developer can determine which adapters to use in a given situation. He might choose one of the built-in adapters BizTalk Server 2006 provides, for example, or use an adapter created for a popular product such as SAP, or even create a custom adapter. In all of these cases, the adapter is built on a standard base called the Adapter Framework. This framework provides a common way to create and run adapters, and it also allows using the same tools to manage all adapters.

BizTalk Server includes adapters:

Microsoft BizTalk Web Services Adapter

Web services adapter allows sending and receiving messages using SOAP over HTTP. SOAP is the core protocol for Web services. This adapter is critical for BizTalk server ability to interact in a service-oriented world. Web services use URLs to identify the sending and receiving systems.

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Table 3-67 illustrates Microsoft BizTalk web services adapters.

TABLE 3-63

MICROSOFT BIZTALK WEB SERVICES ADAPTERS

- Web services adapter allows sending and receiving messages using SOAP over HTTP
- SOAP is the core protocol for Web services
- Adapters are critical for BizTalk server ability to interact in a service-oriented world
- Web services use URLs to identify the sending and receiving systems
- File Adapter allows reading from and writing to files in the Windows file system
- Applications involved in a business process can often access the same file system, either locally or across a network, exchanging messages through files can be a convenient option
- HTTP adapters allow sending and receiving information using HTTP
- BizTalk Server engine exposes one or more URLs to allow other applications to send data to it, and it can use this adapter to send data to other URLs.
- MSMQ Adapter: allows sending and receiving messages using Microsoft Message Queuing (MSMQ).
-
-

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TABLE 3-63 (CONTINUED)

MICROSOFT BIZTALK WEB SERVICES ADAPTERS

- MSMQT Adapter: allows sending and receiving messages using BizTalk Message Queuing (MSMQT). MSMQT is an implementation of the MSMQ protocol that can receive and send MSMQ messages into the MessageBox
- BizTalk server includes this adapter, applications built today should use the MSMQ adapter
- WebSphere MQ adapter allows sending and receiving messages using IBM WebSphere MQ (formerly known as MQSeries).
- SMTP adapter allows sending messages using SMTP
- Standard email addresses are used to identify the parties.
- POP3 Adapter: allows receiving email messages and their attachments using version three of the Post Office Protocol (POP3).
- Windows SharePoint Services (WSS) Adapter: allows accessing and publishing documents stored in SharePoint document libraries.
- SQL Adapter: allows reading and writing information to a SQL Server database.

Source: WinterGreen Research, Inc.

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Table 3-64 illustrates Microsoft BizTalk web services adapters for commonly-used business software.

TABLE 3-64

MICROSOFT BIZTALK WEB SERVICES ADAPTERS FOR COMMONLY-USED BUSINESS SOFTWARE

- Adapters for Siebel
- Adapters for PeopleSoft
- Adapters for Oracle applications
- Adapters for Oracle databases
- Adapters for JD Edwards OneWorld and EnterpriseOne
- Adapters for Tibco Rendezvous
- Adapters for Tibco Enterprise Messaging Service
- Adapters for Amdocs Clarify
- Microsoft partners provide adapters, including connectors for electronic data interchange (EDI)

Source: WinterGreen Research, Inc.

Microsoft BizTalk Server Broker for Managing Applications

The main tool for managing the BizTalk server engine is the administration console. Microsoft management console is a snap-in that provides a user

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interface for administrators. This tool gives administrators the ability to deploy BizTalk applications.

TABLE 3-65

MICROSOFT BIZTALK SERVER BROKER FOR MANAGING APPLICATIONS

- Deploy BizTalk applications
- Wrap together all of the parts in a solution
- Work with a complete BizTalk application as a unit
- Deploy BizTalk application to one or more servers
- Configure BizTalk applications
- Create an orchestration in logical terms
- Define how the BizTalk server engine communicates with a particular application
- Select an HTTP adapter without worrying about the specific URL that will be used
- Make the application work by specifying these details
- Specify that the send pipeline should include a component that adds a digital signature to outgoing messages without worrying about exactly what key will be used to create this signature

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TABLE 3-65 (CONTINUED)

MICROSOFT BIZTALK SERVER BROKER FOR MANAGING APPLICATIONS

- Console allows an admin to create and modify configurations
- Monitor applications
- Monitor the operation of BizTalk using Group Hub page
- Gives information about the current status of these applications
- Examine status in various ways
- Uses color-coded indicators to display problems
- Lets administrators take a proactive approach to application monitoring

Source: WinterGreen Research, Inc.

3.9 Raining Data / Tiger Logic

Raining Data TigerLogic FastSOA complements SOA software platforms from Microsoft, IBM, Oracle, Tibco, and BEA Systems. Tiger Logic best of breed XML data management system is for caching legacy data to improve performance and for storing all XML messages. Systems are used for creating auditability of information processed.

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SOA flexibility needs to be complemented with performance, scalability and auditability improvements. As the number of SOA applications increases, shared services become the bottleneck. Services that access legacy applications and data stores are evolving. SOA access to enterprise shared services brings a concentration of requests through a small number of data access services.

Mid-tier data caching offers a solution to achieve required system performance. Scalability and flexibility occur by moving the required data as close to the services as possible. As more services are added, it becomes difficult to capture all the information exchanged. A high performance central repository is used to store and index XML messages. It is needed for reporting and regulatory requirements.

3.9.1 Raining Data TigerLogic FastSOA Architecture

TigerLogic FastSOA is a standards-based middle-tier Web Services SOA platform. Components are a data cache and a message repository.

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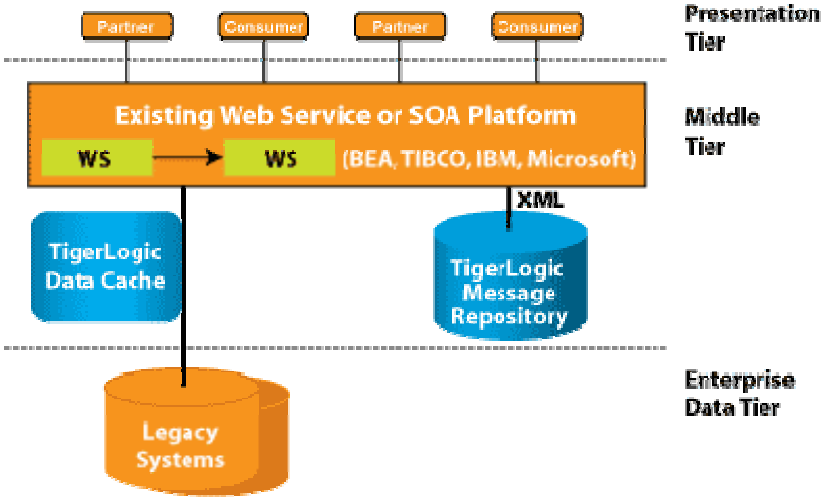
TABLE 3-66

TIGERLOGIC FASTSOA SOA / WEB SERVICES ARCHITECTURE



Source: TigerLogic.

TigerLogic FastSOA (Blue) fits in the middle tier of existing SOA or web services architecture. The TigerLogic FastSOA data cache stores legacy data and services at the middle tier with specified refresh policies (update every fifteen minutes, update at end of day, update when legacy data changes). The middle tier application now goes to cached data or service rather than the legacy RDBMS or enterprise service.

This improves performance and reduces the load on the legacy systems. The TigerLogic data cache can be configured to allow write-through to the legacy system as well as to store the cache in-memory (versus on disk) for improved performance.

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TigerLogic FastSOA data cache comes with a wizard to select the legacy data sources, refresh policies, write-through policies, and implement triggers.

3.9.2 Raining Data TigerLogic FastSOA Architecture

Raining Data TigerLogic FastSOA is standards-based and plugs into the mid-tier of existing Web Services or SOA platform. The mid-tier cache stores data and services in front of the mid-tier applications to offload processing at both the mid-tier and the enterprise data tier. Alternatively, data or services can be cached behind the mid-tier application. Requests go to the mid-tier application, which then goes to the cached data or service.

The TigerLogic FastSOA message repository captures and indexes messages in the native XML format. The XML message repository allows managers to profile messages, payloads, and transactions for auditing. Regulatory requirements are managed.

SOA transactions may be complex and involve many Web Services. Data associated with a single SOA transaction might total 1 MB, involve multiple Web Services, involve multiple updates and be heavily nested. TigerLogic FastSOA is built on the TigerLogic XML Data Management Server (XDMS).

It provides a high performance XML data management. The system can handle, insert, update, and make hierarchical representation on inexpensive commodity hardware. If XML messages have new XML schemas, then the TigerLogic XDMS evolves to handle the new schema and can trigger a change notification process.

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TABLE 3-67

RAINING DATA TIGERLOGIC FASTSOA BENEFITS

- Improve the performance of Web Services
- Improve the auditability of Web Services
- Improve the performance of SOA applications
- Improve the auditability of Web Services
- Accelerate service performance
- Cache data next to the requester or service
- Accelerate performance in-memory cache
- Eliminate round-trips to the source database for each service request
- Reduce overall load on the source system
- Allow the architecture to scale
- Capture messages for auditing and reporting purposes
- Index messages for auditing and reporting purposes
- Provide a high performance native XML database
- Handle new schemas in XML messages

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TABLE 3-67 (CONTINUED)

RAINING DATA TIGERLOGIC FASTSOA BENEFITS

- Evolve XDMS to handle change
- Trigger a change notification process
- Provide application state management
- Provide long-running transactions
- Further offload work from the main data source

Source: WinterGreen Research, Inc.

3.10 Vitria Business Accelerator

Vitria Business Accelerator leverages business process integration software technology by complementing existing infrastructure. A platform-agnostic solution empowers customers leverages existing investments in infrastructure software to integrate services, events, applications, automated processes and human workflow.

SOA agility is needed as business needs change. Leading J2EE applications servers and messaging platforms are used in conjunction with Vitria technology to service-enable an existing infrastructure or access the value and power of open source communities. They reuse existing investments to build composite applications.

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Business Accelerator allows customers to tap into "islands" of SOA initiatives to achieve higher ROI on their existing investments. This is accomplished by ESB federation and mediation capabilities. Customers can build once and deploy anywhere within a heterogeneous environment.

TABLE 3-68

VITRIA BUSINESS ACCELERATOR FUNCTIONS

- Leverage business process integration software investment
- Complement existing infrastructure
- Provide a platform-agnostic solution
- Empower customers
- Integrate services, events, applications, automated processes and human workflow
- Provide agility needed as business needs change
- Integrate SOA platform with leading j2ee applications servers
- Integrate SOA platform with leading messaging platforms
- Service-enable an existing infrastructure
- Support access to existing it assets
- Leverage the value and power of open source communities
- Reuse existing investments to build composite applications.

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TABLE 3-68 (CONTINUED)

VITRIA BUSINESS ACCELERATOR FUNCTIONS

- Allows customers to tap into "islands" of SOA initiatives
- Achieve higher ROI on their existing investments
- Implement ESB federation and mediation capabilities
- Build once and deploy anywhere within a heterogeneous environment

Source: WinterGreen Research, Inc.

Vitria provides a fully scalable SOA integration suite. Business Accelerator ESB allows customers to reduce business risk by starting with a lightweight Enterprise Service Bus (ESB) for small projects. Business Accelerator Process Edition gracefully increases functionality to a full process integration suite when requirements become more complex. Both the ESB and Process Editions leverage the Eclipse next generation modeling environment.

3.10.1 Vitria Resolution Accelerator

Vitria Resolution Accelerator is a comprehensive solution. Features are useful for resolving the complex issue of business exceptions. Manulally processed exceptions cause delays, high costs, and customer dissatisfaction. Exceptions occur at all levels of an IT system, service, process and business.

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Vitria systems handle end-to-end lifecycle management. End-to-end lifecycle management capability provides visibility into exceptions. Process, enabling sophisticated analysis leads to the correction of process weaknesses. Comprehensive auditing and logging of every aspect of the exception resolution process supports stringent regulatory requirements.

Resolution Accelerator feature identifies multiple instances of the same exception. It provides a way to correct them, creating significant productivity improvements. It features visual dashboards that monitor and analyze real-time exceptions, providing insight into business exceptions to optimize processes.

Resolution Accelerator includes rules-based and meta-data driven dictionaries. These guide the user through each step of classifying and routing exceptions, improving ease of use, and speeding time to resolution.

3.10.2 Vitria Resolution Accelerator Return on Investment

In production environments, Vitria Resolution Accelerator has measurable ROI. 66% reduction in exception backlog, 85% automatic issue resolution, and 60% fewer staff are aspects of a total cost of ownership analysis that provides incentive to implement automated integration process..

Resolution Accelerator runs on Business Accelerator and benefits from its open agnostic SOA architecture. By its nature, SOA's loosely coupled architecture and multiple layers increase the need for a business exception solution.

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3.10.3 Vitria Solution

Vitria offers best-of-breed solutions that permit an enterprise to support a partner eco-system. Leading Vitria partners include Red Hat/J Boss, Amberpoint, IBM and i-Way. These partners provide state-of-the-art technology and complementary capabilities.

Vitria gives customers the freedom to do SOA their way, with the building blocks to choose the configuration that works best for their specific needs. Providing an open, platform-agnostic solution, gives an approach to other vendor products in heterogeneous environments. Vitria BPM is positioned to assure SOA implementation efficiently. Vitria state-of-the-art solution has an exception management capability that can generate significant and measurable business benefits.

3.10.4 Vitria Pricing & Availability

Vitria Business Accelerator is priced at $15,000 per CPU. Business Accelerator Process Edition is $40,000 per CPU. Resolution Accelerator is priced at $50,000 per CPU.

3.10.5 Vitria Business Accelerator and BusinessWare™

Vitria Business Accelerator builds on and complements the legacy and B2B integration capabilities of BusinessWare® software. It extends the range of enterprise initiatives from legacy integration to SOA-based process integration.

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3.11 Iona Artix Registry/Repository

Iona Artix Registry/Repository is designed for use in performance-demanding, heterogeneous IT environments. It can be deployed in an incremental manner and extends across an open source product line, FUSE. The product delivers, service network provisioning, SOA validation, and visual service management to Global 2000 customers deploying distributed SOA in the enterprise.

Iona Fuse solutions accelerate adoption of open source for SOA across the enterprise. Fuse family of open source products introduce management capabilities and simplify adoption for new users

Distributed service-oriented architecture (SOA) infrastructure solutions are for performance-demanding IT environments. FUSE(TM) family of Open Source SOA products relates to updates to the FUSE community open.iona.com. The FUSE products are IONA's tested and certified releases of leading SOA open source projects at the Apache Software Foundation. IONA selects specific releases from each project, which it tests, fully documents and distributes under the Apache License, complimented by 24x7 enterprise support, consulting and training for customers looking to deploy Open Source SOA technology in mission-critical business applications.

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IONA FUSE is designed for compatibility with an organization's existing infrastructure, and components can be deployed together or independently and in conjunction with leading Open Source and commercial enterprise technologies, offering unrivalled flexibility. IONA FUSE supports and extends the approach to distributed SOA pioneered by the IONA Artix(TM) suite of commercially licensed SOA products.

Open source software within the enterprise is being used in enterprises as a hybrid strategy, employing closed and open source projects side by side, as complements to one another. IONA FUSE solutions are frequently deployed in conjunction with components of the IONA Artix Suite, including the Artix Registry/Repository, Artix Orchestration, Artix Data Services and Artix ESB.

This combination of open source and commercially licensed solutions for SOA, are a hybrid deployment model. Hybrid open source support is a natural consequence of the Artix product suite's technology-neutral, standards-based design. The FUSE product family is a modular, standards-based design. The hybrid model delivers a broad, best-of-breed product offering that supports the leading Open Source and commercial offerings for SOA infrastructure requirements in a single solution.

3.11.1 Iona Artix Suite Provisioning And Managing SOA Implementations

The Artix suite includes, Artix Enterprise Service Bus (ESB), Artix Registry/Repository, Artix Data Services, Artix Orchestration, Artix Mainframe and SOA Management.

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The enhancements to Artix address customers' growing requirements for SOA governance, management and interoperability across complex, multi-protocol and multi-platform environments. These updates include:

Advances for provisioning and managing SOA implementations are achieved. Artix Registry/Repository allows customers to utilize its active SOA governance capabilities to effectively develop, test, deploy and manage the lifecycle of services across their distributed SOA environments.

TABLE 3-69

IONA ARTIX SUITE FUNCTIONS

- Versioning support for services
- Versioning support for repository artifacts
- ability to customize repository data model
- Improved user interface
- Viewing a visual state of policies, services and containers
- Simplifying IT operations
- Ability to publish services to a UDDI V3 registry

Source: WinterGreen Research, Inc.

3.11.2 Iona Leadership In Supporting SOA Best Practices And Industry Standards

The latest Artix release includes support for the popular Enterprise Integration Patterns(1). By implementing this standard vocabulary of services

developers reduce error rates and shorten the time-to-market for new services deployed across an SOA. IONA also adds capabilities for facilitating the development of complex BPEL processes in Artix Orchestration through support for BPEL message attachments and Identity and Mail services.

TABLE 3-70

IONA ARTIX SUITE SOA INTEROPERABILITY FUNCTIONS

- Addressing customer requirements
- Speed the integration of heterogeneous environments
- Enhanced interoperability between Artix ESB and Artix Data Services
- eliminates the coding of data services with ESB services
- Richer mainframe and CORBA service enablement functionality
- Extend the life of legacy assets
- Artix Registry/Repository
- Support for Artix Orchestration processes
- IONA FUSE(TM) services framework services and containers

Source: WinterGreen Research, Inc.

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3.11.3 IONA Artix

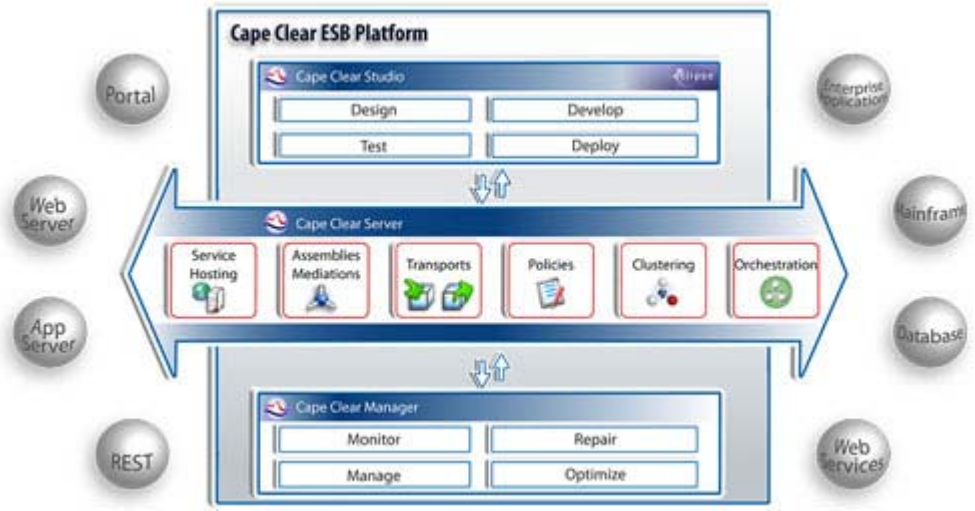
IONA Artix is a suite of advanced SOA infrastructure products that enables customers to deploy distributed SOA. A componentized, technology-neutral SOA infrastructure that works to allow flexibility in SOA adoption. IONA Artix is based on a lightweight, microkernel architecture that provides organizations with the ability to incrementally adopt SOA on their own terms, one step at a time.

3.12 Cape Clear

Cape Clear has positioned to provide an ESB platform that is used to maintain SOA with high performance mediation.

FIGURE 3-71

CAPE CLEAR ESB PLATFORM



Source: Cape Clear.

3.13 Hewlett Packard

Hewlett Packard is a new entrant into the SOA market in 2007, with measureable market share for the first time. Products are positioned to reduce the risk of moving to SOA. IT organizations use HP SOA to help enterprises meet business needs. IT organizations are turning to SOA to provide the ability to reuse code modules.

SOA dramatically improves the flexibility and adaptability of an IT organization by accelerating time-to-market for new applications. SOA helps drive down IT costs by making services highly reusable and enabling business processes that are built for change.

Benefits come with new risks. If not properly implemented, SOA can disrupt the business, instead of becoming more agile, business can become more fragile.

3.13.1 HP SOA Positioning

HP is a leader in SOA. It has moved to make SOA support integration of processes inside the company using SOA.

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TABLE 3-72

HP SOA POSITIONING INSIDE THE COMPANY

- Customers and partners interact with HP as one company
- Products and solutions go-to-market through integrated, global supply chains
- HP workforce operates as a single company
- IT cost and complexity are reduced
- Business performance improves
- 1,200 networked sites
- 215,000 desktops
- 49,000 network devices
- 7,000+ applications
- 900+ web servers and infrastructure
- 21,671 servers
- 228,000 mailboxes
- 26 million emails a week
- 30 million B2B messages monthly

Source: WinterGreen Research, Inc.

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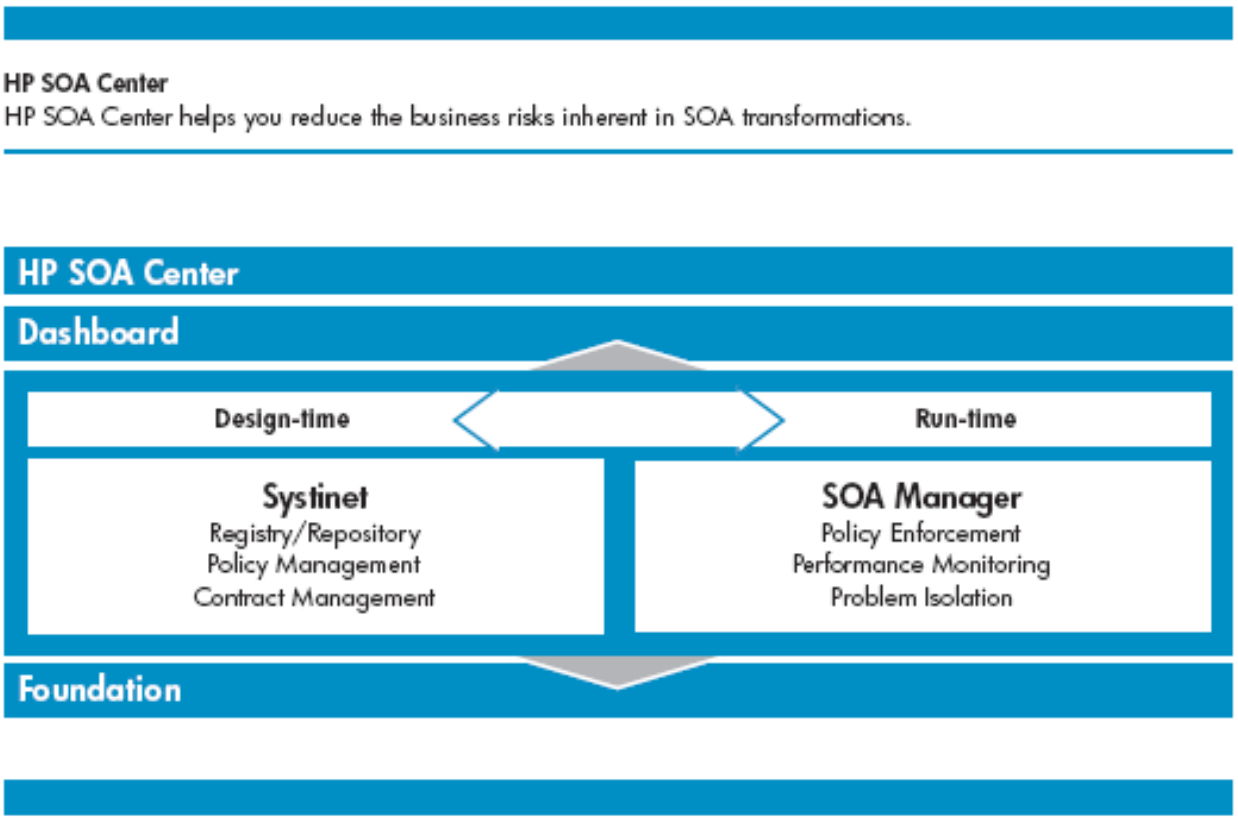
3.13.2 HP SOA Center

HP SOA Center helps users respond to the challenge of integrating the enterprise. It enables users to capitalize on SOA opportunities while reducing the business risks inherent in SOA transformations.

FIGURE 3-73

HEWLETT PACKARD SOA POSITIONING



Source: Hewlett Packard.

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The adaptive enterprise from HP is helped by Systinet that is used to integrate and orchestrate business strategy. HP SOA center includes the essential elements for governance and management that needs to be made to be sure that architecture will scale from pilot to full production. With HP SOA Center, users are able to manage and control the increased complexity that SOA introduces to IT.

TABLE 3-74

HP SOA CENTER ESSENTIAL ELEMENTS

- Increase SOA adoption and service reuse
- Manage and control the increased complexity that SOA introduces to IT
- Scale SOA as the number of services and users grows
- Deploy high-quality SOA
- Deliver measurable business outcomes
- Gain a standard-based registry of services, providing discovery, publishing and governance of service interfaces
- Capture, catalog and describe all service-specific artifacts within the underlying repository
- Establish an integration point for configuration management database (CMDB) and enable heterogeneous access through the Governance Interoperability Framework (GIF)

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TABLE 3-74 (CONTINUED)

HP SOA CENTER ESSENTIAL ELEMENTS

- Optimize the business outcome of SOA
- Include the essential elements for governance and management that need to make sure that SOA architecture will scale from pilot to full production
- Provide end-to-end SOA policy management
- Automate validation of policy conformance at design-time
- Distribute and enforce policies at run-time across enforcement points.
- Enable extensibility for new policies across design time and run-time
- Facilitate creation and communication of service level agreements (SLAs) between service consumers and providers
- Provide essential SOA monitoring
- Get alerts on detected performance issues for SOA based services and resolve performance and availability issues
- Aggregate performance data across service instances and their operations
- Gain an upgrade path for sophisticated SLAs, end-user monitoring
- Leverage HP SOA Center components

Source: WinterGreen Research, Inc.

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HP Systinet software provides a complete SOA governance platform that accelerates adoption and mitigates the business risk of SOA. It provides a trusted "system of record" and increases the adoption of SOA.

TABLE 3-75

HP SYSTINET SOA SOFTWARE KEY CAPABILITIES

- Enable services to be easily found and understood by service consumers and gain a 360-degree view of a service at every phase in its lifecycle
- Enhance the reliability of services through consistency and interoperability and formalize an explicit agreement between consumers and providers
- Manage the service lifecycle from introduction to retirement, understand capacity needs and reduce the overall impact of service changes
- Provide link between design-time governance processes and traditional operations management systems
- Focus on providing SOA-centric run-time management capabilities
- Provide essential performance management, problem isolation and policy enforcement—SOA
- Allow users to rapidly gain control over the operational aspects of the services within an organization
- Start where user can achieve the greatest ROI
- Bring together software and services in SOA
- Provide mature SOA lifecycle solution

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TABLE 3-75 (CONTINUED)

HP SYSTINET SOA SOFTWARE KEY CAPABILITIES

- Integrated solution
- Enable a lower total cost of ownership
- Enable an evolutionary adoption of SOA
- Support heterogeneous platforms—both SOA and traditional

Source: WinterGreen Research, Inc.

HP SOA Center is a key component of the HP BTO for SOA strategy. This strategy is uniquely positioned to help optimize the business outcome of SOA.

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TABLE 3-76

HP SOA CENTER KEY APPROACH TO SOA

- Flexible starting points
- Flexible SOA governance implementation
- Governance, testing or operations
- Single-vendor approach
- Independent solution
- Solution for mixed SOA platforms

Source: WinterGreen Research, Inc.

3.13.3 HP SOA Center Functions

HP SOA Center helps users reduce the business risks inherent in SOA transformations.

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TABLE 3-77

HP SOA CENTER COMPONENT FUNCTIONS

- Platform foundation
- Dashboard
- Design-time
- Run-time
- SOA Manager
- Policy Enforcement
- Performance monitoring
- Problem isolation
- Systinet
- Registry / Repository
- Policy management
- Contract management
- BTO: Optimize the business outcome of IT

Source: WinterGreen Research, Inc.

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HP SOA Center is a key component of the HP business technology optimization (BTO) strategy. BTO helps make sure that dollars invested in IT have resources allocated to match that investment. Every application in development or production needs to be measured to see that it meets business goals. HP software offerings and methodologies focus on internal and external IT processes.

HP BTO optimizes the strategic functions between technology and business. A lifecycle approach enables organizations to align IT with business priorities and to deliver increased value from end to end.

HP SOA Center is designed to accelerate SOA adoption and mitigate risk. Technology of service-oriented architecture (SOA) is powerful, holding the potential to transform both IT and business. SOA introduces new levels of complexity that can put business outcomes at risk. As a result, governance is an imperative and a foundational aspect of SOA.

HP SOA Systinet software is complete SOA governance software and includes a registry and repository foundation as the system of record. It includes a rich set of governance capabilities.

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3.13.4 HP SOA Systinet Software Functions

TABLE 3-78

HP SOA SYSTINET SOFTWARE FUNCTIONS

- Publish and discovery:
- Provides a basis for capturing metadata, relationships and service descriptions within a flexible and searchable service catalog
- Policy and conformance management:
- Automates the process of validating architectural consistency
- Provides registry and repository integrity
- Drives interoperability and conformance of services and their artifacts throughout the service lifecycle

Source: WinterGreen Research, Inc.

HP SOA Systinet software offers consumer management. It allows consumers and providers to negotiate and agree upon conditions or use and service-level expectations, reducing conflicts and misaligned expectations.

Lifecycle management is offered as it manages the state changes of a service as it evolves across its lifecycle and helps users understand the impact of service changes.

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HP SOA Systinet reporting lets users create and generate reports for measuring various facets of SOA, including portfolio, conformance and adoption. Interoperability: provides a UDDI registry for standards-based integration and discovery of services.

HP SOA Systinet governance interoperability framework (GIF): is the widely adopted set of specifications for SOA governance interoperability and provides seamless interoperability with run-time tools and other SOA infrastructure.

Part of the HP business technology includes optimization (BTO) strategy that is used for optimizing SOA. For SOA success, users need an integrated approach that strengthens the relationship among stakeholders and leverages assets across the lifecycle. HP business technology optimization (BTO) solutions optimize business outcomes from IT and include SOA governance, quality and management. Benefits of this approach include greater business agility and fewer duplications of effort by providing services that are consistently discovered, understood and trusted as the basis for new applications.

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TABLE 3-79

HP BUSINESS TECHNOLOGY OPTIMIZATION (BTO) STRATEGY ASPECTS

- Greater business agility and fewer duplications of effort by providing services that are consistently discovered, understood and trusted as the basis for new applications
- Lower maintenance costs and more flexible applications by building consistency into services
- Higher quality services and fewer service outages by providing services that meet business requirements and deliver uninterrupted performance when they are put into production
- Reduced risk of SOA initiatives by delivering the flexibility and cost savings that SOA promises without allowing complexity to turn into chaos

Source: WinterGreen Research, Inc.

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TABLE 3-80

HP BUSINESS TECHNOLOGY OPTIMIZATION (BTO) STRATEGY KEY CHALLENGES

- Seamlessly understanding of the impact of change to services
- Discovering of services that can be reused to support applications
- Determination that services conform to enterprise policies

Source: WinterGreen Research, Inc.

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TABLE 3-81

HP BUSINESS TECHNOLOGY OPTIMIZATION (BTO) SOA SYSTEM OF RECORD CAPABILITIES

- HP SOA Systinet provides a complete system of record for SOA services and a rich set of governance capabilities
- Publish and discover services
- Report and understand SOA
- Verify service conformance
- Create consumer / provider contracts
- Understand impact and manage change
- Governance
- Interoperability
- Framework (GIF)
- UDDI registry SOA repository
- SOA system of record

Source: WinterGreen Research, Inc.

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TABLE 3-82

HP SOA BUSINESS TECHNOLOGY STRATEGY KEY BENEFITS

- Includes an intuitive service catalog for publishing and discovering business services
- Displays role-based views into SOA information
- Shows the user experience through an automated process
- Provides a rich registry and repository platform
- Exposes RSS, rich and UDDI query capabilities
- Has built-in and extensible reporting
- Includes a UDDI registry for seamless interoperability with the SOA ecosystem
- Has rich capabilities, including taxonomy and customization editors, for organizing and managing SOA information
- Contains complete architectural and interoperability policy management capabilities
- Includes capabilities for negotiating consumer and provider contracts and that integrate with HP Business Availability Center software for availability, service health reporting and access to key service metrics
- Results in less conflict and better transparency between consumers and providers
- Supports lower-risk SOA deployments by managing complexity and providing a system of record

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TABLE 3-82 (CONTINUED)

HP SOA BUSINESS TECHNOLOGY STRATEGY KEY BENEFITS

• Encourages reuse through service discoverability and trustworthiness • Provides complete control over the service lifecycle

Source: WinterGreen Research, Inc.

3.13.5 HP SOA Systinet Provides Governance For Accelerating Adoption And Mitigating The Risk Of SOA

Users can choose the capabilities needed. HP SOA Systinet provides governance for accelerating adoption and mitigating the risk of SOA. It acts as your foundation for complete visibility, trust and control into a SOA environment.

Systinet Visibility Edition (VE) software provides a consistent way to describe, organize and publish business services and related information for easy discovery, reuse and run-time interoperability. HP SOA Systinet VE lets users add policy management, consumer management, advance reporting and lifecycle management. HP SOA Systinet VE lets users leverage HP quality management, performance management and operational monitoring and management.

HP SOA Systinet Standard Edition (SE) software extends these capabilities through trust and control functions, enabling governance of SOA services.

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3.14 Fiorano

Fiorano SOA is built on a standards-based enterprise service bus, enabling the effective coordination and interaction of software assets across the extended enterprise. Fiorano SOA 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.

3.14.1 Fiorano ESB

The Fiorano ESB is a web-services capable infrastructure 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.

3.14.2 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.

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

3.14.3 Fiorano SOA Platform

Fiorano SOA platform implements real-time business capabilities built on a standards-based enterprise service bus, enabling the effective coordination and interaction of software assets across the extended enterprise. Fiorano SOA allows companies to draw on existing business logic and processes to assemble solutions for particular problems, leading to flexibility, productivity, and responsiveness to changing business conditions.

Fiorano SOA platform offers a number of benefits over existing solutions for real-time enablement, including faster implementation and deployment cycles, a flexible platform for future expansion offering a high degree of reuse, easy extensibility, seamless interoperability and an improved ROI.

3.14.4 Fiorano SOA Platform Components

The Fiorano ESB is a web-services capable infrastructure infrastructure platform that supports intelligently-directed communication and mediated relationships between loosely coupled (SOA) and decoupled (EDA) business components. Fiorano ESB supports 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.

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3.15 Monitoring SOA

Monitoring SOA depends on messaging systems. SOA is a group of APIs to independent components of code that perfrom a task. The messaging is needed to move information from one component to another.

3.16 MQ Software QNami

MQ Software Q Nami! gives visibility and control over IT enterprise mission-critical business services. High-value transactions are delayed at bottlenecks of the messaging nodes on a network from time to time. MQSoftware permits IT mangers to notice bottlenecks at any point in the transmiss process.

Defined transaction flows can encounter a bottleneck in any step of the message transport execution. Q Nami! monitors and reports transactions and payload data in real-time, while maintaining a complete, easily accessible historical record of transaction service levels. Easily installed and deployed without changes to existing applications, Q Nami! delivers immediate payback through intuitive dashboards and management reports to support infrastructure and process improvements.

3.17 Tidal Intersperse Management and Analysis of SOA Applications

Tidal Intersperse management and analysis of SOA applications transaction tracing, composite SLAs, and enhanced visualization are provided for proactive SOA management. Tidal Software application scheduling and

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performance management software comprehensive solution supports Java and .NET. Tidal Software SOA performance management detailed transaction tracing can capture transaction flow inside components, between tiers, and across application servers for end-to-end monitoring and management in dynamic production environments.

The detailed transaction tracing builds composite SLAs, enabling proactive performance management in the business context. Products work across the multiple applications and servers that are often involved in composite SOA applications. Intersperse delivers a customizable user interface to provide a visual, role-based display of the wide range of information needed for managing SOA deployments.

SOA is used to create rich, composite applications. It has complexities in managing the operation of these dynamic systems. Intersperse supports Tomcat and SAP NetWeaver . It offers coverage for WebLogic, WebSphere, JBoss, and .NET.

Traditional systems management tools approach the problem from a server or network centric view. In contrast, Tidal Intersperse has fine grain visibility into the composite SOA application.

3.17.1 Tidal Intersperse Proactively Pinpoints Performance In The Context Of Business Process

Tidal Intersperse fine grained visibility permits IT managers to be able to proactively pinpoint performance problems in the context of business process. Each part of the overall system can appear healthy while individual user

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transactions can be held up. Diagnostics are used to combine runtime monitoring across multiple application servers. Diagnostics are used to create detailed end-to-end transaction monitoring within a single tool, enabling proactive detection of problems, fast root cause analysis, and recovery. The systems are used to create self-healing solutions for SOA deployments.

Management of enterprise applications requires a level of insight that is achieved through consolidation and visualization of a large amount of complex information. Fine grain monitoring at each server is an essential aspect of effective management of composite applications. These composite applications benefit from detailed visibility into the flow of transactions across servers and applications.

Since the SOA applications are comprised of component pieces of code that are interconnected loosely, it is important to know that each piece of code is functioning as it should. Tidal Intersperse comprehensive set of capabilities are used for managing and monitoring SOA applications.

Capabilities for detailed monitoring and managing of SOA applications include discovery of servers and application components, performance monitoring at both the component (detailed) and web service (message payload) levels, performance analysis and notification through detailed reporting and composite SLA management, and control for automating corrective action to create self-healing solutions.

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3.17.2 Tidal Intersperse Solutions Utilize Standard JMX

Tidal Intersperse solutions utilize standard JMX for monitoring information. Systems deliver a non-invasive, low overhead solution for SOA performance management. Intersperse has a distributed architecture – based on SOA. To best manage SOA the system is moving the overhead of complex processing off the managed application server and into the Intersperse management server. Transaction tracing, composite SLA management, correlation, and context analysis are done on a separate server.

Runtime monitoring solutions that require a shutdown / restart cycle to turn on detailed monitoring or respond to changes or updates made to the SOA environment are not economical because the downtime has a deleterious effect of operations. Downtime can cost $ 1MM per minute. At this rate, down time is not desirable.

The non-invasive architecture of Intersperse allows operators to add instrumentation “on-the-fly”, zooming in on performance detail with zero down-time. The strategy is to provide end-to-end monitoring and management solutions that enable automated diagnostics, recovery, and control of composite applications built on SOA. Intersperse delivers a critical component in completing this goal. A sophisticated runtime monitoring solution correlates information into a single actionable description of the situation. Advanced SOA management and the application performance analytics are targeted to delivering solutions that radically simplify the operation of composite, SOA applications.

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Tidal Intersperse is available to do job scheduling and application performance management.

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TABLE 3-83

TIDAL SOFTWARE MODULES

- Job Scheduling
- Application Performance Management
- Business Intelligence
- ETL Accuracy

Source: WinterGreen Research, Inc.

Tidal Software brings a simple approach to optimizing the operations of complex assets: It seeks to optimize operations supported by infrastructure of enterprise applications including SAP, Oracle, Informatica, and Symantec/Veritas. Automation of datacenters includes making enterprise applications more efficient, productive, reliable, and secure.

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Automating complex and routine tasks are associated with day-to-day application management: job scheduling and performance monitoring creates more reliable systems. From a single console, Tidal Software creates an optimized view of application operations across the enterprise.

3.18 Skyway SOA Visual Workspace Models Used to Build SOA Code

Skyway Visual Workspace™ enables software developers to permit business analysts to visually prototype business requirements, then develop and deploy software direct from the model. Through ease of use integration with BEA AquaLogic® Registry Repository, Skyway Visual Workspace™ is used to create and publish asset metadata and find or reuse assets and services. One development tool can be used instead of two. The end result is customer-facing services developed by the analyst.

Skyway Software modeling tool leverages a registry repository to generate and reuse services. SOA applications speed development. It removes the complexities surrounding Java and JEE. Strategic SOA deployments provide capabilities based on using a registry repository to achieve access to reusable components that are called and used by developers to create new iterations of code.

The combination of BEA's AquaLogic® Registry Repository and Skyway Visual Workspace™ enables asset lifecycle governance, architecture alignment, optimized software reuse, and provides measurable value to all sizes of enterprises.

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Metadata registry repository solutions enable firms to reduce complexity and improve the governance of enterprise programs, such as SOA and Web services, which can become complex if not managed correctly.

Organizations can use models to reference SOA services to meet strategic business implementation of automated process. Collaborative SOA deployment tools are used to implement automated processes that integrate with and utilize an enterprise-wide repository. SOA changes the IT dynamic by supporting planning business changes, then facilitating making those changes based on making small changes to software assets that already exist.

Seamless integration of Skyway Visual Workspace™ through BEA AquaLogic® Registry Repository's Metadata Interoperability Framework allows easy plug in to BEA WorkSpace 360º, which is the industry's first unified SOA toolset to bring business analysts, architects, developers and IT operations professionals into a shared workspace for collaboration and interaction. This ecosystem allows organizations to ensure that their architecture and underlying implementation is aligned with overall business objectives.

"Skyway Visual Workspace™ is a natural fit for an open platform like BEA WorkSpace 360 º," said Sean Walsh President and CEO of Skyway Software. "Combining our iterative and collaborative tools and processes with BEA's system-agnostic approach will enable BEA and Skyway Software customers to drive real business innovation and outstanding results."

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3.18.1 Skyway SOA Model Driven Interactive Services Delivery

Skyway approach to software integration process uses Skyway Interactive Delivery. It is comprised of three components. Skyway Model Driven Development and Deployment (M3D)™ Platform, is a model driven, SOA centric development platform. It enables rapid development and deployment of reusable services, composite applications. User interfaces leverage models rather than having to hand code. The platform is a shared workspace where all roles involved in defining, developing, and deploying services and composite applications.

Business analysts can collaborate with each other to build new automated business processes using models. SOA software development occurs using models to achieve flexibility. Developers can be located in different geographical locations.

Skyway Interactive Delivery™ is an interactive development methodology based on a platform. At the core of this delivery approach requirements can be easily and visually prototyped using a model. Requirements are evolved into the production application. Nothing is wasted or re-done as with other requirements development / prototyping approaches.

Skyway is differentiated from software development tools in key ways. Skyway has model driven development and deployment platforms. Skyway M3D Platform uses models - rather than hand coding - to build discrete reusable services, composite applications, and rich user interfaces, including much of the business logic.

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This is different from SOA model assisted infrastructure. Model constructs exist n the context of code based frameworks. This is different from modeling constructs used to build software using tools. With the latter type of models, developers still have to drop down into Eclipse to hand code to build the software.

Skyway M3D platform is architected as a tightly integrated deployment environment. Everything in Skyway visual workspace operates against a common model. This enables collaboration using a shared workspace paradigm.

Skyway modeling implements next generation graphical coding. The constructs and operations used by developers are represented as graphical models. The graphics point ot optimized services that are kicked off by business analysts in ways that reconfigure the order and choice of different services. This model driven techniques eliminates virtually all of the manual coding needed to build enterprise-class web applications.

Skyway modeling tool extends throughout the logic-modeling and web-modeling layers to eliminate coding requirements. Scalability and flexibility are supported as solutions evolve above the layer of SOA component infrastructure.

3.18.2 Skyway Separates The Business Logic From The Solutions Code Modules

Skyway separates the business logic from the solutions code modules. Its models are not technology specific. This allows developers flexibility. Infrastructure deployment platforms (databases and application servers) are selected during the actual deployment phase of the application lifecycle.

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Planning related to database and application choice can take place in parallel with building the application This is allowing business solutions to be delivered faster.

3.19 Progress Software Actional SOA Management

Progress Software Actional SOA management product delivering visibility inside business process management (BPM) environments. Progress Software (NASDAQ: PRGS) is a global supplier of application infrastructure software used to develop, deploy, integrate and manage business applications.

Actional is a SOA and Web services management product family that can provide unified visibility within existing business process management (BPM) solutions. It goes beyond the edges of BPM processes into infrastructure and services. This ability to automatically connect the business process context to the underlying SOA infrastructure is a key requirement of a SOA governance strategy.

Actional SOA management product family provides policy-based visibility, security, and control for services, infrastructure, and business processes. BPM vendors bundle features with their offering. Silo features fall-short when the business process involves other IT systems and services. Governance requires that processes, services, and policies are able to be managed in the context of one another, and not as separate silos.

Actional addresses the critical requirement for governance. It provides users with the ability to monitor, analyze, and relate activity occurring both within

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and beyond the edges of existing BPM processes. SOA is part of the fabric of enterprise infrastructures. This has the ability to increase visibility, governance, and security. SOA management solutions provide visibility and control. Progress solutions span both BPM solutions and an SOA infrastructure across an enterprise.

TABLE 3-84

PROGRESS SOFTWARE ACTIONAL SOA MANAGEMENT FEATURES

- Actional BPM users and SOA architects
- Visibility into the dependencies between the business process steps and other services
- Processes or services are versioned or changed
- Impact of the changes is provided
- Automatic discovery feature keeps information accurate
- Allowing users to compare how processes change from day-to-day
- Insight into performance
- Behavior of BPM call-outs
- Uncovers unexpected behavior
- Is able to quickly identify the root cause of problems affecting the business process
- Users can set thresholds for alerts
- Detects process slow-downs

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TABLE 3-84 (CONTINUED)

PROGRESS SOFTWARE ACTIONAL SOA MANAGEMENT FEATURES

- Assesses specific services impacting the execution of the overall processes
- Control over process policies
- Allows users to apply policies to processes e.g. audit all steps for Sarbanes-Oxley compliance
- Works without having to know the complete set of services that support the process
- As services or the process changes over time, the policy enforcement
- Automatically adjusts with no manual re-configuration
- Integrates seamlessly with Lombardi TeamWorks
- Provides native support for BPM solutions
- Integration with BPM from Software AG and Fujitsu
- Support for a non-XML payload data
- Allows users to inspect and analyze message content
- Remote Method Invocation (RMI)
- Enterprise JavaBean (EJB)
- Permits customers to look at legacy services in the context of a business process

Source: WinterGreen Research, Inc.

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3.20 Mindreef SOA Testing Tool

Mindreef offers SOA testing. SOAPScope is a flagship product. It is used for verifying that XML documents and Web services. SOAPScope complies with industry standards and internal polices. The features support the WS-Security stack and an XML-based scripting language.

Features are aimed at documenting test procedures in an executable format. Users find XML scripting useful. A machine-readable system is faster and less error-prone than a person trying to follow a manual. Support for WS-Security is driven by compliance mandates. Mindreef offers SOA testing is useful to an increasing number of customers as Web services grow to span multiple organizations.

Mindreef has support for Windows Vista. The aim is to target different customers by their differing requirements. The effect could be customer confusion. Mindreef user differentiation is driven in part by the different groups within an organization that develop applications, with Web services often developed by individual business users rather than a central IT department.

Overlapping feature sets, features are not a subset of the others. SOAPscope developer is a single-user desktop product aimed at individual developers. SOAPscope Tester is aimed at quality-assurance. SOAPscope Tester can execute written scripts using Mindreef's XML format. SOAPscope architect extends into design-time governance, competing in part with SOA repository products. SOAPscope server features multiuser ability to create testing scripts.

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Mindreef SOAPscope customers buy it through a subscription license. Annual fees range from $299 for the Developer to $1,499 for the Server edition. Perpetual license costs are the same as two years' subscription. Subscription model gain access to support and updates rather than for short-term cost savings.

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4. Services Oriented Architecture (SOA) Technology

4.1 SOA Infrastructure Technology

SOA is another name for APIs. SOA is comprised of a stack of decoupled web services and plain vanilla standalone applications that implement some software. SOA is used with decoupled stand alone solutions applications to stitch together another application. SOA is supported by mission critical messaging systems because the ability to decouple information from an application depends on the ability to move that information once and only once in a mission critical manner. Automated process depends on automated communication of information.

4.1.1 Building a Robust Data Integration Layer

A service that provides access to customer information does not have to read-write against multiple underlying systems and hence is not forced to understand the format, structure and relationships of how customer data is stored. A solution is to create a data integration layer that insulates the consumers of data from where and how it is stored.

This requires IT to define the standard data model for customers, products, and employees. Regardless of how data is stored within the organization the programmers must determine the logical structure of the data that makes business sense.

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Data structures must have the capacity to satisfy all the stakeholders that depend on that data to perform their business functions. IT might determine that the customer data object should have ten attributes including name, address, phone number, and account number.

The actual data relates to understanding the physical structure and quality of the data. Organizations need to inventory their data assets. The task of mapping the relationship between the way data is actually stored to the logical data model is painstaking. Implementing SOA relates to building a common data model. Profiling and mapping the physical data is an aspect of SOA.

Building a robust data integration layer in an incremental manner is evolving. IT can pick a product or customer business object. APIs depend on instructions that say start from there, send to here. SOA exists as a subset of a business object. SOA aspects relate to the structure of the physical model, the logical model, and the rules to translate the physical model into the logical model.

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TABLE 4-1

SOA METADATA COMPRISES DATA INTEGRATION LAYER

- Robust data integration layer
- Incremental building
- Product business object
- Customer business object
- APIs
- Instructions that say start from there, send to here
- Subsets of a business object managed
- Structure of the physical model
- Structure of the logical model
- Rules to translate the physical model into the logical model

Source: WinterGreen Research, Inc.

The metadata that comprises the data integration layer relates to knowledge of, and access to, APIs. APIs are just ways to get information in and out of a software application. SOA provides a way to interconnect a subset of several independent applications to make them do a new task. Metadata is key to the reuse and productivity gains promised by SOA solutions.

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These rules comprise information about the data location, format, relationships, transformation logic, cleansing rules, and cross-reference relationships to translate the data from multiple disparate systems into the common logical data model. These rules include custom business logic that defines how data is handled and massaged internally. How a customer's credit score is calculated is part of some piece of software that may or may not be documented.

4.1.2 Microsoft Internet Explorer RSS Functionality

RSS functionality is part of the user interface of IE. There is more to it then letting users subscribe and read feeds from the IE7 user interface. The RSS functionality in IE7 is "powered" by the Windows RSS Platform. The Windows RSS platform API encapsulates 3 main components: common feed list, feed synchronization engine, and feed store.

The RSS functionality in IE7 is built on top of these components. Windows RSS platform is available for Windows Vista. Windows RSS Platform is available as part of Internet Explorer 7 for Windows XP SP2, Windows server 2003 SP1, and Windows XP 64-bit.

The Windows RSS Platform is available to any application. The applications can utilize the Windows RSS Platform to become RSS enabled without having to re-implement basic RSS building blocks. This significantly reduces the time and effort application developers have to invest in order to integrate RSS into their programs.

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Windows RSS platform applications include aggregators and pod casters. RSS applications relate to export and import. This depends on tracking feeds and keeping them in sync.

The common feed list of the Windows RSS platform can help keep RSS feeds in sync. Multiple applications can read, add, or delete from the common feed list and hence are sharing the user's list of subscribed feeds. IE7 is an application. When users discover and subscribe to feeds in IE7, it adds them to the common feed list. The subscription is available to other applications.

Users benefit from multiple applications using the common feed list. Over time, online services provide tools that synchronize the common feed list with their services. This allows user subscription list roaming between applications, and also between computers.

Feed synchronization engine and feed store work together with the common feed list. These components allow application developers to include support for RSS feeds without having to become an expert in RSS formats, synchronization schedules, enclosure downloads, and XML.

Windows RSS platform provides support for every major RSS and atom. Format developers can use different extensions, background scheduled updates, and support for server-friendly technologies like conditional GETs and RFC 3229 for feeds.

Bandwidth-friendly enclosure downloads use background Intelligent Transfer Service (BITS).

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An API exposes a simple object model for feeds as well as direct access to the raw XML stream. This functionality is available as shared technology as part of IE7 on Windows Vista and down-level. Including RSS support in an application is meant to be easy.

Details of the API, features, and implementation are encapsulated in the RSS support.

4.1.3 SOA Data Integration Layer Supports Developer Access To Metadata To Build Services

A data integration layer can be put in place in a manner that permits developers to access the metadata to build services. The metadata can be maintained in XML and stored in a SOA repository. Metadata can be securely accessed, versioned, and managed for changes in functionality. Impact analysis is one aspect of the data integration layer. Metadata is used to understand and maintain the location, structure, format, and relationships of the underlying data. Metadata allows for a loose coupling between the actual data and the services that rely on that data.

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TABLE 4-2

SOA METADATA DATA INTEGRATION LAYER FUNCTIONS

- Permits developers to access the metadata
- Permits developers to access services
- Permits developers to build services
- Supports data integration
- Supports data integration layer
- Can be maintained in XML
- Can be stored in a SOA repository
- Can be securely accessed
- Can be securely versioned
- Can be securely managed
- Used for changes in functionality
- Impact analysis is one aspect of the data integration layer
- Used to understand
- Maintains the location of the underlying data
- Maintains the structure of the underlying data

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TABLE 4-2 (CONTINUED)

SOA METADATA DATA INTEGRATION LAYER FUNCTIONS

- Maintains the format of the underlying data
- Maintains the relationships of the underlying data
- Allows for a loose coupling
- Forms connections between the actual data and the services that rely on that data

Source: WinterGreen Research, Inc.

4.2 State Machine

The state model is an object model in which objects are viewed as having defined states and the transitions from one to another are viewed as separate objects. Lifecycle tracking of an order is most relevant when it is received, then assembled, shipped, and invoiced. All these states are represented as objects in a state model. Each state can be managed independently and is important in track-and trace or quality-control applications.

Rules relate to automatic execution of dependent processes. At the core of a CEP system is a declarative business rules engine that receives and correlates events and applies rules as needed. The rules engine can then generate internal events, which could trigger more rules or send events out.

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The declarative nature of most rule-based systems means that rules are evaluated if the fact (property/relationship of an object) it is referencing is created or changed. In a large-scale deployment a smart state machine is used to evaluates new input, not the whole rule network, every time something changes. This allows the rules to be designed independently of each other.

Rules are standalone pieces of knowledge; they do not know about each other. The IT infrastructure captures and correlates large numbers of events so it can automatically recognize and identify potential problems and opportunities. IT needs to be responsive to business people. Business people must be notified about situations that require their attention, giving them the opportunity to initiate a course of action with the highest probability of delivering value.

The goal of real-time business is to enable an enterprise to recognize situations and respond to the opportunity. Many business operations follow patterns that, if identified, would allow companies to address problems or opportunities literally as they arise. As more companies seek to respond to changing market conditions, trends are toward SLA thresholds. Resources can be reallocated to ensure continued compliance.

Risk management techniques compare fixed support costs with costs of SLA penalties to determine how a violation may affect the business and identify the best course of action.

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4.2.1 Bluenote

Bluenote provides a system whereby language scripts orchestrate the flow of XML payloads through a sequence of steps, untouched by human hands, until an exception occurs. In all such workflows, people are the exception handlers of last resort.

The process that raised the exception kicks off a meeting between the requester of a purchase order and its approver. Methods are set up a call in a conference bridge and then e-mail invitations to the two parties are sent. Computers are intelligent assistants, duplicating what an intelligent human assistant would set up the conference call between the parties.

4.2.2 SOA Network Strategy

Network SOA strategy supports setting up a call in response to an exception. SOA designs enable a software-based service to call and interact with services of humans. An application implements a task automation with a communication that a human worker accepts, performs, and submits. To the application, this just looks like an asynchronous request. It polls for a response or arranges to be notified in an event-driven manner. The service provided by the human looks no different to the application than would a service provided by another piece of software.

SOA and VoIP work together with natural scenarios supported. Dealing with a stalled purchase order illustrates how this technology can achieve automated process in this context. The business rule says that the user has to contact two parties, who must in turn reach an agreement. Playing voice-mail or e-mail tag, does not efficiently managed to close the loop.

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Empowering that business rule to detect common availability, initiate a conference call, and receive a signal from us that tells it to proceed is a central aspect of SOA communication automation.

Creating combined VoIP SOA infrastructure that is interoperable enough to make this kind of scenario routine is evolving. The vision of a common framework for process-to-process, process-to-human, and human-to-human communication is compelling.

4.2.3 SOA Representational State Transfer Is A Mode Of Communication Accessible To Programs And Humans

The representational state transfer is a mode of communication accessible to programs and humans. To software, a URL is a method call. To a person, it's a bookmark that can be saved, traded, and tagged. VoIP/SOA convergence aims for a similar kind of duality. The voice channel is mixed with the data channel, voice and data share a common application context. Software agents work in this context.

4.3 XDMS Technology

XDMS provides a self-evolving, high performance data management system. It is comprised of two components: an XML database and an XQuery engine. TigerLogic XDMS has a multi-schema engine, which can manage multiple, evolving schemas on the same collection. It provides high performance data management. It includes a 64 GB in-memory data cache.

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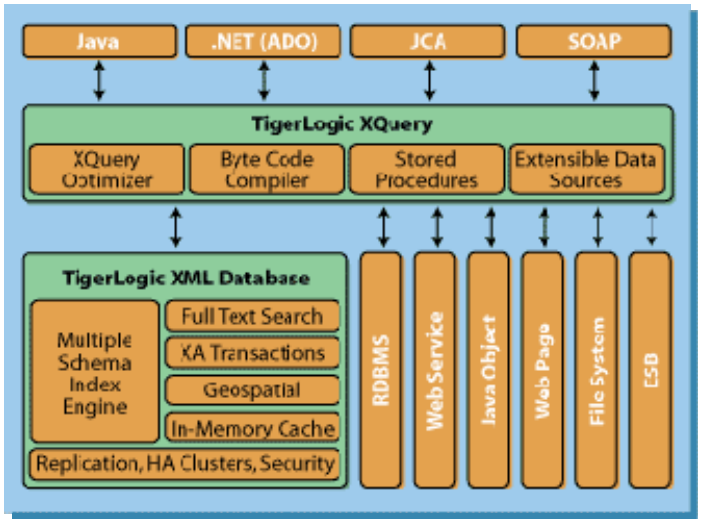
The TigerLogic XML database has the functionality required in an enterprise database including XA transaction compliance, security, replication, and HA clustering. The TigerLogic XQuery engine provides access to the TigerLogic XML database as well as other data sources including relational databases. JDBC, Web Services, FTP sites, file systems, Java objects and Web pages are supported. TigerLogic XQuery is compiled into byte code for high performance. It can be deployed as XQuery stored procedures. TigerLogic XQuery has an application programming interface (API) for Java, .NET (ADO), JCA and Web Services (SOAP).

TABLE 4-3

RAINING DATA TIGERLOGIC XDMS ARCHITECTURE



Source: Raining Data.

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4.3.1 Web Services and Service Oriented Architecture (SOA) Tier Architecture

TABLE 4-4

WEB SERVICES AND SOA TIER ARCHITECTURE

- Designs implement services
- Presentation tier
- Middle tier
- Enterprise data tier
- Presentation tier interacts with users and calls upon services
- Middle tier executes business processes
- Business services
- Data access services
- Enterprise data tier
- Data sources
- Packaged applications

Source: WinterGreen Research, Inc.

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Web Services and service oriented architecture (SOA) are expected to grow dramatically and place demands on the existing technical infrastructure within enterprises and organizations.

Major software vendors IBM, Oracle / BEA Systems, TIBCO, and Microsoft) provide SOA software platform products. Raining Data's TigerLogic FastSOA complements these major SOA platforms by offering a best of breed XML data management system for caching legacy data to improve performance and for storing all XML messages for reporting and auditability.

SOA yields desirable flexibility, the downside is often performance, scalability and auditability problems. As the number of applications in the SOA increases, shared services become the bottleneck, particularly the services that access transaction applications and data stores. Access to enterprise data is where performance problems occur from the concentration of requests through a small number of data access services. Mid-tier data caching offers a solution to achieve required system performance,

Scalability and flexibility are achieved by moving the required data as close to the services as possible. As more services are added, it becomes more difficult to capture all the information exchanges. A high performance central repository that stores and indexes all XML messages is needed for reporting and regulatory requirements. Architectures tend to have multiple layers of access.

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FIGURE 4-5

RAINING DATA TIGERLOGIC XDMS MULTI-SCHEMA ENGINE ARCHITECTURE

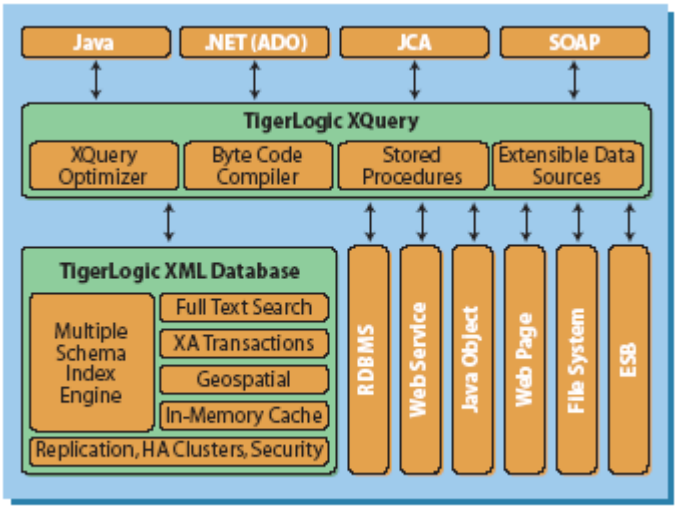

Exhibit 3: TigerLogic XDMS Architecture

Source Raining Data.

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FIGURE 4-6

RAINING DATA TIGERLOGIC XDMS -SOA ENGINE ARCHITECTURE

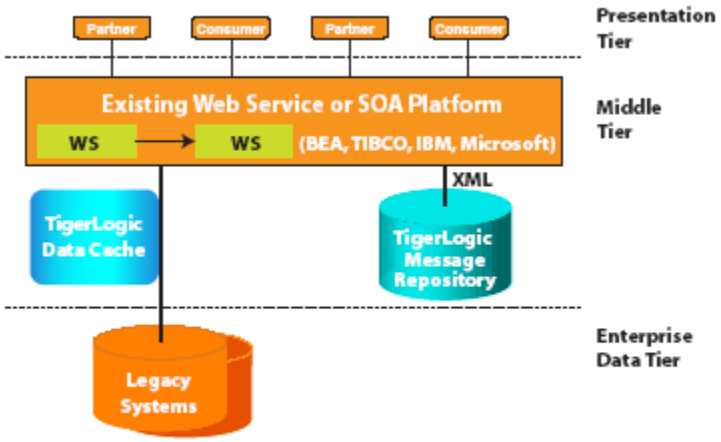

Exhibit 1: TigerLogic FastSOA (Blue) Fits in the Middle Tier of Existing SOA or Web Services Architecture

Source Raining Data.

4.3.2 Raining Data TigerLogic FastSOA Architecture

TigerLogic FastSOA is standards-based and plugs into the middle-tier of existing Web Services or SOA platforms. TigerLogic FastSOA has two major components, a data cache and a message repository. The TigerLogic FastSOA data cache stores legacy data and services at the middle tier with specified refresh policies (update every fifteen minutes, update at end of day, update when legacy data changes). The middle tier application now goes to cached data or service rather than the legacy RDBMS or enterprise.

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4.4 Tibco SOA Products

Tibco products address multiple elements of business process management, business integration, and business optimization. Products can be sold individually to solve specific technical challenges, but the emphasis of the Tibco product development and sales efforts is to create products that interoperate seamlessly and that can be sold together enabling businesses to be more cost-effective, agile and efficient.

Tibco products are marketed and sold as part of Tibco standards-based platform for real-time business. A comprehensive set of solutions is comprised of four categories of software: business process management software, business optimization software, business integration software, and enterprise backbone software.

4.4.1 Tibco Enterprise Backbone Software

Tibco enterprise backbone solution lets businesses establish and manage a flow of real-time event-driven information across their enterprise. Systems allow the guaranteed delivery of data, the ability to deliver information to very large numbers of recipients or the ability to quickly and easily add or modify senders and receivers of data. Enterprise backbone solutions complement standards and technologies with the ability to deliver information across businesses with superior performance and flexibility.

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4.4.2 Tibco Process Collaboration Suite

Tibco® Process Suite is proven and comprehensive process management software that can be seamlessly introduced into an existing IT infrastructure. Tibco Process Suite is a suite of application modules built on an open architecture that is designed to provide a complete end-to-end process management solution. It allows organizations to create an IT infrastructure that is based on their business process - their unique way of doing business.

By separating the application logic away from the process layer, it allows the creation of a layer that provides a collaboration process abstraction, and removes the processes from the control of applications. This 'process abstraction' layer, the independent process layer, is the key to process flexibility and agility.

TIBCO Process Suite is made up of the following major components: Modeling - TIBCO Process Suite allows non-IT staff and business specialists to model business processes through a user-friendly, graphical modeling environment, with complete support for version control. The resulting process map is the guide to integrating people, processes and applications.

Execution - TIBCO Process Suite is powered by the TIBCO® iProcess Engine, a powerful process management engine designed to handle extremely high-volume, mission critical transactions across multiple servers while maintaining the integrity of individual transactions. TIBCO IProcess™ Suite Process Suite also enables comprehensive SOA capabilities through the TIBCO® BusinessWorks integration platform, or other third-party integration technologies.

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Rules - TIBCO Process Suite provides an intuitive tool for business analysts using the same skill level as a good spreadsheet user to model, analyze, test and manage business rules. The spreadsheet-like decision table metaphor is readily learned in minutes.

Analysis - TIBCO Process Suite provides a sophisticated tool to analyze the effectiveness and efficiencies of entire business processes. It enables management to establish and continuously measure Key Performance Indicators (KPIs) for ongoing process performance and improvement.

Frameworks - TIBCO has developed a number of Process Frameworks, which utilize other components of the TIBCO IProcess™ Suite Process Suite to provide tailored solutions for key market sectors. The frameworks include TIBCO® Claims Management Framework, which enables the end-to-end design, automation, integration, management and tracking of the claims process; and the TIBCO® Fulfillment Framework, which offers out-of-the-box definitions for the major order processes required by a telecommunications operator.

4.5 webMethods SOA Fabric Broker

This is a infrastructure platform used to assemble and optimize enterprise SOA components and modules. There is a service bus that provides connectivity between purchase orders, checking of inventory, and shipping.

webMethods Fabric is implemented as Smart Services™. Smart Processes™. Smart Business. These are modules that are part of an integration platform. webMethods Fabric, makes business processes and IT assets more efficient.

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webMethods Fabric extends standards-based integration. Services are key business components captured during integration and managed with infrastructure capabilities. webMethods Fabric is an instrument for intelligent monitoring and predictive analysis.

TABLE 4-7

SOFTWAREAG / WEBMETHODS FABRIC SOA BENEFITS

Connects all existing IT assets / Readily conveys information
Makes available operational metrics
Makes available business metrics
Works without the need to invasively change the RFID service
Correlates processes against key performance indicators
Instruments every service for business activity monitoring
Allows for on-the-fly application development
Works through easy assembly and reassembly
Comprised of easy-to-use products
Typically up and running in less than 90 days

Source: WinterGreen Research, Inc.

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Smart Services™ can be assembled and recombined into Smart Processes™, which are proactive. Services are correlated to key performance indicators. Every step of every process is open to the infrastructure platform. Table 4-7 illustrates SoftwareAG / webMethods Fabric benefits.

Table 4-8 illustrates webMethods Fabric SOA collaborations components.

TABLE 4-8

SOFTWAREAG / WEBMETHODS FABRIC SOA COLLABORATIONS COMPONENTS

Enterprise Services Platform
Business Process Management
Business Activity Monitoring
Composite Application Framework

Source: WinterGreen Research, Inc.

webMethods SOA

webMethods adheres to the fundamental standards that made SOA possible. SOA Governance products come from Infravio. webMethods Fabric™ has secured its leadership position with a SOA product platform to feature complete end-to-end SOA lifecycle management for design-time, run-time and change-time.

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webMethods Fabric provides architects, developers, IT operations, and business users a complete and mature solution from user interaction, messaging, management, registry, and security needs. webMethods Fabric enables services built on heterogeneous platforms, whether Java, .NET, SAP, Oracle, IBM, others—to be assembled into composite applications and processes, enabling better business agility and efficiency.

Guided SOA solutions feature built-in governance best practices covering key elements, such as contracts, architecture, policies, lifecycle management, interface design, and organizational design.

Enhanced features make the promise of SOA attainable by enabling organizations to realize the benefits of SOA.

webMethods Guided SOA Solution

The Guided SOA Solution provides a SOA adoption program composed of a custom-tailored combination of elements: webMethods X-Registry and webMethods X-broker governance products are provided. Built-in policies, processes, and profiles and key SOA assets are provided. Custom deployment configurations, lifecycle policies, contract templates, and taxonomies make the systems work from an engine perspective.

SOA, SOA governance, or SOA registry / repository are provided. webMethods Infravio X-Registry based service oriented architecture (SOA) governance platform are provided. The webMethods Infravio X-Registry SOA Web services is used to implement governance solutions by providing users with a level of control.

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The X-Registry product provides a registry-repository platform for governance of Service Oriented Architecture (SOA) projects. X-Registry is built with customer proven interoperability, scalability, and reliability.

End-to-end service lifecycle governance means that as services are developed, deployed, and changed, they require involvement from multiple constituencies in an organization. The three primary stages in the end-to-end service lifecycle include: Design-Time (Development), Run-Time (IT Operations) and Change-Time (Business).

Developers, IT Operations, and Business users work together on service delivery while maintaining discrete views and appropriate governance of services and policies.

TABLE 4-9

KEY BENEFITS OF SOFTWAREAG / WEBMETHODS INFRAVIO — REGISTRY, REPOSITORY, AND GOVERNANCE

Guided SOA adoption – support and enforce advanced SOA governance polices across multiple SOA stakeholders. Helps ensure high quality SOA regardless of staff proficiency levels, and a "guided" deployment path minimizes the time and cost of trial and error.

Grow SOA across the enterprise – expand SOA across multiple organizations, creating true enterprise-scale SOA.

Establish SOA visibility – know what services exist, who built them, who uses them, and where to get more information about them.

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TABLE 4-9 (CONTINUED)

KEY BENEFITS OF webMETHODS INFRAVIO — REGISTRY, REPOSITORY, AND GOVERNANCE

Manage the full SOA lifecycle – integrated SOA governance during design-time, run-time, and change-time.
Enforce architectural standards – automatically validate new services for policy compliance and establish approval processes.
Enforce security procedures – set parameters for various levels of access to Web services. Protect confidential information from misuse, while allowing access to authorized users.
Extend governance ROI to external partners – Internet-enable products and services via governed Web services.
Establish lifecycle processes – enable diverse stakeholder groups to collaborate, approve, and be notified of lifecycle events associated with policies and services.

Source: Wintergreen Research, Inc.

webMethods X-Registry SOA engine provides rules, access control and security.

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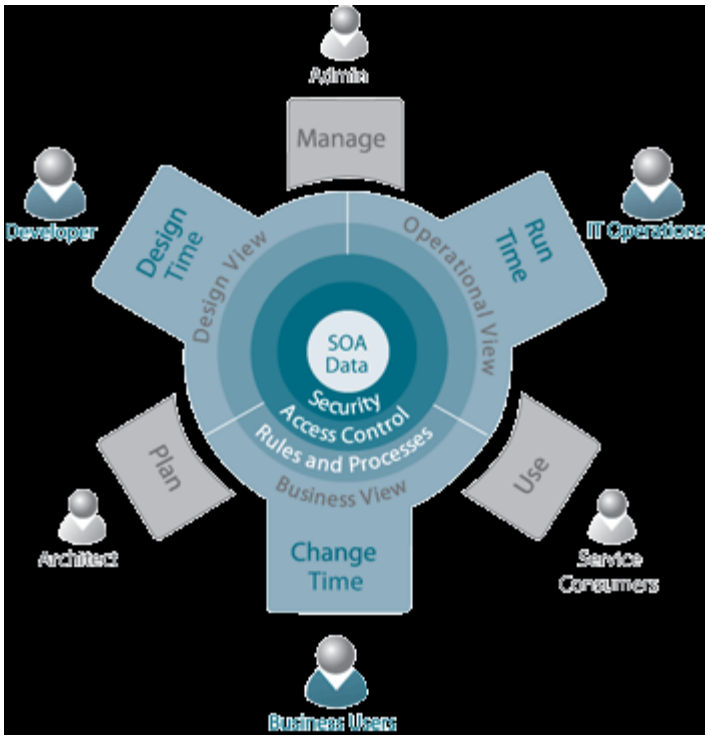
TABLE 4-10

WEBMETHODS SOA REGISTRY ENGINE



Source: WebMethods.

4.6 SOA Dynamic Architecture

SOA dynamic architecture implementation depends on going past linear coding to achieve reassembly of modules based on some way of managing simultaneous process. Google has achieved search engine market dominance via leveraging dynamic architecture.

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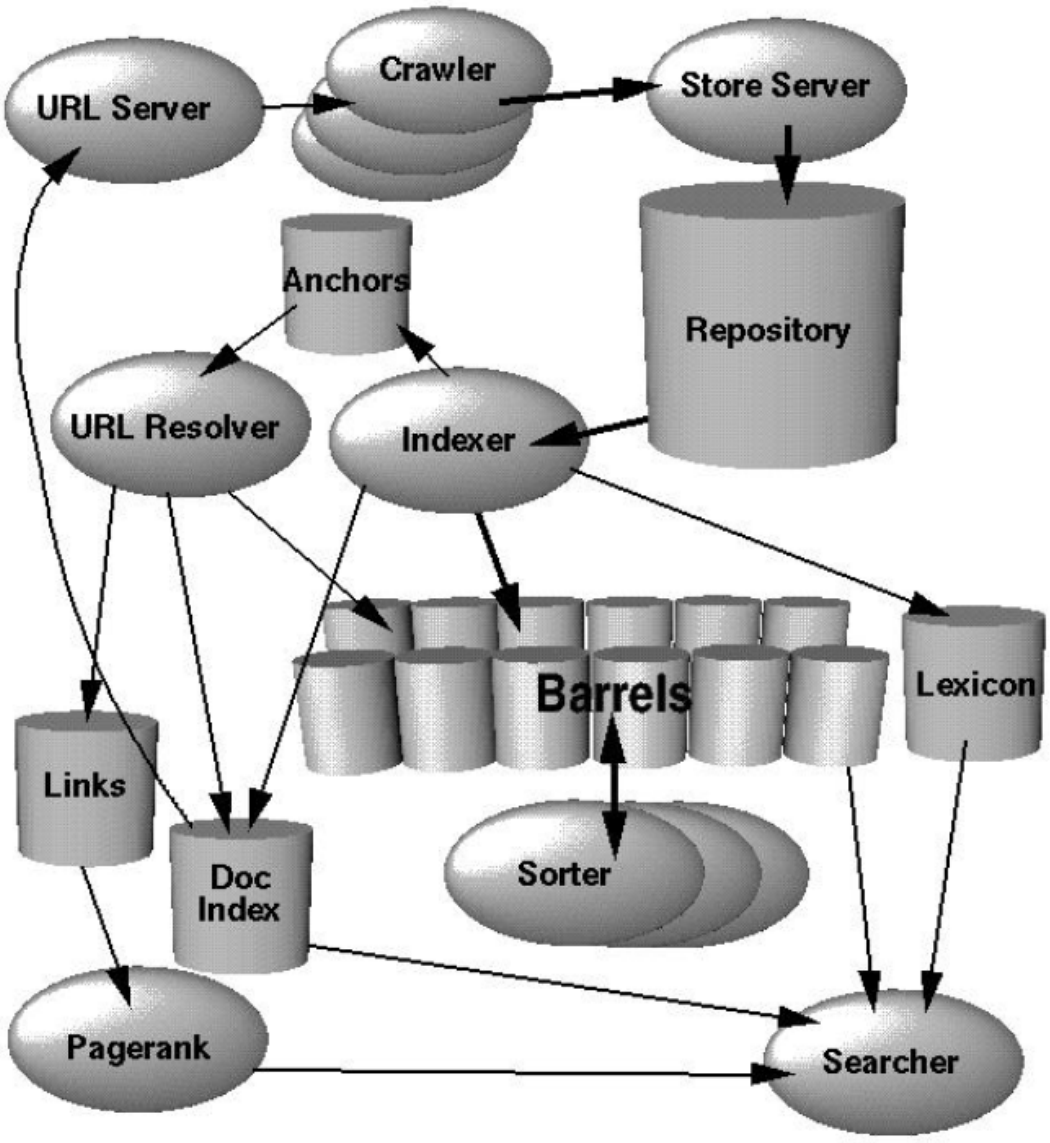
TABLE 4-11

GOOGLE DYNAMIC ARCHITECTURE



Source: Sergey Brin and Lawrence Page

Google permits construction of Web applications using documents and cell based spreadsheets in the context of the search engine architecture shown above. Web applications can be built from the Internet page out using the Google dynamic engine as a base for applications. The Google applications are surely under development in their labs.

This is an assumption based on what they have done so far building on the n-dimensional architecture. Google has been able to differentiate its collaboration tools because of the wide availability to everyone. Google has an open systems approach to implementing suggestions from within the organization. There are huge amounts of innovation coming from Google because of its worldwide reach illustrated with the search engine and innovations based on the new shared spreadsheet.

The collaboration is like an application because it can reach large numbers of people and the system is intuitive to use. The users discuss, share, and publish aspects of the application provide significant reach to users. There is the problem of how to deal effectively with uncontrolled hypertext collections where anyone can publish anything they want.

A large-scale search engine makes heavy use of the structure present in hypertext. Google is designed to crawl and index the Web efficiently and produce satisfying search results using dynamic systems process. This efficiency is being extended by Google to achieve Web based application building.

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4.6.1 Google Search Engine Dynamic Architecture

Google search engine dynamic architecture is based on lists, ID tags, indexes, inverted indexes, compression logic, and a repository. These are the basic elements of SOA. SOA defines reusable modules that are available as decoupled elements that can be managed dynamically.

The sorter takes the barrels, which are sorted by docID and resorted by wordID to generate the inverted index. This is done in place so that little temporary space is needed for this operation. The sorter produces a list of wordIDs and offsets into the inverted index. A list together with the lexicon produced by the indexer generates a lexicon.

The searcher is run by a web server and uses the lexicon list together with the inverted index and the page ranks to answer queries. In Google, the web crawling is done by several distributed crawlers working simultaneously. There is a URL server. There is a store server. There is compression.

There is storage into a repository. Every web page has an ID number assigned whenever a new URL is parsed out of a web page. The indexing function is performed by the indexer and the sorter. The indexer performs a number of functions. It reads the repository, uncompresses the documents, and parses them.

Each document is converted into a set of word occurrences called hits. The hits record the word, position in document, an approximation of font size, and capitalization. The indexer distributes these hits into a set of "barrels", creating a partially sorted forward index.

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The indexer parses out links in every web page and stores information in a file. This file contains enough information to determine where each link points from and to, and the text of the link. Google's data structures are optimized. Google is designed to avoid disk seeks whenever possible, and this has had a considerable influence on the design of the data structures.

4.6.2 BigFiles

BigFiles are virtual files spanning multiple file systems and are addressable by 64 bit integers. The allocation among multiple file systems is handled automatically. The BigFiles package handles allocation and deallocation of file descriptors, since the operating systems do not provide enough. BigFiles support compression.

4.6.3 Repository

The repository contains the full HTML of every web page. Each page is compressed using zlib. The choice of compression technique is a tradeoff between speed and compression ratio. zlib's speed over a significant improvement in compression offered by bzip. The compression rate of bzip is 4 to 1 on the repository as compared to zlib's 3 to 1 compression. In this manner Google defines reusable modules that are available as decoupled elements that can be managed dynamically without any reassembly or linear constraints.

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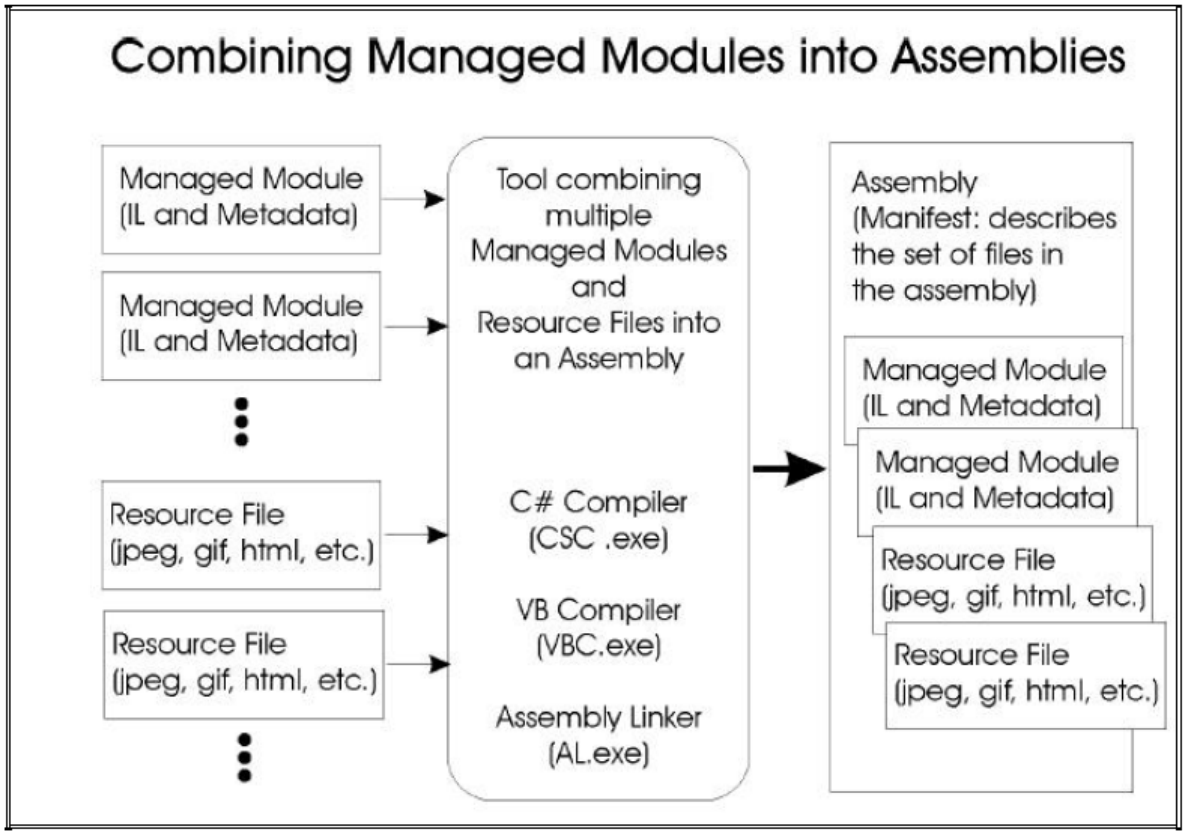
4.6.4 Microsoft .Net Defines Reusable Modules Dynamically

FIGURE 4-12

MICROSOFT .NET DYNAMIC DEFINITION OF REUSABLE MODULES

Microsoft .NET Compiling Source Code into Managed Assemblies



Source: Microsoft.

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.NET Framework is used to manage code programming models. It is used to build applications with visual user experiences.

4.6.5 Microsoft Combines Managed Modules into Assemblies

The Microsoft .Net programming model does not actually work with modules; it works with assemblies. An assembly is an abstract concept. An assembly is a logical grouping of one or more managed modules or resource files. An assembly is the smallest unit of reuse, security, and versioning. Depending on the choices made with compilers or tools, users can produce a single-file assembly or a multi-file assembly.

Building, packaging, deploying, and administering applications and types depends on creating assemblies. This extra conceptual notion offers a way to treat a group of files as a single entity creating a model driven architecture.

Microsoft .NET can work with many different types of code modules at the same time. Microsoft .NET is used for compiling source code into managed modules. Microsoft architecture is available to developer provides management of threads that in turn provides modular processing.

4.6.6 Microsoft Architecture Dynamic Modular Processing

The figure below illustrates .NET assemblies:

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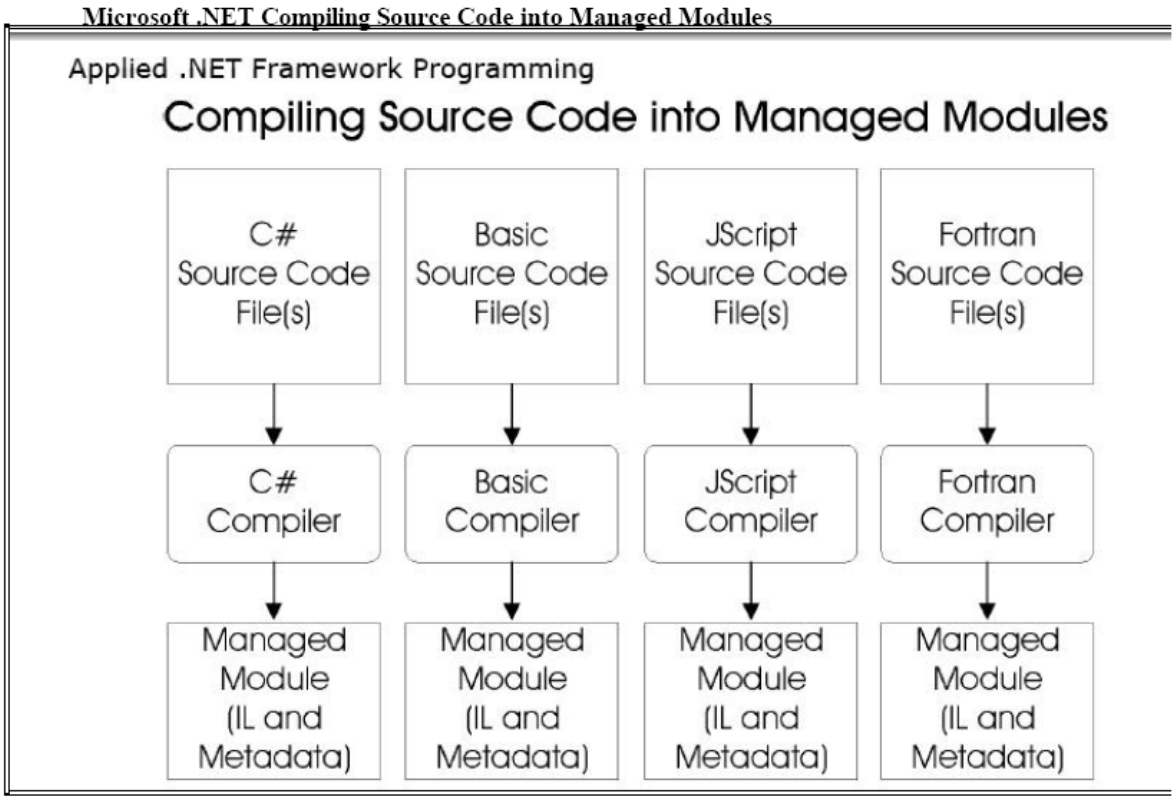
FIGURE 4-13

MICROSOFT .NET COMPILING SOURCE CODE INTO MANAGED ASSEMBLIES



Source: Microsoft.

The Microsoft architecture gives the developers significant flexibility because it provides threads that provide simultaneous modular processing of different program elements.

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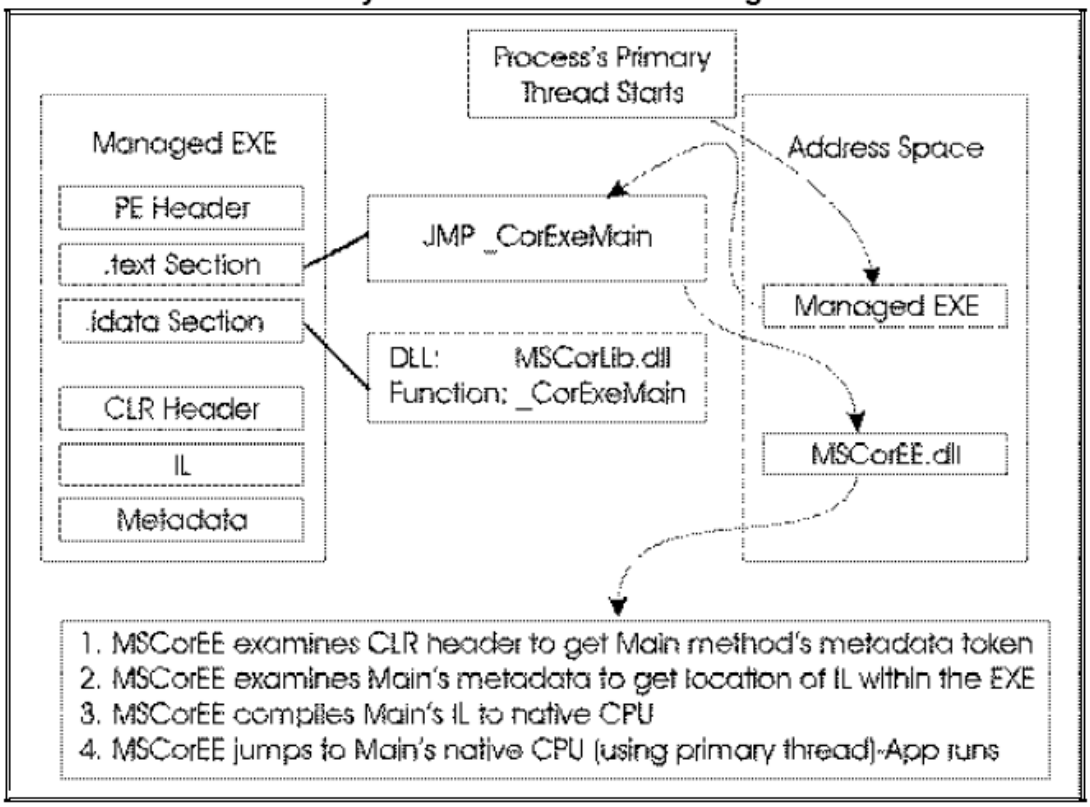
FIGURE 4-14

MICROSOFT ARCHITECTURE DYNAMIC MODULAR PROCESSING

Microsoft Architecture Dynamic Modular Processing



Source: Microsoft.

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4.6.7 IBM SOA Architecture is Dynamic for the Transport Layer

The availability of modules to the programmers gives developers enormous flexibility. IBM SOA architecture is dynamic for the transport layer. SOA is implemented as an ESB that provides transport of messages between services.

By adding more layers to SOA, the IBM architecture can evolve a dynamic aspect that is superior to Google and Microsoft because it promotes shared workload and greater efficiency. Widget (or control) is an interface element.

The process of SOA implementation depends on n-dimensional interaction of layers that define transport, process, presentation, calculation, and API adapters. In this manner, SOA moves beyond linear processing to n-dimensional processing.

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TABLE 4-15

PROCESS OF SOA IMPLEMENTATION DEPENDS ON N-DIMENSIONAL INTERACTION OF LAYERS THAT CAN BE MODELED BY BUSINESS ANALYST

- Define transport
- Message
- Process
- Presentation
- Calculation
- API adapters

Source: WinterGreen Research, Inc.

As these layers are processed simultaneously and independently, n-dimensional processing is implemented presaging a new type of processor that has multiple program counters going simultaneously and in a synchronized manner, but doing different types of task dictated by the SOA. The model for this is the syntax described by n-dimensional calculus.

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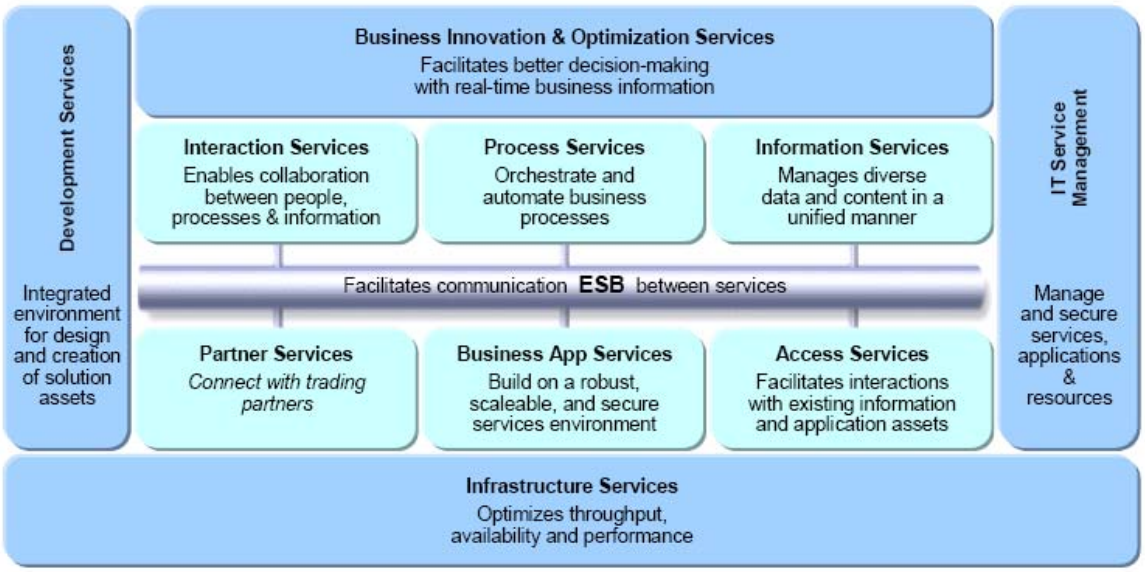
TABLE 4-16

IBM SOA BUSINESS I SERVICES LAYERS



Source: IBM.

SOA is valuable to enterprises that need to solve business-critical problems using information technology, including enterprises that want to minimize redundant infrastructure and create a common business interface across customer and employee systems. Businesses can personalize information to users based on roles and workflows. Organizations can use the Internet to boost revenue per customer through cross-selling, up-selling and access via mobile devices.

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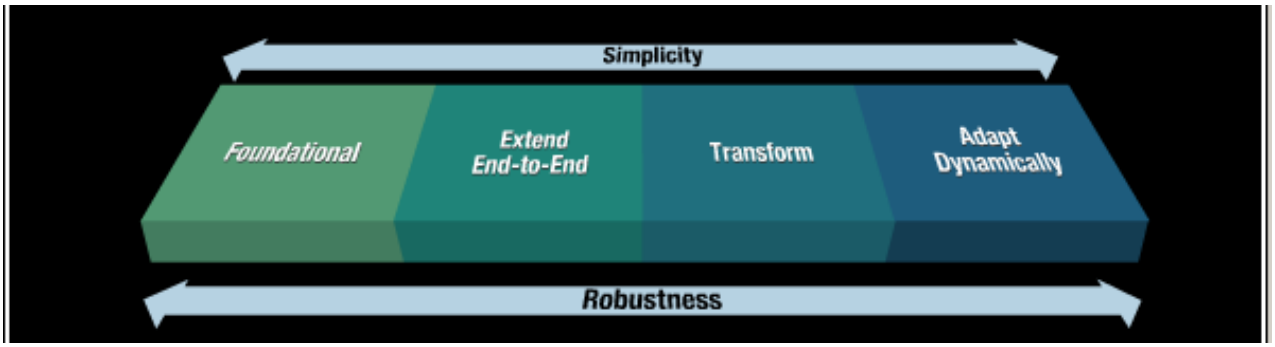
The SOA vision is for application modernization to be implemented through component architectures. SOA leverages the benefits of modular systems, provides modeling tools to develop a roadmap, provide integration tools to implement the steps that are necessary to develop a modularization strategy. SOA product sets describe successful techniques for implementation of a SOA architecture.

FIGURE 4-17

IBM SMART SOA CONTINUUM



Source: IBM.

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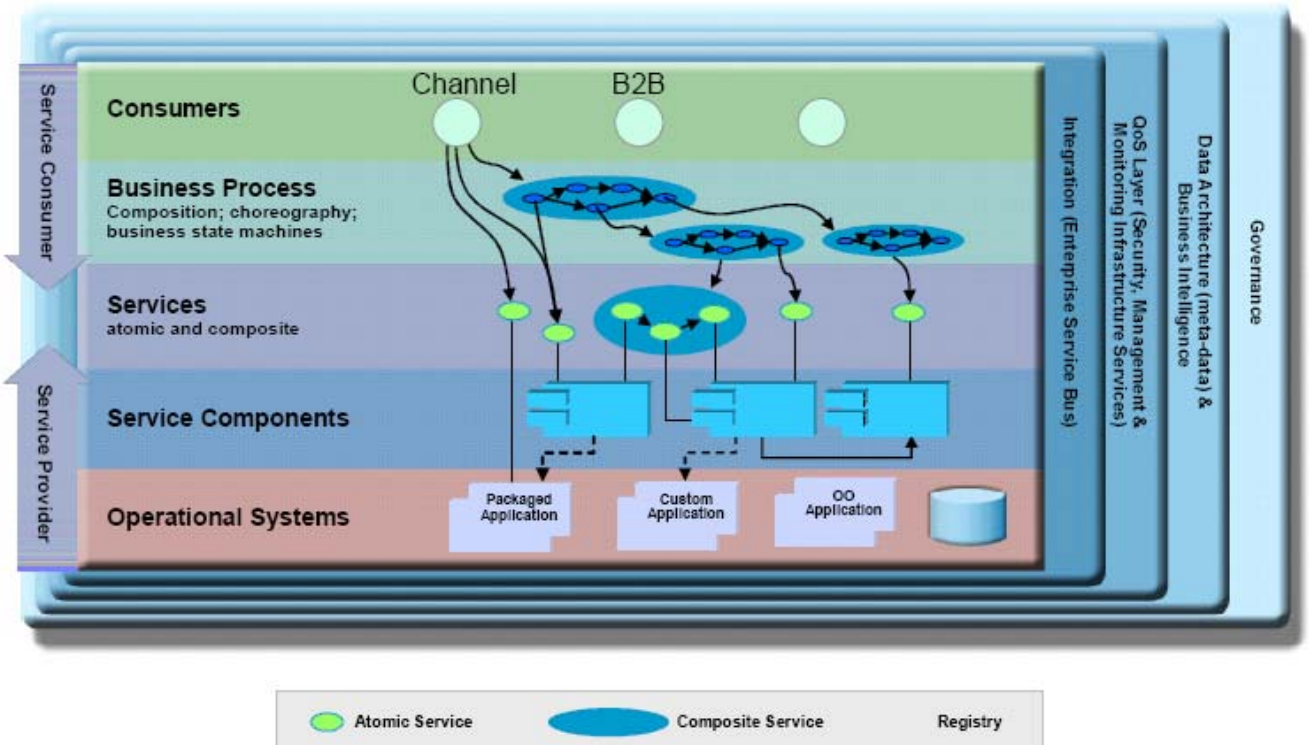
TABLE 4-18

SOA FOUNDATION REFERENCE ARCHITECTURE



Source: IBM.

IBM WebSphere business integration human workflow support expands the reach of to SOA to encompass automation of activities that require human interaction. Workflow is implemented as steps in an automated business process. Business processes involve human interaction.

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4.7 Business Benefits of Service-Oriented Architecture

SOA is set to transform business processes from siloed, replicated objects into highly leveraged, shared services that cost less to maintain. Business benefits of service-oriented architecture relate to efficiency, responsiveness, and rapid adaptation.

4.7.1 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 is one place relates to the keeping it accurate. Duplicated information ends to be out of date, and not consistent with the original information set.

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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.

4.7.2 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 and 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.

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4.7.3 Existing Enterprise Asset Automated Virtualization

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.

4.7.4 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.

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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.

4.7.5 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.

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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.

4.7.6 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.

4.8 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.

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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.

4.8.1 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.

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4.8.2 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.

4.8.3 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.

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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.

4.8.4 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.

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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).

4.8.5 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.

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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.

4.9 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.

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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.

4.10 Business 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 4-19 illustrates the types of information that comprise an event. Table 4-20 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.

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TABLE 4-19

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

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TABLE 4-20

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.

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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.

4.10.1 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.

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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.

4.10.2 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.

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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 4-21.

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TABLE 4-21

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

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TABLE 4-21 (CONTINUED)

INTEGRATION SERVICES

- Support critical path transformation
- Support data flow

Source: WinterGreen Research, Inc.

4.11 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.

4.11.1 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.

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4.11.2 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.

4.11.3 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 4-22 illustrates how business components can be chained together to comprise a business service.

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TABLE 4-22

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 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 4-23.

TABLE 4-23

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

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TABLE 4-23 (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.

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4.12 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.

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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.

4.12.1 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.

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4.12.2 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.

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TABLE 4-24

DESIGN CONCERNS FOR INTEGRATION SYSTEM ARCHITECTURE

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

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4.13 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.

4.13.1 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.

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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.

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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.

4.14 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.

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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.

4.14.1 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.

4.15 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.

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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.

4.15.1 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.

4.15.2 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.

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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.

4.16 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.

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4.16.1 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.

4.16.2 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.

4.16.3 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.

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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.

4.16.4 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.

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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).

4.17 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.

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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.

4.17.1 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.

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4.17.2 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 off 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.

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4.17.3 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.

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4.17.4 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.

4.17.5 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.

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4.17.6 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.

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4.17.7 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.

4.17.8 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.

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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.

4.17.9 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.

4.17.10 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.

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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.

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TABLE 4-25

SOAP-BASED WEB SERVICE PRODUCTION ENVIRONMENT TESTING

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

Source: WinterGreen Research Inc.

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

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

4.17.11 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.

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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.

4.17.12 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.

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

4.17.13 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.

4.17.14 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.

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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.

4.17.15 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.

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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.

4.17.16 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.

4.17.17 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.

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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.

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4.17.18 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.

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4.17.19 XSLT

XSLT language is used to transform XML as illustrated in Table 4-26.

TABLE 4-26

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.

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4.17.20 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 4-27 illustrates uses of a metadata repository.

TABLE 4-27

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.

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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.

4.17.21 Wrappering

The basic concept that makes an evolution to e-services possible is called wrappering. 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.

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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.

4.17.22 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.

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4.18 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.

4.18.1 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.

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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.

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4.18.2 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-with 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.

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4.18.3 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.

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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.

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4.19 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.

4.19.1 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.

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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.

4.19.2 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.

4.20 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.

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BPMI.org is a business process management initiative. Applications and business partners are behind BPMI initiative to move information outside the firewall and over the Internet. The BPMI 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.

BPMI.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. BPMI.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.

BPMI.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.

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4.20.1 Bpmi.Org Defines Open Specifications

BPMI.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.

BPMI.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, BPMI.org provides a standard way to describe their private implementation.

BPMI.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.

4.20.2 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.

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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 4-28 illustrates BPML e-business processes.

TABLE 4-28

BPML E-BUSINESS PROCESSES

- 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

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TABLE 4-28 (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.

4.20.3 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.

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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).

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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.

4.20.4 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 CEFACT 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.

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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. AI companies are taking an active role in developing ebXML.

4.21 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.

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4.22 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 4-29 illustrates service oriented architecture (SOA) functions.

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TABLE 4-29

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
- 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

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TABLE 4-29 (CONTINUED)

SERVICE ORIENTED ARCHITECTURE (SOA) FUNCTIONS

- Support positioning components as services
- Permit services to be reused and combined to address changing business priorities

Source: WinterGreen Research, Inc.

4.22.1 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.

4.22.2 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.

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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.

4.22.3 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

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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.

4.22.4 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

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such as W3C, XML Schema, ebXML, WSDL, Schema Adjunct Framework, and RosettaNet.

4.22.5 Integration Engines Leverage XML Processing

Integration engines leverage XML processing by using XML to move information form one application to another. XML is needed to drive business process electronically end-to-end. Table 4-30 illustrates integration engine XML processing functions that drive business process electronically end-to-end.

TABLE 4-30

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

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TABLE 4-30 (CONTINUED)

INTEGRATION ENGINE XML PROCESSING FUNCTIONS THAT DRIVE BUSINESS PROCESS ELECTRONICALLY END-TO-END

- Generate shipment
- Create invoice
- Send invoice
- Alert shipping manager
- Process payment
- Create ASN

- Ship order
- Confirm goods receipt
- Notify sales operations
- Check work in progress status
- Hold order for approval
- Check delivery status
- Confirm delivery
- Replenish inventory

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TABLE 4-30 (CONTINUED)

INTEGRATION ENGINE XML PROCESSING FUNCTIONS THAT DRIVE BUSINESS PROCESS ELECTRONICALLY END-TO-END

- Send order for parts for more component manufacture
- Reconcile payment
- Send ASN

Source: WinterGreen Research, Inc.

4.22.6 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 CEFACT 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.

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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.

4.22.7 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.

4.22.8 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.

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4.22.9 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.

4.22.10 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.

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4.22.11 Web Services Input And Output Formats

Table 4-31 illustrates Web services input formats.

TABLE 4-31

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 4-32 illustrates Web services output formats.

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TABLE 4-32

WEB SERVICES OUTPUT FORMATS

- Chase CTE
- SWIFT ISO7775
- SWIFT ISO15022
- HTML output template
- Excel
- CSV
- True CSV
- XML
- HTML

Source: WinterGreen Research, Inc.

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4.22.12 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.

4.22.13 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.

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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.

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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.

4.22.14 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.

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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.

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TABLE 4-33

WEB SERVICES PROTOCOLS

- XML (cXML, ebXML, XSLT, XPATH)
- Web Services (SOAP, UDDI, WSDL, ebXML)
- J2EE (JMS, EJB, JCA)
- RosettaNet
- EDI (EDI-INT, 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.

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4.23 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.

4.24 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.

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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.

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4.24.1 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.

4.24.2 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.

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4.25 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.

4.26 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

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TABLE 4-34

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.

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4.26.1 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.

4.26.2 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.

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4.26.3 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.

4.27 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.

4.28 UDDI Registry

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

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4.28.1 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.

4.28.2 UDDI Distributed Web Service Discovery

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

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

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

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

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

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4.28.3 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.

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4.28.4 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.

4.28.5 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.

4.28.6 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.

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

4.28.7 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.

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4.28.8 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.

4.28.9 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.

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4.28.10 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.

4.28.11 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.

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4.28.12 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.

4.28.13 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.

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TABLE 4-35

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

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

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

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

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4.29 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.

4.29.1 WSDL Service Descriptions

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

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

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

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

4.29.2 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.

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

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

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

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

4.30 Language XSLT

XSLT language is used to transform XML as illustrated in Table 4-36.

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TABLE 4-36

XSLT TRANSFORMATION OF XML

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

Source: WinterGreen Research Inc.

4.31 OASIS

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

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

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

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

4.32 ebXML

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

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

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

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4.32.1 ebXML and Open Applications Group OAGIS Standards

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

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

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

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

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

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4.32.2 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.

4.33 IP Addressing And Directory Management

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

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No one wants to run mission-critical applications on a network whose reliability is, at the best of times, unpredictable. Functions of an IP addressing device are illustrated in Table 4-37 following. Table 4-38 illustrates benefits of an IP addressing device.

TABLE 4-37

FUNCTIONS OF AN IP ADDRESSING DEVICE

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

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TABLE 4-38

BENEFITS OF AN IP ADDRESSING DEVICE

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

Source: WinterGreen Research, Inc.

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

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

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4.33.1 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.

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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.

4.33.2 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.

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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.

4.34 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 4-39 illustrates companies driving the web services reliability specification.

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TABLE 4-40

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.

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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.

4.34.1 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 4-41.

TABLE 4-41

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.

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4.34.2 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 4-42 illustrates mainstream application server strategic positioning.

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TABLE 4-42

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.

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4.34.3 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.

4.34.4 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.

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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.

4.35 Web Services Technology

Web services technology is positioned to address issues that arise because of the need to leverage the Internet productively.

4.35.1 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.

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4.35.2 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.

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TABLE 4-43

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.

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TABLE 4-44

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

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TABLE 4-44 (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.

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4.35.3 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.

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Table 4-45 illustrates autonomic features. Table 4-46 illustrates autonomic functions.

TABLE 4-45

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

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TABLE 4-45 (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.

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TABLE 4-46

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

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TABLE 4-46 (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.

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4.35.4 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.

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The consistent environment allows users to apply the proper techniques to be able to understand what is going on is 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.

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4.35.5 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.

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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.

4.35.6 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.

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Eclipse is designed to be an open, extensible environment. Permitting users to switch modes supports designing an application and alternative variations in different environments.

4.35.7 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.

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4.35.8 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.

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4.35.9 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 4-47 illustrates distributed transaction functions.

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TABLE 4-47

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.

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4.36 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.

4.37 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.

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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.

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4.38 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.

4.39 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.

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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.

4.40 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.

4.41 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.

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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.

4.42 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.

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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.

4.43 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.

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4.44 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.

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4.45 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.

4.46 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.

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4.47 Portals

Portals typically address some or all of the following issues illustrated in Table 4-48.

TABLE 4-48

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.

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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.

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4.47.1 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 4-49 illustrates B2B application server quantifiable business benefits.

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TABLE 4-49

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 4-50 illustrates trading exchange positioning.

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TABLE 4-50

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 4-51 illustrates integrated e-market benefits.

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TABLE 4-51

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.

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5. Services Oriented Architecture SOA Infrastructure Company Profiles

5.1 SOA Market Consolidation

Software infrastructure companies have 'service enabled' their offerings. IBM dominates the SOA infrastructure markets with more than half of the market. IBM's dominance comes from its control of the middleware and application integration technology that is the underpinning of SOA. IBM participates in the SOA market with strength because the WebSphere MQ messaging product is such a significant aspect of SOA.

SOA depends on transport of messages from one service to another. SOA is a way of implementing services that decouple applications logic components and thereby facilitate reuse of software modules or objects. Once the software components have bee decoupled, they need to be reconnected with messaging between the components. The IBM mission critical WebSphereMQ is significant because it provides once and only once delivery of transaction messages in a secure manner. This provides the foundation of SOA.

SOA is a way of exposing information from a software module through an API, trough an application interface. Once a service has a way of sending information to and from the services, the messaging component is significant. Web services have a messaging capability called SOAP.

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Java has a messaging service called JMS. Both JMS and SOAP typically use IBM MQ messaging wrappers to provide assured delivery of information form one SOA service to another.

TABLE 5-1

SOA ACQUISITION ACTIVITY

Company	Purchaser
• Sarvega ...	Intel
• Westbridge ...	Actional (merger)
• Actional ...	Progress / Sonic
• Systinet ...	Mercury
• ClientSoft ...	Neon
• Neon ...	Progress / Sonic
• FiveSight ...	Intalio
• SeeBeyond ...	Sun Microsystems
• ThoughtDigital ...	SOA Software
• Flamenco Networks	SOA Software
• Talking Blocks ...	Hewlett Packard (HP)
• Mercury ...	Hewlett Packard (HP)
• Adjoin ...	Computer Associates

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TABLE 5-1 (CONTINUED)

SOA ACQUISITION ACTIVITY

- Kenai Systems ... Forum Systems
- Blue Titan ... SOA Software
- Infravio ... WebMethods
- The Mind Electric ... WebMethods
- WebMethods Software AG
- DataPower ... IBM
- Webify ... IBM
- Collaxa ... Oracle
- Confluent ... Oblix
- Oblix Oracle
- Flashline ... BEA
- BEA Oracle
- LogicBlaze Iona
- Reactivity Cisco
- Vitria Goes Private

Source: WinterGreen Research, Inc.

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Many SOA centric companies have not been acquired. Some of the 'SOA Centric' companies that have not gone done the acquisition path have chosen to mature their products and grow their customer bases prior to considering acquisition activity, thereby upping the valuation. In other cases, the companies are fairly new to the market and are in early stages of creating next-generation SOA products.

5.2 Accenture

Accenture offers global management consulting, technology services and outsourcing including a large SOA practice. Comprehensive capabilities across all industries and business functions are provided. Extensive research supports collaboration with clients to help achieve high-performance businesses and governments. Accenture has 175,000 people in 49 countries. The company generated net revenues of US$19.70 billion for the fiscal year ended Aug. 31, 2007.

5.3 Aldon

The Aldon Suite provides IT business process automation, software change management, distribution and deployment, requirements management, regulatory compliance controls and application release management.

5.4 Cape Clear Software

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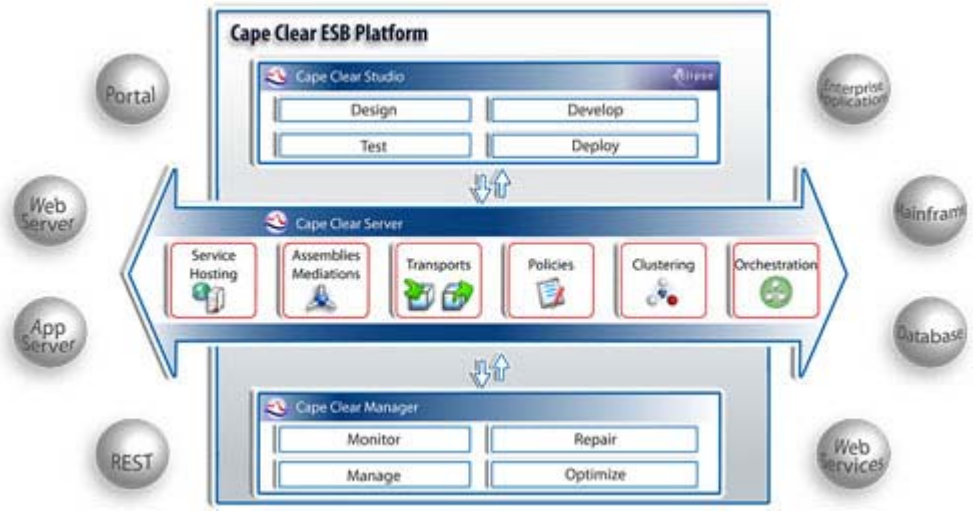
Cape Clear offers an ESB platform. It offers on-demand integration reliability, scalability, and performance to connect any content, services, or software across the Internet using Web services. Cape Clear is in deployment by leading financial services, communications, software on-demand, media, government, energy, transportation, and defense organizations.

Cape Clear Software is a privately- held firm with headquarters in San Mateo, Calif., and offices in Atlanta, Ga.; Chicago, Ill.; Denver, Colo.; Waltham, Mass.; Dublin, Ireland; and, London, UK.

FIGURE 5-2

CAPE CLEAR ESB PLATFORM



Source: Cape Clear.

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5.5 DataDirect Technologies

DataDirect Technologies is an industry leader in data connectivity. DataDirect offers a suite of wire protocol ODBC drivers for Oracle, SQL Server, DB2, Sybase, Informix, and MySQL. Wire protocol ODBC drivers do not require database client libraries and connect directly to the database for performance. They compete with free drivers from the database vendors. Wire protocol architecture is what allows ODBC drivers to deliver fast, scalable, and secure application connections to relational databases.

5.6 DataFlux Corporation

DataFlux offers complete, end-to-end data management solutions for organizations that want to realize tangible value from information assets.

5.7 DataSynapse

DataSynapse provides real-time infrastructure software that enables IT organizations to align with the changing demands of business. Dynamically allocation of compute resources is based on enterprise applications ability to respond to changing demands of business. Business demands and policies depend on solutions that have the ability to speed application time to market, improve quality of service, lower IT operations costs, and reduce application management complexity.

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email: info@wintergreenresearch.com
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TABLE 5-3

DATASYNAPSE MARKET POSITIONING

- Provides real-time infrastructure software
- Enables IT organizations to align with the changing demands of business
- Dynamic allocation of compute resources
- Based on enterprise applications
- Ability to respond to changing demands of business
- Changing business demands and policies
- Depends on solutions that have the ability to speed application time to market
- Improve quality of service
- Lower IT operations costs
- Reduce application management complexity

Source: WinterGreen Research, Inc.

GridServer®, FabricServer™, VersaVision™ software, and RTI Design™ are best practices blueprint for transitioning to real-time infrastructure. DataSynapse provides a standardized, automated approach to configuring,

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tel 781-863-5078
email: info@wintergreenresearch.com
Lexington, Massachusetts

activating and scaling enterprise applications in real-time environments. DataSynapse participates in a SOA virtualization market.

5.7.1 DataSynapse Revenue Growth In 2007

DataSynapse had a solid year of revenue growth in 2007. It increased its sales year-over-year by 50 percent, while making significant additions to its product portfolio and customer roster. The rapidly evolving virtualization and real-time infrastructure markets are targeted. DataSynapse provides a standardized and automated approach to deploying, activating, and managing applications in real-time environments.

5.7.2 DataSynapse Products

Flexible IT solutions are driven by the needs of the business. IT departments are challenged to keep pace with dynamic business growth. IT infrastructure management requires a fundamental change in its business model. DataSynapse provides software that configures applications and their underlying resources to dynamically respond to business demand in real-time.

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TABLE 5-4

DATASYNAPSE PRODUCTS

- FabricServer™
- An enterprise application virtualization platform that dynamically activates, configures, and scales enterprise applications based on business policies and demand.
- GridServer®
- A service execution platform that dynamically scales enterprise software services based on business and performance requirements.
- VersaVision™
- A business-level reporting and analytics platform that measures IT and business service levels, cost, utilization and performance.
- RTI Design™
- A best practices methodology for transitioning from a legacy datacenter model to real-time infrastructure

Source: WinterGreen Research, Inc.

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5.7.3 DataSynapse Enabling Real-Time Infrastructures

Solutions make data center processing efficient. Dynamic resource allocation is better than over-provisioning and c underutilization. DataSynapse technologies create a standardized, and automated approach to configuring, activating and scaling existing applications. Hardware resources are based on policies and changing business demands.

DataSynapse solutions provide production-proven methodology. RTI deployment and incremental adoption are supported. Value is enabled through lower ownership costs, and a scale-as-you-grow adoption cycle.

5.7.4 DataSynapse / Informatica Partnership

The DataSynapse / Informatica partnership is positioned to deliver data integration solutions for the agile enterprise. DataSynapse lowers costs and improves productivity for delivering trusted information. DataSynapse real-time infrastructure software enables IT organizations to achieve more agile, scalable and manageable data integration environments for global corporations. DataSynapse is reselling Informatica PowerCenter enterprise grid.

To comply with regulatory requirements and effectively compete in today's business world, enterprises rely on compute-intensive reporting and analytical data to deliver trusted information. These applications are mission-critical and often experience performance issues and availability problems when having to scale quickly in the face of growing end-user demand and growing data volumes.

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Lexington, Massachusetts

The DataSynapse solution combines DataSynapse FabricServer™ software with Informatica PowerCenter software.

TABLE 5-5

DATASYNAPSE / INFORMATICA PARTNERSHIP SOLUTIONS BENEFITS

- Improved agility
- Automatic deployments of resources
- IT response to changes in business demand
- Improved quality of service due
- Computing power being available when needed
- Improved cost structure
- Low administration costs
- Reduced hardware footprints
- Informatica shares with other applications

Source: WinterGreen Research, Inc.

DataSynapse delivers a solution that improves productivity, saves time, lowers cost and enables joint customers to deliver trusted information for regulatory compliance faster and more efficiently.

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DataSynapse application virtualization solution dynamically configures, activates, and scales applications based on business policies. FabricServer provides provisioning across heterogeneous applications and resources, helping to eliminate downtime, automate service level management, and improve enterprise application performance by creating a real-time infrastructure.

IT organizations can cost-effectively scale out ETL (extract, transform, load) environments and optimize existing resources and allocate them across applications, departments and job loads.

5.7.5 DataSynapse FabricServer™ Real-Time Infrastructure Software

DataSynapse FabricServer™ software is an enabling platform for achieving real-time infrastructure. Enterprise application virtualization platform is software that configures, activates, and scales applications based on business demands and policies. FabricServer can create real-time infrastructure environments that dynamically allocate computing resources to enterprise applications . Lowering existing operational costs and reducing data center growth is achieved by increasing resource utilization.

IT infrastructure real-time infrastructure dynamically responds to business demand. It enables the timely and cost-effective delivery of business services.

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Lexington, Massachusetts

TABLE 5-6

DATASYNAPSE FABRICSERVER™ REAL-TIME INFRASTRUCTURE BUSINESS GOALS

- Reduce costs
- Achieved better, more-efficient resource usage
- Reduce IT operations management costs
- Improve service levels
- Permit dynamic tuning of IT services
- Increase agility
- Support rapid provisioning of new services or resources
- Scale established services

Source: WinterGreen Research, Inc.

FabricServer improves the end-to-end user experience for business applications. By allocating computing resources based on business demand, business calendar, service level agreements (SLAs), and transactional priority more granular control of resources is supported. The DataSynapse Studio™ software is a developer tool for real-time environments that automate and standardize the testing, deployment and packaging of enterprise applications. DataSynapse VersaVision™ software is a business reporting and analytics platform. It provides visibility into real-time infrastructure.

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tel 781-863-5078
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Lexington, Massachusetts

Dynamic configuration, activation and scaling of enterprise applications have a dramatic impact on how organizations manage their data centers. IT can be proactive going forward in implementing real-time strategies. FabricServer IT organizations can focus on simplifying application management, application deployment and increase operational efficiency and agility.

TABLE 5-7

DATASYNAPSE FABRICSERVER DATA CENTER BENEFITS

- Improved business user experience
- Allocation of computing resources based on business demand
- Allocation of computing resources based on business calendar
- Allocation of computing resources based on service level agreements or transactional priority
- Support for the Microsoft .NET Framework, Internet Information Server, and Windows SharePoint Services
- Enabling Microsoft enterprise customers to meet business goals
- Creating an IT infrastructure
- Continuously adapts to support applications and capabilities

Source: WinterGreen Research, Inc.

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tel 781-863-5078
email: info@wintergreenresearch.com
Lexington, Massachusetts

TABLE 5-8

DATASYNAPSE FABRICSERVER KEY FEATURES

- DataSynapse Studio:
- A development tool for configuring enterprise applications for a real-time IT environment.
- Support for Microsoft Application Platforms:
- Supports .NET Framework 3.0, Internet Information Server and Windows SharePoint Services
- Supports Java, J2EE, Legacy and COTS/ISV applications
- Supports technologies in the application portfolio of enterprise customers
- Command-Line Interface
- Enables integration with enterprise scripting languages
- Automates packaging
- Automates deployment of enterprise applications

Source: WinterGreen Research, Inc.

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tel 781-863-5078
email: info@wintergreenresearch.com
Lexington, Massachusetts

If businesses operate in real-time, then so should their IT infrastructures. Technology helps customers create real-time environments. DataSynapse FabricServer software makes it easier for IT organizations to deliver on-demand computing, utility computing, and shared SOA services.

5.7.6 DataSynapse Platform Supports SOA Applications

DataSynapse platform supports SOA applications implemented on clusters of servers. Virtual SOA clustering is implemented as application virtualization. It is aimed at achieving standard server virtualization without multiple operating systems OSs. It is similar to grid computing, in that it aims to combine multiple servers into one large computing resource.

Virtualization is concerned with dividing up a single server. FabricServer has support for Microsoft platforms, including .Net, IIS and SharePoint. In DataSynapse's architecture, all servers are initially configured identically, with every required application installed on each alongside the FabricServer software.

It combines load balancing with management. Requests are distributed to the appropriate server. The latter allows administrators to divide the total compute capacity between the installed applications. In a large cluster, individual servers would be dedicated to a single application. This can be changed as all software is able to be installed on all servers.

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Virtualization can make an IT infrastructure more flexible. DataSynapse software needs to be able to support every application it's managing, meaning that it will not necessarily work with everything. The support for Microsoft environments includes .Net v3, SharePoint and IIS. It supports previous versions of .Net on Windows, and most Java platforms running under Linux, both of which can run either on VMware or bare metal.

DataSynapse users see benefits when using it alongside VMware. This allows multiple OS images to be installed simultaneously. Licensing could get expensive for off-the-shelf applications, as each one needs to be licensed for every machine that it is installed on, even if only a relatively small fraction of the available capacity is used.

5.8 Eclipse Foundation

Eclipse is an open source community with projects focused on an extensible development platforms and application frameworks. Platforms and frameworks are used for building software. Eclipse provides extensible tools and frameworks that span the software development lifecycle, including support for modeling, language development environments for Java, C/C++ and others, testing and performance, business intelligence, rich client applications and embedded development.

A large, vibrant ecosystem of major technology vendors, innovative start-ups, universities and research institutions and individuals extend, complement

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and support the Eclipse Platform. The Eclipse Foundation is a not-for-profit, member supported corporation that hosts the Eclipse projects.

5.8.1 Skyway Software Joins Eclipse Foundation

Skyway Software is simplifying software delivery through model-based, collaborative tools. Iterative delivery processes, is one of many companies supporting the Eclipse Foundation. Eclipse is the leading open source software development community. Eclipse Foundation supports a development platform.

5.9 Exaltec Software

Exaltec is an application software company with its flagship product the b+ J2EE™ Application Generator having attained IBM accreditation.

5.10 Exeros

Exeros® accelerates data governance initiatives. Systems are used for discovering business rules, data lineage, hidden sensitive data and unknown data inconsistencies buried in corporate data sources.

5.11 Extol International

Extol International is a premier source for electronic commerce software for the mid-market enterprise. Applications are rapidly deployable, with a low cost of ongoing ownership.

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5.12 Francisco Partners / GXS

GXS is a leading worldwide provider of business-to-business EDI and supply chain integration, synchronization and collaboration solutions. The company operates a highly reliable, secure global network services platform enabling more than 40,000 businesses, including 75 percent of the Fortune 500, to conduct business together in real time.

It offers an extensive range of outsourced EDI and supply chain management solutions to help companies, both large and small, connect worldwide with their business partners, synchronize product and price information, optimize inventory control management and demand forecasts, and speed the overall performance of their global supply chains. The broad array of outsourced EDI and supply chain management solutions provide integration and tagging capability. GXS has a worldwide reach, with no trading partner left behind.

GXS was acquired by Francisco Partners from General Electric Company (GE) and now operates as an independent firm. GE retains a minority investment in GXS. Francisco Partners is one of the world's largest technology-focused buyout funds with over $2.5 billion of committed capital under management.

5.13 GigaSpaces Technologies

GigaSpaces provides a single platform for end-to-end scalability of high performance and stateful distributed applications with high-volume processing

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tel 781-863-5078
email: info@wintergreenresearch.com
Lexington, Massachusetts

and low latency requirements, and an alternative for implementing high performance and scalable SOAs.

5.14 HCL Technologies Ltd.

HCL Technologies is a 45,000 person Indian IT outsourcing company. It has 500 customers across 17 countries. HCL offers IT services across the application life-cycle from business/IT consulting to global-rollouts and support.

5.14.1 HCL Technologies second quarter revenue FY 2OO7-08

HCL Tech half yearly revenues were at US $ 890 million; up 41%. Q2 revenues were at $461 million; up 39.2% YoY and 7.4% sequentially. LTM (last twelve months) revenues were at US $ 1.65 billion. HCL is an outsourcer that has a focus on value as opposed to volume. Multi-service offerings and outcome based pricing implements a foundation of collaborative transformation as a way of business. This collaborative approach with customers and partners creates a deeper and more sustained impact, providing a base to expand and create new markets.

5.14.2 HCL Technologies Strategy

HCL Technologies strategy is a remote infrastructure management are implemented in the context of commitment to trust and transparency in every aspect of business. The US region has been growing with a QoQ growth of 8.9%.

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email: info@wintergreenresearch.com
Lexington, Massachusetts

Among service lines, infrastructure services, engineering & R&D Services (ERS) and custom application services had accelerated growth. The fastest growth among verticals was recorded in Life Sciences, Financial Services, and Telecommunications.

5.15 Hewlett-Packard

Hewlett-Packard is one of the world's largest computer companies and the foremost producer of test and measurement instruments. HP focuses on simplifying technology experiences for customers - from individual consumers to the largest businesses. The portfolio spans printing, personal computing, software, services and IT infrastructure. HP is among the world's largest IT companies, with revenue totaling $107.7 billion for the four fiscal quarters ended Jan. 31, 2008.

HP technology addresses problems and challenges. HP operates in 170 countries worldwide. It explores how technology helps people and companies. It applies thinking and ideas to create more simple, valuable and trusted experiences with technology, continuously improving the way customers live and work.

HP offers a complete a technology product portfolio. Infrastructure and business offerings span handheld devices to powerful supercomputers. Consumers are offered a wide range of products and services. Offerings go from digital photography to digital entertainment and from computing to home printing.

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tel 781-863-5078
email: info@wintergreenresearch.com
Lexington, Massachusetts

This comprehensive portfolio helps match products, services and solutions to customer specific needs.

5.15.1 Hewlett Packard Service-Oriented Architecture

Hewlett Packard service-oriented architecture has several large customers including the:

− Largest gas station retail management system in the world, China: $12.5M

− 1st production Service Delivery Platform (SDP) in APeJ using SOA principles, Malaysia: $1.5M

− 1st IceWall & HP Select Identity combination solution in a Japan local bank: $1M

5.15.2 HP SOA Center Components

HP Systinet software provides a complete SOA governance platform accelerates adoption and mitigates the business risk of SOA. It provides a trusted “system of record” and increases the adoption of SOA.

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email: info@wintergreenresearch.com
Lexington, Massachusetts

TABLE 5-9

HP SYSTINET SOA CENTER COMPONENTS KEY CAPABILITIES

- Enable services to be easily found
- Enable service consumers
- Gain a 360-degree view of a service at every phase in its lifecycle
- Enhance the reliability of services
- Achieve consistency and interoperability
- Formalize an explicit agreement between consumers and providers
- Manage the service lifecycle
- Achieve introduction to retirement
- Understand capacity needs
- Reduce the overall impact of service changes

Source: WinterGreen Research, Inc.

HP SOA manager software is links design-time governance processes and traditional operations management systems. SOA-centric run-time management capabilities are offered. Performance management relates to problem isolation and policy enforcement.

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tel 781-863-5078
email: info@wintergreenresearch.com
Lexington, Massachusetts

HP Systinet manager allows users to rapidly gain control over the operational aspects of the services within an organization.

5.15.3 HP Financial Information 2008

HP First Quarter 2008 Results -- First quarter net revenue up 13%, or $3.4 billion, from a year earlier to $28.5 billion

HP (NYSE:HPQ) revenue for its first fiscal quarter ended Jan. 31, 2008 is $28.5 billion, up 13% from a year earlier and up 8% when adjusted for the effects of currency. HP added more than 2,000 sales positions in the past year through acquisitions and hiring. HP remains well positioned for profitable growth with a focus on cost initiatives and improved market coverage.

	Q1 FY08	Q1 FY07	Y/Y Change
Net revenue ($B)	$ 28.5	$ 25.1	13%

Revenue in the Americas grew 8% on a year-over-year basis to $11.2 billion. Revenue grew 15% in Europe, the Middle East and Africa to $12.3 billion. Revenue grew 22% in Asia Pacific to $4.9 billion. When adjusted for the effects of currency, revenue in the Americas grew 7%, revenue in Europe, the Middle East and Africa grew 7%, and revenue in Asia Pacific grew 16%. Revenue from outside of the United States in the first quarter was 69%, with revenue in the

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BRIC countries (Brazil, Russia, India and China) growing 35% over the prior-year period and accounting for 9% of total revenue.

5.15.4 HP Personal Systems Group

HP Personal Systems Group (PSG) revenue grew 24% year over year to $10.8 billion, with unit shipments up 27% on a year-over-year basis. Notebook revenue for the quarter grew 37% over the prior-year period, while desktop revenue grew 15%. Commercial client revenue grew 22% year over year, while consumer client revenue increased 29%.

5.15.5 HP Imaging and Printing Group

HP imaging and Printing Group (IPG) revenue grew 4% year over year to $7.3 billion. On a year-over-year basis, supplies revenue grew 6%, commercial hardware revenue grew 7% and consumer hardware revenue declined 5%. Printer unit shipments increased 1% year over year, with consumer printer hardware units down 2% and commercial printer hardware units up 13%. Momentum in key growth initiatives continued, with solid growth in both the graphic arts and the enterprise businesses.

5.15.6 HP Enterprise Storage and Servers

HP enterprise storage and servers (ESS) reported revenue of $4.8 billion, up 9% over the prior-year period fueled by ESS blades, which grew 81%. On a year-over-year basis, industry-standard server revenue increased 11%. Storage

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email: info@wintergreenresearch.com
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revenue grew 10%, with revenue growth of 14% in the midrange EVA line. Business critical systems revenue increased 1%, with Integrity systems growth of 37% offset by declines in PA-RISC and Alpha.

5.15.7 HP Services

HP Services (HPS) revenue increased 11% year over year to $4.4 billion. Revenue in outsourcing Services grew 15%, followed by consulting and integration and technology services, which grew 13% and 9%, over the prior-year period.

5.15.8 HP Software

HP Software revenue grew 11% over the prior-year period to $666 million, led by 19% growth in the business technology optimization portfolio.

5.15.9 HP Financial Services

HP Financial Services (HPFS) reported revenue of $642 million, an increase of 17% year over year. Financing volume and net portfolio assets increased 5% and 14%.

Hewlett-Packard Revenue

(In millions of dollars)

Three months ended

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tel 781-863-5078
email: info@wintergreenresearch.com
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	January 31, 2008	October 31, 2007	January 31, 2007
Net revenue	$ 28,467	$ 28,293	$ 25,082

Hewlett-Packard Revenue

(In millions of Dollars)

	Three months ended	
	January 31, 2008	January 31, 2007
Net revenue:		
Enterprise Storage and Servers	$ 4,820	$ 5,108	$ 4,421
HP Services	4,378	4,348	3,932
HP Software	666	759	598
Technology Solutions Group	9,864	10,215	8,951
Personal Systems Group	10,791	10,133	8,719
Imaging and Printing Group	7,312	7,554	6,999

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HP Financial Services	642	657	547
Corporate Investments	218	210	157
Total Segments	28,827	28,769	25,373
Eliminations of intersegment net revenue and other	(360)	(476)	(291)
Total HP Consolidated	$ 28,467	$ 28,293	$ 25,082

HEWLETT-PACKARD COMPANY AND SUBSIDIARIES

SEGMENT / BUSINESS UNIT INFORMATION

(In millions of dollars)

	Three months ended		
	January 31, 2008	October 31, 2007(a)	January 31, 2007(a)
Net revenue:			
Industry standard servers	$ 2,988	$ 3,059	$ 2,689

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Business critical systems	855	1,034	846
Storage	977	1,015	886
Enterprise Storage and Servers	4,820	5,108	4,421
Technology services	2,241	2,229	2,062
Outsourcing services	1,303	1,271	1,129
Consulting and integration	834	848	741
HP Services	4,378	4,348	3,932
Business technology optimization(b)	548	620	460
Other(b)	118	139	138
HP Software	666	759	598
Technology Solutions Group	9,864	10,215	8,951
Notebooks	5,664	5,164	4,146

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Desktops	4,401	4,222	3,821
Workstations	467	473	405
Handhelds	89	108	191
Other	170	166	156
Personal Systems Group	10,791	10,133	8,719
Commercial Hardware	1,726	1,880	1,616
Consumer Hardware	1,180	1,251	1,241
Supplies	4,399	4,423	4,142
Other	7	-	-
Imaging and Printing Group	7,312	7,554	6,999
HP Financial Services	642	657	547
Corporate Investments	218	210	157
Total Segments	28,827	28,769	25,373
Eliminations of intersegment net revenue and other	(360)	(476)	(291)
Total HP Consolidated	$ 28,467	$ 28,293	$ 25,082

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5.15.10 HP Technology Positioning

HP business groups drive industry leadership in core technology areas:

The Personal Systems Group: business and consumer PCs, mobile computing devices and workstations

The Imaging and Printing Group: inkjet, LaserJet and commercial printing, printing supplies, digital photography and entertainment

The Technology Solutions Group: business products including storage and servers, managed services and software

Next-generation data center

Always on, always connected mobile computing

Ubiquitous printing and imaging

5.16 IBM

IBM is a leader in the creation, development and manufacture of advanced information technologies, including computer systems, software, networking systems, storage devices and microelectronics. IBM has succeeded by providing integrity in its relationships with customers. The defining IBM value is a thoughtful approach problems. The company seeks a relationship to customers that supports business process outcomes based on leading technology.

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tel 781-863-5078
email: info@wintergreenresearch.com
Lexington, Massachusetts

Companies aim to satisfy customers, dedicating efforts to creating success for their clients. IBM seeks to build trusted, long-term relationships with owners, employees, partners, distributors, and services organizations.

IBM seeks to create value for clients and owners, to provide rewarding careers for people, and to be a progressive force in the society. The company has an integrated hardware, software and services market position.

5.16.1 IBM SOA Infrastructure

IBM SOA is used to design and implement reuse of code within complex IT systems in the context of implementing high security in business processes. Infrastructure provided by SOA permits large clients aiming to reduce IT costs for Web-based systems achieve use of the mainframe through server consolidation and the deployment of Linux®-based systems.

The key challenge addressed by SOA infrastructure is to support the implementation of a robust, flexible, platform to support requirements.

IBM SOA infrastructure is used to support flexible Web software implementations in a manner that optimizes existing investment in IT infrastructure. SOA is a move to an environment that includes a repository that can offer very high availability, reliability, and security. Clients reduce costs and increase flexibility. From an internal perspective, the aim is to reduce the complexity of IT environments by consolidating to a smaller number of physical

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tel 781-863-5078
email: info@wintergreenresearch.com
Lexington, Massachusetts

servers generally a mainframe in the context of generating processes from icon based process.

Efficient process consolidation is supported by SOA infrastructure. SOA software solutions are used to support software developed in-house to enable the rapid construction of Web portals and other Web-based systems. Typical implementations are related to systems running on a mixed group of servers, under different operating systems.

5.16.2 IBM WebSphere SOA Business Integration Foundation

IBM WebSphere SOA business integration provides organization for software modules. Transaction management and integration are intertwined. Features and benefits relate to runtime support for business process automation based on desktop icon access to processes that evolve from combinations of existing process modules.

IBM WebSphere® business integration server foundation is used in conjunction with studio application developer integration. Development automation is needed delivers a next generation integration platform. Systems are optimized for building and deploying composite applications that extend and integrate existing IT assets.

Business Process Execution Language for Web Services (BPEL4WS) defines a model and a grammar for describing the behavior of a business

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process based on interactions between the process and its partners. Support for BPEL4WS includes SOA capabilities.

5.16.3 IBM 2008 Fourth-Quarter and Full-Year Revenue

*** Total revenues of $28.9 billion, up 10 percent;**

*** Global Technology Services revenues up 16 percent; pre-tax income up 26 percent;**

*** Global Business Services revenues up 17 percent; pre-tax income up 9 percent;**

*** Services signings of $15.4 billion; short-term signings up 8 percent;**

*** Software revenues up 12 percent; pre-tax income up 21 percent;**

*** 65 percent of revenues from outside the U.S.; E/ME/A revenues up 16 percent; Asia Pacific up 15 percent.**

IBM (NYSE: IBM) fourth-quarter 2007 total revenues were $28.9 billion, an increase of 10 percent (4 percent, adjusting for currency) from the fourth quarter of 2006. The broad scope of global business is led by strong operational performance in Asia, Europe and emerging countries. IBM has continued growth

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tel 781-863-5078
email: info@wintergreenresearch.com
Lexington, Massachusetts

in services and software. In 2008, IBM is well-positioned as a result of a global business reach, solid recurring revenue and profit streams, and strong financial position.

From a geographic perspective, the Americas' fourth-quarter revenues were $11.7 billion, an increase of 5 percent as reported (2 percent, adjusting for currency) from the 2006 period. Revenues from Europe/Middle East/Africa were $10.8 billion, up 16 percent (6 percent, adjusting for currency). Asia-Pacific revenues increased 15 percent (9 percent, adjusting for currency) to $5.5 billion. OEM revenues were $894 million, down 13 percent compared with the 2006 fourth quarter.

IBM total global services revenues grew 17 percent (10 percent, adjusting for currency) and pre-tax income increased 19 percent. Global technology services segment revenues increased 16 percent (10 percent, adjusting for currency) to $10.0 billion, with strong performance in all geographic regions and business sectors.

Global business services segment revenues, marked by significant growth in core consulting and application management services, increased 17 percent (10 percent, adjusting for currency) to $4.9 billion. IBM signed services contracts totaling $15.4 billion, down 13 percent year over year versus a strong fourth-quarter 2006; short-term signings increased 8 percent. The full-year estimated services backlog, including strategic outsourcing, business transformation outsourcing, integrated technology services, global business services and

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maintenance, was $118 billion, an increase of $2 billion from the prior-year period.

Revenues from the Systems and Technology segment totaled $6.8 billion for the quarter, down 4 percent (8 percent, adjusting for currency). Revenues were flat excluding the year-to-year impact of the Printing Systems Division divestiture in June 2007. Pre-tax income increased 18 percent. Systems and Technology revenues from the System p UNIX server products increased 9 percent compared with the 2006 period and revenues from System x servers increased 6 percent.

Revenues from System z server products decreased 15 percent versus the year-ago period. Total delivery of System z computing power is measured in MIPS (millions of instructions per second), decreased 4 percent. Revenues from System i servers increased 2 percent. Revenues from System Storage increased 11 percent and revenues from Microelectronics decreased 15 percent.

Revenues from the software segment were $6.3 billion, an increase of 12 percent (6 percent, adjusting for currency) compared with the fourth quarter of 2006; pre-tax income increased 21 percent. Revenues from IBM's middleware products, which primarily include WebSphere, Information Management, Tivoli, Lotus and Rational products, were $5.0 billion, up 13 percent versus the fourth

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quarter of 2006. Operating systems revenues of $664 million increased 3 percent compared with the prior-year quarter.

For the WebSphere family of software products, which facilitate customers' ability to manage a wide variety of business processes using open standards to interconnect applications, data and operating systems, revenues increased 23 percent. Revenues from Information Management software, which enables clients to leverage information on demand, increased 11 percent.

Revenues from Tivoli software, infrastructure software that enables clients to centrally manage networks including security and storage capability, increased 19 percent, and revenues from Lotus software, which allows collaborating and messaging by clients in real- time communication and knowledge management, increased 7 percent year over year. Revenues from Rational software, integrated tools to improve the processes of software development, increased 22 percent compared with the year-ago quarter.

Global Financing segment revenues increased 8 percent (2 percent, adjusting for currency) in the fourth quarter to $668 million.

IBM Full-Year 2007 Revenue

*** Total revenues of $98.8 billion, up 8 percent;**

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*** Global Technology Services revenues up 12 percent; pre-tax income up 8 percent;**

*** Global Business Services revenues up 13 percent; pre-tax income up 21 percent;**

*** Software revenues up 10 percent; pre-tax income up 9 percent.**

From a geographic perspective, the Americas' full-year revenues were $41.1 billion, an increase of 4 percent as reported (3 percent, adjusting for currency) from the 2006 period. Revenues from Europe/Middle East/Africa were $34.7 billion, an increase of 14 percent (5 percent, adjusting for currency). Asia-Pacific revenues increased 11 percent (8 percent, adjusting for currency) to $19.5 billion. OEM revenues were $3.5 billion, down 10 percent compared with 2006.

Revenues from the global technology services segment totaled $36.1 billion, an increase of 12 percent (7 percent, adjusting for currency) compared with 2006. Revenues from the global business services segment were $18.0 billion, up 13 percent (9 percent, adjusting for currency). Systems and technology segment revenues were $21.3 billion, a decrease of 3 percent (6 percent, adjusting for currency). Software segment revenues in 2007 totaled $20.0 billion, an increase of 10 percent (6 percent, adjusting for currency). Global financing segment revenues totaled $2.5 billion, an increase of 6 percent (2 percent, adjusting for currency).

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IBM ended 2007 with $16.1 billion of cash on hand and free cash flow of $12.4 billion, up 1.9 billion year over year. The balance sheet remains strong, and the company is well positioned to take advantage of opportunities. Share repurchases totaled approximately $18.8 billion in 2007, including $12.5 billion executed through accelerated share repurchase agreements in May. The repurchases are part of the $15 billion authorization for the company's stock repurchase program approved by the IBM board of directors on April 24.

Debt, including global financing, totaled $35.3 billion, compared with $22.7 billion at year-end 2006. From a management segment view, global financing debt increased $2.2 billion from year-end 2006 to a total of $24.5 billion, resulting in a debt-to-equity ratio of 7.1 to 1. The non- global financing debt-to-capitalization ratio was 30.0 percent at the end of 2007, which reflects increased financial leverage associated with the accelerated share repurchase agreements.

INTERNATIONAL BUSINESS MACHINES
(Dollars in millions of dollars)

	Three Months Ended December 31,			Twelve Months Ended December 31,		
	2007	2006	Percent Change	2007	2006	Percent Change
REVENUE						
Global Technology Services	$9,997	$8,590	16.4%	$36,103	$32,322	11.7%
Gross margin	30.1%	29.9%		29.9%	29.8%	
Global Business Services	4,933	4,223	16.8%	18,041	15,969	13.0%
Gross margin	23.1%	24.7%		23.5%	23.1%	

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Systems and Technology	6,796	7,070	-3.9%	21,317	21,970	-3.0%
Gross margin	45.7%	41.8%		39.7%	37.7%	
Software	6,259	5,607	11.6%	19,982	18,161	10.0%
Gross margin	87.1%	86.5%		85.2%	85.2%	
Global Financing	668	620	7.7%	2,502	2,365	5.8%
Gross margin	45.5%	48.6%		46.7%	50.3%	
Other	212	147	44.8%	842	637	32.1%
Gross margin	-15.8%	-6.9%		4.4%	5.7%	
TOTAL REVENUE	28,866	26,257	9.9%	98,786	91,424	8.1%

INTERNATIONAL BUSINESS MACHINES CORPORATION
SEGMENT DATA
FOURTH QUARTER 2007

(Dollars in millions)	Revenue External	Revenue Internal	Revenue Total	Pre-tax Income (Loss) From Continuing Operations	Pre-tax Margin
SEGMENTS					
Global Technology Services	$9,997	$393	$10,390	$1,061	10.2%
Y-T-Y Change	16.4%	-9.6%	15.1%	25.8%	
Global Business Services	4,933	287	5,220	588	11.3%
Y-T-Y Change	16.8%	-17.8%	14.2%	9.2%	
Systems and Technology	6,796	240	7,036	1,364	19.4%
Y-T-Y Change	-3.9%	-33.6%	-5.3%	17.8%	
Software	6,259	712	6,971	2,433	34.9%
Y-T-Y Change	11.6%	12.7%	11.7%	20.8%	
Global Financing	668	445	1,113	341	30.7%
Y-T-Y Change	7.7%	-8.8%	0.4%	-11.8%	
TOTAL REPORTABLE SEGMENTS	28,654	2,077	30,731	5,787	18.8%
Y-T-Y Change	9.7%	-8.3%	8.3%	17.1%	
Eliminations / Other	212	(2,077)	(1,865)	(298)	

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TOTAL IBM CONSOLIDATED	$28,866	$0	$28,866	$5,489	19.0%
Y-T-Y Change	9.9%		9.9%	14.0%	

FOURTH QUARTER 2006

(Dollars in millions)	Revenue External	Revenue Internal	Total Operations	Pre-tax Income (Loss) From Continuing Operations	Pre-tax Margin
SEGMENTS					
Global Technology Services	$8,590	$435	$9,025	$843	9.3%
Global Business Services	4,223	349	4,572	538	11.8%
Systems and Technology	7,070	362	7,432	1,158	15.6%
Software	5,607	632	6,239	2,015	32.3%
Global Financing	620	488	1,108	387	34.9%
TOTAL REPORTABLE SEGMENTS	26,111	2,266	28,377	4,940	17.4%
Eliminations / Other	147	(2,266)	(2,120)	(126)	
TOTAL IBM CONSOLIDATED	$26,257	$0	$26,257	$4,814	18.3%

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INTERNATIONAL BUSINESS MACHINES CORPORATION
SEGMENT DATA
TWELVE MONTHS 2007

(Dollars in millions)	Revenue External	Revenue Internal	Revenue Total	Pre-tax Income (Loss) From Continuing Operations	Pre-tax Margin
SEGMENTS					
Global Technology Services	$36,103	$1,636	$37,739	$3,557	9.4%
Y-T-Y Change	11.7%	-7.2%	10.7%	8.2%	
Global Business Services	18,041	1,193	19,234	2,064	10.7%
Y-T-Y Change	13.0%	-13.1%	10.9%	21.0%	
Systems and Technology	21,317	998	22,315	2,153	9.6%
Y-T-Y Change	-3.0%	-14.5%	-3.6%	23.8%	
Software	19,982	2,416	22,398	6,002	26.8%
Y-T-Y Change	10.0%	7.5%	9.7%	9.3%	
Global Financing	2,502	1,482	3,984	1,386	34.8%
Y-T-Y Change	5.8%	-3.0%	2.4%	-4.7%	

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TOTAL REPORTABLE SEGMENTS	97,944	7,726	105,670	15,163	14.3%
Y-T-Y Change	7.9%	-4.4%	6.9%	10.8%	
Eliminations / Other	842	(7,726)	(6,884)	(674)	
TOTAL IBM CONSOLIDATED	$98,786	$0	$98,786	$14,489	14.7%
Y-T-Y Change	8.1%		8.1%	8.8%	

TWELVE MONTHS 2006

(Dollars in millions)	Revenue External	Revenue Internal	Total	Pre-tax Income (Loss) From Continuing Operations	Pre-tax Margin
SEGMENTS					
Global Technology Services	$32,322	$1,763	$34,086	$3,288	9.6%
Global Business Services	15,969	1,373	17,341	1,706	9.8%
Systems and Technology	21,970	1,168	23,138	1,739	7.5%
Software	18,161	2,249	20,409	5,493	26.9%
Global Financing	2,365	1,527	3,892	1,455	37.4%
TOTAL REPORTABLE SEGMENTS	90,787	8,080	98,867	13,682	13.8%
Eliminations / Other	637	(8,080)	(7,443)	(365)	
TOTAL IBM CONSOLIDATED	$91,424	$0	$91,424	$13,317	14.6%

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5.17 IDS Scheer

IDS Scheer is the leading provider of solutions for business process. ARIS-based solutions provide software, services and methods to support the process lifecycle from design, implementation, controlling and continuous improvement.

5.18 Informatica

Informatica is the leading independent provider of data integration software and services. Informatica permits organizations to gain greater business value by integrating information assets from across the enterprise. Informatica has 2,950 customers. Informatica reduces the cost and expedites the time to address data integration needs of any complexity and scale.

5.19 Information Builders

Information Builders is a leader in Web business intelligence.

5.19.1 Information Builders / iWay Software

iWay Software, an Information Builders company, accelerates business initiatives by reducing time, costs, and efforts of back-office integration up to 80%.

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5.20 Iona Technologies

Iona has evolved into helping corporations create enterprise portals - which are singular points of access on the Web that harness the combined power of a company's software systems for their customers.

5.20.1 Iona High-Performance Integration Solutions

IONA® Technologies is a leader in high-performance integration solutions for IT environments. IONA standards-based integration includes CORBA. Orbix® products are based on Corba. IONA Artix™ is an advanced SOA infrastructure suite.

Systems are used to leverage service-oriented architecture to streamline and modernize IT environments. Iona offers SOA open-source software. The FUSE™ family of open source distributed SOA infrastructure products allows customers to leverage economic benefits associated with the use of open source software.

Iona Artix infrastructure suite implements SOA. Components in LogicBlaze's Fuse stack, include ActiveMQ, offered as part of Artix. Iona bought C24, another privately held company, bringing additional data management capabilities to Artix.

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5.20.2 Iona / LogicBlaze and C24: Open-Source SOA Company

Iona purchased LogicBlaze to grow its SOA business. Iona Technologies LogicBlaze offers a stack of SOA (service oriented architecture) software that combines several open-source components, including the Apache ActiveMQ messaging system and the Apache ServiceMix ESB (enterprise service bus). Called Fuse, the stack is useful in implementing a group of discrete services as a system.

Iona LogicBlaze utilizes ActiveMQ and ServiceMix. Fuse is a large stack of open-source products. Iona is offering the Fuse components separately. SOA revenue depends on accelerating the ability to create services packages that provide integration. Two acquisitions, C24 and LogicBlaze add lines of business and diversify the revenue base. The company has taken action to reduce annualized expenses by $8 million.

5.20.3 Iona Revenue For Full Year And Fourth Quarter 2007

IONA® Technologies (NASDAQ: IONA) full year 2007 revenue was $77.7 million and fourth quarter 2007 revenue of $18.1 million. IONA reported a 2007 net loss of $0.7 million. For the fourth quarter of 2007, IONA reported in 2007 that the CORBA business remained profitable.

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email: info@wintergreenresearch.com
Lexington, Massachusetts

TABLE 5-10

IONA ACTIVITY SUMMARY

- * In 2007 IONA generated positive cash flow from operations of $11.7 million and increased year-end cash and marketable securities to $56.5 million
- * For 2007 Artix revenue grew 26% and total Artix customers increased to 129 in target markets
- * The acquisitions of LogicBlaze and C24 diversified product and revenue streams and led to 30 new customers in 2007
- * Delivered a major upgrade to Artix™, the advanced SOA infrastructure suite, with enhanced interoperability, active governance and expanded support
- * Leading international bank, DZ Bank selected Artix Registry/Repository to govern the use of services across the SOA infrastructure
- * FUSE™ HQ provides systems management and monitoring across the FUSE family of Open Source products from IONA
- * Deployment of FUSE ESB by the Belgium Ministry of Education

Source: WinterGreen Research, Inc.

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5.20.4 IONA Providing Distributed, Standards-Based Solutions To IT Organizations

IONA provides distributed, standards-based solutions to IT organizations with complex, heterogeneous computing environments and challenging integration problems. Software works together. It supports making better decisions, running the businesses more efficiently, and improving business results. Software products enable customers to modernize and streamline IT environments. Corba and Artix lower total operating costs and achieve greater return on investment (ROI) on their existing and future IT investments.

IONA has built its integration products around significant open industry standards, initially CORBA and more recently Web services. A unifying approach to designing and implementing large-scale systems is referred to as service-oriented architecture, or SOA. These can be seen in Orbix and Artix product families. Active participation in open source SOA infrastructure projects includes having a leadership role in the Eclipse Foundation SOA tooling platform project.

5.20.5 IONA Revenue

IONA(R) Technologies (NASDAQ: IONA) distributed service-oriented architecture (SOA) infrastructure solutions are used for performance-demanding IT environments. Full year 2007 revenue was $77.7 million and fourth quarter 2007 revenue of $18.1 million.

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In 2007, Corba business remained predictable and profitable Iona Technologies. C24 and LogicBlaze have lines of business that diversify the revenue base. Products provide growth in attractive market segments and complement existing Artix product line. Intense reviews of bigger deals toward the end of the year resulted in delays. Customers delayed orders at quarter-end, impacting overall results and Artix.

IONA generated $11.7 million from operations in 2007. Acquisitions are on track to be accretive in 2008. To protect profitability and achieve target operating margins, the company has reduced expenses by $8 million.

For 2007 Artix revenue grew 26% and total Artix customers increased to 129 in target markets. The 2007 acquisitions of LogicBlaze and C24 diversified the product and revenue streams and led to 30 new customers in 2007. IONA delivered a major upgrade to Artix(TM), the advanced SOA infrastructure suite, with enhanced interoperability, active governance and expanded standards support.

5.20.6 IONA Customers

IONA Customers include an international bank, DZ Bank. It uses Artix Registry/Repository to actively govern the use of services across the SOA infrastructure. FUSE(TM) HQ provides systems management and monitoring across the open source products from IONA. The Belgium Ministry of Education has deployed FUSE ESB.

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tel 781-863-5078
email: info@wintergreenresearch.com
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5.20.7 IONA Revenue

IONA Technologies PLC
(U.S. dollars in thousands)

	December 31			
	Three Months		Twelve Months	
	2007	2006	2007	2006
Revenue:				
Product revenue	$ 8,049	$13,319	$38,842	$42,056
Service revenue	10,046	9,468	38,818	35,782
Total revenue	18,095	22,787	77,660	77,838

5.20.8 IONA(R) Technologies Distributed Service-Oriented Architecture (SOA) Infrastructure Governance Solutions

IONA(R) Technologies (NASDAQ: IONA) is a leader in distributed service-oriented architecture (SOA) infrastructure solutions. Products are targeted to performance-demanding IT environments. Governance is a key requirement for SOA. IONA SOA governance capabilities are supported by Artix(TM. A) suite of advanced SOA infrastructure products include Artix Registry/Repository.

Iona SOA governance solutions are differentiated by a unique ability to drive and streamline the deployment of services into a distributed SOA network. Iona drives the governance solutions beyond a static archive. IONA has a differentiated approach to meeting customer needs for achieving SOA success. Effective SOA governance requires more than a static record of services.

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The ability to actively govern and manage those services according to the policies and contracts that control their usage is vital. Artix Registry/Repository offers active service governance across their SOA.

5.21 Jacada

Jacada provides a complete web to host software infrastructure to rapidly transform legacy systems into e-business and wireless solutions and empower enterprise developers to build Internet applications.

5.22 Nexaweb Technologies, Inc.

Nexaweb provides the leading software platform for building and deploying Enterprise Internet Applications.

5.22.1 Nexaweb Enterprise Web 2.0 and SOA With HP Governance

Nexaweb offers enterprise Web 2.0 and SOA with HP governance interoperability framework. Nexaweb Enterprise Web suite enables governed RIA, composite and enterprise mashup application development; visual ide supports 'drag & drop' retrieval of services from HP SOA Systinet. Nexaweb® Technologies application platform provides a productivity-driven enterprise. It partners with HP in the governance Interoperability Framework (GIF).

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GIF provides a collaborative, standards-based approach for publishing, associating, accessing and managing service-oriented architecture (SOA) metadata and business service information across multiple vendors and technologies.

Nexaweb's Enterprise Web 2.0 Suite is an application development and deployment platform. It is used for building mission-critical, secure Web-based business applications. Nexaweb is used for building enterprise-class Web applications that access transaction and service-oriented data systems. It is simple and doesn't require re-writing code.

Nexaweb EW2.0 solution has 5,000 global deployments. Rooted in the MIT community, Nexaweb is based in Burlington, Massachusetts. Nexaweb to HP GIF bridges the gap between SOA and application development. Web-based business applications are using governed services from a central repository. Nexaweb enterprise Web Suite, enterprise architects, and developers can quickly search and retrieve artifacts and services from the HP SOA Systinet. Services are used to build and deploy governed, rich Internet, composite, and enterprise mashup applications.

SOA initiatives leverage services created to support application development. The HP GIF program provides a governed way to standardize and organize services. Further advancing this process is by making services available as part of an integrated development process that ensures business applications automatically conform to business and IT governance rules.

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Enterprises roll out their service-oriented architecture in the context of trying to build a stable group of services. The application development stack works within an SOA governance framework. Nexaweb's HP GIF interoperability with HP SOA Systinet makes it possible for enterprises to discover and manage policies at both application design-time and runtime. This removes the complexities of consuming governed SOA services and promotes the rapid development of Web-based business applications.

5.22.2 Nexaweb SOA Application and SOA Governance

Nexaweb Enterprise Web suite is an application development and deployment platform for Web-based business applications. A core component of the suite is Nexaweb Studio, an Integrated development environment that enables visual, drag and drop application development and maintenance. Nexaweb Studio interoperates with the HP SOA Systinet through an RSS interface. Using a wizard, developers can retrieve services and place them into Nexaweb Studio's Service Explorer.

Designed to maintain information about the service and information manager, the service explorer removes the need to import WSDL files directly into the workspace. It creates a 'loose' coupling between the implementation and the service, making it possible to maintain a centrally-managed repository for services.

Nexaweb enterprise Web suite is used to build a governed rich Internet application.

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TABLE 5-11

NEXAWEB ENTERPRISE WEB SUITE FEATURES

- Application architect or product manager logs into HP SOA Systinet
- Application architect creates an application artifact
- Metadata used to describe the application
- Request for consumption on all services
- Metadata required by the application artifact
- Create contract between an application artifact and the service
- Solution providers can make accurate impact analysis assessments
- Request approved, the application architect or product manager asks the developer to create the application and hands over the requirements
- Nexaweb studio creates the application
- During the application creation process, Nexaweb studio queries hp SOA Systinet for the application's metadata and required services

Source: WinterGreen Research, Inc.

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TABLE 5-12

NEXAWEB ENTERPRISE WEB SUITE FUNCTIONS

- Nexaweb studio imports services
- Nexaweb studio uses the metadata about the application to create it
- Nexaweb studio means the developer binds the inputs and outputs of the service execution to the user interface
- Nexaweb platform makes a request at runtime to the HP SOA Systinet
- Retrieves the endpoints of the services
- Abstraction makes it possible to centrally manage all endpoint information
- Endpoints of services may change as a service evolves
- Manage application with console to choose the right implementation
- Application can be changed at runtime
- Removes the need to hardcode service endpoints
- Enterprise architect can validate an application adherence to enterprise policies

Source: WinterGreen Research, Inc.

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email: info@wintergreenresearch.com
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Certification and joint product interoperability efforts ,mean HP Systinet has joined Nexaweb's Web2SOA™ program.

5.22.3 Nexaweb Web2SOA™ Ecosystem Program

Many organizations are reaching an inflection point in their SOA initiatives. They have developed an infrastructure and begun deploying services, but are faced with the challenge of how to go the 'Last Mile' and deliver these services to end-users. Nexaweb's Enterprise Web 2.0 & SOA Ecosystem Program is designed to help customers capitalize on their SOA initiatives, leverage existing infrastructure and quickly deliver rich, reliable and governed Enterprise Web 2.0 (EW2.0) and Service-Oriented Business Applications (SOBA) to end-users via the Web - enabling them to finally realize the productivity and ROI promise of SOA across all facets of the organization. Visit http://www.nexaweb.com to learn more about our Enterprise Web 2.0 & SOA Ecosystem Program.

5.23 Oracle / BEA

Oracle (NASDAQ: ORCL) is a largest enterprise software company.

5.23.1 Oracle / BEA Systems

Oracle / BEA Systems. is a leader in enterprise infrastructure software, delivering standards-based platforms for building enterprise applications and managing Service-Oriented Architectures. Systems work in heterogeneous IT environments.

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email: info@wintergreenresearch.com
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BEA offers the Tuxedo®, WebLogic®, and AquaLogic® product lines. Products are positioned to reduce IT complexity, leverage existing resources, and speed the delivery of new services. BEA provides support for blended IT strategies that combine open source and commercial software.

BEA Systems is a leader in enterprise infrastructure software. BEA Liquid Enterprise™ middleware transforms the business. Oracle and BEA middleware products interoperate. The company has 16,000 customers including the majority of the Fortune Global 500. BEA provides the technology, solutions and services to help companies achieve a Business LiquidITy™ where enterprise assets are freed up to deliver maximum business value.

The agreement for Oracle to acquire BEA gives Oracle a stronger middleware play. The addition of BEA products and technology significantly extends Oracle's Fusion middleware software suite. Oracle Fusion middleware has an open "hot-pluggable" architecture that allows customers the option of coupling BEA's WebLogic Java Server to virtually all the components of the Fusion software suite.

5.23.2 BEA / Sony Pictures Entertainment / Tata Consultancy: Service-Oriented Architecture (SOA)

BEA AquaLogic products are used for accelerated enterprise SOA. Tata Consultancy Services (TCS), (BSE: TCS.BO, NSE: TCS.NS) a leading IT services, business solutions and outsourcing supports Sony Pictures Entertainment, Inc. (SPE) by developing and deploying service-oriented

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email: info@wintergreenresearch.com
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architecture (SOA) solutions that allow Sony to better use IT assets to advance business goals.

Industry best practices, the SOA solutions combine a set of best-of-breed technologies, tools, patterns and standards from Sony Pictures, TCS and BEA Systems to help enterprise organizations align business functions for greater flexibility and efficiency. A SOA framework enables enterprise organizations to quickly sense and respond to changing market conditions.

5.23.3 Oracle and BEA Customers and Partners

Oracle and BEA share a common vision of an open-standards, service-oriented architecture for customers. Oracle seeks to accelerate the adoption of SOA solutions by working closely with customers to address their enterprise application infrastructure needs. BEA customers are expected to benefit as follows:

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TABLE 5-13

ORACLE AND BEA CUSTOMER BENEFITS

- Increased R&D investment across the combined products
- Extended value from integrated Oracle products
- Add security and identity management
- Add content management
- Add business intelligence
- Add performance management
- Leverage BEA middleware application solutions
- Provide investment protection

Source: WinterGreen Research, Inc.

Enhancements to the combined BEA and Oracle are anticipated to provide better integration of the complementary solutions. BEA gains access to Oracle's global sales, sales consulting, support and services organization and broad partner network. Common Oracle and BEA customers get consolidated and consistent support across multiple product lines

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BEA products are anticipated to evolve as part of Fusion Middleware. Oracle expects to continue to focus on the Fusion middleware roadmap and incorporate components of BEA solutions over time

5.23.4 Oracle BEA Systems / Skyway Software Service Delivery and SOA Governance Partnership

BEA and Skyway Software have a partnership dedicated to simplifying software delivery through model-based, collaborative tools and iterative processes. Oracle BEA Systems strategic partnership depends on Skyway Software reselling BEA AquaLogic® registry repository as part of the Skyway Visual Workspace™ product family. The partnership provides an integrated development platform to help enterprises reduce architecture-build costs and improve business agility.

Skyway Software and BEA partnership simplifies software delivery. Enterprises can use existing technology to create SOA-based programs, particularly useful in fast-paced customer-driven market sectors like retail and finance. The flexibility of the partnership means that the technology works across multiple vendor platforms, in a secure and scalable environment.

5.23.5 Oracle / BEA Revenue

Oracle BEA third quarter 2007 revenue achieved 59% year-over-year growth. AquaLogic delivered 27% of license revenue, 31% year-over-year growth, as SOA adoption expands.

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BEA Systems enterprise infrastructure software third quarter total revenues were $384.4 million, up 11% from last year's third quarter. BEA reported third quarter license fees of $134.8 million, down 1% from a year ago, and services revenue of $249.6 million, up 18% from a year ago.

Third quarter results demonstrate continuation of the business momentum. Performance in the quarter was led by AquaLogic products, which represented 27% of license revenue. AquaLogic user interaction had its strongest quarter, and AquaLogic enterprise registry and repository, products are for the emerging hot areas of SOA management and governance.

Sustained momentum began in Q2. These results continue to validate product-driven growth strategy. Led by China and Japan, license revenue in the Asia/Pacific region grew by 24%, demonstrating this growth territory.

BEA innovations deliver solutions for our customers' most demanding needs," Chuang said. "Our growth strategy of delivering new products to meet those needs has been validated by the performance of a growing number of AquaLogic product categories. In addition, WebLogic Communication Platform delivered its strongest quarter ever. In its first quarter, we seeded WebLogic Server Virtualization Edition in key accounts and demonstrated referenceable results. These products represent next generation of dynamic business applications, provide BEA with exciting growth opportunities to build shareholder value.

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5.23.6 BEA Customers and Partnerships

Key customers and partner included Abbott Laboratories, Airbus France, Amgen, Atreus Systems, AT&T, Barclay Card US, Beijing DongCheng District Info Center, British American Tobacco, BT, China Mobile Communication Corporation, Comcast, eBay, Edmunds, Electric Power Agriculture Shanxi, Enterprise Rent-A-Car, Eurocontrol, Fortis, Global Village Telecom, GuangDong Development Bank, Hallmark Card, Hafslund, Instituto Mexicano del Seguro Social, Italtel, Intermountain Health Care, Johnson and Johnson, KLM Royal Dutch Airlines, Mexico Sistema de Administracion Tributaria, Northern Trust Bank, Pearson Educational Management, Petrobras, Police Service Northern Ireland, Polska Telefonia Cyfrowa, Sage, Santander Consumer Bank, Sempra Energy, Smart and Final, Specialist Computer Centres, ST Microelectronics, State of Utah Department of Public Safety, SunLife, Swiss International Air Lines, TD Ameritrade, Telefonica Moviles Espana, Tetra Pak, TIM Celular, USAA, US Air Force, US Army, US FDA, Vivo, Warner Music Group, WebEx Communications and Zurich American Insurance.

Partners include VARs, hardware OEMs, systems integrators, ASPs and ISVs. ArisGlobal, Atreus Systems, Callidus Software, Compliance11, DMLT, Financial Sciences, HealthEdge, i2, InnoPath, Management Dynamics, Nomis Solutions, PDX, Puridiom, Saber Corporation, Siricon, Solstice Software, Thinkorswim, Ventyx, Verisign, VMware and Zycus are selected partners.

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tel 781-863-5078
email: info@wintergreenresearch.com
Lexington, Massachusetts

5.23.7 BEA Revenues

BEA SYSTEMS, INC.

(In thousands of dollars)

	Three Months Ended October 31,		Nine Months Ended October 31,	
	2007	2006	2007	2006
Revenues:				
License fees	$134,782	$136,365	$372,549	$404,735
Services	249,646	211,307	722,339	605,788
Total revenues	384,428	347,672	1,094,888	1,010,523

5.24 Pervasive Software

Pervasive offers embeddable integration that speeds the flow of data between applications and organizations. The company has 20 years of expertise; 1000s of customers; agile integration that spans data warehouses, real-time app integration, data exchange with trading partners.

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tel 781-863-5078
email: info@wintergreenresearch.com
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5.25 PolarLake

PolarLake financial services specific integration of applications has an XML ocmponent. A XML pipelining technology includes a reference data distribution for financial services. PolarLake OTC derivatives product provides reconciliation and matching of OTC derivative portfolios and trade lifecycle management.

PolarLake messaging integrator for financial services provides a XML pipelining platform to support FpML, SWIFT, FIX, CSV, non XML, and Web services. The integration challenge in financial services is greatest where there is high complexity and high frequency of change. PolarLake domain specific applications are purpose built to solve this problem delivering with 80% less resource and 75% less time than traditional integration solutions.

The effort to achieve efficient data management is correlated with the way that distribution of that data is managed. Data needs of downstream applications are a central aspect of SOA. EDM adoption is complex. The cost of integrating downstream technologies is addressed by systems from PolarLake. More efficient and effective integration tools place EDM within reach for a wider array of firms helping them benefit of consistent and clean enterprise data at a cost-effective price.

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tel 781-863-5078
email: info@wintergreenresearch.com
Lexington, Massachusetts

PolarLake's Integration Suite has been used as a reference data hub feeding data from multiple incompatible sources to dozens of downstream systems, each one needing a different data format." - Mike Gilpin, VP Research Director

5.26 Progress Software

Progress Software (NASDAQ: PRGS) provides application infrastructure software for the development, deployment, integration and management of business applications. Systems are positioned to maximize the benefits of information technology while minimizing its complexity and total cost of ownership. The company has 1,600 employees in over 90 countries.

5.26.1 Progress Software Market Presence

Progress Software has a market presence in over 140 countries. Customers include 90% of the Fortune 100 at over 60,000 organizations. Systems are deployed at over 100,000 sites. The company has 2,000 partners. Progress Software offers 5,000 applications and has 5 million users. Application development, deployment, integration, and management products are offered.

5.26.2 Progress Software Strategy

Progress Software product strategy provides innovative and open set of SOA infrastructure products.

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tel 781-863-5078
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Best-in-class capabilities are implemented in heterogeneous, federated and distributed environments. Progress Software offers event processing and data services.

5.26.3 Progress Software Go To Market Strategy

Progress Software has an aggressive field organization, expert in their products, markets and competition. The company seeks to leverage enterprise accounts and expand presence in existing accounts. The way to do this is to leverage existing partners to extend its market presence.

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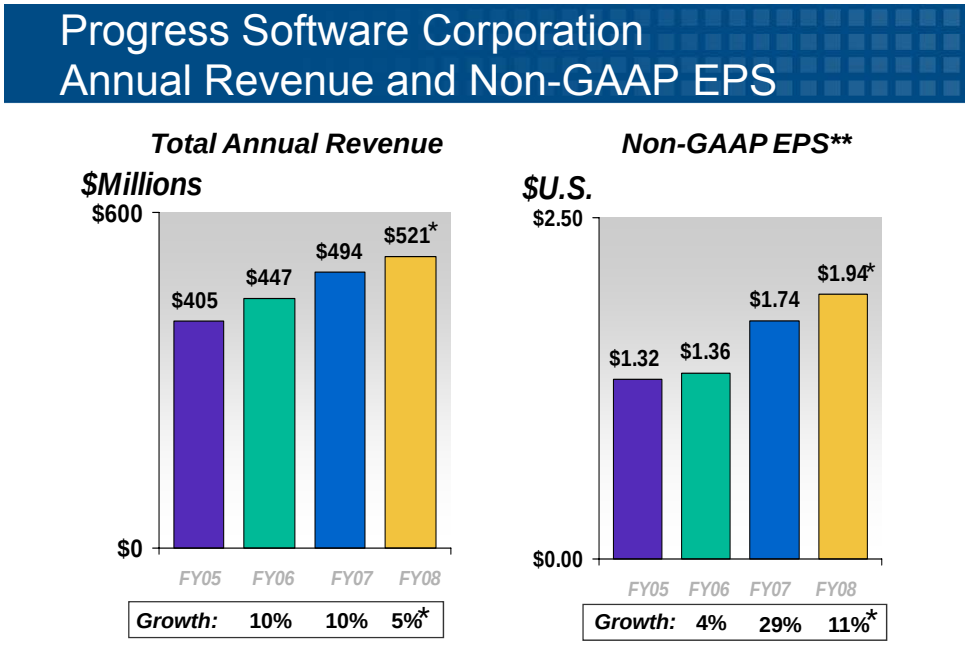
5.26.4 Progress Software Revenue 2007

FIGURE 5-14

PROGRESS SOFTWARE REVENUE 2007



Source: Progress Software.

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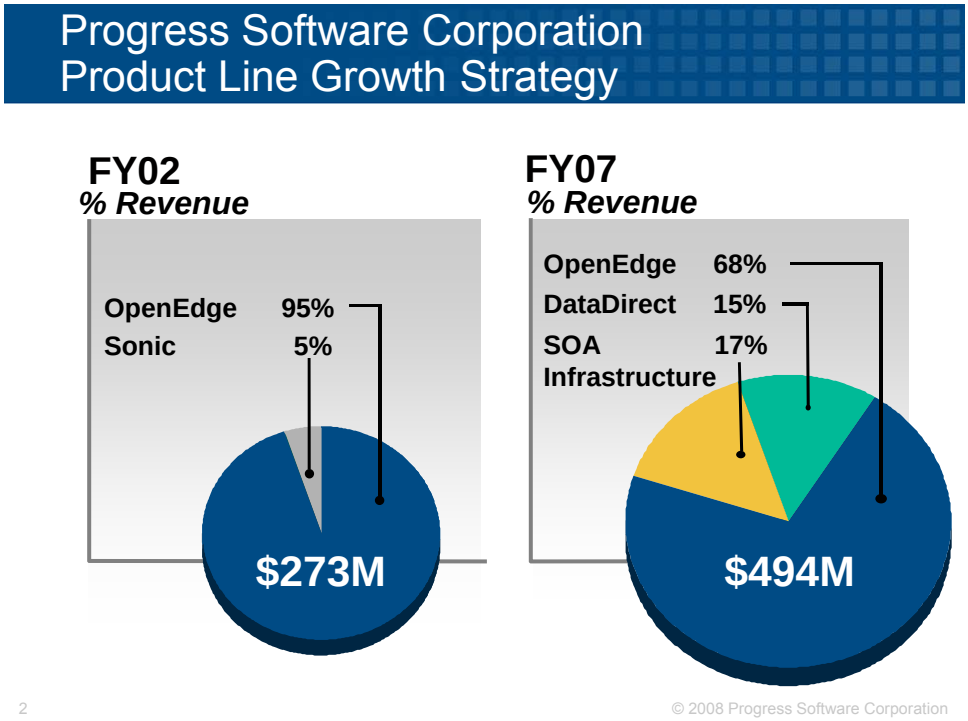
FIGURE 5-15

PROGRESS SOFTWARE SOA REVENUE 2007



Source: Progress Software.

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TABLE 5-16

PROGRESS SOFTWARE CORPORATION

- Geographic Revenue Analysis
- EMEA 46%
- Asia/Pacific 6%
- North America 42%
- Latin America 6%

Source: WinterGreen Research, Inc.

TABLE 5-17

PROGRESS SOFTWARE 2007 ENTERPRISE REVENUE %

Infrastructure…...15%

OpenEdge…….68%

DataDirect…17%

Source: WinterGreen Research, Inc.

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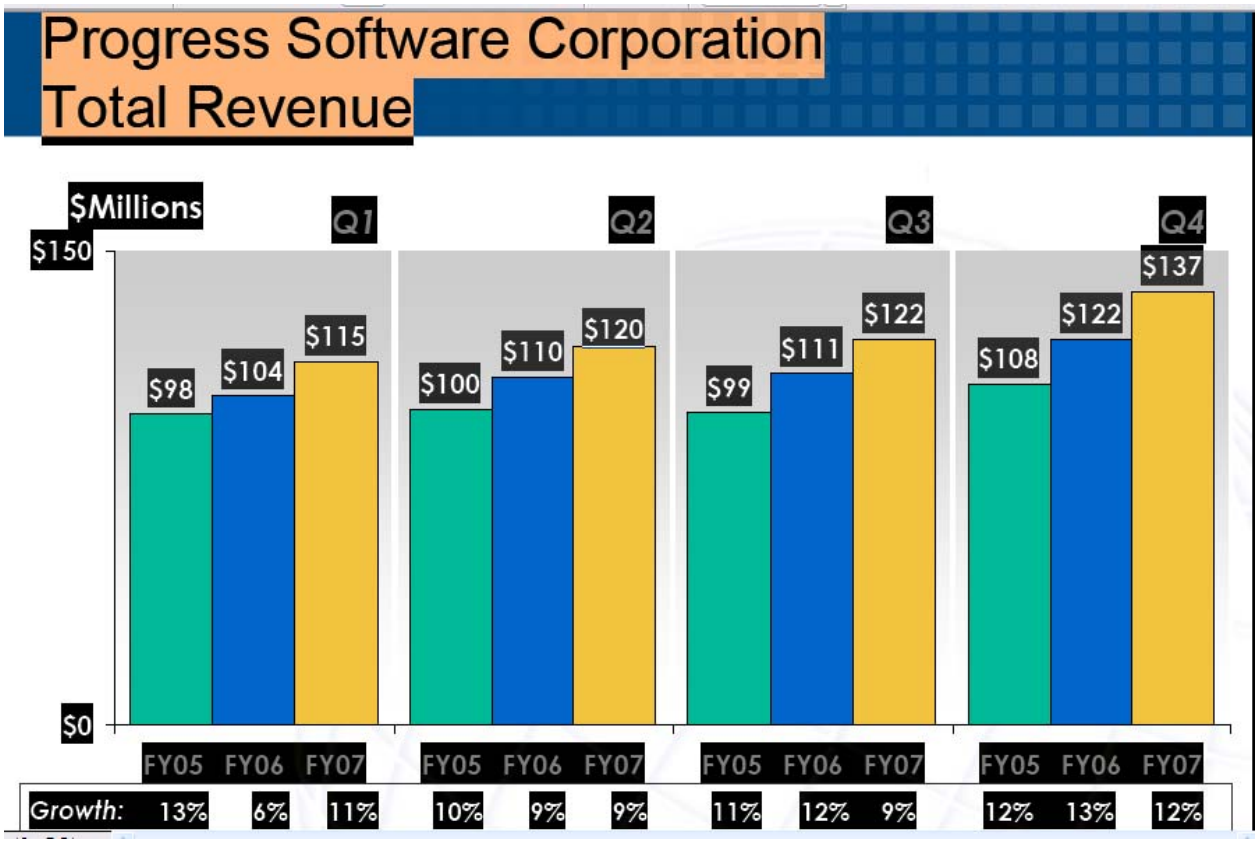
FIGURE 5-18

PROGRESS SOFTWARE REVENUE



Source: Progress Software.

www.wintergreenresearch.com
tel 781-863-5078
email: info@wintergreenresearch.com
Lexington, Massachusetts

Progress supports service-oriented architecture (SOA) deployments with products that create, connect, mediate and control interactions among business services. Progress provides technologies solutions for real-time event processing, SOA governance, and federated data service management. Progress products are standards-based, and interface with a wide variety of business applications in heterogeneous business environment.

5.26.5 Progress Software Services Oriented Architecture Products

Using an SOA approach, information systems are built from shared software code components called "services" which automate discrete business functions. A services infrastructure connects, mediates, controls and monitors these services and their communications to support and optimize business processes. Specialized integration capabilities of the services infrastructure enable legacy systems to take part in an SOA environment.

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tel 781-863-5078
email: info@wintergreenresearch.com
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TABLE 5-19

PROGRESS SOFTWARE SERVICES ORIENTED ARCHITECTURE PRODUCTS

- Sonic™ product line
- Sonic ESB® messaging-based Enterprise Service Bus provides integration of new and existing business applications across organizational boundaries and to remote sites with low latency, high reliability and continuous availability
- Progress® Actional® product line offers Web services and SOA management including monitoring, analysis, security and policy control
- DataDirect® Shadow® RTE enables mainframe and legacy applications to be participants in SOA and Web services production and consumption

Source: WinterGreen Research, Inc.

5.26.6 Progress Software Application Platform Products

Progress Application Platform products empower both end-user organizations and independent software vendors and developers to rapidly develop, deploy and manage the sophisticated applications Includes:

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tel 781-863-5078
email: info@wintergreenresearch.com
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TABLE 5-20

PROGRESS SOFTWARE APPLICATION PLATFORM PRODUCTS

- OpenEdge® platform provides rapid development and deployment of business applications that are standards-based, service-oriented and have a lower total cost of ownership
- Apama® Event Processing platform can monitor rapidly moving event streams, detect sophisticated patterns, and take action - all within milliseconds
- Apama® product provides the foundation for event-driven applications, including business activity monitoring, algorithmic trading, transaction monitoring, market abuse detection and RFID applications
- EasyAsk® product line provides business users and consumers the ability to find the information they need using natural language search and navigation
- EasyAsk® product line supports a wide variety of applications ranging from customer facing e-commerce Web sites to ad-hoc query.

Source: WinterGreen Research, Inc.

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tel 781-863-5078
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5.26.7 Progress Software DataDirect Technologies Strategy and Positioning

DataDirect Technologies is a world leader in data connectivity and mainframe integration, offering comprehensive software for connecting critical applications to data and services, running on any platform, using proven and emerging standards. In a global and fast moving economy, agility, security, and IT optimization are concerns. Flexible service-oriented architecture connection points between applications and underlying data sources is a critical lynchpin in software system design. Best-of-breed software for data access and integration is best practice.

Progress products and technology are used at over 60,000 organizations in 140 countries including 90% of the Fortune 500. Progress technology provides the infrastructure for applications as diverse as ERP and financial trading, across industries as diverse as retail, manufacturing, telecommunications, financial services, and government.

An extensive community of more than 2,500 global partners is critical to building and supporting customers. $5 billion of Progress partner applications and services are sold each year to thousands of companies in over 140 countries.

Progress Software supplies business application platform, SOA infrastructure and data infrastructure software simplifies and accelerates the development, deployment, integration and management of business applications.

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tel 781-863-5078
email: info@wintergreenresearch.com
Lexington, Massachusetts

Service-Oriented Architecture (SOA) business application platforms include Progress OpenEdge for high performance SOA integration and software as a service (SaaS), and Progress Apama for complex event processing.

Innovative event-driven SOA infrastructure solutions include Progress Sonic Enterprise Service Bus (ESB), Progress DataXtend semantic data integration, Progress Actional SOA management and SOA governance, and DataDirect data connectivity for mainframe SOA and web services. Data infrastructure products include DataDirect Connect for database driver and data provider connections to relational databases and XML data integration. EasyAsk is for enterprise search and e-commerce. ObjectStore is for object data management.

5.26.8 Progress Software Powers Innovation

Progress Software Corporation (NASDAQ: PRGS) provides application infrastructure software. SOA development, deployment, integration and management of business applications is supported. Maximizing the benefits of information technology while minimizing complexity and total cost of ownership are achieved using SOA to manage business functions in a modular manner. modular business functions automate process in a manner that is manageable by business analysts instead of programmers.

SOA aims to implement reuse of code modules.

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tel 781-863-5078
email: info@wintergreenresearch.com
Lexington, Massachusetts

5.26.9 Progress Software Data Infrastructure Products

Progress data infrastructure capabilities provide data management, integration, replication, caching, access, and security spanning multiple data stores which can be multi-vendor and in multiple locations including disconnected and mobile data. Data infrastructure enables both database level integration as well as data services support for distributed application services.

TABLE 5-21

PROGRESS SOFTWARE DATA INFRASTRUCTURE PRODUCTS

- DataXtend™: product line provides data integration for distributed applications and delivers real-time views of shared data in the form that applications need
- DataXtend™ Semantic Integrator product employs a common semantic data model to create sophisticated data transformations, enabling organizations to share and integrate heterogeneous data without disruption to existing applications.
- DataDirect Technologies used for connecting business applications to data and services, running on any platform
- DataDirect® products connect applications to a range of data sources using standards-based interfaces such as ODBC, JDBC™, ADO.NET, XQuery and SOAP.

Source: WinterGreen Research, Inc.

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tel 781-863-5078
email: info@wintergreenresearch.com
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Progress products and technology are used at 60,000 organizations in 140 countries including 90% of the Fortune 500. Progress technology provides the infrastructure for ERP and financial trading applications, across as diverse as retail, manufacturing, telecommunications, financial services, and government industry segments. 2,500 global partners support customers. $5 billion of Progress technology in combination with partner applications and services are sold.

5.27 Raining Data

Raining Data Corporation (Nasdaq: RDTA) has reliable data management and rapid application deployment solutions for end users, Independent Software Vendors, and developers of database applications. Raining Data product offerings include TigerLogic® XML data management server (XDMS), a family of multidimensional Pick® Universal Data Model (Pick UDM) based database management systems and components, .NET integration solutions, and a powerful rapid application development (RAD) tool.

TigerLogic XDMS solutions include high volume geospatial data management for tracking objects, dynamic data hub for data aggregation/synchronization and FastSOA for service acceleration. TigerLogic industry-specific vertical solutions include clinical trials data services for the life sciences industry and insurance data services. Fiscal 2007 revenue was $18.7 million. The company has 100 office locations: United States, United Kingdom,

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tel 781-863-5078
email: info@wintergreenresearch.com
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France and Germany. Customers have 500,000 active users across 20,000 customer sites worldwide in a diverse set of vertical applications.

Raining Data offers 24x7 customer support and maintains a strong international presence. .NET Integration: solutions allow Pick D3, IBM UniData® and IBM UniVerse® database platform users to take advantage of the Microsoft .NET Framework and Microsoft SQL server reporting services by providing a bridge between reporting services or a .NET application and the pick data source.

Rapid application development: Omnis Studio® is a powerful and cost-effective cross-platform, object-oriented RAD tool for developing sophisticated thick-client, Web-client or ultra thin-client database applications.

5.27.1 Raining Data Supports Key Technical Specifications

Raining Data plays an active role in directly creating and influencing a number of key technical specifications within the following industry standards groups: Clinical Data Interchange Standards Consortium(CDISC), Health Level 7 (HL7)®.

It supports the Java Community Process (JCP), Open Geospatial Consortium, Organization for the Advancement of Structured information Standards (OASIS), World-Wide Consortium for the Grid (W2cog), World Wide Web Consortium (W3C).

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tel 781-863-5078
email: info@wintergreenresearch.com
Lexington, Massachusetts

5.27.2 Raining Data Business Partners

Raining Data alliance affiliations include: HP Developer and Solution Partner (DSPP), IBM Partner, Microsoft Certified Solution Provider, Microsoft Visual Studio Industry Partner (VSIP), and SQL Server Reporting Services Application Partner. It is a SUN iForce development partner.

5.28 Rogue Wave

Rogue Wave Software is a provider of enterprise class C++ components and infrastructure. Products enable organizations to build and deploy high performance applications. Rogue Wave provides a C++ technology stack including C++ components, UI components, run-time infrastructure, and services. Thousands of worldwide users have Rogue Wave.

Rogue Wave Software provides reusable software components and services to professional developers for enterprise-class application development. Developers at some of the world's leading companies rely on Rogue Wave products.

5.28.1 Rogue Wave SourcePro C++

Rogue Wave SourcePro C++ is a set of cross-platform C++ development components complete with documentation, source code and support that are designed with one goal in mind: to facilitate the delivery of effective C++ applications that are on time, on budget and work exactly to specification.

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tel 781-863-5078
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5.28.2 Rogue Wave Software / IBM Model for C++

Rogue Wave Software provides enterprise class C++ components and infrastructure that supports Service Component Architecture (SCA). The programming model supports implementations written in C++, C, and COBOL. Programming interfaces are an aspect of architecture interoperability across the enterprise. SCA components can be written in a variety of languages.

5.29 SAP

SAP is a leading worldwide provider of business software. It has 43,400 customers in 120 countries. These run SAP applications. Solutions address the needs of small and midsize enterprises. Suite offerings address the needs of global organizations. SAP NetWeaver® platform drives innovation and enables business change. SAP software helps enterprises improve customer relationships, enhance partner collaboration, and create efficiencies across their supply chains and business operations.

SAP solution portfolios support the business processes of 25 industries, including high tech, retail, financial services, healthcare and the public sector. With subsidiaries in more than 50 countries, the company is listed on several exchanges, including the Frankfurt stock exchange and NYSE under the symbol "SAP."

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tel 781-863-5078
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SAP defines business software as comprising enterprise resource planning and related applications of supply chain management, customer relationship management, product life-cycle management, and supplier relationship management.

5.29.1 SAP AG Revenue For The Fourth Quarter And Full Year Ended December 31, 2007

Software related service revenues for 2007 were €7.43 billion (2006: €6.60 billion), which is an increase of 13% (17% at constant currencies2) compared to 2006. Software revenues for 2007 were €3.41 billion (2006: €3.00 billion), representing an increase of 13% (18% at constant currencies2) compared to 2006. Total revenues were €10.25 billion for 2007 (2006: €9.39 billion), which represented an increase of 9% (13% at constant currencies2) compared to 2006.

SAP has an eighth consecutive quarter of share gains. Based on 2007 software and software related service revenues are calculated on a rolling four-quarter basis. SAP worldwide share of core enterprise applications account for approximately $36.7 billion in software and software related service revenues as defined by the company. SAP has 30% for the four quarter period ended December 31, 2007.

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The SAP performance reflects a business positioned to provide business foundations for core business process. SAP anticipated these core software applications to continue to have growth heading into 2008 and beyond. Innovations include SAP Business ByDesign to help capture opportunities in segments of the midmarket, to augment growth going forward.

5.29.2 SAP / Business Objects

SAP Business Objects is a pioneer in business intelligence (BI). It is the leading BI software company. Business Objects transforms the way the world works through intelligent information. The company illuminates understanding and decision-making. It has 45,000 customer organizations around the globe. It operates with a combination of technology, consulting, and education services. It has a strong and diverse partner network.

Business Objects enables companies to make transformative business decisions based on intelligent, accurate, and timely information. Business Objects has dual headquarters in San Jose, Calif., and Paris, France. Business Objects makes us the clear leader in business performance optimization products. This helps penetrates the fast-growing business user segment and is a driver of growth.

5.29.3 SAP Fourth Quarter 2007 Revenues

Software revenues for the 2007 fourth quarter were €2.47 billion (2006: €2.19 billion), which is an increase of 13% (17% at constant currencies2)

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tel 781-863-5078
email: info@wintergreenresearch.com
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compared to the same period of 2006. Software revenues for the fourth quarter of 2007 were €1.42 billion (2006: €1.24 billion), represent an increase of 14% (18% at constant currencies2) compared to the fourth quarter of 2006. Total revenues were €3.24 billion for the 2007 fourth quarter (2006: €2.95 billion) represents an increase of 10% (14% at constant currencies2) compared to the same period of 2006.

5.29.4 SAP Key Events – Fourth Quarter 2007

SAP contracts in key regions were Biomerieux SA, Intersport France, MGI METRO Group Information Technology GmbH, Münchener Hypothekenbank eG, Nationwide Building Society, Saudi Arabian Airlines, and Telekomunikacja Polska S.A. in the EMEA; Foundation Coal, GCC Cemento , S.A. de C.V., GT Solar, Magnesita S.A., Sara Lee Corporation, Tyco Electronics and U. S. Navy in the Americas; China Tobacco Guangdong Industrial, HCL Technologies Ltd, MediaCorp Pte Ltd., Ministry of Finance, New Zealand, Sharp Corporation, Sysmex Corporation, United India Insurance Company Ltd, and Woolworths Limited in Asia Pacific Japan.

In the fourth quarter of 2007, three Global Enterprise Agreements (GEAs) were signed, including Lockheed Martin and Nestlé, all of them operating at the most strategic levels with SAP. For Lockheed Martin, SAP has been a strategic software partner since 1997. Lockheed Martin has deployed significant portions of SAP® ERP and is now engaged in several implementations to further leverage and optimize SAP software across the corporation.

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By signing a GEA, Nestlé, the world's largest food and beverage company, and SAP have decided to extend their successful collaboration. The GEA with Nestlé, which replaces an earlier subscription agreement between Nestlé and SAP, enables Nestlé to make use of SAP's current and future solutions to accompany its business strategy and will continue to leverage the SAP® NetWeaver technology platform to support their core business areas.

On December 4, 2007, SAP introduced the next evolution of SAP® customer relationship management (SAP CRM), an important application in SAP® Business Suite. With an eye toward empowering the growing business user market, this breakthrough new product was co-innovated with leading customers and partners, and is designed to be simple and powerful to solve real business problems.

Continuing its focus on providing banks the flexibility they need to integrate, migrate and update application functionality based on an integrated platform, SAP announced on November 14, 2007, an alliance with Computer Sciences Corporation (CSC). The alliance will address the growing need for banks to differentiate themselves through strategically optimized product pricing.

SAP announced on October 17, 2007, the intent to acquire YASU Technologies, a privately held vendor of business rules management systems. SAP will embed YASU Technologies solutions into its market-leading technology platform, SAP NetWeaver®, to provide the business rules infrastructure that allows companies to move their strategies forward and better maintain compliance while saving time, resources and money.

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tel 781-863-5078
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On October 7, 2007, SAP and Business Objects S.A. announced that the companies have reached an agreement for SAP to acquire Business Objects in a friendly takeover. Core enterprise applications are achieved using software and software related service revenues.

SAP Total Revenue 2007

(in euro millions)	
Software revenue	3,408
Support revenue	3,838
Subscription and other software related service revenue	182
Software and software related service revenue	7,428
Consulting revenue	2,223
Training revenue	410
Other service revenue	113
Professional services and other service revenue	2,746
Other revenue	71
Total revenue	10,245

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5.29.5 IBM and SAP Joint Software Product

Before 7,000 customers and partners IBM (NYSE: IBM) and SAP AG (NYSE: SAP) announced delivering joint software product codenamed “Atlantic”. The integration of IBM Lotus Notes software with SAP Business Suite is central. The combined efforts to create “Atlantic” is a style of applications that presents information and data in the context of users familiar with the Lotus Notes desktop. This makes it easier for users to do their jobs and enhance the return on investment that companies have made in their SAP applications.

Providing workers with access to critical business information in this intuitive, easy-to-use interface enables timely, more informed business decisions. Employees can benefit from increased business analysis, information capabilities and the power to run their business operations directly from their Lotus Notes desktop.

A richer collaboration environment depends on businesses looking to find better ways to collaborate and manage business processes. IBM-SAP solution addresses challenges in one seamless package for millions of users. IBM Lotus and SAP have thousands of mutual customers who have been asking for collaborative functionality. The majority of IBM’s top 100 customers use SAP solutions.

SAP and IBM Lotus are strategic partners to The Coca-Cola Company. The IT goal is to help people be more responsive, productive and effective, and

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tel 781-863-5078
email: info@wintergreenresearch.com
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SAP and IBM Lotus. The partnership between IBM Lotus, and SAP deliver s value. Lotus has been an innovator in collaboration for 20 years.

SAP enables customers to empower their users by providing easy access to SAP business processes and data through productivity tools and user interfaces of their choice. It reaffirms the commitment to the partnership with IBM.

For more than 35 years, IBM and SAP have collaborated to bring joint customers cutting-edge solutions to improve business efficiency at more than 13,000 client sites for their millions of users. Project "Atlantic" is designed to support for SAP workflows, reporting and analytics. The use of roles from within the Lotus Notes client is evolving. Tools are planned to be included to provide the ability to extend and adapt these roles and capabilities. SAP leverages collaborative and offline capabilities inherent in Lotus Notes and Domino products.

5.30 Serena Software

Serena is a leading independent software company focused on application lifecycle management. The company has 15,000 customer organizations around the world, including 96 of the Fortune 100. Serena solutions automate the application development process and effectively manage the IT portfolio.

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tel 781-863-5078
email: info@wintergreenresearch.com
Lexington, Massachusetts

5.30.1 Serena Software Go-To-Market Strategy: Web 2.0, SOA, and SaaS

Serena Software offers Serena xChange product application lifecycle management (ALM). Business mashups are used to implement service-oriented architecture (SOA) and software as a service (SaaS). Enterprise IT organizations deliver complex, mission-critical software applications, Serena power users in business to build IT mashers to develop everyday applications.

Business mashups are easily deployed without burdening IT. By empowering mashers, corporations reduce application backlogs. Sophisticated mission critical applications depend on the ability to innovate quickly enough to satisfy demand to meet changing market conditions. IT departments have five to 10 times the number of requests for applications than they have capacity to deliver.

Businesses need a quicker way to build applications and a quicker way to deploy them. IT SOA platform powers users to innovate. Mashup applications use a SaaS model. Business mashups can quickly be deployed and accessed for a few dollars per user per month. Business mashups are implemented on top of SOA, and SaaS to deliver.

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tel 781-863-5078
email: info@wintergreenresearch.com
Lexington, Massachusetts

5.30.2 Serena Business Mashups

Serena is leveraging its expertise in ALM to merge consumer-driven Web 2.0 technologies with enterprise systems and processes. The company's first step is focused on Business Mashups, in which Serena has invested significantly in new technology that makes it easy for business users or mashers to create new composite applications and deploy them to the Internet without the need for specialized IT resources.

Key to Serena's new business strategy is the launch of Serena® Mashup Composer™, its visual design environment, free of charge to all users. Customers only pay for Business Mashups when they are deployed into production.

5.30.3 Serena Software Business Mashup

Serena Software Business Mashup solution gives companies a fast way to deploy simple software applications that solve everyday business problems. Serena Mashup composer is a point-and-click visual design tool, to connect applications and automate business processes. Sales discount approvals can be interconnected to other web services without writing any code. Mashup composer publishes business mashups to a server and an enterprise-class engine that executes the Business Mashup while providing the high reliability, security, and compliance that IT requires.

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tel 781-863-5078
email: info@wintergreenresearch.com
Lexington, Massachusetts

5.30.4 No Fuss, No Muss Mashups

To get companies started with business mash-ups be offering an initial set of 13 free, pre-built business mashups that can be deployed to address some of the most simple yet time-consuming processes in business. Employee requests for time off or travel approval typically require several emails. Managers get signatures that automate this process with a business mashup that can link the required people and systems.

TABLE 5-22

SERENA PRE-BUILT BUSINESS MASHUP FUNCTIONS

- Automate common business processes
- Automate IT processes
- Vacation Requests
- Employee On-boarding
- Sales Discount Approvals
- Agile Project Management
- Support Case Escalations
- IT Change Requests

Source: WinterGreen Research, Inc.

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tel 781-863-5078
email: info@wintergreenresearch.com
Lexington, Massachusetts

Serena Business Mashups combine content and processes from different systems using industry-standard SOA and Web services interfaces. Systems extend the functionality of existing applications. Virtually any modern system can be "mashed" including: Salesforce.com, Siebel, Microsoft Sharepoint, Remedy, HP Mercury, and others.

To achieve an overall financial goal, Serena's PPM solutions enable organizations to evaluate how well their IT investments collectively support the goals of the business. PPM solutions combine portfolio, project, resource, demand, and financial management data and tools into a single, integrated decision-support framework, allowing companies to visualize project costs.

TABLE 5-23

SERENA'S PPM SOLUTION FUNCTIONS

- • Visualize project costs, resource pools, and resource utilization
- • Orchestrate project requests and demand management
- • Enforce project approvals and cost controls.

Source: WinterGreen Research, Inc.

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Serena PPM products include Serena® Mariner®. Application Lifecycle Management (ALM) Solutions Serena's solutions for ALM integrate business requirements with change and configuration management through a single process model that helps manage the software development cycle from inception through deployment. Serena's tightly integrated, market-leading products provide companies with the ability to: visualize the impact of proposed application changes through modeling, prototyping, and software configuration management to improve software quality and delivery.

5.31 Shunra

Shunra is the pioneer and market leader in predicting how business applications and network services will perform for remote end-users - before deployment. Shunra provides hardware and software network simulation products that address the needs of all IT groups throughout the application development lifecycle.

The Shunra VE solutions simulate any production network environment in your pre-deployment lab. It delivers a powerful, flexible and easy way to test the performance of your applications or network equipment under a wide variety of network impairments - as if they were running in a real production environment. Through this process users understand the impact that the network and applications have on each other's performance and on remote end-users' experiences, and uncover and resolve production-related problems before rollout.

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Shunra provides comprehensive reports and drill down analysis capabilities. These help isolate and resolve the root causes of network and application problems early, and determine whether any modifications to the application, network or infrastructure are needed. Shunra VE gives information to make informed decisions and ensure service levels to remote end-users.

5.32 Silver Creek Systems

Silver Creek Systems is a leader in product data integration solutions. Systems are based on automating the standardization, transformation, and reuse of product data. Silver Creek Systems offers automated product data solutions that standardize and integrate product data. Information supply chains connect enterprise systems, customers, suppliers, and partners.

Semantic technology is used to overcome the limitations of traditional data technologies. The DataLens™ System delivers a full range of product data solutions from initial clean-up and standardization to enrichment, translation, integration and ongoing governance.

Product data solutions from Silver Creek Systems are used by market-leading companies in retail, distribution, manufacturing, high tech, healthcare, telecom, and energy. Complete, correct and consistent data is provided. Increasing the value and usability of product data is a fundamental aspect of eCommerce. Product information management (PIM), master data management (MDM), data synchronization, inventory management, system consolidations, service oriented architecture (SOA) and integration are provided.

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5.33 Siperian

Siperian helps unify critical, common data about customers, products and organizations. Data that is fragmented across different systems needs to be synchronized. This is needed to get data that represents the same information, but is rendered differently in different applications needs work to deliver reliable, complete views. Data works within existing business processes.

5.34 Skyway Software

Skyway Software provides technology and processes to IT organizations that simplify their software delivery process. Reducing application development and deployment schedules by 30 percent is one aim. Model-based Skyway Visual Workspace™ provides an iterative system. The enabling methodology Skyway Collaborative Software DeliverySM facilitates collaborative deployment of SOA-based JEE applications quickly and accurately.

With over 100 years of combined software industry knowledge, Skyway's Leadership Team has a successful history of developing proven market winners. The Leadership Team focuses on developing innovative enterprise-class solutions that provide real business value. Today, Skyway's platform is uniquely positioned in the market because it offers a pragmatic approach to delivering well-constructed, SOA-based applications that are infrastructure future-proof... in half the time of alternative delivery methods.

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tel 781-863-5078
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Fast, accurate software solutions are implemented. Skyway Visual Workspace enables companies seeking a competitive advantage to design and deliver faster, more cost-effective custom applications and services. Using a collaborative workspace that once and for all engages the entire development Team, including the end-user customer, Skyway VisualWorkspace combines with Skyway Interactive Delivery development processes to mitigate business impacts and decrease development expenses. Ultimately, Skyway Visual Workspace offers maximum infrastructure flexibility by accelerating and simplifying custom applications and services.

5.34.1 Skyway Software Focused On Building A J2EE Application Development

Skyway Software has focused on building a J2EE application development platform to help enterprises adapt more quickly to the ever-changing global market. Skyway Visual Workspace delivers on the SOA by producing real business benefits. Returns on investment are captured during the project. They are measured by real productivity gains and significant cost reductions.

5.34.2 Skyway Software Technology And Processes To IT Organizations

Skyway Software provides technology and processes to IT organizations that simplify their software delivery process. Reducing application development

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tel 781-863-5078
email: info@wintergreenresearch.com
Lexington, Massachusetts

and deployment schedules by 30 percent is possible. Enterprises rely on model-based Skyway Visual Workspace™.

Iterative systems enable collaborative software delivery facilitates collaborative development and deployment of SOA-based JEE applications.

Enterprises are able to use a fully integrated version of Skyway Visual Workspace™ for maximum design and development flexibility via modeling techniques. Systems work via traditional hand-coding techniques. Systems are used to prototype, build, and deploy rich Internet applications quickly and accurately.

5.34.3 Skyway Software

Skyway Software is a standards-based, non-proprietary, 100% codeless & graphical SOA solution. The platform is custom built for SOA. The platform is used to build, deploy, manage and extend business level solutions, processes, and services.

5.35 SoftwareAG / WebMethods

Software AG and webMethods are a large independent provider of business infrastructure software. 4,000 global customers use the integration systems to modernize and automate their IT systems. Products are used to achieve rapidly building new business systems demands. Industry-leading product portfolio include best-in-class solutions for managing data, enabling

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tel 781-863-5078
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service oriented architecture, and improving business processes. By combining proven technology with industry expertise and best practices, customers improve and differentiate systems.

Software AG is the world's largest independent provider of Business Infrastructure Software. 4,000 global customers achieve measurable business results by modernizing and automating business processes. IT systems permit rapidly building systems and processes based on reuse of existing systems to meet changing business demands.

5.35.1 Software AG / webMethods Acquisition

The Software AG WebMethods merger supports consolidation of leaders in the provision of business infrastructure software. Software AG is Europe's largest business infrastructure software provider. The acquisition of webMethods is a leading business integration and optimization software company.

Business infrastructure software company has 4,000 enterprise customers worldwide in over seventy countries and is one of the largest independent vendors in the rapidly growing Service-Oriented Architecture (SOA) and Business Process Management (BPM) markets.

Benefits include a significantly strengthened product portfolio, expanded global services, and strong customer support organization. The company has financial strength - With a combined product roadmap already in place, users are fully committed to leading the market through continuing investments in

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tel 781-863-5078
email: info@wintergreenresearch.com
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technology innovation. The focus on the business infrastructure software market along with unwavering customer commitment is what ultimately differentiates Software AG.

The merger is a partnership for growth that fully capitalizes on the unique and complementary strengths of each company. Unique combinations of scale, stability and best-in-class technology means that customers can choose the best solution for their needs without any compromises.

5.35.2 SoftwareAG Crossvision Business Renamed webMethods

High levels of Software AG uses awareness in the integration software market to add to what webMethods does. This leverages the webMethods brand for the combined integration product portfolio. The merger doubles the revenue in the integration area. It creates a balanced revenue split between the webMethods business line and Software AG's classic enterprise transaction systems (ETS) business line.

The customers benefit from the increased financial strength and a combined product portfolio with unmatched depth and breadth including:

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TABLE 5-24

SOFTWAREAG CROSSVISION AND WEBMETHODS FUNCTIONS

- Transaction Modernization, based on Software AG's expertise in mainframe systems
- Integration, combining both companies' experience in the rapidly growing SOA market
- Business Process Management (BPM)
- Business Activity Monitoring (BAM)
- Business optimization technology
- SOA Governance repository/registry

Source: WinterGreen Research, Inc.

Software AG and WebMethods deliver business results, reduce complexity, and increase the value of the IT investment. The combined product portfolio delivers best-of-breed innovation for next generation technologies and services oriented based architectures. Applications are compelling, extend global reach, and continue to add value

The company anticipates annual cost saving synergies of up to $50 million through process optimization, location consolidation and increased back-office efficiencies. Continued investments will be made in retaining key research and

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development know-how and maintaining a stable sales force and customer relationships.

Software AG has more than 35 years of global IT experience and 2,900 employees serving customers in 70 countries.

TABLE 5-25

SOFTWARE AG POSITIONING

- Software technology to increase the value of enterprise IT systems
- 38 years of software expertise
- Based in Darmstadt, Germany
- Offices in 50 countries
- 4,000 customers in 70 countries
- Highly profitable (EBIT margin 23 percent in 2006)
- Third largest enterprise integration software vendor
- Over 65 global business and technology partners

Source: WinterGreen Research, Inc.

This transaction is a major step in building a €1 billion company. Software technology is used to increase the value of enterprise IT systems. Software AG's 3,000 global customers achieve measurable business results by modernizing

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and automating their IT systems and rapidly building new systems to meet growing business demands.

TABLE 5-26

SELECTED SOFTWARE AG CUSTOMERS IN KEY INDUSTRIES

- Banking - Bank of America, Credit Suisse, Citibank, JP Morgan, Morgan Stanley, Volkswagen Financial Services, Wells Fargo, Prudential
- Consumer Packaged Goods –Callaway Golf, Coors, 3M, Sony, Canon, Kodak
- Process industries - ExxonMobil, FMC Worldwide, OXY, AutoFina, Lubrizol, Praxair
- Telecommunications - AT&T, Time Warner, Verizon, SBC, COLT, Lucent
- Manufacturing – Mitsubishi, Audi, Sun, Hewlett-Packard, Dell, Samsung, Motorola, Cisco, Nissan
- Retail – Best Buy, Ahold, 7 Eleven, Aeon, Staples, eBay
- Government – US Navy, US Army, Internal Revenue Service, Treasury of Puerto Rico, Government of Spain
- Education – Pennsylvania State, Florida Community College, Washington State University
- Other – FEDEX Kinkos, General Electric, SAS, Herman Miller

Source: WinterGreen Research, Inc.

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The company's industry-leading product portfolio includes best-in-class solutions for managing data, enabling service oriented architecture, and improving business processes. By combining proven technology with industry expertise and best practices, customers improve and differentiate their businesses.

TABLE 5-27

SELECTED SOFTWARE AG TECHNOLOGIES OFFERED

- • Data Management
- • Application Development
- • Service-Oriented Architecture (SOA) Governance
- • Business Process Management (BPM)
- • Business Activity Monitoring (BAM)
- • Legacy Modernization
- • ESB and Integration

Source: WinterGreen Research, Inc.

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TABLE 5-28

SELECTED SOFTWARE AG PRODUCT LINE

- SOA Governance
- Business Process Management Suite
- B2B Gateway Providers
- Integration-Centric BPM Suites
- ESB Providers
- SOA BPM Engine
- Web Services

Source: WinterGreen Research, Inc.

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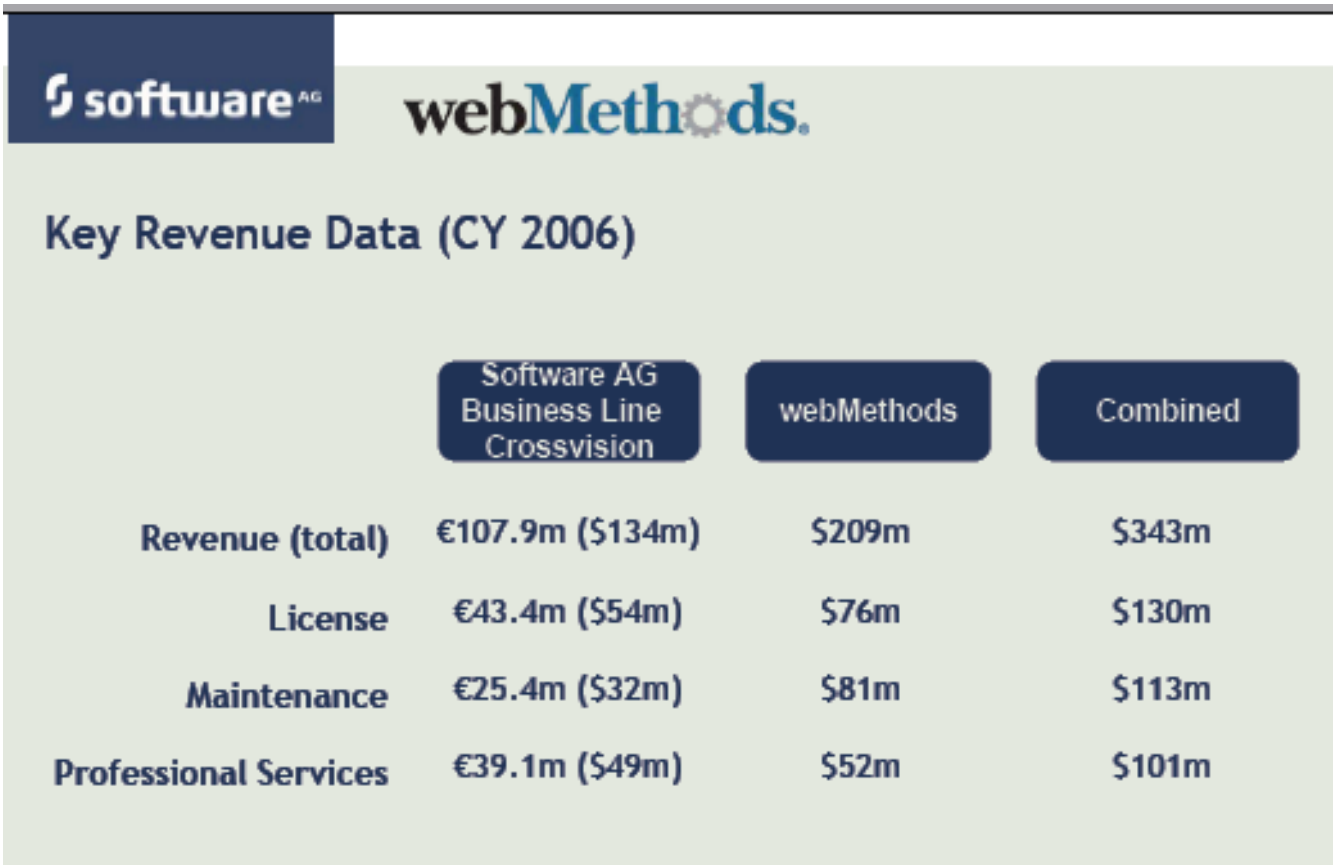
5.35.3 Software AG Revenue

FIGURE 5-29

SOFTWARE AG AND WEBMETHODS REVENUE, 2006



Source: Software AG.

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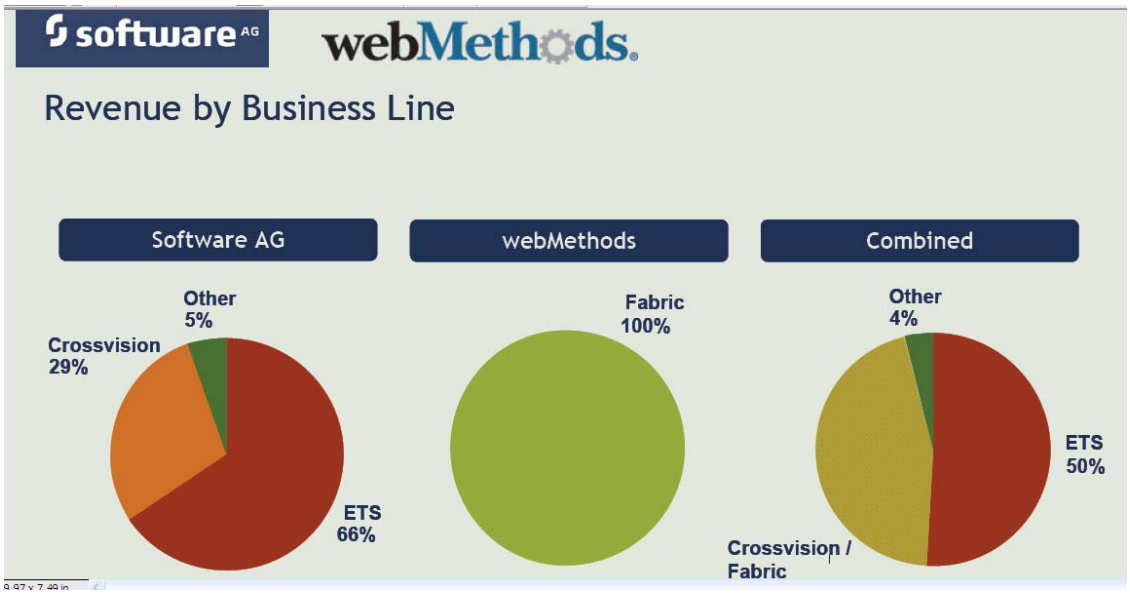
FIGURE 5-30

SOFTWARE AG AND WEBMETHODS REVENUE BY BUSINESS LINE, 2006



Source: Software AG.

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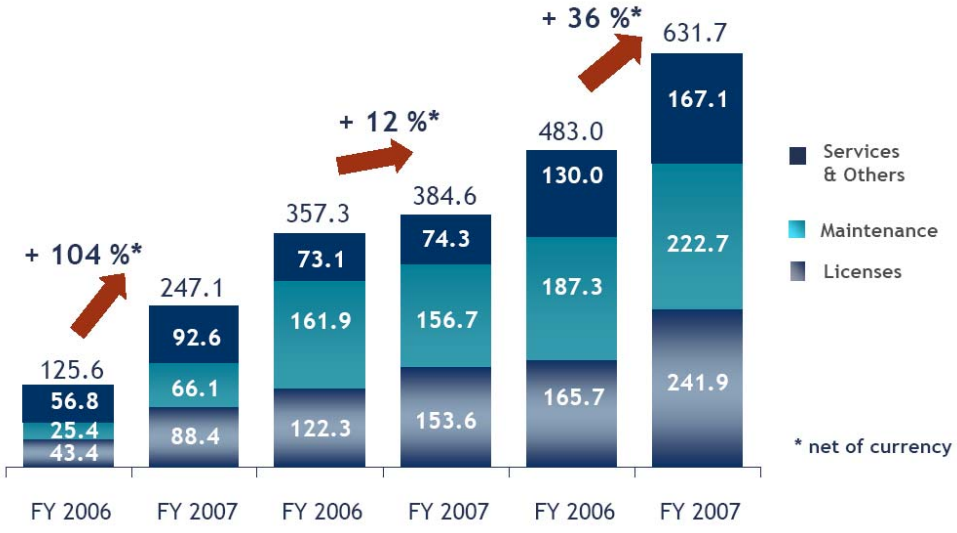
FIGURE 5-31

SOFWARE AG REVENUE BY SEGMENT, 2007



Source: Software AG.

5.35.4 Software AG SOA Value Assessment

Sofware AG offers a tool that helps enterprises calculate the benefits of SOA and business process management (BPM). The value of SOA to an organization is about innovation and the ability to automate process. Two fundamental drivers of IT and business success are ease of use and automation of process.

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5.35.5 Software AG Revenue 2007

Software AG (Frankfurt TecDAX: SOW) group revenues were €621.3 million (2006: €483.0 million). Operating revenues increased by 36%, at constant currency rates. Licensing revenues (currency adjusted) were up 53% to €241.3 million (2006: €165.7 million).

Software AG continued its high momentum growth during fiscal year 2007. The enterprise transaction systems (ETS) business division had strong growth. Operating revenues for 2007 in the ETS business division exceeded expectations and increased by 12% (currency adjusted) to €384.6 million. In the fourth quarter of 2007, revenues improved by 27%. The webMethods business division grew significantly, in effect more than doubling (at constant currency rates) its operating revenue in 2007 to €247.1 million, as a result of organic growth as well as growth through acquisitions. The ETS business division contributed 61% and webMethods 39% to total revenues in 2007.

Software AG was able to increase its free cash flow by 46% to €82.2 million in 2007 (2006: 56.2 million).

Software AG ended its 2007 fiscal year with a strong fourth quarter. Group revenues climbed by 39% to €186.5 million (2006: €134.4 million). Operating revenues increased by 48% (currency adjusted). Licensing revenues again made a substantial contribution to growth. Software AG's licensing revenues rose by 55% (currency adjusted) to €79.8 million in 2007, after €54.1 million in 2006.

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The ETS business division contributed 70% to the Group's licensing revenues. ETS benefited from a major order which resulted in a disproportionate rise in licensing revenues of 55% (currency adjusted) in fiscal 2007.

TABLE 5-32

SOFTWARE AG REVENUE 2007

In Millions of Euro

	2007	2006	
Group revenues	631.7	483.0	
- Licensing revenues	241.9	165.7	
- Maintenance revenues		222.7	187.3
- Business Line ETS	384.6	357.3	
- Business Line webMethods	247.1	125.6	+
Group revenues	621.3	483.0	
- Licensing revenues	241.3	165.7	
- Maintenance revenues		212.9	187.3

Source: WinterGreen Research, Inc.

5.35.6 Software AG Partner Program

Software AG partner program includes a process frameworks designed to capture the specific industry knowledge of partners and integrate it into Software AG's product suite. This enables partners to complete proof-of-concepts project for customers, demonstrating industry expertise and shorten the request for tender process.

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Collaboration has been able to achieve webMethods Center of Excellence working in various areas including knowledge management, technology change management, and delivery assurance. Strategic, preferred global system integrators and offshore development partners achieve product development and testing.

5.36 Software AG / webMethods

5.36.1 Software AG / webMethods Revenue

Segment report for the twelve months ended December 31, 2007
IFRS, unaudited

	ETS		webMethods		TOTAL		ETS		webMethods		TOTAL	
	Dec. 31, 2007	Dec. 31, 2006	Dec. 31, 2007	Dec. 31, 2006	Dec. 31, 2007	Dec. 31, 2006	Q4 2007	Q4 2006	Q4 2007	Q4 2006	Q4 2007	Q4 2006
Licenses	153.026	122.344	88.313	43.398	241.339	165.742	55.734	37.961	24.022	16.108	79.756	54.069
Maintenance	155.735	161.885	57.203	25.393	212.938	187.278	39.419	38.988	19.965	6.206	59.384	45.194
Product revenue	308.761	284.229	145.516	68.791	454.277	353.020	95.153	76.949	43.987	22.314	139.140	99.263
Services	72.934	71.535	88.248	54.679	161.182	126.214	20.689	18.621	23.928	14.457	44.617	33.078
Other	1.418	1.578	4.382	2.155	5.800	3.733	478	1.030	2.309	1.008	2.787	2.038
Total revenue	383.113	357.342	238.146	125.625	621.259	482.967	116.320	96.600	70.224	37.779	186.544	134.379

Software AG and webMethods have come together to create the world's largest independent provider of Business Infrastructure Software. 4,000 global customers achieve measurable business results by modernizing and automating IT systems ...

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5.37 Symphoniq

Symphoniq's product suite, TrueView, harnesses the user experience to identify the infrastructure components that are causing application performance degradation, inside or outside the datacenter, so IT can fix problems faster and more efficiently.

5.38 Tata Consultancy Services

Tata Consultancy Services is an IT services, business solutions and outsourcing organization that delivers results to global businesses. TCS offers a consulting-led, integrated portfolio of IT and IT-enabled services delivered through its global network delivery model.

A part of the Tata Group, India's largest industrial conglomerate, TCS has over 100,000 of the world's best trained IT consultants in 47 countries. The company generated consolidated revenues of US $4.3 billion for fiscal year ended 31 March, 2007 and is listed on the National Stock Exchange and Bombay Stock Exchange in India.

5.39 TBA Group / B2br:

B2br is the system integrator of TBA Group, which acts as a full service provider in the information technology area, offering solutions in the areas of: infrastructure (networks, security and applications), consulting (projects, security,

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migration and quality), corporate software licensing, software and hardware engineering, outsourcing and software factory delivery.

The company has 800 employees. In the fiscal year which closed on March 31st 2007, the company had revenues of R$ 200 Million / ~ USD$ 115 Million. Among B2br's alliances are Oracle, Microsoft, Citrix, TCS – Tata Consultancy Services and True Access Consulting, also another member of TBA Group.

5.40 TechTarget

TechTarget provides enterprise IT professionals with the information relating to developing strategy, to making cost-effective IT purchase decisions, and to managing IT projects. The company has a network of technology-specific Web sites, events, and magazines.

5.41 Tibco Software

Tibco delivers integration software. It has measurable market share in integration markets. BPM and SOA offerings are strengthened by the BPM Staffware product suite. Staffware best-of-breed BPM application process suite has been combined with Tibco BusinessWorks, BusinessFactor and Hawk. With this integration, Tibco leverages the benefits of BPM in a SOA IT configuration.

SOA depends on introspecting the BusinessWorks service library from Staffware Process Suite, pulling Staffware process components for inclusion into

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a BusinessWorks process, readily creating dashboards to monitor all of these in BusinessFactor.

Tibco aims to help organizations meet business objectives and increase success by providing key decision makers with the ability to obtain and utilize accurate and up-to-date information. An organization's defined measures of success include revenue, expense, and customer satisfaction. These allow the organization to rapidly change as business dynamics dictate.

Tibco business integration supports innovation, thought leadership, and knowledge of the market.

5.41.1 Tibco Revenue

Tibco license revenue in fiscal years 2007, 2006 and 2005 was derived from the following three product lines: SOA, business optimization and BMP. The percentages of total license revenue for the three periods was: 2007, 65% from SOA, 19% from business optimization and 16% from BPM; 2006, 71% from SOA, 11% from business optimization and 18% from BPM; 2005, 72% from SOA, 9% from business optimization and 19% from BPM. The fiscal year 2007 increase in the percentage of license revenue derived from business optimization was primarily attributable to the Spotfire acquisition.

License revenue is dependent upon the timing and number of license deals and their relative size. Selected data about license revenue is as follows:

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Tibco Revenue

Year Ended November 30,

2007	2006	2005
Number of license deals of $1.0 million or more		
54	59	42
Number of license deals over $0.1 million		
376	334	316
Average size of license deals over $0.1 million (in millions)		
$ 0.6	$ 0.7	$ 0.6

License revenue in any particular period is dependent on the size and timing of larger license deals. Tibco expects the number of license transactions over $0.1 million to increase in fiscal year 2008.

Service and maintenance revenue increased $40.9 million or 15% in fiscal year 2007 compared to fiscal year 2006, and increased $35.2 million or 15% in fiscal year 2006 compared to fiscal year 2005. The increase in fiscal year 2007

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was the result of a $13.1 million increase in consulting and training services revenue and a $27.8 million increase in maintenance revenue.

The increase in fiscal year 2006 was due to an $8.6 million increase in consulting and training services revenue and a $26.5 million increase in maintenance revenue.

Consulting revenue increased due to an increase in both the number and breadth of engagements, reflecting our increased focus on providing more services to customers. Maintenance revenue increased primarily due to continued growth in the installed software base.

TIBCO event-driven "Information Bus" software helped make real-time business a strategic differentiator. TIBCO infrastructure software gives customers the ability to constantly innovate by connecting applications and data in a service-oriented architecture, streamlining activities through business process management, and giving people the information and intelligence tools they need to make faster and smarter decisions.

TIBCO serves 3,000 customers with offices in 40 countries and an ecosystem of over 200 partners.

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5.41.2 Tibco Revenue:

Ended November 30,				
Three Months		Year		
2007	2006	2007	2006	
License revenue				
99,609	$88,333	$ 259,313	$ 240,071	$
Service and maintenance revenue:				
Service and maintenance	84,211	70,796	310,444	269,908
Reimbursable expenses	2,281	1,920	7,629	7,300
Total service and maintenance revenue	86,492	72,716	318,073	277,208
Total revenue	186,101	161,049	577,386	517,279

5.41.3 Tibco Fourth Quarter Revenue Fiscal 2007

• License revenues were $99.6 million, up 89% sequentially and 13% year over year;

• Tibco closed a record 139 deals over $100k and had 17 deals over $1 million;

• Continued strength and demand across all product lines, with several verticals such as Finance, telecommunications and life sciences showing particular strength;

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5.41.4 Tibco Customers

Tibco expanded its business with leading companies in Q4 such as Agilent Technologies, Air France- KLM, BP, Chicago Mercantile Exchange, Delta, Equiduct, HBOS plc, Live Nation, PNM Resources, Rand Merchant Bank, TeliaSonera, Telenor and UBS.

TIBCO SOFTWARE FOURTH QUARTER 2007 FINANCIAL RESULTS

Year over Year Q4 License Revenues up 13%

TIBCO Software November 30, 2007 total revenue for the fourth quarter of fiscal 2007 was $186.1 Overall market opportunity remains strong. Tibco sees its role as a neutral software infrastructure provider.

Tibco Fourth Quarter Fiscal 2007

• License revenues were $99.6 million, up 89% sequentially and 13% year over year;

• Tibco closed a record 139 deals over $100k and had 17 deals over $1 million;

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Tibco Software

Ended November 30

(in thousands of dollars)

Three Months		Year	
2007	2006	2007	2006
License revenue 99,609 $	88,333 $	259,313 $	240,071 $
Service and maintenance revenue:			
Service and maintenance 84,211	70,796	310,444	269,908
Reimbursable expenses 2,281	1,920	7,629	7,300
Total service and maintenance revenue 86,492	72,716	318,073	277,208
Total revenue 186,101	161,049	577,386	517,279

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tel 781-863-5078
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5.42 Tidal Software

Tidal Software is a leading provider of enterprise job scheduling and application performance management solutions for the enterprise. Tidal products support packaged applications & SOA components peak efficiency.

Tidal Software is a leading provider of advanced application scheduling and performance management software. Systems simplify IT operations by automating performance and process management. Tidal provides a comprehensive management solution that enables IT organizations to maximize the automation, visibility, and control they have in the operation of their systems.

Applications SAP®, PeopleSoft®, and Oracle E-business Suite™ are managed. Composite solutions consisting of packaged applications and custom SOA-based components are made more efficient, productive, reliable, and secure, enabling them to return greater business value.

5.42.1 Tidal Customers

Tidal has increased the efficiency of advanced datacenters for global enterprises such as General Mills, HP, Microsoft, T-Mobile, and ING. The privately held company is venture-funded by JPMorgan Partners, Kleiner Perkins Caufield & Byers, Novus Ventures and VantagePoint Venture Partners.

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5.43 Torry Harris

Torry Harris is a niche provider of distributed computing and middleware services. With a dedicated SOA cell, using the onsite/offshore delivery model, it has implemented several projects for enterprise clients across the world.

5.44 Vitria

Vitria is a leading ebusiness platform provider. BusinessWare®, enables companies to conduct business electronically across corporate networks and over the Internet.

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email: info@wintergreenresearch.com
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Vitria Technology, Inc. goes Private, led by Founders!

In an effort to better serve its customers, the founding members of Vitria Technology, Inc., Drs. JoMei Chang and Dale Skeen, have formed the Innovation Technology Group, Inc. (ITG) to purchase all outstanding shares of the company in a "going private" transaction. In addition to Drs. Chang and Skeen, the investors in the ITG include Weston Presidio, a prestigious private equity firm.

Dale Skeen, Co-Founder & CEO of Vitria said, *"Being on the public market and the regulatory challenges that presented made it difficult to offer our customers the service we felt they deserved. The ability to adapt to our customers' needs in an agile, responsive way is paramount. We feel that being private will increase our customer and market responsiveness, alleviate public-company cost burdens, and enhance our ability to make long-term strategic investments".*

The founders took the company private because they believe in the products and technology and see a bright future for Vitria. Said Dr. Skeen *"Both JoMei and I had a vision 12 years ago, and we executed on that vision to build Vitria as a leader in BPM and Integration software. Leveraging this strong foundation, we have a vision for taking Vitria to the next level, and we are excited to execute on this new vision."*

"Going private", along with the new product introductions, is the first in a series of announcements that will mark a new chapter in Vitria's storied heritage; one highlighted by responsiveness as well as market leading innovation.

Source: Vitria.

5.44.1 Vitria Business Process Integration Products and Solutions

Vitria technology is used in telecommunications, healthcare and insurance, manufacturing, supply chain, and financial services. Business process management systems are used to improve strategic business processes across systems, people, and trading partners. Vitria software is positioned as a platform product used to address business process integration needs.

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Products can help companies implement a service oriented architecture (SOA), integrate internal applications and business processes, orchestrate electronic interactions with partners, and resolve exceptions that occur in normal business processes.

Vitria's Business Process Applications (BPAs) solutions are used for addressing industry-specific problems in the telecommunications and healthcare/insurance sectors. These products combine Vitria business process integration capabilities with pre-built content to reduce the time, cost, and risk of integrating mission-critical processing of orders and insurance data.

Vitria provides SOA in the context of addressing their unique business requirements. Users can start a SOA project fast, and scale quickly. SOA seamlessly offers significant business advantages for companies competing. This objective is complemented by a strong partner eco-system of leading companies including Red Hat, JBoss, AmberPoint, IBM, iWay, and others to provide state-of-the-art technology and complementary capabilities.

Utilizing its robust SOA products, pre-built applications, and custom business process integration solutions, Vitria customers are able to preserve and extend their existing technology investments. Vitria provides real-time, end-to-end visibility and streamlined control over key business processes and data. Vitria technology is complemented with domain knowledge, intellectual capital, and an installed base.

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email: info@wintergreenresearch.com
Lexington, Massachusetts

Vitria Technology is a leading provider of business process integration solutions. Business Accelerator™ is an open, agnostic enterprise-class integration suite used for Service-Oriented Architecture (SOA) and Event-Driven Architecture (EDA). Resolution Accelerator™ provides a major enhancement of its industry-leading solution for business exception resolution that provides more capability for SOA environments, enables faster implementation, and increases user productivity.

Business Accelerator aligns business need for speed with IT's need for technology. It offers flexibility to build a best-of-breed solution by leveraging business process integration software, technology capabilities provided by a number of industry-leading partners, as well as existing infrastructure.

As a platform-agnostic solution, Business Accelerator empowers customers to lower their total cost of ownership (TCO) by leveraging existing investments in infrastructure software to integrate services, events, applications, automated processes and human workflow.

To ensure agility as business needs change, and free themselves from the constraints of vendor lock-in, customers can deploy on leading J2EE applications servers and messaging platforms to service-enable an existing infrastructure or access the value and power of open source communities. They can reuse existing investments to build new composite applications that adapt to ever changing business needs.

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tel 781-863-5078
email: info@wintergreenresearch.com
Lexington, Massachusetts

Business Accelerator allows customers to tap into "islands" of SOA initiatives to achieve higher ROI on their existing investments. This is accomplished by ESB federation and mediation capabilities that allow the customer to build once and deploy anywhere within a heterogeneous environment.

A fully scalable SOA integration suite, Business Accelerator ESB allows customers to reduce business risk by starting with a lightweight Enterprise Service Bus (ESB) for small projects. Business Accelerator Process Edition increases functionality to a full process integration suite when requirements become more complex. ESB and Process Editions leverage the Eclipse next generation modeling environment.

5.44.2 Resolution Accelerator

Resolution Accelerator is a comprehensive solution for resolving the complex issue of business exceptions that cause delays, high costs and customer dissatisfaction. It addresses exceptions at all levels: system, service, process and business, and handles complete end-to-end lifecycle management.

End-to-end lifecycle management capability provides visibility at every step of the exception process, enabling sophisticated analysis leading to the correction of process weaknesses. Comprehensive auditing and logging of every aspect of the exception resolution process support stringent regulatory requirements.

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tel 781-863-5078
email: info@wintergreenresearch.com
Lexington, Massachusetts

Resolution Accelerator includes a unique mass repair feature that identifies multiple instances of the same exception and provides a simple way to correct them at one time, creating significant productivity improvements. It features powerful visual dashboards that monitor and analyze real-time exceptions and history, providing insight into business exceptions in order to optimize processes. Resolution Accelerator includes rules-based and extensive meta-data driven dictionaries that guide the user through each step of classifying and routing exceptions, improving ease of use and speeding time to resolution.

5.44.3 Vitria ROI Return on Investment

In production environments, Resolution Accelerator has achieved measurable ROI of 66% reduction in exception backlog, 85% automatic issue resolution and 60% fewer staff required.

5.44.4 Vitria Pricing & Availability

Business Accelerator ESB Edition is priced at $15,000 per CPU. Business Accelerator Process Edition is $40,000 per CPU. Resolution Accelerator is priced at $50,000 per CPU.

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tel 781-863-5078
email: info@wintergreenresearch.com
Lexington, Massachusetts

5.44.5 Vitria Business Process Integration Products

Vitria is a leading provider of business process integration products and solutions. Vitria targets telecommunications, healthcare and insurance, manufacturing and supply chain, and financial services industries. Business process integration products are positioned to improve strategic business processes across systems, people, and trading partners.

Vitria software platform products address a range of needs related to business process integration. These products can help companies implement a service oriented architecture (SOA), integrate internal applications and business processes, orchestrate electronic interactions with partners, and resolve exceptions that occur in normal business processes.

Vitria's business process applications (BPAs) are specialized solutions for industry-specific problems in the telecommunications and healthcare/insurance sectors. These products combine Vitria's business process integration capabilities with pre-built content to reduce the time, cost, and risk of integrating mission-critical processing of orders and insurance data.

Vitria provides SOA infrastructure that works to provide services in accordance with unique business requirements. SOA projects start fast, and scale quickly and seamlessly using Vitria infrastructure. Significant business advantages are offered for dynamic business implementation of automated process. Solutions are used for resolving business process exceptions.

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tel 781-863-5078
email: info@wintergreenresearch.com
Lexington, Massachusetts

5.44.6 Vitria Partners

Vitria partner eco-system includes Red Hat, JBoss, AmberPoint, IBM, and iWay. Partners provide state-of-the-art technology and complementary capabilities. robust SOA products are supported by pre-built applications and custom business process integration solutions. Vitria extends the existing IT technology investment with its SOA / BPM suite.

5.44.7 Vitria Customers

Vitria's customer base includes global 2000 organizations such as 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.

5.44.8 Vitria SOA Positioning

Vitria provides real-time, end-to-end visibility and streamlined control over key business processes and data.

www.wintergreenresearch.com
tel 781-863-5078
email: info@wintergreenresearch.com
Lexington, Massachusetts

TABLE 5-33

VITRIA SOA POSITIONING

- Increase revenues
- Reduce costs
- Improve customer satisfaction
- Ensure regulatory compliance
- Reduce time-to-market for new products and services
- Develop closer relationships with partners and customers
- Rapidly respond to changing business conditions

Source: WinterGreen Research, Inc.

5.44.9 Vitria Technology Business Accelerator

Vitria Technology. is a privately-held BPM and integration technology company. the company offers Business Accelerator, a flexible SOA integration suite. BusinessWare® EAI platform delivers state-of-the-art legacy and SOA-based process integration solutions for the enterprise.

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tel 781-863-5078
email: info@wintergreenresearch.com
Lexington, Massachusetts

Systems are used to maximize customer productivity. The company offers high-value applications and frameworks, including Resolution Accelerator™.

Vitria Business Accelerator™ Open SOA Integration Suite complements Resolution Accelerator™, next generation exception management software.

5.44.10 Vitria Technology Business Process Integration Products And Solutions

Vitria Technology is a leading provider of business process integration products and solutions. It combines technology with industry expertise. The company has practice areas in healthcare, insurance, telecommunications, manufacturing, and financial services. Business process workflow systems are positioned to dramatically improve strategic business processes

Process flow is supported across systems, people and trading partners. Solutions are built on BusinessWare® business process integration suite.

5.44.11 Vitria Customer Base

Vitria customer base includes blue chip companies 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.

www.wintergreenresearch.com
tel 781-863-5078
email: info@wintergreenresearch.com
Lexington, Massachusetts

5.44.12 Vitria / B2Br Partnership

B2br is the integrator company of TBA Group. The partnership is positioned to grow the Vitria participation and stake in the BPM market. Vitria desires to expand its participation in the Brazilian market.

This partnership agreement is strategic, since B2br is one of the principal players in the Information Technology services sector in the country. The partnership combines B2br's expertise, its proven knowledge of the sector and Vitria's strong solutions portfolio opening new paths for Vitria to strengthen its brand in Brazil.

For B2br, the agreement represents a considerable addition in its capacity to analyze, diagnose and implement EAI, BPM and SOA platforms and architectures. This means B2br's customers are offered solutions focused on process integration which makes business dynamics more agile and flexible, improving operational efficiency.

One of the principal attributes of Vitria products is its handling and resolution capabilities. This means solutions can identify, diagnose and resolve specific process bottlenecks specific to a particular enterprise, significantly reducing delays, high costs and customer dissatisfaction related to business exception problems. Among products, particular solutions treat exceptions all at levels whether it is a system, service, process or business exception. This unique characteristic improves, speeds up and enhances the implementation of SOA solutions.

www.wintergreenresearch.com
tel 781-863-5078
email: info@wintergreenresearch.com
Lexington, Massachusetts

5.45 Wipro Technologies

Wipro Technologies (NYSE:WIT) is a global consulting, technology and business process services division of Wipro Limited. It provides a range of technology-based business services to Global 2000 clients on a global services delivery platform.

5.46 Other SOA Centric Companies

TABLE 5-34

SELECTED OTHER SOA CENTRIC COMPANIES AND ORGANIZATIONS

- Amberpoint
- Business Objects
- Computer Associates (CA)
- WSO2
- Active Endpoints
- SOA Software
- Reactivity
- Forum Systems
- Mindreef
- Layer 7 Technologies
- Cape Clear

www.wintergreenresearch.com
tel 781-863-5078
email: info@wintergreenresearch.com
Lexington, Massachusetts

TABLE 5-34 (CONTINUED)

SELECTED OTHER SOA CENTRIC COMPANIES AND ORGANIZATIONS WEBLAYERS

- ActiveGrid
- AboveAll Software
- Logic Library
- RogueWave
- iTKO
- Parasoft

Source: WinterGreen Research, Inc.

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Lexington, Massachusetts