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E-BUSINESS

SUCCESS ON A SOUND SOFTWARE ARCHITECTURE

DISTRIBUTED COMPONENTS ENABLE RAPID TIME TO MARKET WITH QUALITY

Success *on a* Sound Software ARCHITECTURE

The rise of e-business is forcing every company to reconsider how it conducts business. Most companies will spend the next several years figuring out how to take advantage of the business opportunities the Internet offers. Indeed, many CEOs believe if they don't figure out how to use the Web effectively, their companies won't survive the coming decade.

The popular press is filled with articles about e-business startups that are challenging established companies and stealing valued customers. Some managers of established companies worry about whether their companies can survive in the age of e-commerce. Although it sometimes appears that all the early rounds in the transition to e-commerce have gone to startups, several large companies have demonstrated they can hold their own. The Charles Schwab investment firm, for example, has established its dominance over several Internet companies that sought to enter the on-line trading business. Similarly, CNN, Chevron, The Gap, and Home Depot have all quickly adapted to the Internet and now successfully distribute their products and services on the Web.

E-Business is Changing the Way CIOs Think About Time to Market Software Architecture

While the temptation may be to rush a solution to market by the fastest means possible, savvy CIOs are looking for a way to build a long-term solution quickly, to avoid the necessity of rebuilding an unsound system in a few months' time. However, the key to making this approach work is to fuse business and technology architecture. The methods of business engineering and software development must be seamless. To enable this, the e-business development method must be based on two fundamental underpinnings:

First, there must be a technology infrastructure that incorporates a distributed object infrastructure as well as legacy applications and assets; and component-based applications to meet time-to-market goals

while ensuring reliable software gets built.

Second, there must be a component-based development approach in which each layer in the architecture offers services to higher layers, while hiding the details of how those services are implemented. These architecture components must be reusable, easily integrated, easy to use, scalable and extensible. The Object Management Group's standards related to Common Object Request Broker Architecture (CORBA) and the Enterprise JavaBeans specification, are both important pieces of the framework.

These technology standards are essential to enterprise architecture and inter enterprise architecture. Open standards provide the greatest opportunity to achieve the goals of portability and interoperability. A well-designed architecture should be able to accommodate change in its standard-related components.

For example, the Extensible Markup Language (XML) standard of the W3C consortium is a metalanguage useful to define industry vocabularies so that trading partners can interoperate. These vocabularies are evolving and today there are many of them. Creating open standards between and among these semantic towers of e-business is essential. Through creation of a number of industry task groups, the OMG is helping in this process by working on task forces with sectors including finance, medicine, manufacturing, and telecommunications. The evolving architecture reaches deeply into the interactive relationship between participants such as customers and suppliers. In this way, the OMG is playing a crucial role in providing a neutral forum where industry organizations and companies can join together.

The XML standard of the W3C is a metalanguage useful to define industry vocabularies so that trading partners can interoperate.

Transitioning to E-business

Companies often consider several e-business models when they begin their transition to e-commerce. Most large companies have already developed Web sites that provide customers with information. Similarly, many organizations already use the Internet to provide their employees with new ways to access internal company data and applications. Greater challenges, however, lie in the development of applications that will allow customers to buy products over the Internet or that allow companies to automate the buying process. These business-to-consumer (B2C) and business-to-business (B2B) applications are challenging because they require information sharing between systems that were never designed to do so.

Although many analysts distinguish between B2C and B2B applications, large companies find that enterprise e-business applications soon begin to merge. Even simple Web sales systems usually try to let the customer know when the product will ship or arrive. To do the former, applications need to link with company inventory, manufacturing, or shipping systems to determine the exact availability of the product requested. To determine when the product will arrive at the customer's site, applications usually need to link to the systems of the delivery vendor that will actually transport the product to the customer.

Many companies are modifying their business processes to allow their customers to tailor products to meet specific needs. Tailoring, if it depends on parts or components secured from other companies, usually requires that the selling company link its Web application to applications at the companies that make up its chain of suppliers. This allows the selling company to determine when needed parts or components will be available.

By the same token, once companies start linking their systems to provide inventory information, they usually proceed to add other links to automatically exchange orders, accounting, or shipping information.

Building Distributed Systems

To respond to the e-business challenge, companies need to create distributed systems. The Internet and the Web are just the latest technologies for linking systems and distributing information. Some companies have been developing distributed software systems for years. In the past, however, most distributed systems were limited. If a company decided to connect its systems with suppliers, it limited the connections to key suppliers. If it needed to exchange information with customers, it lim-

GENESIS DEVELOPMENT: SUPERIOR EXPERTISE IN FIVE KEY AREAS FOR DRIVE TO E-BUSINESS

Genesis Development is a leading provider of consulting services and software development expertise in component-based enterprise technologies, electronic business, and business-to-business solutions. With more than 13 years of real-world experience developing large-scale, mission-critical infrastructures and solutions, Genesis combines superior enterprise computing expertise with leading edge Internet/e-business capabilities. Genesis' client list includes UBS AG, Bank Brussels Lambert, UBS Warber, Enron Energy Systems, Hartford Insurance, Prudential Insurance, VIAG InterKom, Infostrada, and Unisys. Genesis is headquartered in West Chester, Pa., and has offices in Austin, Texas, and Colleretto Giacosa, Italy. Genesis specializes in enterprise application integration, software development processes, and middleware architecture such as CORBA and Enterprise Java Beans (EJB). The company offers services in five key business areas: 1) The advisory service helps organizations define IT strategy; 2) the transition service specializes in mentoring IT organizations through the e-business mine field; the 3) architecture and 4) modeling services help firms rationalize IT infrastructure; and the 5) Enterprise development service guides the implementation of mission-critical applications.

Each of these services offers practical IT solutions to firms wishing to take part in the e-business revolution. At the tactical level, Genesis service offerings include project management, application development, business modeling, mainframe migration, legacy system integration, and Web enablement of existing applications.

As a founding member of the Object Management Group, Genesis has always focused on standard-based solutions and has played an active role in standards bodies such as the OMG. "Genesis has been actively involved in the Object Management Group since its inception over a decade ago. This includes maintaining the highest level of membership, sitting on OMG's board of directors, being a member of the Architecture Board, and playing a role in driving toward consensus in many different vertical-industry areas, such as the financial marketplace," said William Hoffman, OMG president.

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ited the information it planned to exchange. Companies did this simply because it was hard to develop distributed systems. Each company used different types of hardware and software. Firms used a plethora of terms to refer to entities that each company supports, such as "accounts," "part numbers," and "orders." In the past, the only way to link different systems was to carefully build translation mechanisms that changed the code formats and terminology used at one company into the code formats and terminology used at another. Each message had to be translated when it was sent and again, when a response was returned. Anyone who has worked on a large, distributed system can relate stories about the complexities, problems, and, in many cases, the failures of these early efforts.

Exploiting Web Sites

This began to change in the mid-'90s for two reasons. First, everyone discovered that the Web and the Internet made it easy to link and communicate with others. Not only could companies reach customers on-line, but also companies that created Web sites found that the sites attracted customers. At the same time, businesses realized that if they adopted the standard Internet protocols (including HTTP) they could avoid many problems they faced when they used various proprietary protocols.

Almost overnight the Internet started to emerge as the universal wire protocol for distributed systems communication.

The second reason for change was the development of object or component technologies. This effort was led by the Object Management Group (OMG). In essence, objects or components offer a way of modularizing or wrapping software and providing it with a standard external interface. Thus, to link one application written in COBOL with another written in C++, you can wrap each application in a common component system and exchange messages between the components.

WIDE RANGE OF CORBA MIDDLEWARE SUPPORTS MISSION-CRITICAL APPLICATIONS

Object Oriented Concepts was founded in 1996 to provide CORBA-compliant middleware to its customers. Since then, OOC has grown into one of the leading providers of CORBA products, with offices in the U.S., Canada, Germany, and Australia. OOC's products are deployed worldwide and used for mission-critical applications. (See www.ooc.com for testimonials.)

OOC offers one of the most complete and fully compliant CORBA product lines available anywhere, including the following products:

- ORBacus 3 for Java and C++ (CORBA 2.0 compliant)
- ORBacus 4 for Java and C++ (CORBA 2.3 compliant)
- ORBacus Names (CORBA Naming Service)
- ORBacus Events (CORBA Event Service)
- ORBacus Properties (CORBA Property Service)
- ORBacus Trader (CORBA Trading Service)
- ORBacus OTS (CORBA Object Transaction Service)
- ORBacus Notify (CORBA Notification Service)
- ORBacus T-Log (CORBA Telecom Logging Service)

The product line is augmented by a number of value-added features, such as a threads abstraction library, an implementation repository, a documentation generator, secure communications via SSL, an API that enables use of the ORB with transports other than TCP/IP, and graphical management tools for administration. Professional training and consulting services, as well as custom development services carried out by OOC's engineers, round out the product line.

All products are highly portable across a large number of operating systems and compilers and have proven reliability, extremely low defect rates, and high performance. OOC's support has been consistently rated as outstanding and is provided by development engineers who can resolve issues quickly.

OOC uses a novel licensing model that not only makes source code available, it removes run-time royalties for most products, making OOC's product lineup the most competitive on the market. Products are free for evaluation and noncommercial use, allowing customers to "try before they buy."

As a submitter to several specifications, OOC is actively committed to CORBA standardization and is well respected as an industry innovator; OOC's Chief Scientist is a member of the OMG Architecture Board.

Overall, OOC offers a complete product line that combines cutting-edge technology with full standards compliance, reliability, performance, excellent support, and it offers outstanding cost effectiveness.

For further information, see www.ooc.com

The OMG's Interface Definition Language (IDL) is as open and universal as the Internet protocols. Using the OMG's IDL, companies can provide common interfaces for diverse application modules and thus provide the basis for integrating otherwise incompatible applications into a common B2B or supply chain application.

Corporate applications commonly use components and data structures that are a lot more complex than the types of data the Internet was designed to pass around. Thus, to effectively link corporate applications over the Internet, with or without components, you need higher level protocols that, in effect, ride on top of basic Internet protocols.

The OMG's Internet InterORB Protocol (IIOP) facilitates communication between components with IDL interfaces; it also provides a number of services. For example, the Naming Service keeps track of where to find various components. Other services provide for transaction processing, persistent storage integrated in the distribution scheme, and the strongest available security and authentication.

Facilitating Commerce

When the Internet and the Web gained popularity in the mid-'90s, most of the attention was focused on individuals exchanging e-mail and surfing Web sites. In the past two years, the main focus has shifted to using the Internet and the Web to facilitate commerce between individuals and companies.

Thus, many companies are now exploring how to develop large business applications that can exploit the Internet. In effect, they have had to move beyond their initial interest in the Web to focus on the problems of integrating diverse

enterprise applications. To do that, companies need to develop distributed component systems. This requires most companies to reconsider their approach to software development and adopt a software architecture that supports both Internet- and component-based applications.

Role of the OMG

Founded in 1989, the OMG comprised a small group of companies that anticipated that software development would increasingly use object- and component-based technologies. The first OMG members were primarily concerned with the problems they would face in passing information between different object languages or component models. By starting well ahead of the adoption curve, the OMG's founders hoped they would be able to create an open, universal distribution mechanism every company could use.

The OMG is structured as a nonprofit, membership-based consortium. Membership is open to any company interested in working with others to create open distributed object and component standards and industry-specific component frameworks.

These standards, coupled with industry-specific frameworks, provide the basis on which companies can integrate different application modules into B2B, supply chain and e-commerce applications.

Early on, the OMG focused mainly on mechanisms that would track the network locations of objects and allow different object-oriented languages to pass messages back and forth between different computers. This early work on distributed protocols and interface languages was highly technical, but it was an important prerequisite for developing distributed object and component systems.

OMG membership is open to companies interested in working to create open distributed object and component standards.

As a result of its focus on network protocols, the OMG decided that it would rely on TCP/IP (the basic Internet wire protocol) and build everything else on top of that. Thus, the OMG's entire body of standards is, in effect, Internet-native technology. At the same time, the World Wide Web Consortium (W3C), the group that sets Internet standards, used the OMG's IDL when it defined its XML protocol.

Remarking on this relationship, Tim Berners-Lee, W3C's director, argued, "Web technology and distributed object technology are naturally complementary. …The OMG has moved toward Internet specs and the W3C toward object specs. We want to ensure that the two groups work together to define a common future. …" In keeping with that goal, W3C and the OMG are collaborating to define next-generation Internet protocols that will lead to a convergence of HTTP and IIOP.

The OMG began by defining an overall distributed architecture, a neutral IDL (OMG IDL), a compiler, and mappings to standard programming languages; the entire OMG middleware system is CORBA. Using these, a developer can access objects written in standard programming languages and generate IDL interfaces that can be used to pass messages back and forth across the CORBA network.

These elements, coupled with basic services such as a Naming service that tracks each object's location, are referred to as an Object Request Broker (ORB). IIOP is the OMG's basic communication protocol. IIOP ensures that any object wrapped in IDL can find and speak to any other object wrapped in IDL, no matter which CORBA implementation the developer uses. The creation of this middleware infrastructure and its implementation by a dozen software vendors occupied the OMG community during the first part of the '90s.

Extending Infrastructure

In the mid-'90s, the OMG focused on extending its basic middleware infrastructure with a suite of standard utilities and services that developers could use to create distributed applications. Among the services the OMG defined were Security, Concurrency, Transaction, Event, and Lifecycle. As each service was defined, vendors implemented them and packaged them with their CORBA development products.

During this same period, the OMG helped to create a standard graphical notation for representing object and component models, which is called the Unified Modeling Language (UML). This stan-

dard is now used throughout the world to graphically represent the structure and function of an application. Recently, the UML has been refined so that the UML's core metamodel can function as a universal repository model.

The OMG's focus shifted again in the late '90s. In the past three years, it has revised its earlier work to ensure its compatibility with Java and the latest Internet technologies, including firewall standards and XML. At the same time, the OMG has created a transactional component model—the CORBA Component Model (CCM)—and has encouraged the development of industry groups to create component frameworks for their respective industries. Industry-specific component frameworks provide the basis by which companies can integrate applications and exchange data in B2B and supply chain applications.

Publishing Free Standards

At the end of each effort, the OMG publishes standards and makes them freely available. The OMG does not create code to implement its standards. Diverse software vendors implement OMG standards. Thus, companies can choose among vendors if they decide to buy software that conforms to OMG specifications. Some companies have chosen to buy CORBA middleware or components that comply with OMG industry-specific interfaces. Others have decided to implement the OMG middleware and component standards for themselves.

As more component implementations become available, companies will be able to buy or build as they see fit. Indeed, many companies have already benefited from products that comply with OMG standards. Most early adopters of CORBA-based distributed systems relied on middleware implementations that were written in C or C++. Many of these companies later switched vendors and shifted their applications to CORBA implementations written in Java to

OMG, WITH 800 MEMBERS, SPEARHEADS DRIVE FOR VENDOR INDEPENDENCE

The Object Management Group™ (OMG™) was founded in April 1989 by 11 companies, including 3Com Corp., American Airlines, Canon Inc., Data General, Hewlett-Packard, Philips Telecommunications N.V., Sun Microsystems and Unisys Corp. In October 1989, the OMG began independent operations as a not-for-profit corporation. Through the OMG's commitment to developing technically excellent, commercially viable and vendor-independent specifications for the software industry, the consortium now includes approximately 800 members. The OMG is moving forward in establishing CORBA as the "middleware that's everywhere" through its worldwide standard specifications. These include CORBA/IIOP™, the UML, XMI™, MOF™, Object Services, Internet Facilities, and Domain Interface specifications.

The OMG is headquartered in Needham, Mass., and has international marketing offices in Australia, Bahrain, Brazil, Germany, India, Italy, Japan, and the U.K., along with a government representative in Washington, D.C. Additionally, the OMG is a sponsor of the Comdex Enterprise series of trade shows and conferences.

The OMG was formed to create a component-based software marketplace by accelerating the introduction of standardized object software. The organization's charter includes the establishment of industry guidelines and detailed object management specifications to provide a common framework for application development.

Such companies as Netscape, Oracle, Sun, and IBM have chosen the OMG's widely popular Internet protocol IIOP (Internet Inter-ORB Protocol). OMG specifications are used worldwide to develop and deploy distributed applications for vertical markets, including manufacturing, finance, telecom, e-commerce, real-time systems, and healthcare.

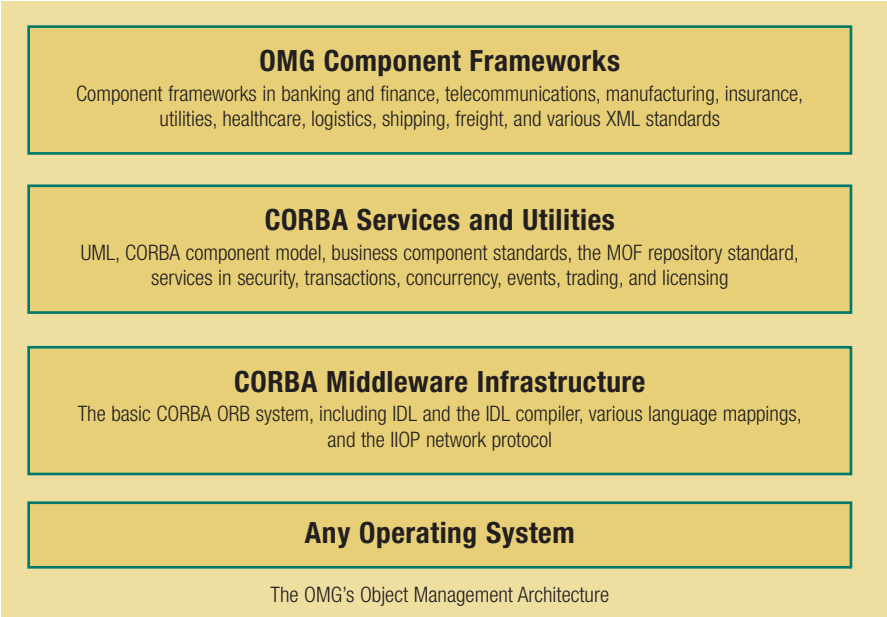
The OMG is structured into three major bodies: the Platform Technology Committee (PTC), the Domain Technology Committee (DTC), and the Architecture Board. Within the Technology Committee and Architectural Board rest all the task forces, special interest groups (SIGs), and working groups that drive the OMG's technology adoption process.

Here are three methods of influencing the OMG process: First, vote on work items or adoptions in the task forces. Second, vote on work items or adoptions at one or both Technology Committee levels. Third, submit technology for adoption at one or both Technology Committee levels. Membership fees are based on these levels of influence.

For more information, visit www.omg.org

make them easier to interface with the Web. Similarly, companies in industries that have already created standard component frameworks are in a position to buy components from a variety of vendors or to develop them internally.

Taken as a whole, the OMG's various standards form a complete distributed component architecture: the Object Management Architecture (OMA). In effect, the OMA can be seen as having three layers. (See the figure.) The bottom layer, sitting on top of the Internet protocols, provides the middleware infrastructure needed for distributed communications.



The OMG's Object Management Architecture

The middle layer, sitting on top of the infrastructure, provides the services and utilities a company needs to model and support distributed application development. This layer includes the OMG's UML for describing component systems, and utilities for handling security and transaction processing for component applications.

The top layer, which is currently under development, consists of industry-specific frameworks of components and standardized vocabularies that developers need in order to work together to link their applications with those of other companies so that they can form supply chains.

Throughout the '90s, the number of OMG members gradually grew as more companies realized the importance of developing OMG standards. The first members were mostly hardware and software companies that were vitally interested in distribution protocols. As the OMG shifted to focus on application modeling and development services, end-user companies began to join. This trend has accelerated as the OMG has increasingly focused on industry-specific frameworks and standards and as it has begun to coordinate its work with various industry standards groups. Today, the OMG has about 800 members and is the largest software standards group in the world.

Ever since the OMG was founded, it has pursued its goal of creating a complete architecture for building open, distributed object and component systems. As the years have passed and new technologies have been introduced, the OMG has modified its architecture as necessary, to incorporate and support the new technologies its members want to use. Thus, the OMG has embraced and incorporated languages such as C++ and Java, new component models such as Enterprise JavaBeans and Microsoft's COM and DCOM, new methodologies such as the UML and business component models, and a variety of Internet protocols.

Changing Architecture

To understand changes occurring in the OMG's architecture, consider how the OMG has responded to the W3C's new XML, which is an extension of the popular Internet HTML language. HTML is a language in which a developer can design a page for display on a Web browser. Most pages you see when you browse the Web were created in HTML.

In essence, HTML specifies a set of tags one uses to mark text to indicate how the browser should display it. XML provides an extended set of tags and, more importantly, it lets developers specify their own tags. By creating a tag set, a developer can turn an XML file into a mechanism for passing data between applications.

Since XML is a standard Internet protocol, it will undoubtedly become a popular way to pass data. Indeed, some industry observers have suggested that XML provides a better way to handle communications between various Internet applications.

Any distributed communication solution requires three things: a

way of packaging the information, a way of modeling and organizing applications so that messages can find their targets, and a way of standardizing interfaces and vocabularies. XML provides a new mechanism for packaging information. Moreover, XML's ability to incorporate new tag sets provides it with a way to use standardized vocabularies that evolve over time.

On the other hand, XML does not provide utilities or services that handle security, messaging, or transaction processing, for example. In other words, XML isn't a distributed architecture; it's an exciting, flexible data packaging mechanism that can only reach its potential when it's used in conjunction with a distributed component architecture such as CORBA.

Put another way, XML is intended for storing and manipulating text used in human-readable documents, such as Web pages. Middleware solutions including CORBA, on the other hand, tie together cooperating computer applications that exchange not only text, but also large amounts of transient data no one will ever read. XML provides a mechanism to handle one problem the OMG's OMA is designed to address. Other CORBA mechanisms complement

and extend XML to provide a complete solution to distributed computing.

Those who want to use XML face one key problem: agreeing on a common vocabulary for the tags used to define XML file data. Several groups have already been established to help companies and groups of companies agree on XML tag sets. In other words, XML developers have exactly the same problems as component developers. Someone has to standardize the vocabulary used to describe the information passed between applications.

Probably the most popular, vendor-independent group currently working on standard XML tag sets is OASIS, the Organization for the Advancement of Structured Information Standards, in Billerica, Mass., (www.oasis-open.org), a membership organization involved in promoting information standards including XML, SGML, and CGM (Computer Graphics Metafile).

The OASIS organizers quickly recognized that they needed to fit their work within a broader architectural context. They decided that they didn't want to duplicate the OMG's vocabulary standardization efforts in their effort to develop standard, industrywide component interfaces. Thus, like other industry groups, OASIS decided to work with the OMG.

The OMG has already standardized one set of XML tags, referred to as XMI. Using XMI, developers can convert UML models into XML files that can be stored in or moved between repositories or data warehouses. In a similar way, software development tools can share UML models by relying on XMI. Thus, the XMI tag set facilitates greater reuse, both within an organization and between organizations working to build integrated supply chains.

In addition, the OMG is integrating XML into the OMG IDL. Thus, XML will be available to any application that uses CORBA. At the same time, the OMG is exploring integrating XML directly into the CORBA IIOP protocol layer. All these efforts provide good examples of how the OMG continues to embrace new technologies and to expand the OMA architecture to keep it current and comprehensive.

XML, like several other technologies that will appear in the next few years, constitutes a new way to handle one aspect of the larger set of concerns that companies must deal with as they develop e-commerce applications. As each technology gains momentum, some proponents will argue that the new technology is a complete solution to all problems companies face. In fact, however, each technology will need to be placed in a broader context and used with other technologies to provide a complete solution. XML, by itself, is an incomplete and immature solution. The OMG is working to identify the best uses of XML, provide it with infrastructure support, standardize its tag sets, and incorporate it into the comprehensive OMG architecture. As other technologies are developed, the OMG will continue to extend its architecture in order to remain the one open, comprehensive approach available for developing distributed e-commerce systems.

As each technology gains momentum, proponents will argue that the new technology solves all problems companies face.

The OMG as a Metaconsortium

To appreciate the OMG's work in developing industry component frameworks and XML tag sets, one only needs to consider the OMG's ongoing relationships with other industry standards groups. It's easy to imagine that the OMG's efforts to standardize the terms used when companies exchange information in supply chain applications might upset other industry consortia that have also tried to standardize vocabularies. In fact, the opposite has occurred. The OMG is rapidly emerging as a component technology resource and clearinghouse for a variety of industry associations that seek to help their members create standardized vocabularies and component frameworks. Many traditional industry-standards groups find that their members want help developing component frameworks or XML tag sets. These consortia, which may or may not be computer or software oriented, suddenly find they are being asked to become leaders in a new, very complex undertaking. Luckily for them, the OMG provides a way they can help their members without reinventing themselves. They can develop a partnership with the OMG and let the OMG provide the overall framework for their component

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and XML standardization efforts.

One such partnership is that of the OMG and CommerceNet. Founded in 1994, CommerceNet is a global, nonprofit membership organization meeting the evolving needs of companies doing e-commerce. Since its founding in 1994, CommerceNet's mission has been to promote and advance interoperable e-commerce to support emerging communities of commerce. Today the organization has more than 600 corporate members worldwide.

Randall C. Whiting, CommerceNet president and CEO, emphasized the value of the OMG relationship when he said, "We are very excited about the opportunity to partner with OMG on the development of an electronic commerce architecture. …We feel that the combination of OMG's expertise in software objects and CommerceNet's expertise in electronic commerce will yield dramatic results that will benefit electronic commerce vendors and users alike."

Listed below are examples of specific organizations from four different industries that currently work with OMG task forces.

The Finance Task Force is working with the following groups:

Society for Worldwide International Financial Telecom (SWIFT). SWIFT is a consortium of banks. The group works to provide its members with technology-based communication services for all major financial markets.

International Accounting Standards Committee (IASC). IASC consists of some 140 professional accountancy organizations located in more than 100 countries. IASC works to standardize accounting practices used by businesses for financial reporting.

Open Financial Exchange (OFX). OFX was created by CheckFree, Intuit and Microsoft in 1997. It works to establish a unified specification for exchanging financial data among financial institutions, businesses, and consumers via the Internet.

The Medical Task Force works with the following organizations:

National Council for Prescription Drug Programs (NCPDP). NCPDP is made up of pharmaceutical manufacturers, wholesale drug distributors, insurance carriers, prescription benefits managers, retail pharmacies, federal and state government agencies,

and professional associations. NCPDP exists to create and promote data-exchange standards for the pharmacy and healthcare industries.

Digital Imaging and Communications in Medicine (DICOM). DICOM includes companies involved in manufacturing and using medical imaging equipment. DICOM works to set standards to ensure that medical imaging devices can exchange data.

Health Level Seven (HL7). HL7 is the American National Standards Institute (ANSI) group that develops standards for the healthcare arena. HL7 develops and promotes standards to ensure that disparate healthcare applications can exchange key sets of clinical and administrative data.

ISO JTC1/SC32 (ISO task force on medical standards). JTC1/SC32 is the task force of the International Federation of the National Standards Organization that focuses on creating international medical standards.

The Manufacturing Task Force is working with the following organizations:

Semiconductor Industry Suppliers Association of America (SEMI). SEMI is a consortium of 13 leading semiconductor companies. SEMI researches semiconductor manufacturing technologies and promotes standards to facilitate semiconductor manufacturing.

ISO TC184/SC4/WG4 (ISO task force on manufacturing automation). TC184/SC4/WG4 is an ISO task force that promotes standards to facilitate manufacturing automation.

Advanced Information Technology for European Manufacturing Industry (AIT).

Petrochemical Open Software Corporation (POSC). POSC is a consortium of 100 companies engaged in the production, refinement, and distribution of petrochemical products and of companies that supply hardware for those operations. POSC works to share information among its members and to promote useful software modeling, data, and application integration standards.

One of the hardest problems facing many organizations attempting supply chain integration is simply agreeing on names.

The Telecom Task Force works with the following groups:

TeleManagement Forum (TMForum). TMForum is composed of companies involved in global telecom deregulation. TMForum companies work together to identify and develop solutions that automate and streamline telecom operations.

Telecom Information Networking Architecture Consortium (TINA-C). TINA-C is a group of telecommunication operators, equipment manufacturers, and computer manufactures that work together to define a common architecture for telecommunications.

TiM1 (ANSI Telecom standards group). This group is an ANSI subcommittee. TiM1 focuses on telecom standards, and especially on standards for the interconnection and interoperability of telecom networks and interfaces.

Cable Television Laboratories (CableLabs). CableLabs is a membership organization consisting of cable-television system operators in North and South America. The group is working on an OpenCable project aimed at creating interoperability standards for set-top boxes.

Multimedia Communications Forum (MMCF). MMCF is an international consortium of telecommunication providers and multimedia application and equipment providers working together to standardize communication interfaces for multimedia systems.

As already noted, one of the hardest problems facing many organizations attempting supply chain integration is simply agreeing on names. In the past, many companies have struggled with this issue internally as they sought to create applications that passed data back and forth between different departments. In situations such as this, accounting suddenly realizes that its "order" is nothing like what the inventory system terms an "order." If agreeing on standard terms within a single company is hard, it's easy to imagine how difficult it can become when one company wants to link its systems with those of a dozen other companies. The rush into e-commerce is certain to focus lots of companies on terminology issues.

Dan Schutzer, FSTC president, made this point when he said, "Membership in the Object Management Group has become essential for anyone working or planning to work with CORBA and distributed objects. …FSTC's attention to the needs of banks, in

particular those that relate to standards and interoperability, makes this a logical affiliation."

In a sense this really isn't a distributed architecture issue or even a software issue, as such. It's a business problem. Companies call the same things by different names, and someone needs to take responsibility for compiling and constructing a common vocabulary. In some cases industries have been working on standardization efforts for many years.

When companies seek to integrate their applications with other companies systems in a common supply chain application, however, vocabulary issues become software problems. To link components, companies must first agree on the names to be used when components pass messages to each other. The OMG understands that terminology issues must be tackled systematically if the results are to be readily available for corporate e-commerce development efforts. Thus, the OMG is now devoting a major part of its effort to facilitating industry groups that seek to create standard terminology for use with component frameworks and XML tag sets.

Widgets Inc.'s Supply Chain

To make this entire discussion a little more concrete, consider a hypothetical, but very likely story that will be enacted many times in the year ahead.

Widgets Inc. wants to become a major Internet retailer in its industry. To do this, the company plans to create a Web site customers can access when they want to buy widgets. As Widgets' managers plan their Web site, they realize that customers will need to tailor the widgets they order. To enable this, Widgets needs to integrate its sys-

VISUAL EDGE: SEAMLESS TIE TO BACK-END SYSTEMS FROM ALL CUSTOMER-FACING TOUCHPOINTS

Only Visual Edge can offer an e-business environment integration architecture designed to enable dynamic, customer-driven application centers. The Visual Edge (VE) integration platform enables e-business applications to integrate with back-end enterprise applications, without hand-coding, heavyweight backbone or middleware frameworks, or requiring changes to existing applications and processes. Unlike EAI solutions, the VE integration platform allows application developers to leverage native business processes for increased account control.

Visual Edge seamlessly integrates directly with and controls back-end systems from the customer-facing touchpoint, whether that touchpoint is a Web site, call center, help desk, mobile solution, agent terminal, or SAP R/3 center. The VE integration platform provides the following benefits:

- Accelerates time to market (gets systems up and running more quickly);
- Lowers barrier to sale: much lighter weight integration solution to get management to buy into;
- Eases configuration: no incremental backbone or middleware framework to install;
- Improves overall performance, while still providing important features such as guaranteed delivery, and results caching for improved reliability;
- Cuts cost by eliminating the need for hand-coding;
- Preserves the investment in existing applications, processes, training; and,
- Controls customer interaction: at the right place (forward applications).

Visual Edge customers include Global 2000 leaders across every major industry, making the company a powerful, effective partner in working to solve enterprise business problems. Visual Edge products are also licensed by leading EAI vendors, platform partners, and e-business application developers.

Control Broker Product Line

The Visual Edge product suite includes control broker platforms designed to link enterprise business processes without expending time or funds in altering legacy, proprietary, or Enterprise Resource Planning (ERP) applications. In particular, the Visual Edge Integration Platform facilitates robust, secure, guaranteed, two-way information exchange between disparate applications within a business community. This platform also easily extends beyond the firewall to integrate with EDI/ERP systems.

For more information, visit www.visualedge.com

tems with those of partner companies that supply Widgets with the parts it needs to create various widgets. Similarly, it needs to integrate with an external package delivery company that will handle actual worldwide delivery of widgets ordered on Widgets' Web site. To keep things simple, Widgets decides to try a pilot in which it integrates its systems with just two companies in its supply chain: parts vendor Parts Inc., and the delivery vendor Deliveries Inc.

When the three companies' software managers meet to discuss developing a supply chain application to support Widgets' new Web site, they realize that they face a number of problems. First, the three companies use different hardware. Second, they use different networking protocols to pass information between applications. Third, their applications are written in various languages, and they are modularized and packaged in different ways. Finally, they use different terms to describe a "part," a "route," and a dozen other key terms.

As the three software managers consider their problems, they realize it would be impossible for any one of them to change their hardware or software applications or protocols to match those of the other companies. In the past each has developed special links to partners, but each also realizes that this would not be practical in this case.

As soon as the pilot project is over, Widgets plans to link with a dozen other suppliers. The problems of creating and maintaining specific links are too complex, and it would sharply limit Widgets' ability to adapt to the rapidly changing e-commerce market. Instead of going with a custom-developed, proprietary linkage, the

three software managers decide they will need to find some common, neutral way to transfer information among their respective companies.

Actually, three types of neutrality will be required. First, the managers need to encode the information being passed between the systems. Second, they need to model the resources at each company so that Widgets' applications will know where to go at Parts to get what they need. Finally, they need to agree on some standard set of basic business terms to use, to ensure that when a Widgets application asks for a "part price" from Parts, it will get the correct type of information.

In effect, Widgets, Parts, and Delivery need one or more neutral organizations to help them organize a way of sharing information.

The three company software managers must first identify a common way to structure the basic information they pass each other. They all agree they will use the Internet as their fundamental wire protocol. They know that won't be enough, however. They will need some higher level protocols to actually package the information they will pass over the Internet. Microsoft protocols such as COM and DCOM won't work because two of the companies use non-Windows operating systems. Similarly, Java won't work, because the companies need to link a number of legacy applications not written in Java. In the end the only protocols really designed for the task the three companies face are those provided by the OMG's OMA.

The OMG provides a common set of protocols (IIOP), as well as open, integrated services to support security concerns and transaction processing. Since the OMG doesn't sell software, but only creates and manages open standards, each company is ensured that it can choose whichever vendor it prefers and acquire a CORBA package from that vendor. As long as Widgets, Parts, and Delivery each support CORBA as a distributed transfer protocol, each can continue to use existing systems internally and exchange neutral information.

The OMG is working with groups of companies from various industries to agree on standard vocabularies for distributed applications.

In addition to needing a way to organize information the companies pass over the Internet, the three managers also need a way to talk about their own software modules. In other words, Widgets needs a way to model the applications at Parts so that Widgets developers will know which applications to access at Parts in order to get the information they need. In fact, this involves each company wrapping its existing applications or modules as components and defining interfaces so that each company's application developers will know how to find the information they need.

Once again, the OMG has neutral technology all three companies can use. The OMG provides a universal modeling system—the UML that developers can use to describe their application structures. In addition, the OMG is developing a standard way of talking about business components so that each company can refine its component descriptions. If the companies desire, the actual interfaces can be specified in the OMG's IDL. Or, if one company prefers, it can define its interfaces in Microsoft IDL or with Java or Enterprise JavaBeans. Since the OMG Architecture supports all three approaches and has defined just how IIOP can interface to each, the companies can continue to make independent choices while maintaining a neutral way of sharing information.

Finally, the OMG is working with groups of companies from various industries to agree on standard vocabularies for distributed applications. In some cases industry groups the three companies might have worked with in the past are cooperating with the OMG and, thus, earlier efforts at standardizing industry-specific vocabularies are often carried over into OMG efforts. The OMG industry groups usually specify standard frameworks of components and the interfaces for those components.

By joining and working with the OMG group focused on Widgets' terminology, the three companies can quickly arrive at a standard vocabulary that will facilitate their needs, but Widgets can rest assured that other suppliers will likely use these terms. At least Widgets can ensure that others in the industry support the terms it adopts and will maintain and extend them

according to well-established, mutually agreed-upon rules.

Embracing the OMG's OMA is hardly trivial. Each company will need to dedicate resources to make the required adjustments. On the other hand, compared with altering their internal systems, or agreeing to standardize on a single proprietary vendor, the OMG approach offers the three companies lots of flexibility. Moreover, it ensures that as Widgets expands its Web application, it can bring others into this open network with minimal difficulty. In addition, although the companies could have chosen to adopt only one part of the OMA—the infrastructure protocols, for example—by using the entire architecture, they guarantee a single, systematic approach that solves all their supply chain problems at once.

The OMA provides infrastructure standards, application modeling and component standards, and naming and vocabulary standards. Finally, by joining the OMG, which is an open consortium controlled by its members, each of the three companies guarantees it can continue to exert an influence on the OMA's ongoing development. Given the complexity of the problems they face entering the e-commerce market, all three companies can reduce technical risk by relying on the OMG to solve their information distribution problems. By simply adopting the OMA, the companies free themselves to focus on more strategic issues they hope will give their companies a significant edge in e-commerce.

Real-World Examples

The Widgets story is a simple, hypothetical example of what lots of companies will face in the next few years. It is based, however, on actual experiences of real companies that have used the OMG's technologies to develop Internet systems. In some cases these systems rely on the Web and customers can access them from Web browsers. In other cases these systems link businesses into supply chains or departments in internal, distributed, Internet-based networks. Consider just a few:

CNN Interactive (www.cnn.com) used CORBA to integrate its Web-based news delivery system. This worldwide system is up and running 24 hours a day, seven days a week, and responds to some 350 million hits a day.

The Gap clothing retailer (www.gap.com/onlinestore) has created a Web store customers can access. The application integrates its suppliers, stores, and inventory and shipment systems into a single Web-accessible system. The Gap used Java to develop the system. To integrate applications running on NT, Solaris, and mainframe platforms, the Gap used CORBA.

Chevron, the petrochemical company (www.chevron.com), has created an application to support

its Web site. Customers can buy Chevron products on-line. This supply chain system integrates a wide variety of Chevron partners and suppliers into a single inventory management system that provides customers with current information about a wide variety of company products.

Baptist Health Systems of South Florida used CORBA to create an internal Web-based application that integrates all its hospital systems, from patient histories and radiology to pharmacology. The Baptist Health Systems' IT people have been very active in the OMG's efforts to develop common component frameworks in the healthcare.

Building supply retailer Home Depot, (www.homedepot.com) has also used CORBA to create a Web-based system that links its customers, stores, inventories, and suppliers.

Airplane manufacturer Boeing-Lockheed Martin-MITRE relies on CORBA for their updated E3 AWACS early-warning surveillance aircraft. This real-time CORBA system passes critical sensor information to battlefield commanders.

Wells Fargo bank (www.wellsfargo.com) has created a Web-based banking system that allows customers to access their bank accounts on-line. The system also provides a wide variety of other customer services. Wells Fargo used CORBA to link its diverse legacy applications in order to support its new Web application.

Each of these systems was developed using a different mix of hardware and software. Some were built from the ground up, but most relied on integrating legacy enterprise applications. Similarly, most involve passing information between applications created by different companies. However, they all use Internet protocols and CORBA to provide a neutral way to pass information among many diverse applications.

The OMG's OMA is the only distributed component architecture available today that is open and vendor neutral.

The OMG has come a long way from its inception in 1989. It has provided the neutral, open, component-oriented middleware infrastructure companies need when they begin considering how to link diverse business systems into distributed B2C or B2B applications.

Modeling Key Applications

But the OMG has gone on beyond that: It now provides higher level utilities such as the UML and business component standards that allow companies to model their key applications in ways developers can use to link those same applications. Moreover, these basic techniques are so successful that a variety of implementation technologies support them.

Thus, Microsoft's Repository uses the UML while Microsoft's COM applications use IIOP to link to non-Windows environments. Similarly, Sun Microsystem's EJB specification incorporates IIOP and IDL to ensure that EJB developers can create components that can access applications written in other languages or data stored in legacy databases.

Building on these achievements, the OMG has become even more relevant in the past three to four years as companies have sought to integrate supply chains using standardized vocabularies.

Standardizing Terminologies

The OMG provides a neutral forum where industry organizations and companies can work together to standardize terminologies. This is true whether the terminology applies to XML tag sets or to frameworks of reusable components.

No matter the level of knowledge and development experience an organization has at the outset of a project to build large-scale Web applications, the company must rely on a proven distributed component architecture. The OMG's OMA is the only distributed component architecture available today that is open and vendor neutral. It's the only architecture that supports all major languages, component models, and platforms.

Equally important, it's the only architecture that provides standards and support at the infrastructure level, through the modeling and component levels, right up to domain-specific frameworks and industry-specific vocabularies.

In the coming decade, the OMG will continue to bring companies and industry consortia together to sort out the basic issues they face as they create distributed component systems to meet the e-business challenge. •