Building an Integrated Order-Management System on Intel® Architecture

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Intel and e-Business

Three years ago, one of the largest technology companies in the world decided to take its business out onto the Internet and into the future of e-Commerce. This company's goal was to develop efficient and easy-to-use solutions that would enable them to do business with customers around the globe at any time of the day or night. And these solutions had to be flexible, provide room for tremendous potential growth, and function consistently and reliably. After all, in the fast-paced and ever-growing business world out on the Internet, customer needs and expectations must be met or another supplier is just a few clicks away. When faced with the important choice of which architecture could meet these important needs both then and into a future of potentially immense growth, the choice was simple—Intel® architecture. The technology company was Intel.

At the beginning of 1998, most of Intel's customer orders were placed and managed via phone, fax, or EDI. The manual processing required a lot of time and involvement from people at both ends of the sales channel.

In an effort to streamline business-to-business transaction processes, Intel made efforts to move its business online. e-Business project teams were formed, business processes were defined, and solutions were developed in preparation for the rollout of a Web browser-based order-management system. Accessible worldwide, Intel's new e-Business system took its first order on July 1, 1998. In just two years, by July of 2000, Intel grew its e-Business to take 85 percent of customer orders electronically. Nearly 1,000 customers in 55 countries transact business with Intel over the Internet, significantly reducing handling time and costs, and improving accuracy.

Interactive Week's annual ranking of the world's online revenue leaders (published in November 2000) put Intel at the top of the chart for the second year in a row, with its e-Business systems taking in $23.8 billion.[1] And Intel architecture is the foundation of this success. Intel architecture is at the core of Intel's e-Business system—providing flexibility, scalability, and maximum performance for Intel's growing e-Business needs.

Building the e-Corporation

INTEL'S EVOLVING VISION

When Intel's e-Business initiatives began, the focus was on getting customer orders online. Once that was accomplished successfully, Intel started looking for ways to fine-tune and enhance e-Business processes. The next step in the evolution of Intel's e-Business was to begin automating the supply chain, including customer and supplier transactions, to move toward 100 percent e-Business. Now that Intel is getting closer to meeting this goal, the next goal is coming into view—working to become a 100 percent e-Corporation. This effort puts a new focus on making all e-Business systems work together seamlessly—from end-to-end supply integration to employee services. Intel's overall vision is the following:

> Use a combination of business systems and Internet technologies to re-engineer and automate internal business processes, in order to significantly improve customer, employee, and supplier business interactions.

Automating and integrating all business processes, both inside of Intel and with its trading partners, plays a pivotal role in building the 100 percent e-Corporation. Enterprise application integration (EAI) and business-to-business integration (B2Bi) are two of many efforts in this area, and each must work together for total and seamless functionality.

- Enterprise application integration (EAI)—Unraveling the mass of complex information lines to and from each application and systemwithin the enterprise. The goal of EAI is to make all systems within the enterprise work together to share relevant information.
- Business-to-business integration (B2Bi)—Working with trading partners to integrate e-Business systems. The goal of B2Bi is to make different transport and messaging systems and applications work together to transfer data and information automatically, minimizing human intervention and input.

INTEL'S IMPLEMENTATION PHILOSOPHY

Direct integration between business systems is the new baseline for tomorrow's integrated supply chain and is Intel's goal going forward. Intel's integration efforts are built around a guiding philosophy with a few central components:

Use best-of-breed, commercially available software. Intel uses best-of-breed software from third-party vendors that is commercially available. These solutions are configured where needed to fit various e-Business needs, but extensive customization is avoided wherever possible. This helps to ensure the software solution remains flexible and scalable, and can also minimize future support issues and costs. Frequently, with highly customized solutions, systems become so tailored and personalized that when changes to software or hardware need to be made, the entire system must be re-engineered.

Intel's best-of-breed environment combines applications from a variety of vendors—each with a core competency in its particular area. If it means that the overall solution will better meet its needs, Intel does not hesitate to tie together multiple applications from different vendors. These applications communicate with each other through standard translators or business links. And because the system is built in this way, Intel is not tied to a single vendor for the overall solution.

Through the use of best-of-breed, commercially available solutions, Intel is working to create a plug-and-play e-Business environment that can be easily adapted to meet future needs just as well as it meets today's needs.

Build on standards. By adopting industry standards when integrating e-Business systems, Intel is working to create open, flexible solutions that enable transparent, seamless ways of transferring information and data to and from trading partners. Intel has been actively involved in RosettaNet*, a technology industry consortium that is developing a set of open, industry-wide specifications for e-Business processes. These specifications, based on Extensible Markup Language (XML), are designed to help e-Business systems and applications speak the same language, making it easier for trading partners across the entire industry to exchange business information

Implement Intel's e-Business solutions on Intel architecture. Intel architecture has proven itself to be a solid and reliable foundation for Intel's e-Business system, providing valuable scalability and flexibility options. This multi-tiered architecture offers multiple performance levels for varying system and application needs, and can be readily modified to meet current and future demands. Intel can easily add capacity to accommodate new services or rising usage. Backed by the power and high performance offered by Intel architecture, Intel's overall e-Business system is highly resilient and versatile.

Order Management—Where We Are Today

E-Business is already a vital part of Intel's order-management processes. The days of placing the majority of orders via phone, fax, or in person are long gone. Today, Intel and its trading partners can communicate and exchange relevant order-processing information over the Internet. Intel can quickly place orders with various suppliers electronically, managing everything from purchase orders to shipment tracking. Intel's customers can work with Intel's order-management systems, including those listed below, to place their orders.

Web Order Management (WOM). Business-to-business (B2B) customers place orders using a real-time Internet interface to Intel's back-end Enterprise Resource Planning (ERP) systems. Customers can also check product availability and inventory status, get marketing and sales information, and contact customer support engineers with WOM.

Supply Line Management (SLM). SLM is an analytical tool designed to facilitate informed decision-making. This application allows customers and Intel analysts to work

together to manage forecasts and backlog, keeping production lines running while maintaining specified inventory levels. This collaborative solution enables Intel customer business analysts and customer buyers to discuss inventories and quantities over the phone while they use the SLM application over the Web.

Electronic Data Interchange (EDI). EDI involves the use of mature, robust standards (American National Standards Institute (ANSI X12) and EDIFACT, the UN Standard) and computer systems to exchange data. At either end of the supply chain, a software translator is used to convert application files to and from an EDI-specific transaction format. This format is agreed upon by Intel and its trading partner. Intel sends and receives EDI transactions to and from the Value Added Network (VAN) through dedicated, leased communication lines.

BENEFITS OF THE CURRENT PROCESSES

Thus far, Intel's e-Business systems have been a resounding success. With easier, online access to ordering systems and information, customers enjoy a flexibility they didn't have with earlier, more traditional ways of doing business. Both the WOM and SLM systems have contributed to a significantly more efficient business process. Order errors have decreased, while productivity has soared—customer business analysts generate 40 percent more orders in the same amount of time.[2] Those same analysts can now spend nearly half their time on high-value activities like relationship management and supply and demand analysis—a significant increase from just 20 percent in 1997.[3] And, doing business with Intel is easier and more convenient for customers, an important benefit. With more than 25 percent of transactions occurring outside of Intel's normal business hours, customers located around the world are conducting business on their own schedules.

LIMITATIONS OF THE CURRENT PROCESSES

Processes that require one or more people to input information at either or both ends of the supply chain have a few key limitations. Valuable employee time—time that could be spent on high-value tasks—is spent on relatively simple tasks, such as keying in basic information that might already be contained in an ERP system. And once the "human touch" element is part of a process, there is substantial room for error through transposed numbers, misspellings, or simple information misinterpretations. Every manual-input stage provides an opportunity for error and delay. Each error and delay triggers another round of manual inquiry and input, increasing costs and latency between the trading partners. Moving toward the goal of the 100 percent e-Corporation, Intel is looking to automate many e-Business systems—moving from a process with a fair amount of human involvement to a process with very little human involvement.

Both WOM and SLM currently require some human input at various locations in the process:

- With WOM, customers must input information on their end. This means they must spend time keying in information that they may have already entered into their own ERP system and that could be sent directly from their ERP system to Intel's system. With the need for a person to re-enter information from one system to another, valuable time is lost and room for human error is present.
- While the SLM system automates supply processes, both Intel analysts and customer buyers are still involved and must still input some information at either end of the process. This takes valuable time that could be spent on higher value tasks and activities and, again, leaves additional room for error.

EDI adds its own complexity, partially because Intel has been using it for so many years. The Standards Board for EDI modifies standards and assigns new versions for those standards, thus creating various versions for specific transactions. For example, for purchase orders, Intel used version 2002 when it initially began using EDI. Currently, Intel uses version 4010 for purchase orders. Two factors drove how Intel chose the EDI formats/versions it would use. One of those factors was the current version of the standard at the time that Intel's trading partner implemented on EDI. The other factor was the trading partner's system requirements, which determined which version of the standard Intel could use and whether it needed to customize that version. These various options can sometimes make it difficult to manage new EDI trading partner implementations.

Order Management—Where We're Going Tomorrow

The first step in taking a business out onto the Internet is developing an e-Business system that works with the processes, systems, and applications that support your business. Many e-Business pioneers have done this in the past few years…and many have done this with a good measure of success. Moving forward into an increasingly demanding business environment, a number of companies are working to integrate their systems with those of their trading partners, taking advantage of the Internet to boost efficiency and communication. One obstacle to reaching this goal is that many of today's highly customized and

tailored e-Business systems are not interoperable…they can't communicate with each other. Today's end-to-end supply chain has numerous architectures, systems, applications, and protocols. If a company's e-Business system is incompatible with its customers' and suppliers' systems, the vision of using the Internet as an efficient, effective business tool will not be fully realized. Employees will still spend valuable time inputting information, manually "translating" from one system to another, introducing both inefficiency and the element of human error.

The demanding world of today's evolving business Internet requires that companies be ultra-efficient, agile, and continually focused on excellence. To take e-Business to this next level, entire industries are working together to get their e-Business systems to speak the same language, no matter what architecture and applications they are using. Intel is working to automate and integrate more and more e-Business processes—both inside and outside of Intel, with customers, suppliers, and vendors. In an ideal and fully integrated environment, supply, inventory, and ordering systems at all ends of the supply chain will be able to communicate with each other when specific products/parts are needed.

HOW WILL WE GET THERE?

In the new e-Business model, EAI and B2Bi must work in tandem to achieve full functionality. On the EAI side of this, Intel is working to simplify the mesh of information lines that comprise today's order-management system. Rather than having a complex web of separate lines to transport information from one area of the order-management system to another, an EAI bus will act as a single information pipeline that carries all information for all applications. Through this bus, information is shared throughout the order-management system and supporting applications.

The B2Bi end of the integration may seem more complex, since each company has its own e-Business systems and processes…making them speak the same language may seem like a nearly insurmountable task. However, this is not necessarily the case. RosettaNet*, a non-profit consortium of information technology, semiconductor manufacturing, and electronic component companies, is developing a set of open, industry-wide specifications to help define e-Business processes. Through these specifications, RosettaNet is developing standard methods to communicate common business information between the companies in the technology industry.

RosettaNet specifications help define the entire e-Business information exchange, opening up lines of communication between back-end ERP systems and enabling near-real-time interaction. These specifications are made up of a few main components:

- RosettaNet dictionaries help companies define the elements of structured transactions and product or service information. The Business Dictionary helps define different types of business data entities and data elements for business process transactions between companies. The Technical Dictionary provides a list of common data elements defining a company's services and products.[4]
- RosettaNet Implementation Framework* (RNIF) defines exchange of information from one company's servers to another in XML, including trading partner agreements, security, and packaging, routing, and transport semantics.[5]
- RosettaNet Partner Interface Processes* (PIPs) are XML-based dialogs that provide framework for the data to be exchanged between trading partners. There are PIPs defining each specific business process, such as placing a purchase order or sending a billing statement. (XML is a language that uses markup tags to help define common data formats, describe and identify the different types of data in the format, and then share both the format and data across the Internet.[6])

Intel is working with RosettaNet XML specifications to integrate its business-to-business order-management process, streamlining communication and creating an environment based on up-to-date and accurate supply information.

As RosettaNet continues working to enable businesses of all sizes to speak the same language, the real measure of success will be shown by the number of companies that implement solutions based on RosettaNet's XML specifications. A new RosettaNet program, RosettaNet Basics, is bringing an affordable, simplified means of adopting and implementing RosettaNet specifications to small- and medium-sized businesses.[7] The more companies in a supply chain that integrate their systems and communicate with their trading partners through RosettaNet XML dialogs, the more valuable that supply chain network will become.

BENEFITS OF AN INTEGRATED, AUTOMATED PROCESS

Information accuracy and automation are the major benefits of a fully integrated order-management process. With an integrated, automated process, information en route to Intel will depart directly from the trading partner's back-end ERP systems, without the need for someone on their end to re-enter data, reducing error

and increasing efficiency. This information is routed through the trading partner's B2Bi gateway, where RosettaNet specifications will define how that information will be packaged and sent over the Internet to Intel. The information will arrive at Intel's servers and then be unpackaged and published to the EAI bus, and an acknowledgement message would then usually be sent back out to the trading partner in a similar, reversed process. Once published to the EAI bus, the information is available to the subscribing back-end system private process(es). The EAI bus will enable numerous back-end systems to access the message, each retrieving the relevant information needed for its process.

With an integrated process, systems both inside and outside of Intel will work together automatically and seamlessly to offer information that is more reflective of the actual supply situation. The current status of an order will be visible both in Intel's system and also in the specific trading partner's system. Information will flow between the business partners' systems in near real time, with less manual re-entry or unnecessary human delay.

Another key benefit of automation is the freeing up of employee resources. With this efficient type of machine-to-machine interaction, involvement of analysts and buyers at either end of the process will be minimized, allowing them to spend more time on customer relationship management and higher-value tasks.

CHALLENGES TO INTEGRATING ORDER MANAGEMENT

The overall integration effort has enormous potential but also a number of obstacles. Right now, a critical challenge is the sheer magnitude of the effort involved to get everyone on the same page. The technology industry is comprised of myriad companies who frequently rely on one another for parts, products, and services in order to build other products and offer other services. In the current business-to-business model, a wide range of applications, processes, and technologies are in use throughout the industry. Many of Intel's trading partners have e-Business systems that are incompatible with Intel's systems, and vice versa. In order to realize the full potential of automated, integrated order-management processes, all companies in the supply chain will need to work to integrate and automate their processes, both inside and outside the enterprise. Across the entire industry, this will involve considerable effort.

Standard and Specification Maturity. Part of this challenge includes working with standards and specifications that have not yet reached maturity. XML is currently the foundation of numerous e-Business framework initiatives. RosettaNet is but one option for Intel and its trading partners. Moving forward, both Intel and its various customers and suppliers within the technology industry will need to decide which e-Business initiatives to support and adopt across the enterprise. Companies should choose which standards to adopt after much careful consideration, both with respect to their own business processes and with respect to their trading partners' e-Business systems. For integration to be truly efficient and successful, trading partners across the entire supply chain would ideally be implementing solutions built on the same framework. Switching to a different standard further down the road typically involves both additional time and costs associated with re-engineering solutions to meet the specifications of the new standard.

RosettaNet itself presents a challenge in that many of the specifications are still under development. The consortium is developing PIPs for specific processes within six major business areas. The consortium plans to finalize the complete set of 114 individual, previously identified PIPs during 2001.[8] Once PIPs are finalized, they can still be modified through a change control process when implementation experiences show a need for enhancement. Whenever significant revisions to a PIP are made, each company and its various trading partners will need to decide whether to implement those changes into their own order-processing systems. Trading partners can agree to continue using the previous version of a PIP (provided it still functions with the currently used Implementation Framework), but many companies will want to take advantage of new functionalities included in the updated version of the PIP. RosettaNet is currently taking information from "use cases" into consideration and is redeveloping PIPs to make them more flexible and modular. This "use case" information will help RosettaNet develop future PIPs, or future versions of existing PIPs, that could potentially be versatile enough to handle new needs without later revision.

Solution Maturity. Many of the solutions built around these e-Business frameworks are being brought into the e-Business system and implemented for the first time; so a great deal of planning, engineering, and time must go into making an order-processing system function as seamlessly as it was envisioned to. For example, there are many software companies working to build solutions around RosettaNet, and each has its own interpretation of the specifications. Once these solutions are brought to work together in the integrated order-processing environment, incompatibilities surface that must be dealt with. Taking time during the early stages of planning and development to deal with various interpretation and incompatibility issues is critical to successful integration.

Once solutions have been moved to production and shown to function well, further implementation efforts are somewhat simplified.

Re-Training. After all ordering systems and processes have been integrated and automated, employees will need retraining on how the new systems work. They may no longer need to input as much information or help move the information along through the system, but they still need to understand key aspects of how the system works, where they can find relevant information, and what they need to do if specific approvals need to be made or if a particular order has a processing issue.

Integrated Order Processing Pilot

OVERVIEW

In an initial B2Bi pilot project, Intel has been working to successfully automate and integrate order-processing activities with eight trading partners. Specifically, this pilot provides for the receipt of new purchase orders and also allows users to make line-item-level changes and cancellations to existing purchase orders.

With B2Bi automation across the sales channel, various trading partners' B2Bi gateways can communicate between one another using a common XML standards-based messaging protocol (e.g., RosettaNet), which in turn enables their ERP systems to communicate. A key goal of B2Bi can be realized through this approach—managing ordering processes by exception[9], as opposed to today's resource-intensive alternative of people involved with and providing input to purchase orders throughout the process.

As shown in Figure 1, two separate solution architectures within the public process and private process spaces provide the overall B2Bi capability. The public process deals with message exchange services, whereas the private process provides the business process and ERP integration services.

Intel chose to physically and functionally decouple the solution architectures for the public and private processes. This allowed the use of best-of-breed solutions for EAI and B2Bi, with loose integration between these very different services. A loosely coupled architecture allows Intel to scale the B2Bi gateway and public process infrastructure independent of the private process infrastructure. Potentially, this can also lead to other order-management communication channels (e.g., browser applications and EDI) sharing a single, private process. Over time, this B2Bi gateway infrastructure can scale and support many distributed back-office business processes for buy, sell, logistics, manufacturing, and subcontracting activities. Running throughout the design of this distributed EAI/B2Bi architecture, Intel architecture provides maximum performance and scalability to continually meet Intel's evolving order-management needs.

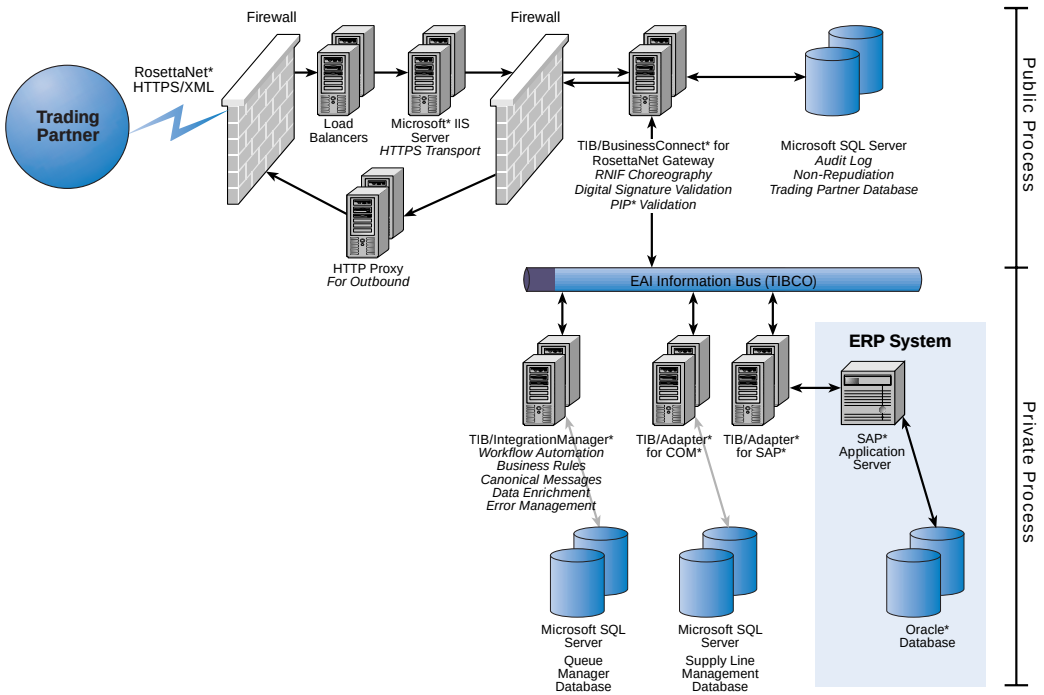

***Figure 1**. Integrated Order-Processing Architecture Running on Intel® Architecture*

ENTERPRISE APPLICATION INTEGRATION (EAI)

In late 1999, Intel selected the TIBCO* ActiveEnterprise* product suite as a strategic EAI tool. Intel has had measurable success and reliability running TIBCO products on Intel architecture. One of the key tenets of the decision to use products from the TIBCO ActiveEnterprise suite was to provide an enterprise message bus architecture for the majority of business process interfaces. Three TIBCO products within this suite were used to build the integrated order-management system's private process capabilities: TIB/IntegrationManager* and TIB/Adapters* for COM* and SAP*. TIB/IntegrationManager provides the order-management process flow control and state management needs for the private process. TIB/IntegrationManager also handles the order-management exception process as well as the routing of order changes and cancellations to an existing order-management database application (Queue Manager database). The SAP adapter provides connectivity to core SAP order-management application program interfaces (APIs) for new orders and private process lookups during private process validation. The COM adapter was later used to extend this infrastructure to connect to Intel's SLM application server to enable the exchange of forecast and inventory data through the inclusion of additional PIPs within the gateway.

ROSETTANET*[10]

At the center of B2Bi capability are the RosettaNet Implementation Framework (RNIF) and Partner Interface Processes (PIPs). The RNIF defines a standard framework for message exchange between trading partners and is designed to help enable interoperability between B2Bi gateway products from different solution providers. The RNIF provides a wide variety of design criteria, each with the goal of providing a single interpretation for message exchange between RosettaNet supply chain partners. At a high level, the RNIF provides the following:[11]

- Guidelines for XML message structures defining message delivery headers and envelopes.
- Criteria for Encryption. These encryption guidelines are for business message content and public process-related message header elements.
- Criteria for Authentication. Authentication is the act of verifying that the sender of a RosettaNet Business Message is who they claim to be. This is accomplished by requiring the sender to digitally sign the message.
- Criteria for Non-Repudiation. Non-repudiation is the mechanism for helping ensure that an originating trading partner cannot deny having originated and sent a message (called "Non-Repudiation of Origin") and that a receiving trading partner cannot deny having received a message sent by its partner (called "Non-Repudiation of Receipt"). Non-Repudiation of Content is provided so both partners know that the data was not altered during transport and routing.
- Criteria for Authorization. Authorization is the act of verifying that the sender of a message is permitted or authorized to send the subject message to the receiving partner. Trading partners must establish agreements between themselves in advance; they must identify the PIPs they will execute and the digital certificates that will be used to sign the messages exchanged.
- Criteria for Business Message Delivery. Message exchange choreography includes parameters such as time-to-perform, retry attempts, and exception handling.
- Criteria for Receipt Acknowledgement. Receipt acknowledgement exchange choreography includes criteria for acknowledging receipt of business messages, including time-to-perform, retry attempts, and exception handling.

RosettaNet PIPs primarily provide the structure framework for the data to be exchanged with key parameters to use within the public process, including the following:

- An XML document type definition for each particular business message of a specific cross-enterprise business process.
- Design for either a single-business-action message exchange with receipt acknowledgement, or a double-action message exchange where a business action would require a business-level response from the recipient, each with receipt acknowledgements.
- Parameters defining time-to-perform, retry, encryption, non-repudiation, and authorization criteria.

In building the pilot process, Intel and involved trading partners are building around RosettaNet specifications. The specific PIPs that help define the end-to-end process include the following:

- PIP 3A4—Manage Purchase Order—Supports a process for trading partners to issue and acknowledge purchase orders, and cancel and change them based on acknowledgement responses.
- PIP 3A7—Notify of Purchase Order Acceptance—Specifies a process for requesting Work in Process Response, containing information on the production status of the product being manufactured, from trading partners.
- PIP 0A1—Notification of Failure (NOF).

— Previous PIP definitions from RosettaNet Web Site, www.rosettanet.org

BUSINESS-TO-BUSINESS INTEGRATION (B2BI)

In late 1999, Intel engaged with TIBCO to implement their TIB/BusinessConnect* for RosettaNet B2Bi gateway product. TIB/BusinessConnect for RosettaNet is now one of several products within the TIBCO ActiveExchange* product suite, and it provides all of the public process capabilities supporting RNIF and PIPs (details provided in *Public Process* section). As such, TIB/BusinessConnect for RosettaNet is compliant with RNIF v1.1 and supports all currently released RosettaNet PIPs.

Initial interoperability tests with trading partners began in mid-2000. Based on the integrated order-management pilot successes, Intel is now scaling the order-management EAI/B2Bi architecture to support additional trading partners. Additionally, PIPs supporting forecast, product information, invoicing, shipping, and other business processes are now being planned or implemented.

RosettaNet-compliant B2Bi gateways provide a generic and similar design that can support all RosettaNet PIPs for any partners. With this "land once, deploy many" design, once the public process infrastructure is implemented, the incremental costs to add other PIPs is significantly lessened compared with the first round of PIP implementations. Also, after initial gateway implementation, setting up additional partners is a relatively easy task. However, interoperability testing with inexperienced partners can consume the majority of public process implementation efforts. In practice, we have found that public process implementation costs decrease as more PIPs are implemented on a gateway, and partner-provisioning costs decrease when testing with an experienced RosettaNet trading partner.

PUBLIC PROCESS

As shown in Figure 1, the public process consists of an Intel architecture-based pipeline with specific steps for the receipt or delivery of messages with trading partners. Within the public process, no business processes are performed upon the data; these processes are performed within the private process (details provided in *Private Process* section). The following steps take place within the Intel architecture-based public process infrastructure:

Inbound messages:

- RosettaNet XML-formatted messages are routed through load-balancing servers, and then received by an HTTP/HTTPS Web server located between the inner and outer firewalls.
- Messages are queued, then pulled through the inner firewall and delivered to TIB/BusinessConnect for RosettaNet.
- Messages are unpackaged within TIB/BusinessConnect for RosettaNet based upon the RNIF framework where authentication, authorization, non-repudiation, PIP structure validation, PIP instance management, and logging are performed.
- Upon completion of all receipt processes for a particular message, the message is prepared and then published to the EAI bus where the subscribing back-end system private process will receive it. A receipt acknowledgement is then sent to the initiator.

Outbound messages:

- An outbound message received at the B2Bi gateway is checked for proper structure and form.
- The message header information is used to determine the partner identity and checks whether the recipient is authorized to receive this message.
- PIP instance state information is managed whether the message is a response to a prior inbound message or a new outbound message.
- The message is packaged based on the RNIF and PIP definition.
- The message is digitally signed.
- The message is delivered to the partner using HTTPS.

PRIVATE PROCESS

Within the private process, order-management business processes are performed. Inbound orders are pre-processed prior to insertion into the ERP subsystems. The major pre-processing steps include transformation to a canonical data form, duplicate order checking, purchase order line-item validations, product identifier validation, and well-formed business data checks. Exceptions are internally escalated using error management routines.

Outbound messages from the ERP system are dispositioned within the private process against any prior inbound PIP instance state information, data is enriched to provide all the PIP data elements, and then messages are sent to the B2Bi gateway for packaging and delivery to the appropriate trading partner.

BUSINESS BENEFITS

The integrated order-management pilot is a move toward the order-processing systems of tomorrow but offers Intel a number of business benefits today. A major benefit is the stability and reliability of the newly integrated system. This is due, in large part, to Intel's implementation philosophy.

- The pilot uses best-of-breed, commercially available applications. Extensive customization is avoided wherever possible, helping to minimize costs associated with support, maintenance, training, and upgrades.
- By building on RosettaNet standards, Intel and its trading partners are able to make their varying e-Business systems communicate with each other through the same basic framework, minimizing the need for individualized, incompatible solutions.
- Intel architecture again forms a reliable core for the integrated order-processing system. This scalable and powerful multi-tier architecture offers a range of performance levels to meet various needs, helping to ensure that as the order-processing system grows, so can the foundation that supports it. With Intel architecture as the support of the system, Intel can easily add capacity to accommodate a growing order-processing system.

Another factor contributing to the overall stability of the order-processing system is the actual integration of applications within Intel. By unraveling the mass of information pipelines between applications—and instead moving the information through one bus to and from all systems—Intel has built a streamlined, supportable order-processing system.

These efforts to integrate and build on standards combine to form a highly automated, reliable order-processing system. Information transfer between trading partner ERP systems is fast and automatic, so Intel and its trading partners enjoy fast access to information, and Intel is able to more quickly respond to customer requests. Automation also means that there is less employee involvement with manually re-entering basic order information for each individual order placed. This saves valuable employee time, allowing them to instead work on higher-value tasks, and also increases accuracy since there is less room for misinterpretations, transposed numbers, or miscalculations. All of this efficiency and improved communication can potentially enable faster-moving supply lines, which in turn can speed up product time-to-market to help Intel better meet customer needs…ultimately the most valuable benefit.

TECHNOLOGY INDUSTRY BENEFITS

Many companies in the technology industry depend on each other for parts and products, and frequently, those parts and products are used to create more parts and products. One small breakdown in the inventory information flow can have a domino effect on numerous companies. In this environment, inventory and supply information is imperative.

With existing, non-integrated e-Business practices, up-to-date ordering and inventory information frequently is not available in real time. An order might be closed off in one part of a process waiting for a person to either process it or move it further down the line.

In the new, integrated e-Business model, information and communication lines are clear and open, and ordering and supply processes can move along quickly. In this model, companies throughout the industry will potentially have order-management systems that can communicate with one another, and information on overall supply and inventory will be more up-to-date and current. This means there will be less room for error with respect to product/part availability, and less room for interpretation. Overall…less domino effect.

By automating the order-management process, supply lines could potentially move more quickly and will be less likely to get hung up waiting for information input at one or more specific points in the process. Fast moving supply lines and better communication between trading partners can have an impact on product time-to-market and the ability of various trading partners to better meet customer needs, potentially boosting growth for the overall technology industry.

RETURN ON INVESTMENT FOR THE INTEGRATED ORDER-PROCESSING SYSTEM

As the integrated order-processing system is expanded into full production to receive orders for more products from more trading partners, Intel will be able to more accurately measure Return on Investment (ROI). Measuring ROI at this early stage of integration isn't entirely practical. Instead, Intel and its trading partners must look to the future value they'll get from their integration efforts. One way to do this is by examining Metcalfe's law:

> "The power of the network increases exponentially by the number of computers connected to it. Therefore, every computer added to the network both uses it as a resource while adding resources in a spiral of increasing value and choice."
>
> —Robert M. Metcalfe
> From research at Whatis?com,
> http://whatis.techtarget.com/definition/0,289893,sid9_gci214115,00.html

In applying this law, trading partners need to view their overall supply chain as one large order-management network. This supply chain network becomes ever more valuable as more companies in the industry adopt and

use standards to help them integrate their e-Business systems with those of their trading partners. As more and more companies integrate their ordering systems, efficient communication between trading partners is improved and information flow throughout the network is increased, ultimately helping to provide a more accurate and up-to-date view of the supply situation.

Looking Ahead

As we move forward into the future of electronic commerce, all business will become e-Business. Many companies are taking major steps to integrate and automate a range of internal and external business processes in an effort to prepare for this continual shift. By focusing efforts on building a 100 percent e-Corporation on Intel architecture, Intel is working to stay ahead of this shift.

Intel is moving beyond integrating and automating the order-management process and moving toward integrating and automating all of its business processes. Initial efforts are focused on integrating the end-to-end supply network and extending it to a larger audience of suppliers and contract manufacturers. Ideally, many companies within the technology industry will have systems that can communicate with each other, easily exchanging order, inventory, and product information, and speeding up product development and time-to-market.

Intel is also working to integrate processes inside the enterprise, automating systems and increasing efficiency, while simultaneously making it easier for employees to manage their employment and benefits. Already, employees can access a number of employee services online, and Intel is continually working to add to the services offered and enhance existing tools.

With the continual shift toward e-Business, Intel sees building the 100 percent e-Corporation as an ongoing process. Today's technology-driven business world is continually evolving—as processes change and new technologies and applications become available, new e-Business opportunities come to light. Intel's e-Business systems must also continually evolve, and Intel architecture provides the flexible, reliable, and high-performance foundation needed to keep pace with both today's and tomorrow's fast-moving business demands.

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