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## RosettaNet for Intel's Trading Entity Automation

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## ABSTRACT

As one of the founding members of the RosettaNet\* consortium, Intel has aggressively pursued utilizing RosettaNet to support its supply chain. Over the past five years, Intel has implemented over 1000 Trading Entity (TE) touch points, encompassing 24 different RosettaNet Partner Interface Processes (PIPs\*) enabling more than 50 unique business transactions with over 200 TEs. In 2004 alone, Intel realized nearly \$40M ROI in business value.

We begin with an overview of key RosettaNet technical components. We then summarize the success Intel had over the past years in building new business processes and the e-Business infrastructure of RosettaNet. Finally, we explore the future of Business-to-Business (B2B) exchanges and the next generation of B2B architecture.

## INTRODUCTION

In 1998, Intel was a leading advocate among a group of companies promoting the concept of Trading Entity Automation (TEA). This resulted in the formation of the RosettaNet Consortium. Intel devoted resources and funding to drive the definition of the essential elements of RosettaNet TEA: the RosettaNet Implementation Framework (RNIF), RosettaNet Dictionaries, and Partner Interface Processes (PIPs).

At the same time as leading RosettaNet standards development, Intel also actively engaged in using these protocols to build TEA solutions for improved business agility and productivity. In early 2000, Intel was one of the first two TE companies to implement RosettaNet. Over the past five years, Intel has made RosettaNet part of Intel's overall e-Business Business-to-Business (B2B) infrastructure and supply-chain automation processes.

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Intel has enabled over 1000 TE touch points, encompassing 24 different RosettaNet PIPs, enabling more than 50 unique business transactions with over 200 TEs. In 2004 alone, Intel realized nearly \$40M ROI in business value from using RosettaNet.

While much of the savings is attributed to automating previously manual processes (such as FAX, Web applications, e-mail), the largest ROI has come from new business models that were unattainable without automation. One of these models is the Outsource eSolutions/3PL model (OeS/3PL). This complex business model involves third-party logistics companies, subcontract manufacturers, suppliers, OEMs, and other customers. Thirteen RosettaNet transactions were utilized across the supply chain to effectively communicate both raw and finished goods material movements.

One of the main challenges in creating a B2B platform is the need to insulate TEs from internal changes. Our internal enterprise systems are very complex, running a variety of Enterprise Resource Planning (ERP) systems for different parts of the supply chain. Each of these internal systems uses a different technology for ERP, OS, database, and interfaces. In this paper, we show how Intel provides a standard B2B platform to allow these disparate systems to effectively and consistently connect to our RosettaNet gateway (public process). We also detail how our architecture insulates internal applications (private processes) from external TEs—allowing Intel to continually evolve its application and technology infrastructure with little or no effect on the TE side of a transaction.

As Intel built its robust public and private process infrastructure, we also expended a great deal of time to optimize the entire B2B supply chain. This ensured that B2B solutions always have a RosettaNet-compliant interface enabling the following:

- Non-proprietary communication with TEs.

- Ease of integration with other RosettaNet-capable TE organizations.

This has been an effective strategy to encourage our TEs to adopt RosettaNet.

## **ROSETTANET STANDARDS AND TRADING ENTITY AUTOMATION**

Intel was a founder of the RosettaNet Consortium ([www.RosettaNet.org](http://www.RosettaNet.org)\*) when it first started in 1998. The RosettaNet Consortium now has more than 500 member companies and has become a leading organization in the creation, implementation, and promotion of open e-Business standards and services.

RosettaNet defines a set of XML-based protocols to facilitate secure electronic exchange of standardized business documents between TEs over the Internet. RosettaNet has three key standard specifications:

- RosettaNet Implementation Framework (RNIF)
- RosettaNet Business and Technical Dictionaries
- Partner Interface Processes (PIPs)

(For more detailed information on these specifications, please visit the RosettaNet standards website.) [1]. The RNIF specifies the protocols for XML-based message packaging, secure and reliable routing, and basic TEA constructs. The RosettaNet Technical and Business Dictionaries describe valid data formats for business transactions. PIPs define sequences of business transactions and interchanges, as well as expected responses.

As illustrated in Figure 1, the RosettaNet RNIF, Dictionaries, and PIPs form the foundation of the RosettaNet infrastructure. The first step of a RosettaNet implementation is to build/enable a RosettaNet infrastructure. By design, RosettaNet is based on XML and platform independence. TEs can implement RosettaNet on different platforms provided these follow the RosettaNet specification.

After a RosettaNet infrastructure is built and tested, TEs need to agree on the types of business transactions they will conduct over RosettaNet. There are many types of business transactions that are defined in RosettaNet PIPs; for example, product catalog and purchase order. TEs must choose what PIPs they will support.

RosettaNet defines standard protocols for public processes to be used between TEs—the processes that all TEs will follow to accomplish business transactions. However, to accomplish trading entity automation, each trading company must integrate its public processes with its own private processes; a linkage between the communications gateway and back-end ERP systems. Private processes are

TE-dependent and are outside the scope of RosettaNet standards.

Once a RosettaNet infrastructure is successfully deployed, and business transactions (PIPs) are selected, a typical RosettaNet transaction proceeds as follows:

- A business request (e.g., purchase order) is generated in a back-end ERP system (private process). The purchase order is packaged following the formats defined in the RosettaNet Dictionaries and organized in the message sequence described in the PIPs.
- A validated PIP package is sent through the RosettaNet infrastructure over the Internet to the targeted TE.
- On receipt of the PIP package, an acknowledgement is issued to the corresponding TE. The package is unpacked and interpreted, then the business request is sent to the back-end ERP (private processes).
- After the back-end generates responses to the business request (e.g., successfully fulfills a purchase order, or rejects an order), a response PIP package is formed and sent back to the corresponding TE.
- Upon TE receipt of the response to the original business request, the message is unpacked, interpreted, and appropriate actions followed.
- Throughout each business transaction, the RosettaNet infrastructure will conduct data transfer over secured channels and keep track of each transaction step in a non-repudiation database.

Developing RosettaNet solutions requires reengineering/integration of internal business processes and collaboration of external processes among TEs. It involves IT professionals, business process experts, and legal teams.

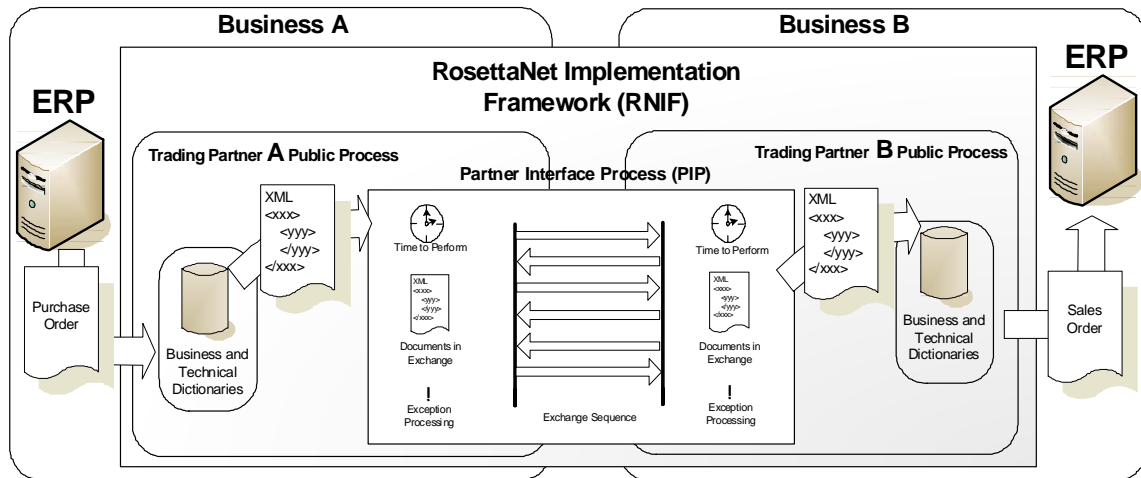


Figure 1: RosettaNet Trading Entity Automation (TEA)

### ROSETTANET’S VALUE PROPOSITION

RosettaNet provides value to companies in a variety of ways. First, by having a commonly understood public interface process, Intel and our TEs will spend less time negotiating how we are going to perform our business interactions. This also solves the problem of having to develop and support niche B2B solutions.

Second, under the RosettaNet umbrella, companies are able to share their best known practices for supply-chain integration and strategize on how to become more efficient without the fear of anti-trust legislation.

Third, companies are able to leverage a common B2B infrastructure that is capable of connecting with all tiers and verticals of TEs. The ROI of the B2B infrastructure is dependent on the utilization. RosettaNet provides a partner interface standard that can now be used with all the tiers and verticals of TEs that we need to engage with.

### Intel’s B2B Platform

From the outset of Intel’s B2B implementation in 2000, we planned for a future in which we would be connecting hundreds and eventually thousands of trading entities to our back-end ERP systems. One of the realities Intel has to deal with while achieving this goal is that our TE population is at significantly varied stages of technology deployment and sophistication.

Many of these TEs were already doing electronic exchanges using Electronic Data Interchange (EDI) and would be transitioning their internal systems to communicate over RosettaNet. Some small and mid-sized enterprises (SMEs) did not have the IT staff or budget for a large-scale RosettaNet implementation. To complicate

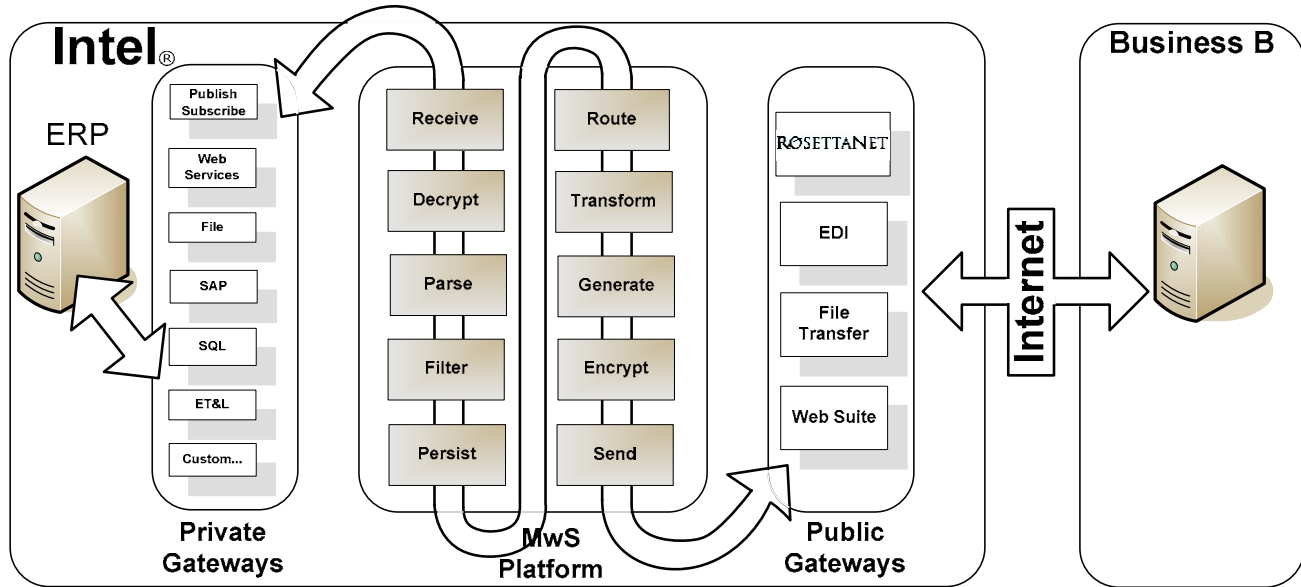
matters, Intel’s internal enterprise systems are very complex, running a variety of ERP systems for different parts of the supply chain. Each of these internal systems has different ERP application, OS, database, and interface standards. However, all entities with whom we trade are able to do some form of electronic transmission. Because it is undesirable for these trading entities to have limited access merely because of the cost of enabling an emerging industry standard. Intel has adopted a policy of promoting selected standards with TEs, while enabling technology-specific gateways as warranted by business needs.

The challenge then became: how can we connect such a diverse TE population with the equally diverse Intel back-end ERP systems—and insulate all of these constituents as systems evolve and change?

We developed an approach to public gateway design for connecting all Intel trading entities:

1. Enable RosettaNet.
2. Allow existing EDI transactions to continue.
3. Create a Web-suite for use by less sophisticated trading entities limited to four foundational transactions (PO, Forecast, Invoice, and ASN).
4. Create a File Transfer solution for non-RosettaNet and non-EDI business transactions.

Early on, Intel made the conscious decision to remove any RosettaNet knowledge and routing information from back-end systems. Instead Intel created a re-usable Middleware Services Platform (MwS) that provides the “glue” between Intel back-end systems and the public gateways used for transactions with our TE population.



**Figure 2: Intel implementation of RosettaNet B2B infrastructure**

There are three primary benefits from this architecture:

1. Back-end systems do not care how the data are presented to the TE.
2. TEs are able to migrate from one delivery mechanism to another with only data changes on the Intel side.
3. Intel back-end systems can evolve and change without affecting the existing and growing TE population.

A secondary benefit is that within the MWS, Intel is able to add or change existing gateways seamlessly. An example of a new gateway we are preparing is the RosettaNet-compliant Multiple Messaging Services (MMS) gateway. Once this is added, it will allow RosettaNet payloads over Web services.

The MWS platform is a highly secure, fault-tolerant set of systems capable of scaling out to meet ever-growing transaction volume. Intel chose a business process orchestration engine from a major vendor as the foundational software for our MWS platform. This software contains the necessary tools to enable most of our functionality, and it is also highly adaptable—allowing Intel to add new features and functionality very quickly.

The creation of the MWS platform has created a core system development competency at Intel, that of moving data between systems and companies. The group with this focus develops and supports a wide variety of data exchanges. This allows the various core ERP systems

developers to focus on their systems and not be encumbered with the complexities of standards and protocols outside their core competency.

To date, we have developed almost sixty separate business solutions connecting over 200 TEs. We process in excess of 200,000 transactions daily—and have never lost data.

To reduce the need to manage all forms of transmissions and choreographies, Intel has enlisted the help of hub providers for some specialized transmission types. These hubs are in effect an extension of Intel and have provided a cost-effective solution for the following:

- Converting TEs running on EDI to RosettaNet. This will allow us to end of life (EOL) our EDI infrastructure without requiring all TEs to convert to RosettaNet.
- Offering File Transfer Protocols (FTP) at a fraction of the cost of deploying and managing our own servers for these protocols. This has allowed us to standardize on a single technology (Web Services), greatly reducing complexity and support costs.

Savings incurred by use of this B2B platform approach are as follows:

- Application development/re-use.
- Shared infrastructure.
- Support/Maintenance.

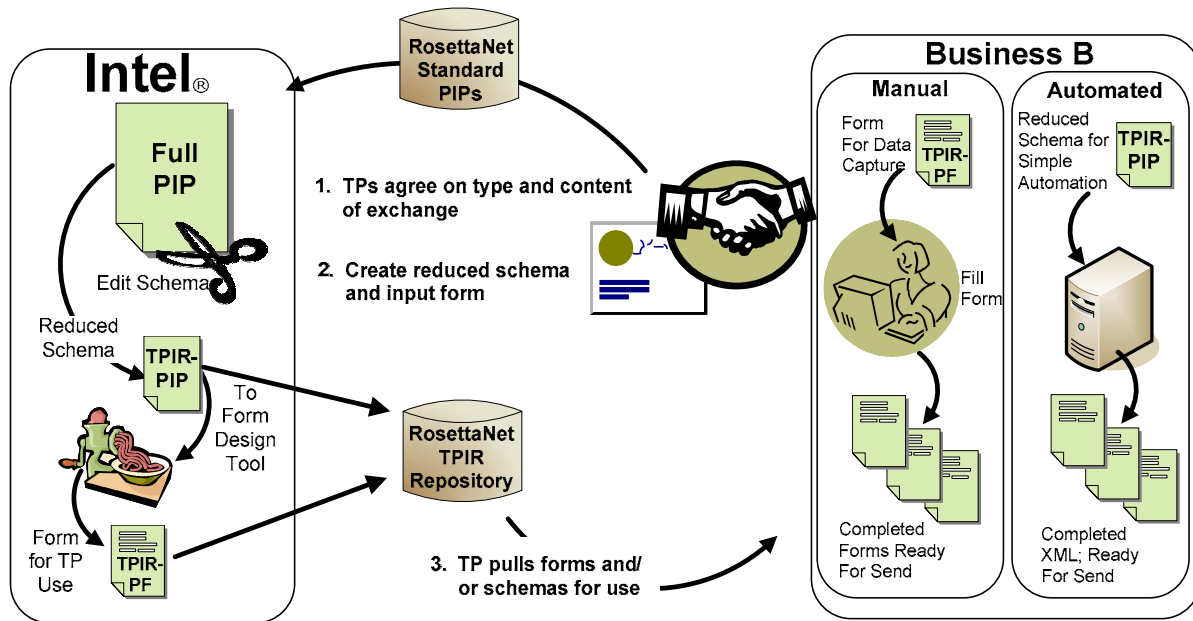


Figure 3: RAE process model (High Level)

**Next Generation B2B**

Intel has always been in the forefront of promoting and developing new technologies including Web Services. We are actively engaged in developing a Web Services infrastructure in our IT environment to promote Web Services protocols as the building blocks for future RosettaNet standards.

Large multi-national corporations in the high-tech industry have broadly and successfully adopted many of the RosettaNet standards. However, SMEs have been very slow to take advantage of the RosettaNet standards. These are their common reasons:

- It costs too much to develop RosettaNet infrastructure.
- They have no expertise to integrate RosettaNet PIPs into their private processes.
- The time required to implement RosettaNet doesn't meet business needs.

To address these issues Intel formed the RosettaNet Automated Enablement (RAE) program in RosettaNet. The RAE program identifies the various types of TE groups where RosettaNet adoption is low, defines the business constraints that have hindered adoption of RosettaNet, and goes on to define the solution to those SME constraints.

The technical intent of the RAE program is to facilitate RosettaNet usage among a broader cross-section of the supply and demand base, without requiring a substantial time or financial investment. The program will accomplish this by augmenting current RosettaNet technology with

new methods, processes, and PIPs that have been converted from Document Type Definition (DTD) to XML Schema format. RAE solutions can then be used as one of a portfolio of technologies to provide lightweight B2B connectivity.

The high-level RAE process flow is illustrated in Figure 3. This process model illustrates how the various RAE components interact with each other to provide a comprehensive SME solution.

A Multi-National Corporation (MNC) can create a Trading Partner Implementation Requirement-Partner Interface Process (TPIR-PIP) by constraining the RosettaNet PIP standard. An XML-based schema TPIR-PIP is created by an MNC by using one of the new XML-based schema RosettaNet PIP standards as a starting point. The RosettaNet PIP standards can be refined by a MNC to constrain or limit PIP content to remove ambiguity and provide clarity for how, specifically, an MNC wants to conduct e-Business with its TEs. The TPIR-PIP is a machine readable document that can then be used to auto-configure the TE's gateway.

Any given PIP may be used between companies for a number of business functions. For example, Advanced Shipment Notification (ASN) may be used as notification of inbound raw materials shipments, outbound shipments to customers, shipments to contract manufacturers, and shipments from contract manufacturers to third-party logistics providers. As each of these functions serve a different business requirement, each has different messaging requirements. The TPIR-PIP allows a company to constrain the community PIP definition and also allows them to assign a unique identification to each of the TPIR-PIPs they create. At runtime, the TPIR-PIP identifier is

embedded in the message header that enables the TE to understand the unique role a particular PIP is being used for.

For TEs that do not have the expertise or business ROI to integrate RosettaNet gateway processing with their back-end systems, or in cases where a TE does not have an automated ERP system, RAE provides a new RosettaNet capability that allows the TE to browse the XML message via a form. This is enabled through the Trading Partner Implementation Requirement-Presentation Format (TPIR-PF) specification. The TPIR-PF provides the presentation metadata needed to render the message in the absence of integration with an application. TPIR-PFs allow an SME to view PIP information and/or manually enter data (as an alternative to integrating the TPIR-PIP with their back-end system).

RosettaNet did not develop a whole new standard to describe the presentation metadata. Instead they selected PDF/XPF, an open standard adopted by major vendors specifically because of its widespread use, stability, and broad capabilities. RosettaNet does not prescribe which tools can be used to implement the TPIR-PF, so many will use widely available and freely distributed, PDF/XPF-compliant tools from well-known vendors to display and respond to the messages.

The first step in developing a TPIR-PF is to define the TPIR-PIP. The TPIR-PF form design session binds the TPIR-PIP schema with the TPIR-PF form that is being designed. This is an important point because the form takes on the same constraints defined in the schema. If the TE tries to enter a value in the form that does not conform to the schema, an appropriate error is returned and the SME is prevented from sending the message.

The RAE specification also defines a Registry interface specification. The Registry provides a TE repository that stores both TPIR-PIPs and TPIR-PFs and can be accessed by any trading partner that wishes to conduct e-Business with an MNC. The Registry allows TPIR-PIPs and TPIR-PFs to be posted, stored, and retrieved. All TPIR-PIPs and TPIR-PFs are under version control within the Registry. The Registry provides for the automated provisioning of the TPIRs to the entitled subscribers of the TPIRs.

## SUMMARY/KEY LESSONS

Intel's aggressive adoption and continued influence into the RosettaNet consortium has reaped a tremendous ROI by making Intel's business with external TEs highly automated and very agile.

One of the key things we learned from using RosettaNet is that RosettaNet has enabled new business processes that could not have been done without using a standard

process and supporting message. Other items that affected the value of using RosettaNet include the following:

- Leveraging collateral that others have developed.
- ROI is based on utilization of capability.
- Consolidate and eliminate redundant B2Bi capability.
- Plan for how to build out (enable) new TEs.
- Senior business stakeholder support essential for initial RosettaNet development and deployment to be successful.

Our MwS platform not only insulates Intel internal systems from TEs but it can also quickly adapt to new standards and technology.

Finally, and most importantly, Intel continues to influence the industry by driving and participating in key milestone programs such as RAE and MMS.

We welcome all industries to actively take part in shaping and implementing the vision of a globally connected supply chain.

## ACKNOWLEDGMENTS

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