Title
RosettaNet: The Organization and the System

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Publication Date
2005-10-01

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October, 2005

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I – Introduction

The process of taking a product from design to sale often requires that a company secure the cooperation of outside entities. The entities that are part of this network of product development and distribution comprise what is known as a "supply chain" (White et al., 2004).

In June 2004, the National Institute of Standards and Technology released a report on various industries' supply chains. Among other industries, the report examined the electronics industry – companies that produce personal computers (PCs), components, telecommunications equipment, and consumer electronics. It found that the electronics industry loses $3.9 billion per year as a result of inadequacies in the supply chain (White et al., 2004).

The electronics industry recognized this issue six years ago and created an organization, RosettaNet, to help develop a more efficient supply chain.

II – Background

RosettaNet is a nonprofit organization dedicated to establishing standards for business-to-business (B2B) interactions in the electronics industry. The organization was created in 1998 by Fadi Chehade, with 40 companies involved in the original effort. Now, RosettaNet has over 500 member companies, which theoretically have committed to using and promoting the standard

(Liang, 2005). We do not know how many of the 500 members actually do use RosettaNet, but Table 1 lists some PC makers and contract manufacturers that report using it.

RosettaNet has offices in the United States, Europe, China, Korea, Japan, Taiwan, Malaysia, Singapore, Australia, and the Philippines (Liang 2005). The main task of the RosettaNet organization is to create standard protocols for specific business transactions. RosettaNet requires that each company wishing to contribute to protocol development provide at least one full-time employee (Paul, 2004). The company is responsible for the employee's expenses and salary while working as part of RosettaNet. All RosettaNet participants must agree that any intellectual property they develop will not be subject to royalties. Participants must also document what they learn and create implementation guides (Paul, 2004).

The RosettaNet organization's standards are known collectively as "RosettaNet." These standards outline a format and method for two companies to exchange business documents over an internet connection. The resulting RosettaNet system is able to compose and interpret messages automatically without any human involvement. The organization has been successful in creating over 90 standards — called Partner Interface Processes or PIPs — for specific business transactions (Behrman, 2002).

III – RosettaNet Standards

The deployment of PIPs is an ongoing process, with nearly a dozen PIPs currently in development. The average development time for a new PIP is three months (Behrman, 2002). This includes experimentation, implementation, testing and public feedback. The majority of a PIP — 80% — is developed in 1-2 months. The remaining time is devoted to testing and securing feedback from tester companies (Behrman, 2002). PIPs are tested by RosettaNet member companies who volunteer for the task (Langley, 2002).

All PIP messages are in the XML (eXtensible Markup Language) format. XML is similar to HTML (Hypertext Markup Language), the language commonly used for internet web pages. However, XML allows a greater degree of customization which makes it useful for business documents. (Section VIII provides an in-depth look at XML.)

The RosettaNet organization divides the PIPs into clusters according to their business function. Each of these clusters contains subcategories called "segments" that further group the PIPs (Figure 1) (Kotinurmi et al., 2004). Segments are denoted by a two-character code that consists of the cluster number and an alphabetical letter ("RosettaNet PIP Directory," n.d.). PIPs are represented by an English name and also by a numerical digit-letter-numerical digit code. Each cluster of PIPs is described in Table 2.

<u>Cluster 0 – RosettaNet Support</u>

PIPs in Cluster 0 handle the administrative end of RosettaNet. These PIPs are used to test RosettaNet connections and send error messages. PIP 0A1, for example, is sent when another PIP fails to execute properly. Four types of notification PIPs are included to facilitate the process of setting up a RosettaNet connection for the first time.

<u>Cluster 1 – Partner Product and Service Review</u>

Cluster 1 consists of PIPs to update and share account information between partners. PIP 1A1 allows companies to share their partner and customer lists. Companies who need to update their own information can do so via PIP 1A2, which allows account details such as billing addresses to be updated. PIP 1B1, the third and final PIP in this cluster, is used by a company to subscribe or unsubscribe from another company's product information list.

Cluster 2 – Product Information

Cluster 2 offers partners the opportunity to exchange information about product lifecycles and manufacturing. Companies can inform one another of new products and product discontinuations or changes. A segment within this cluster can transmit information relevant to manufacturing, such as changes in engineering design and a list of approved manufacturers. PIPs to share information about sales promotions and rebates are also available.

A future segment of Cluster 2, Segment 2D, will offer PIPs to aid collaborative design and engineering.

Cluster 3 – Order Management

Cluster 3 consists of PIPs that handle product purchases and inquiries. Buyers can request price and availability information from a seller. If both parties agree to a transaction, PIPs in this cluster continue the purchasing process. The seller can inform their transport service to expect outgoing shipments; once the transport company receives the item, the seller can monitor or change the shipments via additional Cluster 3 PIPs. If a distributor sends the product out to ship, then the shipping company can utilize a PIP to confirm with the seller that the product has shipped. To complete the transaction, the seller (or its financial institution) can transmit invoices using PIP 3C5 (Notify of Billing Statement).

Cluster 4 – Inventory Management

Cluster 4 offers six different PIPs for companies to exchange forecast information (see Table 2). Four types of forecasts may be exchanged; these include strategic forecasts, embedded release forecasts, threshold forecasts and planning release forecasts. PIP 4A5 allows a partner to reply to another's forecast. The replying party indicates the expected inventory during the time period mentioned in the forecast.

The cluster contains an additional PIP not explicitly related to forecasting. PIP 4B2 allows a party to inform another that a shipment has been received.

Cluster 5 – Marketing Information Management

Cluster 5 provides support for companies to participate in a "design win" process, where one company can decide whether it would like to use another's components in a new product. The company desiring the sale of its component sends various designs for consideration. The company seeking components offers a set of criteria through PIP 5C2 ("Request Design Registration"); the company also has the option to submit the PIP repeatedly if there are changes to the original criteria.

Other PIPs in this cluster support the sale process; sellers can inform partners of blanket shipments and partners' accounts can be debited. Future segments in this cluster will allow partners to share marketing materials.

Cluster 6 – Service and Support

Cluster 6 allows a service provider and a warranty provider to exchange warranty information. A service provider uses PIP 6C1 to request service on a product. PIP 6C2 allows the service provider to seek a claim from the warranty provider after service is complete. To date, these are the only PIPs in the cluster.

Cluster 7 - Manufacturing

Cluster 7 offers PIPs with an emphasis on manufacturing. Companies may authorize manufacturers to begin production via PIP 7B5; manufacturers may share information on the status of production via PIP 7B1. PIP 7C6 allows companies to exchange information about product repairs in order to encourage the development of higher-quality products in the future. The PIP 7C7 notifies a partner whether particular chips meet predefined specifications.

IV - Types of RosettaNet Partnerships

If two companies wish to use particular RosettaNet PIPs, they generally need to sign a contract outlining the terms of RosettaNet use. The contract, called a “Trading Partner Agreement” (TPA), defines the obligations each company has to the other when using RosettaNet. RosettaNet has worked with two other standards-setting organizations, EDIFICE and ESIA/EECA, to develop a Trading Partner Agreement template (“An Industry Framework,” 2003). RosettaNet encourages companies to modify the template to fit their needs. Companies are not, however, required to use this template at all; rather, it is provided as a reference.

Some PIPs require that a TPA be in place as a precondition to using the PIP. In particular, PIPs 4A1, 4A2, 4A3 and 4A5 – four PIPs that notify partners of forecasts – require that the business partners complete an agreement (“RosettaNet PIP Directory,” n.d.). The business process related to these PIPs are intentionally ambiguous to allow a pair of companies some flexibility. For example, organizations using PIP 4A1 may exchange forecasts on a daily, weekly, bi-monthly or monthly basis. Such details must be agreed upon in the TPA document ("PIP 4A1," 2003).

The range of RosettaNet standards allows a company to conduct RosettaNet transactions with a variety of members in the supply chain. For example, a computer manufacturer could use RosettaNet with any of the following:

- Customers / Resellers (e.g., CompUSA)
- Shipper / Logistics (e.g., FedEx)
- Suppliers (e.g., Intel)
- Customs Agencies (e.g., in Malaysia)

We now explore cases in which a computer manufacturer partnered with different types of companies.

<u>PC Manufacturer – Shipper</u>

Dell is one example of a PC manufacturer that has connected to a shipper via RosettaNet. Dell uses a RosettaNet connection with shipper Australia Post, who maintains a supply of Dell printers. When a customer in Australia places an order for a Dell printer, his order information is transferred via RosettaNet to Australia Post (Timson, 2004). RosettaNet messaging allows Dell to monitor the order fulfillment process. Once the printer is delivered, Australia Post's system is updated. Their RosettaNet system sends a message to Dell indicating that the printer was successfully delivered. Dell has reported 99.9% accuracy in order fulfillment with Australia Post (Timson, 2004).

PC Manufacturer – Customs

RosettaNet PIP 3B18 is intended to simplify the importing and exporting of goods into a country. The PIP consists of documentation that a customs body would need before approving a shipment.

In 2003, Dell Computer began testing PIP 3B18 with Malaysia's customs agency. The PIP allows shipment information to be transmitted electronically, thus replacing some manual exchange of documents (Sullivan, 2003a).

V – The RosettaNet System

The RosettaNet set of standards is divided into Partner Interface Processes (PIPs), each of which define a single business process between two partners. A PIP consists of a document template and a diagram of the business process. The document, called a message, contains fields where a partner can enter the information relevant to the transaction. This message is then sent to the partner via a network connection.

The diagram that accompanies a PIP illustrates the business process that two partners must follow immediately before and after the transmission of a PIP message. When the transmission of one PIP message assumes that the exchange of another PIP message has taken place, the diagram denotes this.

The framework on which a partner transmits a PIP is called the RosettaNet Implementation Framework (RNIF). RNIF specifies technical standards for message transport, such as security and header information.

Two RosettaNet dictionaries outline the technical and business terms that a partner should use in RosettaNet transactions. The RosettaNet Technical Dictionary is an XML document that contains names and descriptions of electrical components. This helps standardize the language that might be on an order request form ("RosettaNet Implementation Framework," n.d.). Figures 2 and 3 provide excerpts from the RosettaNet Technical Dictionary. The RosettaNet Business Dictionary defines standard titles and field names for company documents such as invoices and product information sheets ("RosettaNet Implementation Framework," n.d.). Figures 4, 5, and 6 provide excerpts from the Business Dictionary.

VI – Technical Setup of a RosettaNet System

The most common RosettaNet implementation involves adding an intermediary between a company's internal systems and outside RosettaNet systems. This intermediary consists of both a server and software package, and is called middleware (Honkkila et al., 2004). Any of a company's internal systems can be linked to the server via the proper middleware solution.

The server and software are jointly responsible for the composition and interpretation of RosettaNet messages. Recall that a PIP message is like a form, so that the server is merely filling in fields when it composes a message. Upon completion of the message, the server transmits the message to another company's RosettaNet system. The other company's system is able to "understand" a message because format and descriptor names follow the standards set by the RosettaNet organization for each specific business process. Thus, since RosettaNet can compose, transmit, and interpret messages, a high level of human involvement is unnecessary. Often, the role of a RosettaNet administrator may be reduced to monitoring for system exceptions ("Collaborative RosettaNet* Implementation," 2003).

As previously mentioned, a company's internal systems can be connected to the RosettaNet server. The server can then access and modify information from each of these systems; thus, information can be pulled from the proper systems for composing PIP messages. In addition, information from incoming PIP messages can be put into the company's internal systems.

There may be some work beyond the deployment of the software package before the middleware server can interact with a company's other systems as described here. For example, if the hardware is outdated, it may be necessary to implement entirely new systems so that they may be able to interface with the RosettaNet server (Honkkila et al., 2004). Companies must have an internet connection in order to communicate via RosettaNet. Many may also want a firewall to ensure security during transactions.

For these reasons, the cost of a RosettaNet implementation is in the thousands of dollars. Costs can vary widely, however, depending on what technology is already in place at a company. Each PIP is currently estimated to typically cost $20,000 to implement, which is a considerable reduction from the $50,000 originally needed per PIP. The RosettaNet consortium is trying to reduce the cost of each PIP to $5,000-$10,000 (Jorgensen, 2004). Such a cost reduction could make a RosettaNet implementation more feasible for some smaller and medium-sized companies.

The Infocomm Development Authority (IDA) of Singapore assists the country's electronics companies with RosettaNet implementations. The CEO of IDA has said that a typical RosettaNet deployment in Singapore costs US$119,700-$299,300 (Choy, 2004). The high RosettaNet cost in Singapore may be a result of smaller companies that need to start an information technology backbone from scratch.

Former RosettaNet CEO Jennifer Hamilton has stated that implementations may already cost "as little as" $5,000. Of course, human capital and other non-technical resources are also needed to implement a RosettaNet system and related PIPs. The high cost is undoubtedly a key reason that most companies implement only a few PIPs.

VII – Worldwide Implementation Status

Over 7,000 companies reportedly use RosettaNet standards (Choudhury, 2004). Governments, particularly those in Asia, have been openly supportive of RosettaNet. Over 50% of RosettaNet implementations are in Asia (Sullivan, 2003b). RosettaNet has affiliate offices in a number of Asian countries, including Malaysia, Philippines, China, Japan, Taiwan, Singapore, and Korea.

The Chinese government created a RosettaNet affiliate in September, 2003. The affiliate offers funding for companies that wish to implement PIPs (Jorgensen, 2004). Similarly, the Malaysian government offers grants to Malaysian companies to help cover RosettaNet setup costs. Grants in Malaysia match 50-70% of the cost of a RosettaNet implementation (Choy, 2004). Malaysia also has a tax deduction available to any multinational corporation that assists a small or medium enterprise with a RosettaNet implementation ("Gov't Urges More MNCs," 2004).

Singapore's Infocomm Development Authority (IDA) has been encouraging use of RosettaNet since 2000. In April, the IDA announced a plan to bring RosettaNet to 10 supply chains, including procurement, logistics distribution, and customer management (Yeo, 2004). Over the next five years, as many as 500 companies in Singapore are expected to be connected via RosettaNet. As of April, approximately 100 companies in Singapore were already using RosettaNet (Choy, 2004).

A series of e-commerce initiatives in Taiwan have included the RosettaNet standard. Plans A / B and Plans C / D / E have encouraged multinational corporations to help small manufacturers within the country connect electronically to global supply chains. Plan A paired 31 Taiwanese electronics manufacturers with computer giants IBM, Compaq and HP in order to establish an e-business procurement center in Taiwan. Plan B paired 15 Taiwanese companies with multinational corporations such as Compaq, HP and IBM ("Projects ABCDE," 2003). By creating a hub for e-business transactions, individual companies can avoid investing high sums of money in a network of their own. The hub links the companies to others for the purposes of sharing information on cash flow and shipping. The 15 companies are listed in Table 5.

In Malaysia, the Small and Medium Industries Development Corporation (Smidec) grant program has seen mixed results. While $5 million Malaysian dollars have been allocated to the Smidec program, only $2 million has been used. Interest has reportedly been low. According to the RosettaNet Malaysia's executive director Datuk Wong Siew Hai, a marketing campaign is underway to encourage companies to consider RosettaNet. On the other hand, RosettaNet implementation has grown by 30% in Malaysia, and 83 companies have implemented or will soon implement RosettaNet. The number of implemented PIP connections has increased from 614 to 850. RosettaNet Malaysia previously hoped for 1,000 connections by the end of 2005; they now anticipate seeing 2,000 connections in place before the year ends (Peterson, 2005).

VIII - EDI vs. XML

EDI is another standard for interactions within the supply chain. EDI stands for "Electronic Document Interchange." There are multiple variations of EDI; each variation differs slightly. In the U.S., the variation ANSI X12 is popular, while EDIFACT is popular in Europe (White et al., 2004). The JECALS standard is popular in Japan (Honkkila et al., 2004).

EDI is commonly used via a Value-Added Network, or VAN. VANs are networks that provide enhanced services, such as mailboxes for EDI transactions, conversion between standards, and security (Ericson, 2002). Companies contract use of a VAN from a third party, such as GE, EDS, and Sterling Commerce (Ericson, 2002).

A standard internet connection can be used to connect to a VAN, but this requires significant effort on behalf of the trading partners. A software package is needed to send and receive EDI messages over the web (Scheier, 2003). The selection of a software package is a tricky operation; often, a customer and supplier need to have the same software (Scheier, 2003). The software offers features normally provided by VANs, such as mailboxes.

Companies must pay monthly subscription fees of about $50 for a VAN connection. In addition, there is a fee for each EDI message transmitted, typically $0.55 to $0.70 (Fu et al., 1999). Messages are designed to be as small as possible because of these fees. Therefore, EDI does not use metadata — information that explains the meaning of data. Thus, without descriptors, a person inexperienced with EDI could not make sense of the numbers and symbols that comprise EDI messages. For example, while anyone may notice the number “200” appears in an EDI message, only an EDI expert would know whether “200” refers to an order number, price, or other value (Ricker, n.d.).

Abbreviations and codes are also used to keep the cost of messages down. The abbreviations complicate EDI messages; thus, an expert is needed to decode and debug EDI messages (Ricker, n.d.). Incorrect coding may result in misinterpretation of data. For example, a part number could accidentally be construed as quantity information (White, 2004). A sample EDI message appears in Figure 7.

Unlike EDI, XML uses metadata to clarify the meaning of each field. Metadata provides information about each data element in an XML document (Ricker, n.d.). For example, XML would display "<quantity>200</quantity>" rather than only displaying "200." The use of metadata allows the messages to be easily understood.

Compare this with an excerpt of RosettaNet PIP 2A10 (Figure 8), a PIP that indicates product information (Damodaran, 2004a). Angled brackets and slashes separate descriptor names from the data, aiding readability. The use of full words, rather than abbreviations, allow someone untrained with XML to grasp the idea behind the message. Thus, any faults in messages can be understood and resolved more easily.

IX - Barriers to RosettaNet Implementation

As previously mentioned, the initial cost of RosettaNet is a "roadblock to adoption," (Damodaran, 2004b) and the RosettaNet organization is trying to reduce the cost of each PIP implementation to $5,000-$10,000 from the present $20,000 each to deploy (Jorgensen, 2004).

Since RosettaNet is a relatively new standard in the electronics industry, it faces tough competition from pre-existing standards. For example, EDI has been used in the United States for over 25 years (Fu et. al., 1999). In Japan, over 90% of electronics companies in Japan have EDI systems (Wilson, 2001); Japan has been lukewarm to the idea of RosettaNet, despite a Japanese affiliate set up there in 1999.

Cultural issues may also be hindering RosettaNet. Solectron Vice President and CIO Bud Mathaisal asserts that a RosettaNet system's lack of human involvement may be a problem for some (Porter, 2001). Some companies may not feel comfortable allowing their IT systems to interface directly with that of other companies.

X – Current Status and Future Directions

Former RosettaNet CEO Jennifer Hamilton has said that the RosettaNet effort has lagged. She has publicly noted that, "When RosettaNet was formed, we thought it would be a 12-month effort, and here we are five to six years later, and we are still building standards and getting them implemented." (Jorgensen, 2004). Indeed, the RosettaNet effort was once projected to be complete by June 2000; the organization originally intended to disband by this point (Booker, 1999).

In 2001, Solectron Vice President and CIO Bud Mathaisal reported that 95% of the company's transactions are EDI-based, while 5% are through RosettaNet (Porter, 2001). Little seems to have changed, if comments from Solectron's Director of Global Supply Management John Caltabiano are any indication. He has publicly said that the number of Solectron partners who want to use RosettaNet "can be counted on one hand" (Jorgensen, 2004).

Between 2003 and 2004, some of the larger companies using RosettaNet allegedly reported difficulties in persuading their customers and suppliers to join RosettaNet (Schenecker, 2005). These companies, who have hundreds or even thousands of partners, are said to have succeeded in connecting only 50-100 partners through RosettaNet. Of those connections, the number of RosettaNet-based transactions account for only 10-20% of the companies' overall interactions.

Still, RosettaNet and its members continue to pursue the dream of an automated supply chain for the electronics industry. An *Electronic Business* article noted the opportunity for

RosettaNet to spread in Asia. There are few legacy systems in Asia, so there is a slim chance that older systems would stand in the way of RosettaNet deployment (Spiegel, 2004). Intel, Samsung and Sony have announced plans to end all EDI transactions and switch to RosettaNet (Shah, 2002). Some hope that these plans will have a sweeping effect on the industry, since the companies' numerous partners would need to migrate away from EDI in order to continue doing business with them.

The pattern of RosettaNet adoption over approximately the past 5 years is said to closely mimic EDI's pattern of adoption over the previous 20 years: an increase in adoption until a decline in interest and new implementations (Schenecker, 2005).

Future RosettaNet growth remains to be seen; continued alliances with governments and standards bodies may drive RosettaNet adoption in the industry, but implementation challenges remain.

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Appendix

Table 1: Table of PC and Contract Manufacturers Known to Use RosettaNet

PC Companies
Compaq
Dell
Fujitsu Siemens
Gateway
HP
IBM
Sony
Toshiba

Contract Manufacturers
Compal
Flextronics
Hon Hai

Table 2: PIP Clusters and Hierarchy

Cluster 0 – RosettaNet Support
0A – Administrative 0C – Testing
Cluster 1 – Partner Product and Service Review
1A – Partner Review 1B – Product & Service Review
Cluster 2 – Product Information
2A – Preparation for Distribution 2B – Product Change Notification 2C – Product Design Information 2D – Collaborative Design & Engineering*
Cluster 3 – Order Management
3A – Quote and Order Entry 3B – Transportation and Distribution 3C – Returns and Finance 3D – Product Configuration
Cluster 4 – Inventory Management
4A – Collaborative Forecasting 4B – Inventory Allocation 4C – Inventory Reporting 4D – Inventory Replenishment 4E – Sales Reporting 4F – Price Protection*
Cluster 5 – Marketing Information Management
5A – Lead Opportunity Management* 5B – Marketing Campaign Management* 5C – Design Win Management 5D – Ship From Stock and Debit
Cluster 6 – Service and Support
6A – Provide and Administer Warranties, Service Packages, and Contract Services* 6B – Provide and Administer Asset Management* 6C – Technical Support and Service Management
Cluster 7 – Manufacturing
7A – Design Transfer* 7B – Manage Manufacturing WO (Work Order) & WIP (Work in Progress) 7C – Distribute Manufacturing Information

Table 3: Partial List of RosettaNet Partnerships in the PC Industry

Intel – Foxconn (1)
Intel – Asustek (1)
HP – DHL (1)
Dell – Australia Post (2)
Sony – Samsung (3)
Intel – Malaysian Customs (4)
Dell – Malaysian Customs (4)

Sources: (1) "Direct Ship 3PL Program," 2003 (2) Timson, 2004 (3) Wilson, 2001 (4) Sullivan, 2003a

Table 4: Table of PC Companies and Suppliers Using RosettaNet (Currently/Formerly)

Company	PIP	Purpose of PIP
Dell	3B18**	Notify of Shipping Documentation**[1]
Flextronics	3A4	Request Purchase Order[2]
	3A5	Query Order Status[2]
	3A6	Distribute Order Status[2]
	3A7	Notify of Purchase Order[2]
	3A8	Request Purchase Order Change[2]
	3A9	Request Purchase Order Cancellation[2]
	3B2	Notify of Advance Shipment[2]
	4A1	Notify of Strategic Forecast[2]
	4A4	Notify of Planning Release Forecast[2]
	4A5	Notify of Forecast Reply[2]
	4C1	Distribute Inventory Report[2]
Foxconn	3B2	Notify of Advance Shipment[3]
Fujitsu Siemens Computers	0A1	Notification of Failure[2]
	2A1	Distribute New Product Information[2]
	3A1	Request Quote[2]
	3A4	Request Purchase Order[2]
	3C3	Notify of Invoice[2]
	4C1	Distribute Inventory Report[2]
Gateway	0A1	Notification of Failure[2]
	3B2	Notify of Advance Shipment[2]
	3B6	Notify of Shipments Tendered[2]
HP	0A1	Notification of Failure[2]
	2A12	Distribute Product Master[2]
	2C8	Notify of Bill of Material[2]
	2C10	Notify of Approved Manufacturer List[2]
	3A4	Request Purchase Order[2]
	3A6	Distribute Order Status[2]
	3B2	Notify of Advance Shipment[4]
Intel	3A4	Request Purchase Order[1]
	3A8	Request Purchase Order Change[1]
	4A2*	Notify of Embedded Release Forecast*[1]
	4A3*	Notify of Threshold Release Forecast*[1]
	4C1*	Distribute Inventory Report*[1]
	3B2	Notify of Advance Shipment[5]
	3C3	Notify of Invoice[5]
	3C6	Notify of Remittance Advice[5]
	4B2	Notify of Shipment Receipt[5]
	3B18**	Notify of Shipping Documentation**[6]
Sony (2, 7, 8)	3A4	Request Purchase Order[2]
	3A8	Request Purchase Order Change[2]
	3A9	Request Purchase Order Cancellation[2]
	3B2	Notify of Advance Shipment[2]
	3C3	Notify of Invoice[2]
	4A3	Notify of Threshold Release Forecast[2]
	4A4	Notify of Planning Release Forecast[2]
	4B2	Notify of Shipment Receipt[2]
	4C1	Distribute Inventory Report[2]
	3A7	Notify of Purchase Order Update

* Anticipated Deployment; ** PIP in Testing Phase Sources: (1) Sullivan, 2003c (2) “RosettaNet Trading Partner Directory,” n.d. (3) “Direct Ship / 3PL Program,” 2003 (4) Schoonmaker, 2001 (5) “Intel and Shinko Use RosettaNet,” 2003 (6) “Collaborative RosettaNet* Implementation,” 2003 (7) Wilson, 2001 (8) “RosettaNet Annual Summary Report,” 2003

Table 5: Taiwanese Companies Involved in Plan B

Acer
ADI Corporation
Arima Computer
ASUSTeK Computer
Compal Electronics
Compeq Manufacturing Company
Delta Electronics
First Intenational Computer
Inventec Corporation
MicroStar (MSI)
MiTAC International
PRIMAX Electronics
SAMPO Technology Corporation
TATUNG
Twinhead International

Figure 1: Hierarchy of PIP Organization

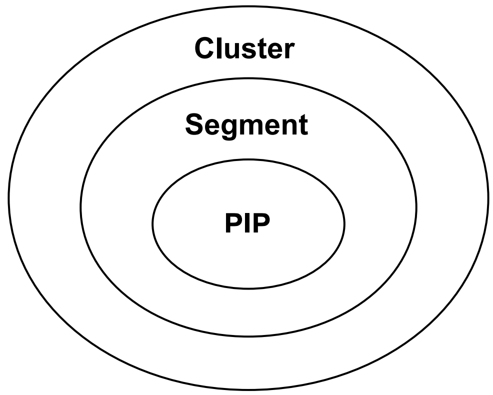

Figure 2: Excerpt of the RosettaNet Technical Dictionary, version 3.2.

```
	<class id="RNC535" propDefs="RNS204 RNS391 RNS457 RNS888-001 RNS-XJA001">
		<identifiers>
			<code>RNC535</code>
			<majRev>008</majRev>
			<minRev>000</minRev>
			<date.def>2001-06-15</date.def>
			<date.maj>2002-12-13</date.maj>
		</identifiers>
		<names>
		<preferred.name>Connector - Card</preferred.name>
		</names>
		<definition.short>A connector widely used in electronic products as a
general plug-in option interface such as PCMCIA, Smart Card, Compact Flash, SD,
SIMM.</definition.short>
		<definition.ext>A two row connector widely used in personal computer
products as a general plug-in option interface. While the separable interface is
standardized, extreme space constraints have resulted in a wide variety of mounting
arrangements.</definition.ext>
		<app.specific name="industry.domains">EC</app.specific>
	</class>
```

The dictionary defines terms common to the electronics industry in order to ensure that two companies have the same understanding of an object. In this excerpt, the term "Card Connector" is defined. Both a short definition and an extended definition are given. The short definition is enclosed between the <definition.short> tags, while a lengthier definition appears between the <definition.ext> tags.

Figure 3: Excerpt of Dictionary entry on "Flywheel," from the RosettaNet Technical Dictionary* version 3.2

```
       <class id="FLN001" propDefs="RNS-FLN001 RNS-MEC001 RNS-XJA001">
              <identifiers>
                     <code>FLN001</code>
                     <majRev>3</majRev>
                     <date.def>2000-06-16</date.def>
              </identifiers>
              <names>
                     <preferred.name>FLYWHEEL</preferred.name>
              </names>
              <definition.short>Mechanical device used to store energy as rotary
motion.</definition.short>
              <app.specific name="industry.domains">MECH</app.specific>
       </class>
```

The dictionary defines the meanings of electronic parts and components likely to be passed along the supply chain. The dictionary ensures that people have the same understanding of components. The object name appears between the <Name> tags. In this case, the component "Flywheel" is defined. A brief definition of a flywheel is enclosed within the <definition.short> tags.

Figure 4: Excerpt from Business Dictionary defining the title "Accounts Receivable Contact"

```
<BusinessProperties>
<Name>AccountsReceivableContact</Name>
<Definition>Name of a designated Accounts Receivable contact within an
organization.</Definition>
</BusinessProperties>
```

Common business titles are defined to ensure that two companies operate with the same understanding of a title. In this example, "Accounts Receivable Contact" appears between the <Name> tags, which indicates that this entry defines that title. The role of the Accounts Receivable Contact appears between the <Definition> tags.

Figure 5: Excerpt from Business Dictionary defining "Confirmation Number"

```
<FundamentalBusinessDataEntities>
<Name>ConfirmationNumber</Name>
<Definition>An identifier used to reference the confirmation information that
describes the processing of a business action e.g. subscription
confirmation.</Definition>
<Type>String</Type>
<Min>1</Min>
<Max></Max>
<Representation></Representation>
</FundamentalBusinessDataEntities>
```

The business dictionary defines terms likely to be found on forms and in business transactions. The term is enclosed within the <Name> tags, while the term definition is enclosed within the <Definition> tags.

Figure 6: Excerpt from Business Dictionary Defining the Concept "Volume Dimension"

```
<QuantitativeFundamentalBusinessDataEntities>
<Name>VolumeDimension</Name>
<Definition>Volumes of regular solids are those that have well defined dimensions of
length, width, height, and diameter that can be measured with a suitable instrument
such as a metric ruler. A suitable geometric formula may then be applied to obtain the
volume.</Definition>
<Type>Real</Type>
<Min>1</Min>
<Max>15</Max>
<Representation>9(13)V99</Representation>
</QuantitativeFundamentalBusinessDataEntities>
```

The Business Dictionary also defines concepts common to the electronics industry. In this example, the term "Volume Dimension" is defined. The definition appears between the <Definition> tags, while information within other tags offer supplementary information.

Figure 7: An EDI Message Describing a Purchase Order

```
ISA*00* *00* *08*61112500TST *01*DEMO WU000003
*970911*1039*U00302000009561*0*P?
GS*PO*6111250011*WU000003 *970911*1039*9784*X*003020
ST*850*397822
BEG*00*RE*1234**980208
REF*AH*M109
REF*DP*641
REF*IA*000100685
DTM*010*970918
N1*BY*92*1287
N1*ST*92*87447
N1*ZZ*992*1287
PO1*1*1*EA*13.33**CB*80211*IZ*364*UP*718379271641
PO1*1*2*EA*13.33**CB*80211*IZ*382*UP*718379271573
PO1*1*3*EA*13.33**CB*80213*IZ*320*UP*718379271497
PO1*1*4*EA*13.33**CB*80215*IZ*360*UP*718379271848
PO1*1*5*EA*13.33**CB*80215*IZ*364*UP*718379271005
CTT*25
SE*36*397822
GE*1*9784
IEA*1*000009561
```

The lack of metadata leaves the meaning of abbreviations and numbers unclear to someone unfamiliar with EDI syntax (Damodaran, 2004b).

Figure 8: An Excerpt of a RosettaNet PIP Message, Describing Product Information

```xml
<ProductInformationObject>
	<GlobalActionCode>Add</GlobalActionCode>
	<Version>1.2</Version>
	<ObjectName>Cover345</ObjectName>
	<Supplier>DUNS Number</Supplier>
	<Description GlobalLanguageCode="EN">
	  Note the red areas on the model are Work in Progress</Description>
	<ModificationDate>
		<DateStamp>20031015Z</DateStamp>
	</ModificationDate>
</ProductInformationObject>
```

The use of metadata descriptors allows someone to understand what each line of data conveys (Ricker, n.d.). It is easy to identify the modification date and other attributes in the message.