



WHITE PAPER

The EPCglobal Network: Enhancing the Supply Chain



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Introduction

Radio Frequency Identification (RFID) stands poised to fundamentally change supply-chain management, enabling enterprises to realize significant savings to the top and bottom line. This is evidenced by some of the earliest adopters of RFID technology. Consider Procter & Gamble, which expects to increase after-tax profits by \$150 million and realize a working capital increase of \$1 billion through adoption of RFID.

The value of basic RFID technology has been covered extensively within major supply-chain industries, as well as technology businesses where management of asset tracking is a core focus. But an even more compelling value proposition for RFID is emerging as the EPCglobal Network™ gains momentum and traction. By leveraging RFID and emerging standards around item identification such as the Electronic Product Code™ (EPC), the EPCglobal Network addresses real-world challenges by enabling the automatic dissemination and discovery of real-time, accurate, and on-demand product information for all parties in the supply chain.

This paper provides a brief overview of RFID technology with a focus on how the EPCglobal Network can drive the value of RFID to all parties in the supply chain.

RFID in the Supply Chain

RFID is a wireless technology in increasingly widespread use for applications such as E-ZPassSM, Smart Tag, and Mobil[®] Speedpass[™]. In simple terms, RFID couples tiny chips with very small antennas. The tiny chips contain information that the antennas transmit without requiring line-of-sight (i.e., visual) scanning. Tagged items can thus automatically transmit data to RFID readers within a certain range. One emerging use for the technology is to track valuable items as they move through physical supply chains. Although RFID tag costs are still relatively high (40 cents), they are declining quickly and approaching a level at which it becomes practical to tag products at the item level. This will open the door for large-scale use of RFID tags on consumer goods, as evidenced by Gillette purchasing 500 million RFID tags to track its high-value razor product lines.

Most applications of RFID for tagging and tracking items have been for operations within a single company. For instance, some retailers are using RFID to track items throughout their internal distribution infrastructure (e.g., from regional distribution center to retail stores). Other companies are using RFID tags to track items moving through a manufacturing or distribution facility. But most applications to date have not yet had to address the challenge of tracking products as they cross the physical boundaries between trading partners.

According to the U.S. Department of Transportation, the amount invested in transportation logistics and related services added up to approximately 11 percent of the U.S. Gross Domestic Product (GDP) in 2002. Given the massive investment in distribution systems and the enormous expense associated with maintaining these inventories, the value of applying RFID to automate the tracking of item movement between parties in the supply chain is guaranteed to be significant.

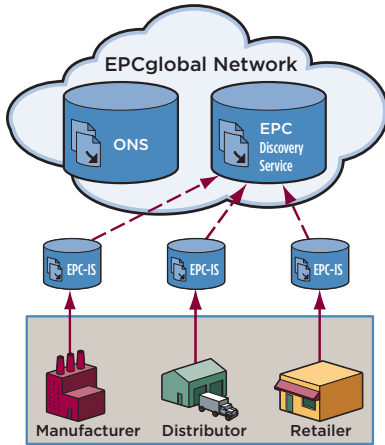


Figure 1: The elements of the EPCglobal Network system.

To take RFID beyond the confines of a single organization and create value for the entire supply chain, a few things are needed. First, there must be a standardized way of uniquely identifying items within the supply chain. Second, there must be a standard means of discovering and sharing the data that describes each identified item.

The first requirement is addressed through EPCs. EPCs are essentially the next generation of Universal Product Codes (UPCs) used in bar codes, except EPCs have the added benefit of being able to identify products uniquely at the item level. The EPC is a virtual unique license plate for a product that identifies the manufacturer (e.g., Gillette), product class (e.g., Mach 3 Razor), and serial number (e.g., the 574,896th instance of the Mach 3 Razor).

Using this EPC, members of the supply chain can thus identify and locate information about the manufacturer, product class, and instance of a particular product. Depending on the type of tag, EPCs can be used to uniquely identify up to 268 million unique manufacturers, each with 16 million types of products. Each unique product can include up to 68 billion individual items, meaning the format can be used to identify hundreds of trillions of unique items.

The second requirement to extend RFID value across trading partners is a standards-based method to discover and share data about EPCs. This is the role of the EPCglobal Network. The EPCglobal Network leverages the existing Internet infrastructure to create a low-cost, standards-based set of services for trading partners to discover information associated with each EPC. It is made up of three main elements: the Object Naming Service (ONS), the EPC Information Services, and the EPC Discovery Service (Figure 1). Each plays a unique and important role in enabling the secure discovery and sharing of detailed, real-time product information.

The ONS is the authoritative directory of information sources that are available to describe EPCs in the supply chain. EPC Information Services are the actual data repositories that are used to store information about unique items in the supply chain. The EPC Discovery Service is essentially a chain-of-custody registration service. For each manufacturer, the EPC Discovery Service provides a directory of all EPC Information Services that have read and contain information about a particular manufacturer's products. Although each of these three components is critical, the EPC Discovery Service is the most valuable component of all, enabling many applications of the enhanced product data set.

Using the EPCglobal Network to Create Real Value

The EPCglobal Network truly enables an entirely new class of applications that have not been available or possible until now (Figure 2). The following are examples of real-world business problems that can be solved using the EPCglobal Network.

+ Shipping and Receiving

One of the constant challenges in today's supply chains is maintaining the accuracy of shipments sent and received by parties throughout distribution. Often the shipments contain the wrong quantities of product, or even the wrong product type. Checking and ensuring the accuracy of deliveries is manually intensive, and still has limited effectiveness because identification at the item level is not possible with today's bar codes. The result is either time spent investigating exceptions, actual product loss, or inventory inaccuracy. Each of these ultimately impacts the consumer in the form of higher distribution costs and resultant higher prices.

The EPCglobal Network delivers an efficient solution that streamlines and automates the whole process. EPCs, as previously discussed, allow for unique identification down to the item level. For instance, each can of soda on a pallet of soda cases can be individually identified. And because this identification happens automatically as the pallet moves through a receiving door equipped with an RFID reader, the exact amount and type of product is immediately known to all parties. Any discrepancies between the amount ordered and received can be automatically identified and noted for both the shipper and receiver of the goods.

+ Product Theft

Up to \$30 billion each year is lost due to theft, often called "product shrinkage." The majority of this loss occurs in the middle of the supply chain, for example between the manufacturer's front door and the retailer's back door. Without full and timely visibility into the whereabouts of each product within the supply chain, it is impossible to identify and stop the sources of loss.

Because the EPCglobal Network captures product arrival and departure at each point, it enables comprehensive distribution visibility that creates a record of the chain of custody for each product. And though not actually preventing the theft of an item, or even the legitimate loss of an item, the capability to pinpoint the custodian of the product when it was lost allows the manufacturer or retailer to take preventative measures for the future.

+ Counterfeiting

Product counterfeiting is a significant problem worldwide and increasingly in the United States. In the pharmaceutical industry, for example, drug counterfeiting is a particularly serious issue, spurring the U.S. Food and Drug Administration (FDA) to form the Counterfeit Drug Task Force. Confirming a drug's authenticity (i.e., that it did not just "magically" appear in the middle of the supply chain) is challenging given the complexity of modern supply chains.

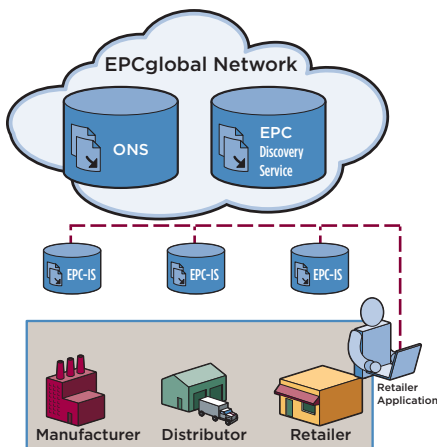


Figure 2: The retailer and other parties can view real-time supply-chain information.

The EPCglobal Network can help address these challenges by enabling drug shipments to be automatically scanned and authenticated as they traverse the supply chain from manufacturer to pharmacy. This electronic pedigree can be used to determine the authenticity of a shipment. The pedigree for a shipment can be stored and accessible to all parties, preventing counterfeit drugs from being introduced into the supply chain.

+ Product Recall

Product recalls create another expensive source of loss in the supply chain. The inability to pinpoint only the faulty instances of a product often leads to the destruction of perfectly good products (i.e., throwing the good out with the bad). Product recalls also interrupt the flow of other products within the supply chain.

By enabling more granular identification of products, the EPCglobal Network will enable manufacturers to immediately identify the exact location of specific recalled products within the distribution channel. Also, members of the supply chain can periodically check, in real time, for the issuance of “recalls” that are applicable to a particular EPC.

The preceding examples are just a few of the potentially useful applications of the new EPCglobal Network. As the EPCglobal Network gains greater adoption, the many industries deploying RFID technology will continue to create new applications that address their most urgent needs. Adoption by the Consumer Packaged Goods industry, pharmaceutical companies, and the government (U.S. Department of Defense) is likely to be just the beginning.

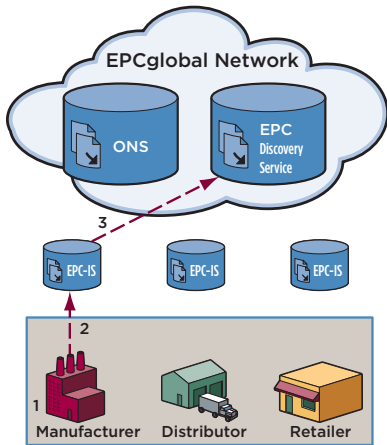


Figure 3: EPC information is registered with the EPC-IS.

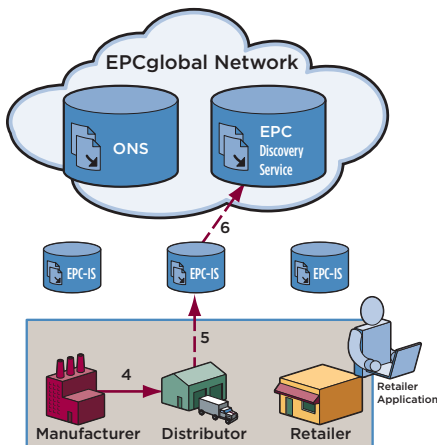


Figure 4: Distribution information is available to all parties.

How the EPCglobal Network Works

The process by which the EPCglobal Network enables the discovery of detailed, up-to-date product information across the supply chain begins with a product getting an RFID tag that includes an EPC (Step 1). This EPC is registered within the ONS when the tag is manufactured, and remains with the tag (and the tagged product) as it moves through the supply chain. The information associated with this particular product is also added to the manufacturer’s EPC Information Service (Step 2), and knowledge that this data exists within the manufacturer’s EPC Information Service is passed to the EPC Discovery Service (Step 3). When the product leaves the manufacturer’s facility, its departure is automatically registered with the EPC Information Service (Figure 3). Likewise, when the product arrives at the next point in the supply chain (e.g., a distributor site) it is automatically read and its arrival is registered with the distributor’s EPC Information Service (Step 5). Once again, knowledge of information on this product is registered with the EPC Discovery Service (Step 6).

In one scenario, a retailer may need to get information about the product it has just received. It asks the ONS for the location of the manufacturer’s EPC Information Service. The root ONS provides the location of the manufacturer’s ONS, which in turn provides the location of the manufacturer’s EPC Information Service (Figure 5). This query process is transparent to the supply-chain member requesting data through an application and takes only milliseconds to execute.

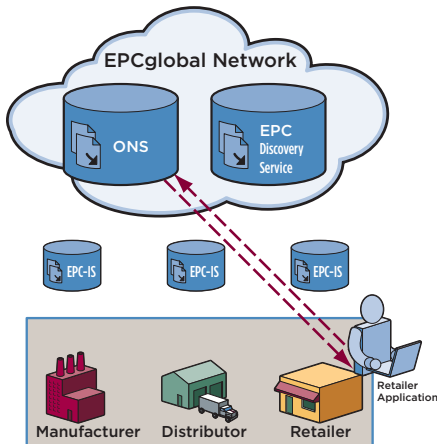


Figure 5: The ONS is a critical repository of location information.

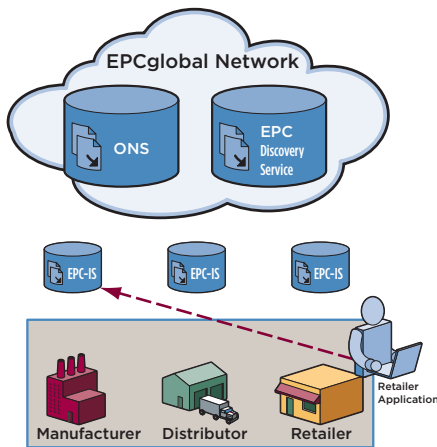


Figure 6: Retailers and other parties have a real-time view through the EPCglobal Network.

Using the manufacturer’s EPC Information Service location, the distributor’s application can request the product information it seeks (Figure 6).

As products make their way across multiple points throughout the supply chain, this process of products being scanned, and the knowledge of their data within EPC Information Services being passed on, repeats itself. The registration of this product knowledge by each EPC Information Service into the EPC Discovery Service enables full supply-chain visibility.

By viewing the presence of knowledge for the product, any member of the supply chain can get an immediate view of where a product has been. The result is real-time, complete visibility of the supply chain.

The EPCglobal Network and the Evolution of Product Data Sharing

The evolution of data exchange within the supply chain stands to take a major step forward with the advent of the EPCglobal Network. Throughout most of their history, supply-chain networks consisted of parties that exchanged product information directly between one another. This information exchange was manageable with a modest number of products, a simple product data set, and a well-known, simple distribution channel. However, as the number of products grew, the number of trading partners increased, and the data set grew more complex, these methods of information exchange became relatively inefficient, inaccurate, and ineffective. Value-added networks (VANs) brought an improvement to the flow of information because supply-chain parties were often able to reduce the number of disparate data sources. But then the suppliers or retailers were forced to join multiple VANs to reach all their respective trading partners. As supply chains increase in complexity, the practical reality is that many members of the supply chain remain “invisible” to other members.

The EPCglobal Network is the logical next step in the evolution of supply-chain networking and information sharing. The low-cost, standards-based platform of the EPCglobal Network will ensure compatibility and scalability across a diverse set of users, allowing a free flow of information. The EPCglobal Network allows for a single implementation without individual partner setup. This creates a low friction environment that facilitates exponential growth more quickly than expensive and time-consuming point-to-point communication solutions.

+ The EPCglobal Network’s Infrastructure Requirements

To support the enormous number of items traversing supply chains at any given moment in time (large Consumer Packaged Goods companies are known to ship hundreds of billions of units each year), the industry will need a large-scale infrastructure that is unlike anything ever deployed before in the supply chain. Fortunately, there is another existing, and deployed, infrastructure that can address this need. The Domain Name System (DNS)

Wal-Mart, the world's largest retailer, requires that its top hundred suppliers use RFID on their supply pallets. Other global organizations, including Gillette, Procter & Gamble, and Coca-Cola, as well as the U.S. Department of Defense, are also implementing RFID technology.

is one of the largest directories in use today, and handles over billions of queries daily to support Web site lookups and email delivery. Although this volume promises to eventually be dwarfed by the activity on the EPCglobal Network, the DNS has proven its capability to continue to scale to meet incredible growth. Some estimates predict that the EPCglobal Network system will need to support hundreds of billions of lookups per day. To be worthy of global commerce, the infrastructure will need to handle this load while delivering carrier-grade reliability (99.999 percent).

As a leader in critical infrastructure for the Internet and telecommunications networks, VeriSign is poised to play a key role in the EPCglobal Network. The VeriSign® Advanced Transactional Lookup and Signaling (ATLAS™) infrastructure provides a proven, highly reliable, highly scalable platform for supporting the EPCglobal Network. The ATLAS infrastructure currently supports multiple VeriSign offerings, including DNS services for .com and .net domains. It has immediate capacity to expand to over 100 billion queries per day, and its proprietary design enables limitless scalability as the needs of the EPCglobal Network grow.

In 2004, EPCglobal selected VeriSign to provide the root ONS for the EPCglobal Network. The root ONS serves as the top of the network architecture, routing requests for product information to the manufacturers of those products, who in turn will be able to identify the EPC Information Services that contain data on the EPC in question.

In addition to providing the core “root” ONS functionality, VeriSign also delivers a suite of complementary EPCglobal Network Services, EPC Information Services, and EPC Discovery Services. These services extend the value of RFID beyond an enterprise by enabling all parties in the supply chain to conduct secure, real-time discovery and sharing of product data. VeriSign's offerings also include a Managed ONS solution, which seamlessly ties in to the root ONS to ensure reliable response to requests for product information.

Conclusion

Expectations for the efficiencies and cost savings to be gained from RFID technology and the EPCglobal Network are high—and with good reason. The EPCglobal Network and its component ONS, EPC Discovery Services, and EPC Information Services promise to streamline the supply chain while increasing visibility, accuracy, and communication among all the parties involved. Selected as a provider of the authoritative root ONS by EPCglobal, VeriSign will apply the proven expertise and innovation that has made it a leader in secure, intelligent infrastructures for the Internet to this exciting new technology.

Visit us at www.Verisign.com for more information.