WHITE PAPER

Answers to the Most Frequently Asked Questions about RFID

Are you ready for radio frequency identification (RFID)? For organizations that manage global supply chains and vast trading partner networks, the promise of RFID is substantial. The increase in efficiency, data integrity and inventory visibility will help lower costs along with delivering goods faster and more accurately to the end user.

However, trying to map out a strategy is complex and takes into consideration all aspects of the enterprise — from warehouse and transit planning to network infrastructure requirements. As with any technology, there are still challenges that exist with RFID such as limitations detecting tags located near liquid or metal, global standards and affordability. Many questions remain unanswered.

This white paper provides detailed answers to some of the most frequently asked questions about RFID today. Topics are organized into four main categories: business, technology, financial and industry specific.

Business Issues

What is the promise of RFID?

RFID is all over the news. Major retailers like Wal-mart and Target have already begun pilot initiatives. Analysts anticipate that RFID is going to be a significant IT investment over the next five to ten years. But what does it all mean to your company? The business implications of RFID are immense and include gaining competitive advantage and freeing up working capital. RFID improves supply chain visibility, lowers operating expenses and lifts sales. The benefits are pervasive throughout the supply chain — from the manufacturer to the distributor to the retailer to the consumer. In a highly competitive business environment, RFID represents the "next frontier" of supply chain efficiency that many companies are striving to attain.

What is the average timeframe to consider when planning an implementation?

The more time the better. Try to avoid waiting until a specific mandate is looming ahead. Give yourself enough time to really understand what RFID can and cannot do. Figure out how this technology fits into your particular business process before you move forward with a rollout. In terms of a timeframe for this, allow anywhere between six months and a year, which covers moving from the initial touch to learning what it can do to a relatively small staged pilot to an initial rollout.

How do I go from a small pilot to a broader implementation?

In general, the best advice is to stage your pilots progressively. Start out with a technology pilot and then move to a functional pilot where you're trying to make the technology work in your business process. And finally go to a real business pilot where you are actually measuring the return on investment (ROI). You should build as you go, because each stage represents an opportunity to refine systems and processes to reduce costs significantly at the next stage.

What about privacy?

Any discussion about RFID should include privacy. Most industry and business communications have focused on the very positive aspect of this technology, but there are real privacy concerns out there among consumers. The technology-based answer is that the capabilities of RFID just don't correspond to some of the scarier stories. Read

ranges are very limited, so there is no chance that someone is going to read RFID tags in your home from space - or even from the street.

However, any discussion about privacy needs to start with the acknowledgement that consumers have a well-founded expectation of privacy. The industry as a whole understands this and is working on defining methodologies that would allow consumers to choose whether or not the goods they take out of the store carry RFID tags or not. New RFID tags are designed with "kill switches" that allow consumers to permanently disable them as a matter of choice. There is a significant value to the consumer with this technology. For example, items are returnable without receipts because of the RFID tag, but the industry must do a better job of explaining this value. The bottom line is that the choice has to be the consumers. And the industry is dedicated to putting that power into their hands.

Once RFID pilot systems are up and running, how do I continue to receive the strong business benefits without it becoming burdensome to the enterprise?

Scalability and sustainability of enterprise-wide RFID solutions encompasses the critical next stage. Technology companies are working aggressively to address this concern. Today, most people seem to accept that as a technology, RFID works. This means that companies can tag items in the supply chain such as pallets and cases, and read them reliably.

The next challenge the industry faces is making RFID not just work, but also making it work at scale — make the technology manageable. There's a big difference between an RFID pilot with tens of readers and a real implementation with hundreds or even many thousands of readers. How are people going to deploy these readers reliably and monitor them to make sure they are working effectively? If companies are going to rely on RFID data, they must be able to rely on the systems that gather that data.

Why must I have both a bar code and RFID system? Will one suffice?

There's some talk that the RFID tag means the end of the bar code. That's simply not true. Right now, even with several successful pilots, RFID is going to take years to become pervasive throughout the enterprise environment. Many of today's RFID implementations are at the pallet and carton level. And in these scenarios, RFID performs wonderfully. However, unit-level item identification is still the domain of the bar code. Until every item is 100 percent RFID, the bar code remains an important part of the supply chain and trading partner networks. RFID and bar codes are not mutually exclusive. It's remarkably similar to having two different blades on a Swiss Army knife. Just because you have a corkscrew blade, does that mean you are going to throw away your pen knife blade? Obviously not.

What is the status of the electronic product code (EPC) standards? What is the impact?

The EPC standard originated from the MIT Auto ID Center, a private/academic consortium backed by leading retailers, manufacturers and technology companies. Initially, there were two classes of EPC tags - Class 0 and Class 1. EPCglobal, but now there is a single, next-generation tag standard — UHF Generation 2.

In many ways, Motorola identifies a number of similarities between RFID and WiFi® (IEEE® 802.11) systems. Just as we helped standardize robust WiFi solutions for many markets, we are bringing robust, scalable RFID solutions to market to address these problems.

Standardization drives cost, and it's vital to enterprise-wide implementations. And higher volume means lower costs. Most previous RFID implementations were proprietary in nature — one company controlled everything. Everything was custom — the readers, the tags and the data format. Standardization delivers one vision that's highly executable and drives the adoption forward, lowering costs with increased volume. EPC is — without a doubt — the RFID standard of the future.

Technology Concerns

What is state of the art for RFID today?

EPC has emerged as the main RFID standard for today's supply chain initiatives and trading partner networks. Similar to a vehicle identification number (VIN), EPC is a unique identifier that is stored within an RFID tag, which contains both a chip and an antenna. Once the EPC information is accessed using an RFID reader, this unique identifier becomes available for use in tracking the tagged item throughout the supply chain - from manufacture to retail. Currently, tagging and reading at the pallet level is successful with the RFID technology being

tested. And tagging and reading at the case level works when cases are on a conveyor or in a material handling system.

What are the technology challenges with RFID?

There are five main phases with every technology, and RFID must go through them as well, the same way that light bulbs, computers and washing machines progressed on the path to widespread adoption. The first phase is when companies are basically making the technology work. It's been demonstrated in 2004 that RFID technology works. RFID is in the second phase which is making it manageable. This is when the technology works and can be deployed and scaled at a reasonable cost with minimal overhead, and you can begin to derive significant business benefits. Looking to the future, the next phase of technology adoption is making it essential. RFID will move from something that's useful to a must-have in every supply chain operation, based on its proven business value. From essential it will go to ubiquitous - meaning that it will be everywhere in the enterprise. And finally, RFID will be so ubiquitous that it becomes transparent - it's everywhere, and it's been there so long that it's not noticed anymore.

So RFID today has gone from the making it work phase to making it manageable phase and companies are finding the business benefits and ROI. Scaling on an enterprise-wide level must be addressed because RFID isn't really a rip-and-replace solution. It must work seamlessly with other technologies such as bar code data capture, wireless networks and portable data terminals. The key here is in viewing RFID as one part of a broader solution set (i.e., warehouse management system - WMS). A large part of the answers to these questions of scaling, reliability and integration is going to be addressed by the technology companies. Bridging the gap requires architectural solutions that address the need to capture, move and manage a wide variety of data, whether that data is RFID, bar code, voice or key entered.

Keep in mind that all of these challenges are to be expected, because RFID is simply following the same phases that every other technology experiences — from the light bulb to the washing machine. The important thing to understand is that many technology companies are recognizing the need to build RFID systems that integrate well with existing infrastructures.

What kind of products will I need for an RFID deployment? How do I manage all these devices?

There are really two sets of products that need to be built to meet RFID needs. The first is a core hardware product … or reader. Several different form factors are necessary to ensure that RFID easily integrates into existing business processes in today's retail supply chain. For example, a classic dock or portal reader will reside on an inbound or outbound dock to read whatever comes into or out of the facility. There's also a strong need for mobile readers so that product is tracked as the driver is moving around the warehouse. It's a great value added way to read the data, but it also affords you an acceptable substitute for a larger number of dock and portal readers. In addition, conveyor readers read individually tagged cases at high speeds, some at up to 540-feet a minute. Handheld mobile computers with an integrated RFID reader are vital as associates move inside the warehouse or around the store. Mobile computers let you take advantage of the RFID tags without relying solely on fixed readers. And finally, a layer of management software and appliances ties this network of disparate devices together. It offers a central point that enables you to see what's working and what's not, what data is coming in and where it's going. With it, you can manage both the data and the devices.

How do I ensure the security of the EPC data?

Unattended data capture is one of the stronger business benefits to RFID. And this leads to the question: How do you know that the data is secure

and accurate? Work continues to develop new security protocols between the tag and reader, but the fact that the range of the technology is limited really does significantly minimize the risk. More important is the need for a robust wired and wireless network security methodology to ensure that as the RFID data moves around a corporation, and possibly over large geographic areas, it remains secure.

Financial Considerations

How expensive are EPC tags and readers?

EPC readers typically cost several thousand dollars for a typical system that includes a reader, antennas and a mounting structure. However, for most companies, the most compelling question is: "how much are the tags?" As EPC becomes more widely accepted, it is likely that literally tens of billions of tags will be needed for the pallets and cases that move throughout the global supply chain. Given this volume, there is a strong incentive to keep tags costs low and to seek continuing reductions in price. Today, passive UHF tags utilized by the EPC initiative typically cost about 15 cents when purchased in quantities of millions. There is a belief that this cost can be reduced to as low as 5 cents over the next few years, if tag requirements rise to the billions to allow volume efficiencies in the production of the tags. To a certain extent, it is a little bit of a chicken and egg problem — tags will be really cheap when people buy billions of them, but people will only buy billions when they are really cheap. The good news is costs and prices tend to decline consistently every year.

Industry-Specific Relevance

Is all of the RFID focus on retail?

Right now, RFID is more prevalent in the retail supply chain, with the emphasis on applications at the pallet and case level for select major retailers. RFID is also beginning to be implemented at the item level for increased visibility into inventory and real-time notification of out-of-stocks. Most of the attention is focused on retailers because this is where the most visible pilots are being conducted. Significant pilot activity is also occurring at the United States Department of Defense (DoD), which has its own RFID initiative.

Now that the EPC standards are well established, the technology is moving quickly to other vertical markets that have a need for the traceability that RFID can supply — such as manufacturing, for tracking e-pedigrees of pharmaceuticals, aviation for passenger safety and baggage tracking, transportation for tracking cargo containers and vehicles, and more.

About Motorola

Motorola, is committed to building a broad portfolio of RFID systems and solutions to meet our customers' needs. We believe strongly that RFID will provide the most value to our customers as part of an overall mobility solution that includes the ability to capture, move, and manage a variety of data, whatever the source, including RFID. To that end, we will offer a variety of RFID solutions that are designed to integrate seamlessly with out other key technology and product offerings, including bar code scanners, portable data terminals and wireless local area networks.

Motorola is invested in the success of open RFID standards in general, specifically EPC, and is actively working as a part of EPCglobal to define the next generation of RFID standards.

Glossary of Terms

Following is a list of terms utilized in this document as well as additional industry-standard terminology.

Active Tags: RFID tags that use an embedded battery to provide power and a radio signal. These generally cost between $10 and $100. They are much more expensive than passive tags, but possess greater data capacity and range.

AutoID Center: the private/academic consortium associated with the Massachusetts Institute of Technology (MIT) that invented the concept of the electronic product code (EPC). Many major global retailers and manufacturers were members before this group became EPCGlobal.

Antenna: structures that radiate and receive radio energy. These are built into both RFID readers and tags.

EPC or Electronic Product Code: a unique number that identifies an item in the supply chain. It's designed to be stored in an RFID chip to allow an item to be tracked as it moves throughout the supply chain. You can think of it as a universal product code (UPC) plus a serial number, with some differences.

EPCglobal: the non-profit organization that manages standards and numbering schemes associated with EPC and the successor organization to the Auto ID Center. EPCglobal is a membership-driven organization and is a subsidiary of the Uniform Code Council and EAN International, the leading retail bar code standards organizations best known for UPC.

Frequency: the speed that a radio signal cycles through its minimum and maximum values during a given time period. RFID tags operate at different frequencies. EPC operates in frequency bands around 868 MHz (Europe) or 915 MHz (United States).

Interference: anything that prevents radio waves from traveling between a tag and reader correctly and causes the tag to be read incorrectly. Interference is sometimes caused by other radio signals or by some physical objects metals and liquids that absorb or reflect the radio signals.

ONS Object Name Service: an element of the overall EPC system that allows an EPC number in a tag to be translated into a location on the web where information about that object is stored.

Orientation: whether or not a tag is aligned with the reader. Read ranges are generally longer when this is the case.

Passive Tags: RFID tags without batteries. These tags get energy directly from the radio waves transmitted by a reader. They tend to be very inexpensive hold limited data and have a shorter read range than active tags. EPC is focused on passive tags.

Programming: the act of writing data to an RFID tag.

Protocol: a standard way of talking (or communicating) between a reader and a tag. At present, EPC has defined two main protocols Class 0 and Class 1, the "language" that tags and readers use to talk to each other.

Protocol Speed: the speed at which tags and readers can speak to each other. Varies by protocol, but is typically hundreds of tags per second.

Read-Only Tag: a tag with data that is programmed at the factory and cannot be changed. Class 0 is a read-only tag.

Read Range: the distance where a tag is read by a reader without any objects between the two. This distance varies depending on the reader and tag used, but can be up to 40 feet with the best performing EPC readers and tags.

Reader/Writer: a device designed to read data from or read data to an RFID tag.

RFID (Radio Frequency Identification): a technology that uses radio waves to uniquely identify tagged items.

RFID Chip: the small computer, almost as small as a grain of sand, which is the heart of every RFID tag. The two main parts of an RFID tag are the chip and the antenna.

Smart Label: printed labels that include an RFID tag built into the label.

Tag: an RFID chip packaged so that it can be applied to an item to allow it to be tracked.

Transponder: this is the technical name for a tag.

UHF or Ultra High Frequency: a technical name for a range of frequencies between approximately 400 MHz and 900 MHz. EPC UHF tags operate in the UHF band at around either 868 MHz or 915 MHz.

UHF Generation 2: the current EPC standard for factory-programmed tags..

Write Once Read Many (W.O.R.M) Tag: a tag that is designed to be written or programmed once and only once and then read many times throughout its life when it is applied to an object.

Writeable Tag: a tag where data can be written and rewritten many times.

Write Range: the distance where a tag is written by a reader/writer without any object between the tag and the reader/writer. Normally, write range is lower than read range.

Additional Resources

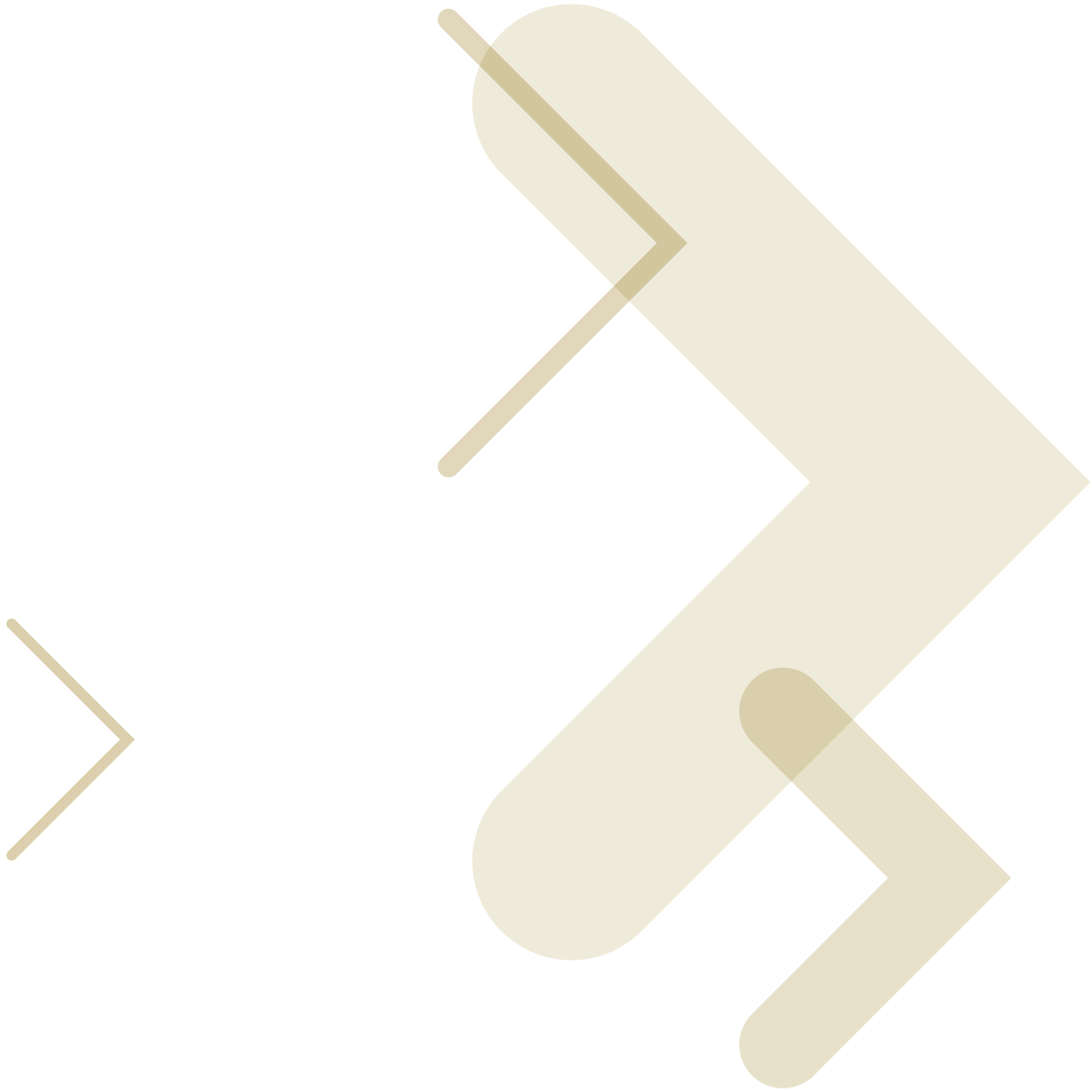
EPCglobal official web site –
http://www.epcglobalinc.org/home

Information on the Department of Defense and RFID
http://www.acq.osd.mil/log/rfid/index.htm

Articles on the impact of RFID on supply chain - Achieving Supply Chain Excellence through Technology (ASCET) -
http://www.ascet.com/welcome.asp

RFID technology basics from the Association for Automatic Identification and Mobility (AIM) -
http://www.aimglobal.org/technologies/rfid/

Current RFID news - RFID Journal –
www.rfidjournal.com



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