

SUPPLIER COMPLIANCE WITH THE DEPARTMENT OF DEFENSE RFID MANDATE: WHO IS AFFECTED, WHEN, AND WHAT TO DO TO COMPLY

This white paper provides information on the compliance requirements of the initial phase of the Department of Defense (DOD) radio frequency identification (RFID) mandate for suppliers shipping directly or indirectly to DOD clients. It also includes fundamental information on RFID systems and their components, as well as suggestions on business considerations for implementing an RFID solution.

Executive Overview

For vendors supplying goods directly or indirectly to the Department of Defense (DOD), it's not a question of "if" they should begin the process of integrating RFID (radio frequency identification) into their shipping procedures, but "when and how?" In July 2004, the Under Secretary of the U.S. Department of Defense issued a policy regarding RFID, stating:

"[N]ew solicitations for materiel issued after October 1, 2004, for delivery after January 1, 2005, will contain a requirement for passive RFID tagging at the case (exterior container within a palletized unit load or shipping container), pallet (palletized unit load), and the UID item packaging level of shipment in accordance with the appropriate interim/final Defense Federal Acquisition Regulation Supplement (DFARS) Rule/Clause or MIL-STD-129 as appropriate."

A number of DOD suppliers, including Lockheed Martin, Northrop Grumman, GE Transportation, Rolls-Royce and Raytheon are already testing RFID or running pilot projects in preparation to meet the requirements of the new policy (see RFID Journal, "RFID News Roundup," Nov. 19, 2004). These prime contractors recognize the necessity of compliance and understand that RFID offers a new technology for driving improved operational efficiencies.

The policy applies both to DOD prime contractors and to companies that ship to the DOD directly or subcontract to prime contractors. Many of those suppliers may have been reluctant or unable to dedicate resources to implementing RFID. However, they are now compelled by these mandates to adopt the technology. The challenge for those suppliers is in finding a solution that enables compliance now and creates the foundation for future compliance as next-generation RFID mandates roll out.

Another issue is return on investment (ROI). Suppliers need to be able to justify capital expenditures based on process improvements that offset the total cost of ownership and promise substantial ROI in the long term.

Although compliance deadlines have passed and broad application of RFID is relatively new, rapid evolution is under way, fueled by the phenomenal market potential of this technology as well as ongoing RFID research. Complete RFID solution providers, as well as those focused on elements of a solution, are also rushing to market products and services aimed at large and small companies alike.

WAL-MART Mandate And The DOD

The DOD is not alone in the push to move suppliers into RFID. Wal-Mart, the world's largest retailer, announced in June 2003 that its top 100 suppliers would be required by January 2005 to put RFID tags on all cases and pallets of consumer goods shipped to a limited number of Wal-Mart distribution centers and stores. Wal-Mart's initiative to improve supply chain performance is based on concrete historical data. Companies with better demand-forecast accuracy also have 15 percent less inventory, 17 percent better perfect-order ratings, and 35 percent shorter cash-to-cash cycle times than their peers, AMR Research's benchmarking studies show (see the AMR Research Report "The Hierarchy of Supply Chain Metrics: Diagnosing Your Supply Chain Health," February 2004).

The DOD, Food and Drug Administration, the Department of Homeland Security, and industry groups such as EPCglobal and International Standards Organization (ISO) acknowledge the potential benefits of raising the bar for supply chain operational efficiencies. Advantages can also be realized outside the supply chain; superior protection of intellectual property, easier regulatory compliance and development of pharmaceutical pedigrees, "farm-to-fork" tracking of consumable products, and safer harbors and airports are just a few examples of these potential advantages.

Link to DOD mandate: The DOD RFID Policy can be found at http://www.acq.osd.mil/log/logistics_materiel_readiness/organizations/sci/rfid/rfid_policy.html

Initial Compliance -- A Phased Approach For Suppliers

The DOD mandate is structured to affect suppliers in phases, based on the type of materiel supplied and where it is being shipped. In the first phase, passive UHF RFID tags properly attached to cases and pallets of materiel satisfy the mandate's requirements.

Phase 1 applies to vendors delivering goods for new contracts that are subject to Defense Federal Acquisition Regulation Supplement (DFARS) Rule/Clause or MIL-STD-129 only, ordered after October 1, 2004, in these classes:

- Class I SubclassPackaged Operational Rations
- Class IIClothing, Individual Equipment and Tools
- Class VIPersonal Demand Items
- Class IXWeapon Systems Repair Parts & Componets

Approximately 17,000 of the estimated 40,000 DOD suppliers will be affected by Phase 1 requirements.

The phased approach to compliance for suppliers allows the use of EPC Class 0 and Class 1 RFID tags. Suppliers are required to use tags and infrastructure that conform to standards defined by EPCglobal. The approach also includes guidelines on the migration to the next-generation tag, known as UHF Generation 2 (Gen2), which will be rolled out by vendors in 2005. (Greater detail on tags and the elements in an RFID solution can be found later in this document.)

The mandate also limits the scope of its current effect by requiring only vendors shipping to the San Joaquin and Susquehanna (New Cumberland) DOD depots to conform in Phase 1. As subsequent phases of the mandate roll out, more and more suppliers will be required to comply, and more Defense Logistics Agency (DLA) depots will be requiring that the materiel they receive is tagged; by January 2006, all goods must be RFID-tagged and all depots will be compliant.

Standards And The Distinction Between UID Marking And RFID Tagging

In an industry that is rapidly evolving, it's natural that technical challenges and interoperability issues exist. RFID solution providers are addressing those issues by working with standards groups. Two organizations are leading the efforts to standardize RFID: EPCglobal and ISO. The standards are being developed in conjunction with AutoID Laboratories, a cooperative alliance of leading providers, universities and groups mandating RFID compliance. These organizations are developing standards, for the EPCglobal Network and Electronic Product Code network, that will enable immediate, automatic and accurate identification of any item in the supply chain of any company, in any industry, anywhere in the world.

DOD suppliers should not confuse standards relevant to "Unique Identifier" (UID) codes with those relevant to RFID tags.

- A UID is a permanent marking device (code) specific to an item. UID regulations are currently not included in the RFID mandate.
- RFID tagging requirements apply to supply chain logistics -- tagging and tracking of items, cases and pallets of goods.

The DOD's RFID implementation strategy includes plans for associating UID marking and RFID tagging requirements in January 2007. However, immediate compliance does not require UID data to be associated with RFID data, although it is permissible if the UID item falls into the "case or pallet" level of the four classes referenced above.

New contracts written that do not include a DFARS clause are currently not obliged to comply with the mandate. A UID is a permanent marking device (code) specific to an item. RFID tagging regulations apply to supply chain logistics -- tagging and tracking of items, cases and pallets of goods.

Two locations for more information are:

http://www.epcglobalinc.org/standards_technology/EPCTagDataSpecification11rev124.pdf

http://www.acq.osd.mil/log/logistics_materiel_readiness/organizations/sci/rfid/rfid_faq.htm#RFID_UID

Who's Out There To Help?

The cost of compliance, and the inherent "pain" of changing processes and making alterations in their data infrastructure, may dismay suppliers who are now investigating RFID. However, they can take solace in the fact that the revenue potential of providing RFID components and complete solutions is spurring growth in available resources. Suppliers can choose from a growing list of companies that produce the hardware and services comprising an RFID solution.

There are a few complete solution providers who have commercially implemented RFID systems, and consequently have the direct experience necessary to guide their business partners and clients through the assessment, planning and design, as well as the implementation, stages of an RFID solution.

There are also entities that can be considered "third-party consolidators" (3PL). They specialize in handling the logistics for suppliers and could prove to be a convenient solution, based on the supplier's business practices.

Also, expect changes in the industry. Just like other technology-driven industries, there will most likely be a "shake up" in which some companies fail, others are integrated into larger companies, and some companies thrive and continue to be market leaders.

As part of their planning process, DOD suppliers should carefully determine who they want to help them meet initial compliance and extract the greatest ROI from their RFID solution. Successful strategies usually include working with a single source for each element in a solution.

Compliance-Related RFID Basics

Understanding the basics of RFID will help any supplier minimize errors and will help them make good decisions in defining their RFID solution.

RFID is a technology that enables the wireless exchange of information between RFID tags and a reader. Viewed from a high level, an RFID system is relatively simple. It consists of:

- RFID tags, which consist of a semiconductor chip and antenna(s) attached to the chip
- One or more read/write devices (also called interrogators or readers)
- One or more external antennas attached to the reader
- Application software and a host computer system

There are two basic types of RFID tags: active tags and passive tags. As stated before, EPCglobal passive tags satisfy initial compliance regulations for suppliers shipping goods in the four classes cited. Also, passive tags are suitable for almost all goods in the supply chain that are subject to compliance. Both types of tags incorporate semiconductor chips that store information, and both provide information to readers without a direct line of sight between the reader and the tag. Each RFID tag is encoded with a unique identifier that enables every asset or item of merchandise to have a unique serial number. That encoding is part of the tag preparation procedure, a procedure that is known as "commissioning."

Active tags are battery-powered and continuously emit radio signals. They can store relatively large amounts of data, and are normally used when a longer tag read distance is necessary. The benefits of active tags include faster read rates, longer read ranges, continuous real-time product tracking and the ability for tag data to be updated.

Passive tags acquire energy from transmitted radio signals and "reply" with their stored information to commands from readers. In commercial use, the tags are usually discarded once they have reached the receiver. In some cases however, passive tags can be reused. The vision that the DOD has for its "value chain" includes instances in which passive tags can be reapplied, the case or pallet is sent again into the supply chain, and the notification information documenting the return is sent to the new receiver.

Passive tags are further categorized into Classes: EPC Class 0 and Class 1 tags. According to the DOD mandate, "the DOD will use and require its suppliers to use EPC Class 0 and Class 1 tags, readers and complementary devices." (See DOD mandate, July 30, 2004, Radio Frequency Identification Policy, Section 2.5.)

- Class 0 tags (Class 0 64-bit read-only, Class 0 96-bit read-only, and writeable Class 0 (64-bit and 96-bit)) contain only, and writeable Class 0 (64-bit and 96-bit)) contain commissioned. (Writeable

Class 0 tags give suppliers the flexibility of commissioning at their level and "locking the tag down" as a read-only tag when it goes to the depot; that process meets DOD requirements.)

- Class 1 tags (Class 1 64-bit write-once read-many, Class 1 96-bit write-once read-many) are read/write; read/write functionality allows tags to be reused.

Tag-construct standards have been developed by the DOD and EPCglobal. While the DOD has created a construct that it considers to be its standard, the EPCglobal SGTIN (SGTIN-64 or SGTIN-96) tag construct is accepted by both the DOD and commercial retailers mandating RFID compliance. Suppliers should note that if they use EPCglobal tag constructs, they are required to be a member of EPCglobal. Standardizing on the construct that is conventional within your industry could be to your advantage, and opting for the constructs referenced above could be advantageous, especially if you ship goods to the DOD as well as commercial clients.

Conventions specifically defining the construction of EPC codes have been developed; based on the class of tag used, tags are encoded with digital identification information unique to each supplier.

Two conventions exist within the DOD tag construct for identifying the supplier:

- CAGE (Commercial and Government Entity) codes
- DODAAC (Department of Defense Activity Code in Contracting) codes

In each case, the code identifies the supplier and ensures uniqueness of serial numbers across all suppliers.

Fortunately, there's flexibility within the DOD regulations. Suppliers choosing to buy read-only tags will receive tags that include a serial number scheme that the tag manufacturer has determined; suppliers choosing to buy writeable Class 0 tags and Class 1 tags will receive "blank" tags that they encode properly through their commissioning process.

Printers, readers and external antennas

- RFID labels are clearly the central element in any RFID solution, but they must somehow be commissioned, which as we have defined in this discussion means that the supplier uses a device to "burn" data onto an RFID chip and either incorporates it with the label or sticks it on the goods to be shipped. Printers with RFID tag-related functionality are available from several vendors.

EPCglobal-compliant RFID readers fall into three broad categories: handheld, embedded and fixed. Handheld readers offer portability (the reader can be brought to the item) and flexibility. Embedded readers are inserted into printers and label-application machines. Fixed readers, which include readers incorporated into conveyor belt automation, stationary locations and dock door portals, communicate with RFID tags as the items pass the readers' antennas. Typically, fixed readers are used to verify that the shipment contains the correct items and that it is being loaded onto the right truck. Fixed readers might also be established as part of a shipment assembly station, allowing workers to put together shipments by hand and then employ the reader.

Currently, readers need only be capable of communicating with first-generation RFID tags. Since EPCglobal members are in the process of defining a single, next-generation tag standard -- Gen2 (referenced earlier) -- all readers should ultimately be capable of reading Gen2 RFID tags. Suppliers should consider the value of purchasing readers that are technically ready to read both current tags and are capable of being upgraded to read Gen2 tags. These multi-protocol readers promise greater return on investment relative to ongoing evolution in tags.

What type of antenna/reader setup is appropriate is determined by the physical space in which the items pass, and perhaps even the maturity of the RFID solution -- suppliers may start with handheld readers and migrate to fixed readers as they streamline their applications. Or, they may find uses for both types of device and apply them where it's advantageous.

Keep in mind that owning a printer is not essential to compliance. There are several options for meeting compliance:

- *Suppliers can purchase RFID inlays (the RFID chip, already encoded and ready to be applied) and attach them as appropriate.*

- They can get tags that are read/write capable (both Class 0 and Class 1), encode (burn) them using a read/write device, and then produce a complete smart label using a printer that they own.
- Suppliers can position the inlay (encoded by the manufacturer or by the supplier) beneath or near the 4" x 6" military label, printed using their own printer.

Once an item, case or pallet of items is assembled, a properly encoded smart label must be attached in accordance with DFARS regulations. For the most part, RFID labels are attached to cases and pallets with adhesives, just like bar code tags. Most readers also are capable of writing to the tag, which gives suppliers the option of purchasing writeable Class 0 and Class 1 tags.

Large, external (but fixed inside the plant) area antennas are intended for long-range and large-area tag-reading applications. They are optimized to perform in a variety of industrial/warehouse environments, as they can easily be mounted indoors on ceilings and walls to create read zones around doorways and dock doors.

Panel antennas can be fixed on ceilings and walls to create read zones and internal working areas where cases and pallets are assembled.

Software implementation

The data communicated between the tags and readers is passed to software commonly referred to as "middleware," which resides on a host computer system. The manner of handling RFID data depends upon legacy software application functionality. If your existing software is already RFID-enabled, you will not need to purchase middleware that handles the data. However, if it is not, it will be necessary to purchase software to move the data, integrate it with the legacy system, and allow processes to continue running.

Data from the readers is relayed to the information infrastructure, then managed and moved as appropriate. Once the data is in the system, it is associated with the item. It is potentially available to the enterprise at many levels, and ultimately is communicated as an Advanced Shipment Notification (ASN) to the DLA via the tracking system that the supplier has in place.

When the supply depot receives the materiel, it can then compare the ASN to the item(s) being received, verify that it is in fact what it should be, and close the supply chain loop by paying the invoice from the supplier.

Implementing A Solution

Whether you are compelled to implement RFID in response to DOD or retailer mandates, or have decided that now is the time to take steps to elevate productivity using RFID, the first task ahead is to find answers to questions relevant to your needs and long-term vision: What do we need to do? Who is involved? How do we get there?

The first and probably most critical question you need to ask is, "What level of compliance is required?" The answer should provide a basic understanding of what you have to do. For most suppliers, first-generation passive tags, applied "slap and ship," will suffice. However, careful reading of the DOD mandate will provide greater detail. Consultation with a complete solution provider can clear up any confusion and help you anticipate where you need to be two, five and ten years from now.

Once you've determined how to reach compliance, the next issue is determining who will do the work. Many firms own and manage their distribution; others rely on 3PL consolidators.

If you choose to employ a 3PL consolidator, you'll want to evaluate the business case for using them just as you would any other contractor.

Some issues to consider might include:

- Is outsourcing better, faster or cheaper?
- Is finding a 3PL consolidator a good short-term approach that we can use until we have a solution in-house?
- What's our long-term strategy?

Using a 3PL consolidator might be a convenient option, since it's up to them to know what to do and to get it done. But, even if you employ a 3PL consolidator, you have a vested interest in the process and need to be involved in the planning and execution. And studies show that higher operational efficiencies are realized as RFID is pushed further and further back in the supply chain, even into the assembly line. Thus, you can anticipate that you will most likely bring RFID into your location sometime.

Suppliers who opt to handle the tagging and shipping logistics themselves have many more decisions to make. Working through the flow of steps for getting goods into shipment, you will need to consider:

- Which products need to be tagged? You can determine this by consulting the DOD policy and your contract or purchase order.
- Which tags should we choose? Based on business factors such as clients, the volume needed, the effect of the product on the tag, other wireless communications in use, and current shipping procedure, you can determine which tags will be suitable.
- How will we apply the commissioned label? You'll need to consult DFARS regulations for direction on positioning.
- How will we verify that the label is working properly?
- What's the current and planned software implementation?
- How are we communicating ASN to DOD and others, and how do we "close the loop"? Electronic transmission will be the only accepted method. The DOD has established the Wide Area Workflow (WAWF) Receipts and Acceptance system. WAWF is a secure Web-based system for electronic invoicing, receipt and acceptance. It promotes timely payment and enables the loop to be closed.

Establishing a pilot program that enables rapid progression to compliance can be beneficial. It's during the pilot program that companies build their business case. Ideally, the implementation can be groomed over time to further cultivate business efficiencies. Of course, the pilot program also gives you the opportunity to pinpoint the technical and operational challenges unique to your process. It's clear that for smaller companies, a pilot program might not be the best process. Companies with relatively simple shipping operations may benefit by moving straight into implementation, and then work to streamline the system based on day-to-day experience.

Most likely, you will employ an RFID hardware, software or solutions provider to help. Pilot programs also serve as a practical test for the products and expertise the provider delivers.

Augmenting any methodology, any process, has its challenges. That's why implementing the solution necessitates careful consideration of your needs and the ability to react to the "growing pains" associated with establishing and fine-tuning your RFID installation.

Ultimately, every partner in the supply chain needs to be equipped with technology that functions together. Communication among partners on both strategy and technology will mitigate problems and speed return on investment.

Perhaps the most common challenge for suppliers is the fact that the deadline for compliance has arrived. Forward-thinking suppliers need to establish an RFID solution that ensures compliance and delivers superior performance and results. And they need to do it immediately.

Conclusion

RFID is being established in commercial and military operations, and the technology is here to stay. In three years, all DOD suppliers will be required to ship items, cases and pallets, properly tagged, in order for the materiel to be accepted by any of the DLA depots. Even if your company has not been immediately affected by the January 2005 DOD mandate deadline, you need to take the initial steps in the journey toward establishing an RFID solution within your data and supply chain management strategy.

The DOD, Wal-Mart and leading retailers recognize the value of squeezing greater efficiency out of the supply chain. Real-time product tracking will result in huge amounts of data, and within that data there will be opportunity for improving business operations.

Standards and the inevitable increased availability of elements in an RFID solution will help bring total cost of ownership down, but don't expect that to occur rapidly. Solid return on investment should occur, but it won't be apparent immediately. Even early adopters, such as Procter & Gamble, "didn't know where the benefit was [when they first explored RFID]. They had an idea, but they didn't know where it was going to be until they actually implemented the technologies. So when you start to test RFID and when you start to really work with it, you'll begin to understand how it will deliver the eventual ROI to your business." (See RFID Journal, "The Cost of Compliance," by Christine Spivey Overby, senior analyst, Forrester Research, March 30, 2004.)

You have options. While the mandate requirements are strictly defined, end users have the ability to determine which path to compliance is most advantageous. Flexible complete solution providers can work with you to assess your situation and offer the portion of products or assistance that you want.

Arming yourself with a good understanding of the technology and important considerations can ensure that the decisions that you make will minimize errors. Visit www.symbol.com for white papers, executive guides and other documentation describing the business advantages as well as the latest developments in RFID. Good advice from a truly experienced provider can make a huge difference in developing, implementing and maximizing your RFID solution now, as well as realizing its benefits in the long run.

More information on WAWF can be found at: <https://wawf.eb.mil/FuncInfo.html>