

RFID Vision in the DoD Supply Chain

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Today's U.S. military is a dynamic, rapidly moving force designed to be effective in an asynchronous battlespace. The enhanced mobility and speed of a combat force capable of performing in austere theaters with limited infrastructure creates a new class of challenges for military logisticians. The performance of logistics during the combat phase of Operation Iraqi Freedom created a compelling case for change to fast, accurate, flexible, and mobile sustainment support.

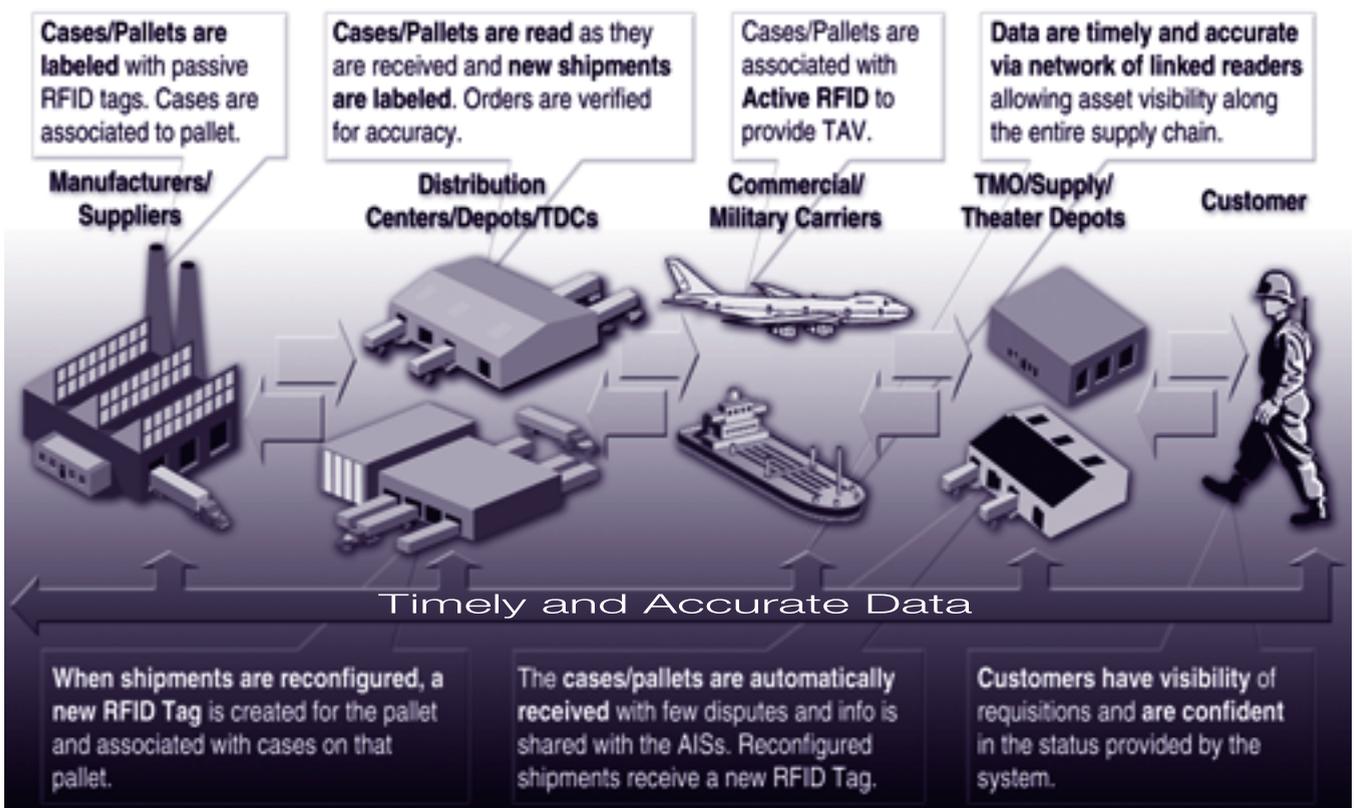
Historically, military logisticians supported the warfighter with limited information on assets, particularly in theater. This obstacle led to ineffective inventory management, introducing waste, inefficiency, and delay across the supply chain. Ultimately, these shortfalls impacted the warfighter's overall materiel readiness, the ability to close the force, and the operational availability of weapon systems. The lack of synthesized end-to-end, real-time theater information on assets (including both at-rest and in-

transit items) across all components, undercuts the ability of the combatant commander (COCOM) to exercise directive authority for logistics.

The bumper-sticker thought that is frequently used to refer to this issue is "visibility," but visibility is not an end in itself. Visibility is a tool to achieve specific outcomes in support of the following objectives:

- Reliably deliver the required item to the right location in the correct quantity at the time required from the most appropriate source
- Make available tools and information for decision makers to exercise effects-based management of the logistics network
- Manage end-to-end capacities and available assets across the end-to-end chain to best support warfighter requirements
- Promote the ability of the supported COCOM to effectively exercise directive authority over logistics.

FIGURE 1. Defense Department RFID-Enabled Supply Chain



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The Enabling Technology: Radio Frequency Identification

Radio Frequency Identification (RFID) is an enabling technology that will allow military logisticians to create synthesized and integrated end-to-end information on assets.

The Department of Defense is already a globally sophisticated user of active RFID, with over a decade of experience in the technology and the most extensive network in the world. Now the DoD is standardizing the use of active RFID and moving ahead with the application of passive RFID technologies. In 2004, the acting under secretary of defense for acquisition, technology and logistics issued a policy requiring the implementation of RFID across the DoD. The Department of Defense is taking a leadership role in passive RFID, both as an early adopter of the technology and by driving the development of the technology and standards.

The policy directs military services and defense agencies to immediately expand the use of high data capacity active RFID currently employed in the DoD operational environment. The policy also directs the phased application of passive RFID by DoD suppliers who will be required to put passive RFID tags on the cases and pallets of materiel shipped to DoD as well as the packaging of all items requiring a Unique Identification (UID). Beginning in 2005, DoD suppliers will be required to apply passive RFID on shipments of selected classes of supply going to the Defense Distribution San Joaquin, Calif., and the Defense Distribution Susquehanna, Pa. Further classes of supply and nodes will be added over the next several years, with full implementation expected by 2008.

DoD's Vision for RFID

The end state for the DoD supply chain is to be a fully integrated adaptive entity that leverages state-of-the-art enabling technologies and advanced management information systems to automate routine functions and achieve accurate and timely in-transit, in-storage, and in-repair asset visibility with the least human intervention. RFID is a foundational technology on the path to achieving this vision. DoD will ultimately operate a single, seamless, responsive enterprise visibility network, accessible across the backbone and usable by people and systems across the end-to-end supply chain. As a starting point, the DoD vision is for RFID to facilitate accurate, hands-free data capture in support of business processes in an integrated DoD supply chain enterprise as an integral part of a comprehensive suite of automatic identification technology (AIT) applications that DoD will leverage, where appropriate, in the supply chain to improve warfighter support, as depicted in Figure 1 on the previous page.

Clearly not all DoD logistics supply chain operations are captured in this picture. However, the primary actions

performed by the physical nodes to move materiel through the logistics chain are the shipping/receiving/transportation processes. Figure 1 shows materiel movement that physically "touches" each node throughout the logistics path. But materiel can start, end, and move through different paths between logistics nodes: manufacturers/suppliers to defense distribution center for stock replenishment; defense distribution center to supply depots/theater distribution center for stock replenishment outside the continental United States; defense distribution center to supply depots for stock replenishment in the continental United States; supply department/theater distribution center to customer; direct vendor delivery.

All these segments are impacted by RFID. Materiel movement includes moving retrograde back through the supply chain in the opposite direction. RFID (active and passive) read and write capabilities will be required at the farthest point in the supply chain delivery system to support retrograde. The return/retrograde process is the same as the shipping process.

With passive RFID, DoD will capture more granular data automatically, injecting advanced technology at the transactional level. This foundation will streamline the movement of materiel through warehouses and depots, increase inventory accuracy, and generate productivity improvements. Active RFID is a cargo-tracking capability and provides the ability to manage consolidated shipments. With the addition of passive RFID to the technology portfolio, the military is developing an end-to-end capability relying on complementary active and passive technologies to deliver an RFID suite applicable to all inventory—in-transit, in-process, or on the shelf.

Historically, information across the supply chain has been captured only at the predefined nodal touch points. The data capture has generally been used to update systems of record and in some situations, to generate status notifications. To speed the adoption and implementation of passive RFID technologies and accelerate the learning curve, components are initially using passive capabilities for transaction sets similar to (and sometimes identical to) legacy transactions. However, once the foundational implementations are established, the true promise of passive RFID may be realized. RFID delivers near real-time status, enables better inventory control (particularly in a deployed or combat environment), and can make track and trace around the world, across the silos, a reality.

No longer will the DoD be constrained to capturing information on at-rest and in-transit inventories at fixed locations. As RFID tagging becomes more ubiquitous and RFID technology more portable, real-time information can be captured wherever required to support the requirements of the COCOM. Equally important, the adoption of passive RFID standards will serve to undermine

the silos and barriers to information flow across and among the components that have historically been a challenge for the DoD. The military logistician will be able to deploy and move a logistics infrastructure and visibility capability as rapidly as the COCOM can deploy and engage the combat force.

RFID in the Bigger Picture of Automatic Identification Technology Apps

RFID is a part of a larger suite of AIT applications, all of which the DoD will leverage, where appropriate, in the supply chain. As an enabling technology, RFID data must be available to the automated information systems (AISs). To take advantage of the capabilities RFID provides, managers of all major logistics systems modernization programs will update appropriate program documentation to include the requirement for RFID capabilities as part of the system operational deployment in conformance with the business rules and initial timeline set forth in the DoD RFID Policy. Managers of major acquisition programs will update programs as required, including the requirement for RFID capabilities where applicable.

Active and passive RFID will continue to complement one another as passive RFID technology is implemented throughout the DoD. Many shipments moving through the defense transportation system are currently tracked using active RFID and a bar-coded military shipping label. The implementation of passive RFID will complement the current successes of active RFID for shipments outside the continental United States.

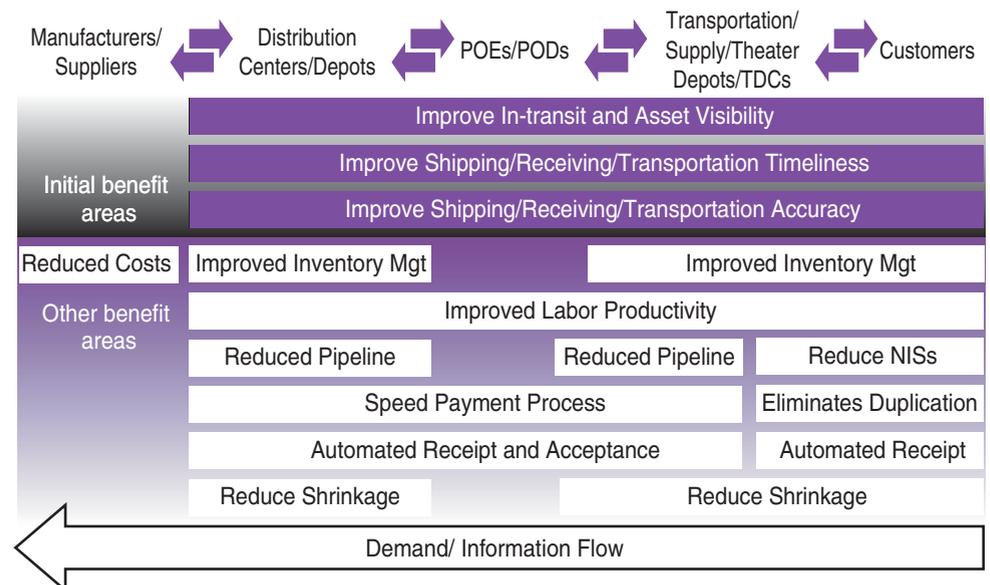
The association of a passive tag to an active tag will provide improved container stuffing and unstuffing time and improved accuracy to facilitate “inside the box/pallet/container” visibility. This passive and active association is created by building a “nested” structure of passive tags (UID item packaging, case and pallet tags) that are subordinate to the active tag (container and 463L pallet-level tags). Historically, active RFID has been excellent at providing nodal visibility. The implementation of passive tags provides efficient and accurate item and detailed content visibility. The marriage of active RFID with passive RFID will facilitate more accurate and timely automatic capture and reporting of data within the multiple layers of information required in DoD’s dynamic environment.

The Relation of RFID to UID

RFID deployment also complements the ongoing Unique Identifier (UID) initiative. While the UID and RFID initiatives are closely related, they have important fundamental differences. UID is a permanent, unambiguous, and globally unique identifier for an item. RFID is a means of collecting data using radio frequency technology. RFID will be used as a hands-free data collection method to identify UID items located within various levels of materiel packaging. In order to identify the UID item using RFID, the RFID tag data on the unit packs, shipping containers, exterior containers, and palletized unit loads must be associated to the UID information in a logistics system. Using RFID tags as a means of data collection and associating the tag data with UID information will help maintain precise UID asset/in-transit visibility and to improve data quality, item management, and maintenance of UID materiel throughout the DoD supply chain. The hands-free data collection method will help extend and take advantage of the implementation of the UID policy. However, the UID initiative requires a data matrix be applied to each UID item. The data matrix is a two-dimensional barcode, an alternate form of AIT. The combination of 2D barcode and RFID technologies incorporated into AIT equipment will facilitate the UID and RFID relationship.

Because of the “nested” structural relationship that will result, it is envisioned that passive RFID will be used to verify contents, track physical movement, and virtually build the contents of a 463L pallet or SEAVAN container. Passive RFID will accurately verify, in real time, and communicate to the local AIS (and personnel physically loading the pallet/container) the contents of the 463L pallet or SEAVAN container. Once the pallet/container is properly configured, an active tag is attached to the 463L pallet or SEAVAN container to track and trace the trans-

FIGURE 2. High-Level Illustration of the Benefits of RFID Across the DoD Supply Chain



portation. At the final destination, when the pallet/container is unloaded, passive RFID will again verify the contents and track the physical movement of the materiel within the destination node. Additionally, this nested data will be used to create a transaction of record and close the transportation transaction once the items are received.

As stated before, RFID is part of a family of AIT devices that includes, but is not limited to, bar codes, optical memory cards, smart cards, micro-electro mechanical systems, and satellite tracking systems. RFID and bar codes will coexist for several years, as both technologies have their merits. However, RFID brings several benefits over bar codes:

- Eliminates human error
- Improves data accuracy/asset visibility
- Performs in rugged, harsh environments
- Allows for dynamic, multi-block read/write capability
- Facilitates source data collection
- Allows for simultaneous reading and identification of multiple tags.

The employment of RFID provides several benefits to the overall DoD supply chain. Figure 2 on the previous page identifies these potential benefits and the respective nodes.

DoD-wide Business Process Change

It is envisioned that each military service and defense agency will review its internal business processes to further refine the most appropriate employment of RFID. The widespread integration of RFID into the DoD business processes should be managed with the same level of attention as a major system fielding. Although this technology enables accuracy and timeliness of data within current and future systems of record, introducing RFID will require significant planning, equipment fielding, AIS changes, and training. The systems approach should be taken to ensure a long-term, fully integrated solution.

The real value of RFID lies not in what we know it can do today, but in uncovering what it will do in the future. DoD is in the midst of the most fundamental transformation of logistics capability ever attempted, and RFID is a foundational element. Through RFID deployment, DoD is laying a foundation that allows military logisticians to see an exciting capability—Web-centric logistical control—riding on new applications able to see and manage end to end not just the enterprise-centric silos managed by legacy approaches today, but factory to foxhole, delivering the right item to the right place at the right time, even in the face of rapidly evolving conditions in the battlespace.

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