

RFID: Crossing the Chasm

BY GALEN GRUMAN

IT moves tagging technology beyond retail into new territory to gain real-time control over assets

ANYONE WHO SELLS CONSUMER GOODS TO BEST Buy, Target, or Wal-Mart knows that tagging product pallets with RFID tags is mandatory. The tags help suppliers and retailers speed the tracking of inventory as it moves from manufacturer warehouses to transportation centers and eventually to retailer warehouses.

But RFID has benefits that reach far beyond inventory tracking. By combining RFID tags with asset management systems, enterprises are implementing sophisticated, real-time asset control processes. "Asset management is one of the biggest growth areas for RFID," says Erik Michielsen, RFID analyst at ABI Research.

RFID brings expanded benefits to more parts of the organization than just the warehouse.

Major automakers, including BMW and Toyota, and shipping companies, such as NYK Logistics, were among the first to deploy RFID for asset management. They used WhereNet's active RFID tags — transponders that emit a signal — on cars or shipping containers waiting in shipping lots. By monitoring these tags within asset management systems, these companies can ensure that the lot gates alert guards when a vehicle leaves the lot outside its scheduled time or that the right container is placed on the right truck or train. Transponders such as WhereNet's are typically the size of several decks of cards, which restricts their use to large objects, and cost between \$40 and \$80.

But passive RFID tags are cheap (often costing less than a dime) and small (about the size of a postage stamp, and not much thicker), allowing them to be affixed to small items such as laptops, chemical containers, ID badges, and aircraft parts. This enables affordable tracking of a wide range of objects, not just big ones.

For example, Virgin Atlantic Airways plans to use RFID tags on aircraft parts to track their location in repair shops and to store maintenance data so that crews can see what parts need repair while they are still in the aircraft. And, Robert Bosch Tool recently began offering RFID tags on 65 commercial-grade models of its tools for use by larger construction companies to help speed up equipment check-in and checkout at job sites. It charges between 1 percent and 5 percent more for the RFID-equipped tools, which can be read by the two main tool management systems from ToolMaster Technologies and ToolWatch. For about \$10 per tool, the company will place tags inside competitors' tools. In the coming years, John Doherty, product manager at Bosch, expects hardware makers to offer construction companies RFID readers that can also write information, thereby allowing contractors to track repair and usage history and thus use the tags to manage tool maintenance and replacement cycles.

Many of the early adoptions of RFID for asset management have started with traditional inventory management deployments, expanding as IT proves RFID brings benefits to more parts of the organization than just the warehouse.

NASA Retools Its Chemical Operations

At its Dryden Flight Research Center at Edwards Air Force Base, north of Los Angeles, NASA and its contractors use lots of chemicals when developing and servicing aircraft. Many are corrosive, prone to exploding when mixed with other

chemicals, or hazardous to human health and the environment. Yet, they are spread across large areas, located at NASA, Air Force, and contractor hangars, in staging areas on runways, and on the desert floor.

NASA had used bar codes on chemical containers and had relied on staffers at the dispensaries to scan each chemical and record the amount dispensed and to whom it was dispensed. But with budget cuts for its operations staff, NASA needed a more efficient approach, says Tom Ambrose, environmental and safety officer at Dryden Flight Research Center.

So the agency deployed RFID tags on all its containers. It also put readers in various storage lockers, which weigh the containers to track usage and make sure the right material is stored in each locker. This process helps avoid dangerous combinations by comparing the chemicals' actual weights with their expected weights. At entrances to work areas, the agency has placed Intermec RFID portal readers to monitor what chemical containers come in or leave, as well as with whom, which is assessed by reading RFID tags on employee badges.

The Dryden system is connected to an Oracle-based database and an asset control application called the Hazardous Materials Management System. It takes inventory every few seconds at all locations and uses that information to determine what chemical containers are where and with whom and then correlates that status to the process rules, Ambrose says. This helps ensure that chemicals don't end up in the wrong place, get used by unqualified or unauthorized technicians, or get taken out of the facility altogether. (Frequent checking helps overcome the occasional blip in reading a tag that leads to false alarms; the system is programmed to ignore instances in which a container seems to disappear for a few seconds but alerts security staff if it doesn't reappear after a few cycles.)

The automated system allows NASA to get by with fewer staff members, and Ambrose is now exploring whether the automated system will allow Dryden to make some chemi-



NASA labels its chemical containers with RFID tags to avoid dangerous combinations during storage and handling.

PHOTO: COURTESY OF NASA

icals available through self-service automated kiosks, which would cut down on technicians' travel time when retrieving commonly used chemicals from depots.

By combining this data with information on container weight from storage lockers, the system can also detect how much of each material has been used, which helps fine-tune replenishment. NASA is trying to reduce the amount of chemical material it orders and stores, given that the disposal of unneeded or expired chemicals often costs more than the chemicals themselves, Ambrose says.

Ambrose expects the next stage will be to move to Generation 2 RFID tags, which provide authentication, thereby allowing NASA to control who is authorized to read specific information on the tags. His concern is that as chemicals are shipped to or from NASA on public highways, terrorists could read the earlier-generation tags and figure out what chemicals are in the trucks. Through authentication, NASA systems would have full access to the information; public

safety officials such as police would have access only to basic information, such as how to isolate the material in case of an accident; others would have no access whatsoever.

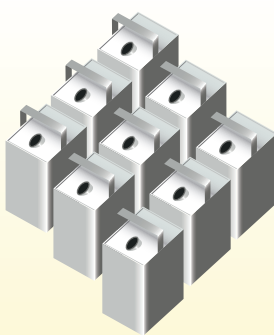
Hewlett-Packard Curbs Network Downtime

Product manufacturers often create lots of data about their products as they move through the assembly line to make sure any defects are tracked and that the system is flowing smoothly, with parts going to the right stations in the right condition. But that creates a complex network that's difficult to maintain, says Greg Edds, manager of global operations at Hewlett-Packard. Worse, if the network gets overloaded or goes down, the whole assembly line is stalled.

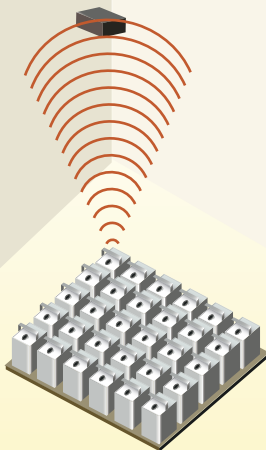
That's why HP is implementing the new RFID Generation 2 tags and readers in its Brazil printer plant. (Gen2 tags can be read by multiple brands of readers and can store more information than can earlier-generation tags.)

NASA Ramps Up Safety

National Space agency tracks chemical usage at its Dryden Flight Research Center via RFID tagging. Security staff is alerted if chemicals are moved or used improperly.



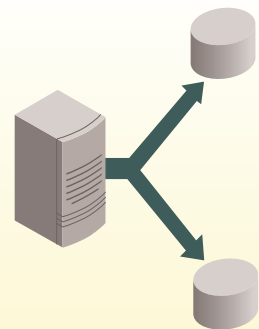
1. RFID tags on all chemical containers track movements throughout the facility.



2. In the storage warehouse, tagged containers are weighed to gauge how much material has been used.



3. Portal readers at work entrances correlate workers to which containers they are handling.



4. The Hazardous Materials Management System combines an Oracle-based database and an asset control app.

“Add some software and active RFID tags, and you can know the exact location of an asset.”

— Marcus Torchia, Yankee Group



Hewlett-Packard has installed RFID portal readers in its Brazil printer plant.

Rather than wire each station to the network, HP has deployed devices that can read an RFID tag affixed to a unit under construction to get its history and status and then write the updated status to the tag as the part moves on to the next station.

“The only network connection is to the last station on the line to upload the complete history of the product for final production tracking and historical analysis,” Edds says. “So the server infrastructure can be

reduced. In case of network loss, the results can be stored locally until the network is back up, which eliminates any factory disruption.”

Edds expects the RFID approach to reduce network management costs and make the assembly line more efficient, although he won't reveal estimated savings. HP is also using RFID readers elsewhere in its production facilities to meet mandates by several of its retailers that all product boxes have RFID tags. For example, at its Memphis, Tenn., scanner and printer assembly plant, HP tags product boxes and pallets to monitor their location in both the production facility and warehouses. That's particularly important for HP because several subcontractors work on premises, so HP needs to record when products leave the subcontractors' ownership and become owned — and thus paid for — by HP. HP's experience with this more traditional use of RFID gave the company the comfort level to pilot the asset management project at the Brazil factory, Edds says.

Social Security Administration Rejuvenates Asset Management

The Social Security Administration frequently takes inventory of its office equipment to make sure taxpayer-paid resources remain accounted for. In the past, the agency's auditors would scan bar-code labels on each piece of equipment, which is a slow process because the bar codes first had to be located on the equipment. But now, having become comfortable with the technology in its warehouses, the

agency's logistics group uses RFID tags, says Gary Orem, the group's project manager.

Quickly, the group's IT team realized that the RFID technology could do more than just track pallets of pamphlets and stationery: It could help actively control access to equipment. So the agency is now experimenting with a system to track when equipment is moved from an area, starting with the IT offices in Washington, D.C., that also house loaner equipment. Access to that area is fairly open. Because the doors are often left unlocked, it's not hard for someone to drop by and borrow equipment without formally checking it out. So the group has placed an RFID reader on the door to detect when equipment passes through. The idea is to see how accurate the reader is at such a location. Next, the group will install a motion detector to determine whether the equipment is coming or going, says Matthew Anderson, a programmer in the group. Then, it will tie in the RFID reader's data with the agency's SQL database and Oracle asset management system to enable real-time tracking of the loaner and IT equipment.

The ultimate goal, Orem says, is to track all equipment in the building and to discover in real time when equipment leaves the building. That will require putting readers at exits and connecting them to the agency's asset management system to verify whether permission was granted to remove the equipment, alerting security staff — and perhaps even locking the doors automatically — if not. Orem would also like to



The Social Security Administration correlates data from its readers to the agency's SQL database and Oracle asset management system.

PHOTO (TOP): COURTESY OF HEWLETT-PACKARD; PHOTOS (LEFT AND TOP RIGHT): COURTESY OF SOCIAL SECURITY ADMINISTRATION

track who is taking the equipment by having RFID tags on employees' badges, to make sure the person carrying the equipment is authorized to do so. That means coordinating with the agency's security group, which would need to deploy the RFID tags on employee badges and link its systems to those within the logistics group. In September, the security group agreed to consider doing so.

The agency is also using RFID to regulate access to its fueling center. Until recently, employees had a fuel card they swiped at the pump to dispense the gasohol used in the agency's vehicles. But that system couldn't ensure that the vehicle being fueled belonged to the agency. Also, the agency was getting mileage and other car-status information manually, as employees filled out forms, often with errors, Orem recalls. So the agency has added RFID tags to the fuel pumps' nozzles and a reader to the agency's vehicles. (The RFID reader's sensor is put in the gas tank's collar and is connected by wire to the reader stored in the car's trunk.) When the nozzle is inserted into the tank, the

reader validates the pump and then sends a wireless signal to the pump to turn it on. The reader is also connected to the vehicle's computer, which keeps data on mileage and operational status. This data is uploaded at the same time, so the agency gets accurate records of mileage and can detect repair and maintenance needs automatically, Anderson says. The cost, Orem says, is about \$200 for each of the fleet's 65 vehicles, a small cost, indeed, when measured against the potential savings. ↻



The Social Security Administration extends its RFID system all the way to the gas that fuels its fleet of vehicles.

A New Generation of RFID

RFID TECHNOLOGY IS CHANGING. Advancements continue to make active tags smaller and more affordable so they can be used for smaller items, not just cargo containers or automobiles.

Moreover, the Generation 2 tag standard, called Gen2, brings several benefits: less signal interference with other tags when multiple readers are in use; cross-vendor interoperability; faster read rates (as much as 10 times faster); required use of a unique identifier to help validate identity; support for authentication through an optional, encrypted, nonbroadcast password; international interoperability; kill support so that a reader can disable a tag that is no longer needed; and reduced power consumption for the readers. The standard was ratified in December 2004 by the EPCglobal industry group. Manufacturers have just begun shipping Gen2 tags.

Current RFID tags are passive, reflecting a radio signal back to a reader. When the signal reaches the tag, it bounces off the embedded chip, which changes the radio signal slightly to encode its data — similar to the way paint reflects back specific colors when full-spectrum light is shone on it. That bounce-back approach typically limits passive RFID tags' range to about 10 feet.

Active tags — essentially transponders — can have radio ranges of hundreds of feet, making them ideal for tracking objects in large areas. But they require a power source (usually a battery), radio, and an antenna and thus typically are the size of several decks of cards. They also cost between \$40 and \$80, as opposed to 10 cents for passive RFID tags. These factors combine to limit their utility to just large, highly valuable objects. The active tag

readers are more costly as well.

But in the next few years, the active tags will get smaller and cheaper, making them more suitable for smaller, lower-value items, says Marcus Torchia, senior wireless analyst at Yankee Group. And because most work with the increasingly common 802.11 networks, they will easily fit into most organizations' IT infrastructure, he says.

"Add some software and active RFID tags, and you can know the exact location of an asset," Torchia says. Plus, active tags eliminate the need for portals or gates that are used in passive RFID environments to funnel objects close enough to the readers. According to Torchia, active tags also allow for more applications by offering two-way communications, sensor integration, independent system intelligence, and constant visibility. — G.G.

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1. Over the course of one year, do you buy, specify, recommend, or approve the purchase of the following products or services worth:

Please include amounts for all locations of your organization. Consultants: please include what you recommend for your clients as well as what you buy for your own business.

- | | | |
|----------------------------------|--------------------------------|----------------------------|
| 01. \$100 million or more | 06. \$5,000,000 to \$9,999,999 | 11. \$100,000 to \$399,999 |
| 02. \$50,000,000 to \$99,999,999 | 07. \$2,500,000 to \$4,999,999 | 12. \$50,000 to \$99,999 |
| 03. \$30,000,000 to \$49,999,999 | 08. \$1,000,000 to \$2,499,999 | 13. Less than \$49,999 |
| 04. \$20,000,000 to \$29,999,999 | 09. \$600,000 to \$999,999 | 14. None |
| 05. \$10,000,000 to \$19,999,999 | 10. \$400,000 to \$599,999 | |

Product category	Write code in box
Large systems	<input type="text"/>
Client computers	<input type="text"/>
Networking / Telecom (including servers)	<input type="text"/>
Wireless	<input type="text"/>
Internet / Intranet / Extranet	<input type="text"/>
Security	<input type="text"/>
Storage	<input type="text"/>
Peripheral equipment	<input type="text"/>
Software	<input type="text"/>
Service/Support / Outsourcing	<input type="text"/>

2. What is your primary job title? (PLEASE CHECK ONE ONLY)

- | | |
|---|---|
| IT / Technology Management | <input type="checkbox"/> 10. IT Staff |
| <input type="checkbox"/> 01. CTO, CIO, CSO, Vice President | <input type="checkbox"/> 11. Other IT Professional |
| <input type="checkbox"/> 02. Director | Corporate / Business Management |
| <input type="checkbox"/> 03. Manager / Supervisor | <input type="checkbox"/> 12. CEO, COO, President, Owner, Vice President |
| <input type="checkbox"/> 04. Network Manager / Director | <input type="checkbox"/> 13. CFO, Controller, Treasurer |
| <input type="checkbox"/> 05. Engineer | <input type="checkbox"/> 14. Director |
| <input type="checkbox"/> 06. Systems Analyst / Programmer / Architect | <input type="checkbox"/> 15. Manager / Supervisor |
| <input type="checkbox"/> 07. Other IT Management | <input type="checkbox"/> 16. Other Business Management Title |
| IT / Technology Professional | |
| <input type="checkbox"/> 08. Consultant / Integrator | <input type="checkbox"/> 98. Other Title |
| <input type="checkbox"/> 09. Developer | (specify) _____ |

3. Please indicate your job function(s)? (PLEASE CHECK ALL THAT APPLY):

- | | |
|--|--|
| IT / Technology Functions | Corporate / Business Functions |
| <input type="checkbox"/> 01. Executive | <input type="checkbox"/> 09. Executive |
| <input type="checkbox"/> 02. Department Management - IT | <input type="checkbox"/> 10. Department Management - Business |
| <input type="checkbox"/> 03. Networks / Systems Management | <input type="checkbox"/> 11. Financial / Accounting Management |
| <input type="checkbox"/> 04. Applications Development | <input type="checkbox"/> 12. Research / Development Management |
| <input type="checkbox"/> 05. Management of Enterprise Applications (CRM, ERP, SCM, etc.) | <input type="checkbox"/> 13. Sales / Marketing Management |
| <input type="checkbox"/> 06. Research / Development Management | <input type="checkbox"/> 14. Other Business Functions |
| <input type="checkbox"/> 07. Consultant / Integrator | <input type="checkbox"/> 98. Other Functions |
| <input type="checkbox"/> 08. Other IT Functions | (specify) _____ |

4. Are you involved in buying, specifying, recommending or approving the following IT products / services?

(PLEASE CHECK ALL THAT APPLY):

- | | |
|---|--|
| Software / Products / Technologies | <input type="checkbox"/> 18. Web / Video Conferencing |
| <input type="checkbox"/> 01. Customer Relationship Management | <input type="checkbox"/> 19. Storage |
| <input type="checkbox"/> 02. Enterprise Resource Planning | <input type="checkbox"/> 20. Disaster Recovery |
| <input type="checkbox"/> 03. Business Process Management / Outsourcing | <input type="checkbox"/> 21. Security |
| <input type="checkbox"/> 04. Business Intelligence / Data Mining / Data Warehousing | <input type="checkbox"/> 22. Anti-Virus / Content Filtering |
| <input type="checkbox"/> 05. Portals | <input type="checkbox"/> 23. Firewall |
| <input type="checkbox"/> 06. Financials / Payroll / Billing | <input type="checkbox"/> 24. VPN |
| <input type="checkbox"/> 07. Performance / Application Management | <input type="checkbox"/> 25. Identity Management |
| <input type="checkbox"/> 08. .NET | <input type="checkbox"/> 26. Authentication / Authorization |
| <input type="checkbox"/> 09. Other Software | <input type="checkbox"/> 27. Intrusion Detection & Prevention |
| <input type="checkbox"/> 10. Networking | <input type="checkbox"/> 28. Encryption |
| <input type="checkbox"/> 11. Web Services | <input type="checkbox"/> 29. Other IT Products / Technologies |
| <input type="checkbox"/> 12. Content Delivery Networks | Hardware / Peripherals |
| <input type="checkbox"/> 13. Network and Systems Management | <input type="checkbox"/> 30. Servers |
| <input type="checkbox"/> 14. VoIP (Voice Over IP) | <input type="checkbox"/> 31. Notebooks / Laptops |
| <input type="checkbox"/> 15. Telecommunications | <input type="checkbox"/> 32. PDAs / Handhelds / Pocket PC / Wireless |
| <input type="checkbox"/> 16. Wireless | <input type="checkbox"/> 33. Printers |
| <input type="checkbox"/> 17. Remote Access | <input type="checkbox"/> 34. Other Hardware / Peripherals |

5. What is your organization's primary business activity at this location? (PLEASE CHECK ONE ONLY):

- | | |
|--|--|
| General Business Industries | Technology Providers |
| <input type="checkbox"/> 01. Defense Contractor / Aerospace | <input type="checkbox"/> 12. Service Provider (MSP, BSP, ISP, ASP, etc.) |
| <input type="checkbox"/> 02. Retail / Wholesale / Distribution (non-computer) | <input type="checkbox"/> 13. Computer / Network Consultant |
| <input type="checkbox"/> 03. Pharmaceutical / Medical / Dental / Healthcare | <input type="checkbox"/> 14. Systems / Network Integrator, VAR / VAD |
| <input type="checkbox"/> 04. Financial Services / Banking | <input type="checkbox"/> 15. Technology Manufacturer (hardware, software, peripherals, etc.) |
| <input type="checkbox"/> 05. Insurance / Real Estate / Legal | <input type="checkbox"/> 16. Technology - Related Retailer / Wholesaler / Distributor |
| <input type="checkbox"/> 06. Transportation / Utilities | Government / Education |
| <input type="checkbox"/> 07. Media (print / electronic) | <input type="checkbox"/> 17. Government: federal (including military) |
| <input type="checkbox"/> 08. Communication Carriers (telecomm, data comm., TV / cable) | <input type="checkbox"/> 18. Government: state or local |
| <input type="checkbox"/> 09. Construction / Architecture / Engineering | <input type="checkbox"/> 19. Education |
| <input type="checkbox"/> 10. Manufacturing & Process Industries (non-computer) | <input type="checkbox"/> 98. Other |
| <input type="checkbox"/> 11. Research / Development | (specify) _____ |

6. How many people are employed at this organization, including all of its branches, divisions and subsidiaries?

(PLEASE CHECK ONE ONLY):

- | | |
|---|--|
| <input type="checkbox"/> 1. 20,000 or more | <input type="checkbox"/> 5. 500 - 999 |
| <input type="checkbox"/> 2. 10,000 - 19,999 | <input type="checkbox"/> 6. 100 - 499 |
| <input type="checkbox"/> 3. 5,000 - 9,999 | <input type="checkbox"/> 7. 50 - 99 |
| <input type="checkbox"/> 4. 1,000 - 4,999 | <input type="checkbox"/> 8. Less than 49 |

7. Which of the following operating systems are in use or planned for use at this location?

(PLEASE CHECK ALL THAT APPLY):

- | | |
|--|---|
| <input type="checkbox"/> 01. Windows XP | <input type="checkbox"/> 04. Linux / Unix / Solaris |
| <input type="checkbox"/> 02. Other Windows | <input type="checkbox"/> 05. Other |
| <input type="checkbox"/> 03. Mac | (please specify) _____ |

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