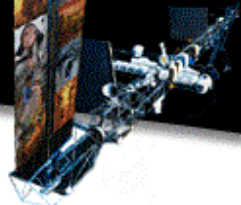


RFID Technology Defined –Current and Future Impact on Your Business!

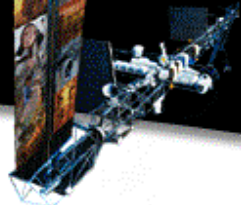
ClearOrbit™
real-time supply chain execution



**“The question is not will RFID
change the way you do business,
the question is will you be ready?”**

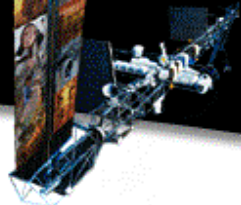
*Colin Cobain
Chief Technology Officer*

TESCO
Every little helps

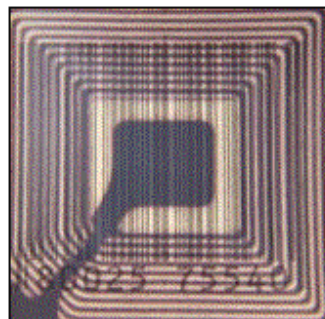


Agenda

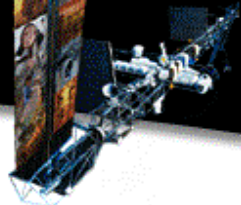
- **Overview**
- **RFID Technology 101**
- **Customer Requirements**
- **Solutions**



Enter RFID



- **All benefits of bar code plus:**
 - No human intervention
 - No line of sight requirements
 - Simultaneous reads
 - Read/write tags



Promise of RFID – “Silent Commerce”

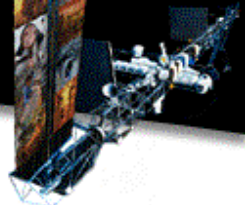


- **Reduce fixed asset inventory 1 – 5%¹**
- **Reduce receiving expenses 65%²**
- **Revenue gains of 1 – 3%³**
- **Inventory reductions 10 – 30%²**

¹MIT/AutoID Center

²Accenture

³Forrester Research



RFID – new technology?

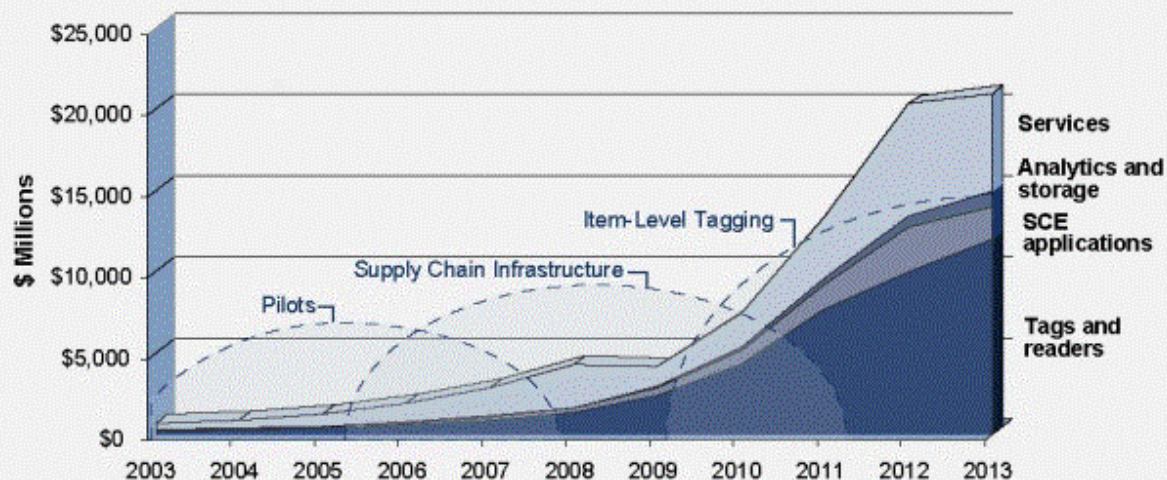
- Developed in 1944 by British to identify aircraft
- Meat tagging
- Security / entry applications
- Gasoline pumps (EZPass)
- Tollbooth applications
- Container tracking with GPS
- Retail item tagging





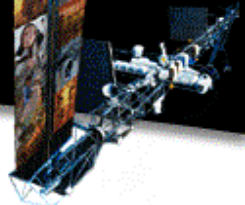
Prediction on Adoption

Figure 2: RFID market evolution



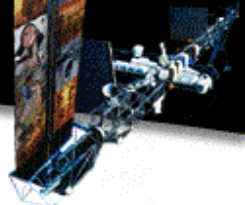
Source: AMR Research, 2003

AMR Research, Inc. copyrighted information
RFID Will Be Bigger than Y2K, July 31, 2003 Scott Lundstrom



Risks & Limitations

- **Immature Technology**
 - Evolving Technology
 - Evolving Standards
- **Price Point**
- **Various Materials Cause Readability Issues**
- **More sophisticated automated decision management systems**
 - Elimination of User Interface
 - Host System Impact
 - Amount of data generated and validated

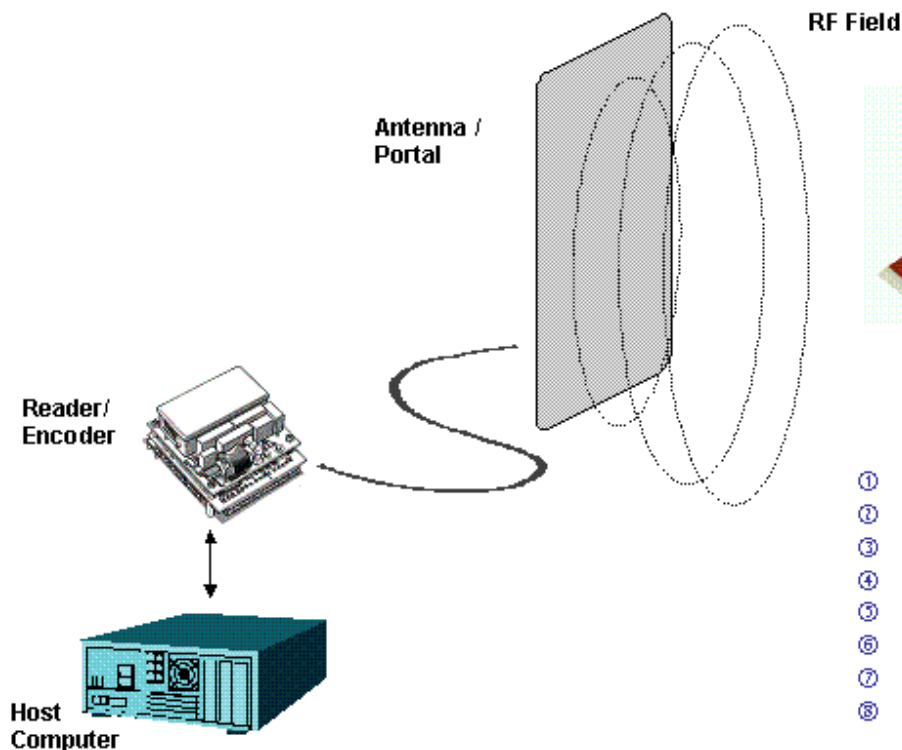


Agenda

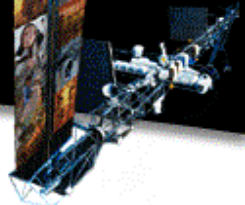
- Overview
- **RFID Technology 101**
- Customer Requirements
- Solutions



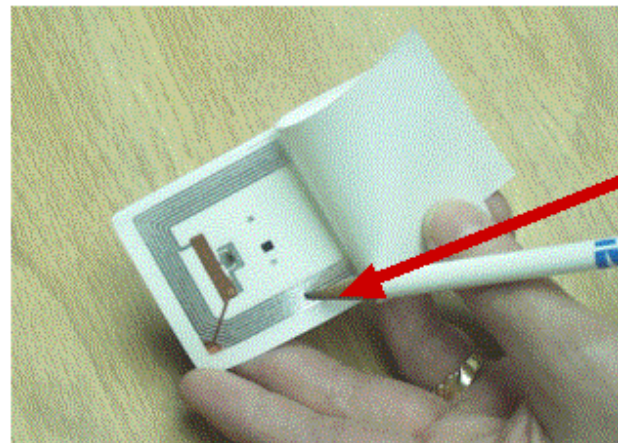
What is RFID?



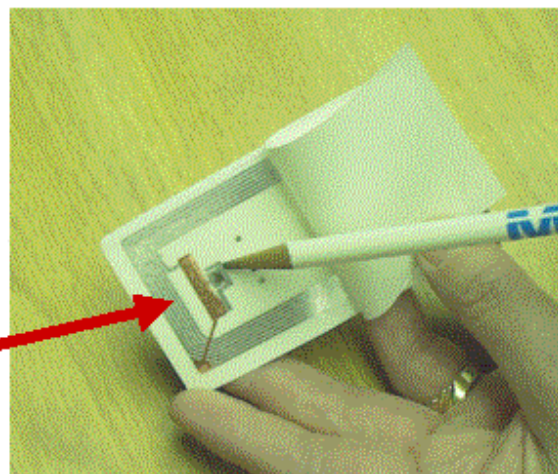
- ① Tag enters RF field
- ② RF signal powers tag
- ③ Tag transmits ID, plus data
- ④ Reader captures data
- ⑤ Reader sends data to computer
- ⑥ Computer determines action
- ⑦ Computer instructs reader
- ⑧ Reader sends data to tag



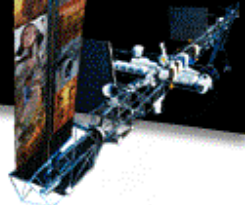
RFID Label



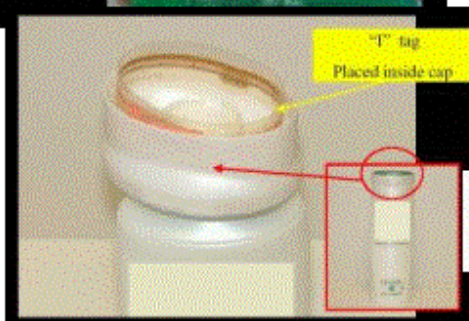
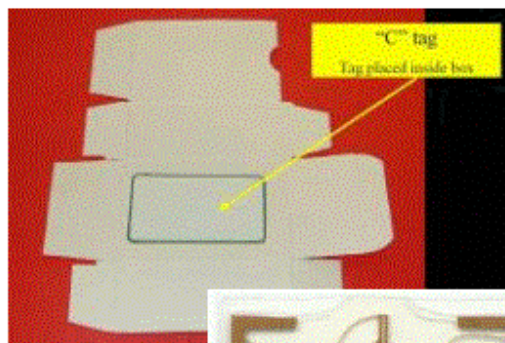
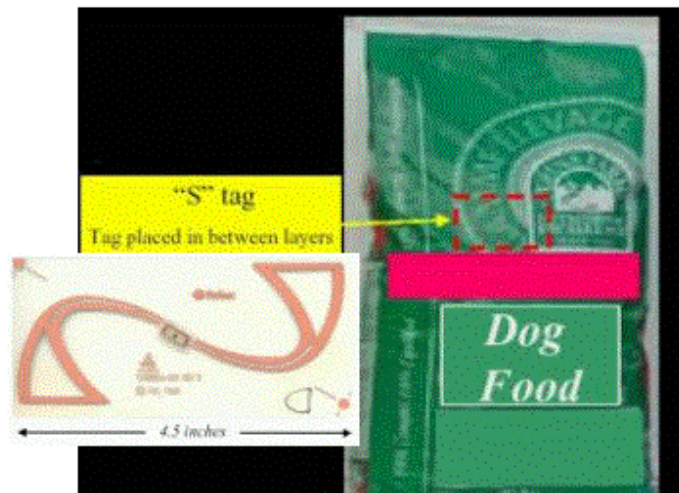
RFID Antenna

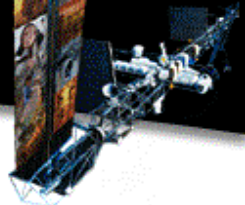


RFID Chip



Item-Level Packaging Examples





Tag Power

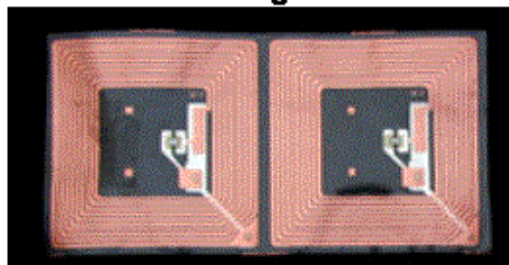
- **PASSIVE - Beam Powered**

- Converts RF energy into DC power
- Very Long Life products
- Range is dependent on several factors:
 - Reader Transmit Power
 - Reader Sensitivity
 - Integrated circuit efficiency
 - Environmental conditions

- **ACTIVE - Battery Powered**

- Generally operate asynchronously
- Battery boosts range and tag sensitivity
- Battery powers onboard functions when away from reader

Passive RFID Tag



Active RFID Tag

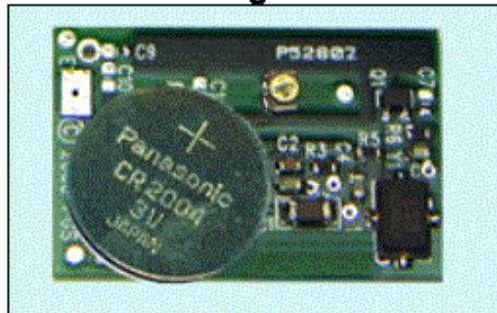
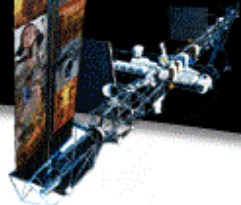
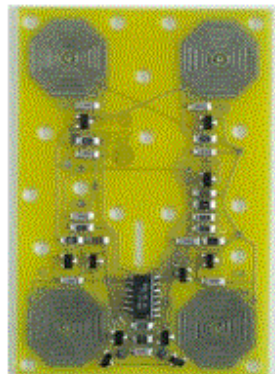


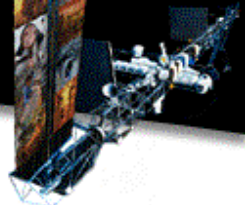
Photo Source: PSC Electronics



Tag Memory



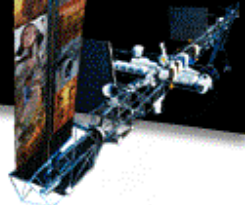
- **Read Only Memory (ROM):**
 - Data is burned into IC at manufacture
 - Can never be changed
 - Virtually no control or alignment of data content with respect to enterprise
- **Write Once, Read Many (WORM)**
 - Data generally written into the IC at factory and locked
 - When locked can not be reprogrammed
- **Read/Write**
 - Some data may be programmed at the factory and locked
 - Other data may be written, erased and rewritten into memory in the field
 - By customer individually
 - During operation



Frequency

- **Low Frequency - 125 KHz to 134 KHz. Worldwide**
 - Good for liquids, good near metal.
 - Relatively expensive tags, very wide variety of shapes.
 - Can have large antennae with 4 to 5 feet of range.
- **High Frequency - 13.56 MHz. Worldwide**
 - Good for liquids, poor near metal.
 - Inexpensive tags, very wide variety of shapes, good Standards.
 - Generally up to 3 feet of range.
- **UHF - 902-928MHz, 868MHz, 862-869MHz.**
 - Poor near liquids or metals.
 - Very inexpensive tags, restrictions on shape.
 - Ranges of over 10 feet.
- **uW - 2.45GHz. Worldwide**
 - Very poor near liquids or metals.
 - Very small tags, potentially very low cost.
 - Ranges around 3 feet.





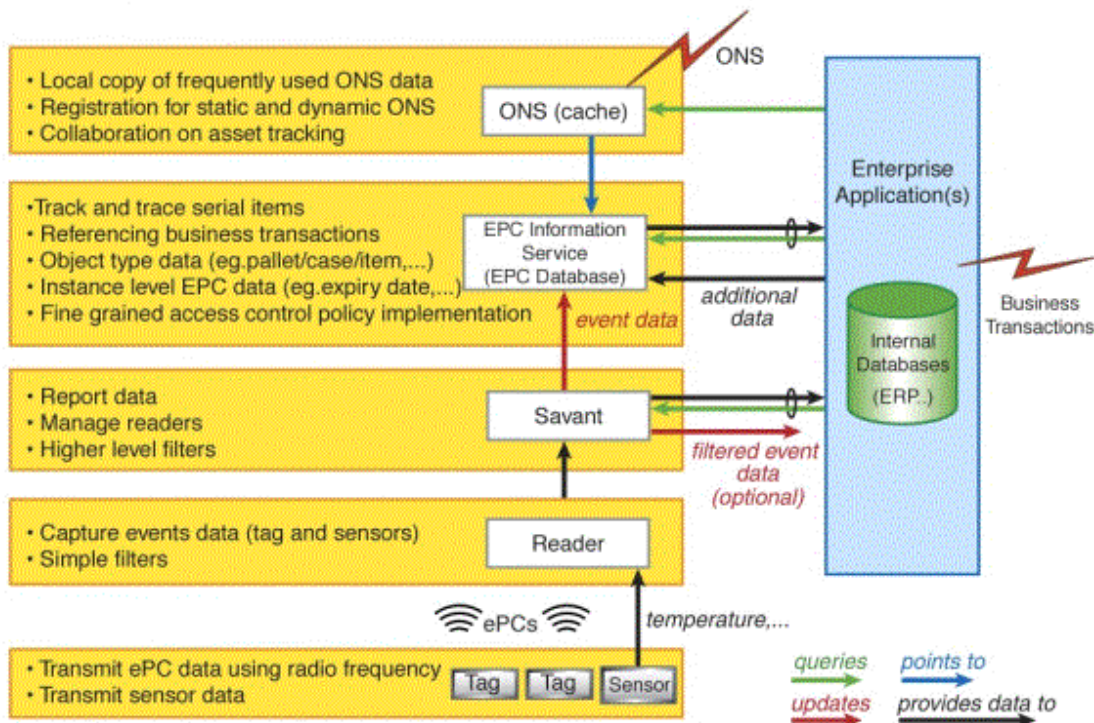
RFID “Smart Labels”

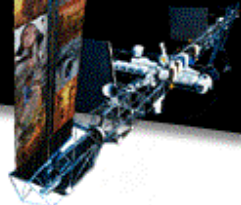
- **RFID tag embedded in bar code label**
- **RFID tag programmed and validated during the print process**
- **Provides three modes of data transfer:**
 - Visual (text)
 - Barcode
 - RFID
- **Ideal for “hybrid” applications**





EPC Network Architecture-inside the Enterprise

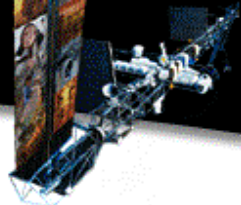




EPC Tag Classes

- **Class 0**
 - Preprogrammed at manufacture (read only)
 - UHF (900 MHz)
 - Readers not interoperable w/ other classes
 - Class 0 + is read/write
- **Class I**
 - Write Once, Read Many
 - 2 versions, 900MHz and 13.56MHz
 - Readers not interoperable w/ other classes
- **Class I v 2 (not finalized)**
 - Works in any country
 - Reads ISO-18000-6, Class 0 and Class I
 - More memory
- **All can be sent a 'kill' command**
- **4 varieties of EPC – 3 64 bit and 1 96 bit**

EPCglobal 



EPC Tag Format

- **Example EPC**
- **01 0020XY 10CC01 002046BE**
 - **Header (8-bits)**- defines the number, type and length of all subsequent data
 - **EPC Manager (28-bits)** - identifies the entity (most often the manufacturer) responsible for tracking and maintaining the object class and serial number codes
 - **Object Class (24-bits)**- acts as the tracking mechanism for specific groups- e.g., SKU, lot number, etc.
 - **Object Identification Number (36-bits)**- serves as the unique identification number for the item.

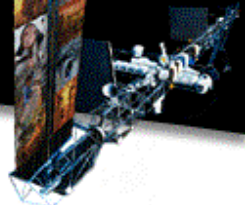
Electronic Product Code:

01
Header

0004Y7
PC Manager

0002B9
Object Class

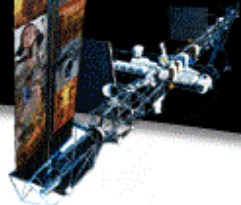
000622CA
Serial Number



RFID Hardware Providers

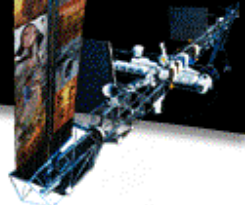
- **Chips / Tags**
 - Alien, Matrics, Texas Instruments, Phillips, etc.
- **Readers**
 - Intermec, LXE, SAMSys, Symbol, etc.
- **Printer / Encoder**
 - Printronix, Zebra, etc.
- **Smart Labels**
 - Moore Wallace, Printronix, Zebra, etc





Associated Devices

- **Barcode**
- **GPS**
- **RTLS**
- **Sensors (temperature, pressure)**



Agenda

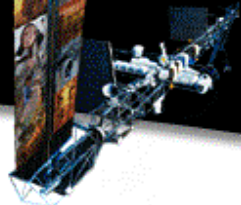
- Overview
- RFID Technology
- **Wal-Mart & DoD Requirements**
- Solutions



Wal-Mart's Goal

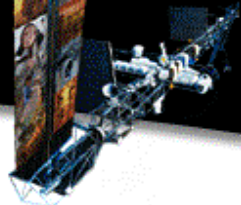


- 100% real-time visibility from packaging provider to the retail shelf
- Implement lean manufacturing processes across supply network
- Resulting in:
 - Lower than ever cycle times
 - Lower than ever inventory in the supply chain
 - Maintain the "Always Low Price" Model
- Competitive Necessity
 - External and internal adaptation of technology
 - Push technology upstream

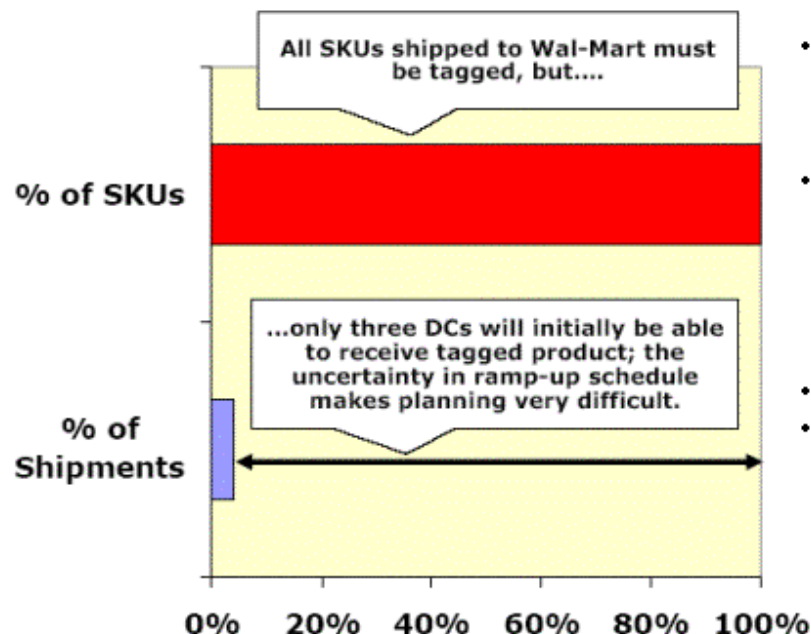


Wal-Mart's Requirements

- **Pallet Level Tag & Case Level Tagging**
- **EDI ASN to include pallet & case tag ID's**
- **Cases must be 100% readable within 10 feet on 540 FPM**
- **Tag specifics:**
 - 96-bit EPC tag with embedded Global Trade Inventory Number (GTIN) and serial number
 - Will accept any UHF EPC Class 0/1 today
 - Class 1 G2 moving forward
 - UHF 868 – 956MHz world wide
- **No use of EPCglobal network (ONS)**

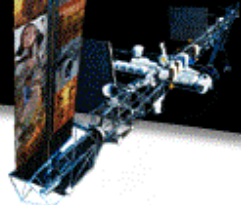


Uncertainty surrounding Wal-Mart RFID ramp up makes planning difficult



- **2004:** RFID pilot, refine strategy and pilot applications and infrastructure
 - Review tagging plans in February 2004
- **January 2005:** regional implementation
 - 100 top suppliers + 26 "committed" suppliers
 - Every case and pallet
 - First Regional Pilot: 3 Distribution Centers around Dallas, 150 Stores
- **2005:** Continued domestic expansion
- **2006:** Rollout to all suppliers by year end

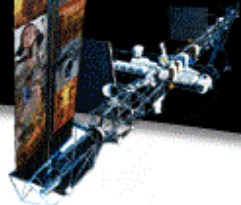
Source: ARC Advisory Group



DoD Requirements - Background

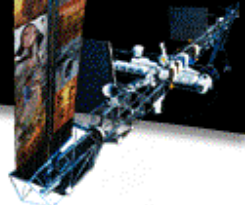


- **Largest supply chain in the world**
- **All containers shipped to Gulf and Afghanistan have active tags (Savi Technology) since 1997**
- **Active tags are expensive and proprietary – driving need for passive tags in broader rollout**
- **Collaborative approach with suppliers**
- **More willing to pay for technology (contractual issues)**
- **Intend to leverage commercial technology and standards (e.g., EPC)**



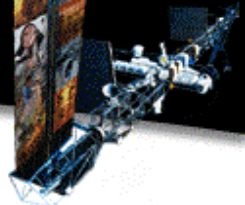
DoD Requirements

- **Items to be tagged**
 - Case- and pallet-level tagging
 - Item-level tagging for packaging currently requiring UID (greater than \$5,000)
- **Modifications to EPCglobal standards**
 - Class 2 vs. Class 1, Gen 2
 - 256-bit vs. 96 bit
 - UID embedded in EPC number
 - Rewritable (DoD) vs. license plate (EPC)
- **Timeline**
 - Proposed DFAR (Defense Federal Acquisition Requirements) May 2004
 - Final policy Defense Federal Acquisition Requirements (DFAR) July 2004
 - All Contracts Renewing after October 2004
 - All shipments for those contracts after January 2005

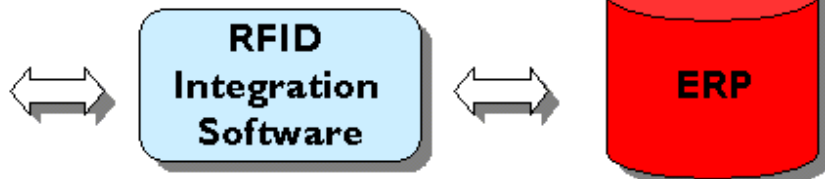


Agenda

- Overview
- RFID Technology
- Wal-Mart & DoD Requirements
- **Solutions**



Solution Components



RFID Hardware Implementation

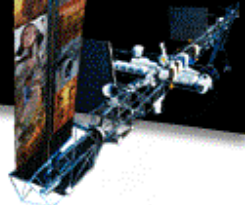
- Hardware selection
- Tag placement
- Site surveys
- Hardware acquisition
- Hardware support

RFID Integration Software

- BPR
- Software
- Implementation Services
- Maintenance & Support

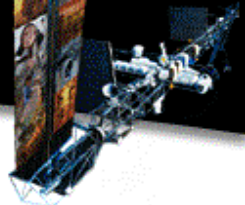
ERP Software

- Minimal impact to current environment



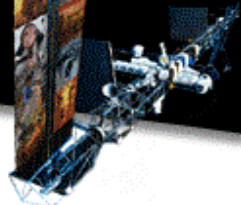
ClearOrbit RFID Vision

- **Software to assist manufacturers and distributors in cost-effective RFID deployments**
 - Hardware independent with device driver methodology
 - Integrated to ERP/WMS environment – minimal disruption
 - Allow phased approach
- **Partner with leading hardware integrators**
- **ERP/WMS-specific implementation services**
- **Natural extension of our heritage and expertise:**
 - Track, trace and control
 - Leverage ERP data model
 - Focus on ROI

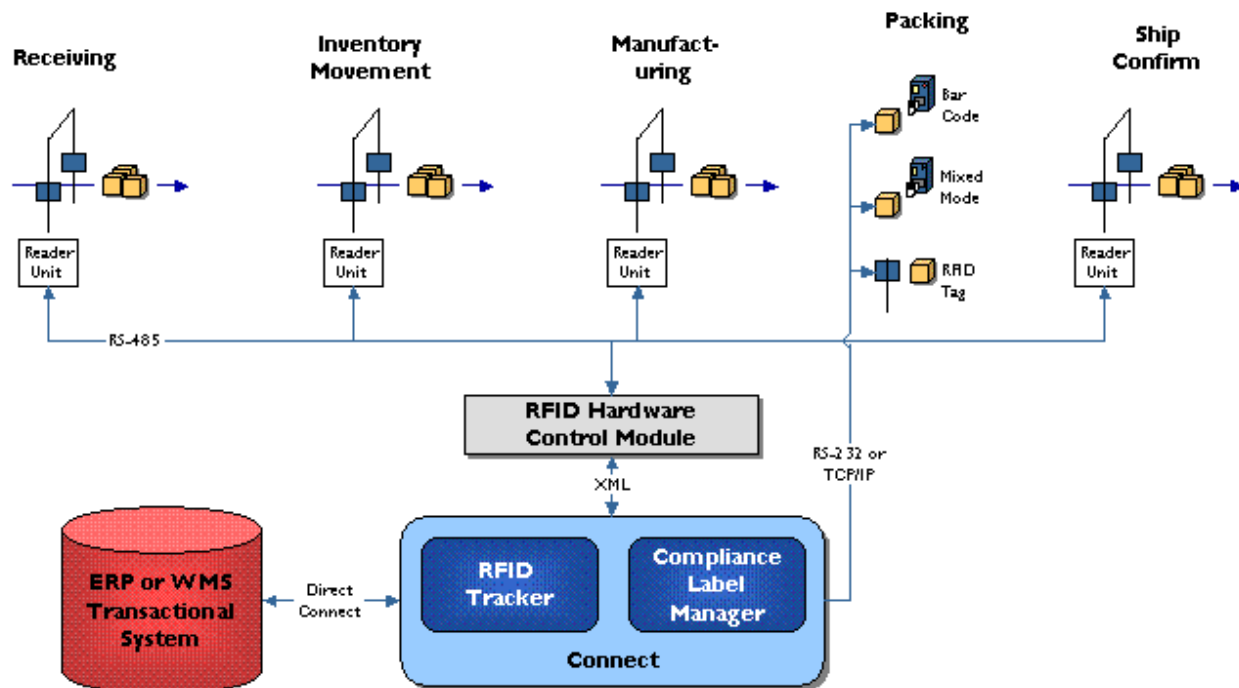


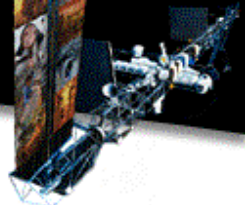
ClearOrbit RFID Enabled Products

- **Compliance Label Manager (*Outbound Compliance*)**
 - Manage label compliance and RFID compliance holistically
 - Dynamic printer selection, data selection, label format, tag format
 - Hardware driver methodology
 - No change to ERP or legacy applications
 - Configurable rules engine
 - Support for XML and Web Services
- **RFID Tracker (*Reader/Tag Management*)**
 - Read RFID tags and uses rules engine to execute ERP Transactions
 - Compatible with leading middleware (e.g., Savant)
 - Configurable rules engine
- **Collaborative Print Manager (*Inbound Compliance*)**
 - Drive Barcode or Tag Compliance at supplier shipping dock
 - Tag format and content automatically pulled from your ERP data
 - Web screen interface or API's

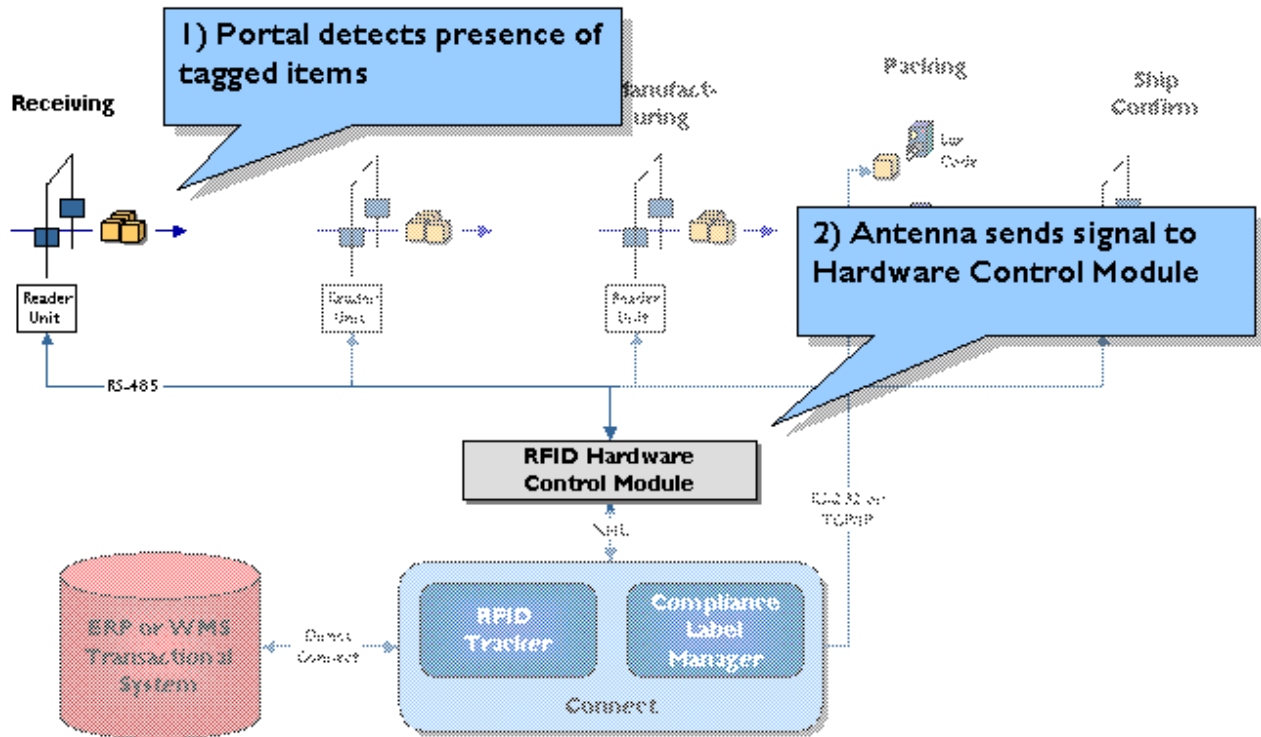


RFID-Enabled Supply Chain



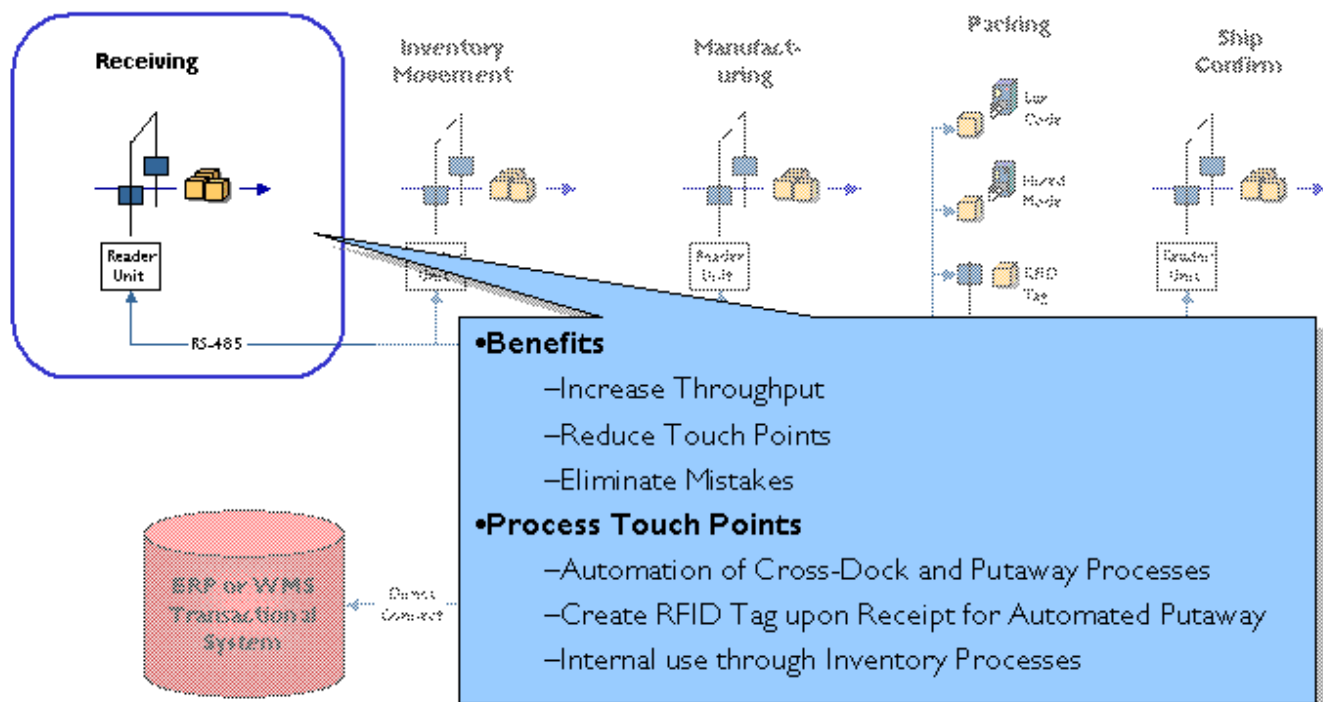


RFID Hardware Functionality



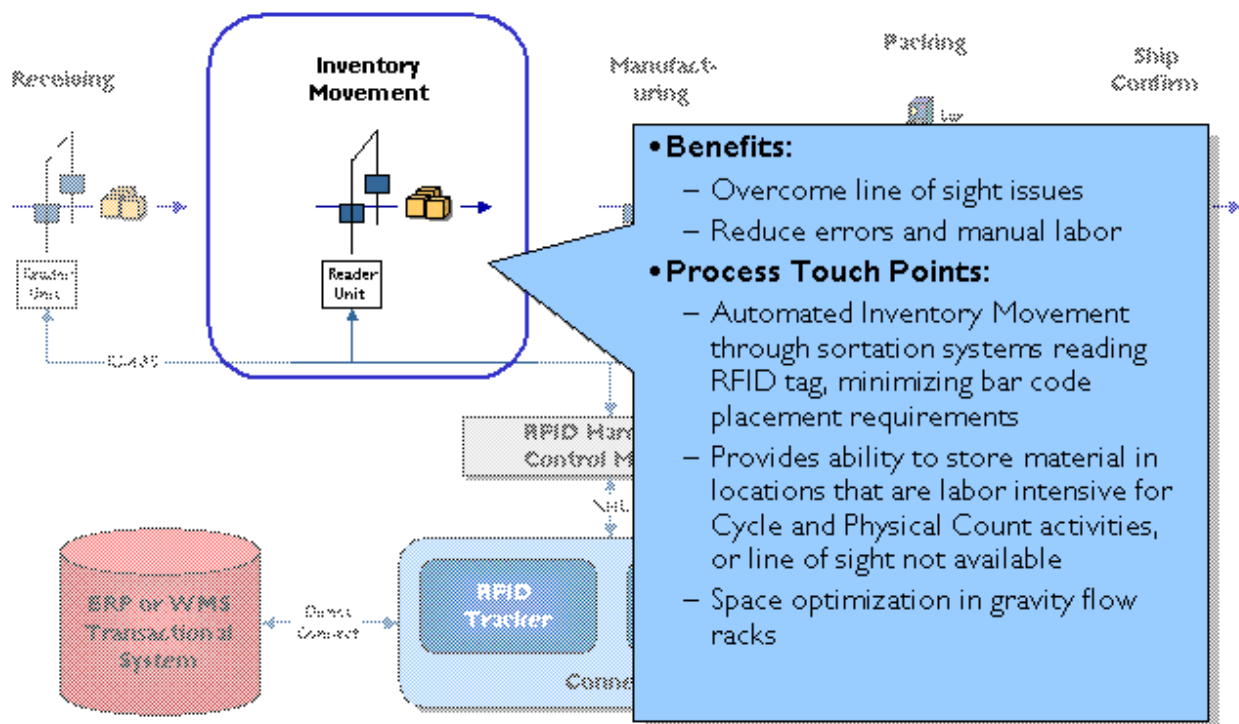


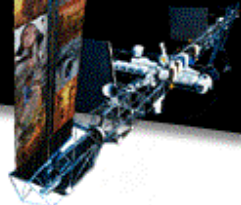
RFID-Enabled Receiving





RFID-Enabled Inventory





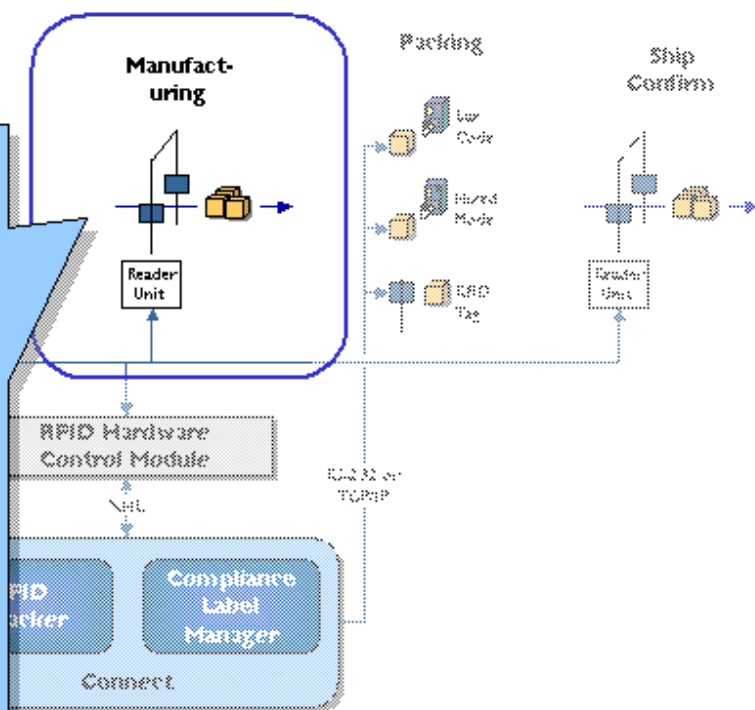
RFID-Enabled WIP

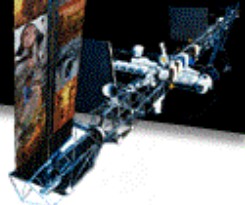
• Benefits:

- Improved tracking of items through WIP
- Serial genealogy

• Process Touch Points:

- Attach RFID tag on reusable totes during assembly
- Reader portal at each assembly step
- Automatically trigger appropriate transaction -- WIP issue, WIP move, Batch Step Complete (OPM)
- Alert worker to input quality info at appropriate time
- RFID-enabled Kanban cards





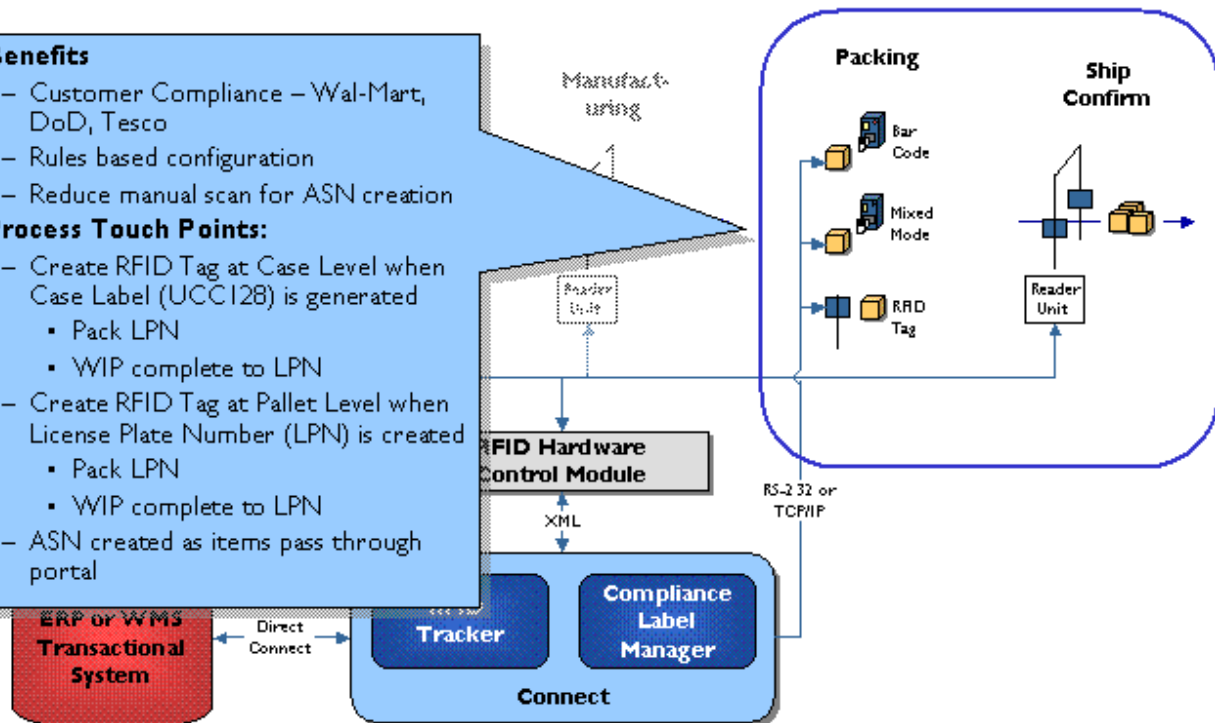
RFID-Tagged Shipments

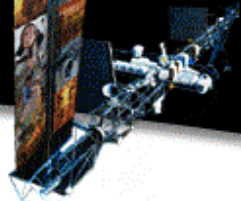
• Benefits

- Customer Compliance – Wal-Mart, DoD, Tesco
- Rules based configuration
- Reduce manual scan for ASN creation

• Process Touch Points:

- Create RFID Tag at Case Level when Case Label (UCC128) is generated
 - Pack LPN
 - WIP complete to LPN
- Create RFID Tag at Pallet Level when License Plate Number (LPN) is created
 - Pack LPN
 - WIP complete to LPN
- ASN created as items pass through portal





What recommendations do we have?

- **Be proactive in planning for RFID**
- **Start with pilot applications**
 - Evaluate “smart labels” as an option to pilot RFID in one part of your business (i.e. receiving) without impacting other parts
- **Gain understanding to shape requirements with your customer**
- **Build a business case**
- **The standards WILL change so be ready and don't invest in proprietary technology**
- **Work with experts**

A satellite view of North America from space, showing the United States, Canada, and Mexico. The Earth's curvature is visible at the top. A satellite is visible in the top right corner.

Thank You!

Doug Mohr – doug.mohr@clearorbit.com