Oracle
RFID Solution
An Applications Perspective

Drive the New Supply Chain Model

{Name}
{Title}
What is RFID?

RFID is a technology for tagging physical items with a unique ID that can be easily and non-invasively read -- a “wireless bar code.” The ID can then be associated with a system representation of the object that contains all associated item records (e.g., contents, state)

• **Chip** holds memory that stores identifier
  • Implements wireless protocol

• **Antenna** receives power and analog signal from reader
  • Converts radio signal to and from analog electrical signals

• **Edge Server** collects observations & drives readers
  • Forwards events to database tier for distribution

• **RFID Tag** contains chip, power source, & antenna
  • Sends back identifier upon power up

• **Reader** communicates with tags in range to read all identifiers and memory (payload)

• **Event Queue**, often implemented as transient queue
  • At most basic level, Database serves as a “better bus”
  • Data archiving and aggregation performed in application-neutral level

• **Application** receives transient messages & reacts immediately

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What is RFID?

A Key Technology for Event Tracking

RFID

*Radio Frequency Identification*
Sense presence of object near antenna

GPS

*Global Positioning System*
Tag on object broadcasts its location

RTLS

*Real Time Locating Systems*
Triangulate tag location with several antennas

Most cost effective for event tracking through a limited number of portals
Different RFID Tags

Tags Come in Many Flavors and Frequencies

<table>
<thead>
<tr>
<th>Power Source</th>
<th>Active</th>
<th>Passive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temp</td>
<td>More limited</td>
<td>Wide range (-40°-185°F)</td>
</tr>
<tr>
<td>Range</td>
<td>Longer</td>
<td>Shorter</td>
</tr>
<tr>
<td>Memory Capacity</td>
<td>Larger</td>
<td>Smaller</td>
</tr>
<tr>
<td>Cost</td>
<td>$10-$100</td>
<td>15¢ - $1s</td>
</tr>
</tbody>
</table>

Frequency

- **Microwave** (1GHz+)
  - Range: 1 - 10m

- **UHF** (300-1000MHz)
  - Range: 1 - 3m

- **VHF** (30-300MHz)
  - Range: 1 - 3m

- **HF** (3-30MHz)
  - Range: 1cm - 0.7m

- **LF** (30-300KHz)
  - Range: 1cm - 1.5m

Considerations for Selection

- Directionality
- Anti-collision: Identifying multiple tags at once
- Data capacity and rate
- Reflection and interference
- Regulations and standards
  - Reader-to-tag
  - Tag data
- Supply chain partners
- International availability
- Tag cost
Standardized ID Formats

*Store a Code to Reference All Necessary Data*

- Tag cost and read time increases with data size so …
- Current focus is on ID-only tags (96 bit) so …
- The ID must be a standard key of a business object and …
- Used to access the data of the object …
- Which may be anywhere in the network so …
- We need a “name service” to find the data and …
- A standard format for returning the data

Class 1 Tags, EPC, EPC IS, ONS
**Example: EPC Definition**

Analogous to GTIN or UPC

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**ELECTRONIC PRODUCT CODE**

<table>
<thead>
<tr>
<th>Segment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Header</td>
<td>0-7 bits</td>
</tr>
<tr>
<td>EPC Manager</td>
<td>8-35 bits</td>
</tr>
<tr>
<td>Object Class</td>
<td>36-59 bits</td>
</tr>
<tr>
<td>Serial Number</td>
<td>60-95 bits</td>
</tr>
</tbody>
</table>

Identifier assigned by UCC.EAN for your company, organization, or plant.

Identifies the product. Analogous to Item Manager for GTINs. Manufacturer controls this assignment.

Uniquely identifies each package (e.g., a box of cereal). Manufacturer controls this assignment.

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- Container EPCs can be associated with an Item
- Actual formats may differ (e.g., EPC vs. DoD)
- Requires flexible enablement in your Item Master (PLM) system
Triggering Application Processes with RFID

Apps Must Infer the “Meaning” of an RFID Read

**Physical World**
- Physical movement of material

**Interface**
- User initiated transaction for that action
- Check whether this is a relevant business event

**Applications**
- Update Associated Business Object
- Associate to Business Object and call API

**Traditional (User / UI)**
- RFID events (filtered & consolidated)

**RFID (Inferred)**
- Non-business object related events

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ORACLE®
Data Privacy and Security Management

*Today, Commercial Security Outweighs Personal Privacy*

- Important current concern is Commercial Security
  - Syndication - Who has access to which data?
  - Commercial security is most critical with open-loop systems

- Broad adoption at Point of Sale is in the future
  - Need standards, education and shared value proposition
  - Service has good value proposition, but also privacy concerns
Why is RFID Hot Now?

A Convergence of Developments

Technology / Standards Enablement
- Falling RFID Tag Costs
- Ubiquitous Connectivity
- XML Messaging

Compliance Initiatives
- Wal-Mart
- DoD
- Metro
- Tesco
- JC Penney
- Albertsons

Business Process Evolution
- Supply Chain Collaboration
- Global Numbering (EPC) and Catalogs (UCCNet)
- VMI and Consignment

Broad-Based RFID Market Interest
What are Companies Doing Today?

• General Investigation
  – Will RFID benefit their business?
  – Is it more accurate than bar-coding?
  – What tags, readers, printers should I choose?

• Trying to Comply with a Customer Mandate
  – DoD, Walmart, Target, Tesco, Metro and Albertson’s have issued mandates to their suppliers to achieve RFID compliance by 2005

• Conducting “Conference Room Pilot”
  – May not have a specific mandate
  – Testing RFID environment – hardware, software, etc.

• Scaling to Enterprise
  – Early adopters
  – Completed at least one pilot project
  – Investigating production roll-out
Potential Business Benefits

✓ **Increase Differentiation and Competitive Advantage**
  *Example:* Manufacturers can quickly incorporate RFID to respond to retail mandates

✓ **Increase Productivity**
  *Example:* RFID allows for the elimination of manual barcode scanning for inventory tracking

✓ **Increase Supply Chain Visibility**
  *Example:* A retailer can reduce out of stock situations by RFID enabling their store shelves

✓ **Minimize Costs**
  *Example:* RFID can pinpoint exactly where a manufacturing process broke down and can minimize the amount of product pulled back for a recall
Potential Business Benefits (cont’d)

✓ **Maximize Return on Assets**  
  *Example:* A hospital can track expensive assets (medical equipment, wheelchair, etc) at any point in time, anywhere in a hospital

✓ **Prevent Theft, Fraud, and Counterfeiting**  
  *Example:* In the pharmaceuticals industry, RFID can eliminate counterfeit products with ID for each bottle to reduce losses of 2-7% of profits

✓ **Reduce Risk and Liability**  
  *Example:* The cattle industry can minimize their risk associated to health outbreaks related to meat by using RFID to track their livestock
Challenges with RFID for the Real Time Enterprise

**Manage**
the explosion of data and events in a single source of truth that is scalable, reliable, and secure.

**Capture**
appropriate, filtered information from a variety of different readers and sensors.

**Analyze**
the data and events in real-time to provide business intelligence and business activity monitoring for continuous process improvement.

**Access**
the information any time, anywhere by all appropriate people, applications and business process.

**Respond**
to events and information automatically and allow for people to manage by exception.
How Oracle Delivers
Oracle Sensor-Based Services
Support RFID from Capture to Respond

CAPTURE
Event Sources
- Sensors, RFID, System Events
Application Server
- Data Collection, Cleansing, Dispatch

MANAGE
Grid Infrastructure
- Event Storage and Distribution
Application Server
- Security, Integration, Development Tools

ANALYZE
Business Processes
- SBS-Enabled Applications Agents
Business Process Monitoring

ACCESS
Information Access / Visibility
- Collaborative Workplace
Alerts
- Responsive Enterprise
Oracle RFID Solution

① Supported Business Processes

② Technology Enablers

③ Implementation Options
RFID-Initiated Shipping & Receiving

Built-in Support for RFID-Enabled Business Processes

1. Load of pallets and/or cartons with RFID tags on each

2. Drive load through RFID reader in receiving dock

3. Interface to readers, clean and filter data, then pass IDs to application

4. Access objects associated with the IDs (e.g. LPNs on ASN), then raise correct Business Event

5. Access associated source document (e.g. the PO’s ASN)

6. Process the Business Event (e.g. receipt of pallet of carton)

7. Confirm success or failure (e.g. trigger green light or sound buzzer)

8. Putaway, rescan or divert material
Internal Requisition Fulfillment without RFID

Warehouse 1

Mfg Completion & Label Printing

Direct Ship

Warehouse 2

Standard Receipt

Requires Three Mobile User Interactions
Internal Requisition Fulfillment with RFID

Warehouse 1
Mfg Completion & Label Printing

Direct Ship

Warehouse 2
Standard Receipt

Automated by moving RFID-enabled pallet through reader portals

Requires **Only One Mobile User Interaction**
Future Direction: Grow Process Support
Continue Building RFID Capabilities

Discrete & Process Manufacturing
- Automatic build of product genealogy
- Operation moves & assembly completions

Warehouse Management
- Packing and returns verification
- Non-repudiation of receipt

Enterprise Asset Management
- Track assets in environment with poor controls (i.e., hospital)
- Store service records in mini-database on product
Oracle RFID Solution

1. Supported Business Processes
2. Technology Enablers
3. Implementation Options
Hardware and Tag Agnostic Infrastructure

There is No “Best” Hardware or Tag, but It Doesn’t Matter

Many Issues Exist for Hardware & Tag Selection

*Example:* Hardware landscape is still immature and changing

- However -

Oracle Insulates You from These Issues

- Integrate to a variety of reader hardware to RFID-enable any flow
- Applications do not care about the tag frequency
- It’s about the business logic linking data to application flow
Warehouse Device Integration
Enable Broad Use of Automated Equipment

Data Transfer
- RFID & barcode capture
- Scales & dimensioning devices

Printers & Response Devices
- Label / RFID label / report printers
- Light stacks, buzzers, & message boards

Storage
- Automated storage / retrieval systems
- Carousels
- Pick-to-light

Material Movement
- Conveyors / diverters & monorails
- Automatic guided vehicles
- Sortation devices

Yellow = For or related to RFID
RFID Events and Edge Processing

Capture and Route RFID Data

Handheld Scanner / Reader (with Driver)

Fixed Sensors (e.g., RFID)

Lightstack, Message Boards, or Notification Devices (e.g. SMS, Pager)

Filtering & Device Integration

Naming / PML Services

Operational Data

Stream Data
Minimized & Normalized

Distribution

Backend Applications
Security and Identity Management
Experienced, Proven, and Reliable

• Over 25 Years of Security Leadership
  - First Oracle customer was a government customer

• Information Assurance
  - 17 independent security evaluations over past decade
  - Substantial financial commitment to independent security evaluations
  - More evaluations than any other major database vendor
  - Culture of security at Oracle

• Robust Security Features & Identity Management Infrastructure
  - Row level security
  - Fine grained auditing
  - Integrated database security and identity management with Web Single Sign-on, Oracle Internet Directory
  - Strong authentication
Oracle RFID Solution

1. Supported Business Processes
2. Technology Enablers
3. Implementation Options
Oracle Sensor-Based Services

Flexible Adoption and Implementation Options

- Increasing RFID Adoption
  - RFID / EPC Enabler
    - Compliance Application
      - Adapters to Wal-Mart, Metro, etc.
      - Print RFID labels: Zebra, Printronix, Intermec, etc.
      - Verify shipments with RFID readers: Alien, Matrics, Intermec, etc.
  - RFID Infrastructure
    - Sensor-enable existing business processes
    - Integrate RFID data into existing applications
    - Scale to enterprise-wide global deployments with Grid
    - Architect enterprise infrastructure to support sensors
  - RFID Pilot Kit
    - Pilot, prototype and test RFID in lab or warehouse
    - Ready to run with leading RFID tags and readers
    - Out-of-the-box analysis reports
    - Customized business intelligence
  - RFID Applications
    - Sensor-centric business processes
    - Complete business automation
    - E-Business Suite (WMS and more)
    - Partner applications (ISVs)

Increasing Benefits

Increasing RFID Adoption
RFID / EPC Enabler
Meet Industry Mandates Today

- Meet Industry Mandated Deadlines
  - Wal-Mart, DOD, Metro, Tesco, Target, Albertson’s, etc.

- Quickly Install and Comply
  - Upgrade to latest version not required
  - Works with your legacy system

- Print RFID Labels
  - Drive any RFID-enabled label printer

- Verify Outbound Shipments
  - RFID readers: Alien, Intermec
  - RFID driver framework for all other readers

- Upgrade Path
  - Easy to integrate into existing systems
  - Seamlessly upgrade to Oracle WMS
RFID Pilot Kit

*Prototype and Test RFID in Lab or Warehouse*

- Capture and analyze data out-of-the-box
- Test new devices and filters, and perform custom, advanced data analysis
- Ready for integration with existing enterprise systems and deployment

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**Oracle RFID Pilot Kit**

(1) Select driver

(2) Select filter

(3) Scan tags

(4) Automatic data archive in sensor database

(5) View data analysis and visibility reports

(6) Configure / develop new Driver

(7) Configure / develop new filter

(8) Custom analytics with business intelligence tools
RFID Infrastructure

Centralize or Decentralize Edge Server Deployment

**Single Site** (Centralized)

- Warehouse 1
- Centralized Edge Server Service
- Warehouse 2

**Multi-Site** (Decentralized)

- Warehouse 1
- Oracle AS Edge Server
- Enterprise-wide IT Infrastructure
- Warehouse 2
Oracle RFID Solution

Maximize the Return on Your RFID Investment

Automate and Optimize Business Processes

Architected to Achieve Success

Leverage Your Existing Investment

Start Small and Grow
For More Information

Customers, visit:


Oracle Internal, visit:

http://rfid.us.oracle.com