



IBM Research

# Panel III: Transformation of the Service Supply Chain Enabled by Technology

Wharton-Stanford Service Supply Chain  
Thought Leaders Forum

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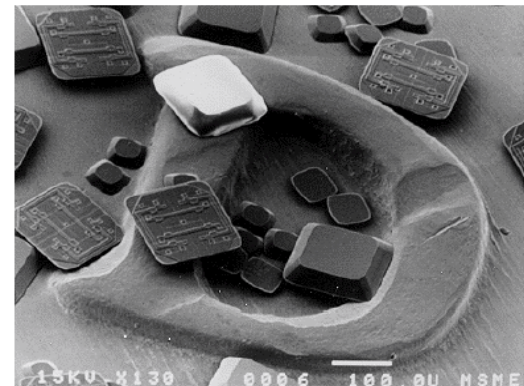
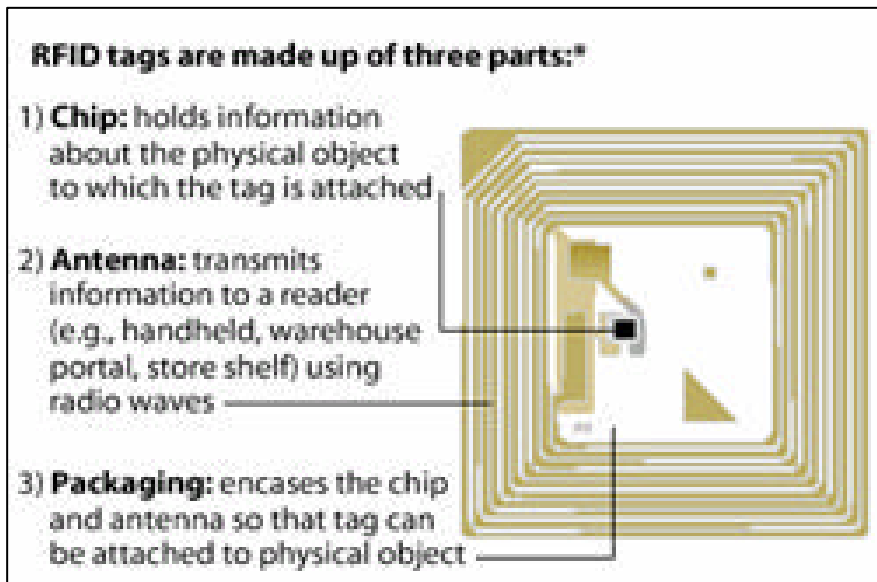
# Transformation of the Service Supply Chain by RFID technologies

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- RFID Background and Applications
- Managing the service supply chain
- Achieving the potential of the emerging RFID technology
  - Integration
  - Integration
  - Integration

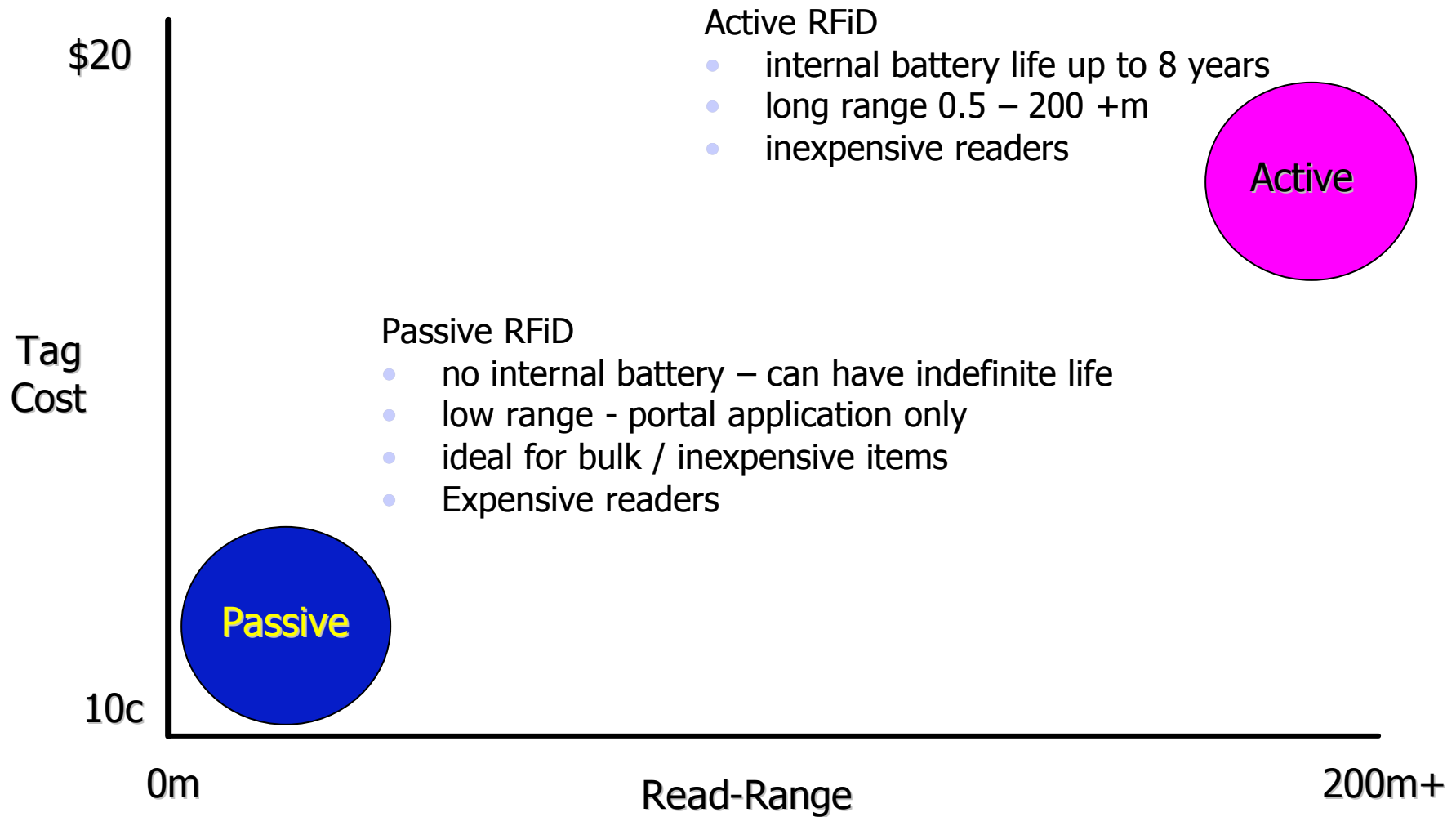
## RFID Tags and Readers

- Tags may be hidden or out of line-of-sight
- Readers may have multiple tag reading capability
- Long range possible
- Tags may vary in form from small and flexible to large and robust
- Passive RFID tags have virtually unlimited life
- Tags carry larger amounts of data and have Read / write capability



RFID Tags on face of a dime

## RFiD: Passive? Active?



## Electronic Toll Collection E-ZPass



915 MHz battery tag – 10 meter range

- Tag is linked to cash or credit-card account
- Used in 7 North East states: NY NJ DE PA MA MD WV
- 2.5 million customers, 5 million tags (2001)
- 2/3 of NY Port Authority Tolls Collected by E-ZPass

## Retail Sales - Speedpass



Purchase Gas at the Pump



Convenience Store Purchases



Speedpass Watch

Short-range low-frequency tags

<http://www.speedpass.com>

## Object Labeling – Intermecc Intellitag



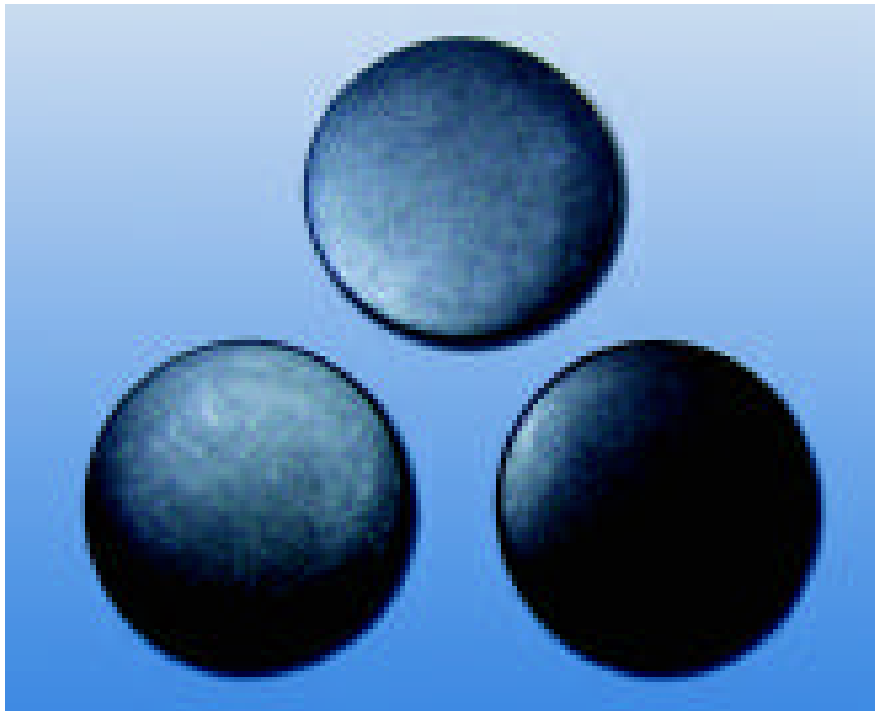
915 MHz passive tag – 2 meter range

<http://home.intermec.com>

## An example

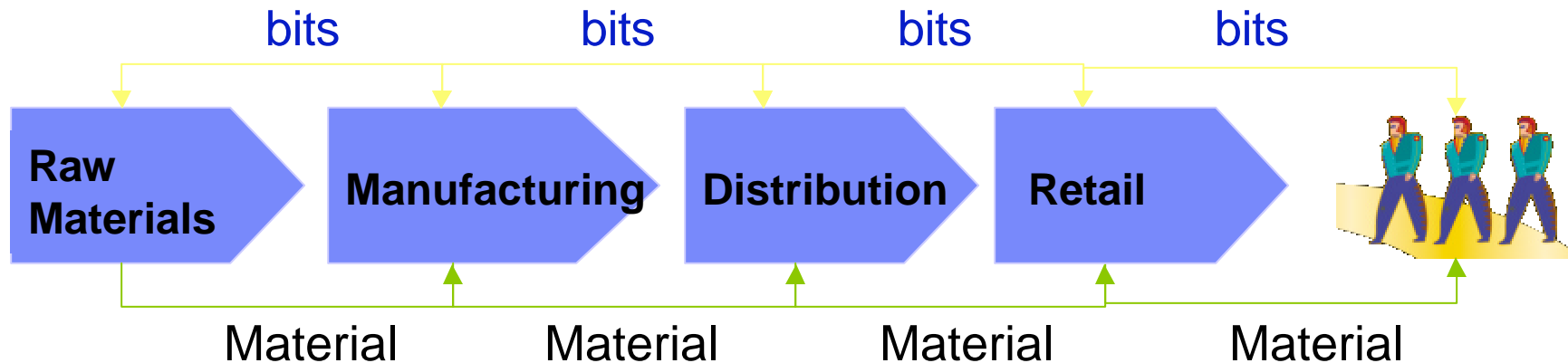
### RFID Journal: TI Unveils RFID Textile Tag

- The new Laundry Transponder operates at 13.56 MHz and complies with the ISO 15693 standard.



- Circular tag is 22 mm in diameter
- Plastic protects the tag from the harsh environment
- “The tag will exceed the lifetime of a garment by two or three times”
- Read range is 12” at 50 tags/sec.

## Auto-ID: The convergence of the physical and digital worlds



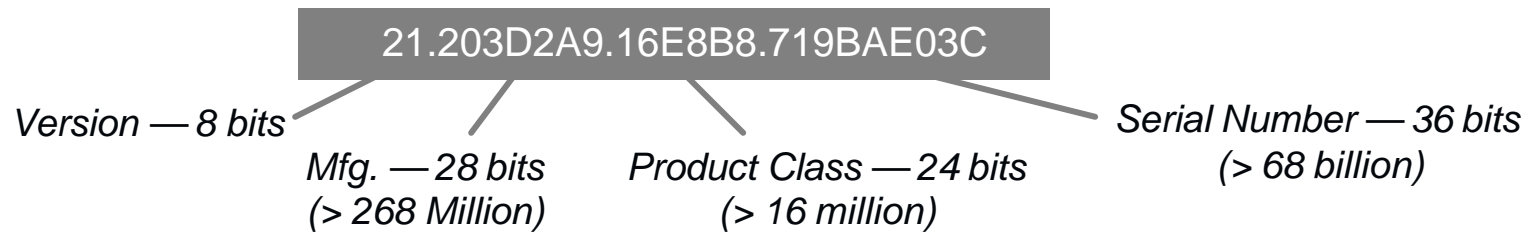
### Auto-ID: *Automatic Identification*

- Large number of companies collaborating to create interoperable standards, based on RF-ID technology
- “Identify any object anywhere automatically”

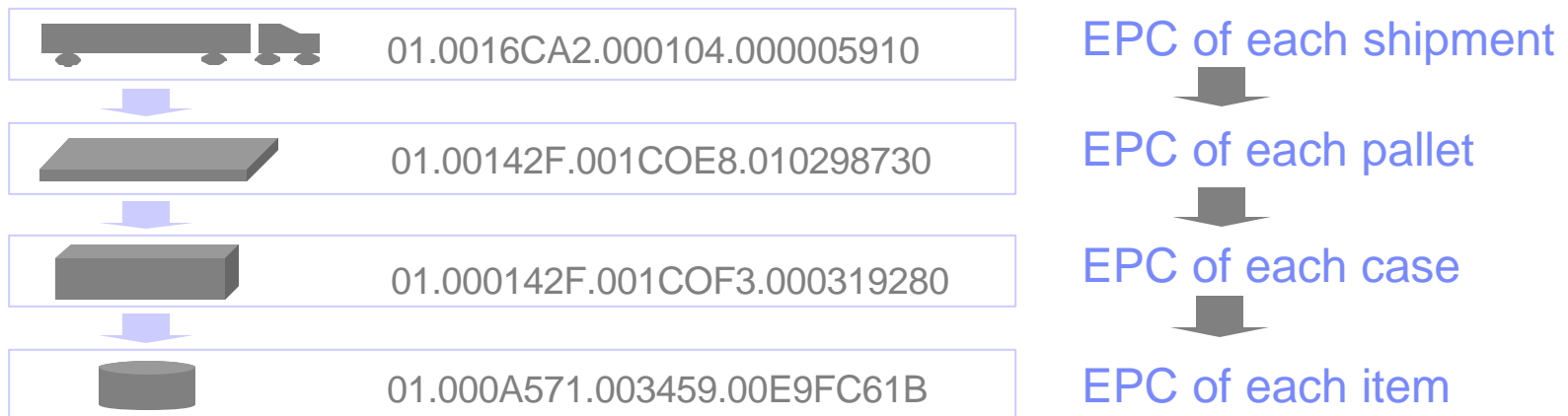
**Goal:** Identify, track and control everyday objects using inexpensive RFID tags

# Auto-ID system is based on the Electronic Product Code (EPC)

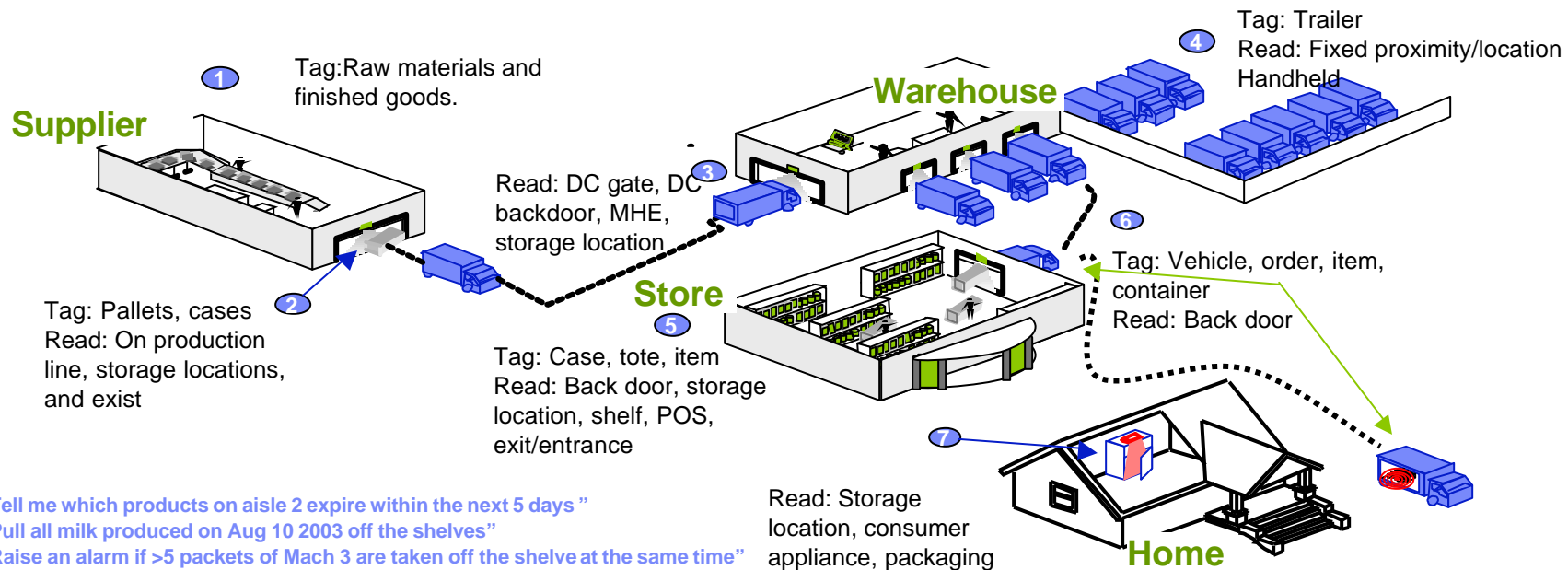
The EPC can catalog an enormous number of discrete items (about the number of grains of rice consumed globally each year)...



...and is flexible enough to capture identification information at any level



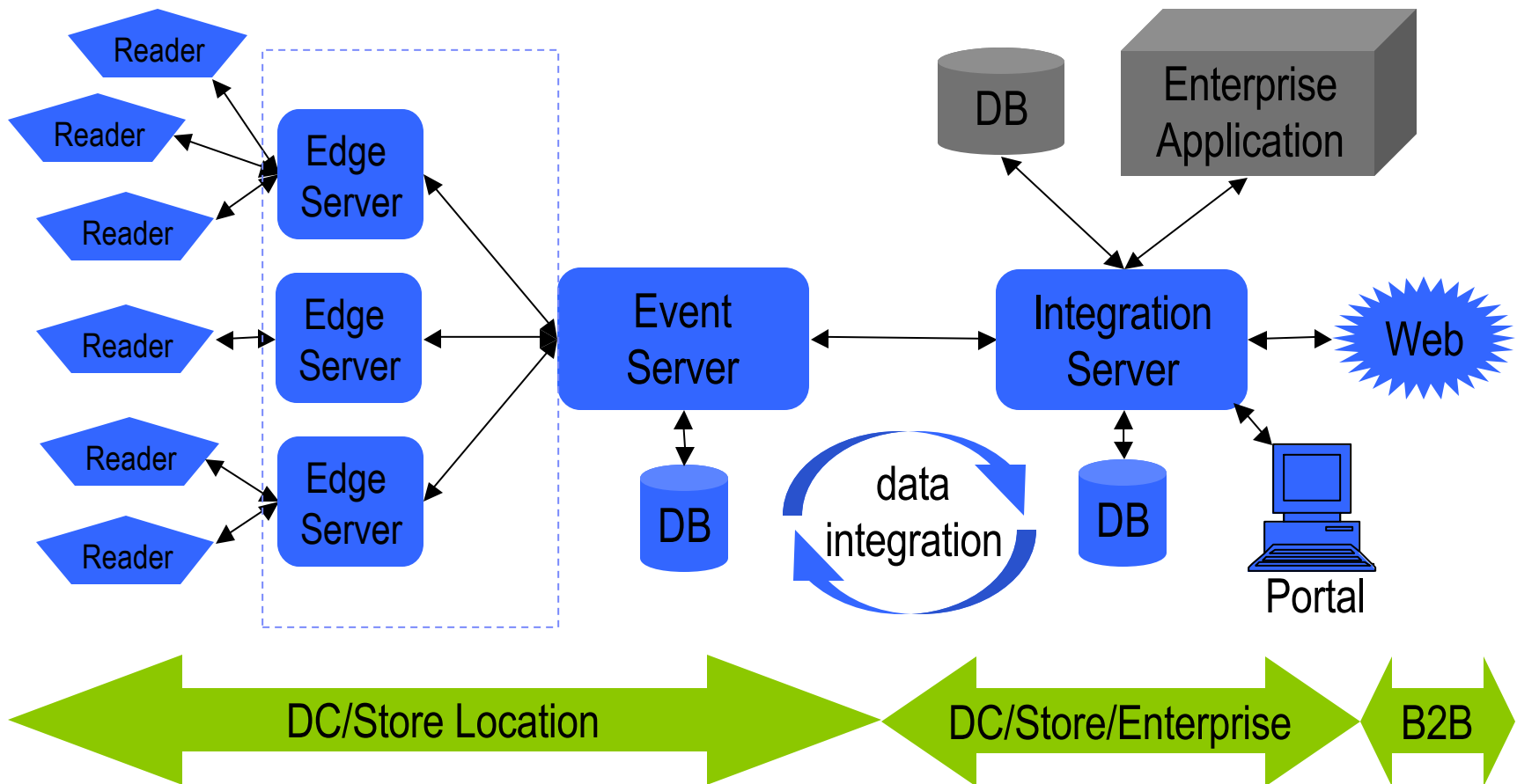
# The Auto-ID enabled Value Chain and Key Benefit Areas



| Cost  | Revenue  | Operational Effectiveness   |
|---|--|---|
| <ul style="list-style-type: none"> <li>• Reduced labor costs</li> <li>• Lower shrink costs</li> <li>• Lower inventory costs</li> <li>• Reduced reconciliation costs</li> <li>• Reduced returns costs</li> </ul> | <ul style="list-style-type: none"> <li>• Improved product availability on shelf</li> <li>• Increased cross channel selling opportunities</li> <li>• Enhanced ‘point of decision’ sales capabilities</li> </ul> | <ul style="list-style-type: none"> <li>• Improved product visibility</li> <li>• Improved asset &amp; labor visibility</li> <li>• Improved data accuracy</li> <li>• Reduced handling requirements</li> <li>• Greater temperature &amp; rotation capability</li> <li>• Improved planning, forecasting &amp; allocation</li> </ul> |

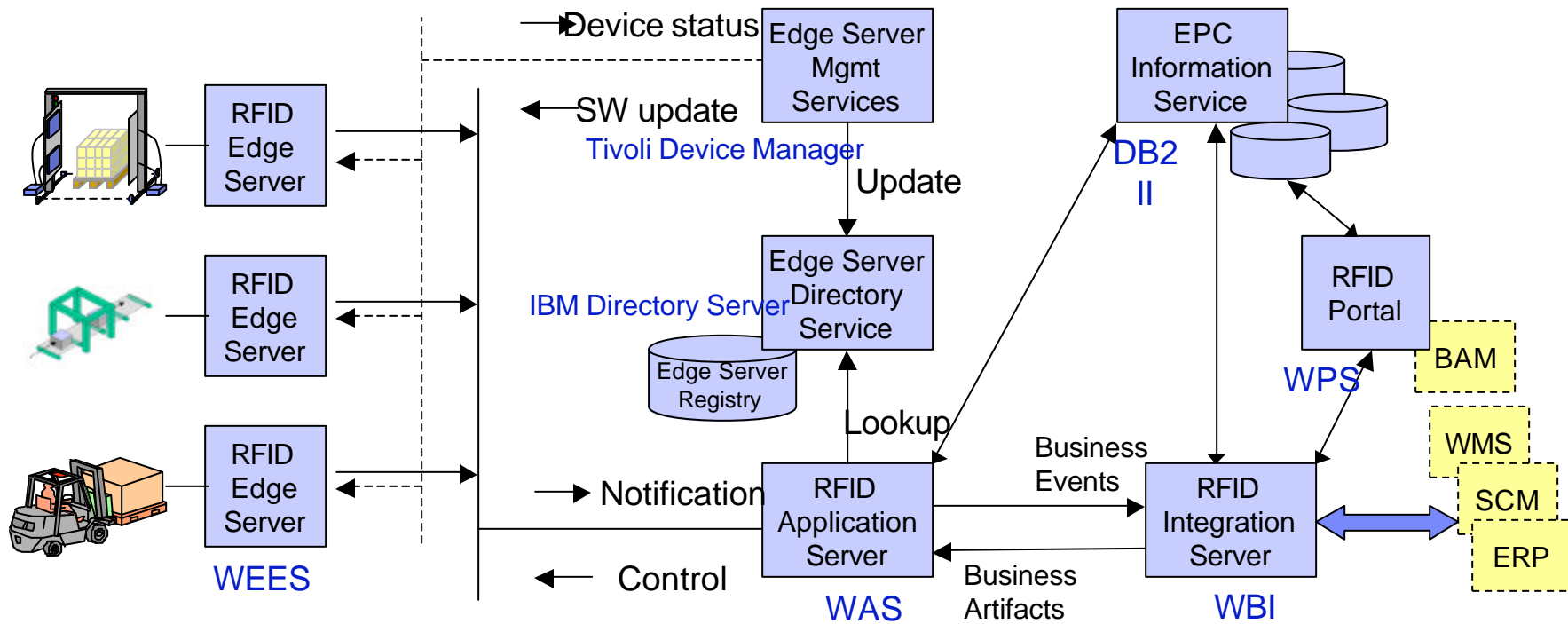
Source: IBM Business Consulting Services analysis, Auto-ID Center

# Overview of the Architecture Components (Future)



■ RFID Solution    ■ Existing environment

# RFID Information Infrastructure



## RFID Edge Server Functions (I)

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- System management
  - startup & shutdown
  - dynamic reader discovery
  - monitor & report errors
- Configuration management
  - Edge Server configuration (IP addresses, timeouts, location etc)
  - reader configurations (frequency, priority, timeouts etc)
  - key mgmt (if authentication is to be performed at the edge?)
- Connectivity
  - synchronous (HTTP)
  - asynchronous (MQe) for disconnected operation
- Software deployment
  - device drivers
  - filters & aggregators
  - dynamically (re) load software modules
- Security
  - authenticate readers at the edge (TBD: is this necessary?)

## RFID Edge Server Functions (II)

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- Filtering
  - duplicates, noise & incomplete reads
  - strictly local, no enrichment of tags
  - in memory, not persistent
- Aggregation
  - based on location/time/external signals from other devices
  - strictly local, no enrichment of tags
  - in memory, not persistent
- XML Services
  - parsing & creating XML messages
- EPC tag value and payloads remain opaque inside the Edge Server
  - may want to filter/aggregate by header and/or object type field, e.g. for kill
- No application logic outside of filtering and aggregation
  - process logic in Event Server at the store, region or company level
  - eventual event persistence in store level RFID Event Server

# RFID Event Server

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All of the functions of the RFID Edge Server plus

- **Persistence**
  - Store all incoming RFID events from the associated Edge Servers for future reference by other systems
- **Controller for the attached Edge Servers**
  - pass commands and data to the network of Edge Servers
  - synchronous and asynchronous
- **Central access point for all RFID related information at the store level**
  - network management
  - alert display (based on J2EE rather than a Portal, WPS can optionally be bundled)
- **Some support for simple process management**
  - e.g. manual coding of simple process logic
- **Gateway to the RFID Integration Server**
  - Send and receive commands and data from the RFID Integration server
  - synchronous and asynchronous
- **Not necessarily coupled to the RFID Integration Server**
  - can be used with other higher level RFID infrastructures as well, e.g. existing BPM/EAI systems .

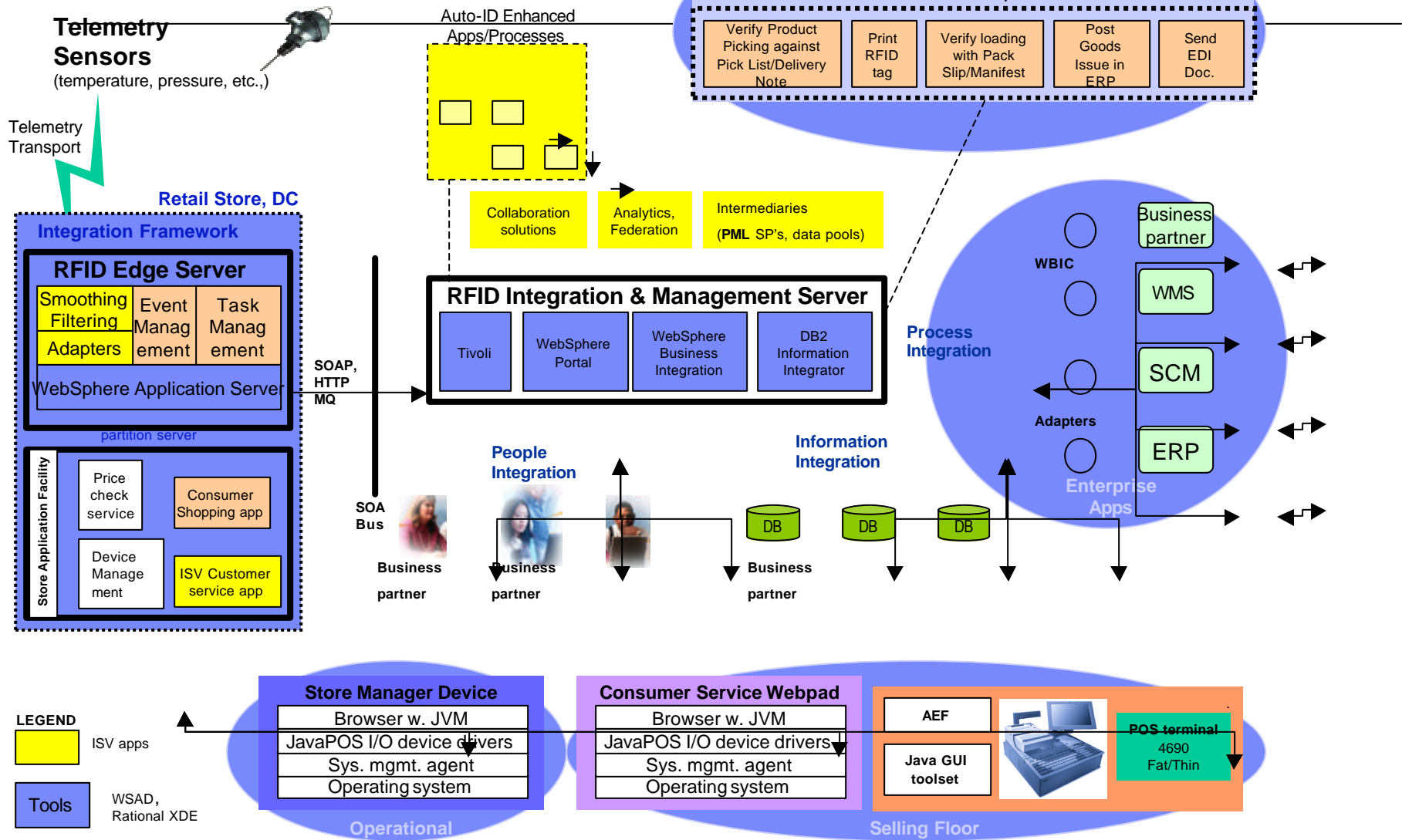
## RFID Integration Server

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All of the function of the RFID Event Server plus

- Process Integration
  - sophisticated, cross LOB or cross enterprise process management
  - process driven application integration
- Data Integration
  - enrichment of RFID data from existing data sources
  - data validation and cleansing
  - ETL (future)
- B2B Integration
  - exposure of RFID related data to various partners along the supply chain
- GUI Integration
  - display RFID data side-by-side with existing data
- Not necessarily coupled to the RFID Event Server
  - can work with other low level RFID infrastructures as well, e.g. (very) intelligent readers

# Integration Without Bounds



## Summary

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- RFID technology will continue to evolve
  - Prices will continue to fall for base technology
- New applications for managing the supply chain will be conceived
- Success of the RFID promise will depend on successful adoption of core supporting infrastructure
  - Integration technology is key