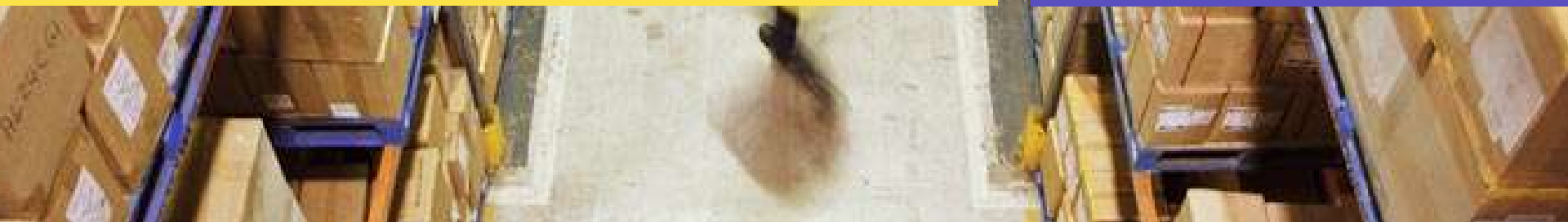




Trends and Innovations in RF Identification

Jim Wright
Senior Solutions Architect
Sun Microsystems, Inc.



Agenda


- What's changing?
- When customers meet RF Tags
- When data and bandwidth explode
- Device management written big
- Edge data in the big picture
- Access and security

RFID – What's changing?

- RFID is a 50 year old technology so why the excitement today?
- What's new is - “Networked RFID”
 - RFID + The Internet
 - Cheap tags with only ID
 - Detailed data resides across a network
- Networked RFID is essentially the harbinger for sensor-driven networks
 - Drive new applications and achieve levels of business efficiencies through the use of real-time data

RFID and the Enterprise

Sensors
Temperature,
Pressure, Speed,
Vibration etc.



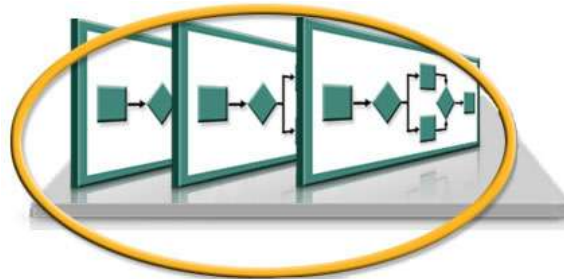
RFID Tags
Active, Passive,
Semi-Passive etc.



Devices
Mobile Devices,
GPS, Other devices



**Using real-time data to
achieve new levels of
business efficiencies
for enterprises**



**Business
Efficiencies**
ROI, Customer
Satisfaction,
Brand Integrity



**Business
Applications**
Warehouse
Management,
ERP, Legacy

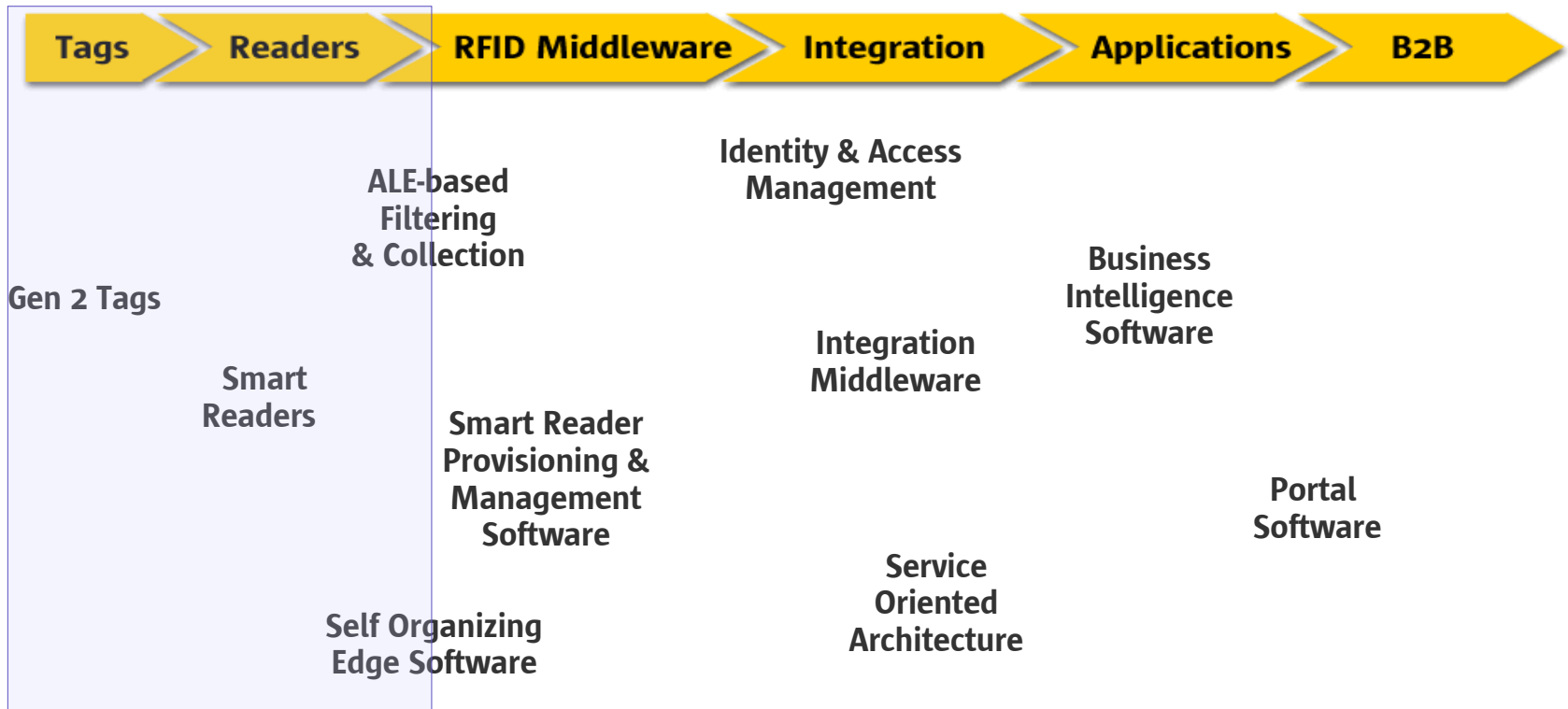


**Business
Partners**
Suppliers,
Distributors,
Customers etc.



The RFID Integration Chain

Components to consider for Mission Critical RFID



Key Requirements

Availability, Scalability, Manageability, Security, Integration

When Customers Meet RF Tags

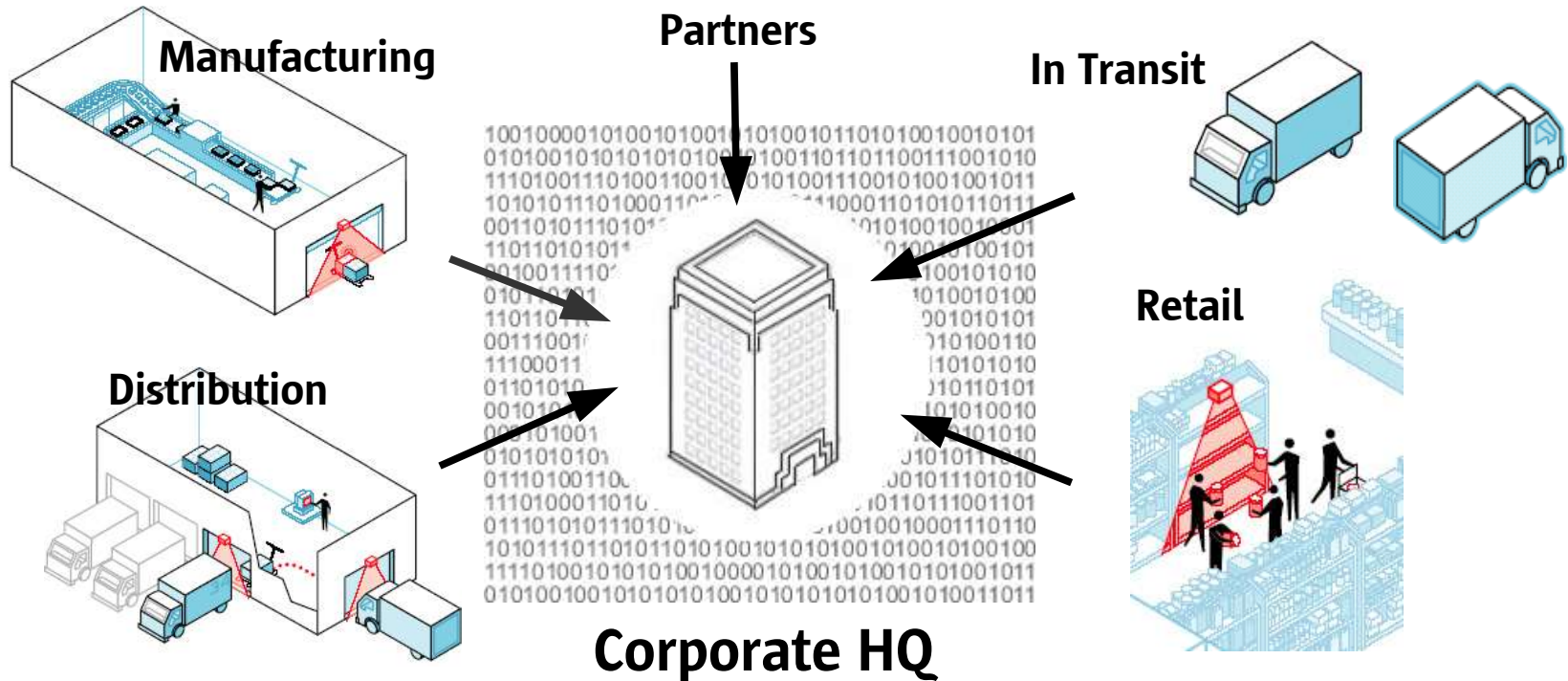
Learning from “Gen 1” Tags

- Privacy
 - Passwords
 - “Killable” tags can be erased
 - Improved security encryption
- Speed and reliability
 - High read rates and accuracy (-> 100%)
- Size
 - 2 to 3 times smaller

“Gen 2” Tags to the Rescue

- Cross vendor compatibility
 - Tags and readers interoperable across vendors
- Greater memory
 - 96 bits plus password
 - 8 bits assignable memory in non-EPC modes
- Improved RF
 - Spread spectrum, frequency hopping UHF with frequency-modulation capabilities
 - Minimize interference with other devices

When Data & Bandwidth Explode



What are the expected network and storage requirements?

How do we manage those expected data volumes effectively?

How much data will we see?



or



Network Bandwidth Requirements

Network Bandwidth in a sample Warehouse

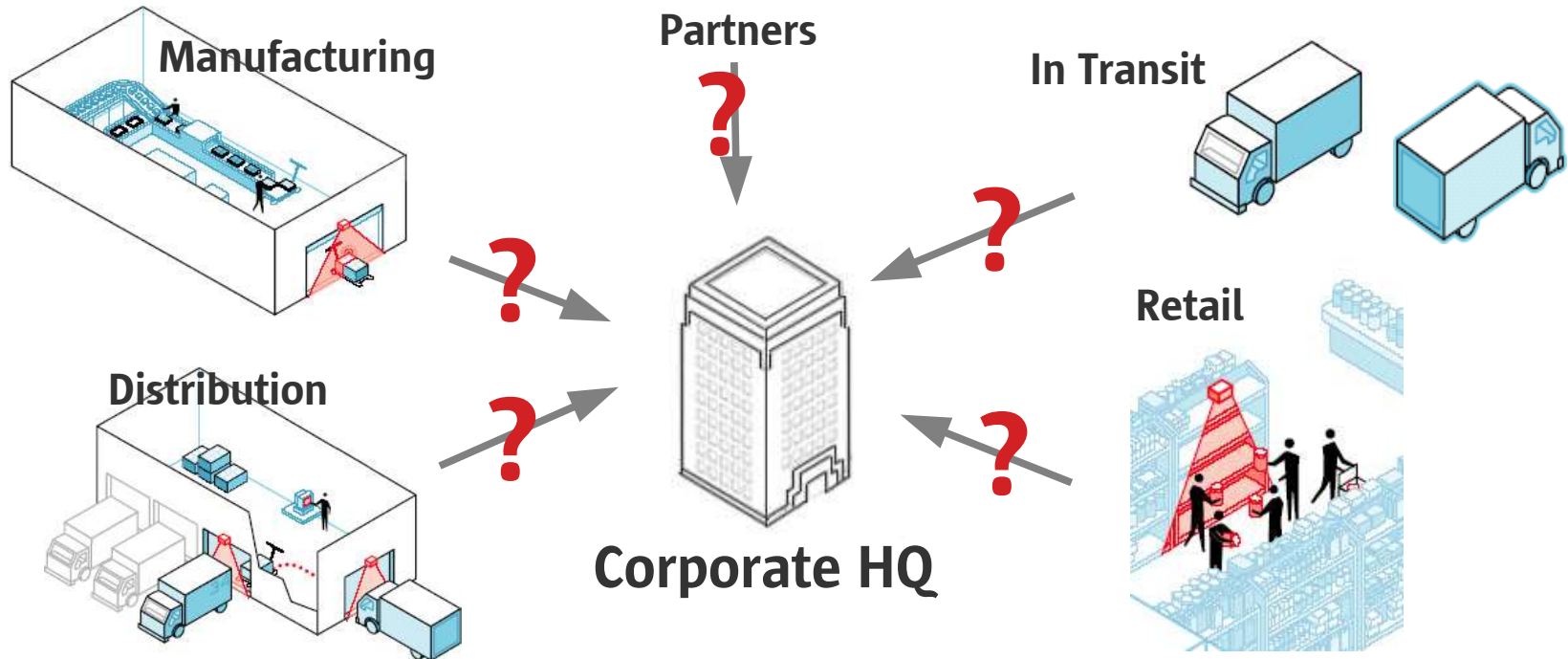
# of Readers	200
25% Reading at any given instant	50
# of reads/second	500
Bytes/Read	72
Data generated per second in Mbytes	1.7

Data Storage Requirements

Incremental EPC Data generated by a sample manufacturer

Production/packaging Line Speed (items/second)	1
# of Production/Packaging Lines	10
# of Reads per Item	2
EPC Bytes	12
Timestamp (Date, Time, Year + TZ Offset)	12
Location (GLN - 13 Digits/Chars + extra)	16
Other Sensor Data	32
Total Data generated in Bytes/Read	72
Total bytes of raw data generated per second	1,440
Total KB of Data generated / second	1
Data generated in a day (Mbytes)	119
Data Generated in a Month (Gbytes)	4
Data Generated in a Year (Gbytes)	43

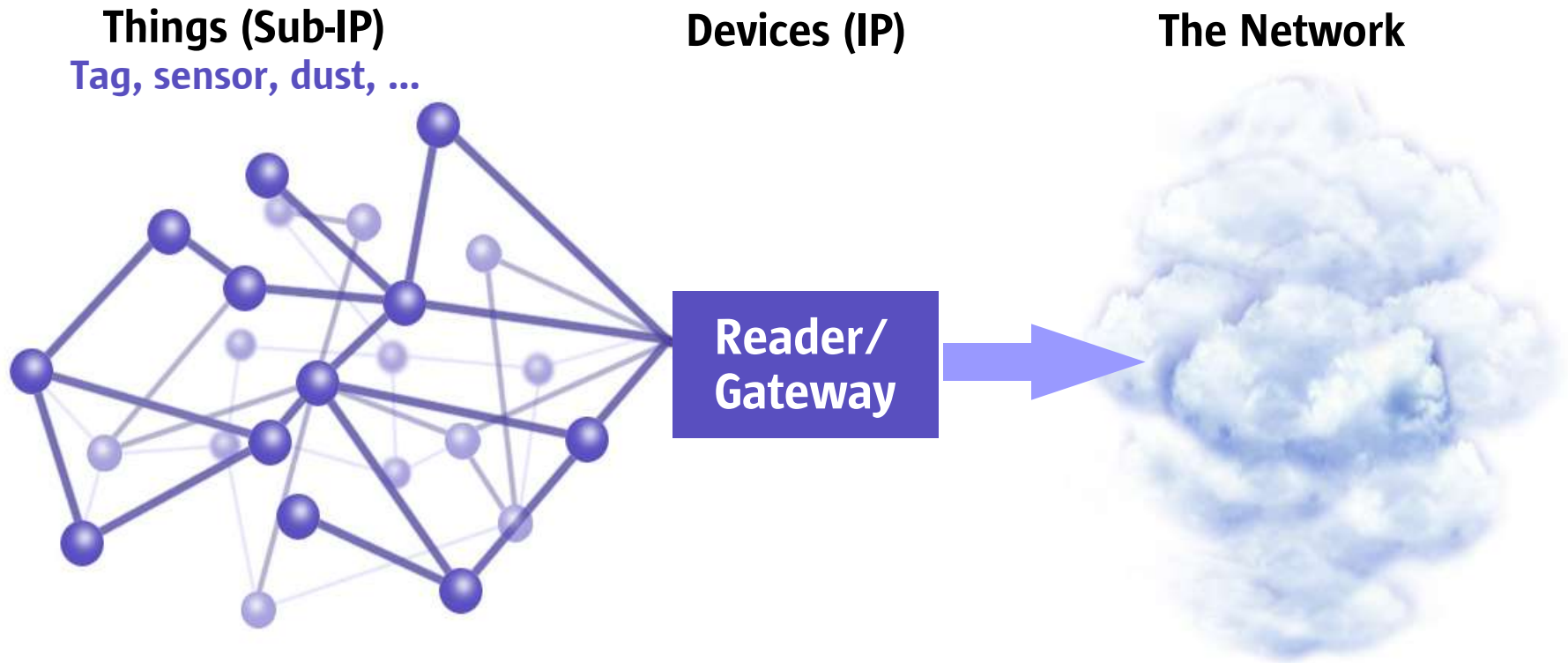
Infrastructure Issues



What if my Network is limited, intermittent or fails regularly?

How do I recognize and fix problems at remote sites with no IT Support?

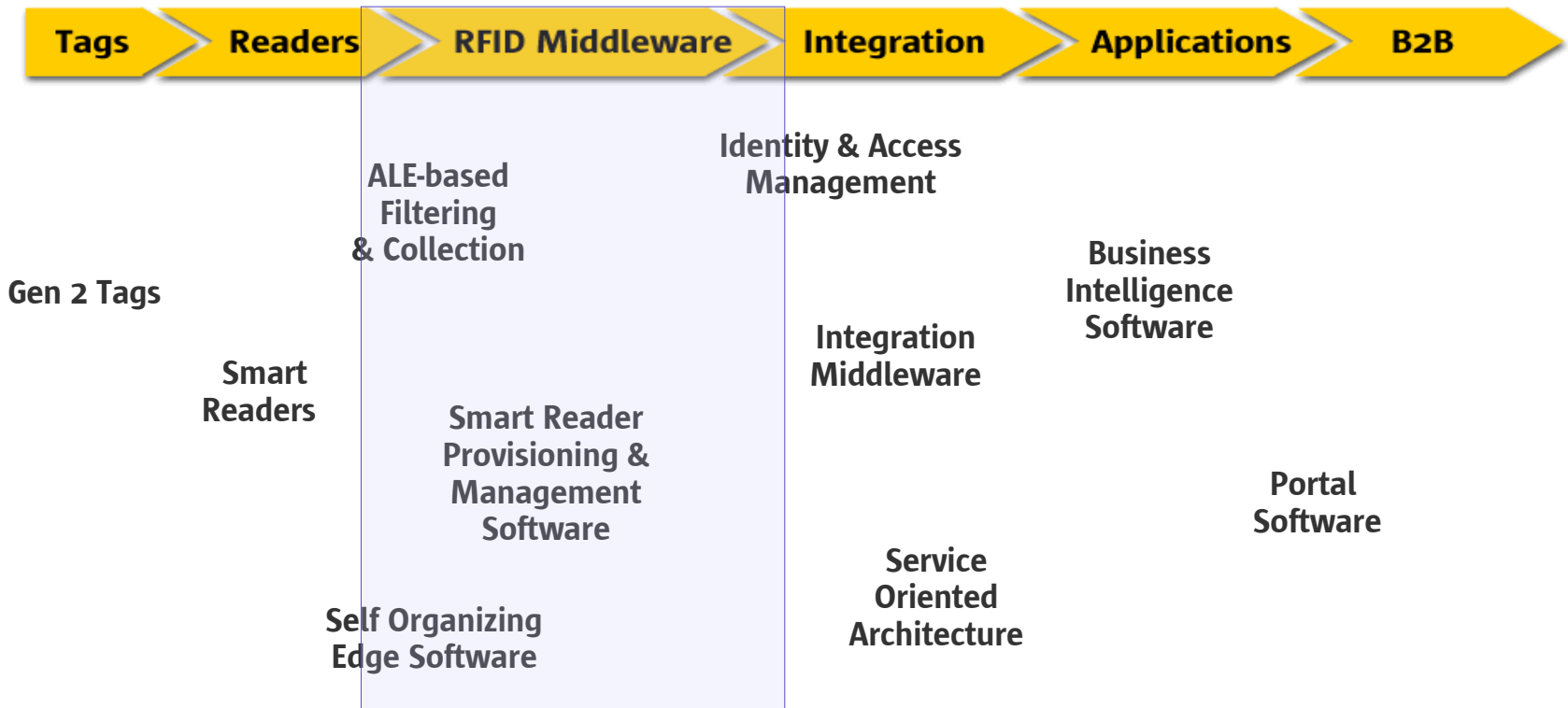
Recommendations for the edge



1. Use Self-assembling networks
2. Do most of the data processing at the edge
3. Keep Data Locally; Sync when required
4. Avoid Single Point of failure

The RFID Value Chain

Components to consider for Mission Critical RFID



Key Requirements

Availability, Scalability, Manageability, Security, Integration

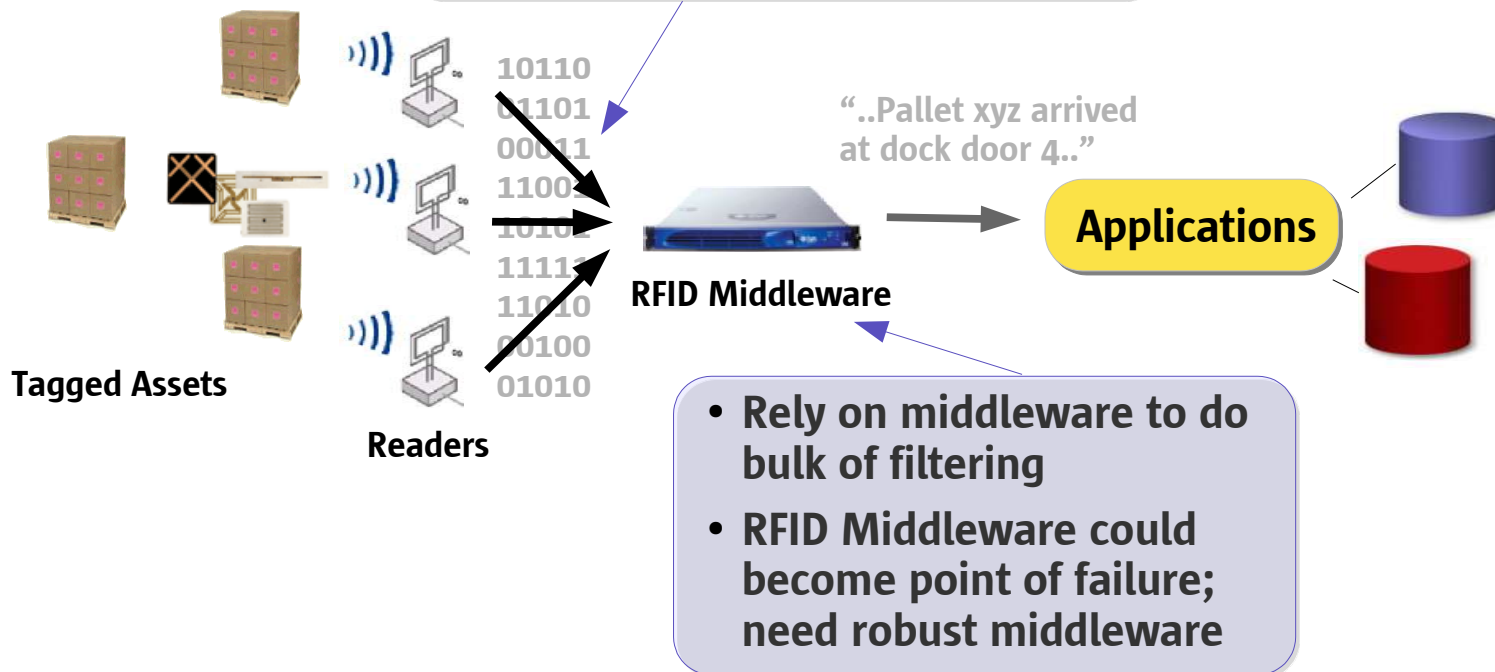
Device Management Written Big

Or Filtering \neq Middleware!

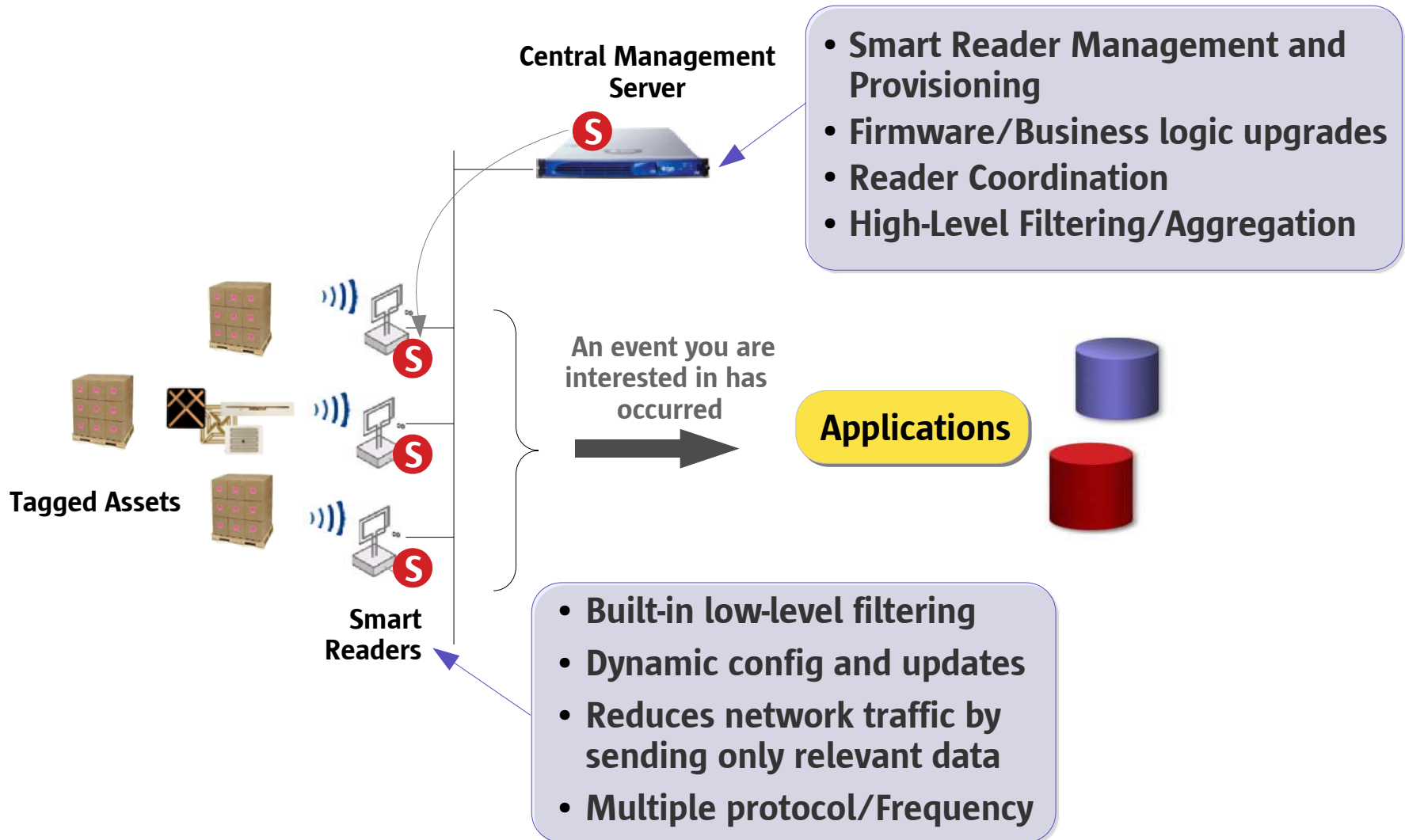
- RFID Middleware is narrowly viewed as being limited to filtering
- What about:
 - Centralized Reader Config and Management
 - Reader/Device Provisioning
 - Reader/Device Coordination (e.g. Interference)
 - Business Event Filtering

What is a “Dumb” Reader?

- No intelligence besides reading and forwarding data
- Little or no filtering of data
- Floods the network with data
- Cheap, Single protocol/frequency



What is a “Smart” Reader?



Dumb vs. Smart Readers

Dumb Readers

Pros

- Simple and Cheap
- Potentially disposable

Cons

- Generates a lot of network traffic
- Relies on RFID middleware to do bulk of filtering; RFID Middleware could become point of failure
- Management of Readers

Smart Readers

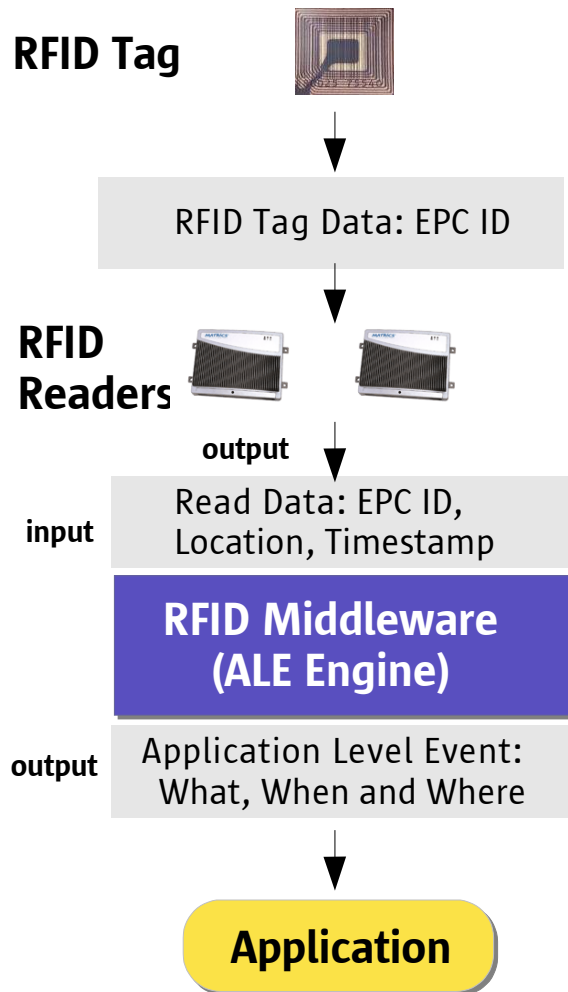
Pros

- Reduces Network Traffic
- Enables better/centralized management e.g. Firmware & software provisioning

Cons

- Still needs middleware for event aggregation and inter-reader coordination

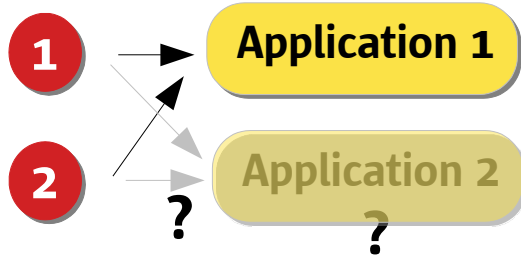
Data Filtering - What is ALE?



- ALE stands for Application Level Events
- ALE is a SW specification for the filtering and collection of RFID data being defined and ratified by EPCGlobal
- ALE enables the aggregation and translation of individual reader events into events meaningful to applications

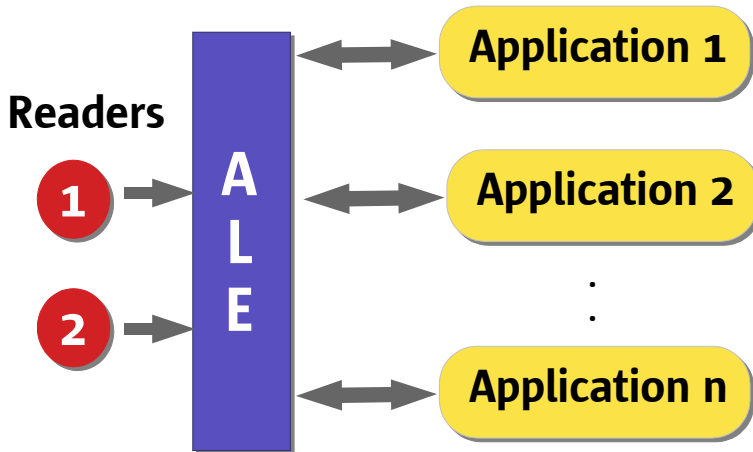
Why ALE is important to Scaling

Readers



An Application-centric approach on incorporate RFID data is not scalable

What if you need a new application to access data from your existing readers?

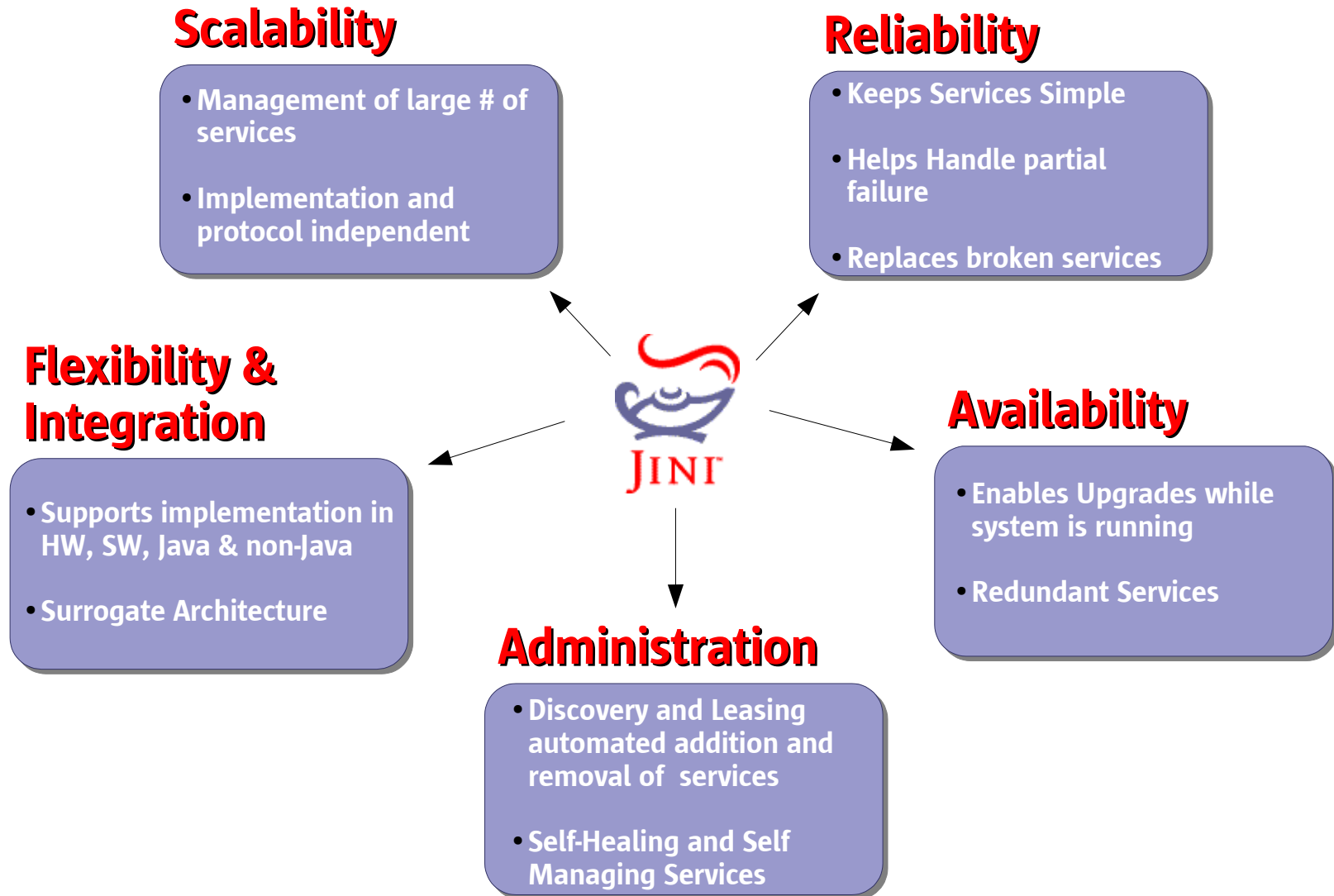


ALE-based middleware enables a more scalable approach to integrating RFID

In this example, with the same set of readers

- Application 1 can request RFID reads only when an object enters or leaves a door
- Application 2 can request RFID reads every 10 seconds for inventory tracking
- Application 3 can request all RFID reads whenever they happen

RFID Middleware Requirements



Device Management

Jini Network Technology provides...

- A simple infrastructure for delivering network services
- An proven distributed framework



and Enables...

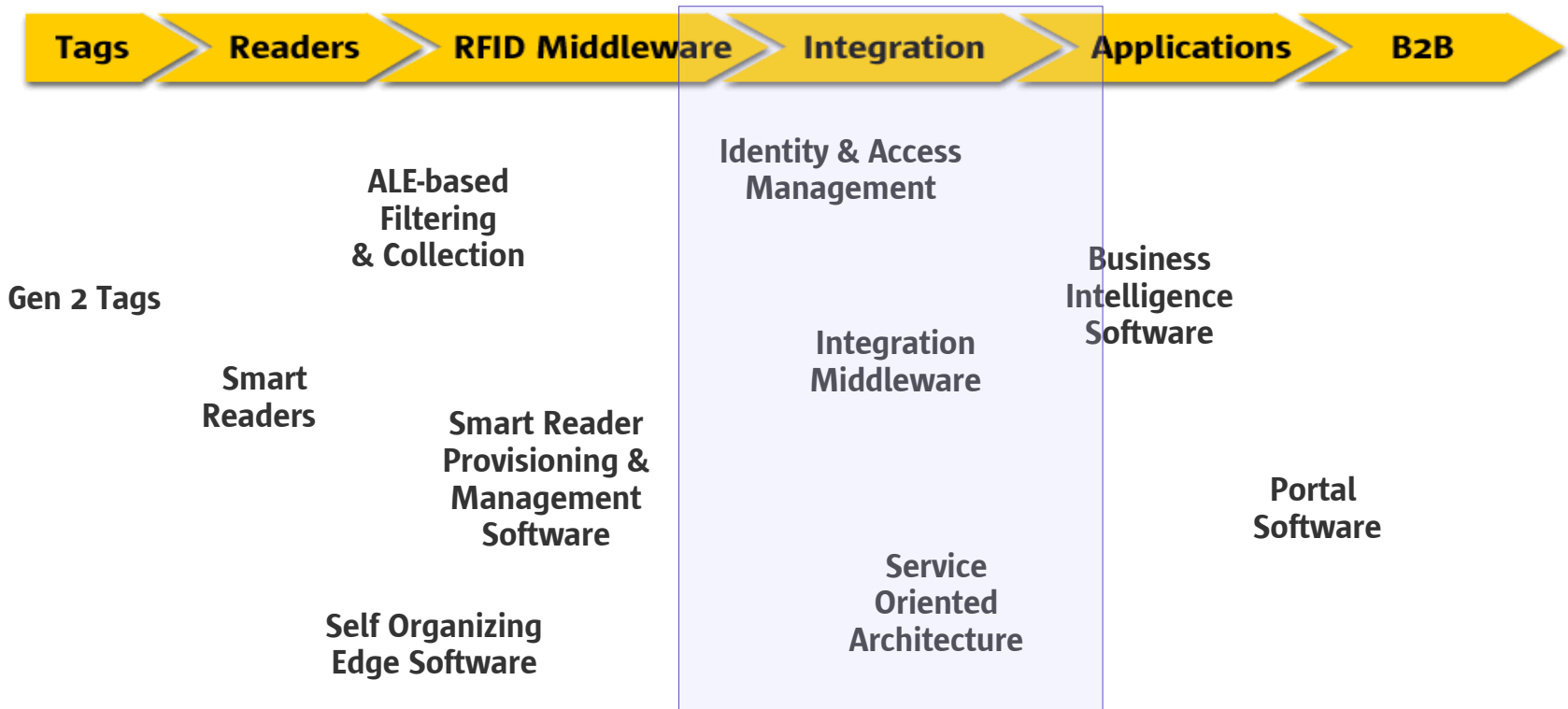
- The spontaneous interaction between programs or devices that provide or consume services
- How Services are added or removed from the network
- How new clients can find existing services without administration

rio.jini.org

Project Rio builds on Jini's distributed architecture concepts to enable dynamic adaptive network capabilities using Policy-based and Quality of Service mechanisms

The RFID Integration Chain

Components to consider for Mission Critical RFID

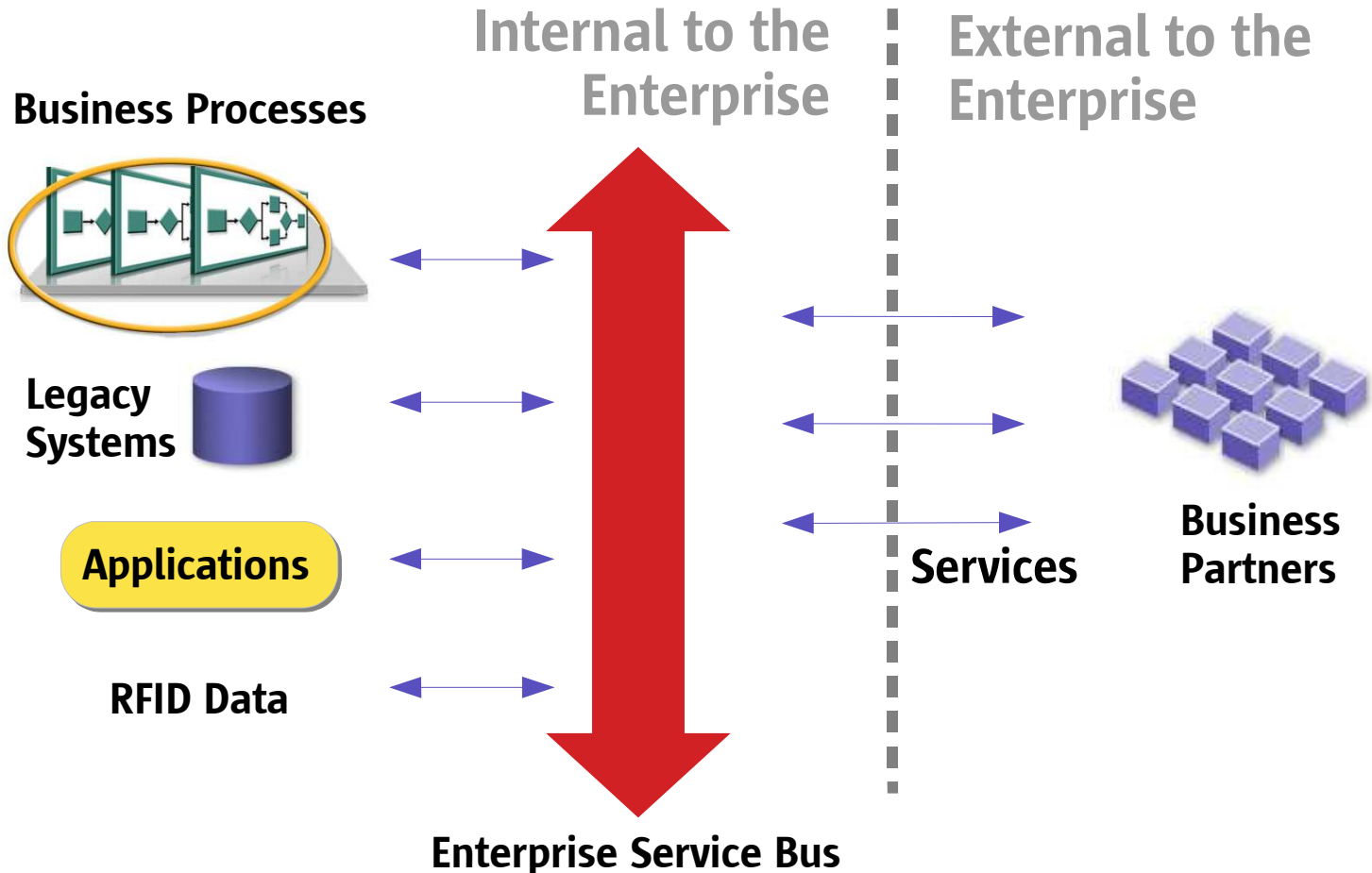


Key Requirements

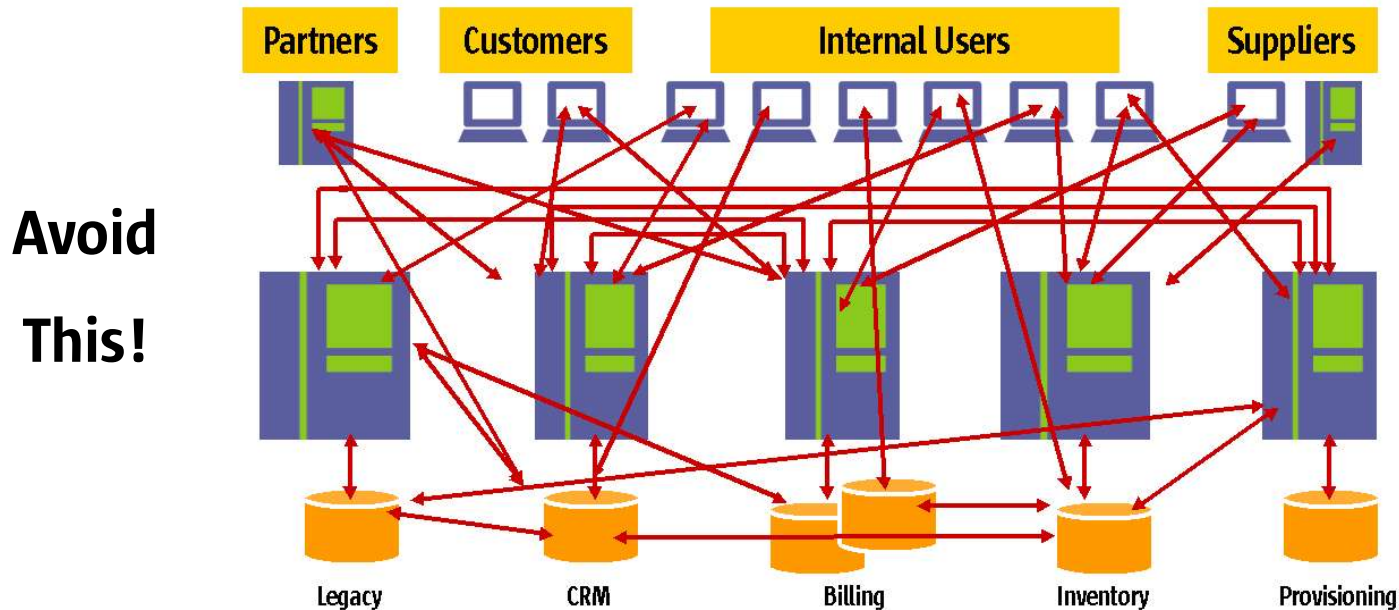
Availability, Scalability, Manageability, Security, Integration

Edge Data in the Big Picture

Integration Issues

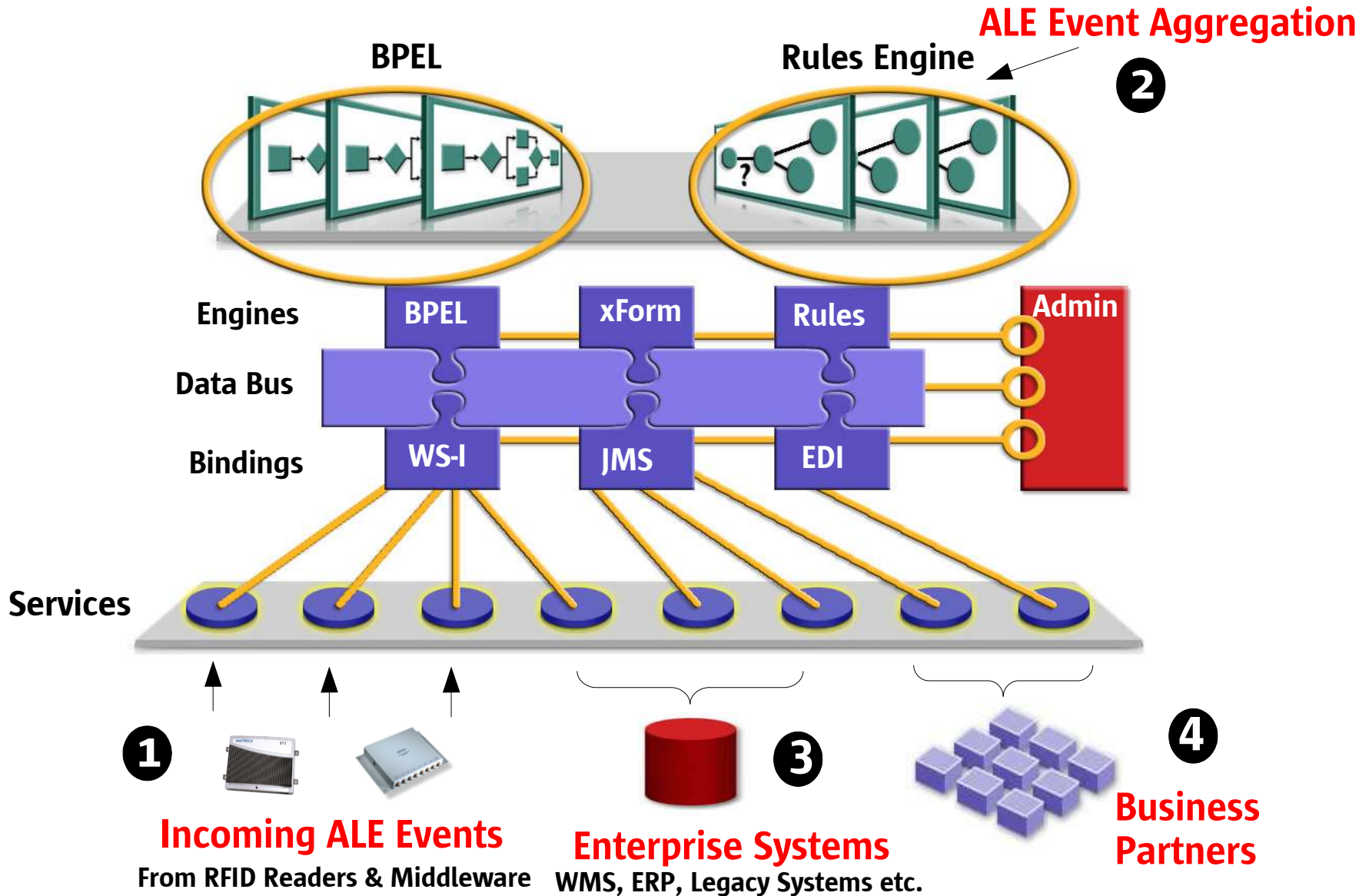


Recommendations for Integration

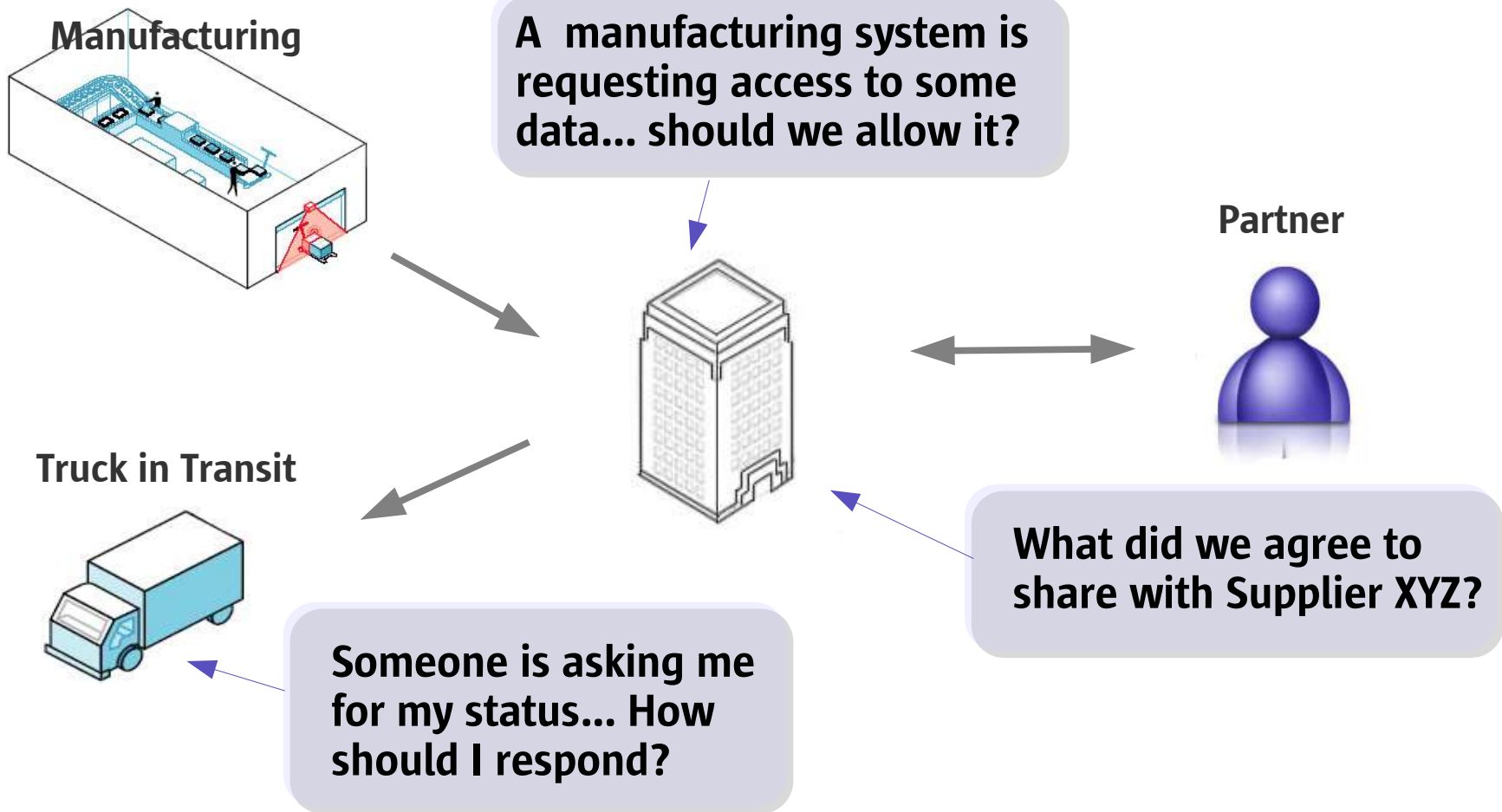


1. **Avoid direct integration with readers**
2. **Implement EAI Strategies for Incremental Integration to accommodate any existing systems**
3. **Think distributed; Avoid single point of failure**
4. **Consider security implications while designing**

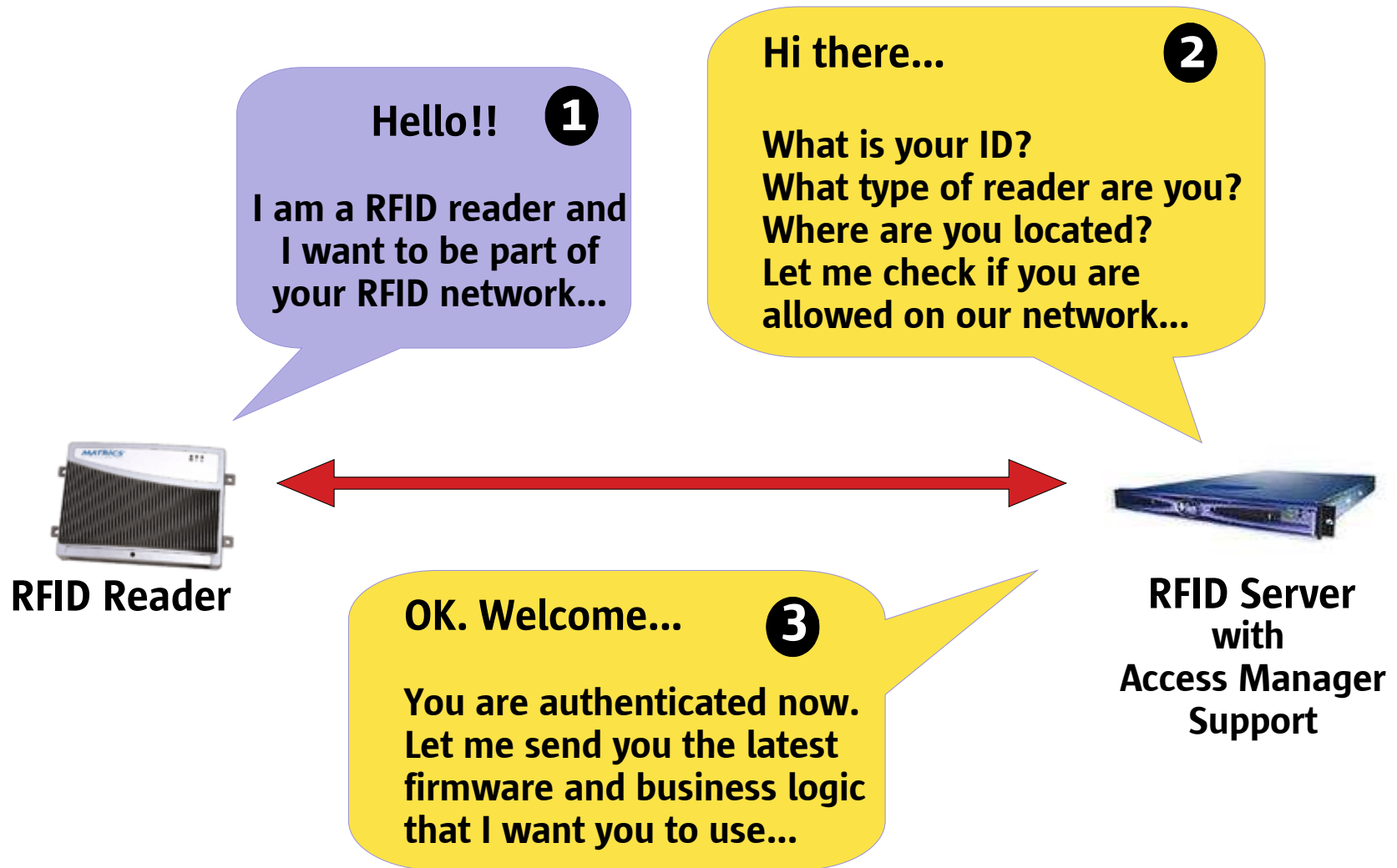
Sun RFID and SOA



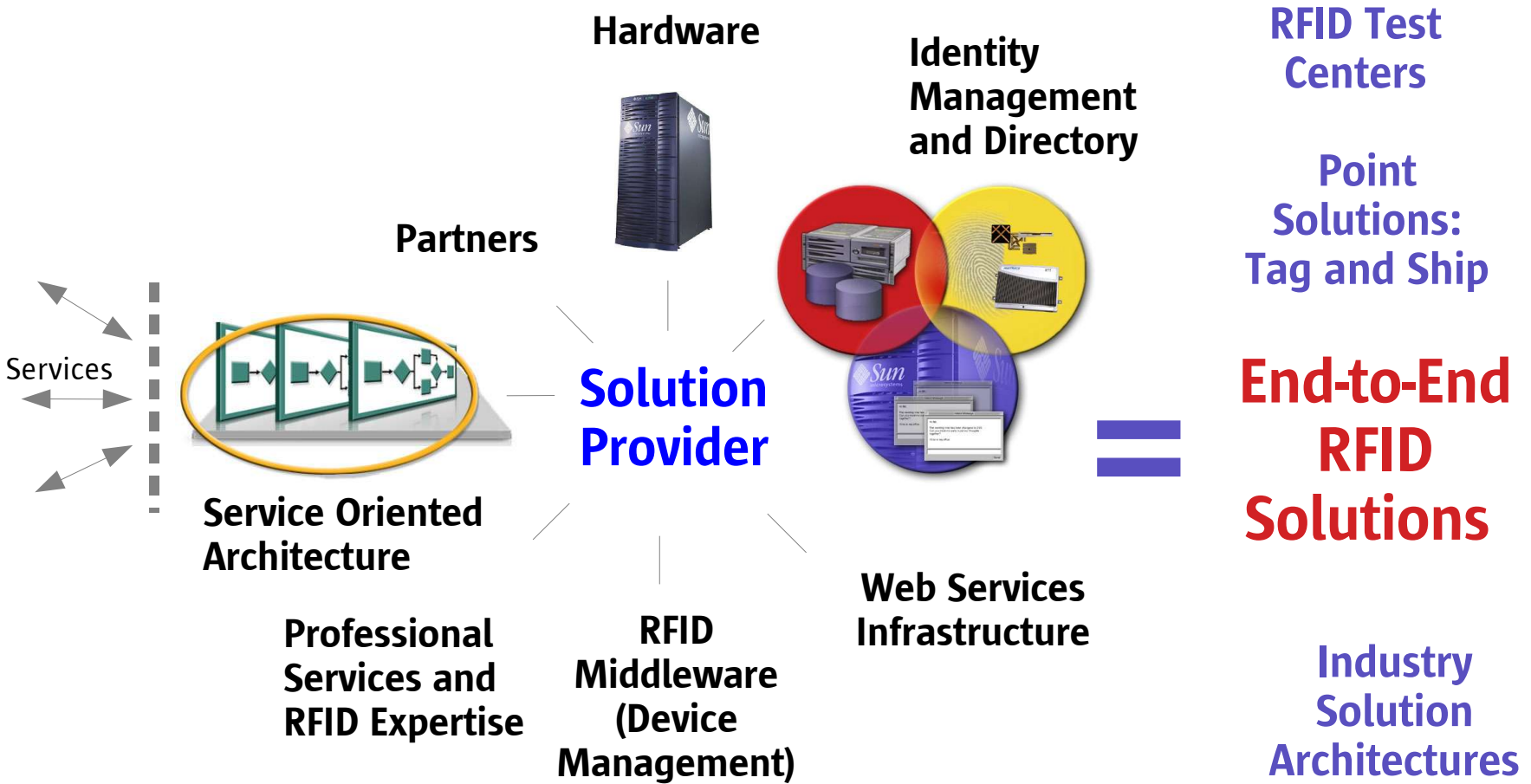
Access and Security Issues



Access and Identity Control



Delivering on RFID Successfully





Thank You! Questions?

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RFID Info: www.epcglobalinc.org

