

ORACLE®

Sensor-Based Services

Business is Becoming Real Time

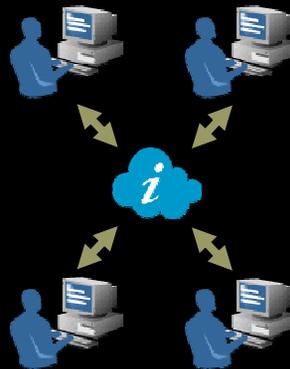
Traditional Business

- Weeks
- Megabytes
- Punch Cards
- Few People



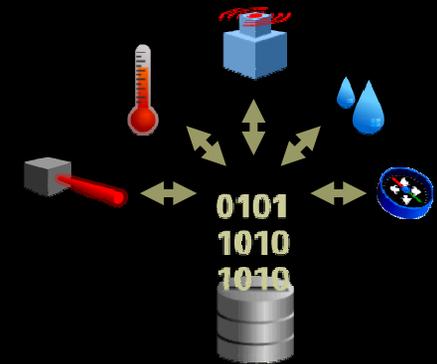
Internet e-Business

- Days
- Terabytes
- Human Driven
- Many People



Real Time Business

- Minutes
- Exabytes
- Event Driven
- Automated



Business Processes Are Interdependent

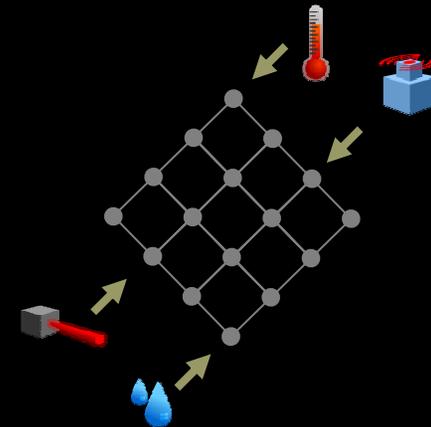
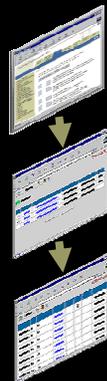
Internet e-Business

- Linear
- Human Intervention
- Limited by Submit Button



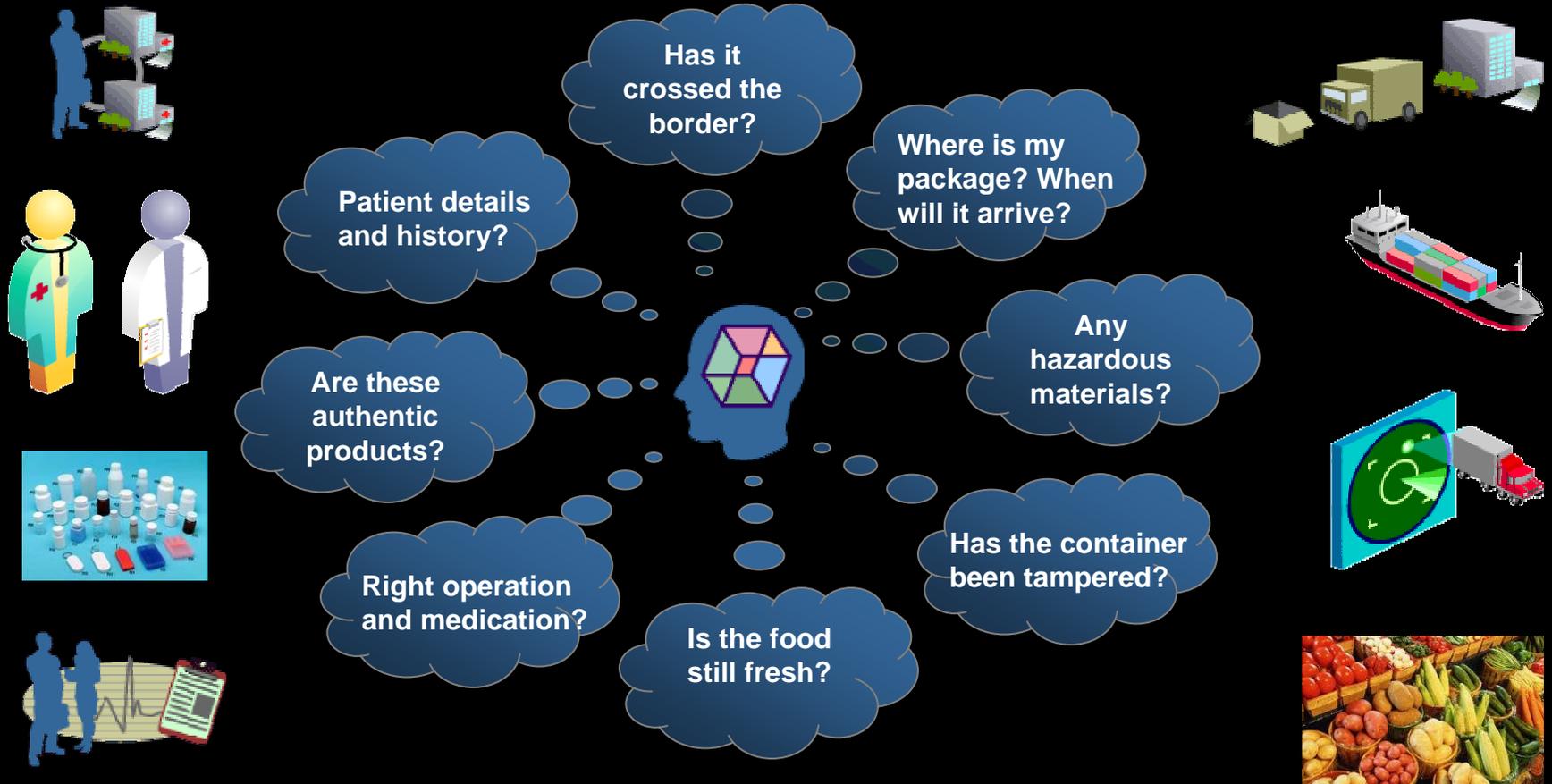
Real Time Business

- Interdependent
- Physical Event Trigger
- Many Starting Points



Businesses Need Information

Decisions Depend Upon Accurate Data



RFID Technology

- **Radio Frequency Identification**

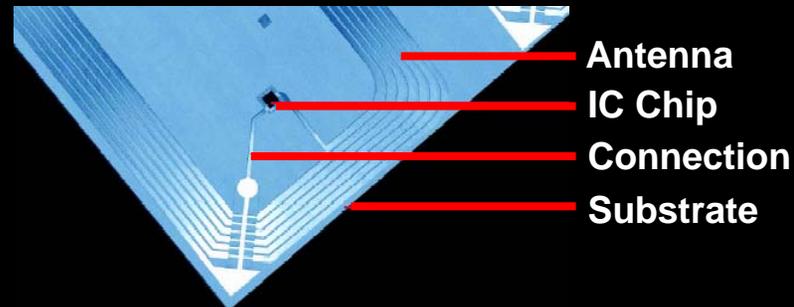
- Auto identification and data collection technology
- Enabling “smart items”
- Chip stores unique ID and information
- Tag transmits information wirelessly via radio waves
- Many different frequencies (e.g. HF 13.56 MHz, UHF 915 MHz)

- **Advantages**

- No line of sight required
- Read multiple tags simultaneously
- Increased accuracy

- **Examples**

- Security Badges
- EZ-Pass



RFID Tags: Passive vs. Active

	Active	Passive
Power Source	Internal battery on tag	Powered by radio waves
Life	Limited by battery	Unlimited
Operating Temp	More limited	Wide range (-40°-185°F)
Range	Longer	Shorter
Memory Capacity	Larger	Smaller
Feature Set	Additional sensors, alarms, GPS	Identity, basic data
Cost	\$10-\$100	15¢ - \$1s
Example Use Case	Track large assets, save information to tag	Single use tags, typically in open-loop supply chain

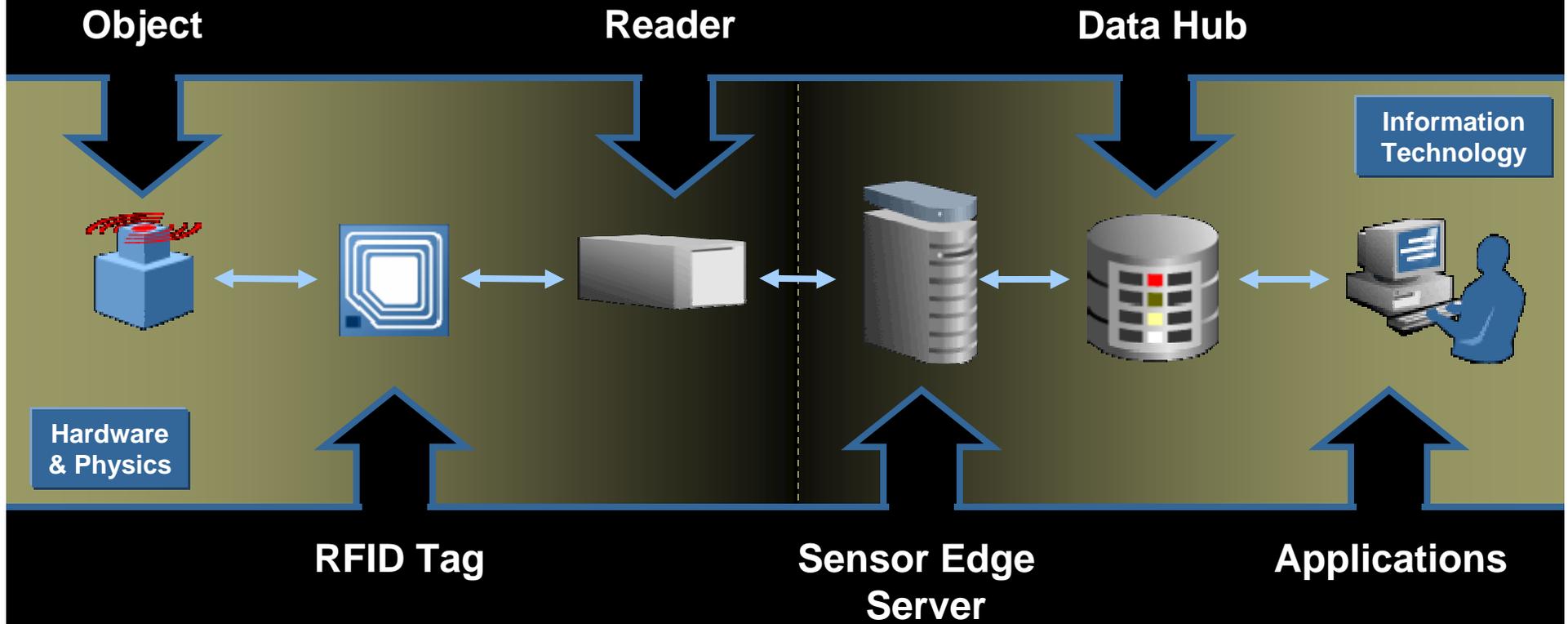
RFID Tags: Varying Frequencies



Considerations

- Directionality
- Anti-collision
 - Identifying multiple tags at once
- Data capacity
- Data rate
- Reflection & interference
- Privacy
- Regulations & standards
- Reader-to-tag
- Tag data
- Supply chain partners
- International availability
- Tag cost
- Security (ex. Blocker tag)

RFID: Physical World → IT World



Information Challenges





Challenge: Capture

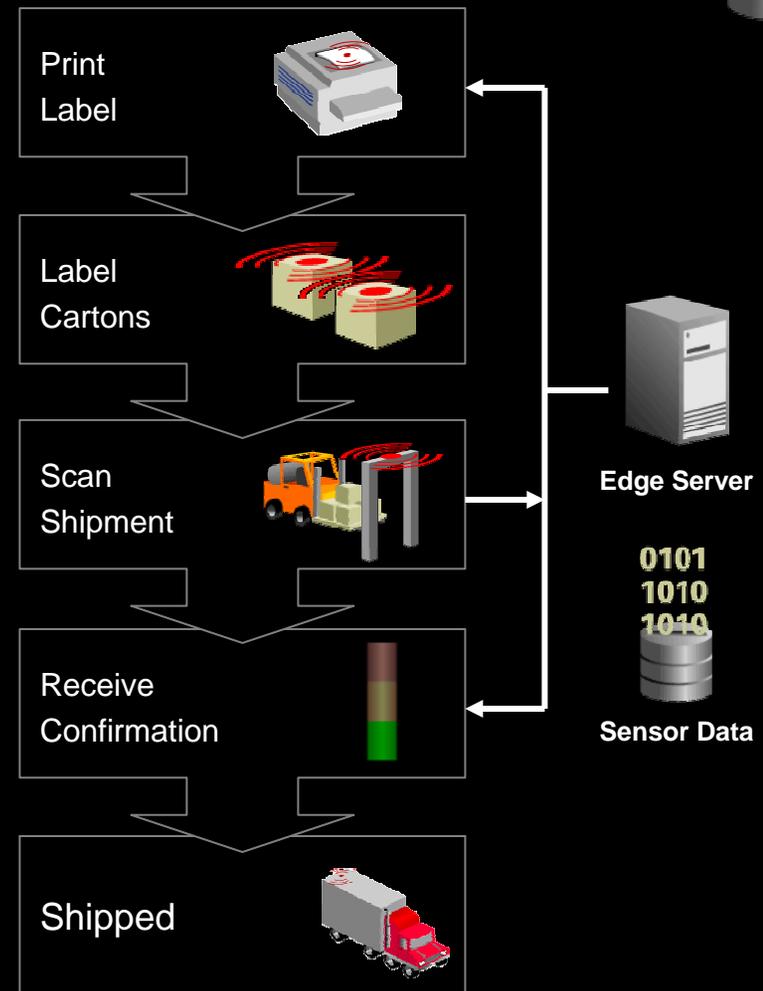


- **Many types of event sources and sensors**
 - RFID (handheld, portal, truck mount, etc.), barcode, location, moisture, temperature
- **Many RFID and sensor vendors**
 - Alien, Intermec, Matrics, ThingMagic, SAMsys, Zebra
- **Many different frequencies, protocols, interfaces**
 - LF, HF, VHF, UHF, Microwave
 - Ethernet, PCMCIA, RS-232
- **Many devices in different locations to manage**
 - Device health, device upgrade
 - Central management
- **Information Capture**
 - Data format not consistent
 - Data is granular and redundant
 - Information based on observations from multiple sensor sources

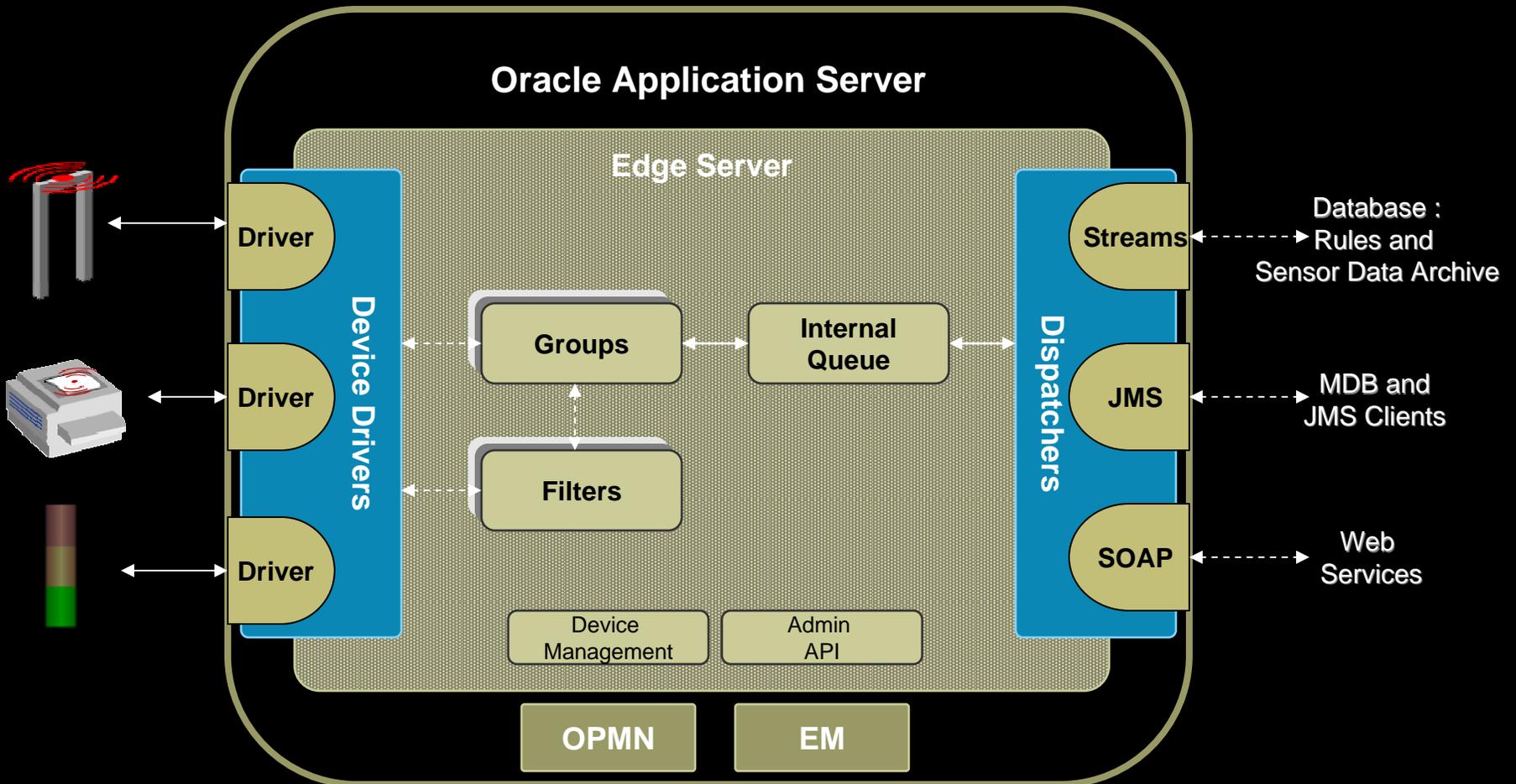
Oracle Edge Server



- **Collect Sensor Data**
 - RFID Readers, RFID Label Printers, Light Stacks
- **Cleanse Sensor Data**
 - Cleanse, Normalize, Filter Sensor Events
- **Dispatch Sensor Data**
 - Deliver Sensor Data to Backend Systems
- **Device Management**
 - Manage and Monitor Sensors and Response Devices
- **Edge Developer Kit**
 - Extend Edge Server to Support New Devices

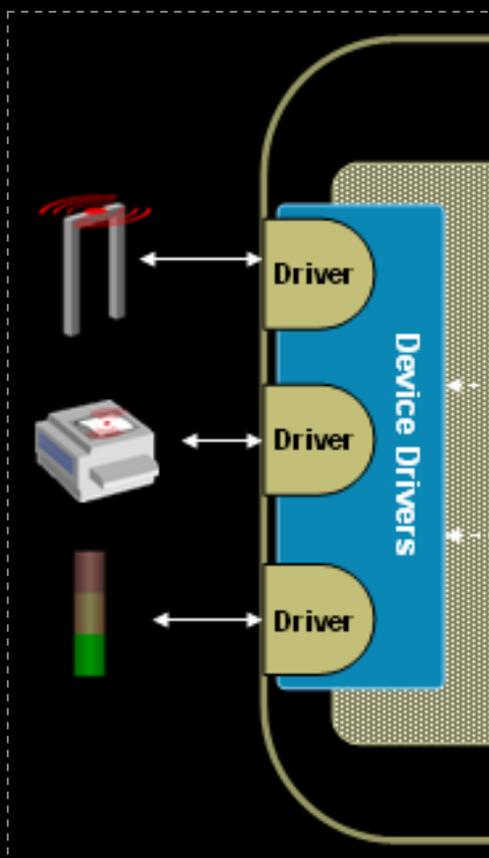


Oracle Edge Server



Oracle Edge Server

Sensor Devices Support



- **Driver Framework**
 - Plug-and-play architecture
 - Develop new drivers anytime
 - Applications are device agnostic
- **Sensor and Device Support**
 - RFID Readers
 - RFID Label Printers
 - Light Stacks
 - Extensible to other devices
- **Drivers (Available in 10.1.2)**
 - Alien RFID Readers
 - Intermec RFID Readers
 - Patlite Light Stacks
 - Zebra RFID Label Printers (OTN)

Oracle Edge Server Device Management

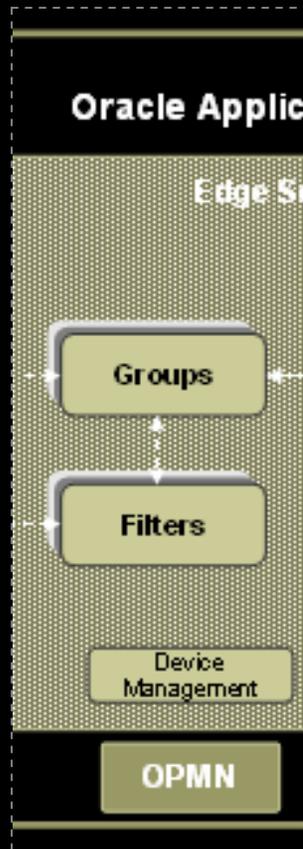


The screenshot shows the Oracle Edge Server Device Management web interface. It is divided into three main sections: 1. "Edge Server List" which shows a table of edge servers (e.g., rfid_edge_server1, edge2) and a diagram of an "RFID Edge Server" connected to various devices. 2. "Edge Device Groups" which shows a table of device groups (e.g., Unassigned, EdgeEvent Device 1, jong's test device2, Test Group 1) and a diagram of a device connected to a group. 3. "Filter Management" which shows a table of filters (e.g., CrossReaderRedundantFilter, ShelfFilter, PassFilter, PalletPassFilter, PalletShelfFilter) and a diagram of a filter connected to a device. The interface includes navigation menus, search bars, and various control buttons.

- **Edge Server Management**
 - Centralized Management of all Edge Servers
 - Enterprise Manager Integration
- **Device Management**
 - Centralized Management
 - Device Drivers
 - Filters
 - Dispatchers
 - Extending Edge Capabilities
 - Edge Developer Kit
 - Centralized Archive upload
 - Custom Driver Parameters exposed through UI

Oracle Edge Server

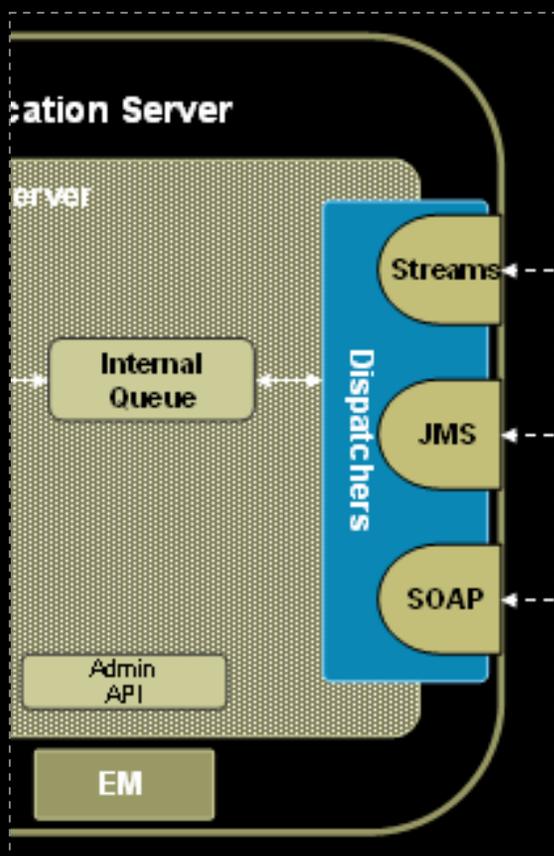
Device Groups and Filters



- **Device Groups**
 - Allows administrators to logically group devices together
 - Group devices for cross filtering
- **Filter Framework**
 - Remove unwanted or low-level events
 - Extensible filter architecture
 - Centralized filter management
- **Filters (Available in 10.1.2)**
 - **PassThru** : Filter for portal readers, produces 'detected' event
 - **Shelf** : Filters for shelf and proximity readers producing enter/exit events
 - **PalletPass, PalletShelf** : Aggregation filtering for both Pass and Pallet filters
 - **Group** : All filters can be applied to groups and individual devices
 - **CheckTag** : Test tag to verify reader health

Oracle Edge Server

Internal Queue and Dispatcher



- **Internal Queue**
 - Guarantees data will not be lost if dispatch link is down
 - Dynamically switches between transient and persistent store and forward
- **Dispatcher Framework**
 - Send normalized and “relevant” events to database and applications
 - Extensible dispatcher framework
 - Centralized dispatcher management
- **Dispatchers (Available in 10.1.2)**
 - **Streams** : Applications can be written as PL/SQL, C++, or Java code that is called by the database upon satisfying specific rules, or JMS listener on the Application Server.
 - **JMS (OC4J)** : Applications can be written as JMS Listener or Message Driven Beans
 - **Web Services** : Call out to customer application SOAP routines when events are received
 - **HTTP** : Post to specified URL when events are received

Oracle Edge Server

Edge Developer Kit (EDK)



- **Develop Extensions**
 - Driver Extensions
 - Dispatcher Extensions
 - Filter Extensions
- **Develop Sensor Enabled Applications**
 - Small footprint
 - Easy to Manage
 - Identical Application Interfaces
- **Test code with Hardware or Simulation tools**
 - Reader Simulator
 - Filter Simulator
 - Dispatcher Simulator

EPC Compliance Enabler

EPC Compliance Enabler

- **Meet the Industry Mandate Deadlines**
 - Wal-Mart, DOD, Metro, Tesco, Target, Albertson's, etc.
- **Quick to Install and Comply**
 - No footprint requirements
 - Supports any backend system: Oracle, Legacy, Other
- **Invest Now for the Future**
 - Single or Global Deployments
 - Scalable, Reliable Architecture
 - Standards-Based Enterprise RFID Infrastructure
- **Upgrade Path**
 - Easy to integrate into existing systems
 - Seamlessly upgrade to Oracle WMS 11.i.10+

EPC Compliance Enabler

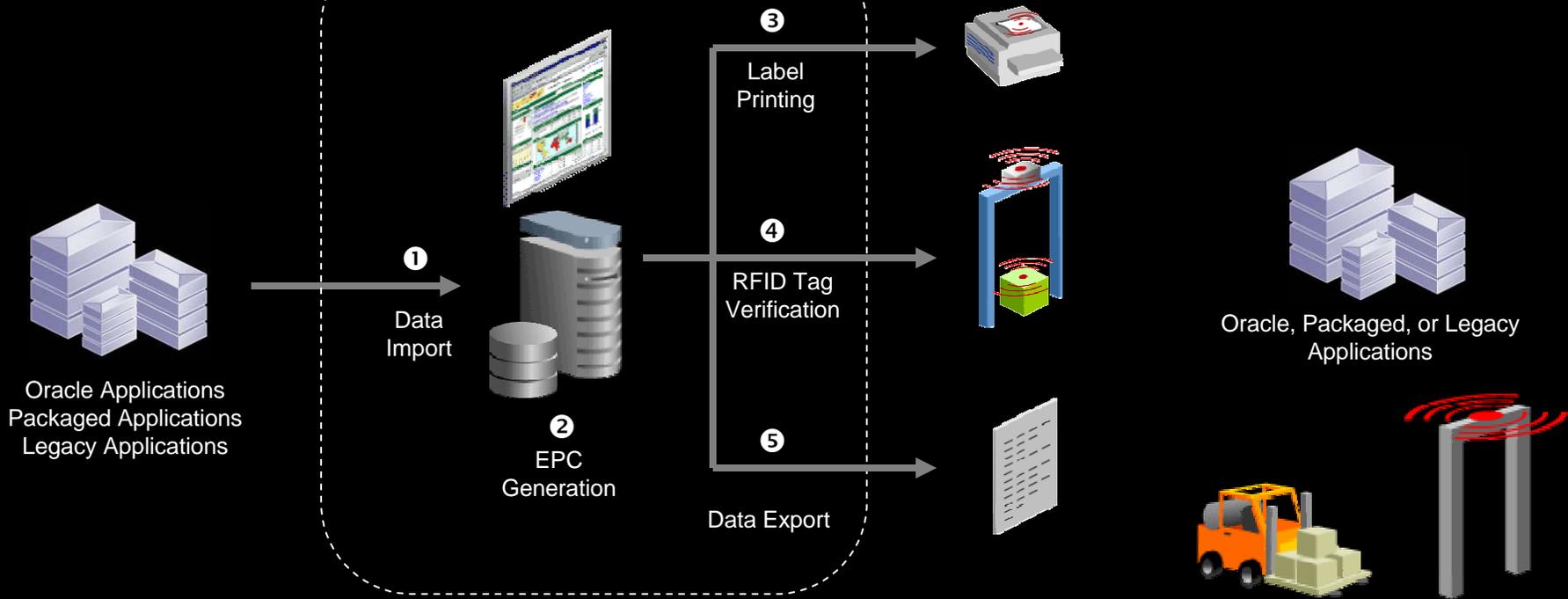
Supplier



Customer



Oracle EPC Compliance Enabler



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EPC Compliance Enabler

EPC Generator

File Edit Import Shipment Tools Help

Welcome! It is Thu Jun 24 14:34:03 PDT 2004

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Data Import Dashboard

You have 0 new records to import

You have 3 bad records to fix

EPCGen is currently connected to printer: Zebra non-rfid printer

Validate Data

Fix Errors

View EPCs

Shipment Verification Dashboard

The following records have been verified

Time	GTIN	SSCC

All pallets have been exported.

Pallet Verification History

Data Export Dashboard

The following records have been exported

Time	GTIN	SSCC
2004-06-23	9231414100...	
2004-06-23	9231414100...	
2004-06-23	9231414100...	
2004-06-23	9231414100...	
2004-06-23	9231414100...	
2004-06-23	9231414100...	

Last pallet 37 was exported on 2004-06-23

Data Export History

Functionality

- **Data Import**
 - ASN data from Oracle or legacy system
 - Flexible formats: Database tables, XML files, Web Service
 - Either GTIN or SSCC defined
 - Data correction interface with case level atomicity
- **EPC Generation**
 - EPC Generation Rules: Define, Store, Export
 - GTIN vs. SSCC
 - Configurable encoding – 96-bit vs. 256 bit, etc.
- **RFID Label Printing**
 - Standard Integration: XML file produced with EPC
 - Loftware, Zebra and more
- **RFID Tag Verification**
 - Read EPCs and mark seen cases/pallets
 - Configurable thresholds
 - Error messages: if extra cases seen, if not “enough” cases seen
 - Notifications via response devices: light stacks, message boards, audio
- **Data Export**
 - Flexible formats: Database tables, XML files
 - Further integration with OracleAS Integration and B2B

Id	ParentRowId	Epc	CreationDate	Ssc	Gtin	PoAsn	PrinterIp	PrinterPort
6		EPCPARENT...	May 4, 2004	23434	5675865765...	PO_ASNWAL...	144.25.139...	4444
7	1	EPCCHILD...	May 4, 2004	2234324323...	56758657586...	PO_ASNWAL...	144.25.139...	4444
8	1	EPCCHILD...	May 4, 2004	2234324323...	5675865234...	PO_ASNWAL...	144.25.139...	4444
9		EPCPARENT...	May 4, 2004	21132323434	5623432434...	PO_ASNWAL...	144.25.139...	4444
10	4	EPCCHILD...	May 4, 2004	2343243242...	5354243246...	PO_ASNWAL...	144.25.139...	4444

Sequence	Component	Component Value	EPC Segment Length	EPC Output Representation
10	FIXED	00110000		8 BIN
20	FILTER			3 BIN
30	FIXED	010		3 BIN
40	COMPANY-PREFIX			24 BIN
50	GTIN			10 BIN
60	SERIAL			30 BIN

Row Id	5	ParentRowId	
Epc	EPCPARENTVALUE	CreationDate	2004-05-04
Ssc	23434	Gtin	5675865765675
PoAsn	PO_ASNWAL1	PrinterIp	144.25.139.122
PrinterPort	4444	PathName	
FileExt		FilterObjectType	1
EpcRuleId	2	Status	
Status Code	P	Group Id	
PrinterName	Zebra 1		

OK Cancel

RFID Pilot Kit

RFID Pilot Kit

- **Gain Insight on Your Business Processes**
 - Track and trace
 - Visibility portal with pre-built reports
- **Ready to Capture, Analyze Out-of-the-Box**
 - Plug and play RFID readers and RFID printers
 - Secure, scalable data storage
 - Powerful business intelligence tools for custom analysis
- **Scale to Global Enterprise Deployment**
 - Proven, mature technology
 - Oracle Database 10g, Oracle Application Server 10g

RFID Pilot Kit

- 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



3 Scan Tags



- 1 Select Driver
- 6 Configure / Develop new Driver

Oracle RFID Pilot Kit



- 5 View Data Analysis and Visibility Reports
- 8 Custom Analytics and with Business Intelligence Tools



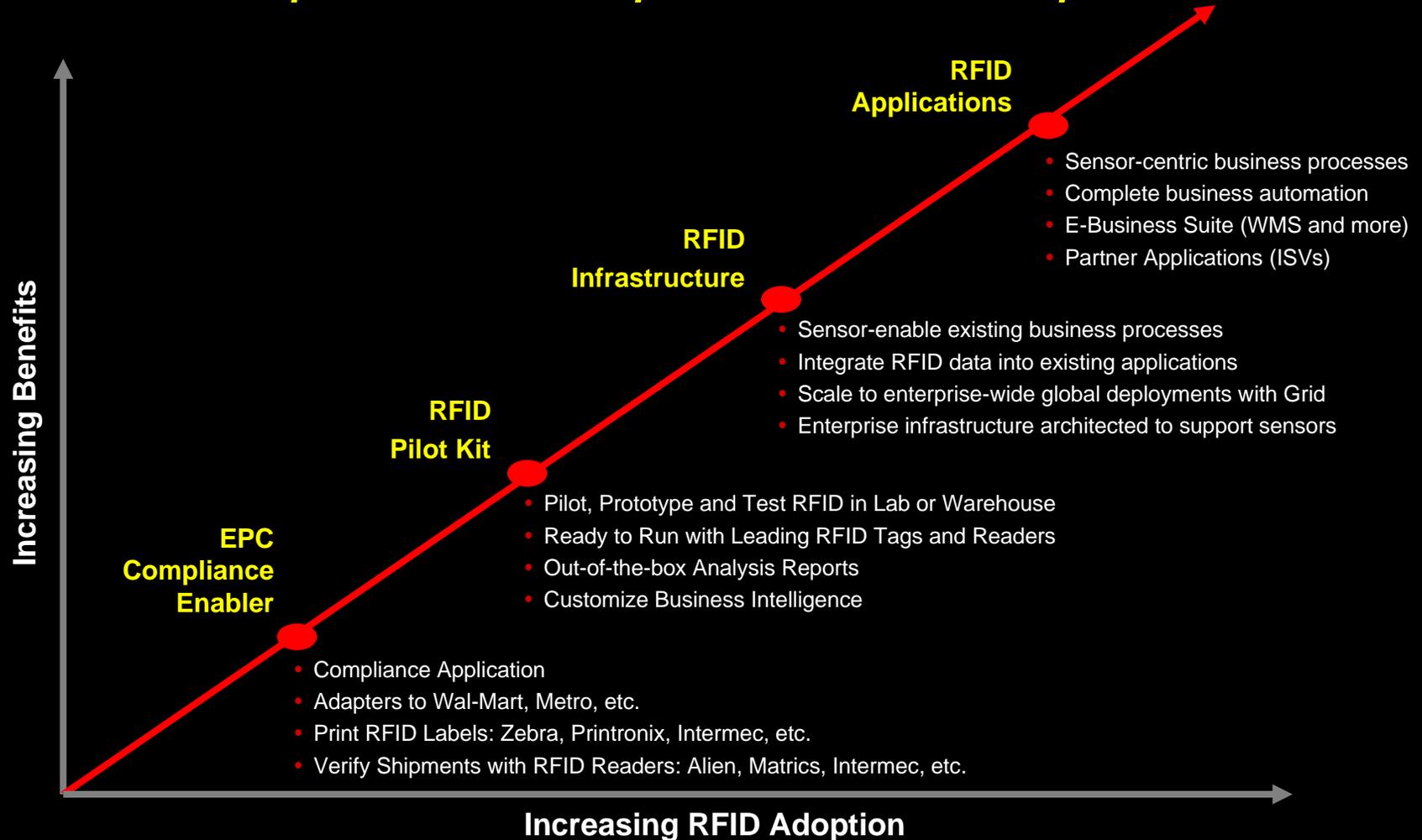
- 2 Select Filter
- 7 Configure / Develop new Filter



- 4 Automatic Data Archive in Sensor Database

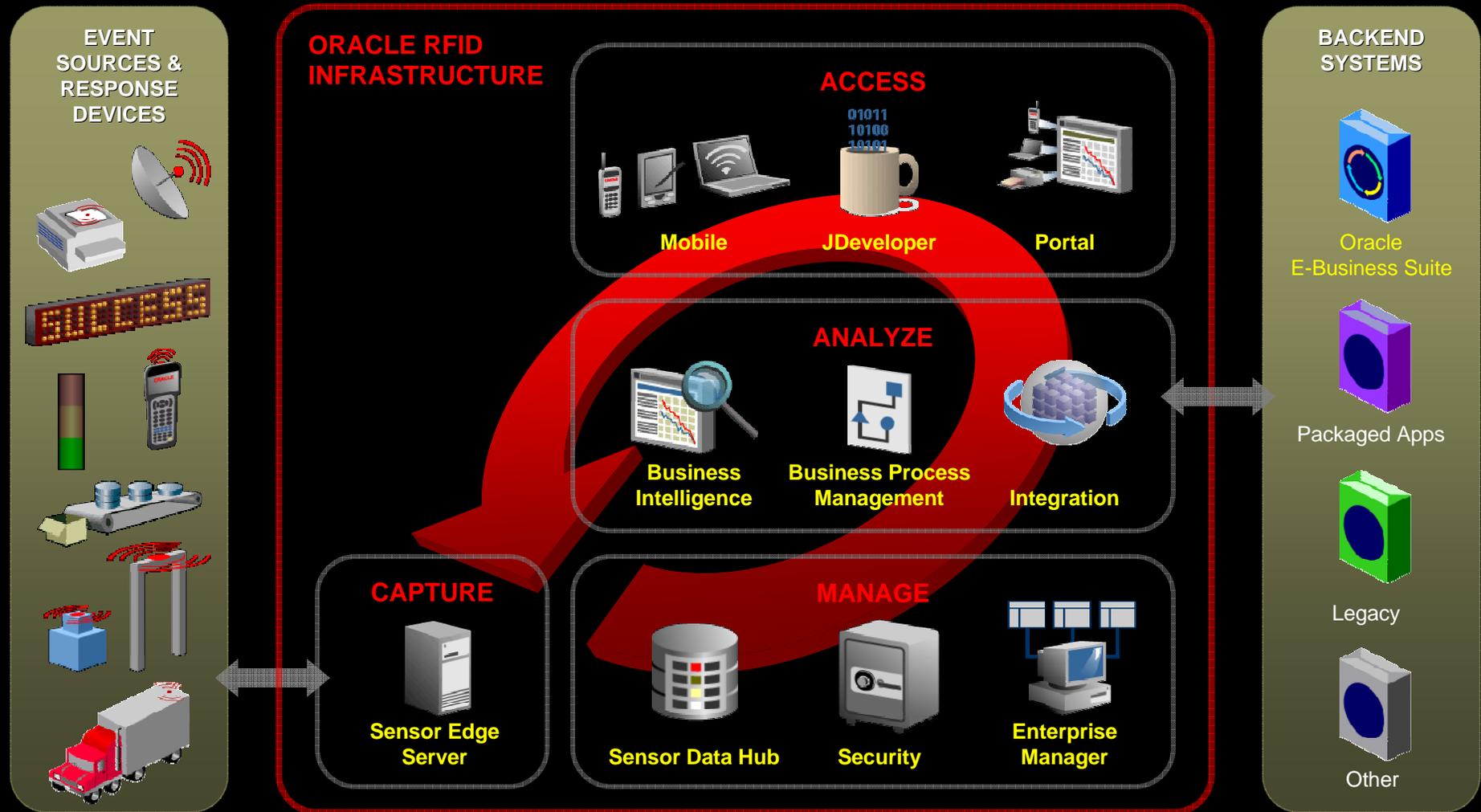
Oracle Sensor-Based Services

Flexible Adoption and Implementation Options



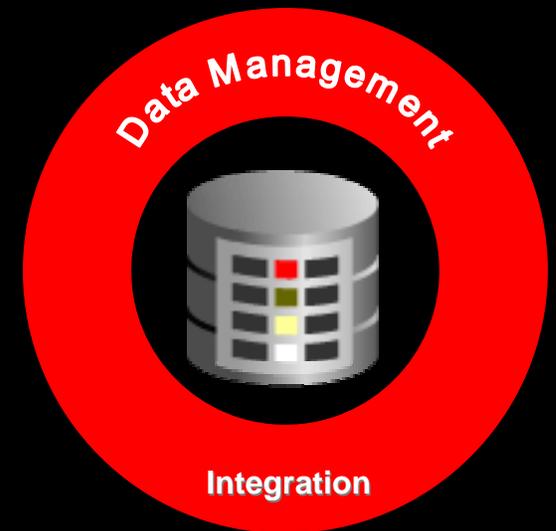
RFID Infrastructure

Oracle RFID Infrastructure



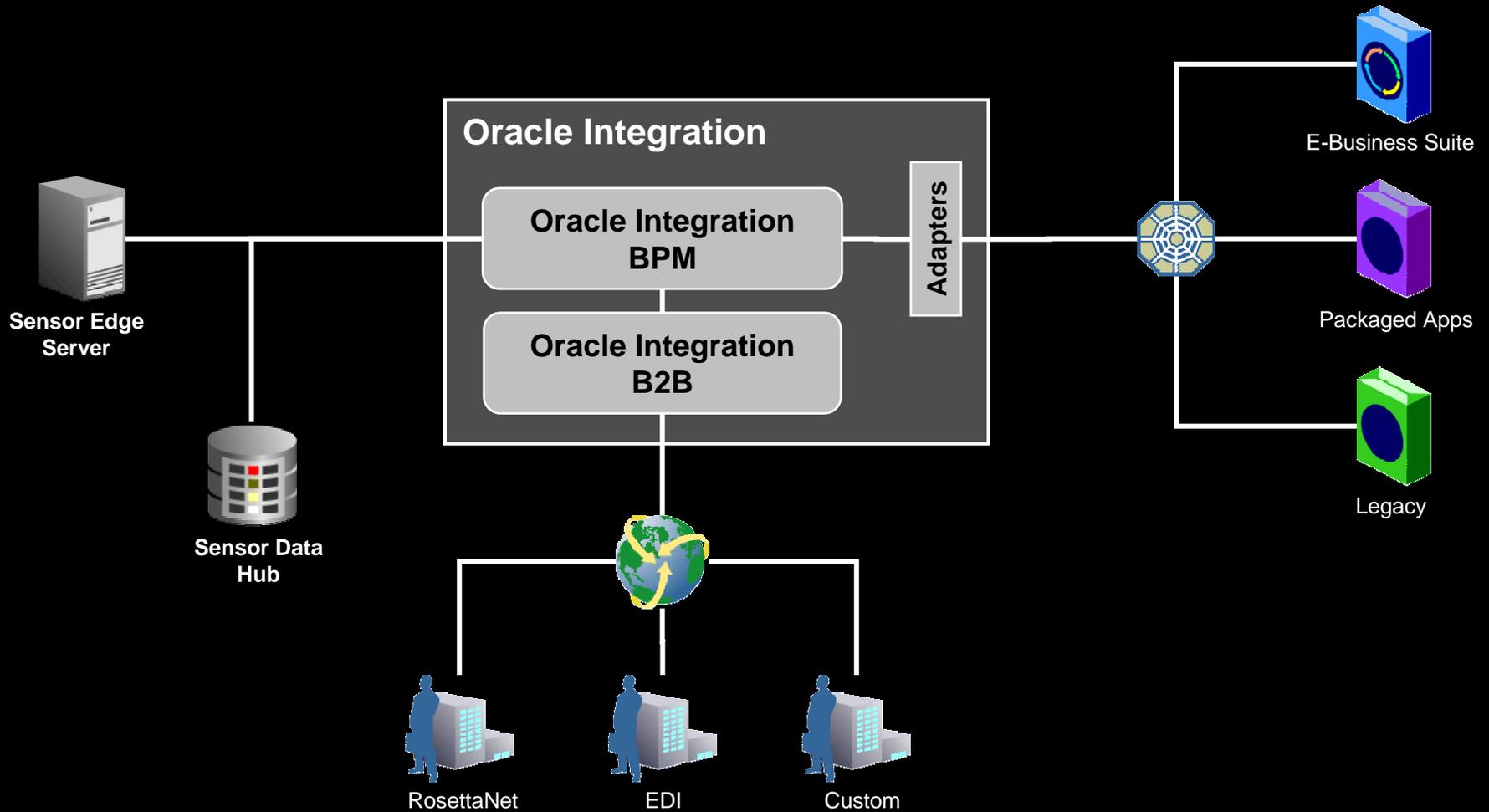
Oracle Sensor Data Hub

- Central sensor data repository
- Physical world events with context
- 24/7 monitoring for push-based notifications
- Customize rules to triggering notifications and application events
- Maximize sensor technology benefits with minimal application changes



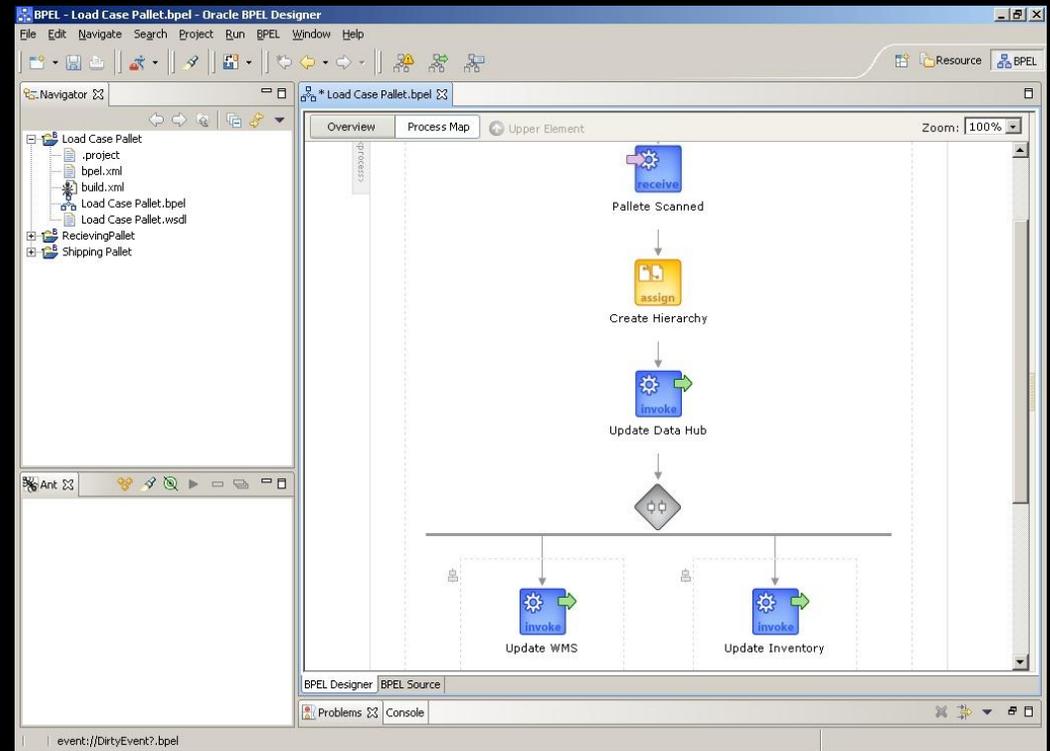
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Oracle Integration



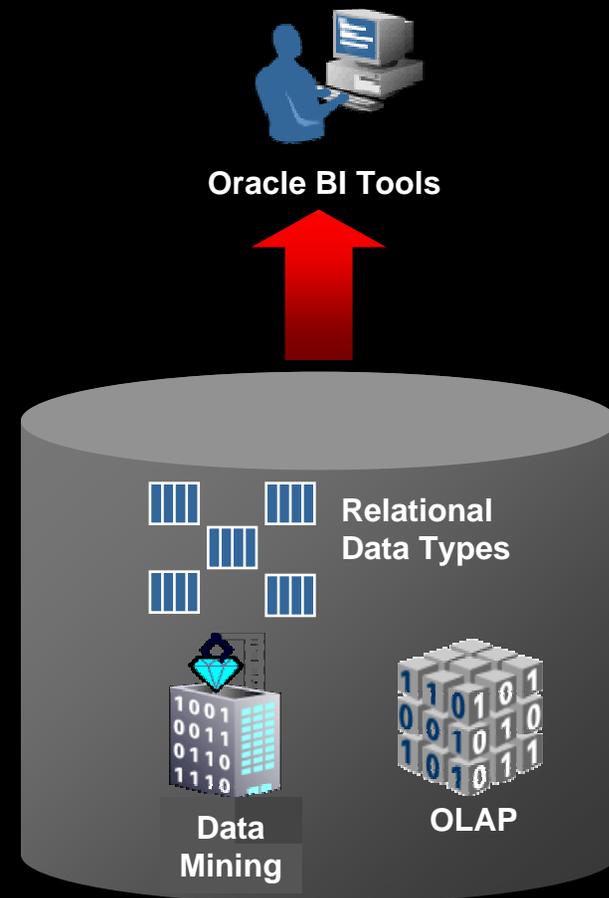
Oracle BPEL Process Manager

- **Integrate RFID Events**
 - Raw events
 - Aggregation
- **Easy to Develop**
 - Process Modeling GUI
 - Data type designer
 - Mapping and transformation editor
 - Trading partner management



Oracle Business Intelligence

- Single source of information - Oracle Database
- Accessed with the tools you know



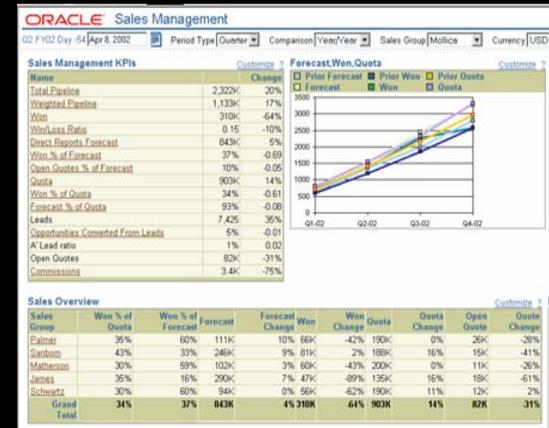
Oracle Business Activity Monitoring

Sensor Data Analytics

- Monitor key performance indicators
- Uncover business trends
- Create real-time event driven processes
- Adapt to changing business requirements
- Optimize entire value chain

Business Intelligence Delivered

- “Who has the highest order \$\$ volume?”
- “Where are orders delayed?”
- “When do my perishable items need to be sold?”
- “How many times in the last 6 months have we been out of stock?”



Oracle Sensor-Based Services

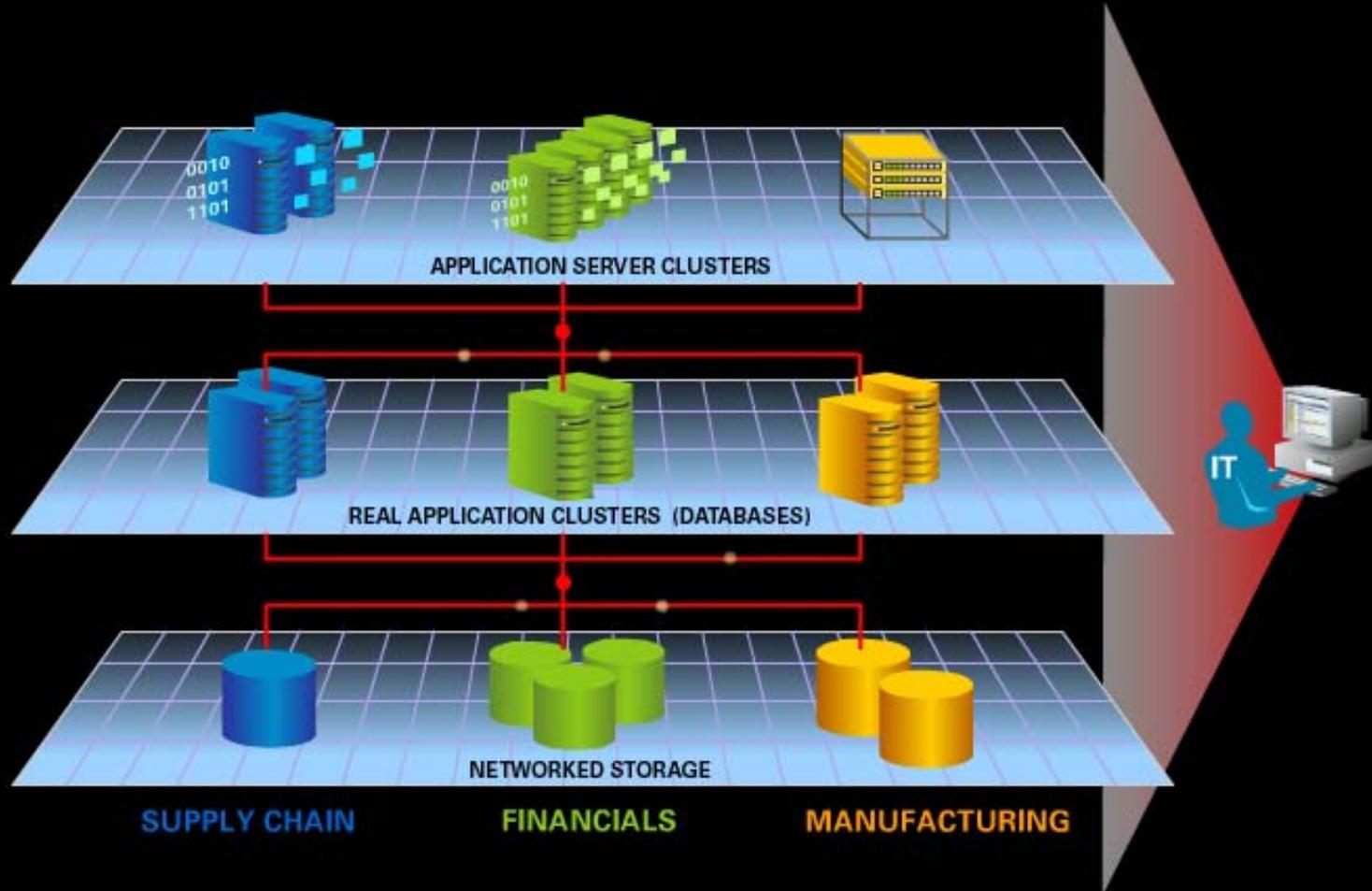
Enabling the Real-Time Enterprise



Integrated support for RFID and sensor-based computing.

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Oracle Grid Computing



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