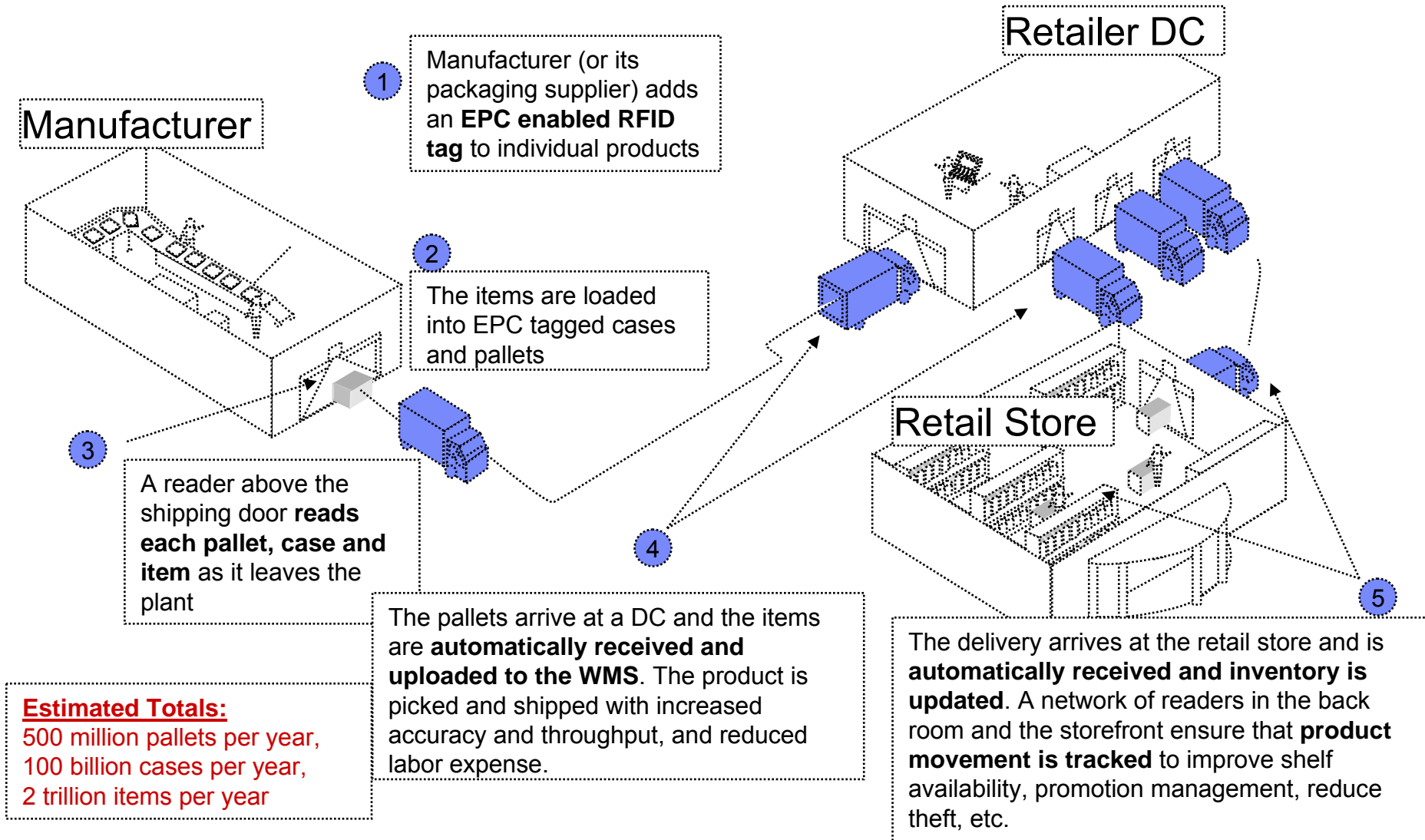


RFID impacts operations at different levels in Supply Chain

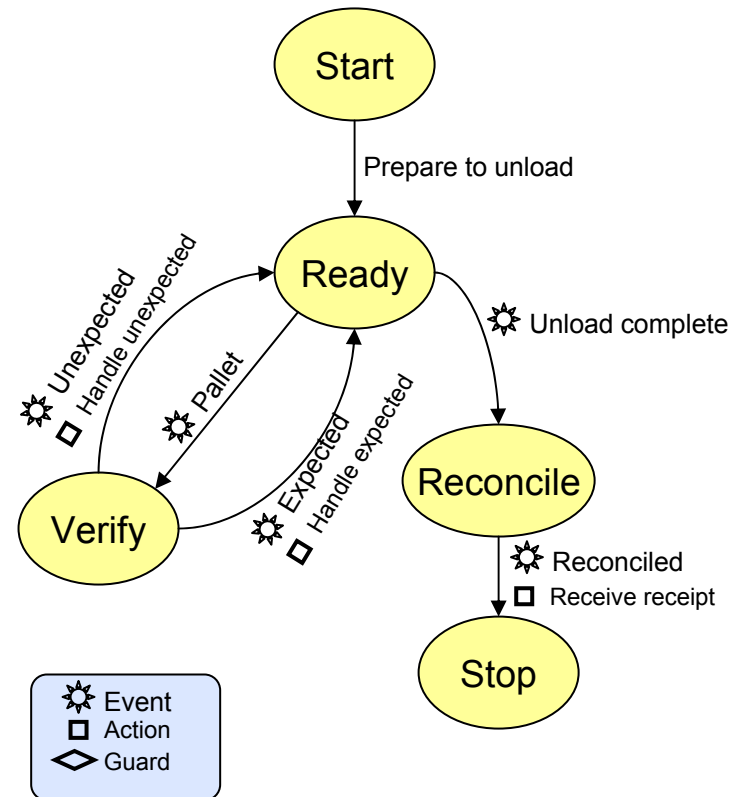
RFID can make real time tracking of inventory possible and coupled with related process improvements can benefit both manufacturers and retailers



Example Dock Door Receiving use case and business process

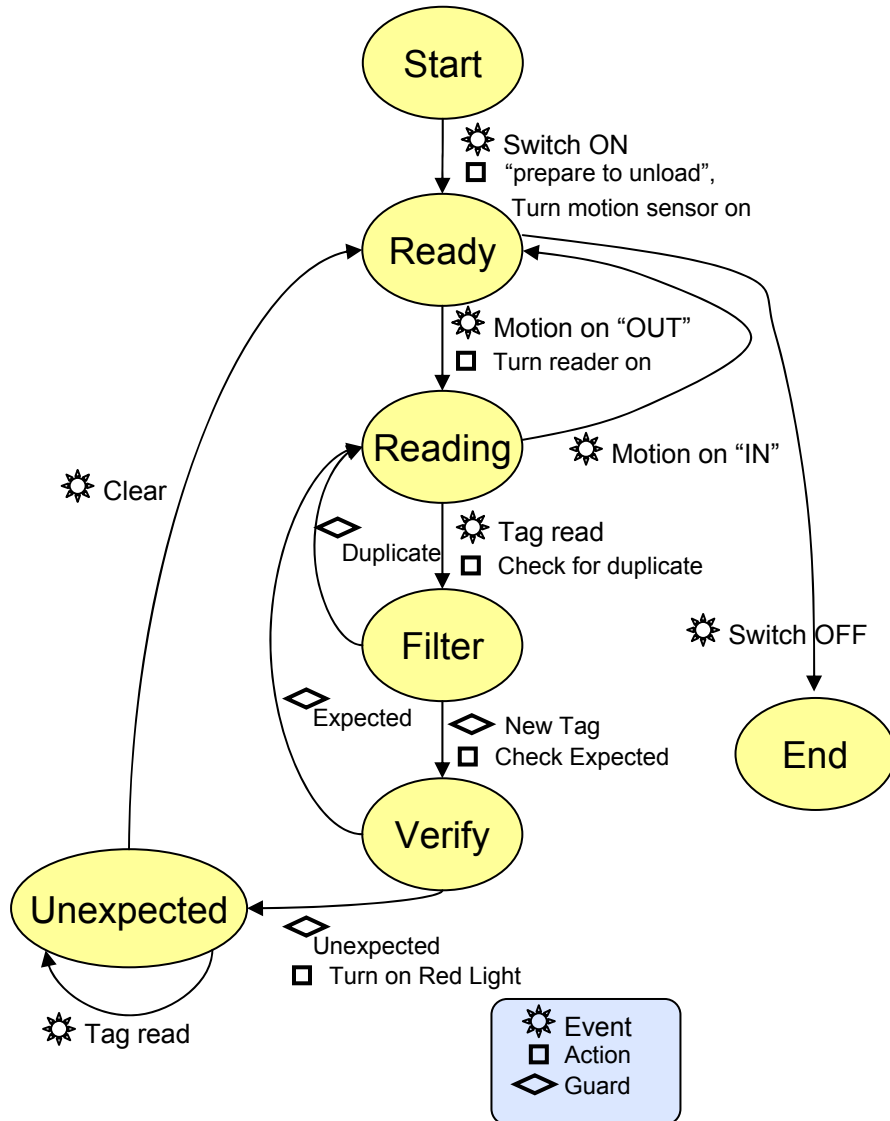
■ Receiving Use Case

- A retailer has previously placed an order for goods with the retail Distribution Center (DC).
- The DC prepares an Advanced Shipment Notice (ASN) at the time of shipping goods and sends it to the retailer.
- At the store receiving dock the operator turns on the dock door switch and starts to unload the truck.
- One pallet at a time is taken through the dock door. Green light indicates dock door is ready, amber indicates the dock door is busy.
- For unexpected pallets the red light is turned on. The operator then loads the pallet back into the truck.
- At the end of the loading operation the operator turns of the switch to indicate the completion of the unloading operation.
- The operator is then given a *receive receipt* to confirm the receipt of goods.

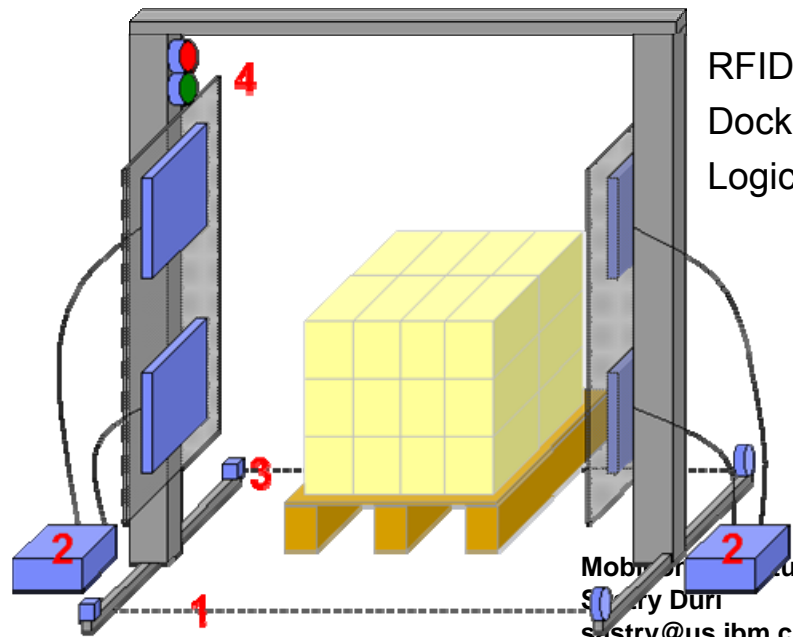


High-level Business Process

Example Dock Door Receiving RFID Process



RFID enabled Dock Door



RFID enabled Dock Door: Logical View

Devices (Sensors, Actuators, Controllers)

- Integrated units capable of supporting business operations
 - RFID reader, sensors to detect movement, actuators to provide feedback, computing unit to coordinate and control activities
 - E.g.: RFID enabled dock door shown previously
- High-level definitions of devices to support easy operational integration, configuration, management and monitoring
- Device abstractions
 - RFID
 - EPCglobal standards: Reader Operations, Reader Management, Gen 2
 - Other sensors: proximity detectors, electric/optical eyes, Sonar, temperature sensors, GPS, cameras, etc.
 - Light stacks, audio alarms, sorting arms
- Control flow/data flow
 - Means define in high-level terms the control flow and data flow
- Programming models, tools

Process Improvements Enabled by RFID: On Shelf Availability

- Out-of-Stock: un availability of products on shelf when consumer wants
- Shelf Replenishment
 - Without RFID replenishments once or twice a day
 - With RFID stock can be monitored frequently and shelf replenished more frequently
- On Shelf Availability has three components
 - Routine Replenishment
 - Restock products on shelves when inventory reaches certain threshold
 - With routine replenishment stock outs on shelves can still occur
 - Direct Replenishment
 - Replenish shelves directly from receiving dock when *out-of-stock* products are received instead of going through regular put away followed by routine replenishment
 - Predictive Replenishment
 - Taking into current conditions, and movement of products through supply chain initiate actions that would prevent future stock outs
 - For example, sudden popularity of a new toy cannot be handled through Routine and Direct replenishments alone

Data Handling

- RFID data collection units generate large volume of data which needs to be reduced through filtering, and enriched, transformed with business context to bring it up to the right level of abstraction for business applications to act on it.
 - Tag Read event → Tag Read with Product Info → Shipment
 - Collection & Filtering
 - ALE
 - Enrichment & Transformation
 - E.g.: associating activity based on read location of tag, adding product info, and special handling info, RFID tag read transformed into Hot Item event
 - Correlation: pattern detection, associations
 - E.g.: A case was observed at the receiving dock at time t_0 and was not observed at the end of conveyor by t_{0+20}