

Investing in RFID Seminar
RFID Journal Live! 2006
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Las Vegas, Nevada



Putting RFID to Work

May 1, 2006



Private Company Showcase/Software Startups

Jonathan Golovin, Ph.D., CEO, T3Ci

Eric Peters, CEO, TrueDemand Software

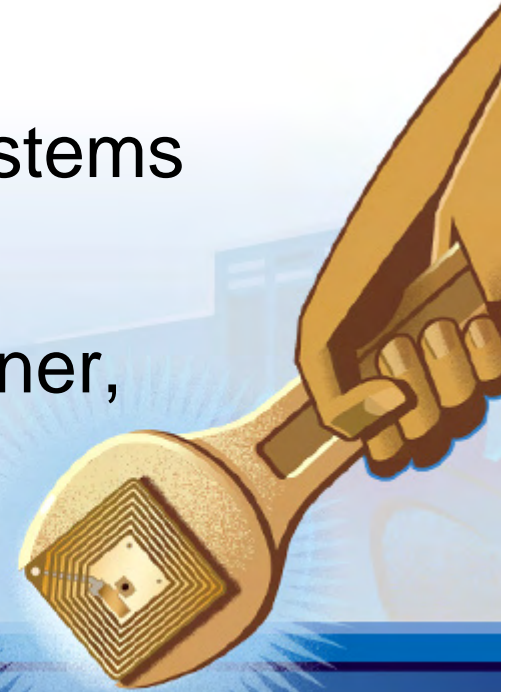
Marc Osofsky, Vice President, Marketing & Product Management, OATSystems

→ Ashley Stephenson, CEO, Reva Systems

Moderator: **Ed Schneider, General Partner, Quan Ventures**



Putting RFID to Work



Reva Systems

Ashley Stephenson - *CEO*



Putting RFID to Work

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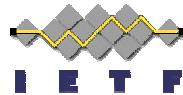
Reva Background

- *Network-Intelligent RFID solutions to power production-scale deployments*
- Management team with proven track records
 - Ashley Stephenson, CEO (*Xedia Chairman and CEO*)
 - Dave Husak, CTO (*C-Port CTO/Co-Founder*)
 - Mike Grady, VP Engineering (*Argon CEO/Co-Founder*)
 - Mike Miskovsky, VP Business Development (*Avaki*)
 - Larry Ring, VP Sales (*OAT Systems, Celarix*)
- Deep experience in;
 - Networking
 - RF
 - Data Integration
 - Supply Chain



Reva Industry Leadership

- Key contributors to trade and standards organizations



- Driving standards required for RFID adoption
 - Air protocol (EPC Gen2, ISO 18000-6C)
 - Reader-side protocol (LRRP WG Co-chair with Intermec)
 - Application connectivity (ALE, Web Services, SAP All..)
 - European ETSI contributions (LBT with TG34)
- Engaged with industry leaders in many Verticals
 - CPG, Retail, Pharma/Healthcare, DoD, Manufacturing, etc.



RFID Network Infrastructure

- In this presentation I will discuss the role of an RFID Network Infrastructure in the RFID enablement of a facility.

Note: a facility could be a Factory, Warehouse, Distribution Center, Retail store, Hospital, Airport, 3PL, etc.

- Reva Vision
 - Reva Systems believes that the fixed and mobile RFID readers within these facilities should be operated and managed as a system and not as a collection of autonomous devices.

RFID Ecosystem

- An RFID Network Infrastructure does not exist in isolation.
- It coexists with many other components of the RFID Ecosystem including;
 - RFID Readers
 - I/O Devices (Electric Eyes, Lightstacks, Actuators)
 - Tag Data Capture, Storage and Manipulation
 - Enterprise Network Management & Operations
 - Enterprise Middleware and Applications
 - Standards
 - Local Automation and Workflow

A Reader Strategy

- For RFID to become widely deployed in the next 5-10 years Readers must continue to evolve to be:
 - Cheaper (\$500, < \$200 ?)
 - Standardized (both air + network protocols)
 - Flexible (easily deployed, replaced)
 - Controllable (system level performance)
 - PoE, USB, WiFi (avoid expensive RF cabling)
 - Fixed (portal, shelf, conveyor, POS)
 - Mobile (forklifts, handhelds)

An I/O Device and Sensor Strategy

- Traditional GPIO/Serial sensors and actuators will migrate to network connect via Ethernet (PoE) and wireless (WiFi), ZigBee?
- Electric eyes, Motion Detectors, Lightstacks, Actuators, Temperature sensors will belong to the facility not to an individual reader.
 - Their functionality will interact with the system of readers e.g.
 - ElectricEye[7] might enable Readers[3,6,7]
 - Read Results from Readers[5,8] might require Actuator[4] to be energized.
 - MobileReader[2] might need to disable PortalReader[1]

Tag Data Strategy

- Facilities may contain millions of tags
- 1000's of tags may be in motion at any time.
- Facility RFID Infrastructure must be able to handle many 1000's of tag reads per second without data loss.
- Middleware and Applications must be able to access captured tag data as and when needed.
 - Not necessarily in real-time, means tag data staging/storage is needed in the RFID infrastructure
- Future applications will also need to read more extensive tag data from tags (user data)
 - Increases tag read data and rates by order of magnitude

Operations & Management

- Enterprises will typically operate many RFID enabled facilities
 - 10's
 - 100's
 - Perhaps 1000's worldwide
- The RFID Network Infrastructure of these facilities must be remotely manageable as an extension of the Enterprise network.
 - Just another NOC managed infrastructure.

Middleware Integration

- Enterprises will have varying Middleware and Application needs for access to RFID data.
- RFID Network Infrastructure must accommodate current and future application requirements for access to RFID tag data
 - e.g. SAP, IBM, Microsoft, customer specific.

Standards

- RFID will not succeed without global standards at many levels
 - Air Protocols
 - Reader Protocols
 - Data Access Protocols
 - Management Protocols
- RFID Network Infrastructure will emerge as an important layer in the standardization process.

Scalability

- RFID Deployments scale in many dimensions:
 - Number of readers
 - Number of tags in motion (read rates)
 - Number of applications accessing data (1 going to many)
 - Number of facilities enabled (1, 10, 100, 1000s)
 - Number of bytes of data on tag (96bits -> many KB)
 - Number of different tag types (passive, semi-passive, active)
 - Number of different types of reader (fixed, mobile, PoE)
 - Number of levels of tagging
 - pallets, cases, or items
- RFID Network Infrastructure provides the scaling layer

Deployability

- To be practical and cost-effective RFID must be easy to deploy.
 - Within a site
 - From site to site
 - Within an Enterprise
 - Side by side with other technologies
- TCO is an (very) important consideration

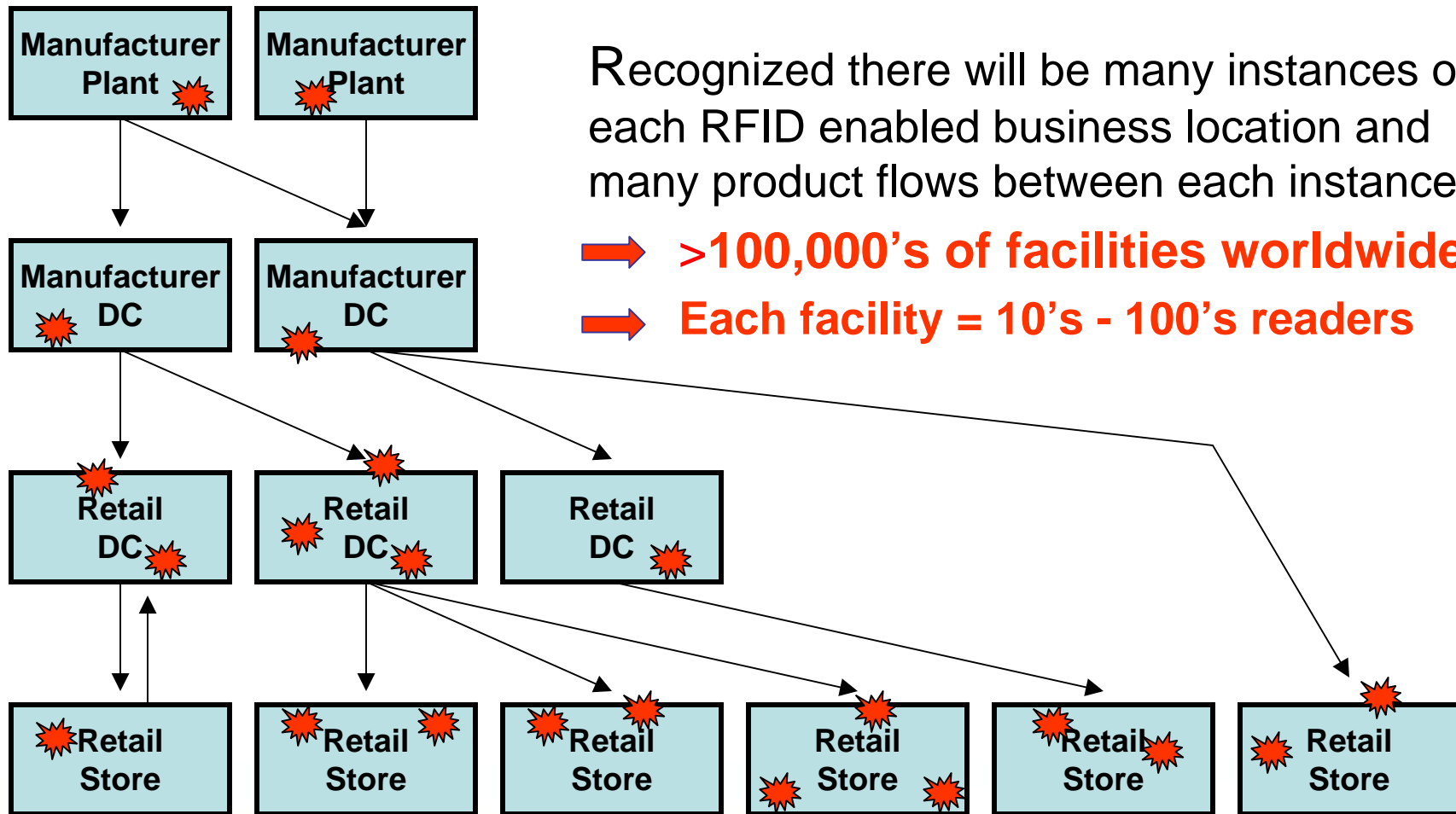
Upgrade Path

- RFID will be evolving rapidly in the next few years.
- Any architecture for implementation must plan to accommodate new reader types, new protocols, new tags characteristics (range, sensitivity, operating modes)
- RFID Network Infrastructure can isolate the middleware and application layers from many of these inevitable changes providing a transparent upgrade path.

Automation & Workflow

- In addition to high level business oriented workflows there are also low-level logic operations that may be required to validate tag data operations
- Many of these local workflows require real-time, multi-system response at the facility level.
- The RFID Network Infrastructure layer is an ideal place to implement this logic.

RFID = >100,000s of Facilities



Recognized there will be many instances of each RFID enabled business location and many product flows between each instance.

➔ **>100,000's of facilities worldwide**

➔ **Each facility = 10's - 100's readers**

RFID = Millions of Network Devices

- RFID Readers

- Ethernet, PoE, WiFi
- TCP/IP
- Flash/Firmware

- Local Apps/Services (Security, DHCP, SNMP...)



Feig



Intermec



Thingmagic



Symbol

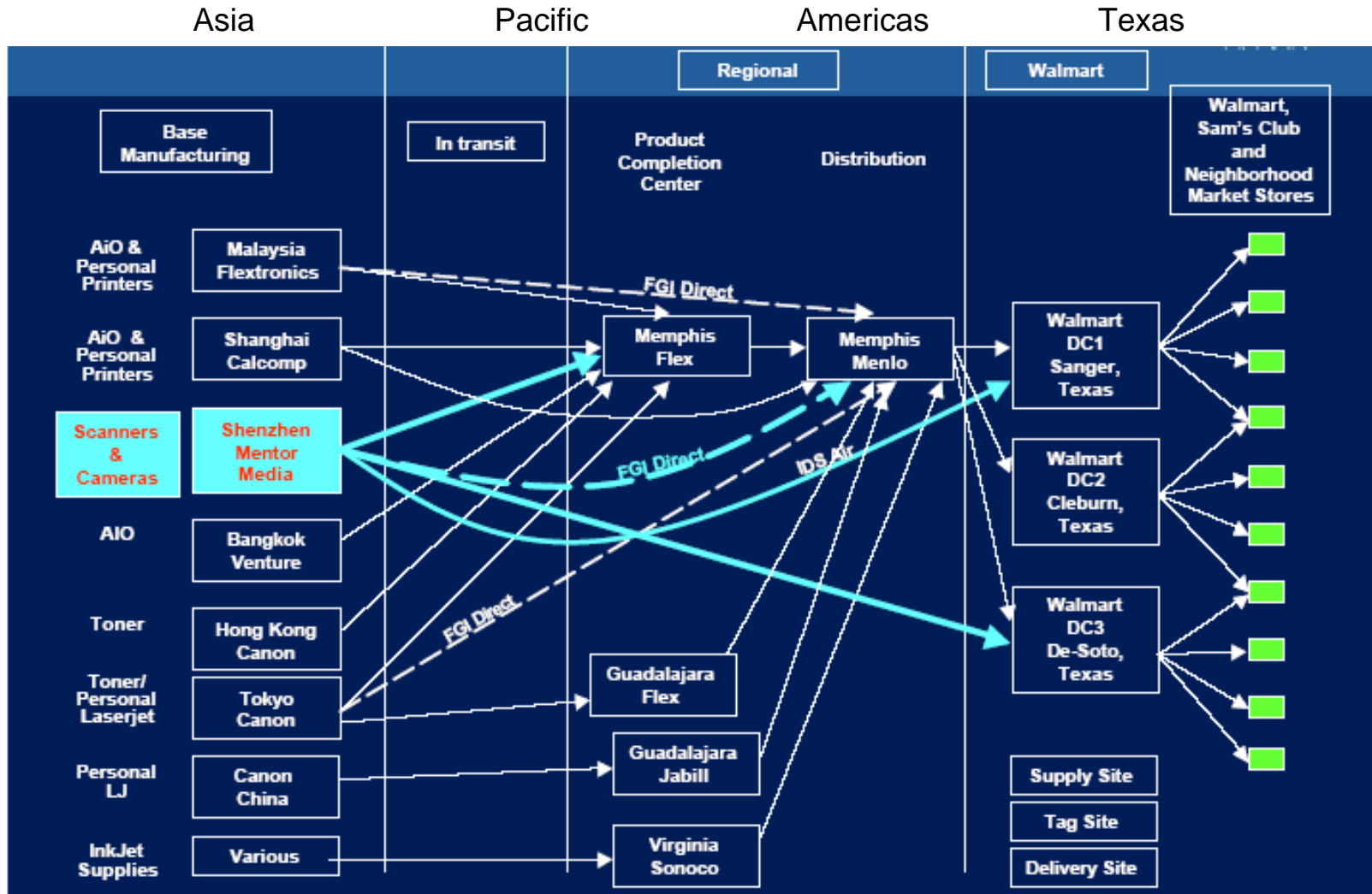


AWID

- RFID Reader deployments **will** grow to resemble other large scale networking roll-outs:

- LAN PC's, DSL modems, Cable Modems, IP Phones, WiFi Access Points

HP RFID Enabled Global Supply Chain



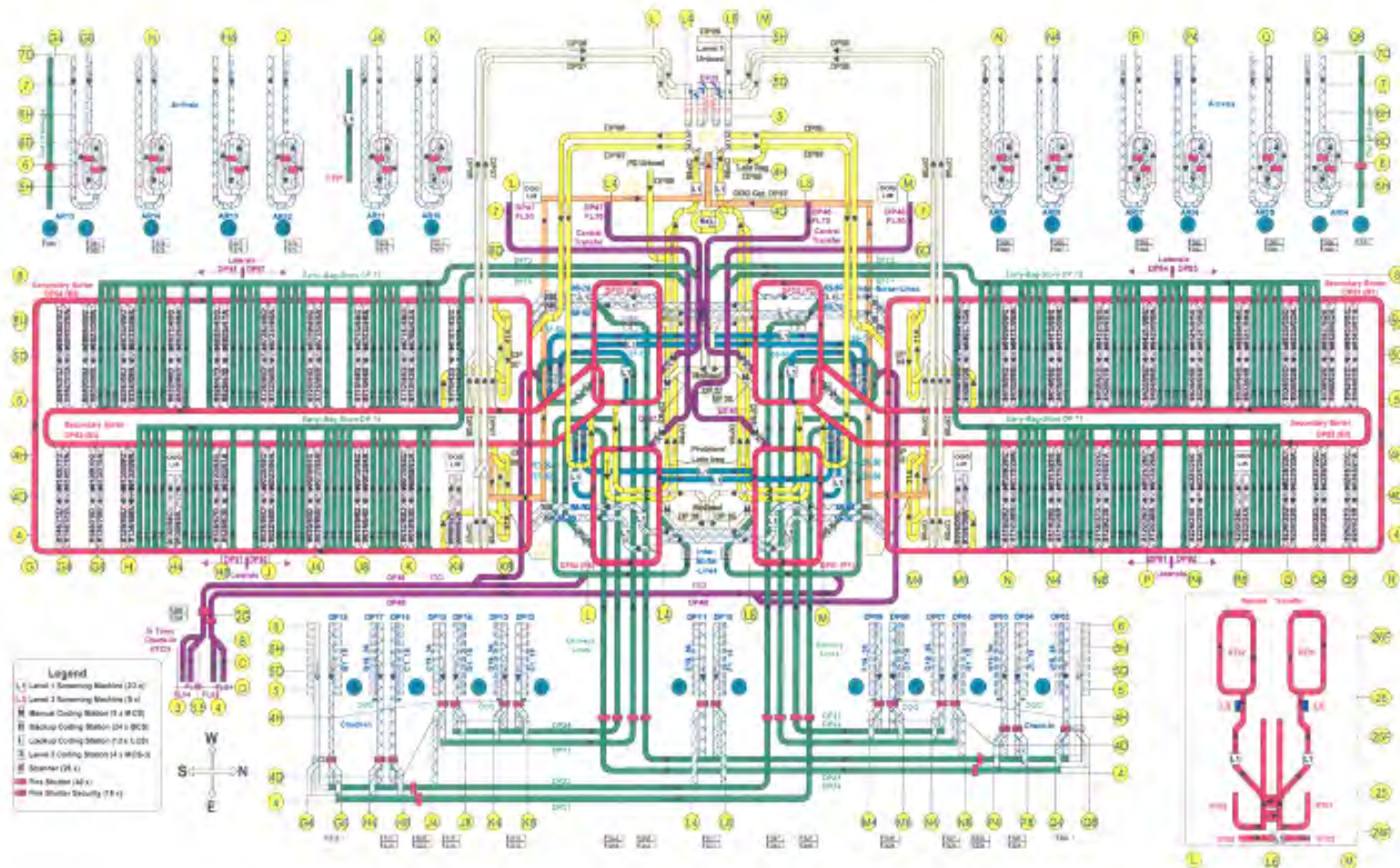
Wal-Mart RFID Installations



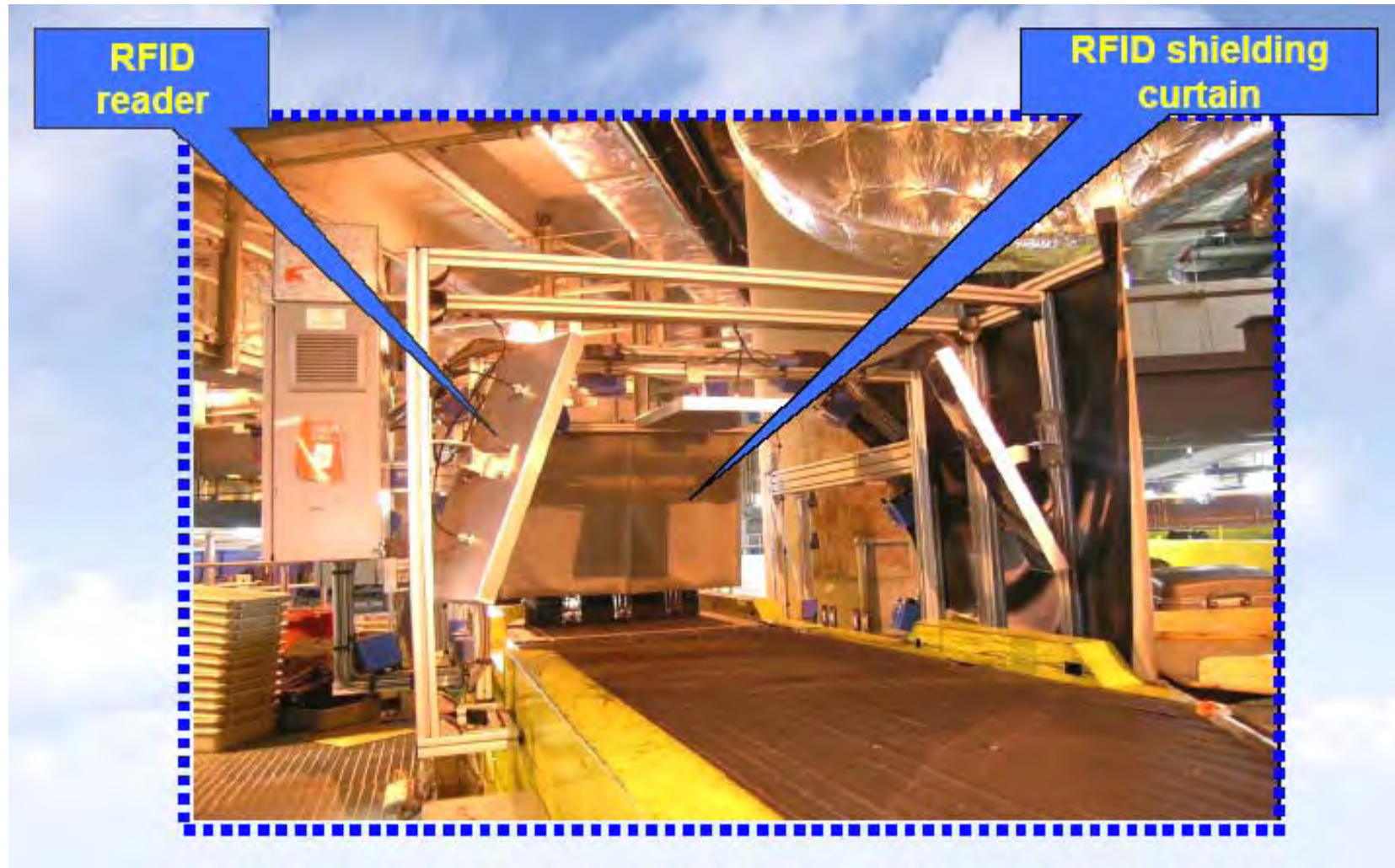
- January 2005
 - 3 Distribution centers
 - 104 Wal-Mart Stores
 - 36 SAM's Clubs
- Installed
 - Over 14,000 pieces of hardware
 - 230 miles of cable (data, cable & coax)
- April 2006
 - Growing to 500+ locations
- Purchasing
 - Over 15,000 new RFID readers.
 - 100s miles of new networking
 - Ports, Cable, Switches, etc.

RFID Enabled Airports

Baggage Handling System Overview for the Hong Kong International Airport



RFID Baggage Handling



Mobile RFID Readers (via WiFi)



Fork Lift RFID Readers



RFID on DVDs + Shelf Readers

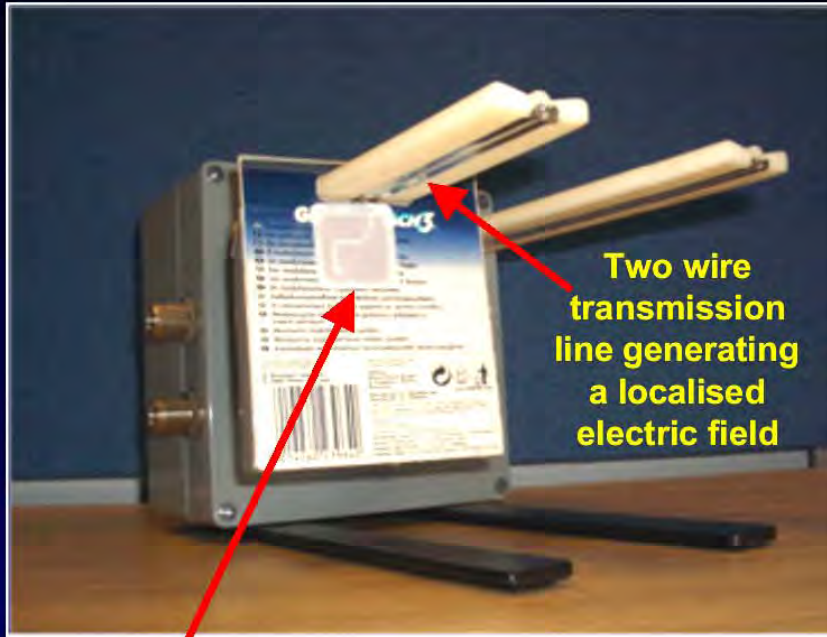


Tag Chip

Antenna

Images: Avery Dennison

RFID on Razors and Apparel with Rack / Rail Readers

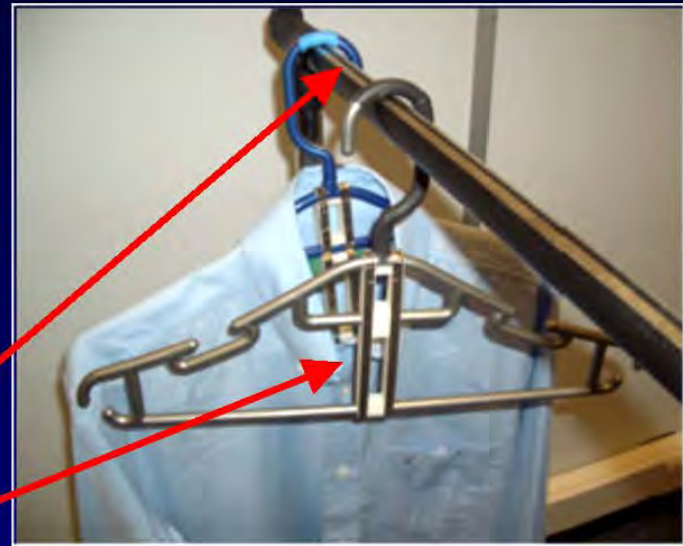


Two wire transmission line generating a localised electric field

AD820 inlay reading in the near field

Transmission-line rail

Transmission line structures and simple near-field loops can 'guide' the RF to where you need it, allowing large number of near-field and far-field Gen2 tags to be read rapidly and localised precisely



'Smart' hanger guides the RF to the near-field tag

Images: Avery Dennison

The State of the RFID Market

- Promise of RFID is still compelling
 - Many industries
 - Many applications
 - Many, many sites (each with many readers)
- Adoption is still in its early days
 - Few early adopters, many waiting on a better ROI story
 - Enterprise-wide rollouts still in the planning phase
 - Gen2 technology just emerging
- Pilots demonstrate current approaches will not scale
 - Technical barriers prohibit pilot-to-production migration
 - Every site requires custom implementation
 - Large rollouts will be too resource intensive and expensive
 - need for cost-effective **RFID infrastructure** and **RFID readers**

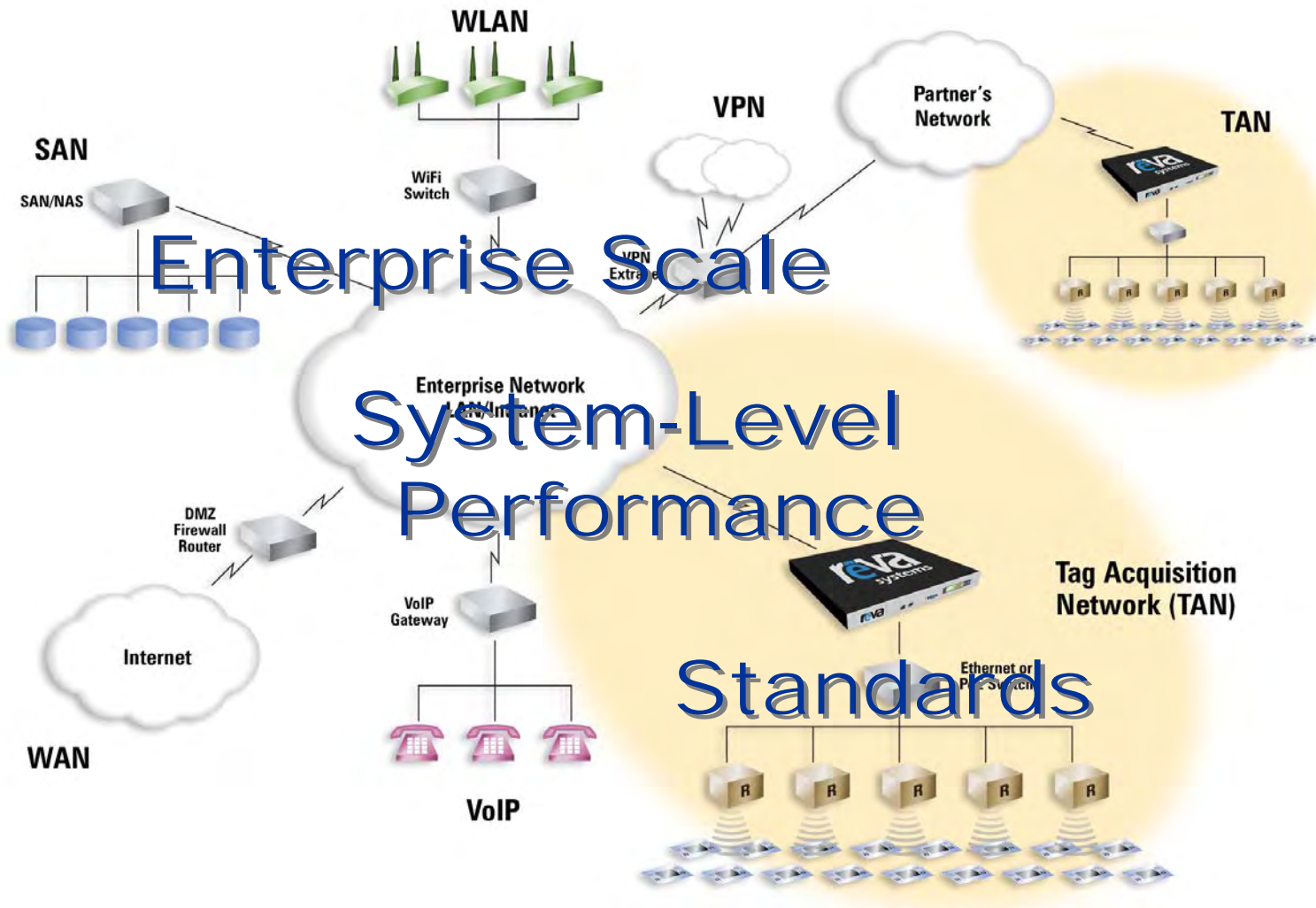
Opportunity: A New Product Category

Reva is defining a new product category:

“RFID Network Infrastructure”

- Reva Founded in April, 2004.
- Reva announces the Tag Acquisition Networks (TAN) and the Reva Tag Acquisition Processor (TAP) in October, 2005
- Reva customer deployments underway in 2006

Tag Acquisition Network (TAN)



Tag Acquisition Processor



Reva TAP



Reva Management Console

- Tag Acquisition Processor:
 - Reader / RF coordination and management (Gen2 aware)
 - Data pre-processing and presentation to application and middleware layer.
 - Facility level I/O coordination (motion sensor, electric eye, light-stack, actuators)
- Intelligent network device
- 1U, rack-mountable form factor
- Linux and Java-based
- Redundantly deployed within a facility
- Support for standard (ALE, JMS, SQL) and app-specific (SAP-Aii, etc) interfaces
- Reva Management Console (UI):
 - Site mapping and configuration
 - Facility virtualization
 - Aided deployment
 - Management and monitoring

Summary

