Welcome!

NDIA RFID Seminar
November 4, 2005

Overview of RFID

Productivity by RFID
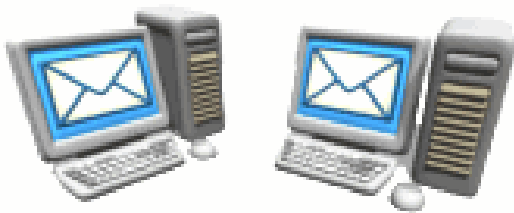## Pete Cipriani

Introduction

ERP – Enterprise Resource Planner

WMS – Warehouse Management System

CRM – Customer Relationship Management

Personal Computers
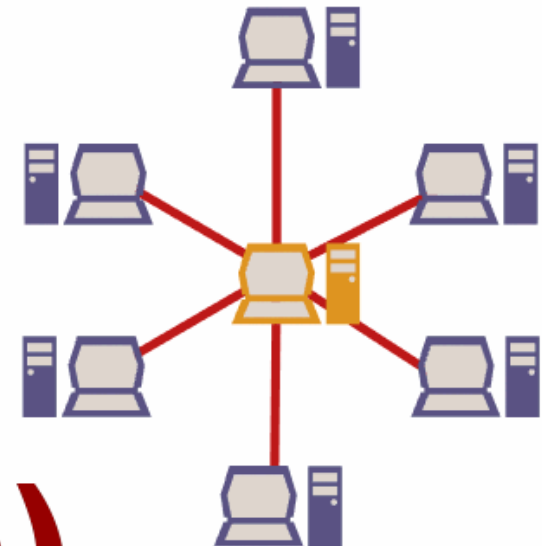
Internet
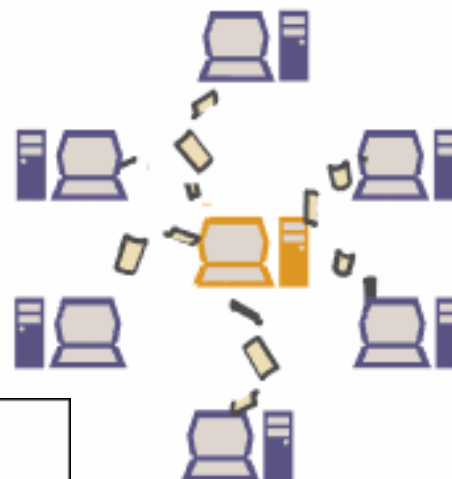
Business Processes

Network Applications

RFID)))

Overview of RFID
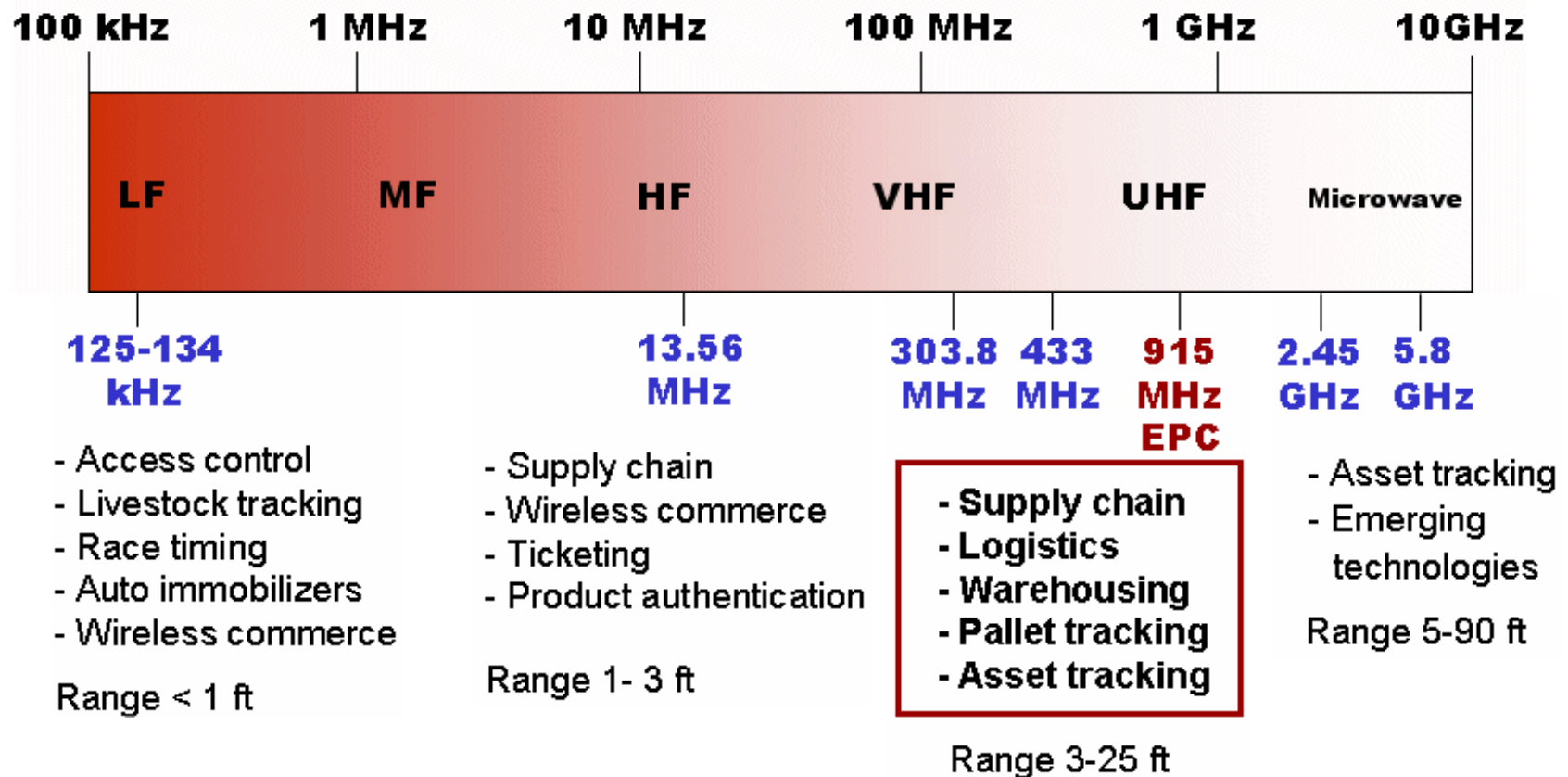
- Definition
    - What is RFID?
    - RFID vs. Barcode
- Applications
- Technology
    - Passive RFID Systems
    - Active RFID Systems
- RFID History
- EPCglobal

Radio **F**requency **ID**entification (RFID) is …

- Wireless information transfer via radio waves

- RFID tags can signal their presence, unique identity, location and other user-defined info

- Reads are performed in milliseconds

- Automatic (no human error)

- No line of sight required and no physical contact

- Works in harsh environments

- System of tags, readers, antennas and software

Productivity by **RFID**)))

Different Frequencies are used for Different Applications.

100 kHz	1 MHz	10 MHz	100 MHz	1 GHz	10GHz
LF	MF	HF	VHF	UHF	Microwave

125-134 kHz

- Access control
- Livestock tracking
- Race timing
- Auto immobilizers
- Wireless commerce

Range < 1 ft

13.56 MHz

- Supply chain
- Wireless commerce
- Ticketing
- Product authentication

Range 1- 3 ft

303.8 MHz **433 MHz** **915 MHz EPC**

- **Supply chain**
- **Logistics**
- **Warehousing**
- **Pallet tracking**
- **Asset tracking**

Range 3-25 ft

2.45 GHz **5.8 GHz**

- Asset tracking
- Emerging technologies

Range 5-90 ft

RFID vs. Barcode

	RFID	Barcode
Data Quantity	Up to kbytes	1 to 100 bits
Writable	Read only, WORM, R/W	Read only
Dirt Influence	No effect	Very high
Sight Obstruction	No effect	Failure
Degradation / Wear	None	Susceptible
Unauthorized Copying	Encryption prevented	Susceptible
Read Speed	Milliseconds	> second
Read Distance	> 100 feet	< 8 feet
Data Format Standards	Few	Many
Quality Standards	No	Yes
Reader Interoperability	Limited but growing	Yes
Cost	> $.20	Pennies - or less

RFID for *personal productivity*…

- Automatic toll collection

- Building access control

- Timing marathons / IronMan

- Exxon / Mobil Speedpass

- 400 McDonald's stores

- Anti-theft auto immobilizer

- Ticketing and event access

- Library check out

- Pet identification

Applications

RFID for *business productivity*…

- Asset management

- Container and homeland security

- Pallet and container tracking

- WIP (Work In Progress)

- Inventory management

- Retail shelf management and checkout

- Warranty and maintenance

- Theft control systems

- In-transit visibility

- Document management

- Medical care

- Tracking re-usable containers

Productivity by RFID

Shipping and Receiving

- Verify physical receipt
- Confirm quantity, P/N, S/N
- Compare actual count to manifest
- Identify and communicate discrepancies
- Update business systems

Benefits:

- Increase accuracy
- Reduce labor
- Reject improper loads before opening
- Automatic upload to Inventory, A/P, etc.
- Better decisions due to asset visibility

WAL★MART

P&G

DEPARTMENT OF DEFENSE · UNITED STATES OF AMERICA

Productivity by RFID))

Supply Chain Traceability

- Locate 'Lost' items
- Enable tracing of recalls
- Pinpoint entry of counterfeits:
  - Drugs
  - Auto parts
  - Casino chips
  - DVD's

Benefits:
- Reduce labor
- Limit scope, cost and panic of recalls
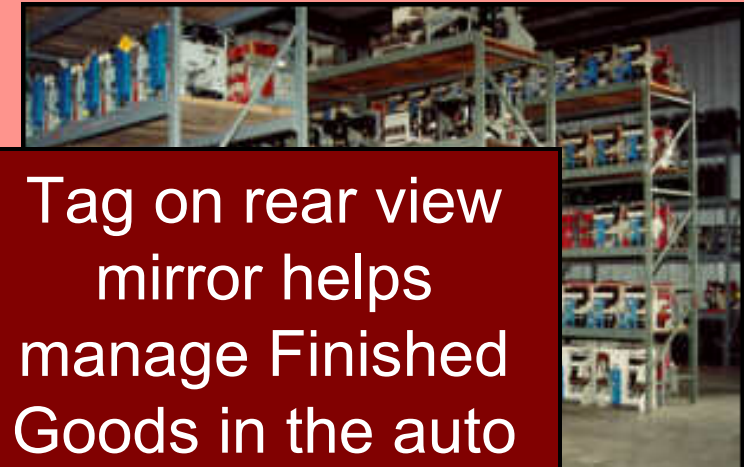- Expose and defeat counterfeits

Applications

Inventory Control

- Take inventory by reading RFID tags on parts, goods or containers

- Designate parts as "selected for use" without removing from inventory

- Use for raw materials and finished goods

Benefits:

- Inventory always current

- Inventory always accurate

- Reduce human labor

Tag on rear view mirror helps manage Finished Goods in the auto inventory.
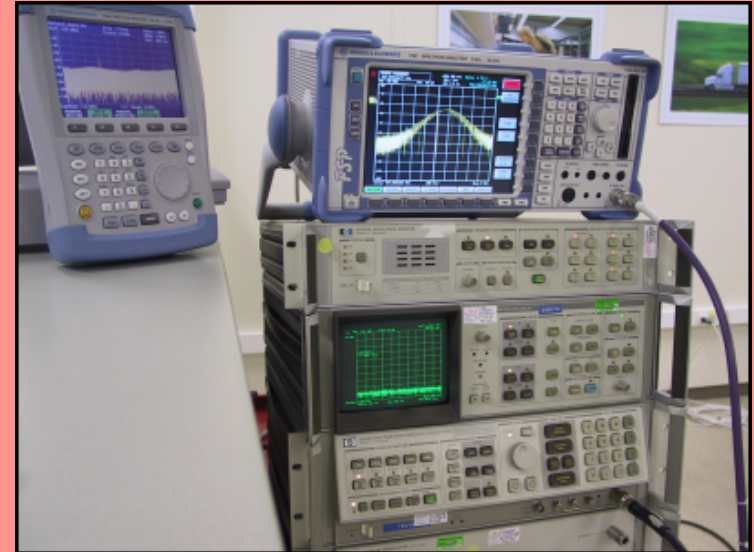
Applications

Tracking Tools and Equipment

- Track, schedule and document:
  - Calibration of measuring instruments
  - Maintenance of tooling
  - Plan use of time limited materials

Benefits:

- Reduce down time and waste
- Automate maintenance schedules
- Prevent waste by tracking expirations
- Simplify compliance with ISO and other quality plans
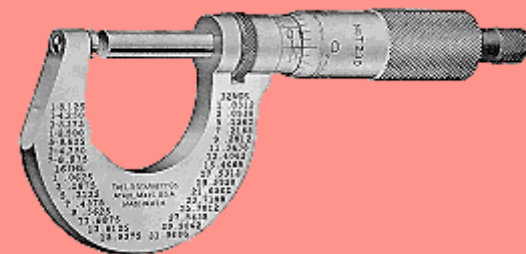
Manufacturing

- Object being fabricated commands the CNC machines
- Eliminate shop floor paperwork
- Keep process instructions current

Benefits:

- Increase responsiveness to market
- Increase throughput
- Support JIT operations
- Achieve Manufacturing run sizes of 1
- Reduce labor
- Simplify record retention and retrieval

JOHNSON CONTROLS

1500 car seats daily!

GM
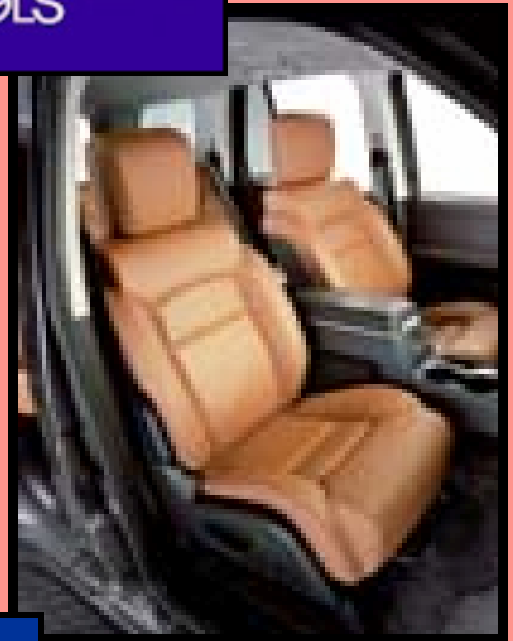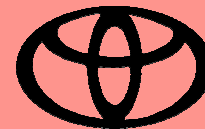
Productivity by RFID))

Assembly and Kitting

- Locate, pick, assemble right parts
- Select right parts for kit
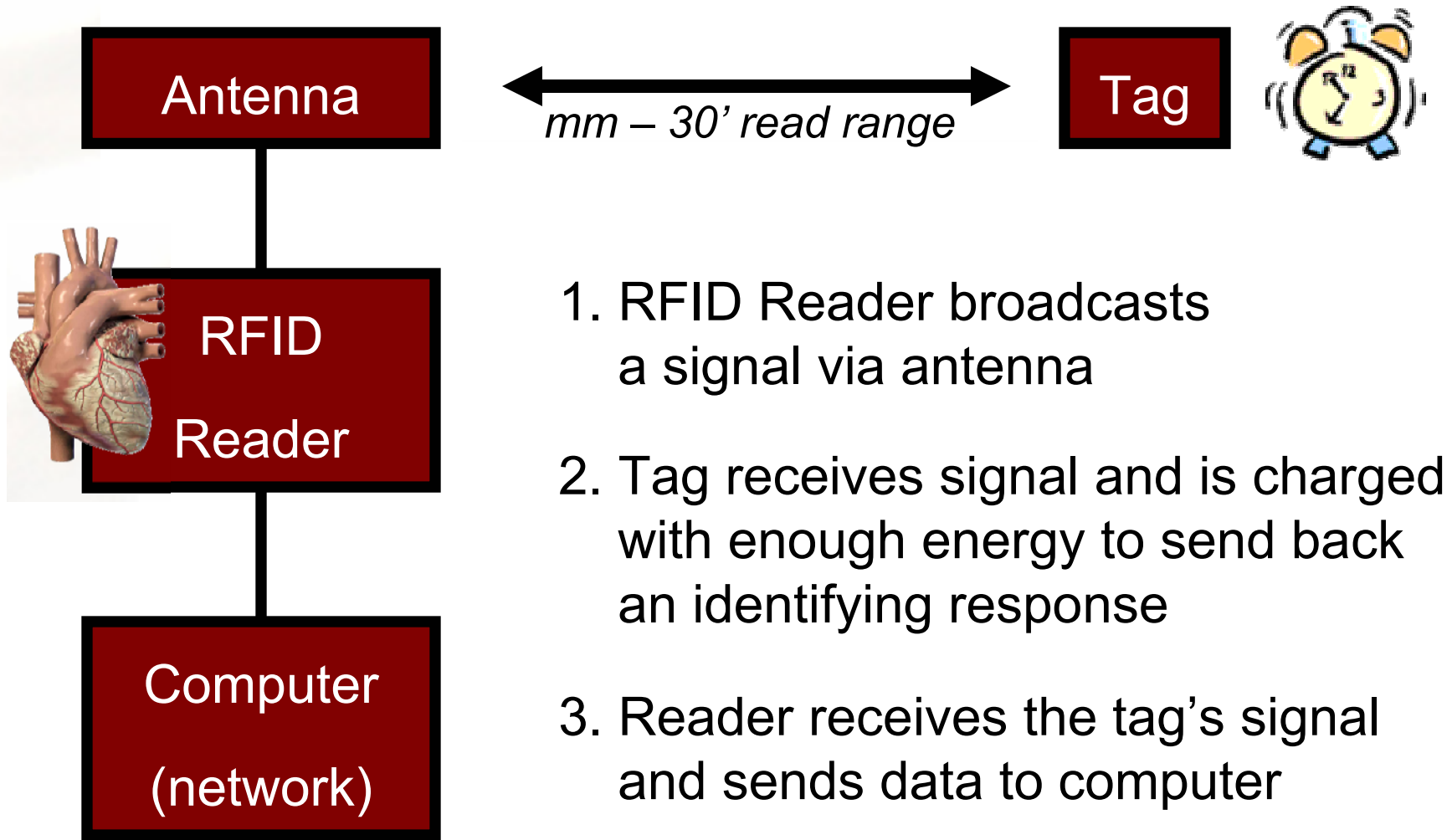- Track reusable containers
- Automatic log in/log out

Benefits:
- Decrease errors
- Increase quality
- Increase throughput
- Reduce labor

Passive RFID

Antenna ←→ **Tag**

mm – 30' read range

RFID Reader

Computer (network)

1. RFID Reader broadcasts a signal via antenna

2. Tag receives signal and is charged with enough energy to send back an identifying response
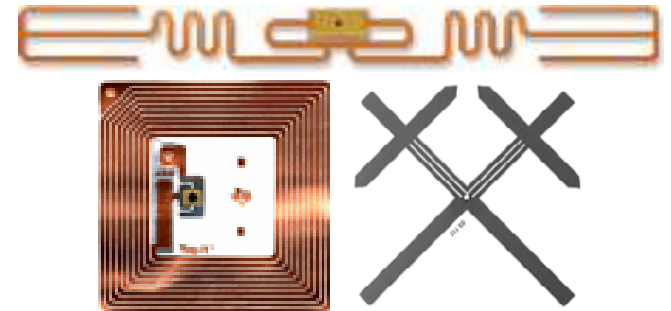
3. Reader receives the tag's signal and sends data to computer
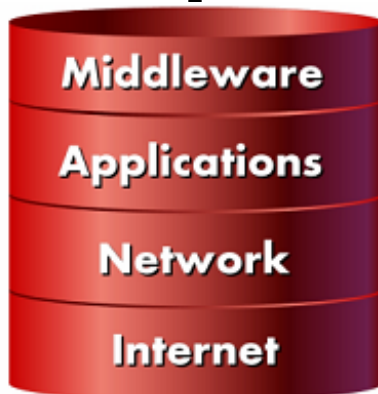
Passive RFID

Antennas vary in size.
They can be circular
or linear polarized.
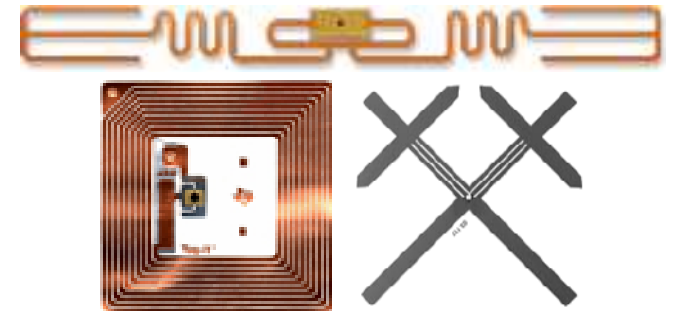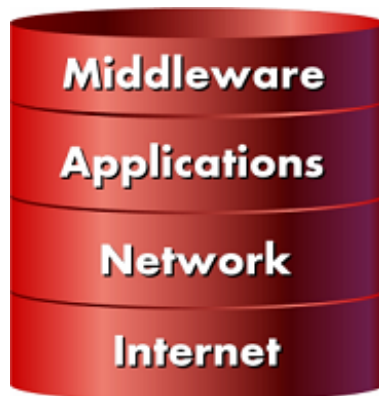
Tags vary based on frequency,
sensitivity and packaging.

Readers can be fixed or portable, single or multi-
port, single or multi-protocol, simple or intelligent.

Middleware

Applications

Network

Internet

Middleware filters data, preparing it for applications.
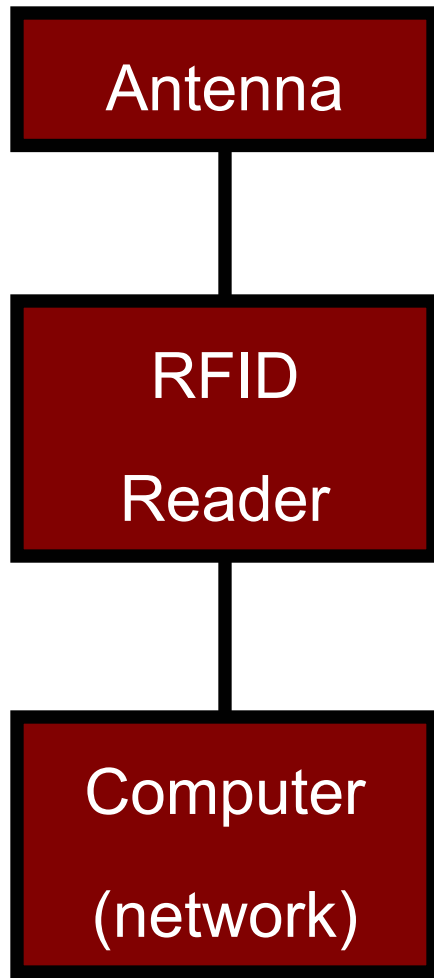Applications are WMS, ERP, Accounting, etc.

Productivity by **RFID**)))

Handheld readers have reduced read ranges.

They are commonly WiFi or other wireless protocol back to the network.

Middleware

Applications

Network

Internet

Antenna

RFID Reader

Computer (network)

Up to 1200' read range

1. Active RFID tag beacons at predefined intervals

2. Reader receives the tag's signal and sends data to computer

RFID Comparison

	Passive RFID	Active RFID
Primary Purpose	Identifying	Identifying / Locating
Range	Short - mm to 30 ft.	Long <1200 ft.
Can use Sensors?	No	Yes
Cost	$.20 to $5	$15 to $100
Types	Disposable and Reusable	Reusable
eCommerce Applications	Yes	No

Friend or Foe?

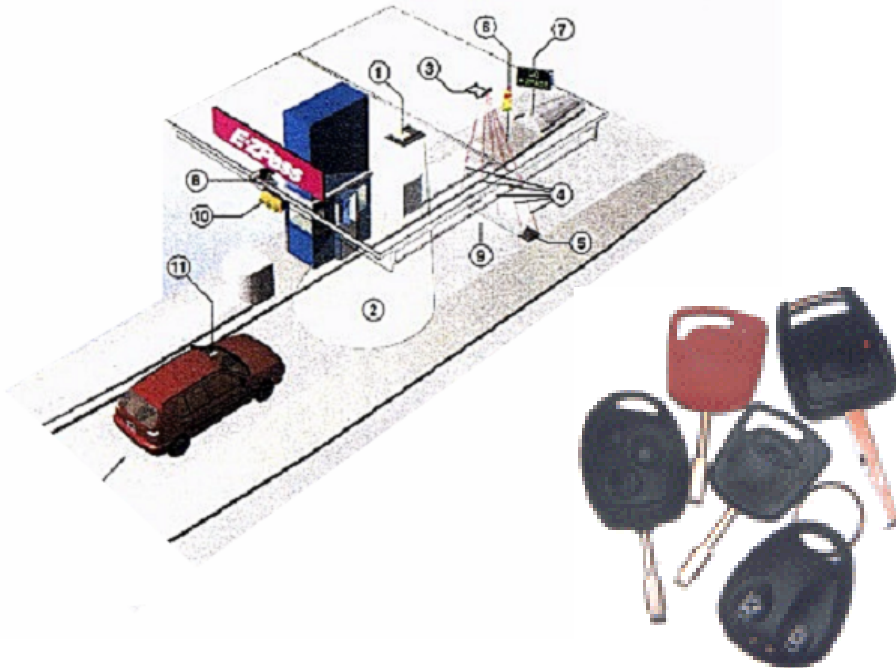RFID was originally developed in WW2 to identify incoming Allied aircraft.

Productivity by RFID ·)))

1980's and early 1990's

Radio Frequency Identification, now coined "RFID", found proprietary uses in productivity, security and supply chains.

Productivity by RFID ·))

Mid 1990's - The Internet connects everything

But something's missing…

… a way to get real-time data
into the systems, automatically.

RFID would be an ideal technology, but…
it lacked standards and interoperability.

Productivity by RFID))

1999 - MIT founds the Auto-ID Center
Co-founded by:

SUPPLY CHAIN EFFICIENCY

TOTAL ASSET VISIBILITY

REDUCE OUT OF STOCKS

REDUCE SHRINKAGE

MIT AutoID Center created an Intelligent Infrastructure:

Tag - RFID tag architecture with a specified 915 MHz air-to-air protocol

EPC - **Electronic Product Code**, a naming scheme for physical objects

ONS - **Object Naming Service**, a redirection service that is based on the Internet's DNS (Domain Naming Service)

PML - **Physical Markup Language**, an XML schema for classifying physical objects

Savant™ - Middleware for EPC network

EPC – Data Protocols

21.203D2A9.16E8B8.719BAE03C

Version 8 bits

EPC Manager 28 bits
(> 268 Million)

Object Class 24 bits
(> 16 million)

Serial Number 36 bits
(> 68 billion)

No serial numbers

Greatly Extended

UPC

1971 619

Productivity by RFID·))

- Mandates announced:

WAL★MART

TARGET

METRO Group

BEST BUY.com

DEPARTMENT OF DEFENSE · UNITED STATES OF AMERICA

Albertsons

TESCO

- Intentions announced:

Kroger

CVS/pharmacy

BOEING

AIRBUS

FDA · U.S. Food and Drug Administration · Department of Health and Human Services

Thank You!

- **RFID Labeling Books**
- **RFID Journal Magazines**
- **RFID UHF EPC Tags**

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