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Today's Agenda

- What's this all about?
- Why RFID
- RFID basics
 - What is RFID?
 - What is an RFID tag?
 - How do they make these things anyway?
 - How does all this stuff communicate?
 - What as a class?
 - EPC layout
- What are some of the problems?
- Where are my bar codes?
- How do I stick these on my stuff?
 - Apply manually
 - Apply automatically without bad tag removal
 - Apply automatically with bad tag removal
 - Fully automatically converted on site
- What should I do first?

What's This All About?

WAL-MART, the DOD, Target, Metro and others are driving the implementation of RFID tagging

Wal-Mart has mandated that the top 100 suppliers be compliant by January 2005 on cases and pallets (the mandate has been relaxed)

All other Wal-Mart suppliers must comply by 2006

Next steps will be individual products (some pharmaceuticals are moving now)

Why RFID?

Benefits Include:

- Reduced inventory & shrinkage
- Reduced labor expenses throughout the supply chain
- Lower OUT of STOCK Items
- Does not require line of sight (like bar codes)
- Better product tracking and warehouse management
- Raw material management
- Ability to read entire contents of mix loads

What Is RFID?

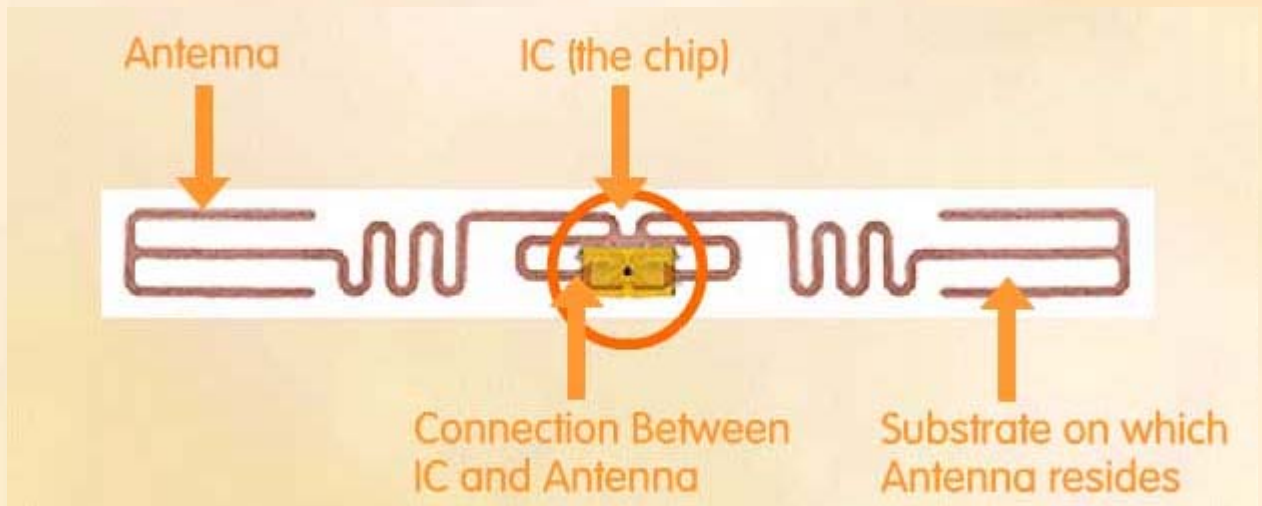
RFID is an acronym for “Radio Frequency Identification”

RFID Technology uses low-power radio signals to exchange data wirelessly between the Tag Chip and Readers/Encoders. The Energy Field “wakes up” the Tag and provides power to Passive Tags. Encryption Algorithms can provide security.....

- Uses an EPC – Electronic Product Code and Other Protocols
- Also know as “Smart Tags”
- 21st century intelligent bar codes that can be networked
- Real time access to product information and location

What is an RFID Tag?

A tag consists of a "Transponder" (an antenna consisting of a coil of wire or conductive ink) and a chip/microprocessor. Also the tag is usually encapsulated.



What is an RFID Tag?

Tags come in all sorts of shapes and sizes

Each type of tag may require a different protocol to read or write to

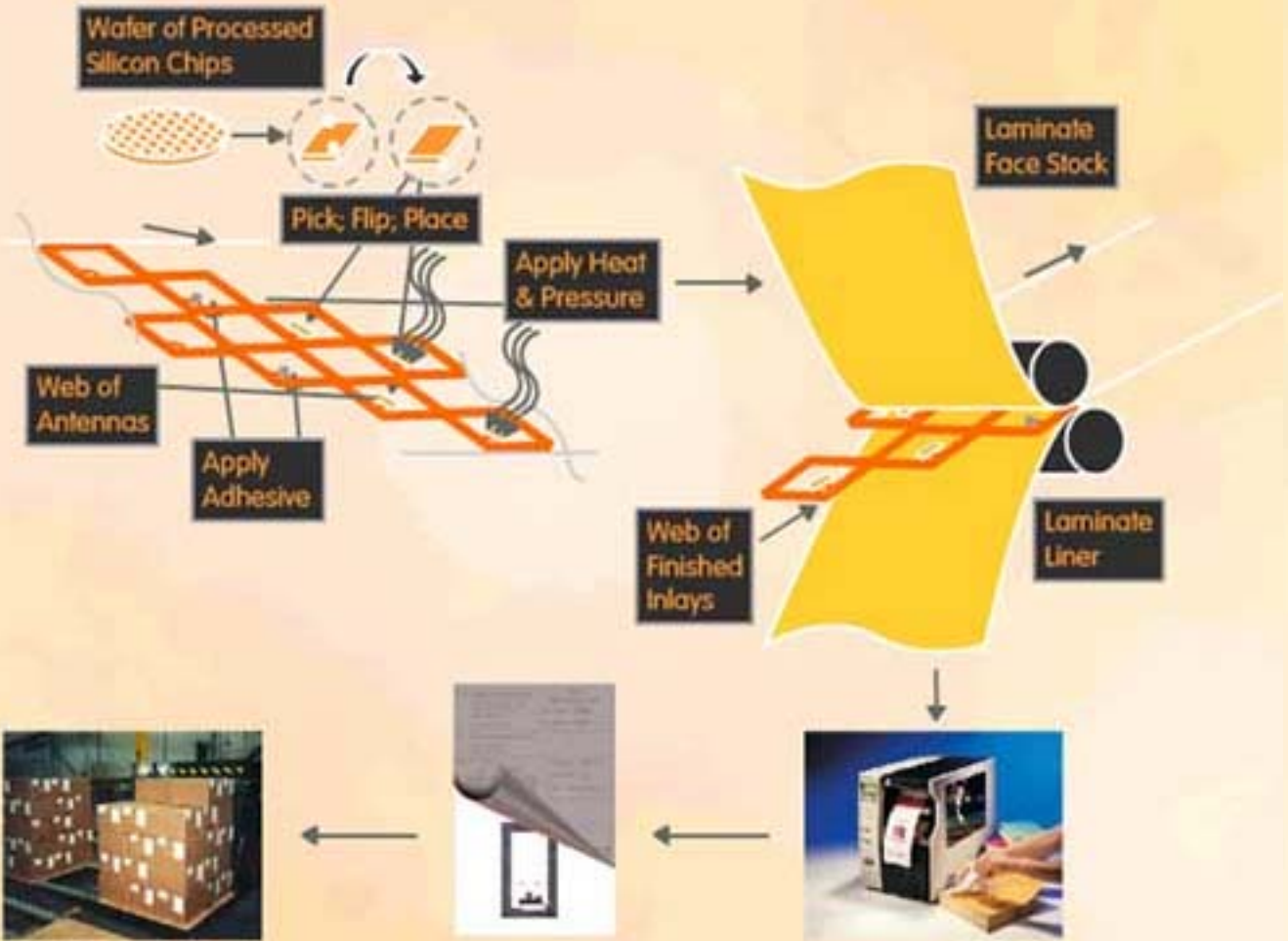
Tag frequencies range from LF (125-150 KHZ) to High HF (13.56 Mhz), ULTRA High UHF (868-960 Mhz) and microwave (2.4 -5.8 Ghz)

Generally the size of the tag/chip design determines read range, data exchange rate, data storage capability, protocol and write range

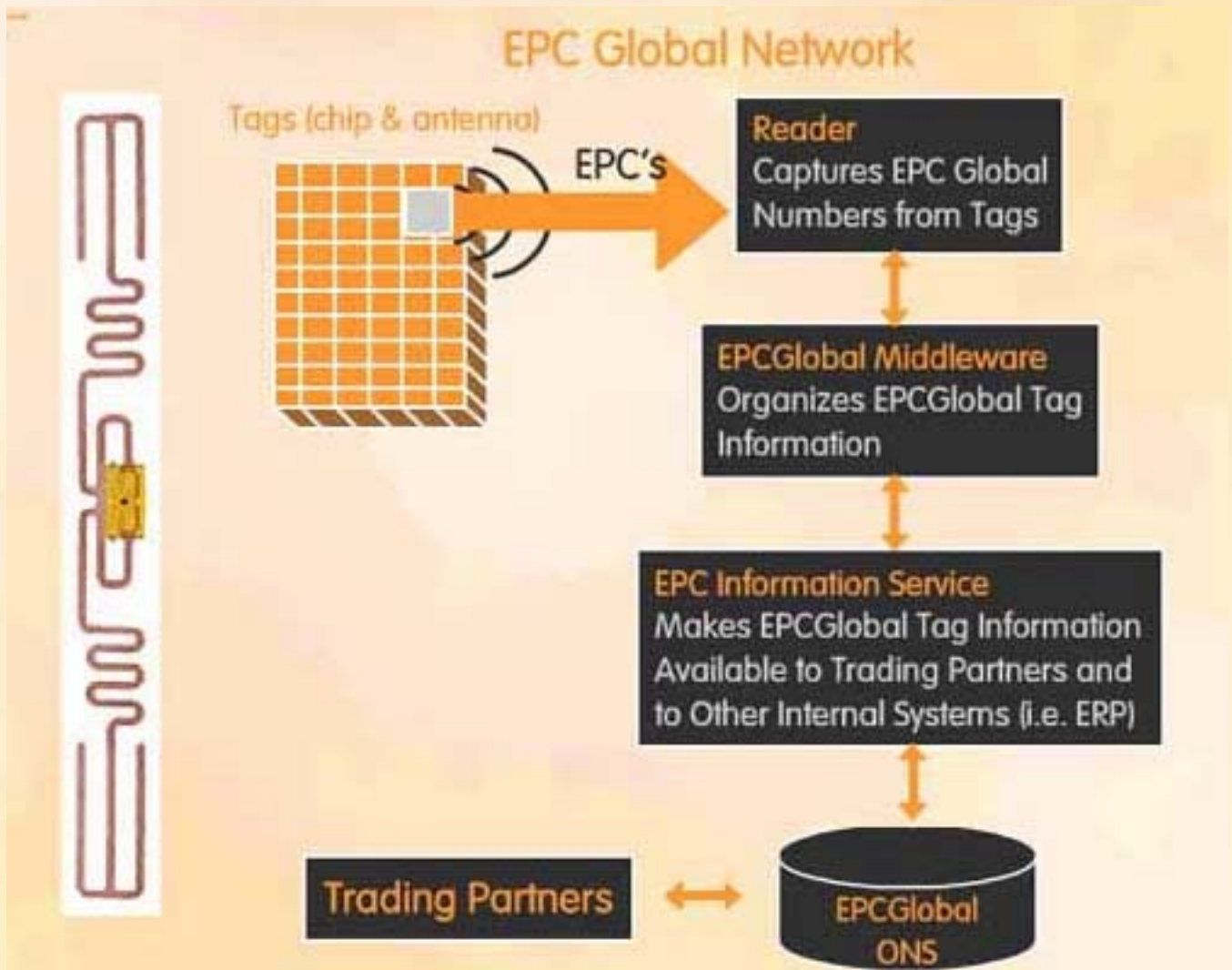
The RFID system also includes an "Interrogator" (transceiver/receiver) and an "Antenna"

Tags can be Active (battery powered) and Passive (powered by the reader field)

How Do They Make These Things Anyway?



How Does All This Stuff Communicate?



What's A Class?

Passive tags are defined by power source (active or passive), frequency (LF, HF, UHF, Microwave), protocol (EPC, ISO, Proprietary...) and memory

EPC Specifications:

- Class 0 – UHF, Read Only (factory programmed, 64 or 96Bit)
- Class 0 Plus – UHF, Read-Write
- Class 1 - HF One Time Programmable 96 Bits (operates at 13.56 Mhz)
- Class 1 UHF – One Time Programmable 96 Bits
- Class 1, Gen 2 – Merges Class 0 and Class 1 and ISO 18000-6 (96-256 Bits); can be used globally
- Class 2 – A proposed UHF Read-Write Tag
- Class 3 , 4 and 5 Read-Write can contain sensors and integrated transmitters for data logging and special applications

EPC Layout

01 0000A89 00016F 000169DCO

Header
0-7 Bits

EPC Manager
8-35 Bits

Object Class
36-59 Bits

Serial Number
60-96 Bits

Header – (0-7 Bits) – defines length of code –
01 indicates EPC Type 1 96 bits in length;
RANGES From 64 to 256 Bits

EPC Manager – (8-35 Bits) – manufacturer's
product code

Object Class – (36-59 Bits) – just like an SKU –
exact type of product

Serial Number – (60-96 Bits) – unique identifier
for up to 2^{96} products or 68+ billion unique serial
numbers

What Are Some Of The Problems?

Tags are difficult if not impossible to read or write to near metals and liquids

Tagging pallets instead of the pallet load is very challenging – very vulnerable to damage

Reading tags on cases internal to pallets can be difficult for certain products

Tags have failure rates from the converter, even with 100% testing, end-users are finding out that tags may be good near Read/Write, but may not be good for far Read/Write and can fail during handling

Writing to tags can slow production speeds

Interference from near tags

Tag placement

Lack of IT infrastructure to handle large volumes of data

Costs of integration and deployment

Privacy issues

Where are my Bar Codes?

Bar codes will continue to co-exist in most applications for a long time to come

Many end-users and original manufacturers will not be able to utilize RFID especially in the foreseeable future



How Do I Stick These On My Stuff?

Apply Manually

Tags come from a converter with a label. Off-line printers can establish protocol, write and print the human readable. Tags are applied manually to products.



Slap and Ship

How Do I Stick These On My Stuff?

Apply Automatically without Bad Tag Removal

Pre-converted tags/labels can be encoded, written to and applied using automatic equipment (OEM Printers) with or without human readable printed on the label



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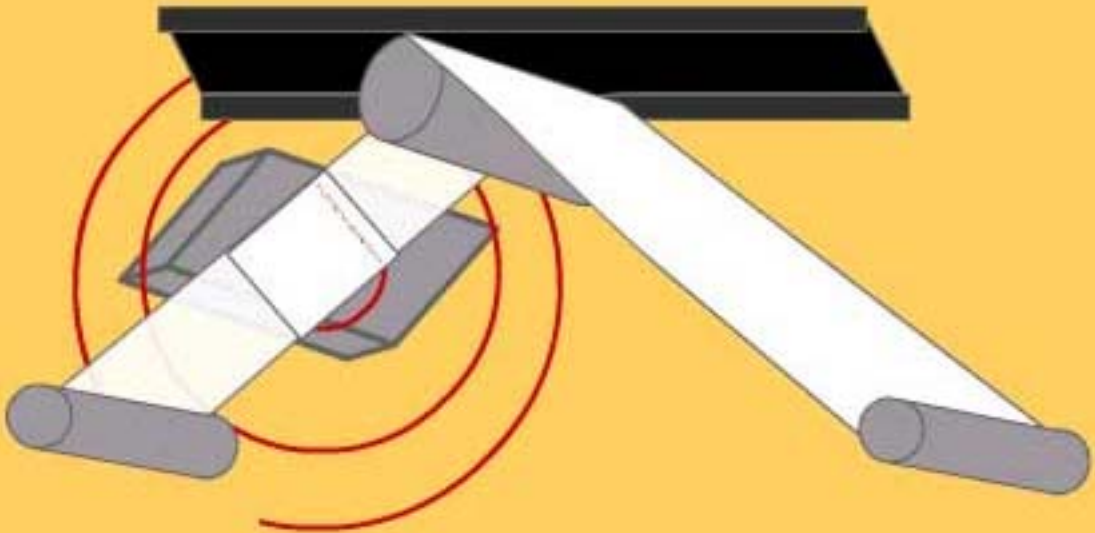


Faulty labels remain on the web
New labels are instantly written

How Do I Stick These On My Stuff?

Fully Automatic

Tags can be converted on-demand at point of application using a system like alchemy



What Should I Do First?

Set up a pilot test

You need a professional to help with RF physics

Determine environmental variables

Understand the RF physics that relate to your operating environment

- Sources of potential interference
- The impact on installed wireless communications
- Analysis of planned equipment locations

Determine the product material variables

- Determine the tag type, tag placement for your products for optimal operation

Set up network architecture

Understanding the environmental and product variables will allow you to design the optimal RFID network architecture

- Location and set-up
- Equipment specifications – readers and writers, tag selection
- Reader configurations – power, interrogation rates, etc
- Connectivity for communication