

Overview Uses of Radio Frequency Identification (RFID) Tags

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What is RFID?

- Definitions
- Background
- Types of RFID



What is RFID? - Definitions

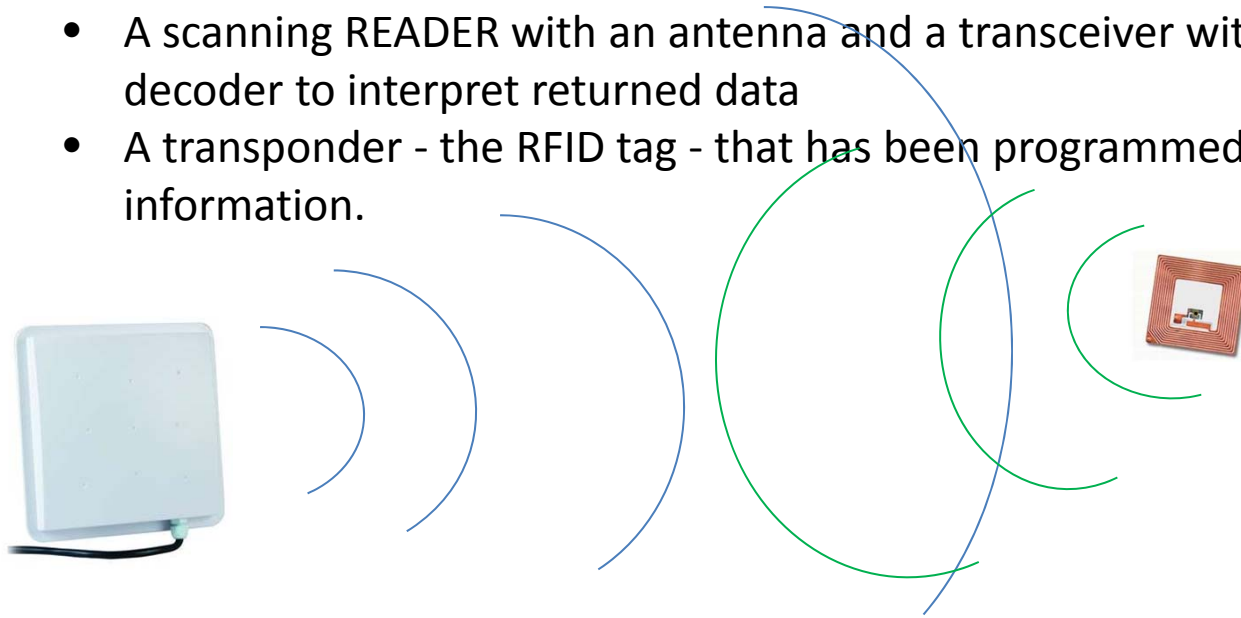


- Radio Frequency Identification (RFID) refers to systems that uses radio waves to read tags and cards for object identification.
- “RFID” as a classification could refer to a score of different technologies, in the vernacular it refers to a handful of industries and uses based on common standards
- Today we will discuss “RFID” in terms of relatively well-defined technical standards and nascent industries and applications in the United States that are developing around the technology, and focus more on the commercial uses and risks.

What is RFID? - Definitions

- BASIC ELEMENTS:

- A scanning READER with an antenna and a transceiver with a decoder to interpret returned data
- A transponder - the RFID tag - that has been programmed with information.

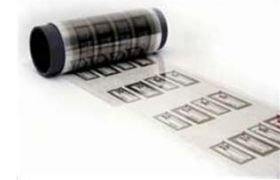
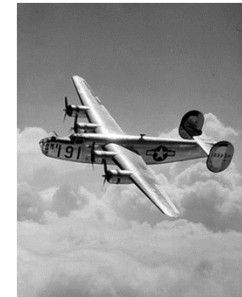


- BASIC FUNCTION:

- The scanning antenna puts out radio-frequency signals , the RF radiation provides a means of communicating with the transponder (the RFID tag) AND it can provide the RFID tag with the energy to communicate in the case of passive tags
- The tag emits the information from the chip back to the reader

What is RFID? - Background

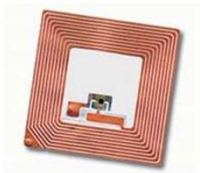
- World War II - Predecessors
 - Airplane Identification
- 1973
 - First patent for a re-writable tag
 - First RFID Keyfob use
- 1990's (U.S. Focus)
 - IBM's UHF System
 - MIT & the Auto-ID Center
 - Standards Associations
- 2000's
 - Initial Commercial Markets
 - Stabilization/Commoditization of Technology



What is RFID? – Types of RFID

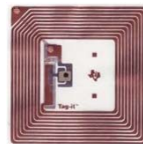
By Tag Transmission

- Active
- Passive



By Frequency

- LF
- HF
- UHF



By Read Distance

- Near Field (NFC)
- Mid Range
- Long Range



Types of RFID – By Tag Transmission

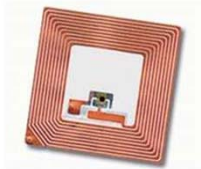
Active Tags -

- Have an onboard battery for an active transmission, tend to be used for longer range applications or where positive reads/confirmation are more critical. Price ranges tend to be from US\$ 5 to 20 per tag in typical uses.
- Typical Use – Vehicle Identification for Toll and Security Gates



Passive Tags -

- Harness the power in the signal from the reader itself to power the chip function and return signal to the reader. Price ranges tend to be from US\$ 0.10 to \$1.50 per tag in typical uses.
- Typical Use – Item and Personal ID



Types of RFID – By Frequency



Low Frequency (LF)

- 125 and 134.2 kHz
- Read Range – 1 inch to 6 feet
- Benefits – not thwarted by interference from metals and liquids
- Drawbacks – slow communication, does not handle multiple tag environments well, most expensive tags
- Typical Use – Keyfobs in Automotive

Types of RFID – By Frequency

High Frequency (HF)

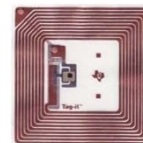
- 13.56MHz with several different standards on format
- Read Range –6 feet or less
- Benefits – not as affected by liquids, large chip memory capacity and more chip complexity
- Drawbacks – limited range, more expensive than UHF
- Typical Use – Item and Personnel ID, Contactless Payment, Smartphone NFC



Types of RFID – By Frequency

Ultra High Frequency (UHF)

- 433 MHz, 860 -956 MHz and 2.45 GHz, dominant is 860 -956 MHz
- Read Range – up to 10 feet with commodity tags, up to 100 feet with specialty tags
- Benefits – affordable/commoditized, multiple simultaneous reads,
- Drawbacks – highly susceptible to interference from metals, liquids and other RF & EF, low chip memory and function
- Typical Use – Item and Personnel ID



Types of RFID – By Read Distance



Near Field (NFC)

- Less than 1 inch ranges
- Ideal for Secure Read purposes
 - Personnel ID
 - Payment
- Good for authorization/approval
 - Requires active action “tap in” from user to get positive read
 - Lowers possibility of accidental or malicious reads

Types of RFID – By Read Distance

Mid Range

- 1 to 10 foot read distances
- Ideal for Inventory purposes
 - Items, Assets, Inventory
 - Personnel/ID for non-critical functions
 - Security Gates for item management (deterrence)



Types of RFID – By Read Distance



Long Range

- 10 to 300 foot read distances
- Commonly used for Vehicles or Capital Equipment
 - Traditionally Required Active tags but now can do with larger passive tags
 - Several Proprietary Technologies around long distance systems



Examples - Uses of RFID

- Item Tracking & Location
 - Inventory
 - Assets
 - Security Systems
 - Product Authentication
 - Item Servicing
- Patron & Personnel Tracking & Location
- Animal Tracking & Location-Security and Theft Prevention
- Consumer/User Tools
 - Product Promotion/Advertising
 - Service Tools
- Payment Authorization

Areas of Function in Solution

- Variants

- Tag Chip
- Readers
- PC/Device
- Network Traffic
- Database



Industry Players

- Hardware Manufacturers
- Chip & Tag Producers
- Software
- Deployers/Institutions
- Consumers & Public

Summary

- RFID is emerging as an increasingly common scanning technology in countless industries simultaneously
- Adoption and Demand Patterns are still emerging
- Advantages and Benefits are Multi-faceted