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# Use of IoT and RFID technologies across different sectors

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# Agenda

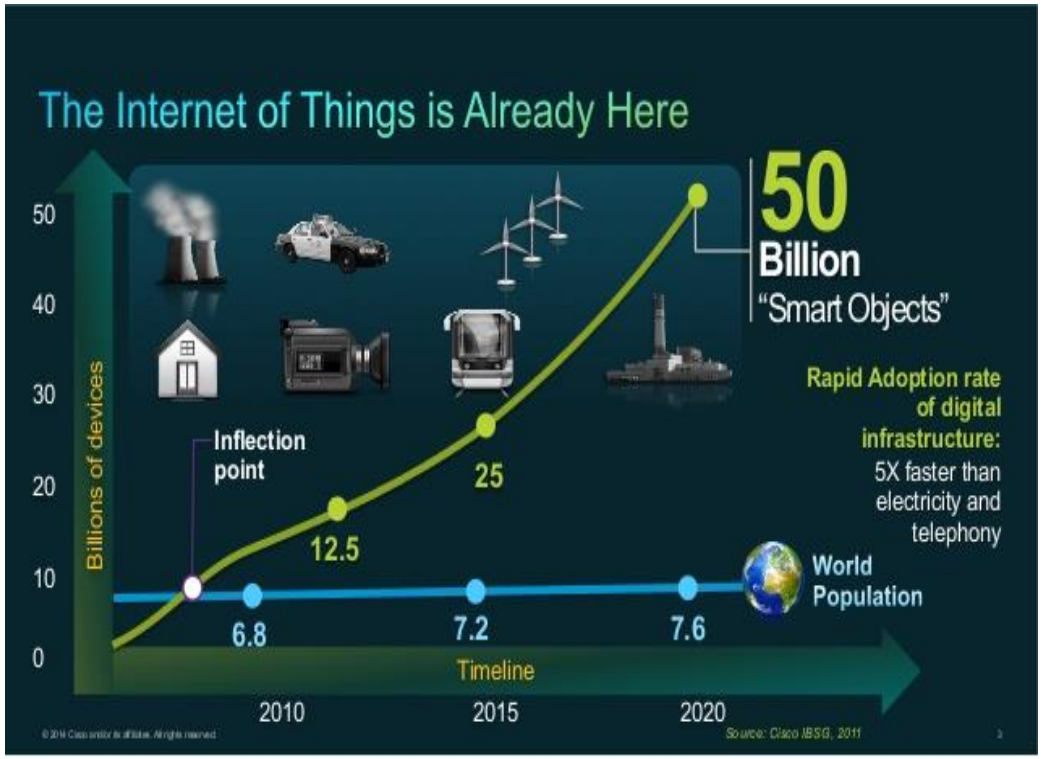
- **Introduction**
- **RFID Basics**
- **RFID Applications**
- **RFID Adoption challenges**

# Section 1

## Introduction

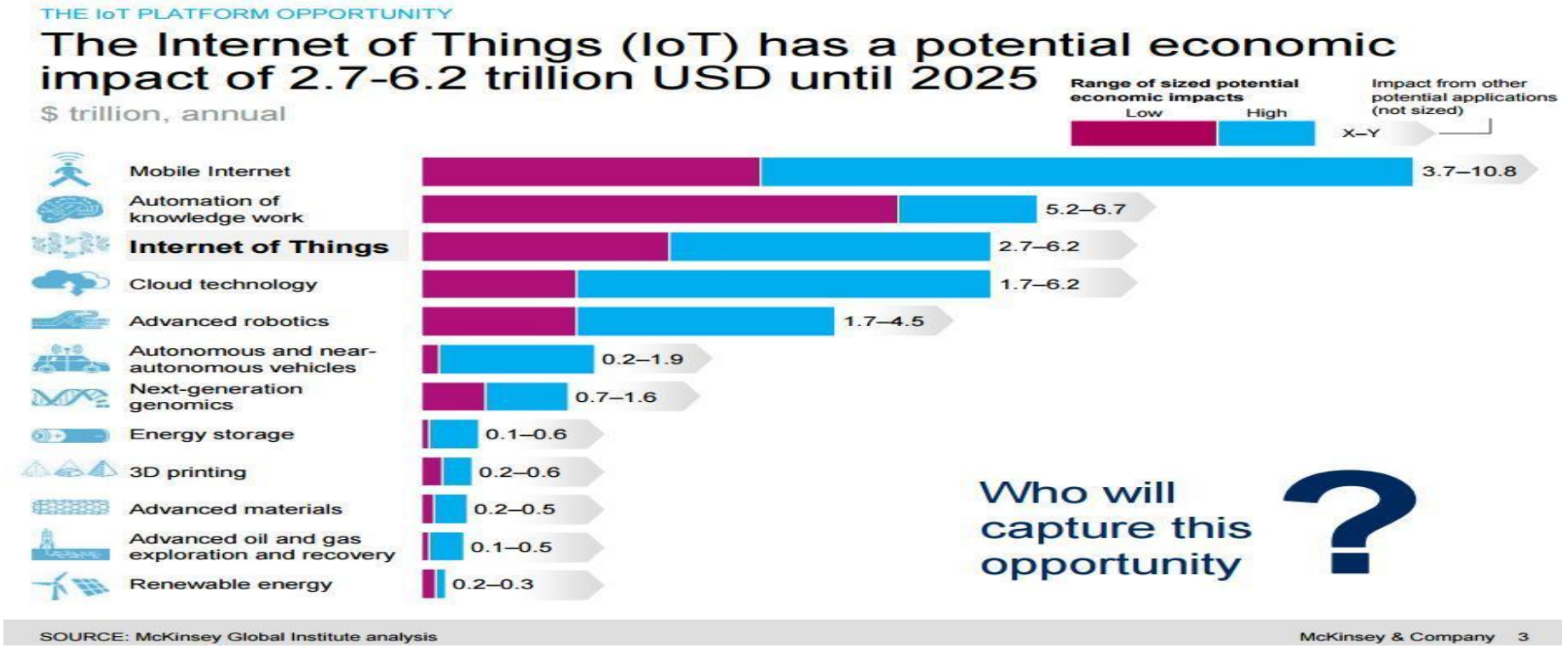
# Introduction

- **More connected devices than humans !!**
- **There will be more than 50 billion smart objects by 2020**



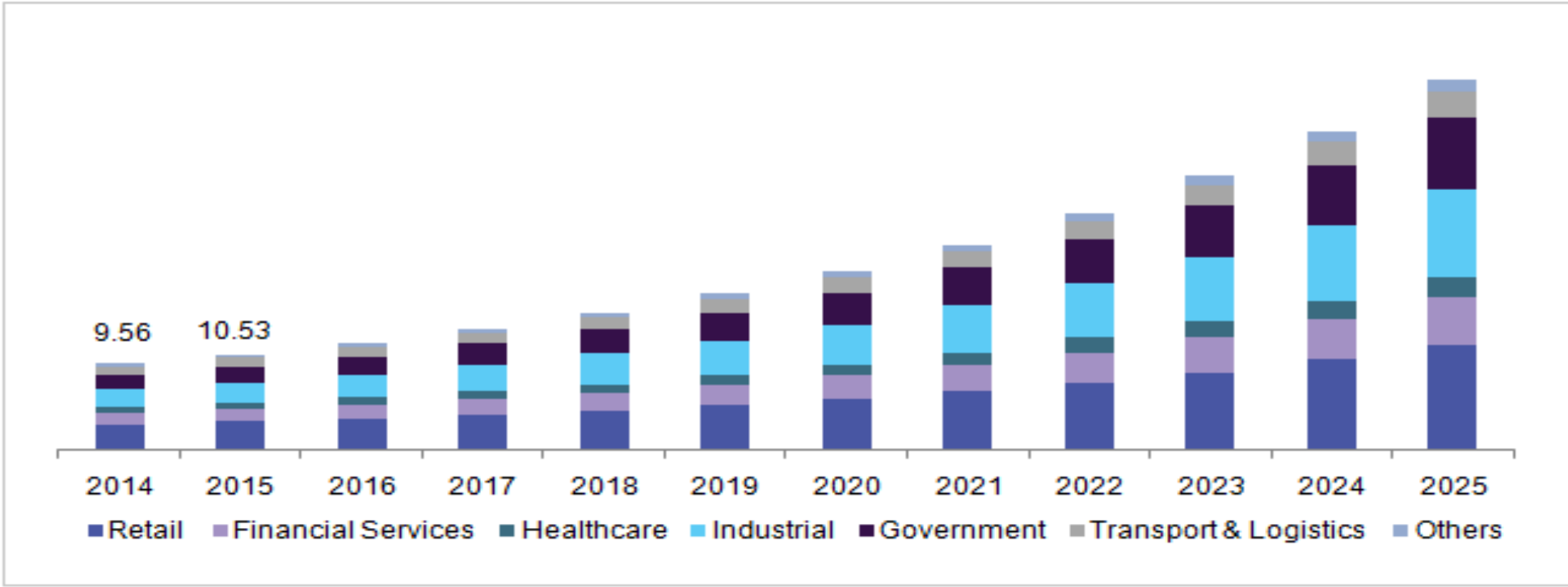

Source: CISCO

# IoT Markets forecast



# Global Radio frequency identification (RFID) technology market, by application, 2014 - 2025 (USD Billion)

The global RFID technology market is estimated to reach USD 40.5 billion by 2025




Source: https://www.grandviewresearch.com/industry-analysis/radio-frequency-identification-rfid-technology-market

# Motivation


**Tracking**

**Locating**

**Monitoring**


**Security**


**Resource optimization**

# Identification History

# Earlier Work

- **Radar Communication.**

- **IFF Transponder (Friend or Foe ),**
  **British Army 1939.**

- **Communication by Means of Reflected Power,**
  **Stockman. H, Proceeding of the institute of Radio engineers 1948.**

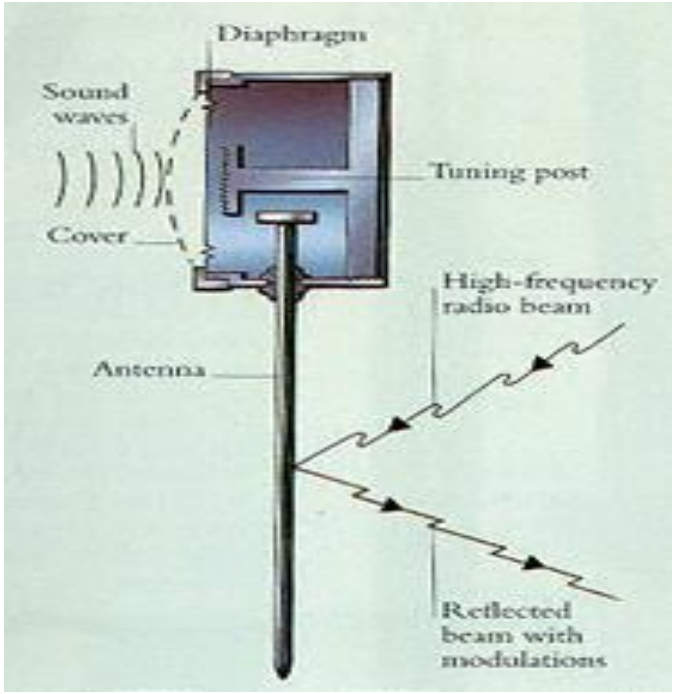
# Great embassy seal bug

**In 1946, Soviet school children presented a two foot wooden replica of the Great Seal of the United States to Ambassador Averell Harriman.**

# Great embassy seal bug

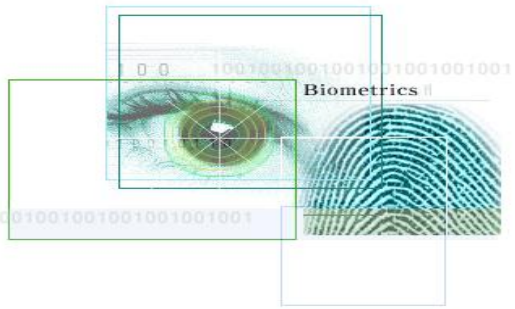
**During George F. Kennan's ambassadorship in 1952, a Secret technical surveillance countermeasures (TSCM) Inspection discovered that the seal contained a microphone and a resonant cavity which could be stimulated from an outside radio signal.**

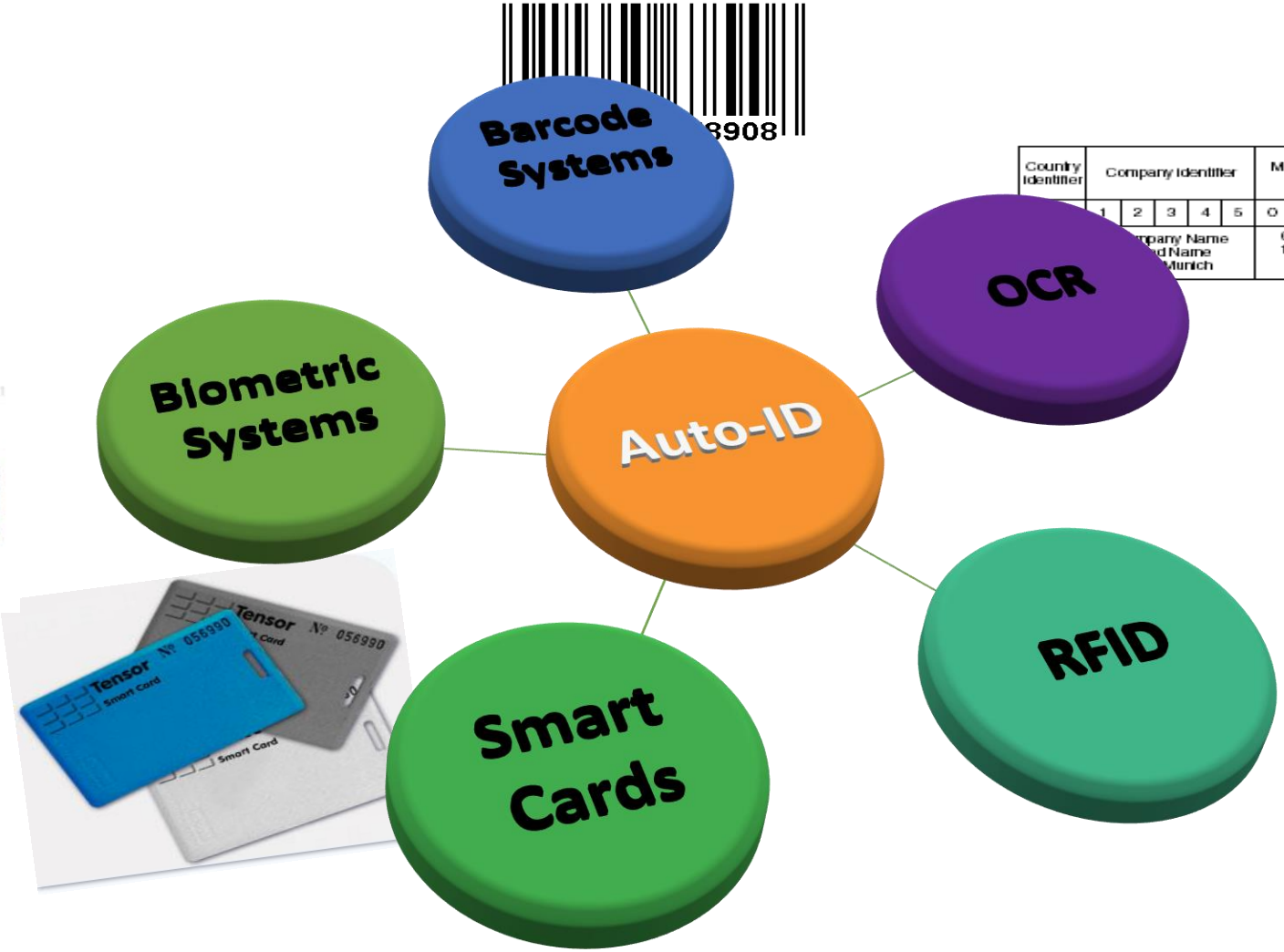
# Great embassy seal bug




- **active only when a radio signal of the correct frequency was sent from an external transmitter.**
- **Sound waves caused the membrane to vibrate, which varied the capacitance "seen" by the antenna, which in turn modulated the radio waves that struck and were retransmitted (backscattered modulation).**
- **A receiver demodulated the signal so that sound picked up by the microphone could be heard, just as an ordinary radio receiver demodulates radio signals and outputs sound.**

# What is RFID?


Biometrics

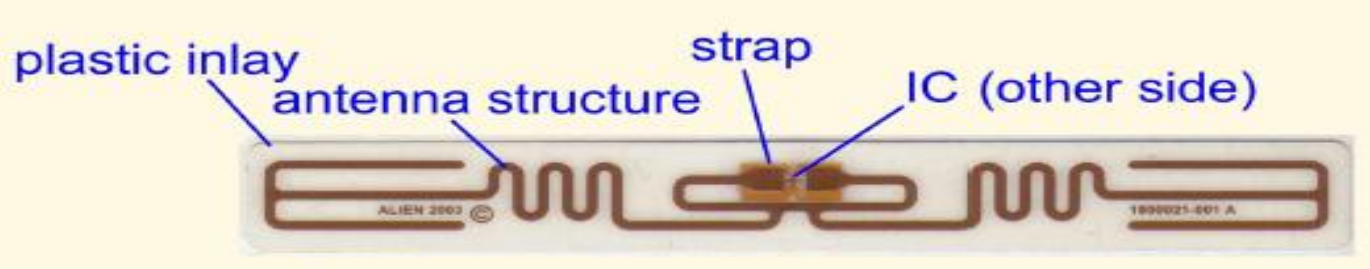

Barcode Systems
Biometric Systems
Auto-ID
OCR
RFID
Smart Cards
Country Identifier
Company Identifier
Manufacturer's item number
CD
1 2 3 4 5 0 8 1 5 0 9
Chocolate Rabbit 100 g
Tensor
Smart Card

# Section 2

## RFID basics

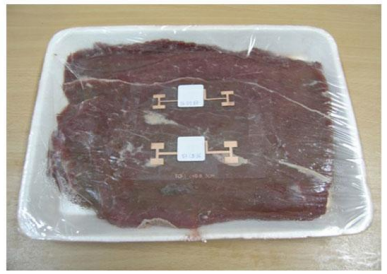
# Radio frequency identification

- **Tiny micro device**
- **Chip + antenna  + optional  capabilities (memory, sensors,**
- **Unique identification serial number (32 – 64 – 96 – 128 ,…) Bits**



# Making ordinary objects ‘Smart’

**Passive read/write tags affixed to caps of containers**




# RFID Tags

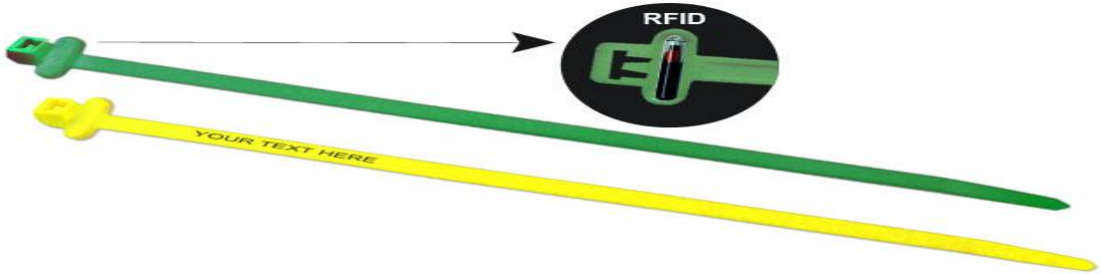
**Chipless**

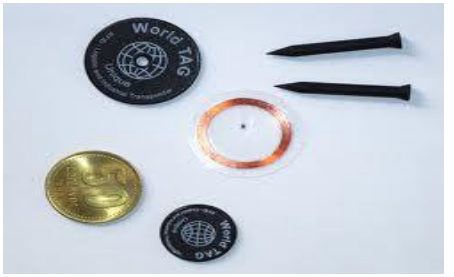
**Energy**
- **Passive**
- **Semi Passive**
- **Active**

**Read / Write**
- **Memory Access basis**

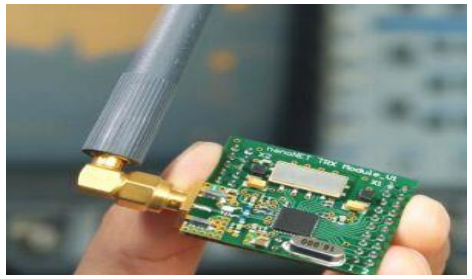
**Range**
- **shirt**
- **Proximity**
- **Vicinity**
- **Longue range**

# RFID Tags



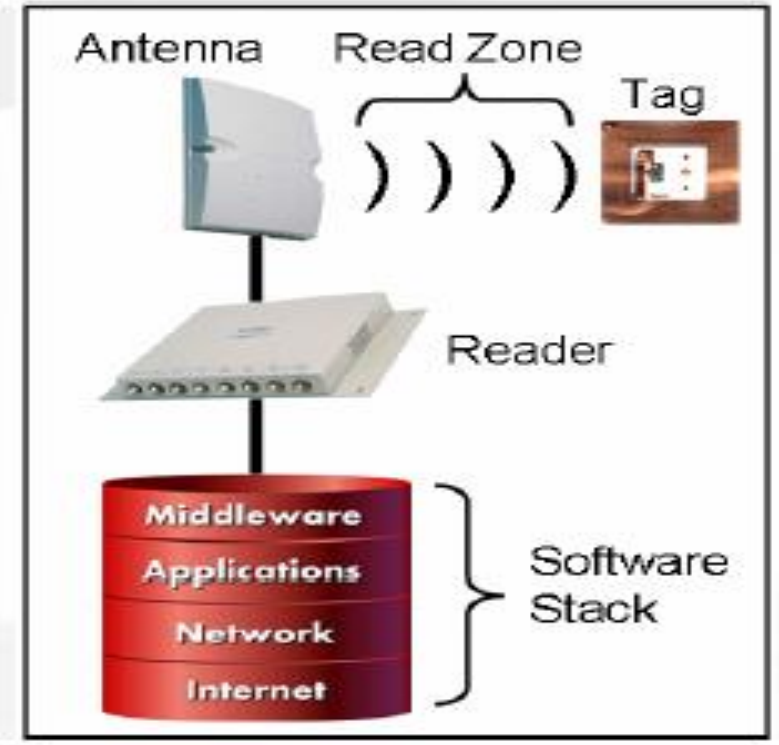







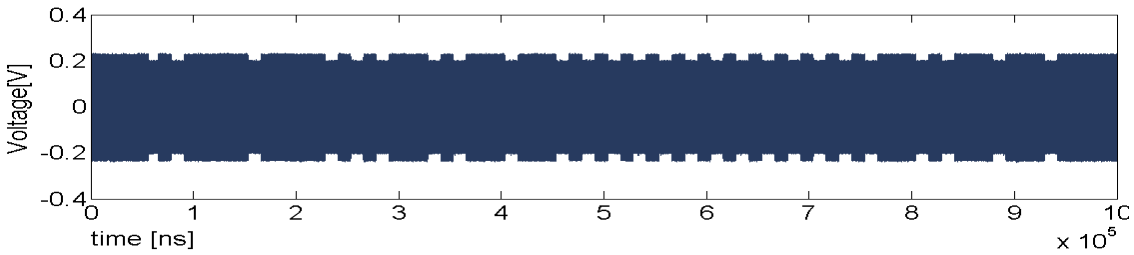
# RFID Reader

# RFID Basics

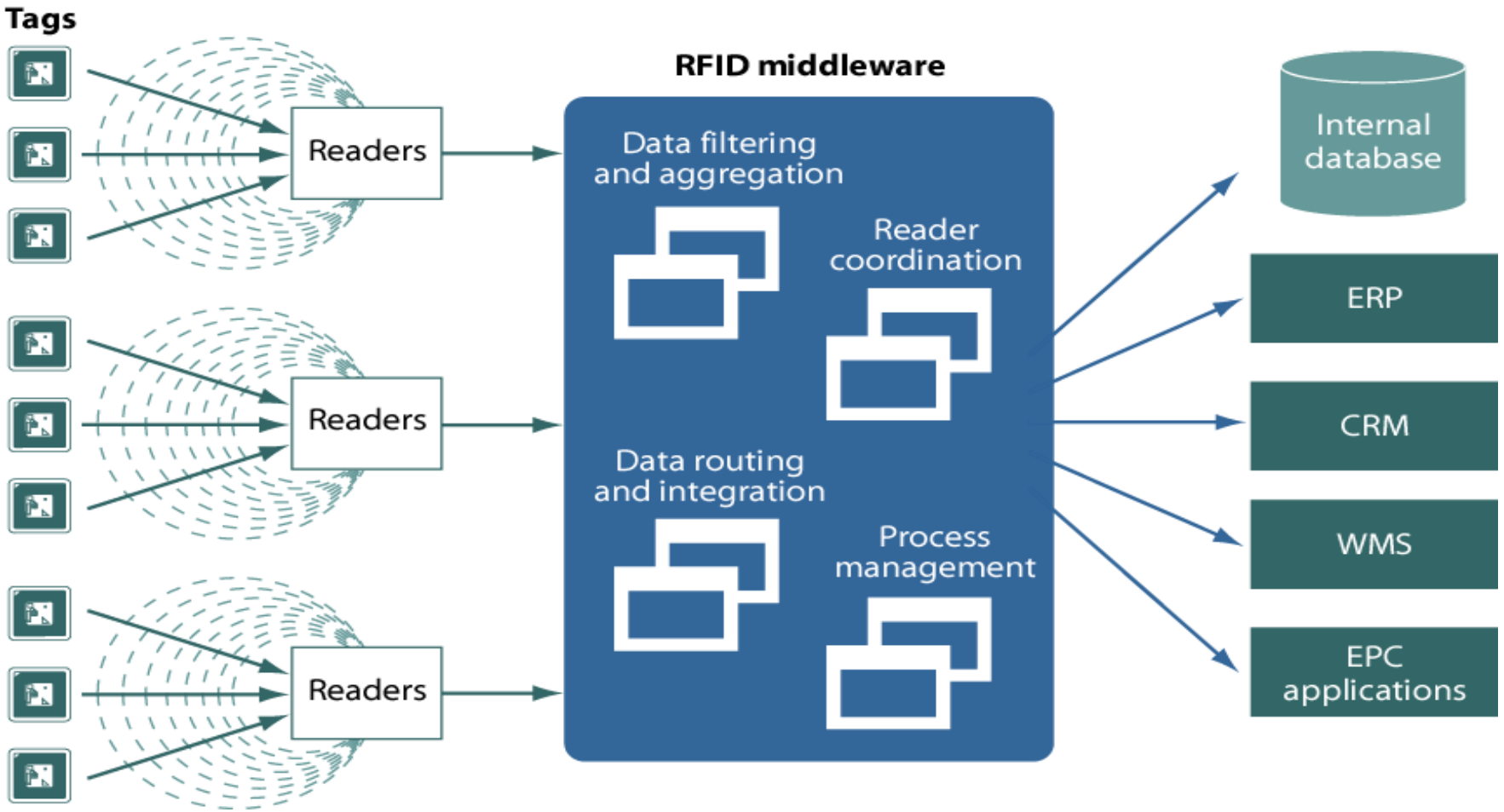



- **RFID Base station**
- **Tags**
- **Middleware**

- **Passive communication is assured thanks to Load modulation technique (impedance modulation, Backscattering )**



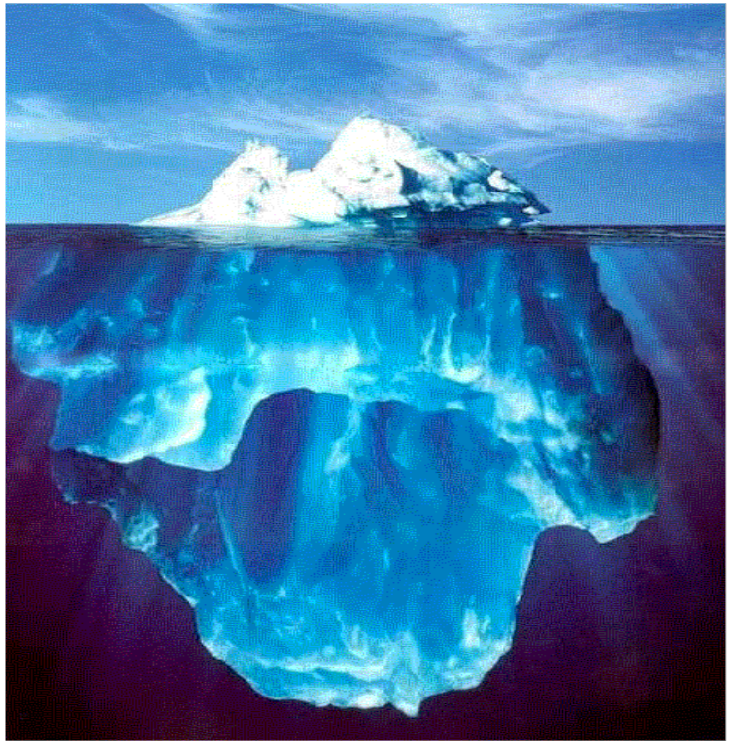
# RFID Generic Architecture Solution



# How does it looks ?

**Printed Electronic, Telecommunications, antenna, wireless energy transfer, on ship design, security , plastic technologies, RTLS, instrumentation, Big Data, cloud, Machine learning …**

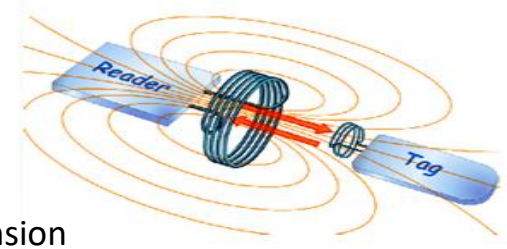
**Visibility !!**



# Physics Behind

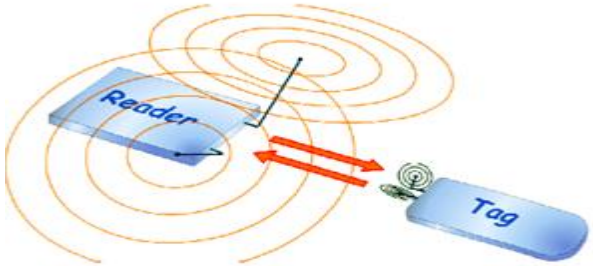
$D << \lambda$

*D*: Maximum dimension of the radiating structure




$$r = \frac{\lambda}{2\pi}$$

Distance from the reader antenna

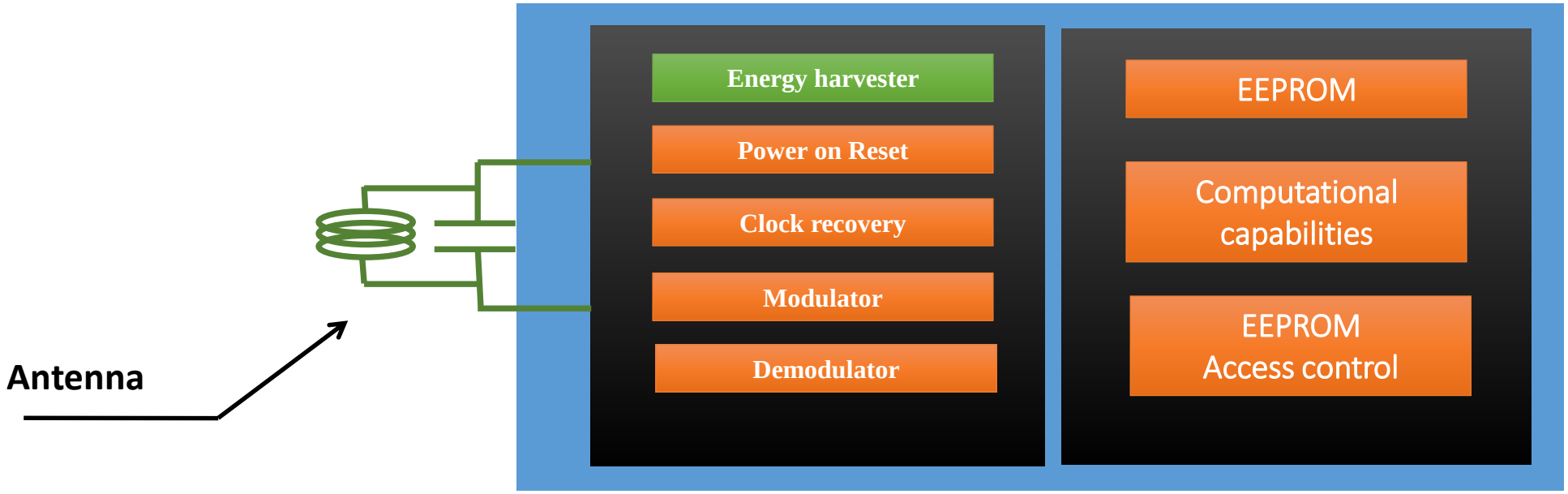



**Near Filed communication** | **Far field communication**

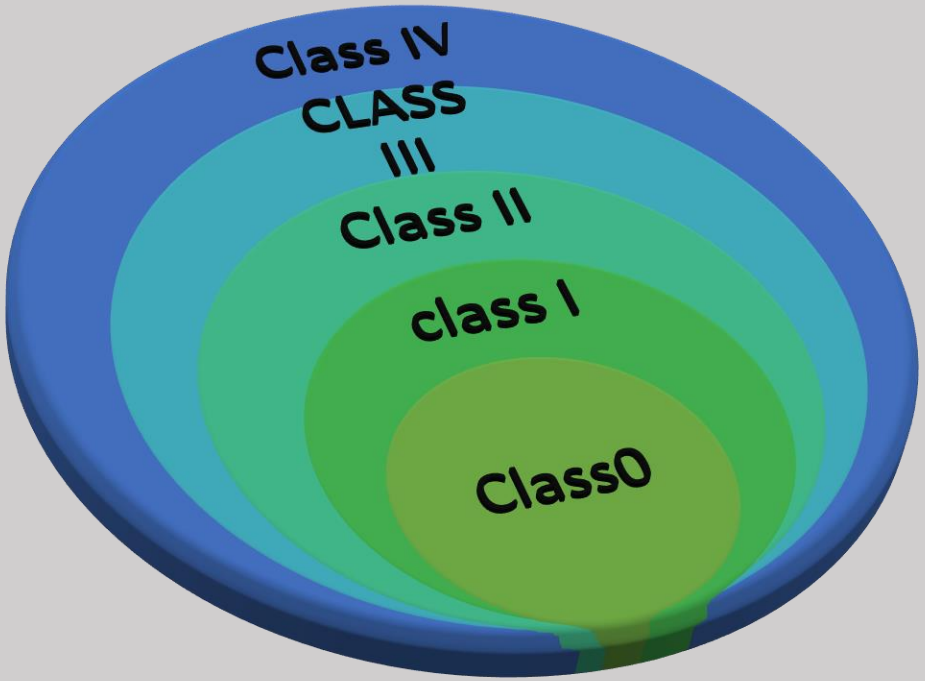
125 KHz- 150 KHz | 13.56 MHz | 433 MHz | 860 MHz 960 MHz | 2.4 GHz | 5.8 GHz

10 KHz | 100 KHz | 1 MHz | 10 MHz | 100 MHz | 1 GHz | 10 GHz

# Generic RFID Tag Architecture



# RFID Classes




- **Class 0 : Read only**
- **Class I : WRITE ONCE READ ONLY (WORM)**
- **Class II : READ WRITE**
- **Class III: Read write with on board sensor**
- **Class IV: Read write with integrated transmitter**

# Section 3

## RFID applications

# RFID enables city  digital transformation

- **Retail**
- **Healthcare**
- **Administration**
- **Environment**
- **Security**
- **Industry**
- **Defense**
- **Etc**

# RFID Applications : Just imagine !!












# NFC

- **Near field communication**
- **Mobile phone, is an enabler of new smart services**
- **Mobile operator ecosystem**

# Towards a better customer experience

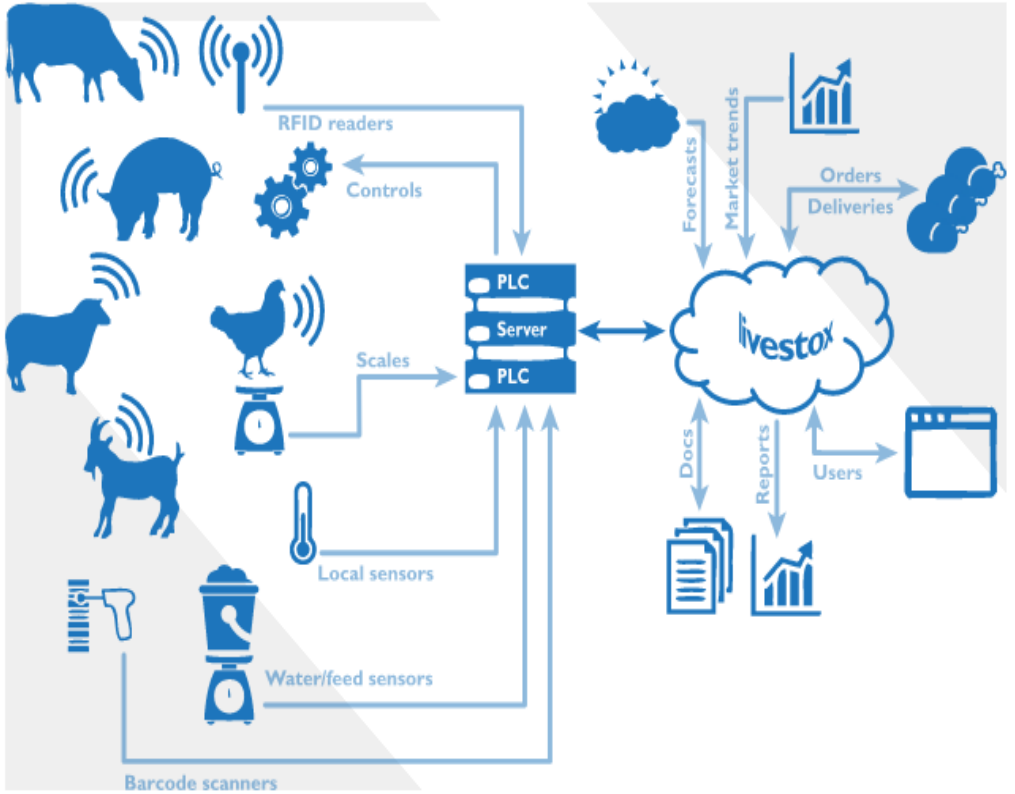
**Smart Payments**
Tolls, Tickets, vending
Goods, services, …

**Enhanced user experience**
Service notification
NFC connection Handover
**Customer analytics**

**Smart Authorization**
Access to transport, buildings
Rental or sharing
Fleet management
VIP retail experience

# Live stock traceability

- **Livestock management.**
- **Optimizing productivity.**
- **Helping ensure food safety and quality.**



# Fish traceability

**Traceability of a fish farm from hatchery to consumer:**

- **name,**
- **production area,**
- **quantity,**
- **hatchery supplier**
- **transportation details (temperature and water conditions).**

# Food security

- **Identify and trace food & drink information along the supply chain.**
- **Time, food care requirements, and processing conditions**
- **Smart packaging**
- **Cold chain monitoring**
- **Warehouse monitoring**
- **Detect contaminated food**


# WSN Applications

**Forest**

**Greenhouse**

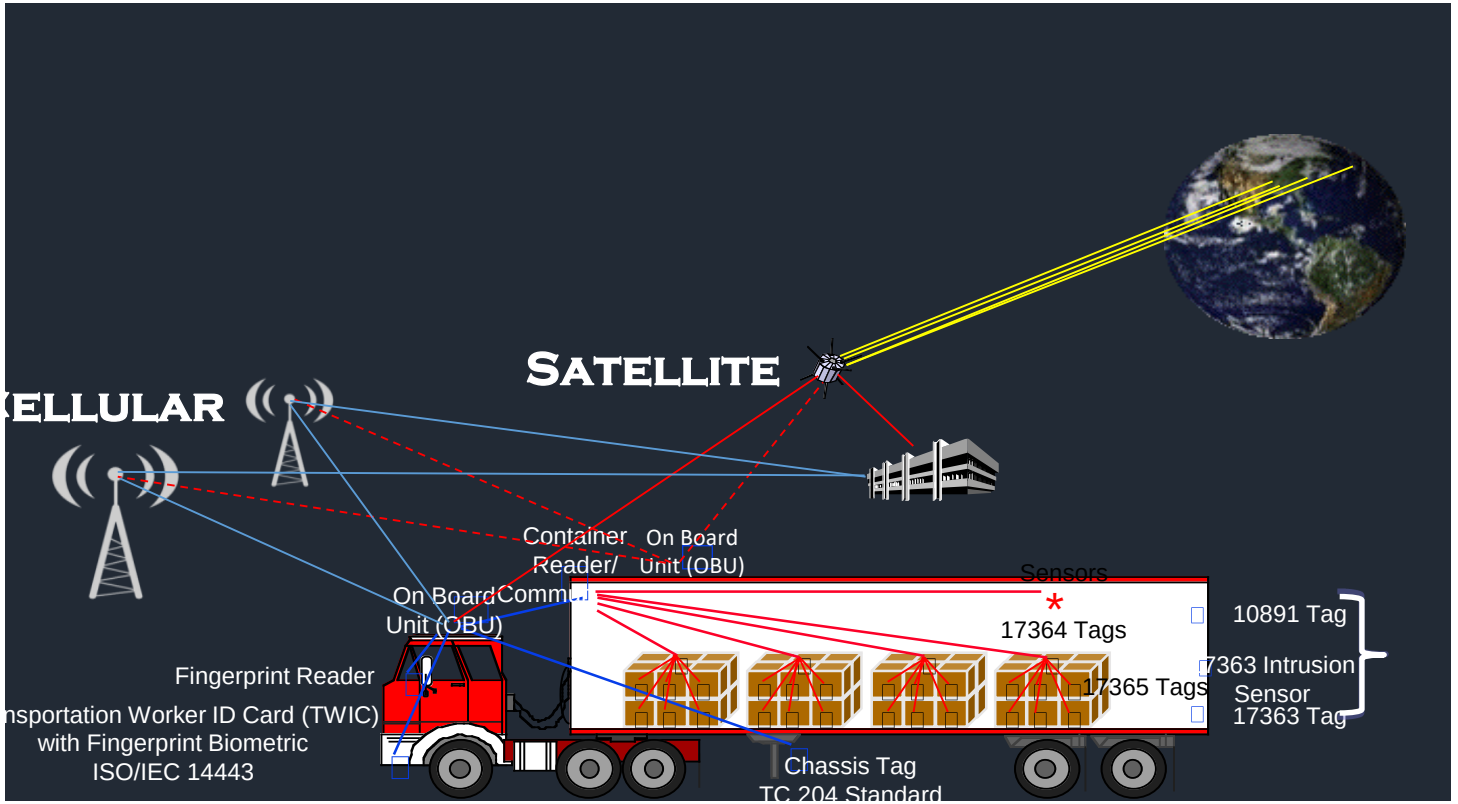
**Military**

**Healthcare**

# Pharmaceutical security & Healthcare

- Anti counterfeit drugs
- Blood bag tracking & monitoring
- Medical surgical instrument
- Equipment and staff location

# Supply Chain Monitoring




**Reliable product life cycle tracking (status, inventory,…)**
**Sensing**

# warehouse management

**Shipment & receiving verification**
**Tracking where it counts; the point of Entry and Exit**
**Track and Trace Accuracy with Dock Door RFID**

# RFID & Industry 4.0

- **Product life cycle monitoring**
- ***Manufacturing***
- ***Supply Chain***
- ***Pre- and Post-Sale***

# Retail

- **EAS  (Electronic Article Surveillance)**
- **Inventory management**
- **Information system visibility**
- **Increase work efficiency**
- **Boost sales**

# Sports

- **Timing measurement**
- **Real time player performance monitoring**
- **People tracking**
- **Event security & management**

# Section 4

## RFID adoption challenges

# Raising awareness

- **Trainings**
- **Seminars**
- **Events**
- **Workshops - Demo**

# change management acceptance

- **Awareness**
- **Understanding**
- **Adoption**
- **Commitment**

# National  Working Groups strategy  !

- **Public / Private collaboration**
- **Case studies**
- **National test  demo center**

# Capacity Building

- **RFID technologies could not be used on a plug & play basis**

# Support startup ecosystem  (innovation,….)

- **Entrepreneurship**


# Return on investment and  monetization

# Thank You