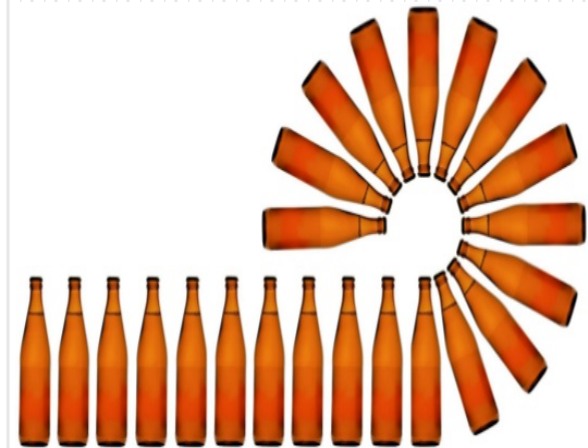


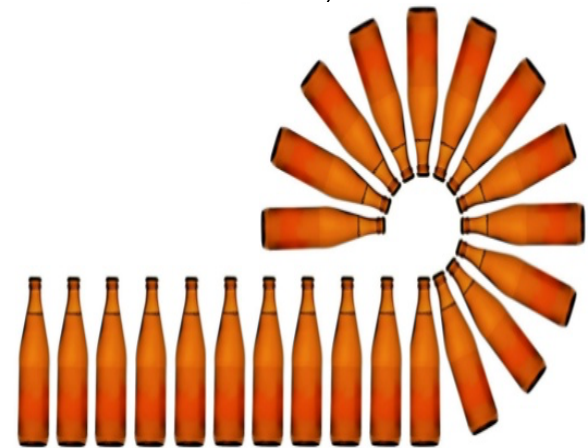
# Root Beer Game – in Progress



# Root Beer Game Completion Schedule

- Practice session (**completed** in class) – *February 13*
- Finish Round 1 – **completed** in class *February 20*
- Team decision (via e-mail to professor) on Round 2 change – **Received** (*February 25*)
- Game **reset and ready** to start Round 2 – *Feb 27*
- Complete Round 2 and Submit deliverables – *by March 20*

What's  
the  
plan?

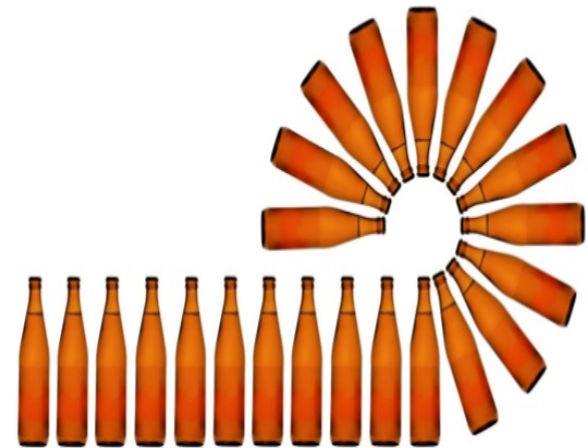


# Root Beer Game: Round 2 Options

Each Team Can make 1 of the following changes for Round 2

- A. Point of Sale (POS) information available to all Roles (not just retailer)
- B. Shipping Delay reduced to 1 week from 2
- C. Information Delay (Order) reduced to 1 week from 2

What's  
the  
plan?

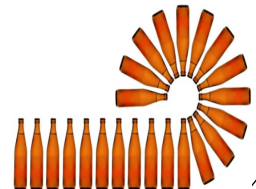


# Root Beer Game: Deliverables

One submission per group

1. Complete the performance spreadsheet of your group (link in blog)
2. Short write-up: How you played the beer game. What strategies you employed and how they changed when you played the beer game the second time compared to the first.  
e.g.
  - What was your strategy in the game for placing orders placing and holding inventory? How did this strategy change for Round 2?
  - How was the communication and cooperation between various players in the group? How did it change from Round 1 to 2?
  - What lessons from the beer game would you give to supply chain managers?

What's  
the  
plan?

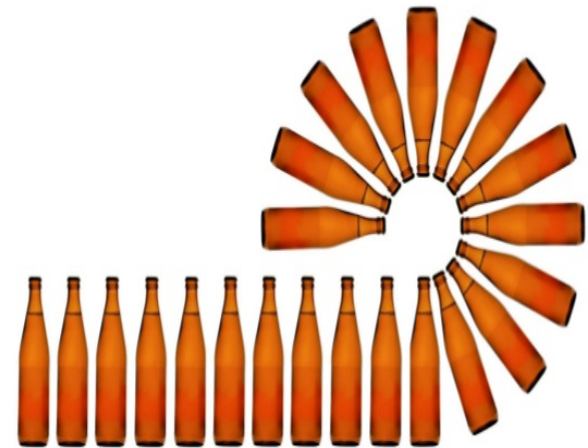




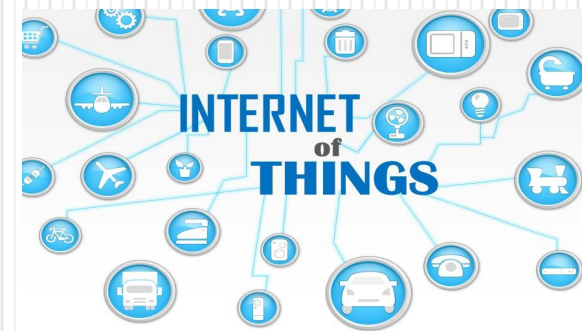
# Root Beer Game: Note

- The demand pattern may change between the different rounds.
- The intent of playing multiple rounds is to demonstrate how manipulating certain aspects of the game can influence the performance of the supply chain.

What's  
the  
plan?



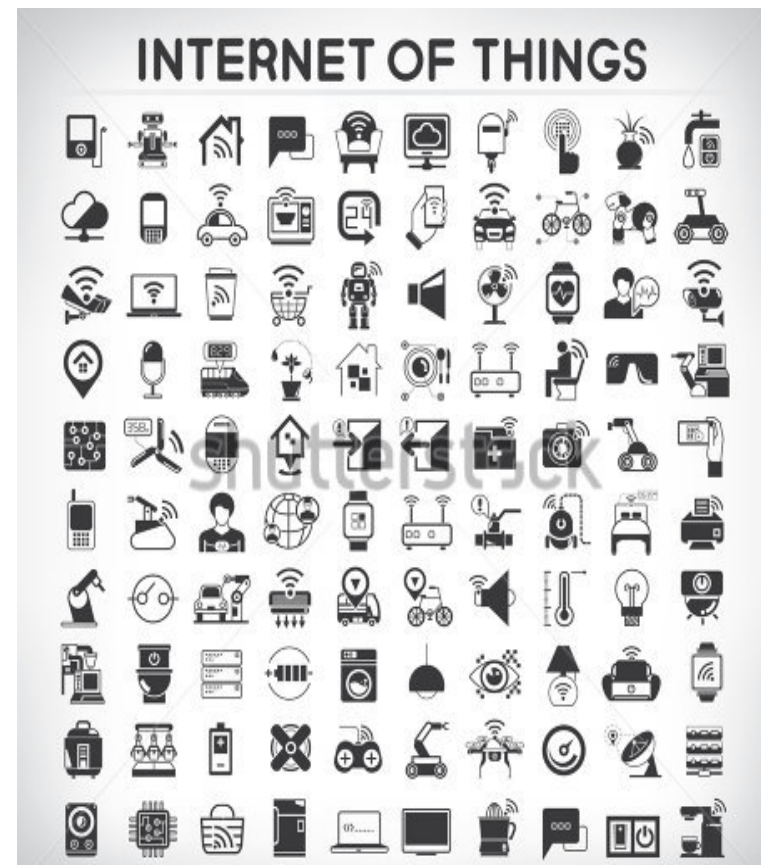
# What is this 'Internet of Things' (IoT)?



# The Internet of Things (IoT)

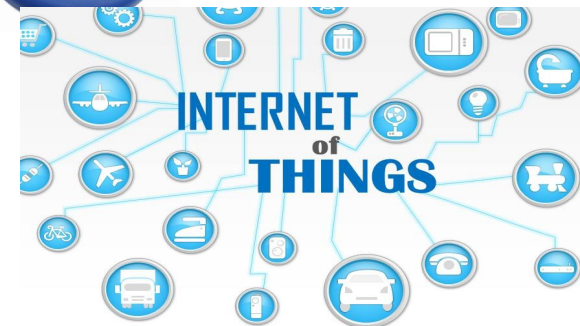
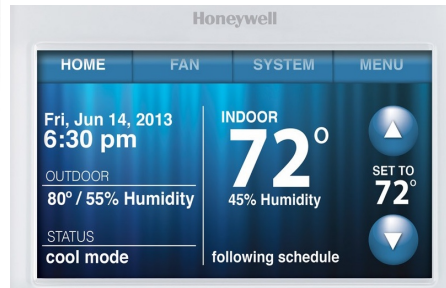
Loosely coupled, decentralized system of smart objects

Number of technologies and research disciplines that enable the Internet to reach connect with the real world of physical objects.

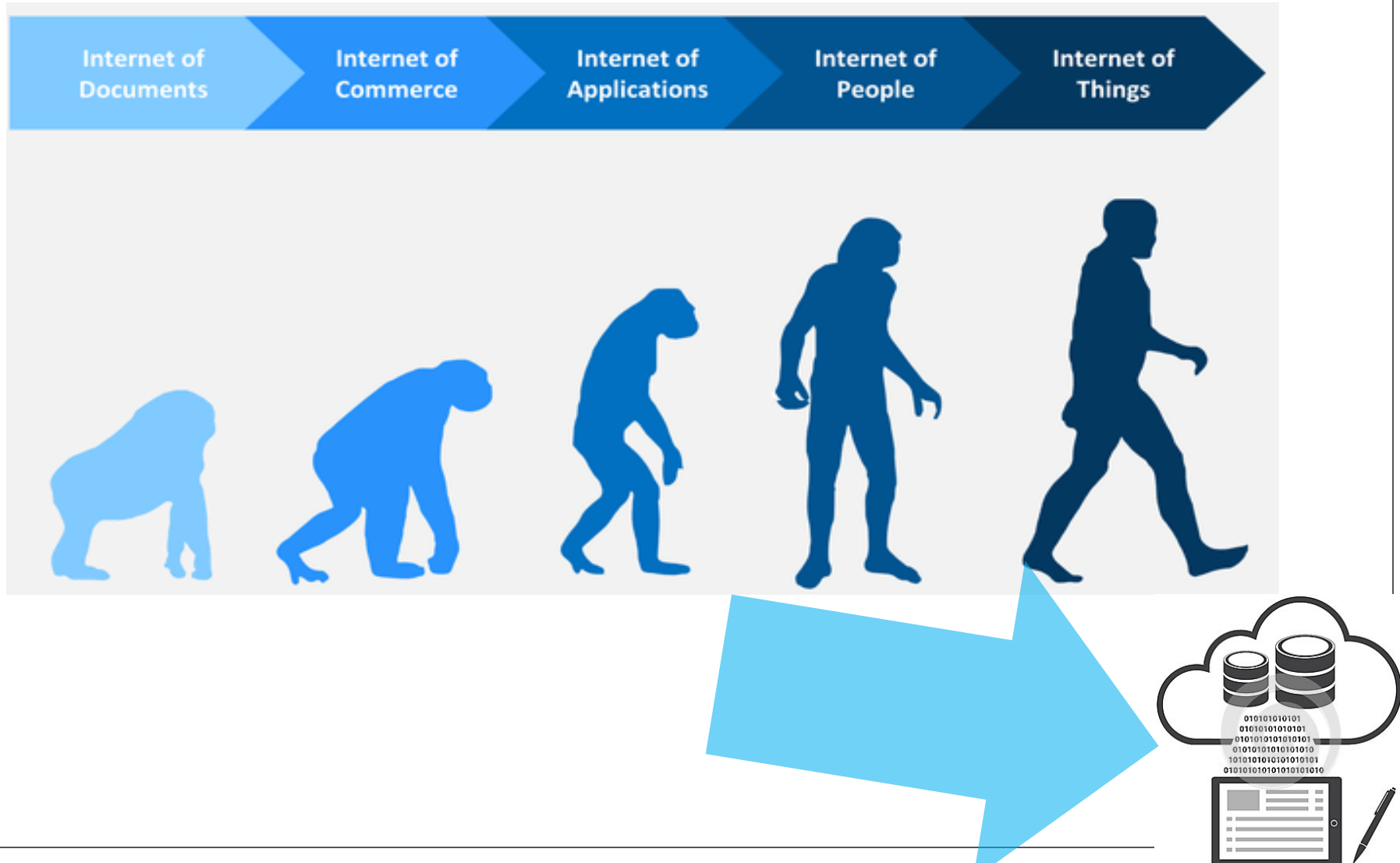




# My Personal Internet of Things (IoT)



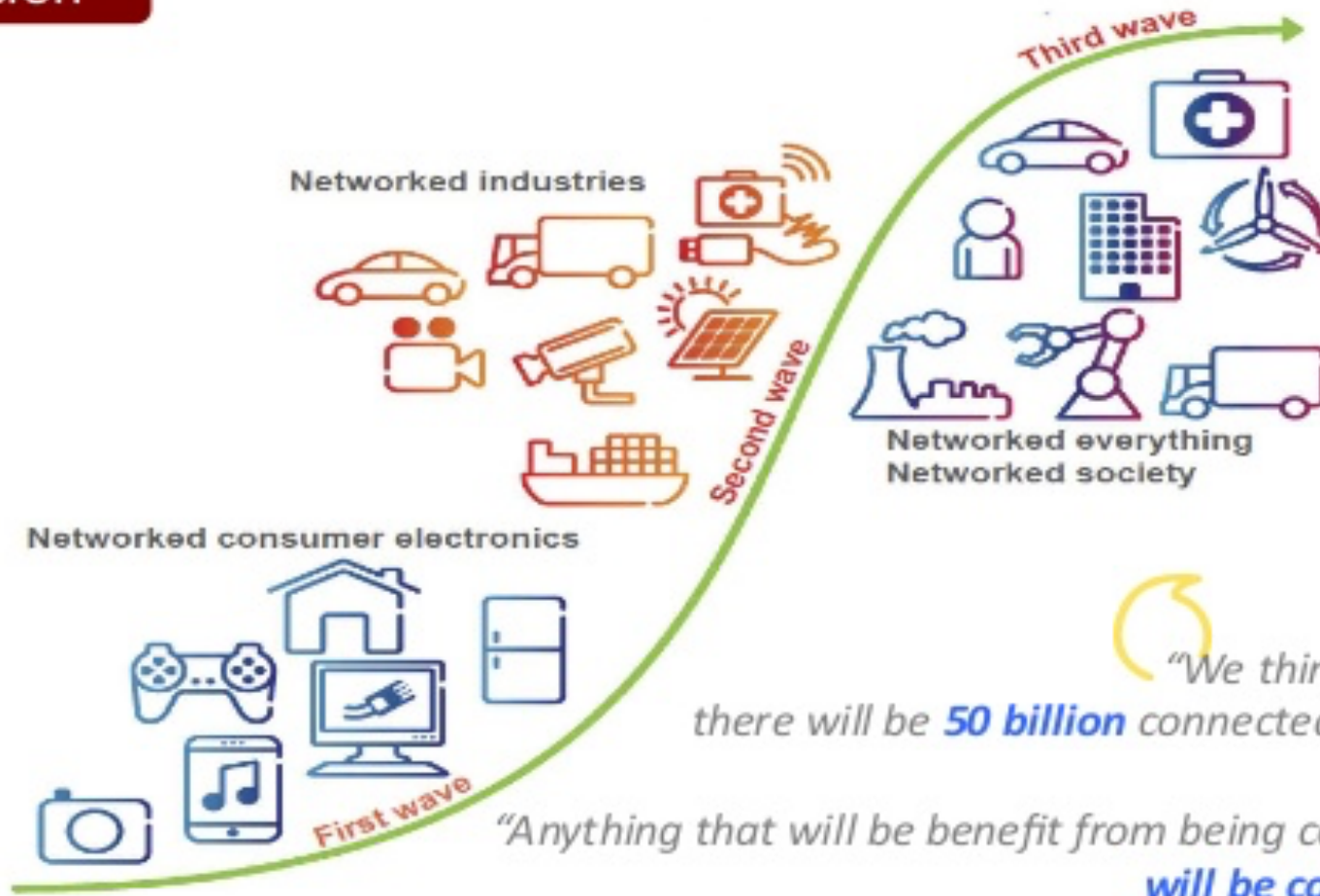
# Evolution: Internet → Things





# Internet of Things: Evolution

## Vision



*"We think in 2020  
there will be **50 billion** connected devices"*

*"Anything that will benefit from being connected,  
**will be connected**"*

price, production  
operational in

ion

and a few more  
as

ancing

rank of similar  
any of sugar in

the offspring in  
and health.

performance

at certain  
in movements

Direct Phone and Android devices and in general any device which uses both Wi-Fi or Bluetooth interfaces

### Perimeter Access Control

Access control to restricted areas and detection of people in non-authorized areas.

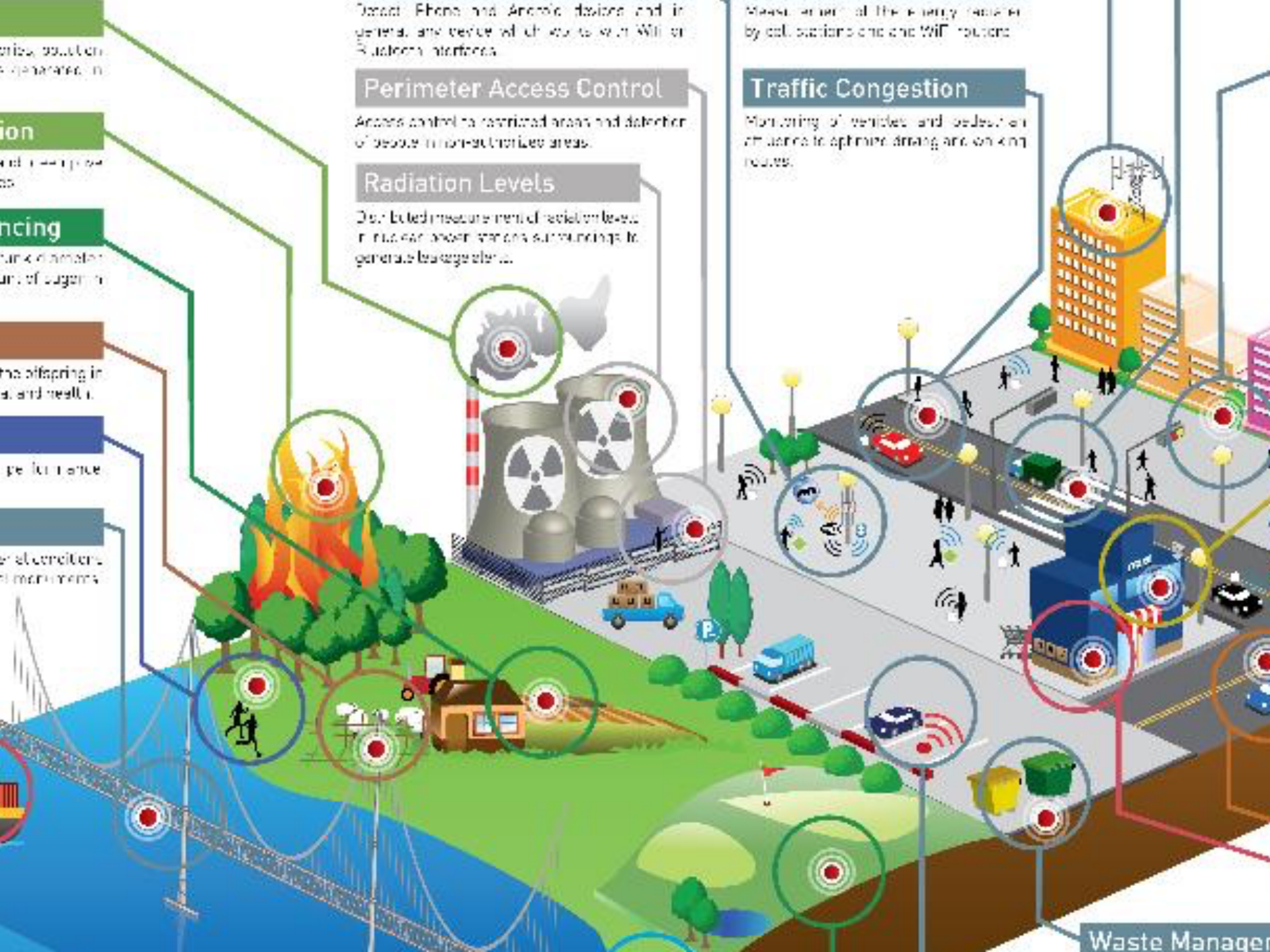
### Radiation Levels

Distributed measurement of radiation levels in nuclear power plants surroundings to generate leakage alerts.

### Traffic Congestion

Monitoring of vehicles and pedestrian movements to optimize driving and walking routes.

Waste Management

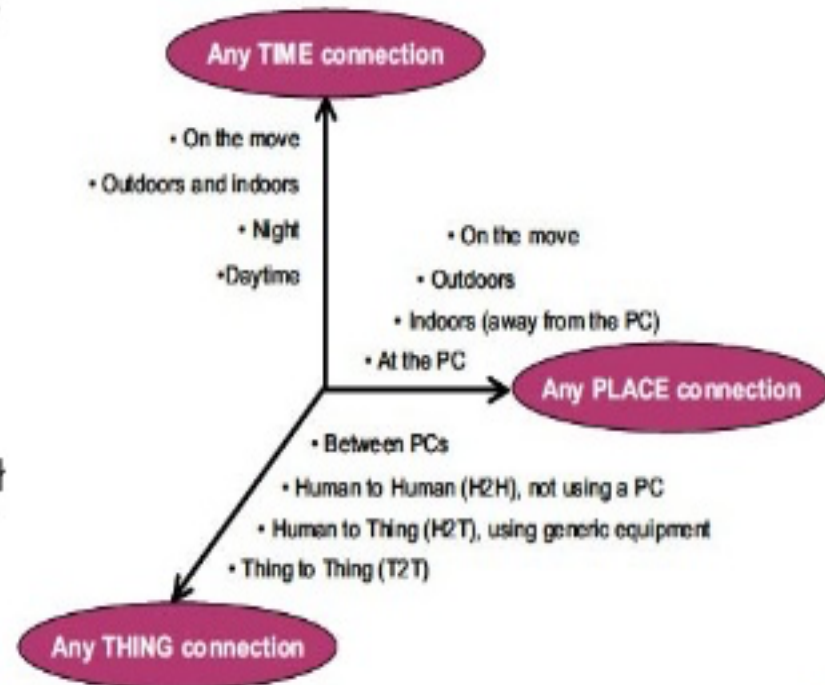




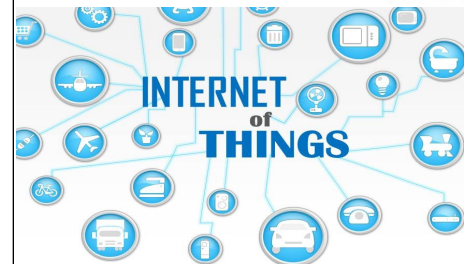


# Internet of Things: Characteristics

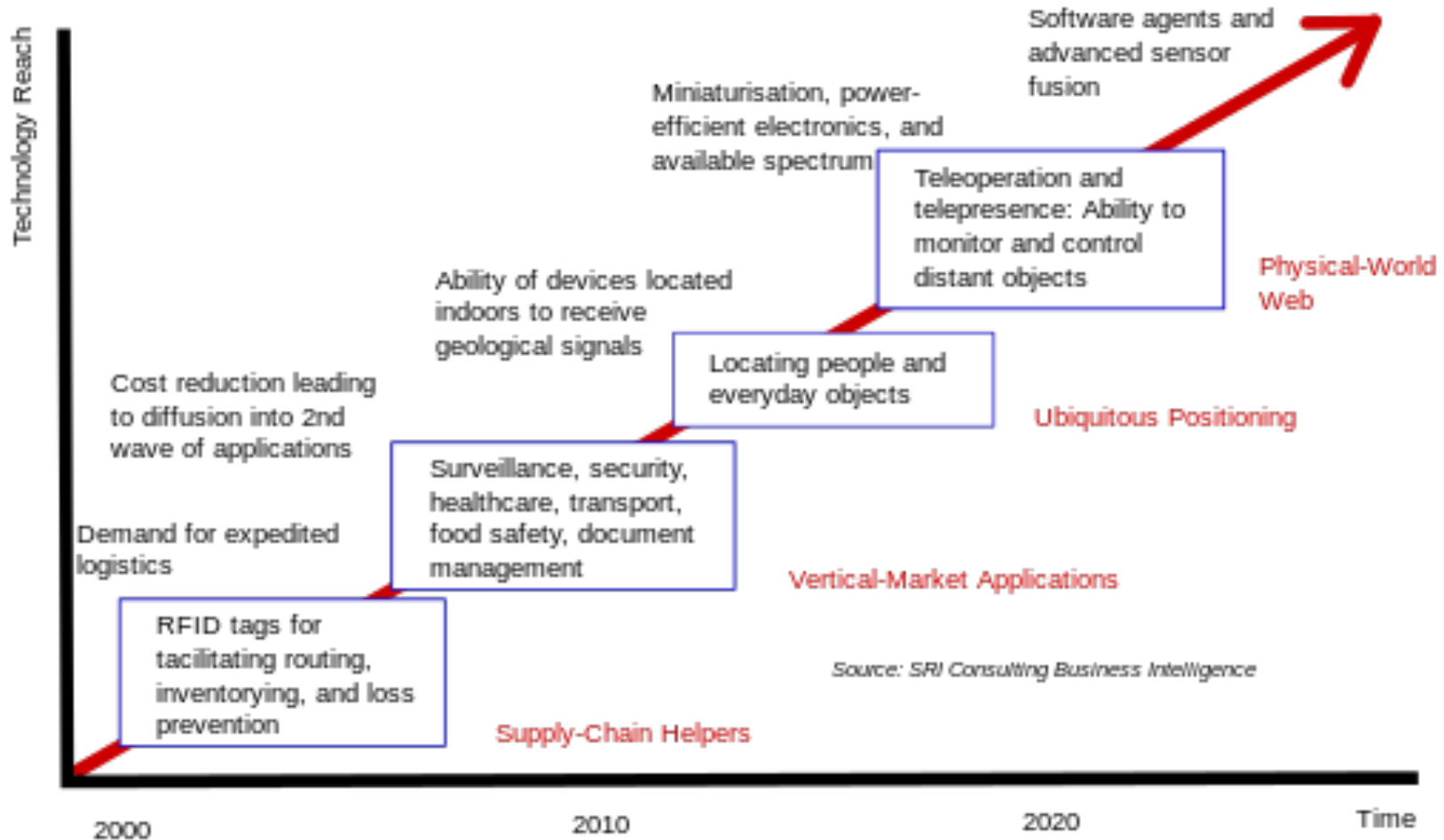
- ▶ **Pervasive**  
→ Embedded everywhere
- ▶ **Ubiquitous**  
→ Invisible
- ▶ **Heterogenic**  
→ Many technologies, interact each other
- ▶ **Scale**  
→ Order of magnitude high than current Internet.



*"From any time, any place connectivity for anyone, we will now have connectivity for anything!"*



## Technology roadmap: The Internet of Things



[https://en.wikipedia.org/wiki/Internet\\_of\\_things](https://en.wikipedia.org/wiki/Internet_of_things)

# RFID-Radio Frequency Identification



# Overview

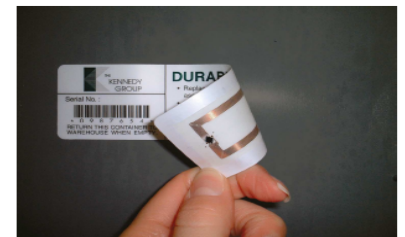
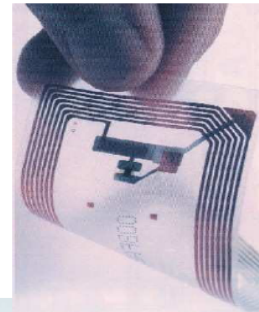
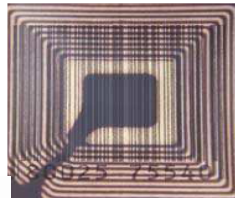
- Components of RFID
- Applications of RFID
- Challenges in RFID
- Security and Privacy concerns regarding RFID



# Components of RFID

## Tags

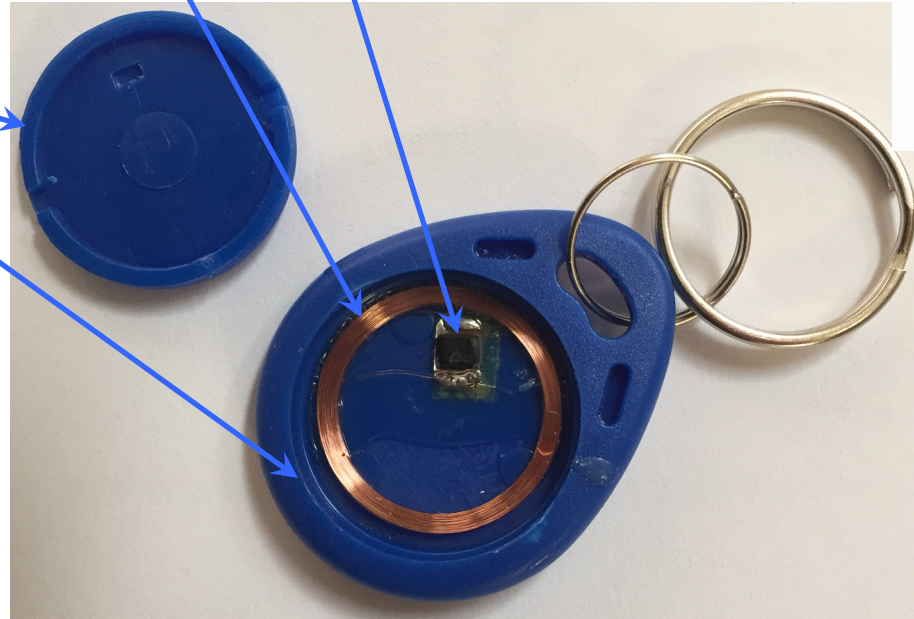
- Attached to items that RFID is intended to track
- Consists of
  - Electronic Integrated Circuit
  - Miniature Antenna
  - Substrate



# Components of RFID

## Tags

- Identifying # (can be internal)
- Electronic Integrated Circuit
- Miniature Antenna
- Substrate



# RFID Tag Types

- **Passive Tags:**

- Powered by incoming RF. Smaller, cheaper, long-life
- Approximate range 5meters



*Passive*

- **Active Tags:**

- Battery Powered. Can be read 100 feet away
- More reliable reading



*Active*

- **Semi Active Tags:**

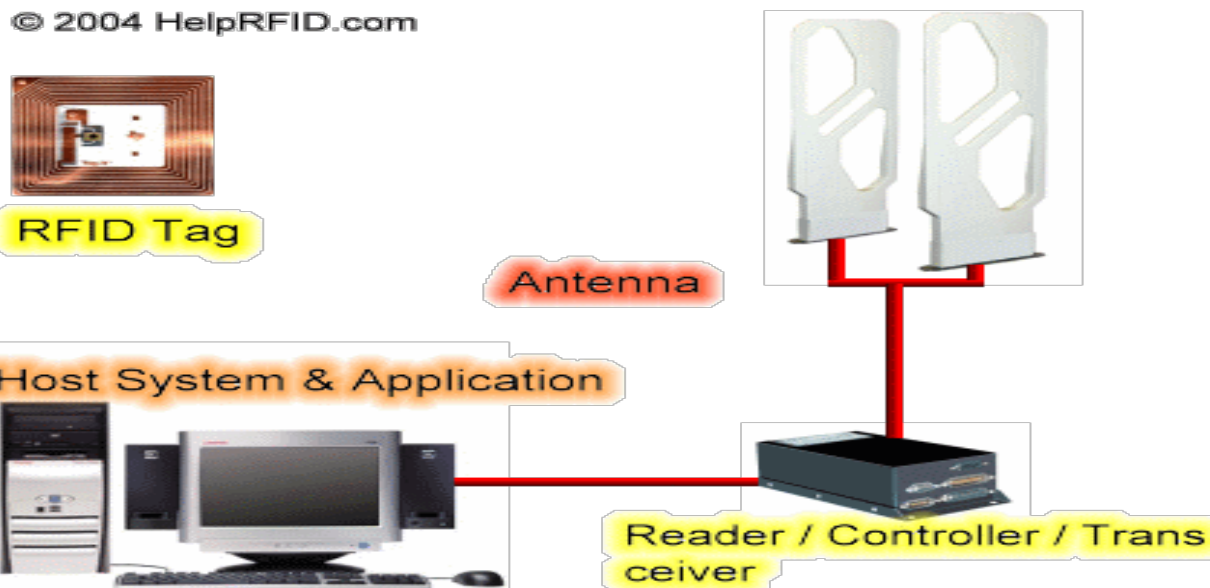
- Transmit using 'Backscatter' of readers RF power
- Battery for Logic
- Range like passive. Reliability like Active

**RFID**)))



# Components of RFID (Contd)

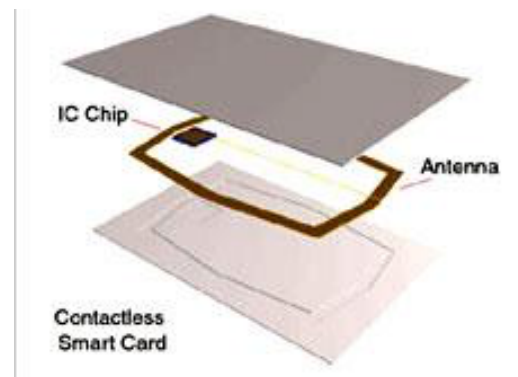
- **Scanner and Readers** - Creates electromagnetic signals which are transmitted to the RFID tags through antenna
- **Antenna** - Transmits and receives Electromagnetic signals between Tag and Reader
- **Host** - Computer system that communicates with the RFID reader



# RFID: Applications



- Pioneered by British during World War II to identify aircraft
- In 1960 the US Government started using RFIDs on nuclear and hazardous materials
- Door openers use RFID
- Automatic Toll Collection
- Sensor + RFID can be used to monitor products inside sealed shipping containers
- Access Control, Equipment Tracking



# What would it Take: Classroom RFID Attendance Application?

- —
- —
- —
- —
- —



# RFID in Supply Chain Management



Check out the video on use of RFID in Inventory Management.

<http://www.youtube.com/watch?v=4Zj7txoDxbE&NR=1>

# RFID-Supply Chain Management

## Benefits

- Innovate ways to identify, locate and monitor goods as they travel through supply chain of many industries.
- Increased accuracy of orders
- Reduce inventory handling cost
  - Improve Inventory handling
- Fewer misplaced items(in warehouse)
- Reduce losses from theft

# RFID in **WAL★MART**<sup>®</sup>

- Wal-Mart uses the ‘slap and ship’ level
  - Advantages to **WAL★MART**<sup>®</sup>
    - Improved Inventory Control
    - Better control over Overage, Shortage and Damage claims management
    - Improved order accuracy
    - Improved forecasting
    - Lower overall inventory level
    - Improved sales
    - Improvement in customer service level
      - Esp. with internet shopping
- from store inventory 



# Store of Future with RFID?

- Shopping in the future made easier by RFID!

<http://www.youtube.com/watch?v=zBz3aoikLpU&feature=related>

- Is this realistic
  - Technically?
  - Customer Acceptance?
  - Business Value?





# Credit Device RFID Applications

- Known as ‘Contactless Payment Systems’
- RFID circuitry embedded on back of the card
- **Advantage:**
  - No dependence on magnetic stripe to complete transaction.
- **Disadvantages:**
  - Lesser security
  - Easier to spend





# Animal Tracking Using RFID

- **External Tag Placement**

- Can be attached to the collar
- Can be directly attached to animal's body

- **Advantages:**

- Less tagging trauma to animal
- Greater ease in maintainability
- Lower Initial Cost

- **Disadvantages:**

- Increased possibility of tag damage or loss
- Varying environmental operating conditions



# Animal Tracking Using RFID (Contd)

- **Internal Tag Placement**

- Insertion of tag within animal carcass

- **Advantages:**

- Increased protection from damage
- More stable operating environment

- **Disadvantages:**

- Increased trauma to animal
- Increased initial cost
- More expensive maintenance



Ref: Implants in humans, horses, fishes, animals

- Animal ID Standards ISO 11784 and 11785 use RFID

# Secure Document RFID Application

- **E-Passport RFID Chip**

- Contains RFID chip / contactless smartcard
- Chips stores digitally signed Information like Photo, name, age, expiry and issue date

- **Advantages:**

- Difficult to forge

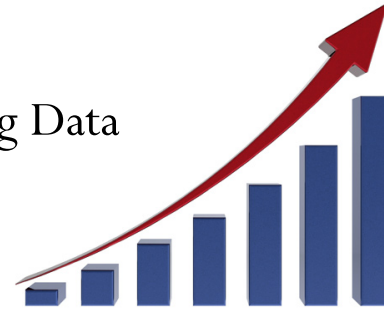
- **Disadvantages:**

- Unauthorized access to passport without owner's knowledge
- Eavesdropping on communication between reader and passport.



# RFID- Some Challenges

- Reduce Tag Prices (5 Cent Initiative)
- IT Infrastructure
- Data Volumes of New Scale
  - Online Handling of Huge Amounts of Streaming Data
  - Storage, Network Bandwidth & Systems
  - How to find useful information
- Integration
  - DB's, Data Warehouses and Enterprise Applications
  - Business Processes (systems, policies, physical facilities, etc.)
- Global Standards
  - Frequency of Tags & Readers
    - USA, Europe and Japan use Different Frequencies



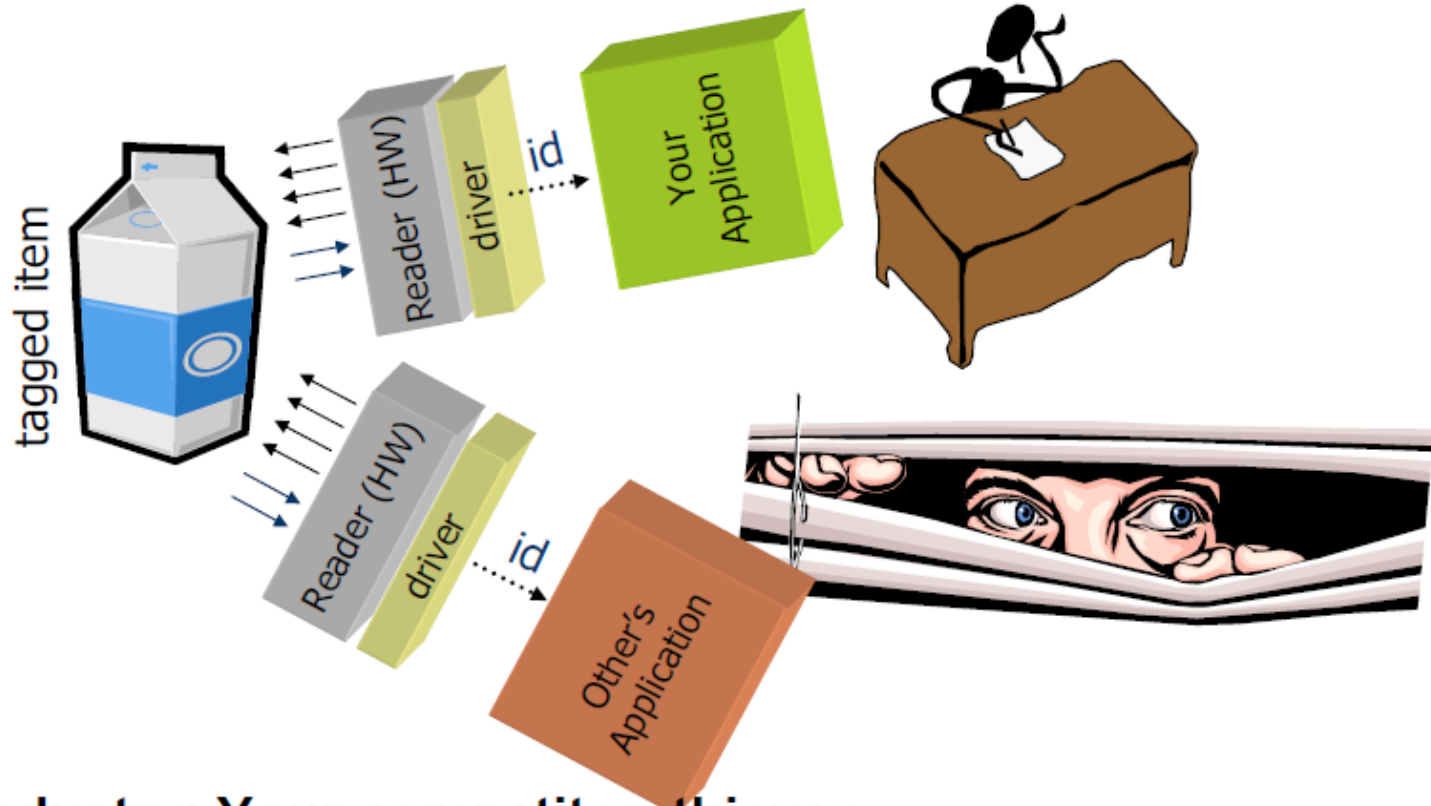
# RFID – Privacy Concerns

## From Consumer's Perspective:

- They are not well informed
- Unclear reason for its usage
- Companies usually have low credibility
  - They could have something to hide
- Laws do not really protect people against misuse
- Secure technology?
- Enough experiments?



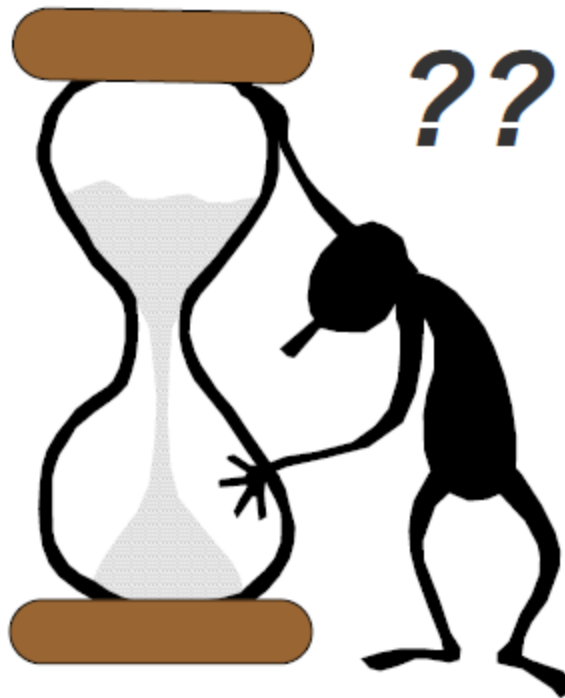
# RFID-Security Concerns



**Industry: Your competitor, thieves, ...**

**End Consumer: companies trying to profile you, thieves**

Thank You!



# Extra Slides



# RFID: Applications (Contd)

- Warranty Information on RFID tags
- Smart medical cabinets remind patients to take medications and call doctors if missed
- Retail loss prevention
- No need to unload grocery carts for checkout

# RFID Applications in Libraries

- **Advantages**

- Rapid and simplified patron charging
- High speed Inventory
- No strain on librarians
- Reduction of material cost and handling

- **Disadvantages**

- High Cost
- Privacy Concern

## LibBest Library RFID Management System



# Internet of Things

## Possible Implementations



IERC - European Research Cluster on the Internet of Things