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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Internet Of Things

Prepared by

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SNSCE

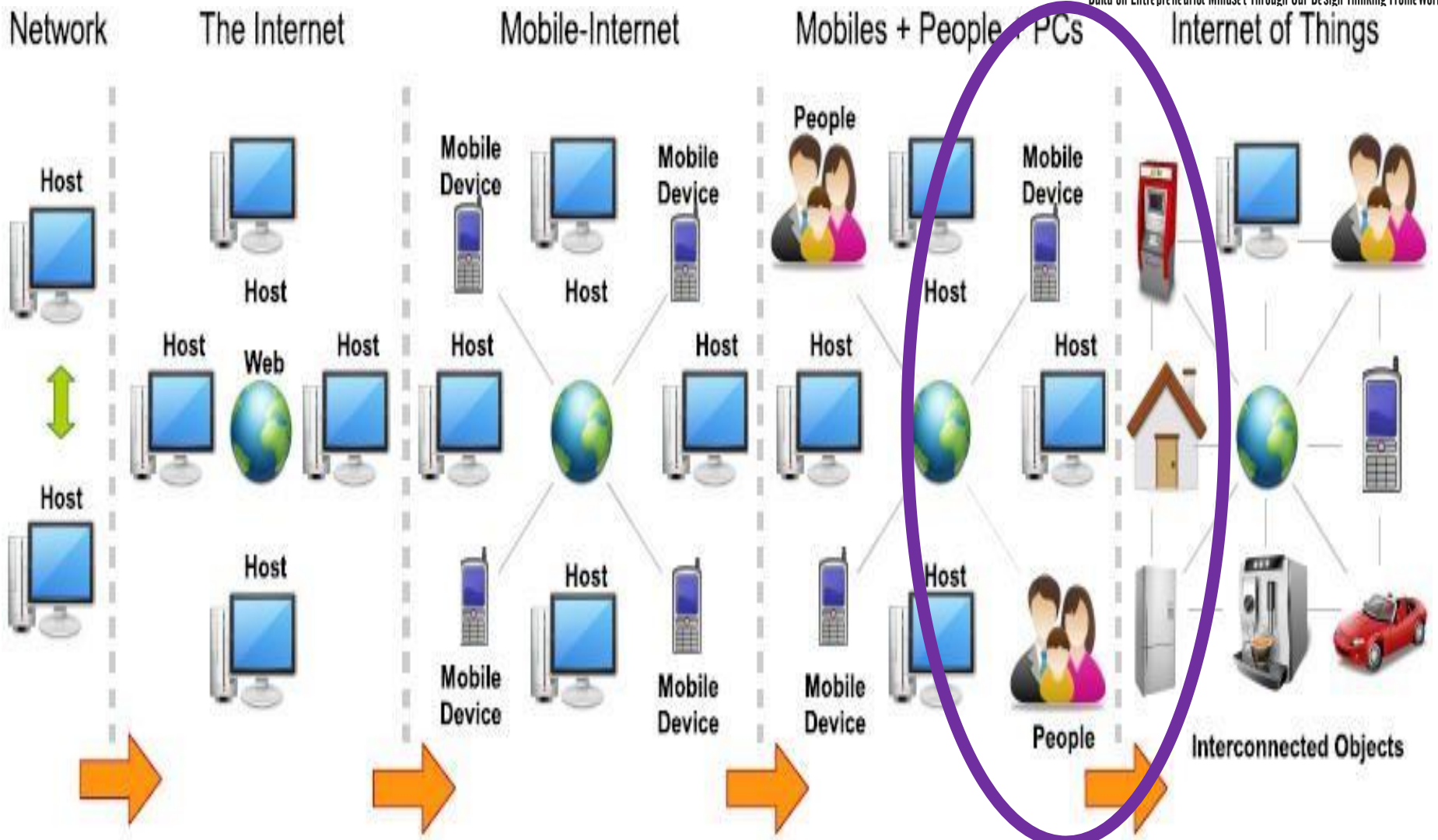
What is IOT

- The interconnection via the internet of computing devices embedded in everyday objects, enabling them to send and receive data.
- The Internet of Things is the network of physical objects or "**things**" embedded with electronics, software, sensors, and network connectivity, which enables these objects to collect and exchange data.
- It allows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration between the **physical world and computer-based systems,** and resulting in improved efficiency, accuracy and economic benefit.

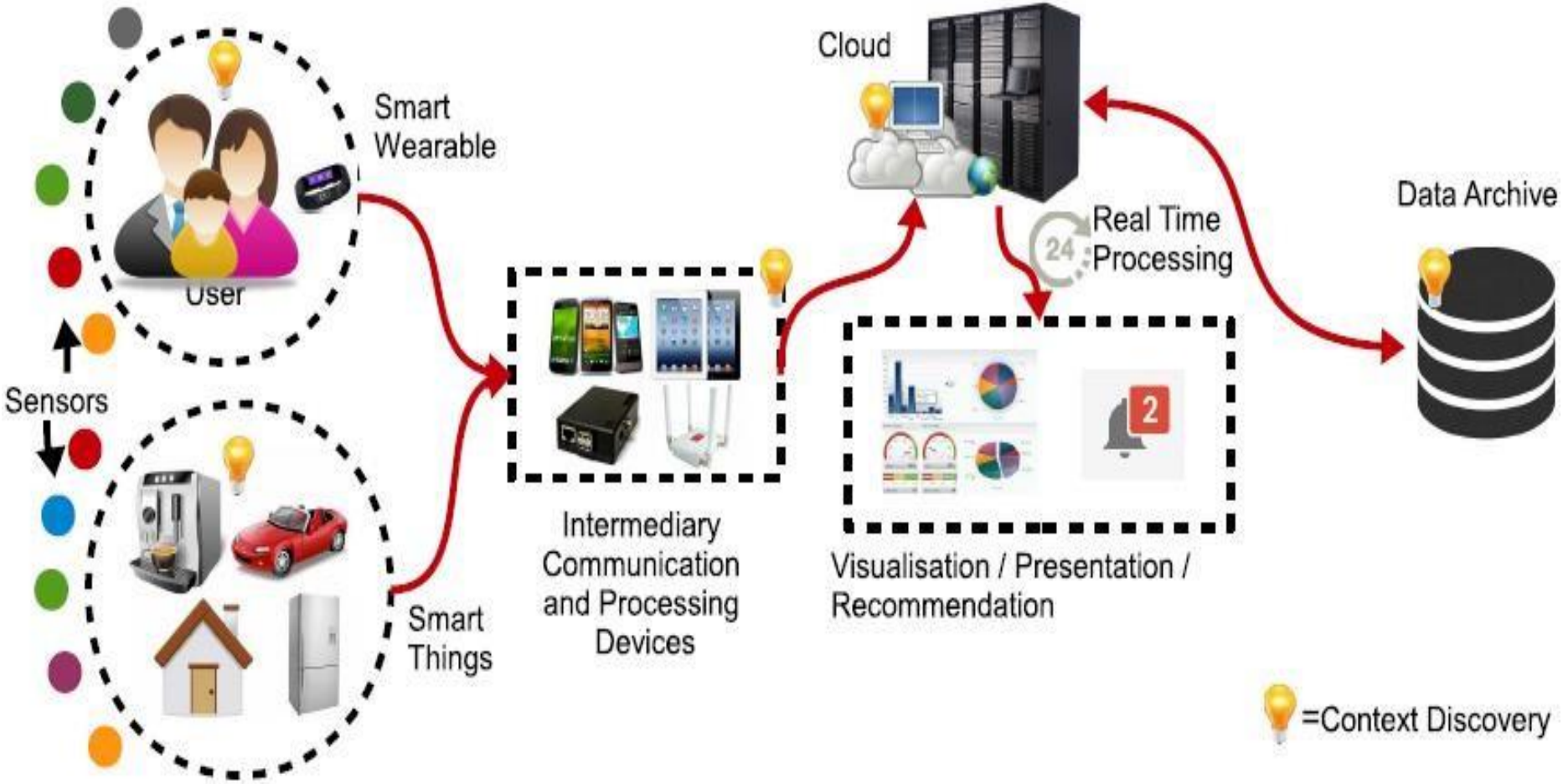
What is IOT

- "**Things**," in the IoT sense, can refer to a wide variety of devices
  - such as heart monitoring implants, biochip transponders on farm animals, electric clams in coastal waters, automobiles with built-in sensors, DNA analysis devices for environmental/food/pathogen monitoring or field operation devices that assist fire-fighters in search and rescue operations.
- These devices collect useful data with the help of various existing technologies and then autonomously flow the data between other devices.

Where are we now in 2025



IoT ecosystem



Ecosystem components

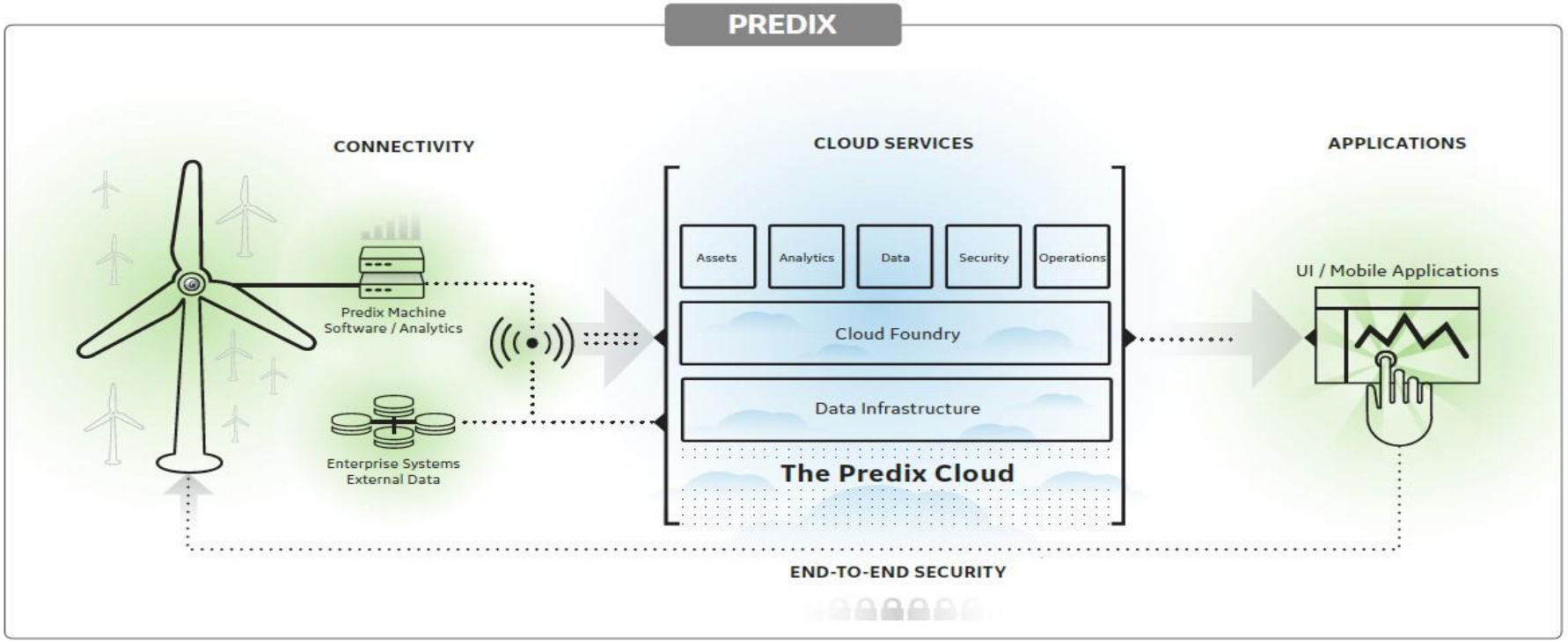
- Device manufacturers
  - Sensors/actuators, smart appliances
    - Network service providers
      - Operators, NMS providers
- ***Cloud service providers***
  - ***Data centres, dBase, dWarehouse***
- Platform providers
  - Middleware providers, SDKs
- 3rd party application developers
  - Analytics providers, tools, APIs

IoT

App

Example

General Electric (GE) deploys sensors in its jet engines, turbines, and wind farms. By analyzing data in real time, GE saves time and money associated with predictive maintenance.



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History of IoT

- The concept of the Internet of Things first became popular in 1999, through the Auto-ID Center at MIT and related market- analysis publications.

- Radio-frequency identification (RFID) was seen as a prerequisite for the IoT at that point. If all objects and people in daily life were equipped with identifiers, computers could manage and inventory them. Besides using RFID, the tagging of things may be achieved through such technologies as near field communication, barcodes, QR codes, blue-tooth, and digital watermarking.

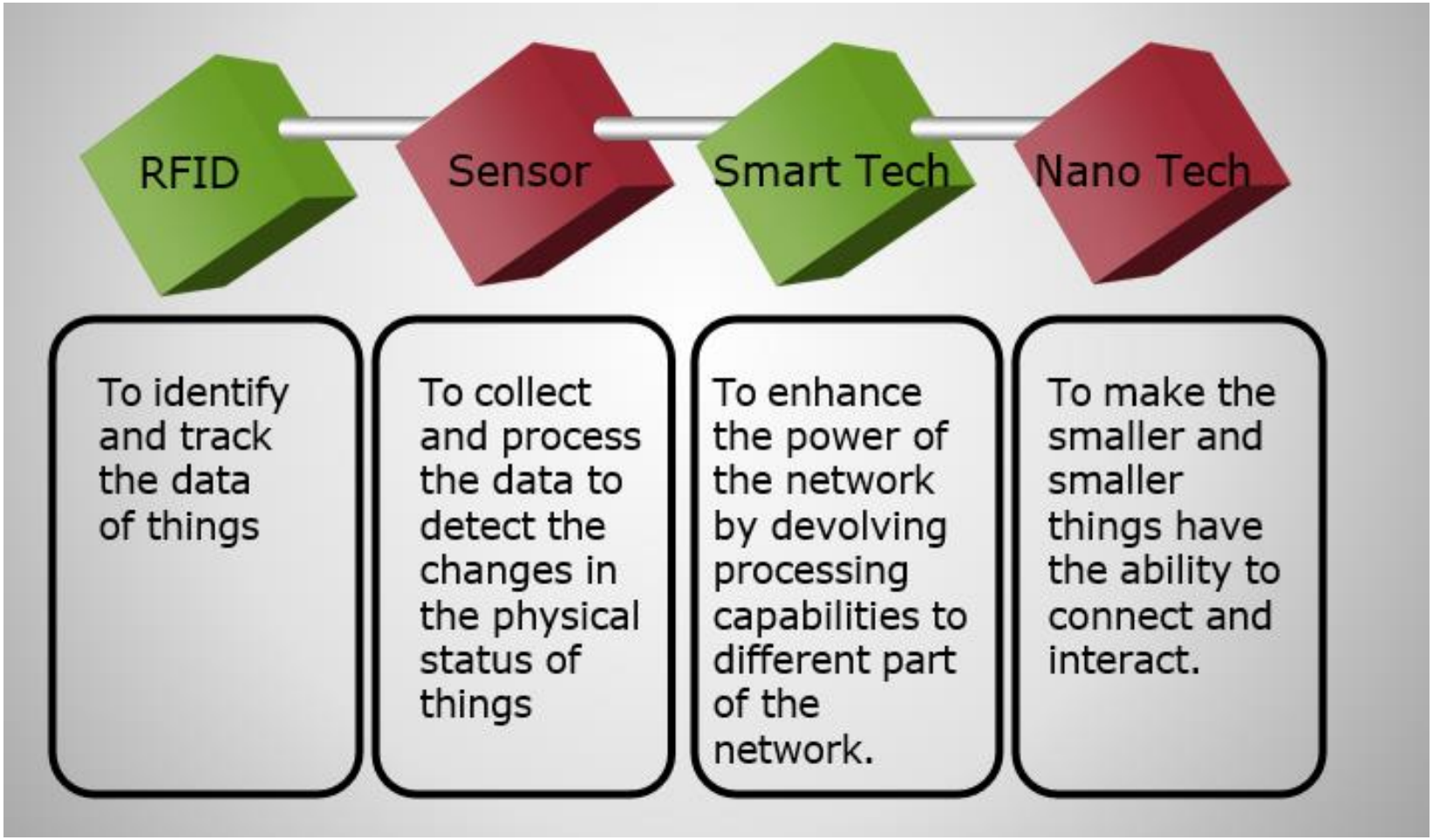
How IOT Works?

• Internet of Things is not the result of a single novel technology; instead, several complementary technical developments provide capabilities that taken together help to bridge the gap between the virtual and physical world.

• These capabilities include:

- **Communication and cooperation**
- **Addressability**
- **Identification**
- **Sensing**
- **Actuation**
- **Embedded information processing**
- **Localization**
- **User interfaces**

How IoT Works?

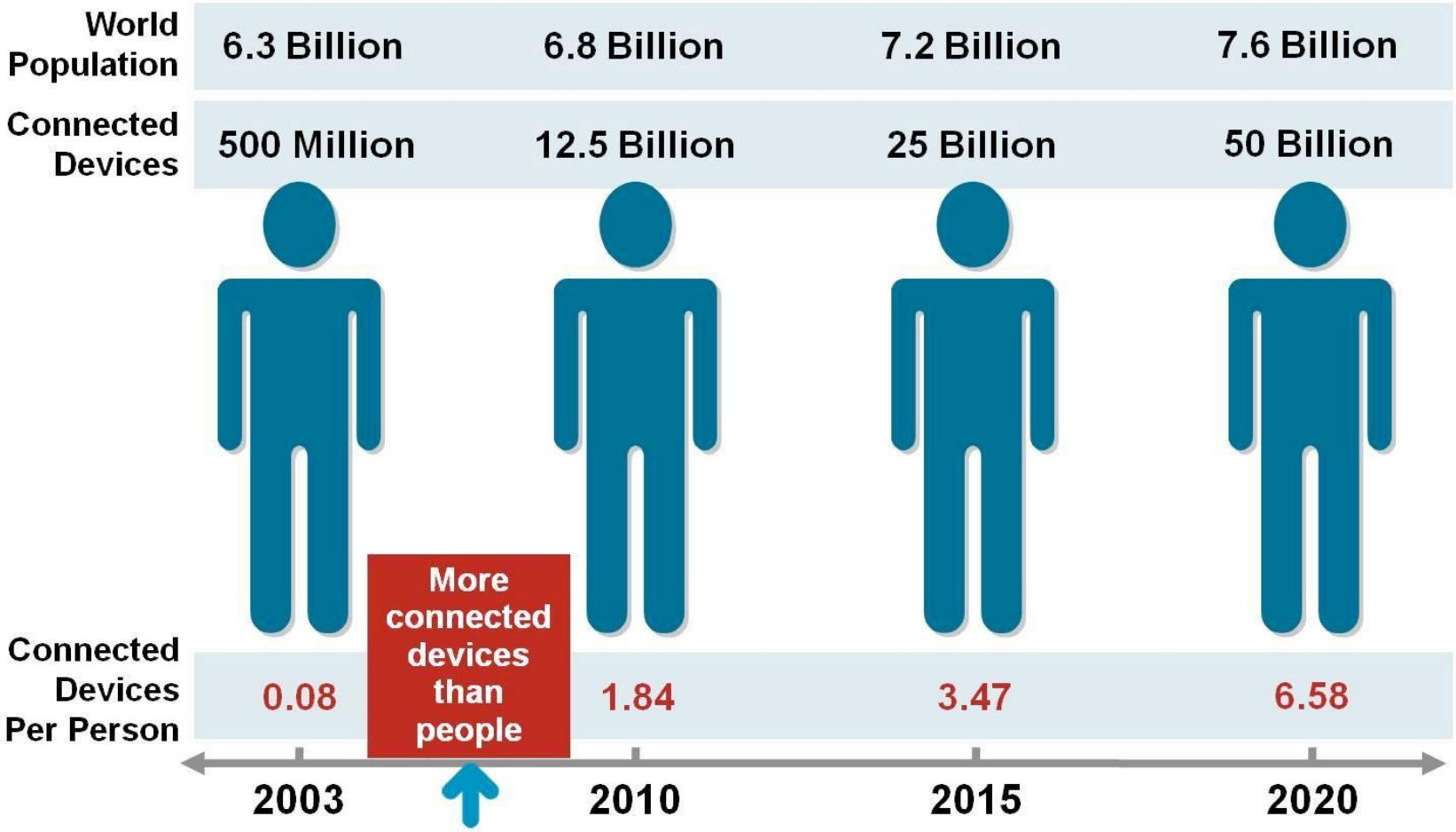


The Structure of IoT

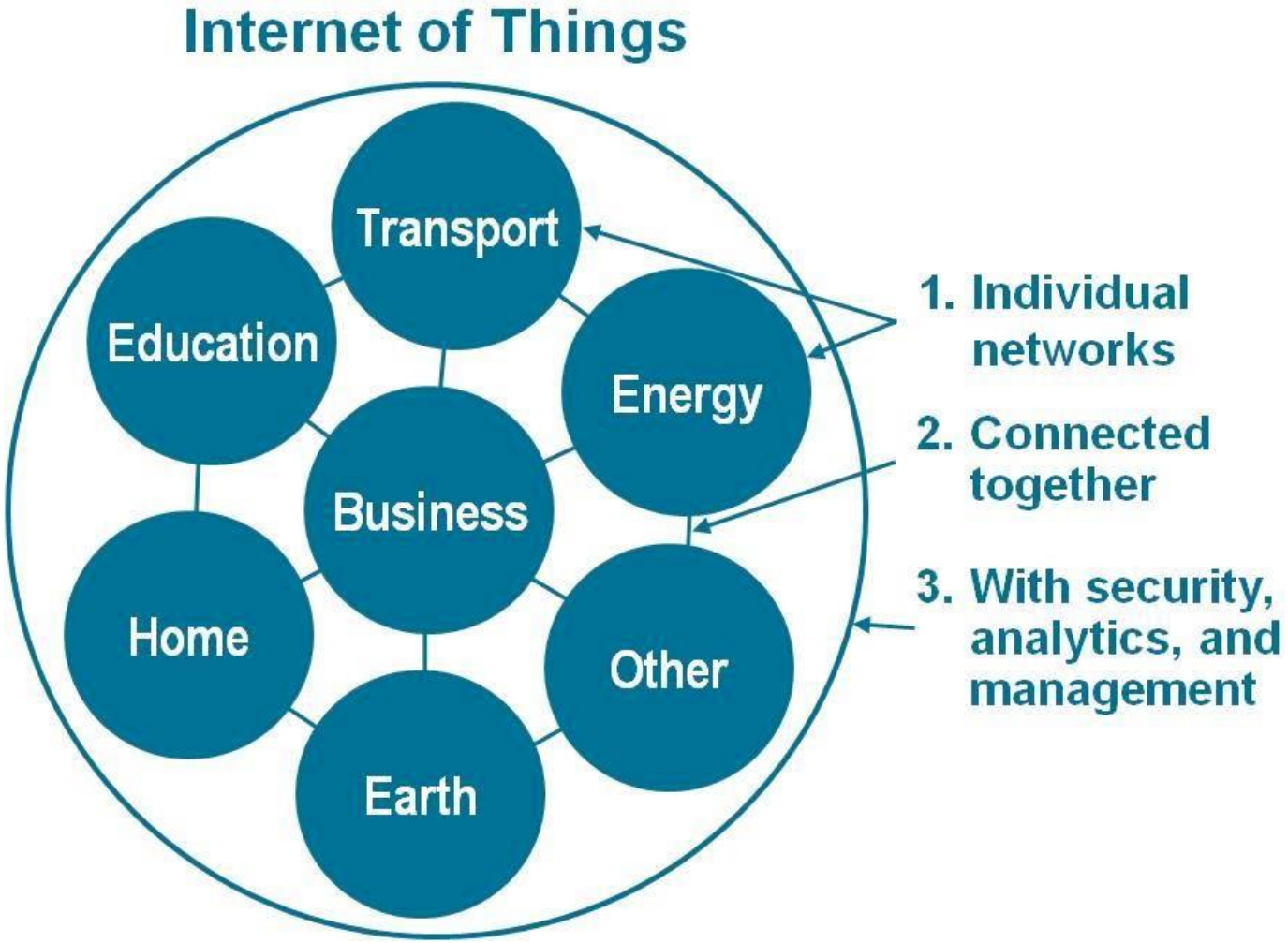
- The IoT can be viewed as a gigantic network consisting of networks of devices and computers connected through a series of intermediate technologies where numerous technologies like RFIDs, wireless connections may act as enablers of this connectivity.

- ***Tagging Things :*** Real-time item traceability and addressability by
  - ***RFIDs.***
- ***Feeling Things : Sensors*** act as primary devices to collect data from the environment.
- ***Shrinking Things :*** *M*iniaturization and ***Nanotechnology*** has provoked the ability of smaller things to interact and connect within the "things" or "smart devices."
- ***Thinking Things : Embedded intelligence*** in devices through sensors has formed the network connection to the Internet. It can make the "things" realizing the intelligent control.

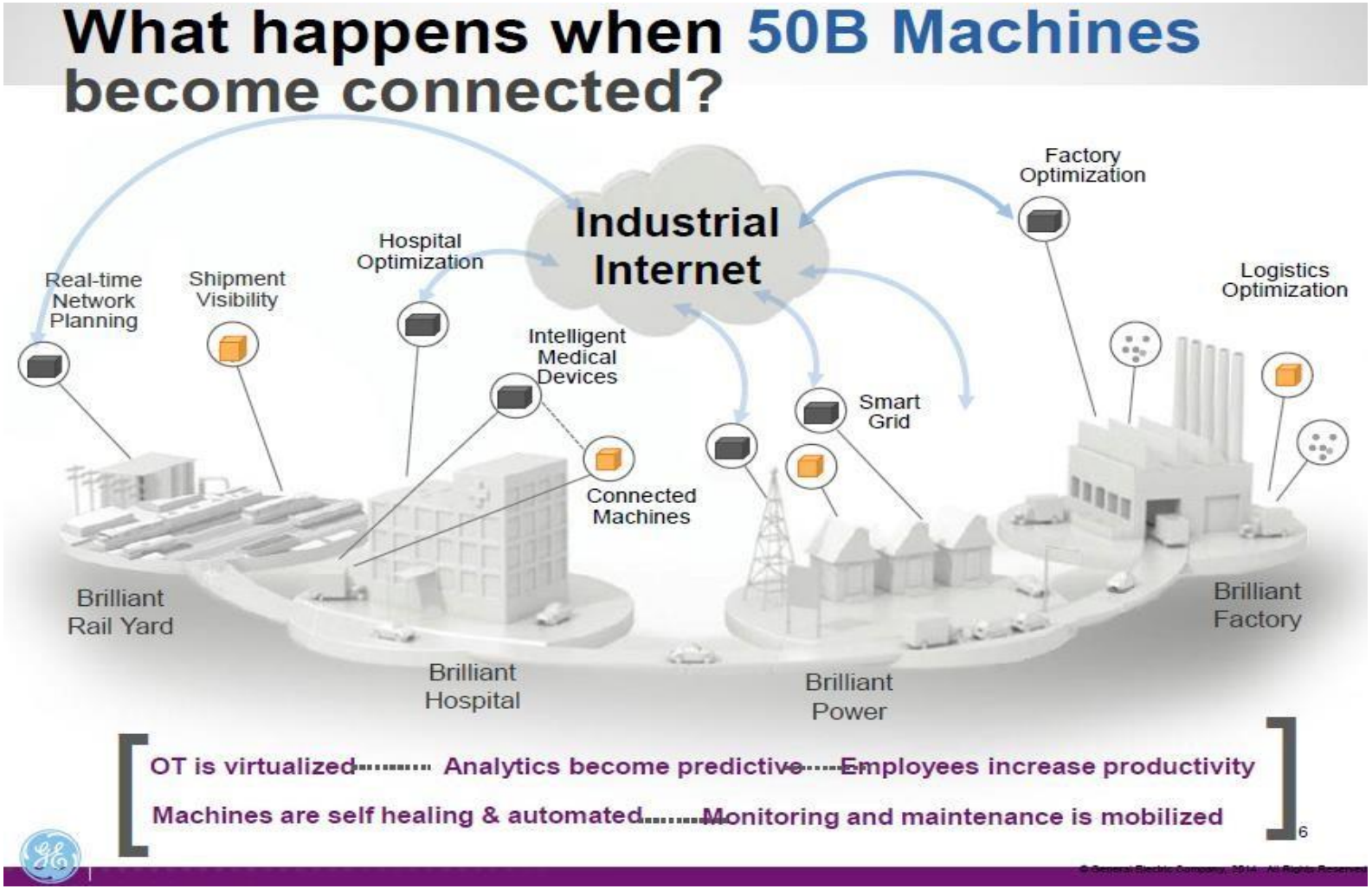
Current Status & Future Prospect of IoT



IoT as a Network of Networks



The Future of IoT



The Potential of IoT

Value of Industrial Internet is huge

Connected machines and data could eliminate up to $150 billion in waste across industries

Industry	Segment	Type of savings	Estimated value over 15 years (Billion nominal US dollars)
Aviation	Commercial	1% fuel savings	$30B
Power	Gas-fired generation	1% fuel savings	$66B
Healthcare	System-wide	1% reduction in system inefficiency	$63B
Rail	Freight	1% reduction in system inefficiency	$27B
Oil and Gas	Exploration and development	1% reduction in capital expenditures	$90B

Note: Illustrative examples based on potential one percent savings applied across specific global industry sectors. Source: GE estimates

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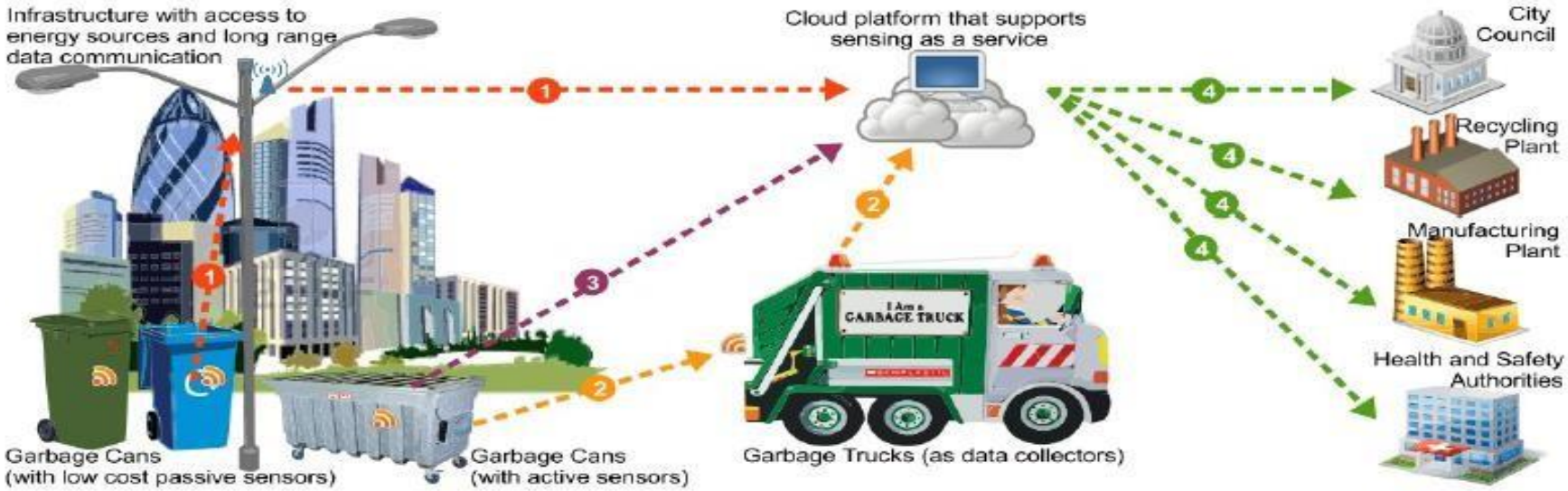
Few Applications of IoT

- ✓ Building and Home automation
- ✓ Manufacturing
- ✓ Medical and Healthcare systems
- ✓ Media
- ✓ Environmental monitoring
- ✓ Infrastructure management
- ✓ Energy management
- ✓ Transportation
- ✓ Better quality of life for elderly

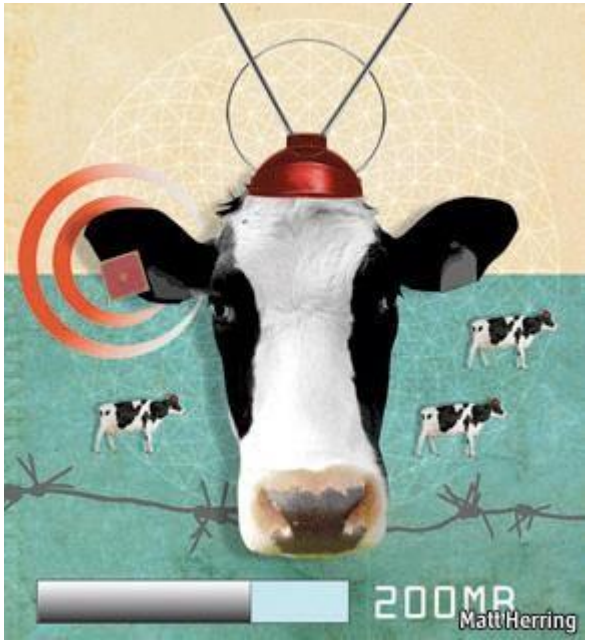
Few Applications of IoT

Efficient Waste Management in Smart Cities Supported by the Sensing-as-a-Service



[Source: "Sensing as a Service Model for Smart Cities Supported by Internet of Things", Charith Perera et. al., Transactions on Emerging Telecommunications Technology, 2014]

Sensors in even the holy cow



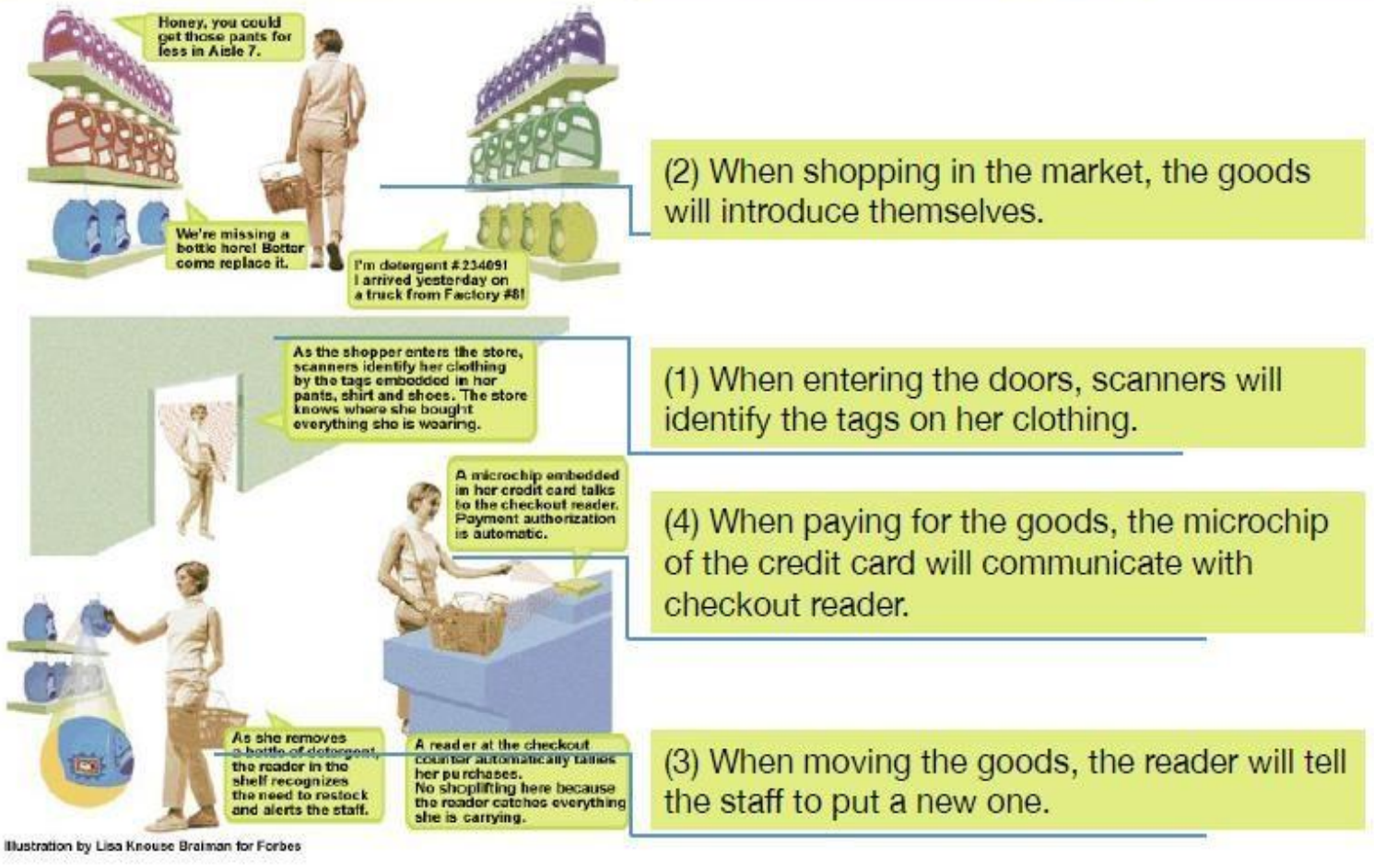
In the world of IoT, even the cows will be connected and monitored. Sensors are implanted in the ears of cattle.

This allows farmers to monitor cows' health and track their movements, ensuring a healthier, more plentiful supply of milk and meat for people to consume.

On average, each cow generates about 200 MB of information per year.

Few Applications of IoT

IOT Application Scenario - Shopping



Few Applications of IoT

Few Applications of IoT

Few Applications of IoT

Thought Controlled Computing

The flagship product, MindWave, is a headset that can log into your computer using just your thoughts. Researchers recently used the EEG headset to develop a toy car that can be driven forward with thought.

NeuroSky's smart sensors can also track your heart rate and other bodily metrics and can be embedded in the next generation of wearable devices.

"We make it possible for millions of consumers to capture and quantify critical health and wellness data," Yang (CEO of Softbank) said. Softbank is the funder.

[Source: http://venturebeat.com/2013/11/04/next-step-for-wearables-neurosky-brings-its-smart-sensors-to-health-fitness/]

TECHNOLOGICAL CHALLENGES OF IOT

- At present IoT is faced with many challenges
  - Scalability
  - Technological Standardization
  - Interoperability
  - Discovery
  - Software complexity
  - Data volumes and interpretation
  - Power Supply
  - Interaction and short range communication
  - Wireless communication
  - Fault tolerance

Criticisms and Controversies of IoT

•Scholars and social observers and pessimists have doubts about the promises of the ubiquitous computing revolution, in the areas as:

- Privacy
- Security
- Autonomy and Control
- Social control
- Political manipulation
- Design
- Environmental impact
- Influences human moral decision making

Thank You