Internet of Things (IoT)

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Plan of Presentation

➢ What is Internet of Things?

➢ History

➢ How IoT Works?

➢ Few Applications of IoT

➢ Current Status & Future Prospect of IoT

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What is IoT?

The Internet of Things (IoT) 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.

A "**Thing**" in the context of the Internet of things (IoT), is an entity or physical object that has a Unique identifier, an embedded system and the ability to transfer data over a network.

- Heart monitoring implants
- Biochip transponders on farm animals
- Automobiles with built-in sensors
- DNA analysis devices & Other Wearbles etc.

These devices collect useful data with the help of various existing technologies and then autonomously flow the data between other devices.

History of IoT

KEVIN ASHTON – "FATHER OF THE IOT"

"So you get stuff like the smart wine bottle, the smart bikini, and the smart water bottle. This stuff is not the Internet of Things – this stuff is all rubbish."

He believed **IoT could "turn the world into data" that could be used to make macro decisions on resource utilization.**

"**Information is a great way to reduce waste and increase efficiency, and that's really what the Internet of Things provides**"

[Source: The Reimagination Thought Leaders Summit ,Sydney, 17 November 2015]

How IoT Works?

The Internet of Things (IoT), also sometimes referred to as the Internet of Everything (IoE), consists of all the **web-enabled devices** that collect, send and act on data they acquire from their surrounding environments using embedded sensors, processors and communication hardware. These devices, often called "connected" or "smart" devices, can sometimes talk to other related devices, a process called **machine-to-machine** (M2M) communication, and act on the information they get from one another. Humans can interact with the gadgets to set them up, give them instructions or access the data, but the devices do most of the work on their own without human intervention. Their existence has been made possible by all the tiny mobile components that are available these days, as well as the always-online nature of our home and business networks.

THE INTERNET OF THINGS LIFECYCLE

COLLECT → COMMUNICATE → ANALYZE → ACT

COLLECTION

Devices and Sensors are collecting data everywhere.

- At your home
- In your car
- At the office
- In the manufacturing plant

COMMUNICATION

Sending data and events through networks to some destination

- A cloud platform
- Private data center
- Home network

ANALYSIS

Creating information from the data

- Visualizing the data
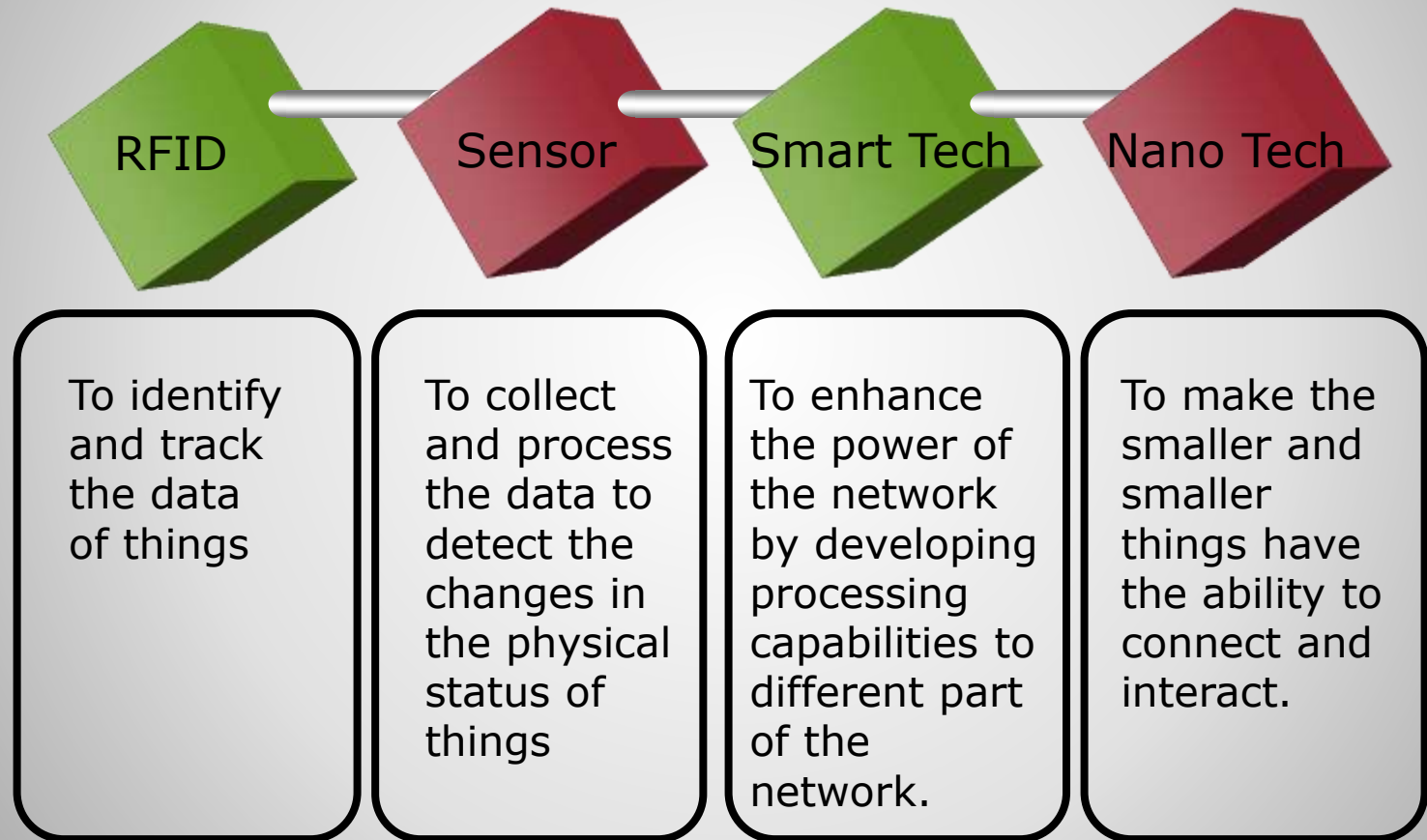- Building reports
- Filtering data (paring it down)

ACTION

Taking action based on the information and data

- Communicate with another machine (m2m)
- Send a notification (sms, email, text)
- Talk to another system

How IoT Works?

RFID   Sensor   Smart Tech   Nano Tech

| To identify and track the data of things | To collect and process the data to detect the changes in the physical status of things | To enhance the power of the network by developing processing capabilities to different part of the network. | To make the smaller and smaller things have the ability to connect and interact. |

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 *RFID*s.

➢ *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.

Applications of IoT

"The Ultimate Goal of IOT is to Automate Human Life."

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
- ✓ … … …

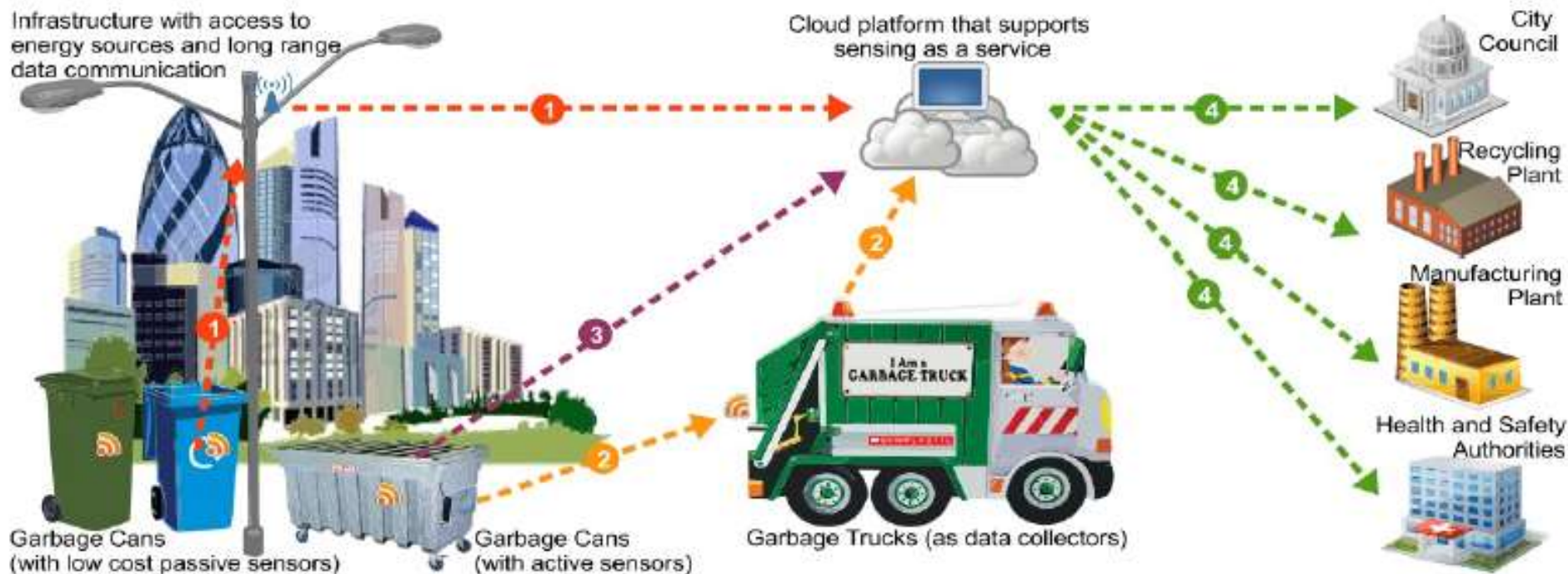*You name it, and you will have it in IoT!*

Create **USD 41Billion** by providing visibility into the availability of parking spaces across the city.

Smart Parking

Residents can identify and reserve the closest available space, traffic wardens can identify non-compliant usage, and municipalities can introduce demand-based pricing.

[Source: http://www.telecomreseller.com/2014/01/11/cisco-study-says-ioe-can-create-savings/]

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

Infrastructure with access to energy sources and long range data communication

Cloud platform that supports sensing as a service

City Council

Recycling Plant

Manufacturing Plant

Health and Safety Authorities

Garbage Cans (with low cost passive sensors)

Garbage Cans (with active sensors)

Garbage Trucks (as data collectors)

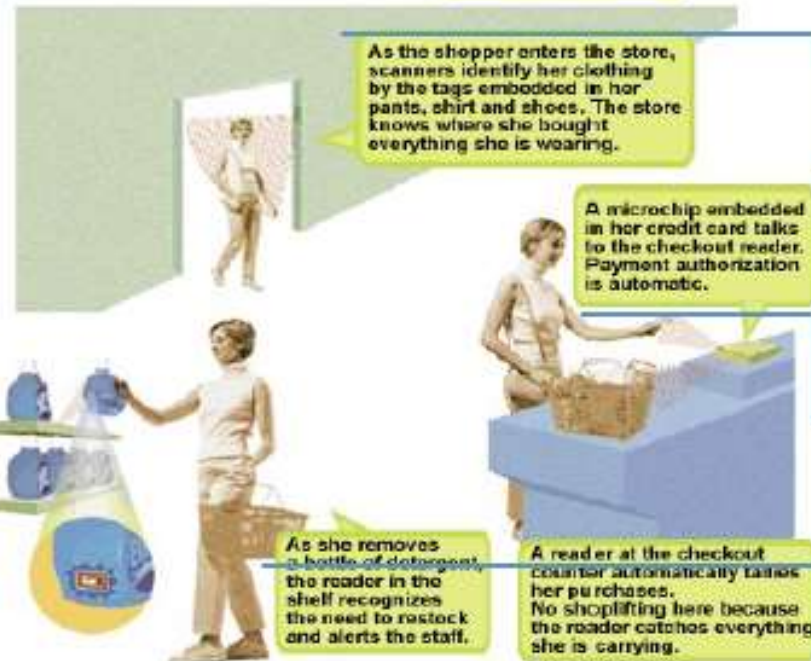# Sensors in even the holy cow!

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

IOT Application Scenario - Shopping

Honey, you could get those pants for less in Aisle 7.

We're missing a bottle here! Better come replace it.

I'm detergent #234091 I arrived yesterday on a truck from Factory #8!

As the shopper enters the store, scanners identify her clothing by the tags embedded in her pants, shirt and shoes. The store knows where she bought everything she is wearing.

A microchip embedded in her credit card talks to the checkout reader. Payment authorization is automatic.

As she removes a bottle of detergent, the reader in the shelf recognizes the need to restock and alerts the staff.

A reader at the checkout counter automatically tallies her purchases. No shoplifting here because the reader catches everything she is carrying.

(2) When shopping in the market, the goods will introduce themselves.

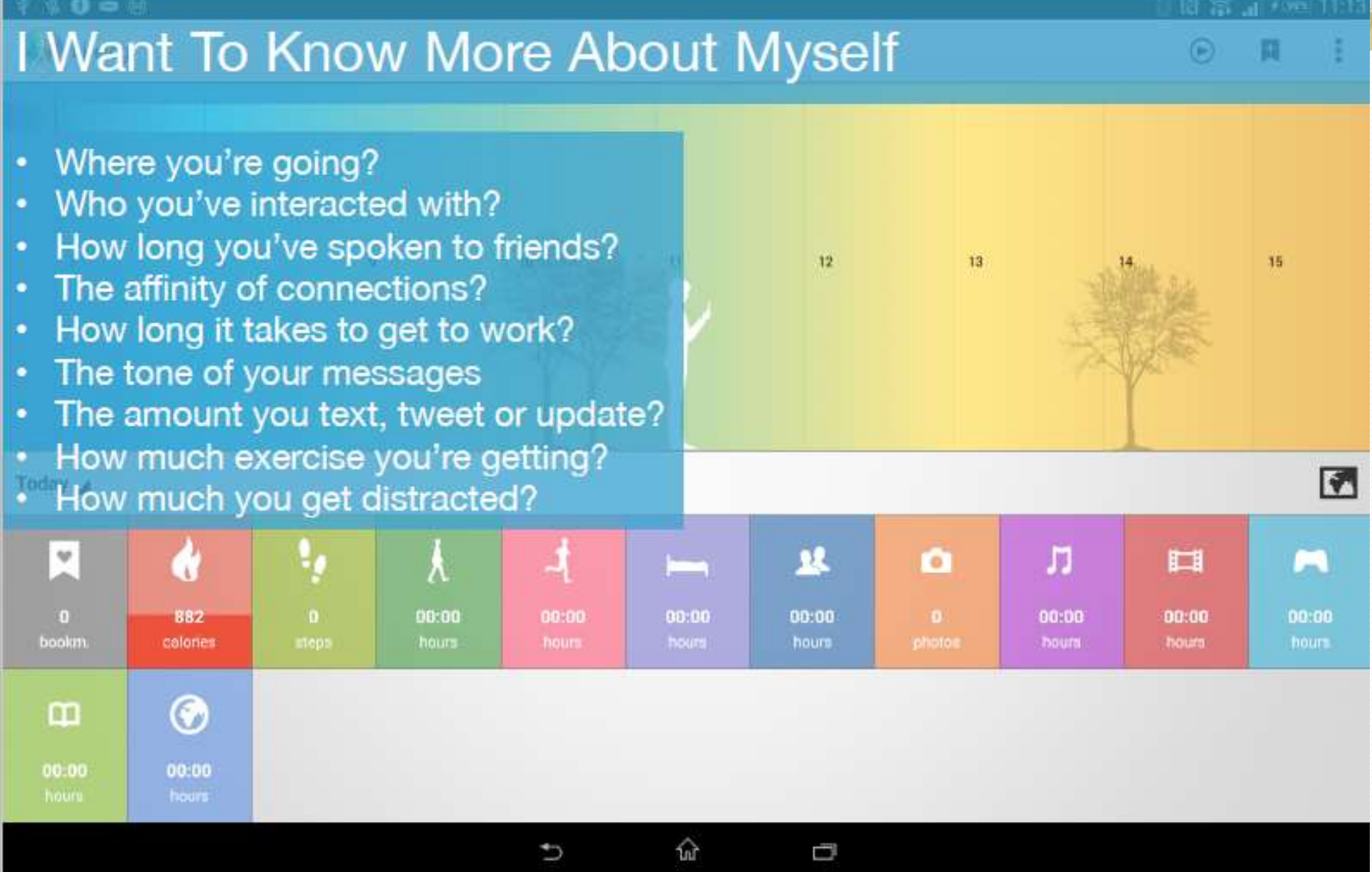(1) When entering the doors, scanners will identify the tags on her clothing.

(4) When paying for the goods, the microchip of the credit card will communicate with checkout reader.

(3) When moving the goods, the reader will tell the staff to put a new one.

Illustration by Lisa Knouse Braiman for Forbes

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I Want To Know More About Myself

- Where you're going?
- Who you've interacted with?
- How long you've spoken to friends?
- The affinity of connections?
- How long it takes to get to work?
- The tone of your messages
- The amount you text, tweet or update?
- How much exercise you're getting?
- How much you get distracted?

Can Internet of Things (IOT) Help Us To Know More About Ourselves?

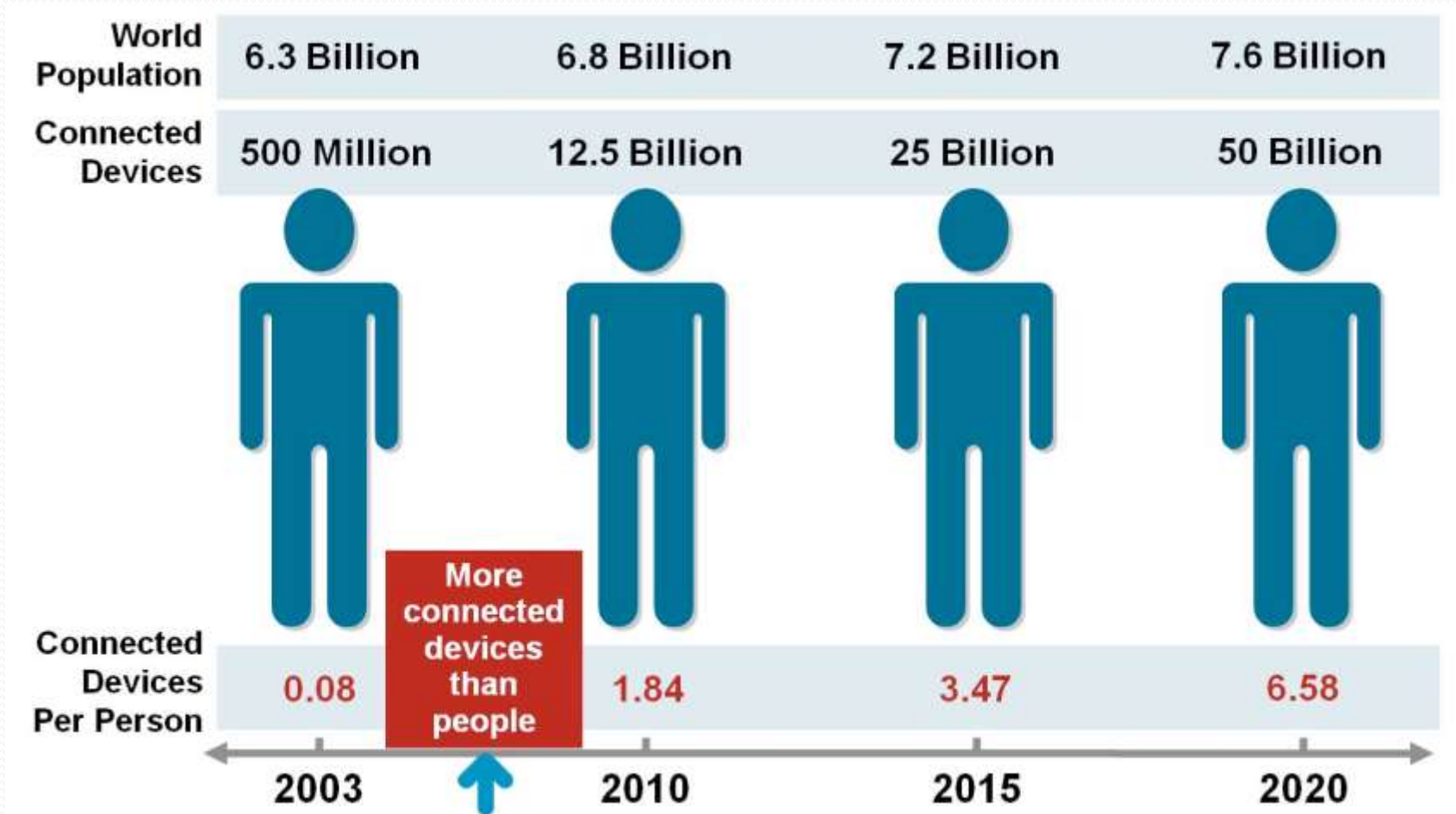*IoT helps you in LIFE LOGGING*

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.

Current Status & Future Prospect of IoT

World Population	6.3 Billion	6.8 Billion	7.2 Billion	7.6 Billion
Connected Devices	500 Million	12.5 Billion	25 Billion	50 Billion

More connected devices than people

Connected Devices Per Person	0.08	1.84	3.47	6.58
	2003	2010	2015	2020

"Change is the only thing permanent in this world"

TECHNOLOGICAL CHALLENGES OF IoT

At present IoT is faced with many challenges, such as:

- Scalability
- Technological Standardization
- Inter operability
- Discovery
- Software complexity
- Data volumes and interpretation
- Power Supply
- Interaction and short range communication
- Wireless communication
- Fault tolerance

"Big Data is not magic. It doesn't matter how much data you have if you can't make sense of it."

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

SUMMARY

Internet of Things
Only Tip of an Iceberg

THANK YOU