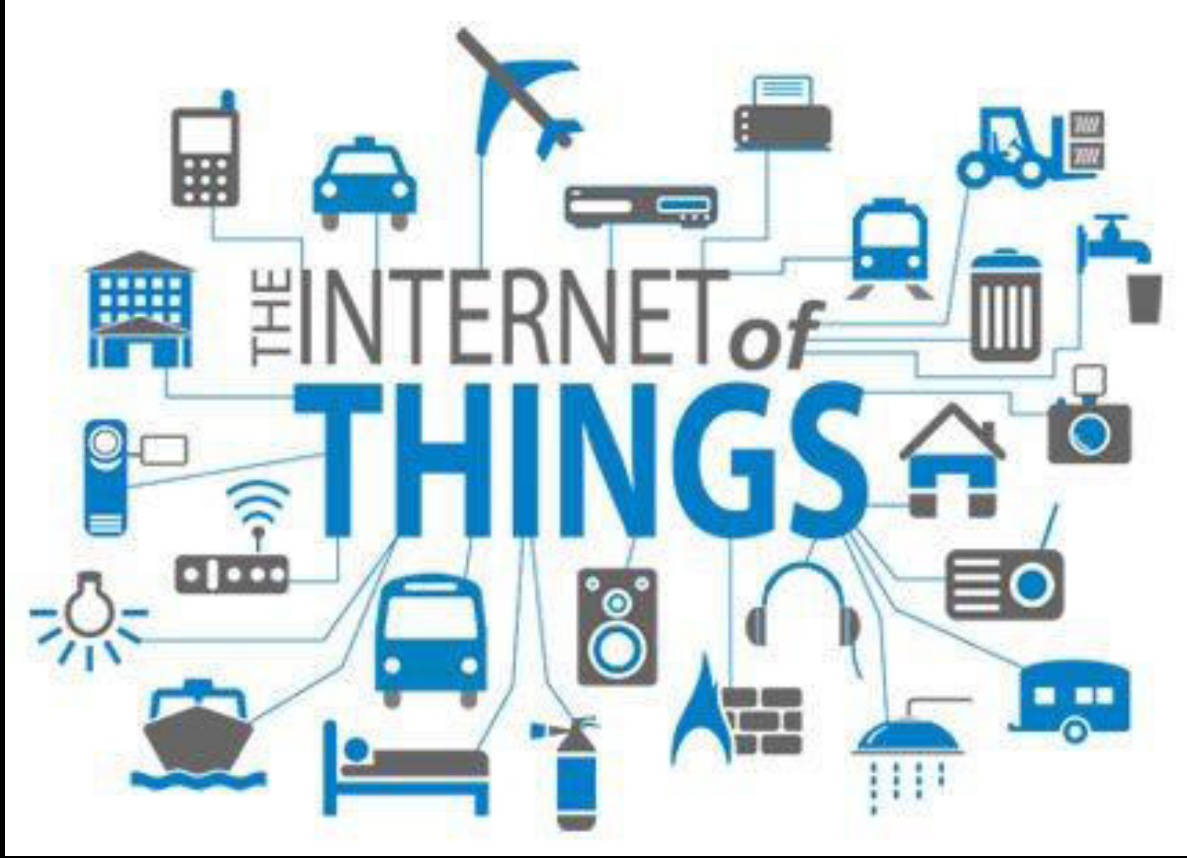


Internet of Things (IoT)

Plan of Presentation

- What is Internet of Things?
- History
- How IoT Works?
- Few Applications of IoT
- Current Status & Future Prospect of IoT
- Technological Challenges of IoT
- Criticisms & Controversies of IoT

What is IoT?

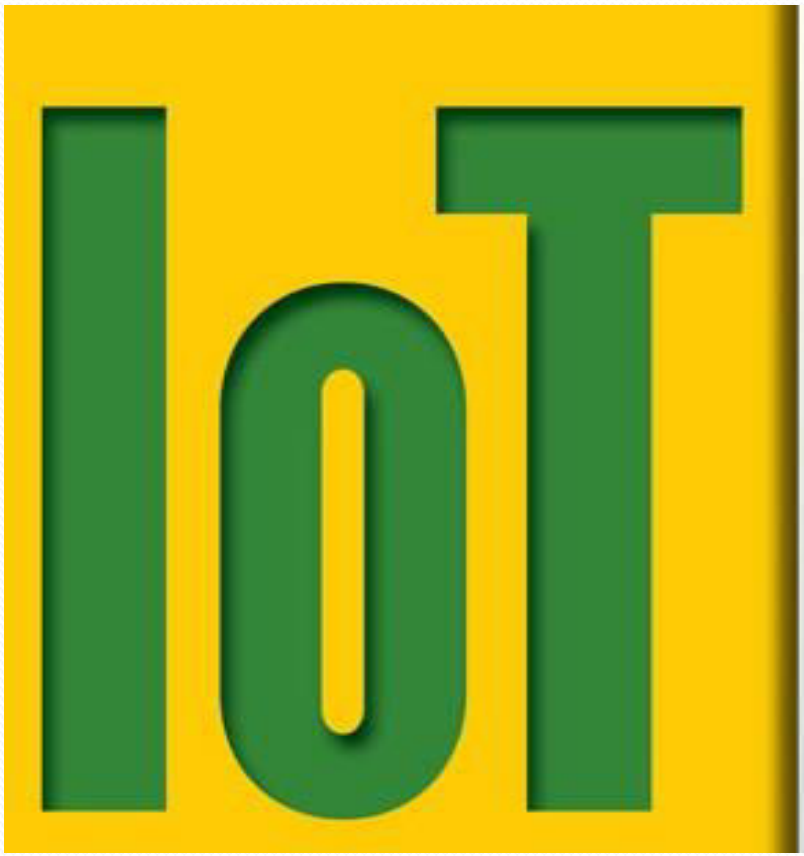
The Internet of Things (IoT) is the network of physical objects or "things" embedded with electronics, software, sensors, and network connectivity, which enables these objects to collect and exchange data.

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



1999

The IoT Gets a Name

Kevin Ashton coins the term "Internet of things" and establishes MIT's Auto-ID Center, a global research network of academic laboratories focused on RFID and the 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

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

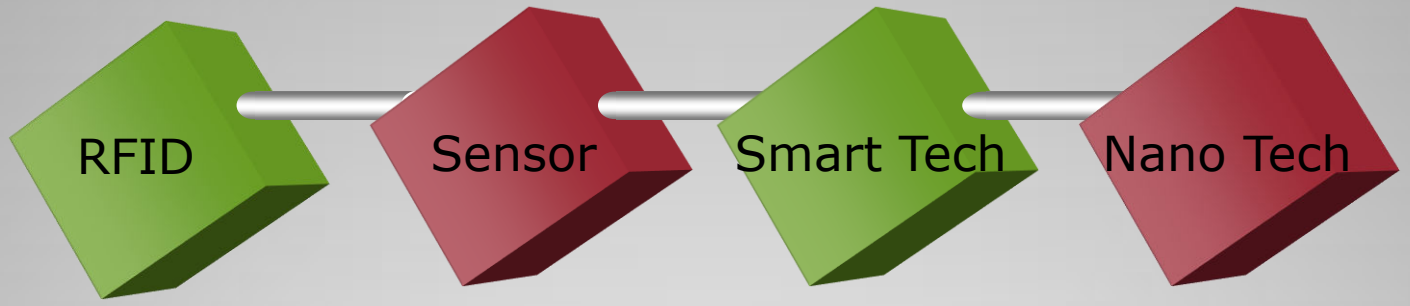
- Visualizing the data
- Building reports
- Filtering data (paring it down)

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?



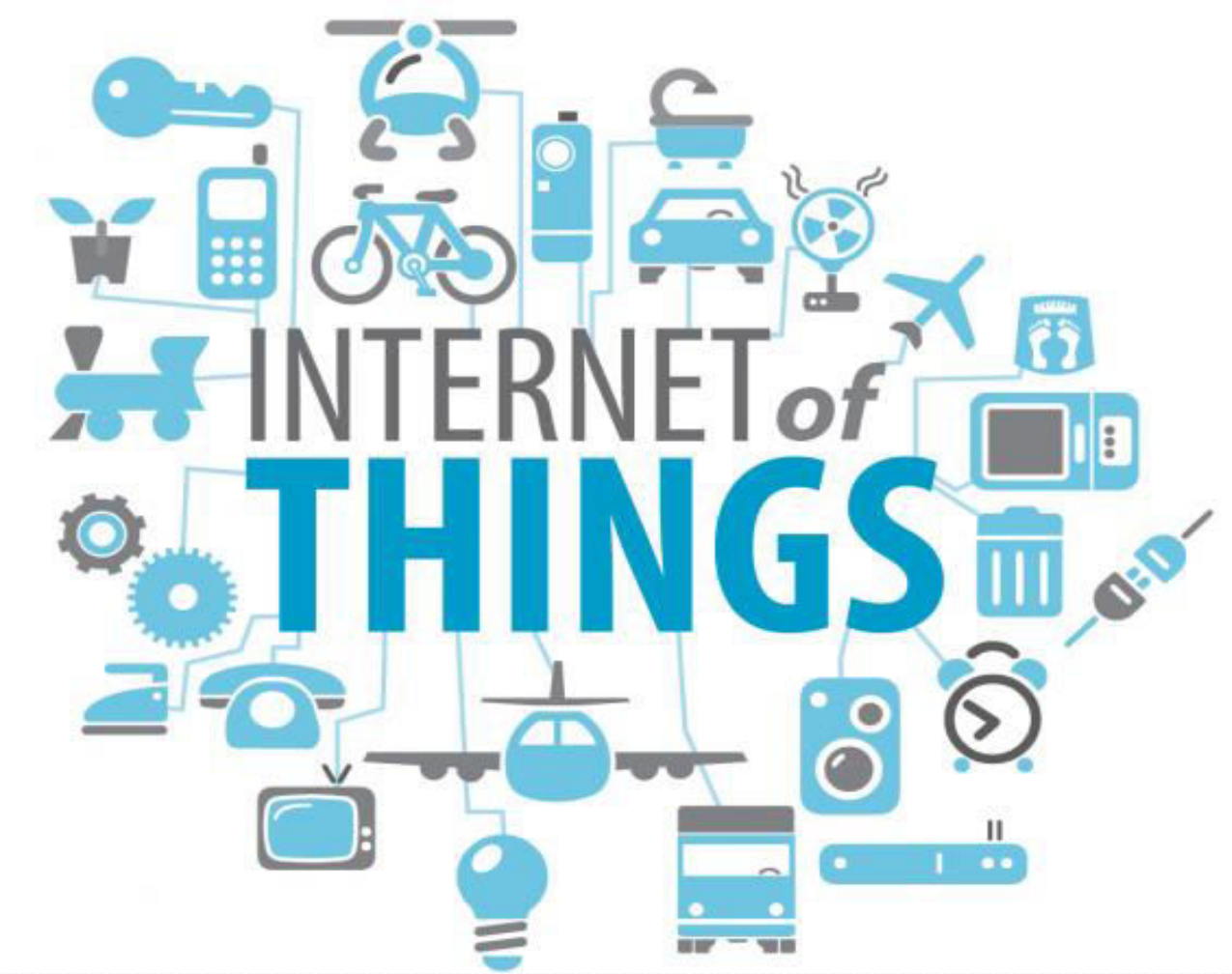
To identify and track the data of things	To collect and process the data to detect the changes in the physical status of things	To enhance the power of the network by developing processing capabilities to different part of the network.	To make the smaller and smaller things have the ability to connect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

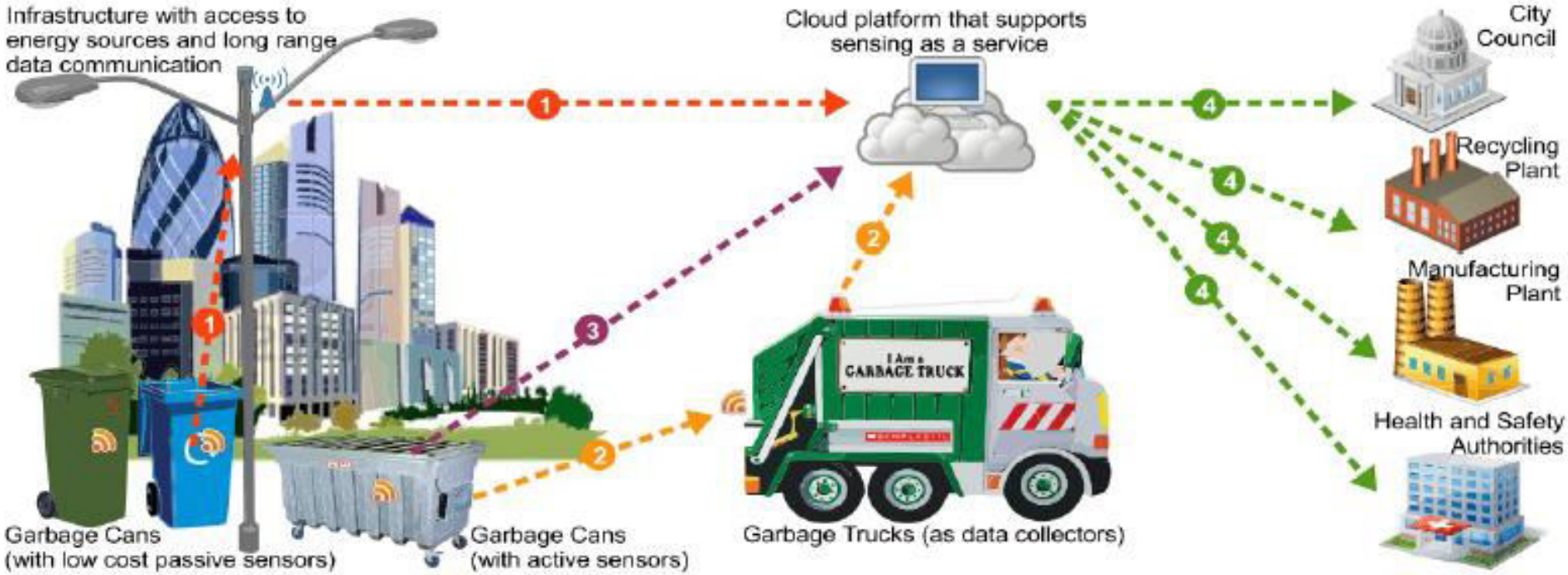
Smart Parking

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

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



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

IOT Application Scenario - Shopping

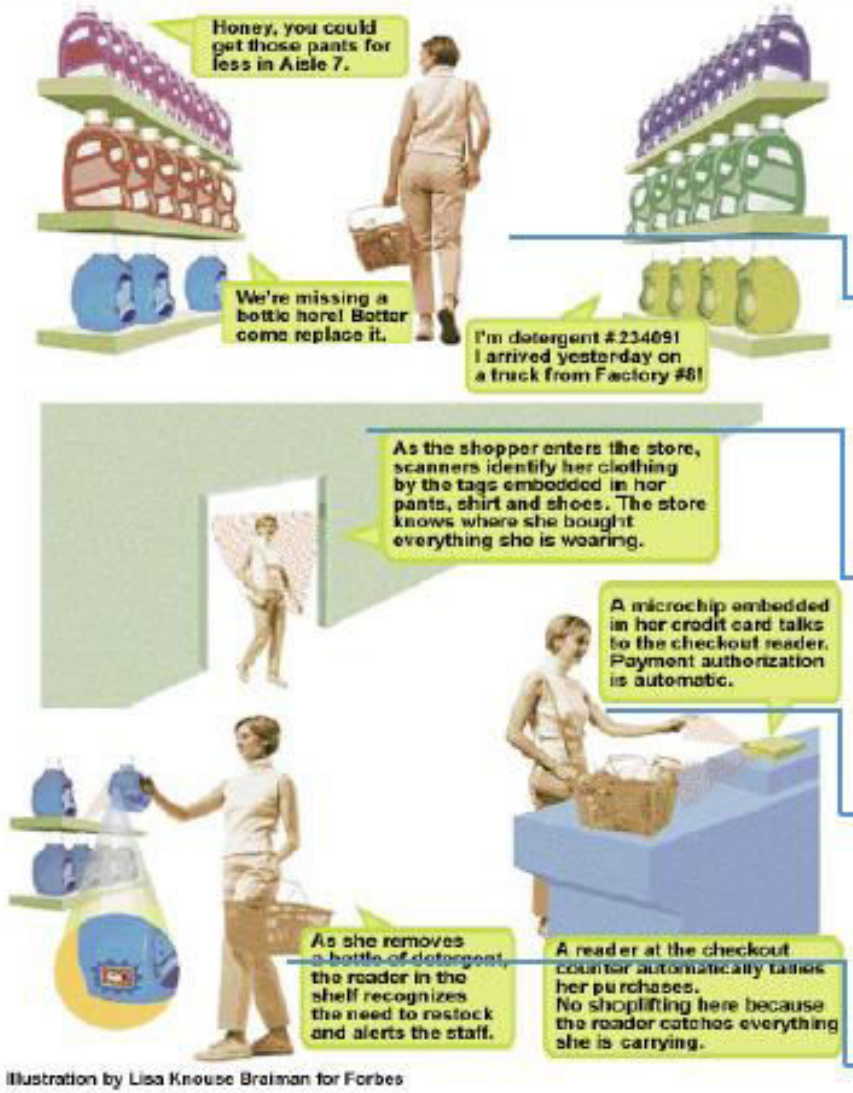


Illustration by Lisa Krouse Brannan for Forbes

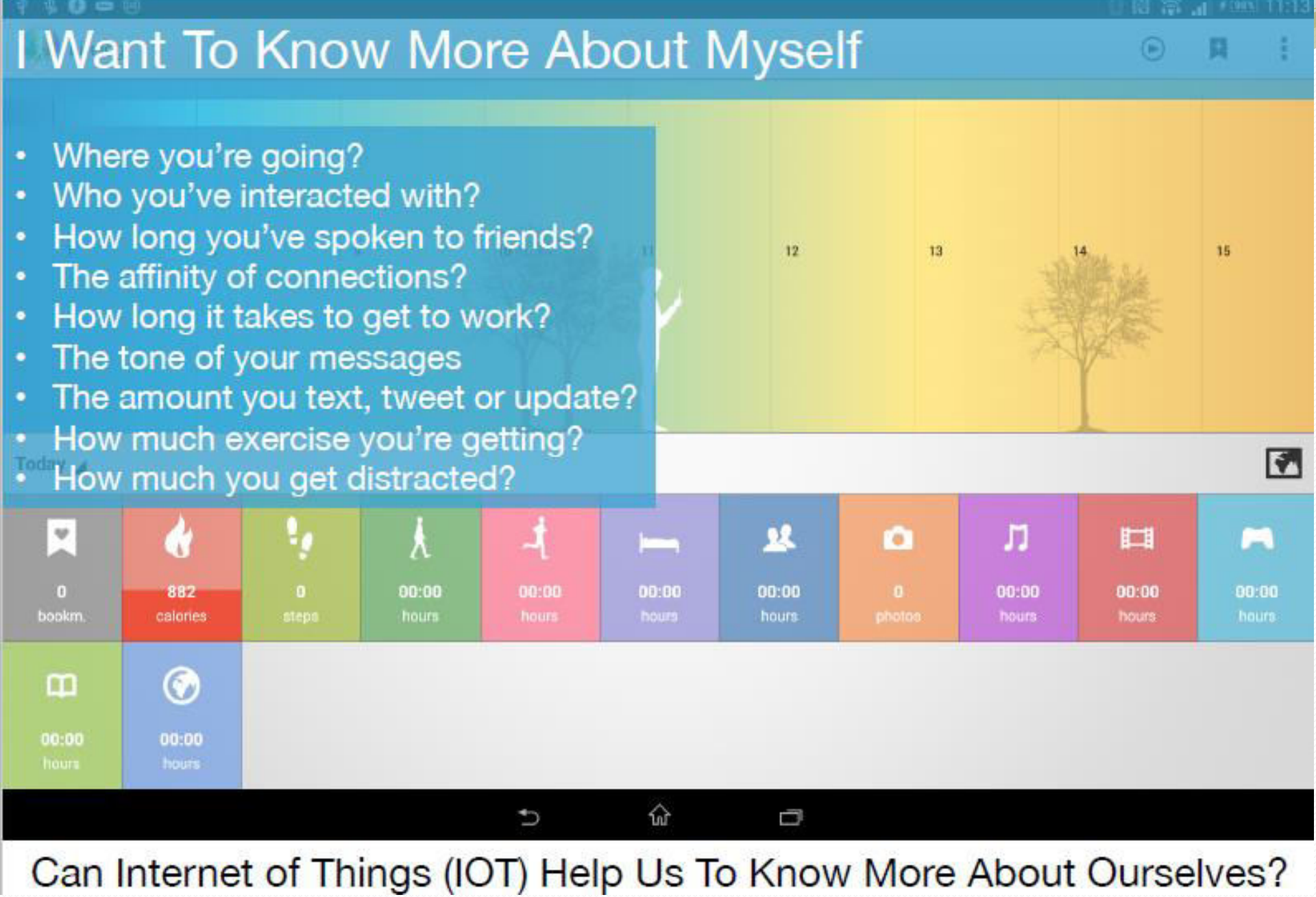
(2) When shopping in the market, the goods will introduce themselves.

(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.

HOW MANY STEPS
HAVE YOU
WALKED TODAY?



IoT helps you in LIFE LOGGING

Thought Controlled Computing

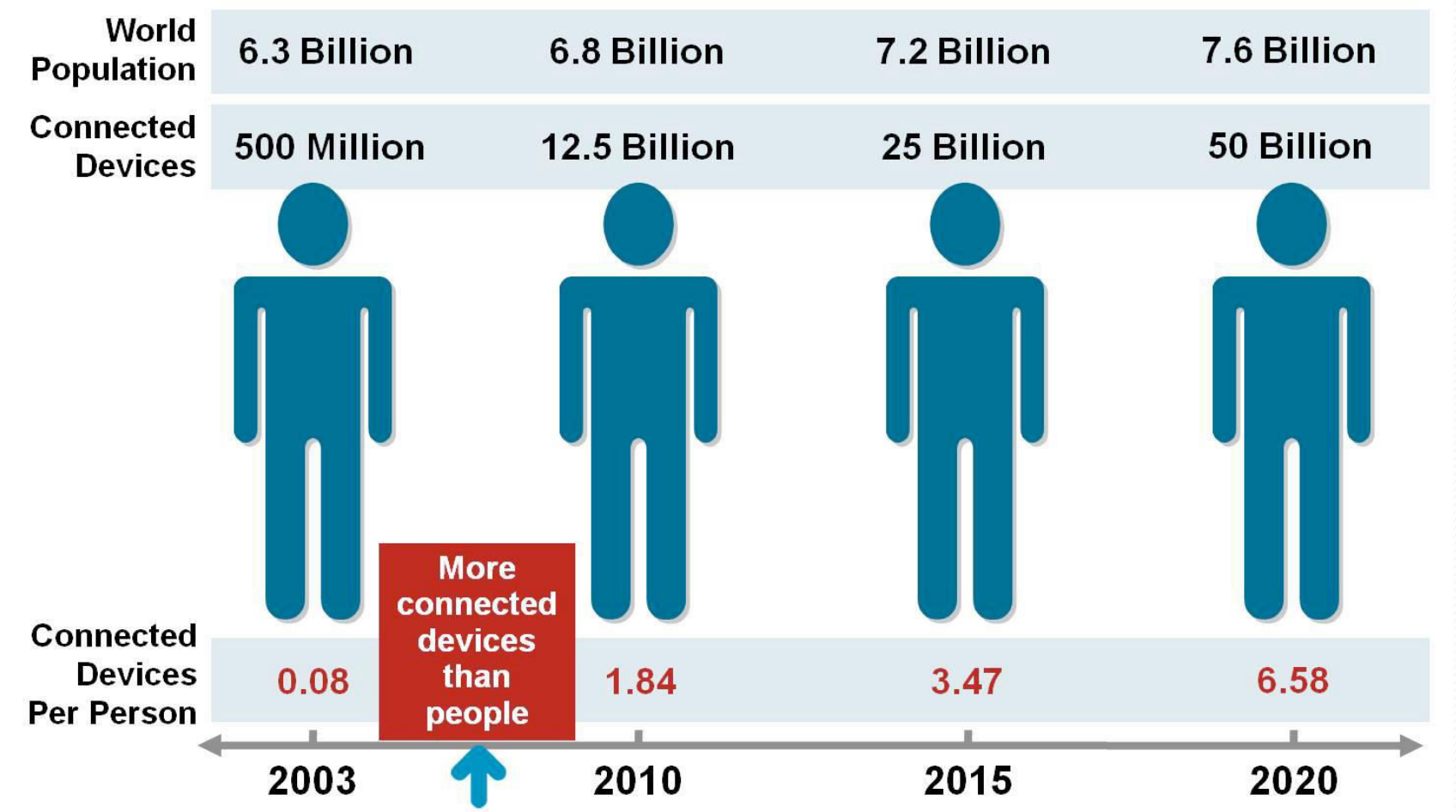
The flagship product, MindWave, is a headset that can log into your computer using just your thoughts. Researchers recently used the EEG headset to develop a toy car that can be driven forward with thought.

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.

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

Current Status & Future Prospect of IoT



"Change is the only thing permanent in this world"

TECHNOLOGICAL CHALLENGES OF IoT

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

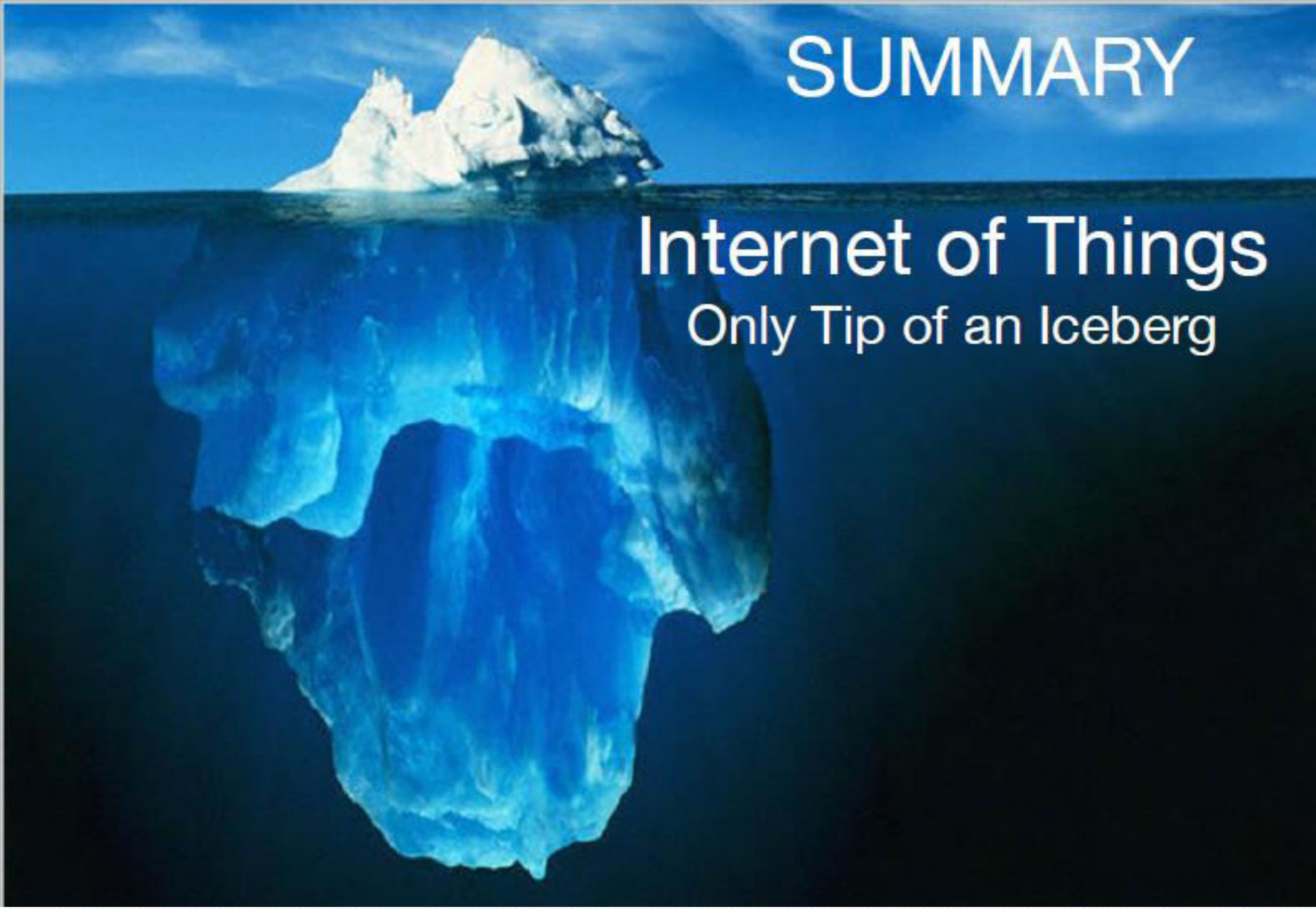
- Scalability
- Technological Standardization
- Inter operability
- Discovery
- Software complexity
- Data volumes and interpretation
- Power Supply
- Interaction and short range communication
- Wireless communication
- Fault tolerance

"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