Internet of Things

Internet of Things

Pushkar Harshe

Contents

the Internet of things

watch the ITU forum on IoT

dangers
- hacking
- labour
- effect
- dependency

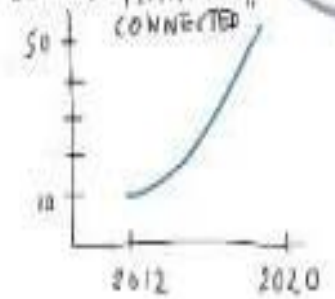
what-is-it?
- communication
  - things-to-things
  - things-to-persons
  - machine-to-machine
- infrastructure
  - internet
  - intranet
- paradigm shift

benefits
- >>> efficient energy usage
- improvement health
- >> sustainable cities
- drop transactions cost

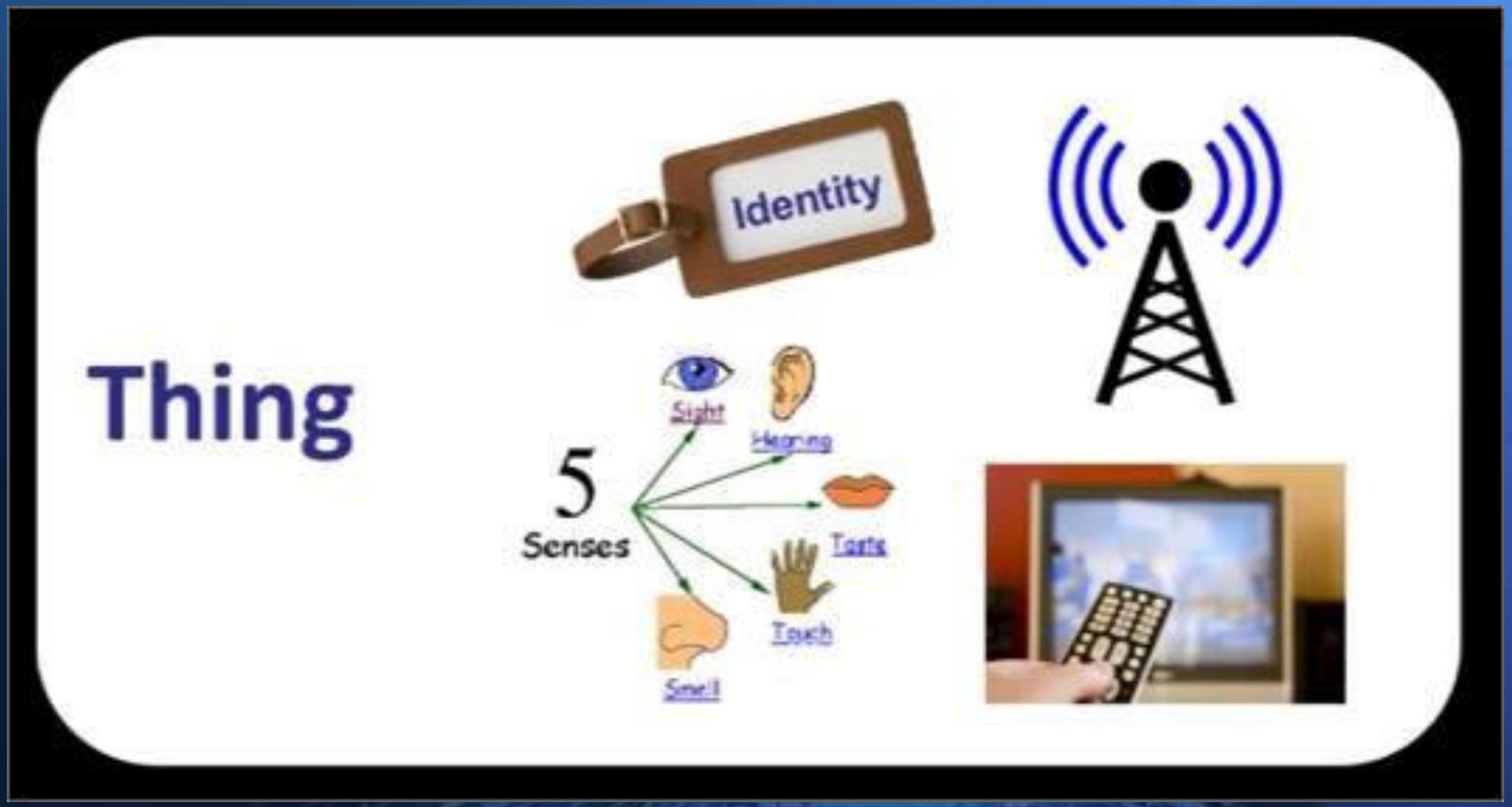
applications
- tracking
  - ships
  - cargo
  - production
- monitoring
  - health
  - pacemaker
  - refrigerator
    - food
    - shelf life
    - supplies
- control
  - remote
    - thermostat
    - use
    - energy
    - @ home
- prevention
  - theft

issue
- legal
- need?
- standards
- security
- privacy

numbers
- 2020
  - things
  - connected
  - 50,000,000,000

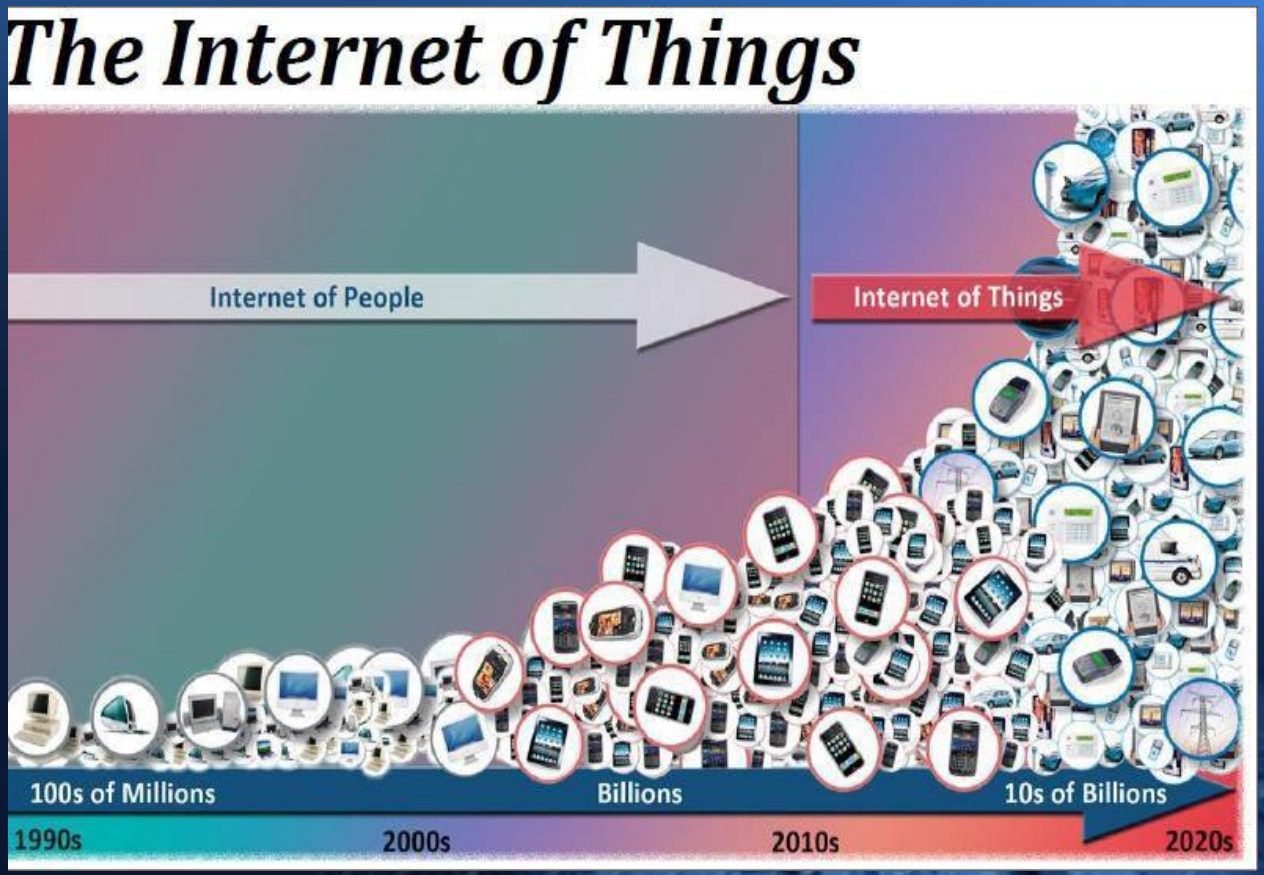


Thing Thing



Ask google : where is my keys.?
Where are my kids?

History


The Internet of Things
Internet of People
Internet of Things
100s of Millions
Billions
10s of Billions
1990s
2000s
2010s
2020s

What's the Internet of Things

- **History**

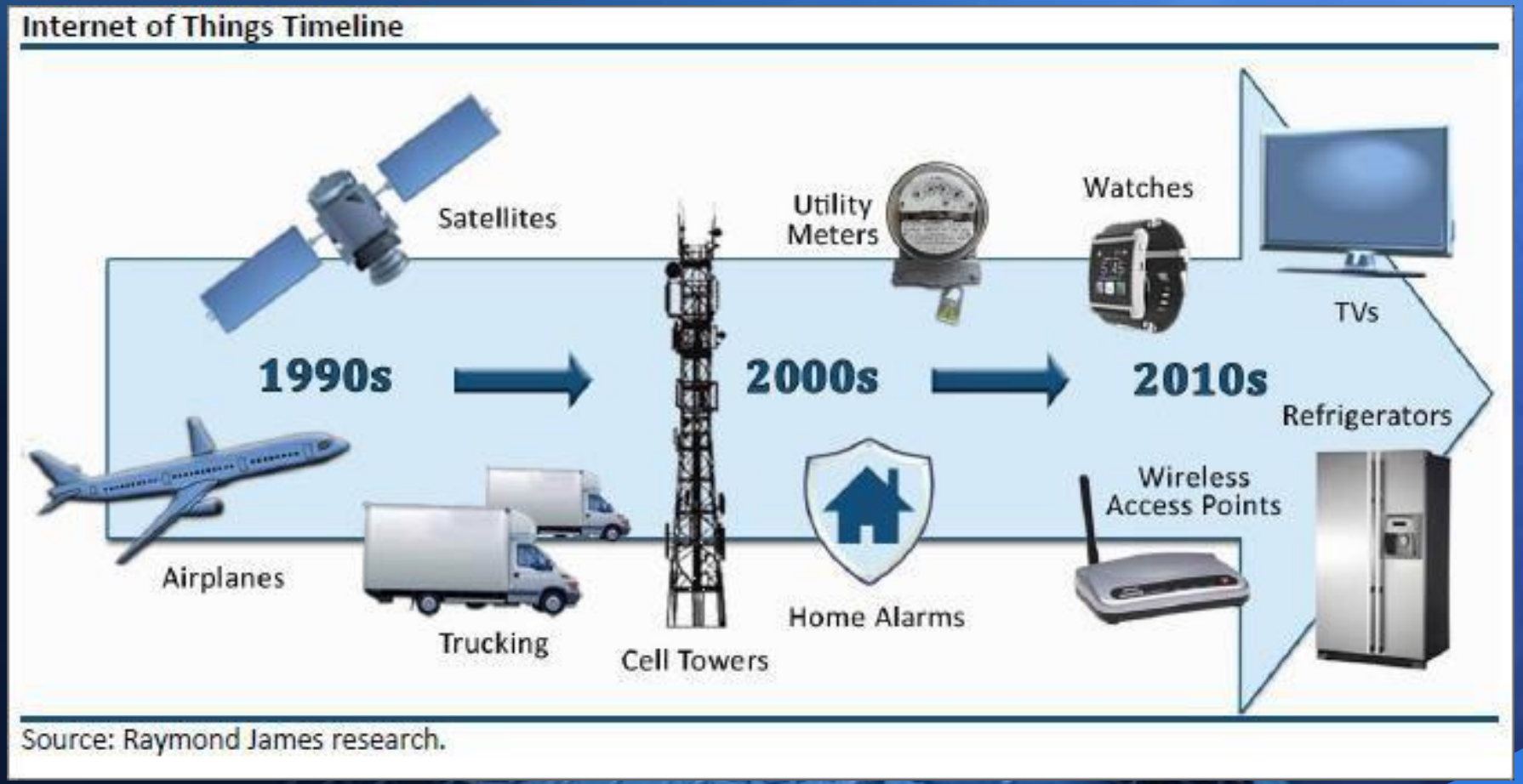
1997, "The Internet of Things" is the seventh in the series of ITU Internet Reports originally launched in 1997 under the title "Challenges to the Network".

1999, Auto-ID Center founded in MIT – Keven Ashton 2003, EPC Global founded in MIT

2005, Four important technologies of the internet of things was proposed in WSIS conference.

2008, First international conference of internet of things: The IOT 2008 was held at Zurich.

IoT Timeline



What's the Internet of Things

- **Definition**

  (1) The Internet of Things, also called The Internet of Objects, refers to a wireless network between objects, usually the network will be wireless and self- configuring, such as household appliances.

  ------Wikipedia

(2) By embedding short-range mobile transceivers into a wide array of additional gadgets and everyday items, enabling new forms of communication between people and things, and between things themselves.

------WSIS 2005

What's the Internet of Things

- **Definition**

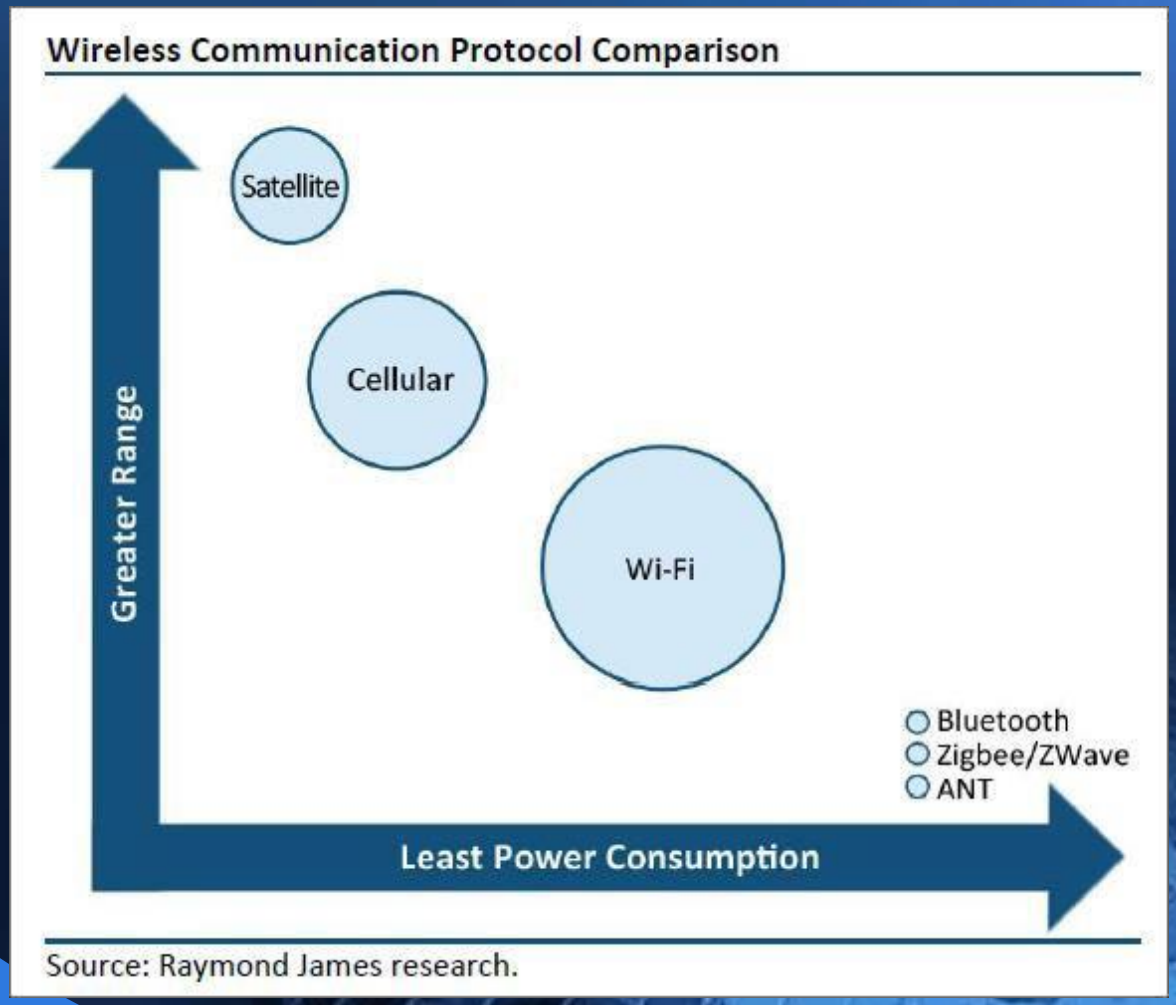
(3) The term "Internet of Things" has come to describe a number of technologies and research disciplines that enable the Internet to reach out into
the real world of physical objects.

------IoT 2008

(4) "Things having identities and virtual personalities operating in smart spaces using intelligent interfaces to connect and communicate within social, environmental, and user contexts".

-------IoT in 2020

Driver of IoT connectivity



What's the Internet of Things

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

EX: UK Gov

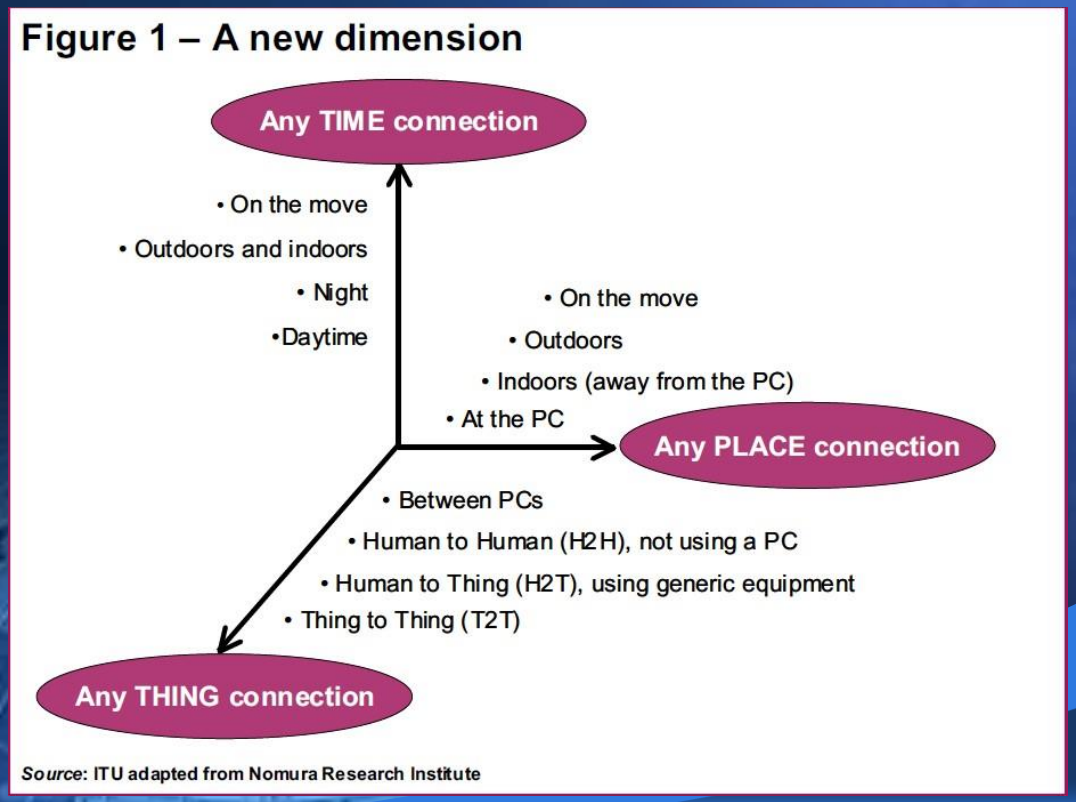
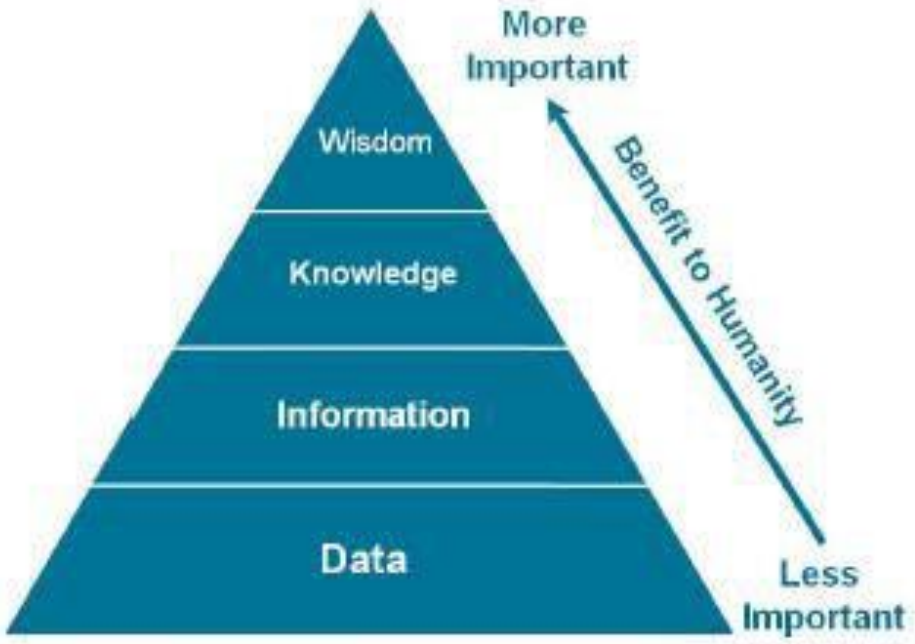


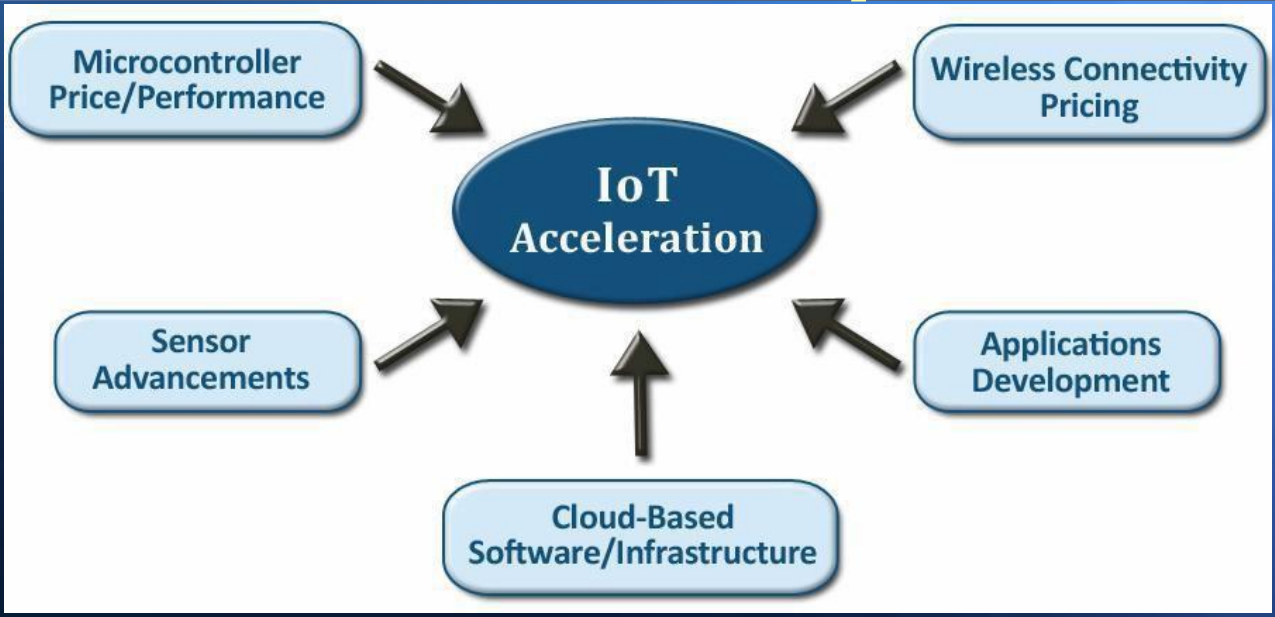
Figure 3. Humans Turn Data into Wisdom

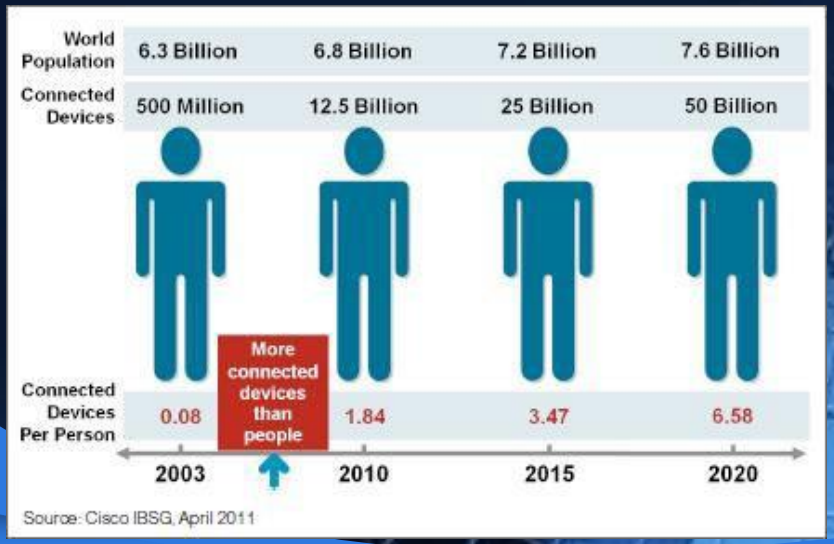


Source: Cisco IBSG, April 2011

It is also important to note there is a direct correlation between the input (data) and output (wisdom). The more data that is created, the more knowledge and wisdom people can obtain. IoT dramatically increases the amount of data available for us to process. This, coupled with the Internet's ability to communicate this data, will enable people to advance even further.

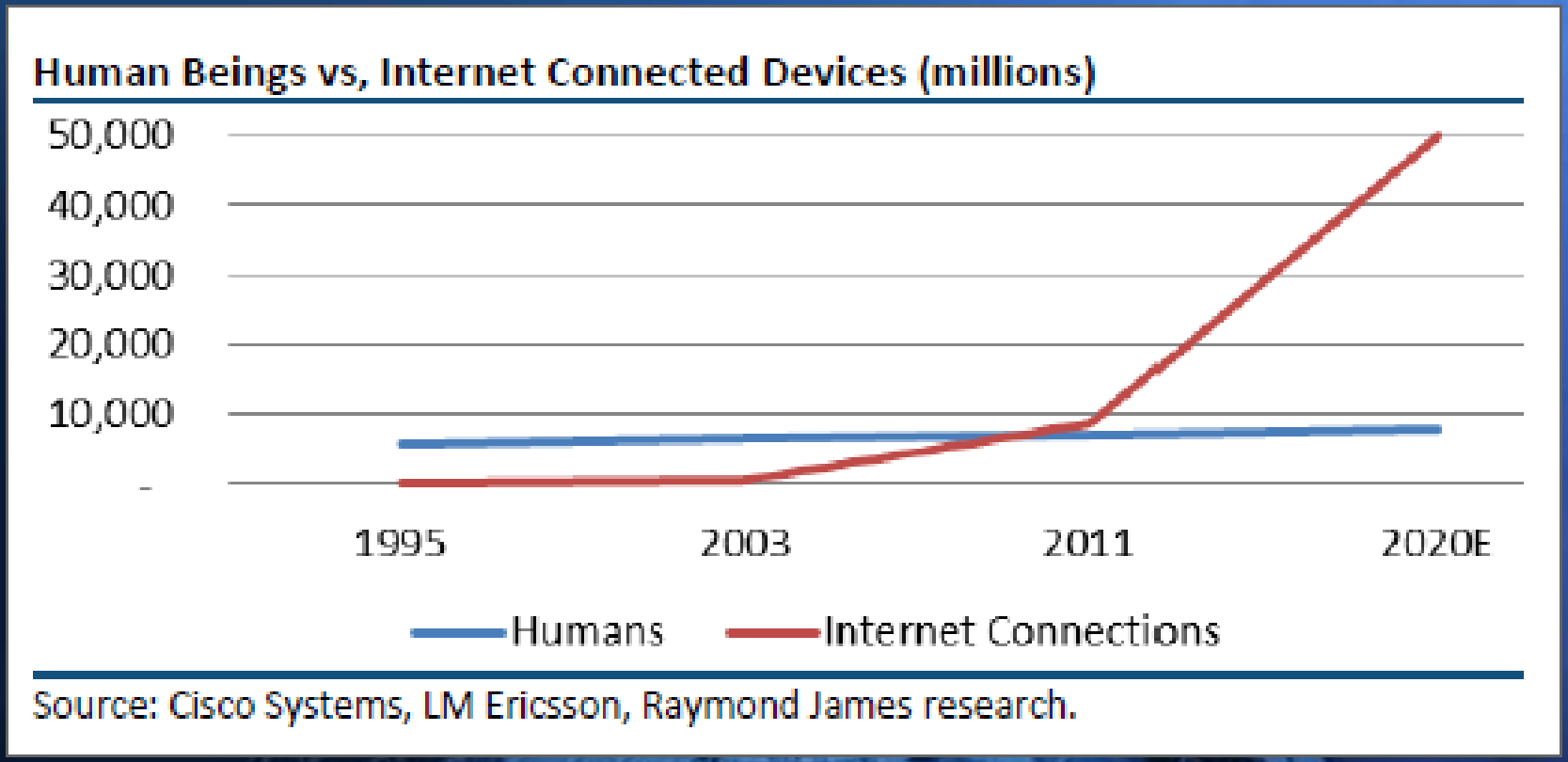
IoT Perspective





	2003	2011	2020
Humans	6,3B	7B	7,6B
Devices	500M	12,5B	50B

Perspective



Why Internet of Things

- *Dynamic control of industry and daily life*

  Resource efficiency –energy conservation

- *Improve the resource utilization ratio*

- *Better relationship between human and nature*

  Pollutiion and disaster avoidance.

- *Forming an intellectual entity by integrating human society and physical systems*

Why Internet of Things (ii)

- *Universal transport & internetworking*
- *Accessibility & Usability?*
- *Acts as technologies integrator*

Businesses perspective of IoT

The driver of all this connectivity is essentially the desire to "add value" to products or services

e.g: $100 handset turns to $600 smartdevice – connected to internet

Cisco study

Businesses Additional profit	Potential of using internet
613B	50%
14,4 trilions net profit for the coming two decades	

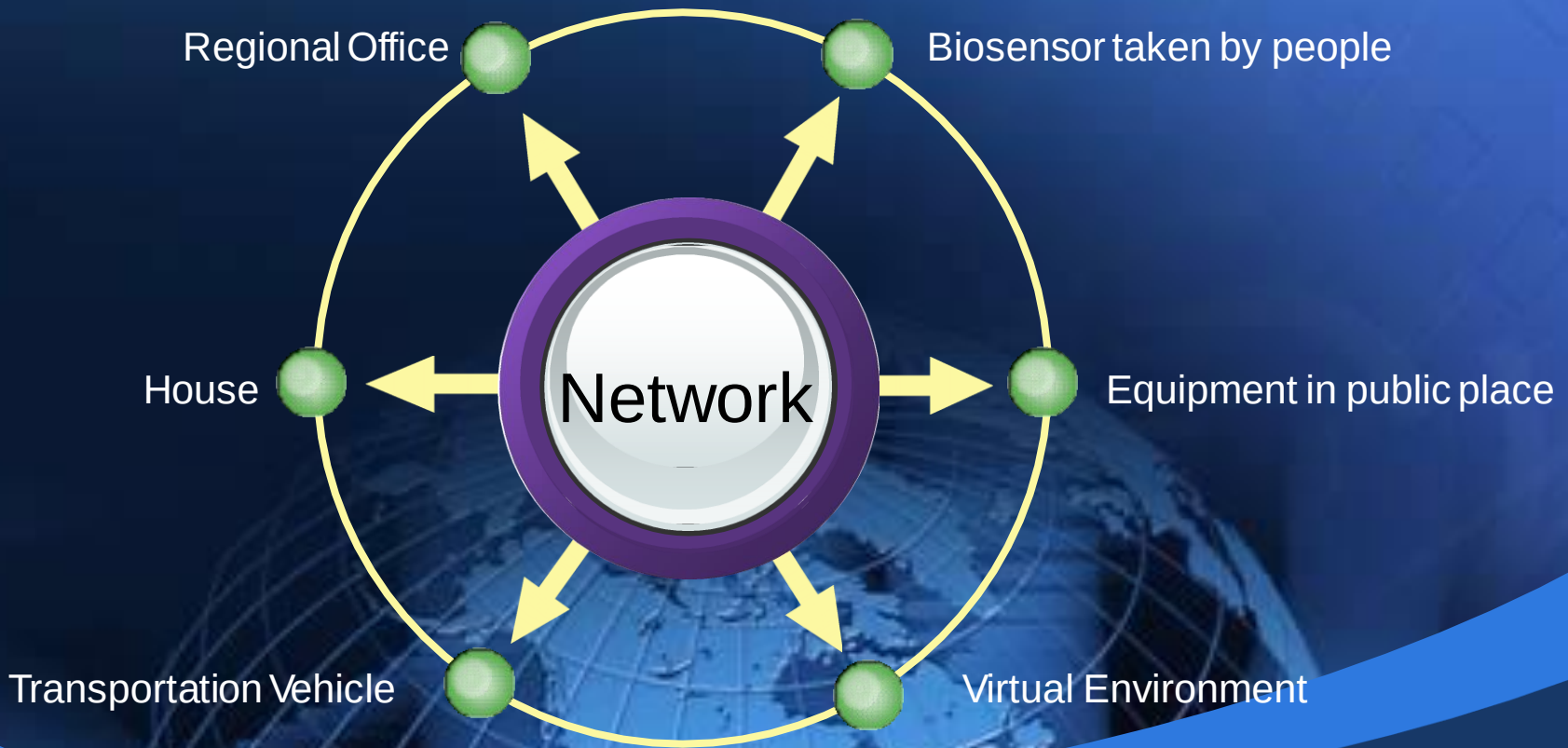
The IoT value chain

Product	Description
Radios	Chips that provide connectivity based on various radio protocols
Sensors	Chips that can measure various environmental/electrical variables
Microcontrollers	Processors/Storage that allow low-cost intelligence on a chip
Modules	Combine radios, sensors, microcontrollers in a single package
Platform Software	Software that activates, monitors, analyzes device network
Application Software	Presents information in usable/analyzable format for end user
Device	Integrates modules with app software into a usable form factor
Airtime	Use of licensed or unlicensed spectrum for communications
Service	Deploying/Managing/Supporting IoT solution

Source: Raymond James research.

The application of IoT(1)

Vertical Market Solutions



The application of IoT(1)

The Looming Opportunity: Internet of Things

aria

Consumer
- Smart home control (lighting, security, comfort)
- Optimized energy use
- Maintenance

Retail
- Product tracking
- Inventory control
- Focused marketing

Medical
- Wearable devices
- Implanted devices
- Telehealth services

Military
- Resource allocation
- Threat analysis
- Troop monitoring

Industrial
- SmartMeters
- Wear-out sensing
- Manufacturing control
- Climate control

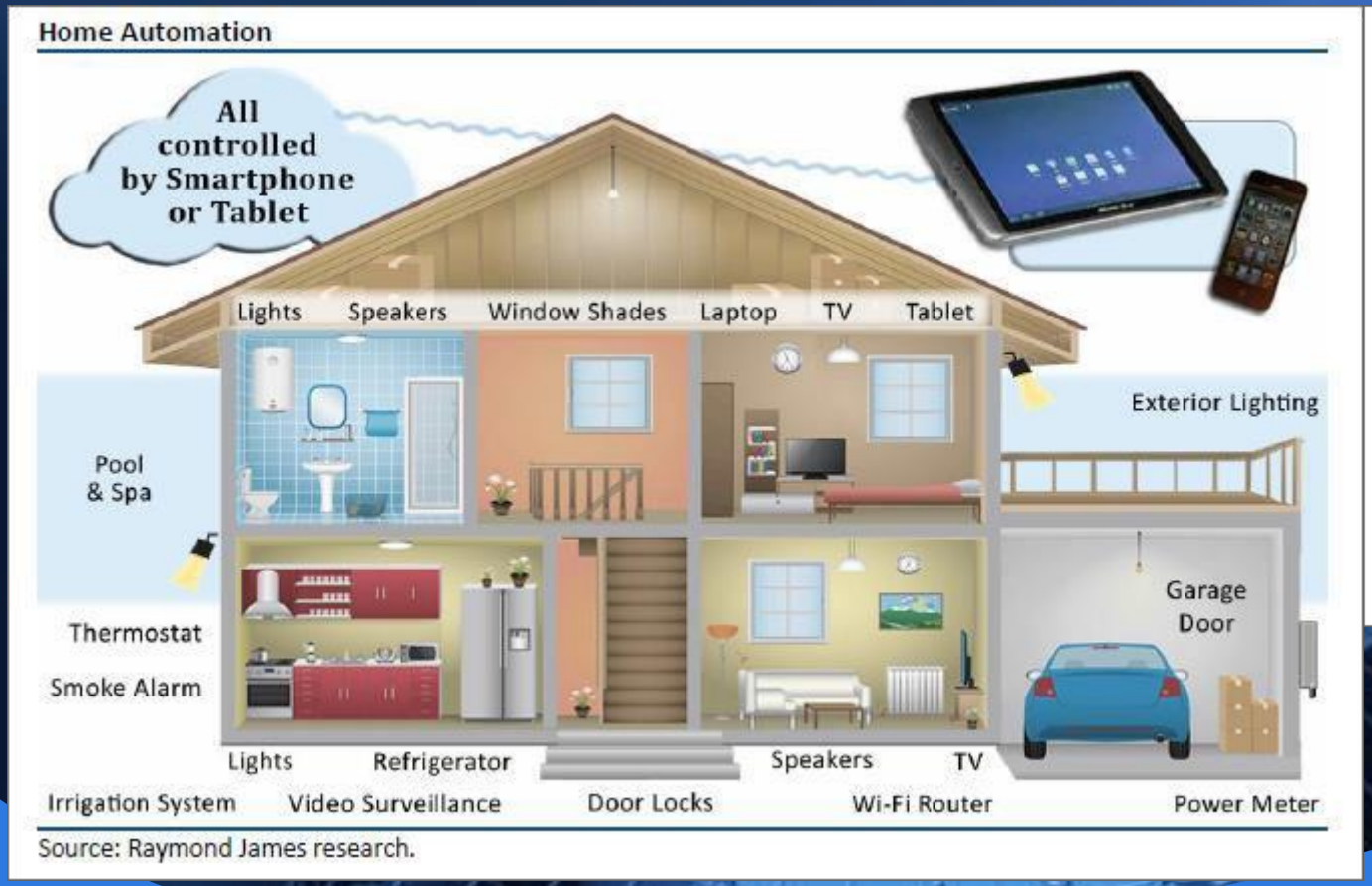
Automotive
- Parking
- Traffic flow
- Anti-theft location

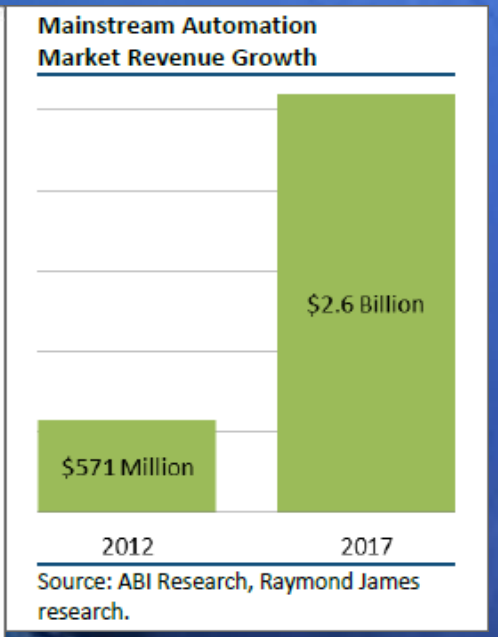
Environmental
- Species tracking
- Weather prediction
- Resource management

Agriculture
- Crop management
- Soil analysis

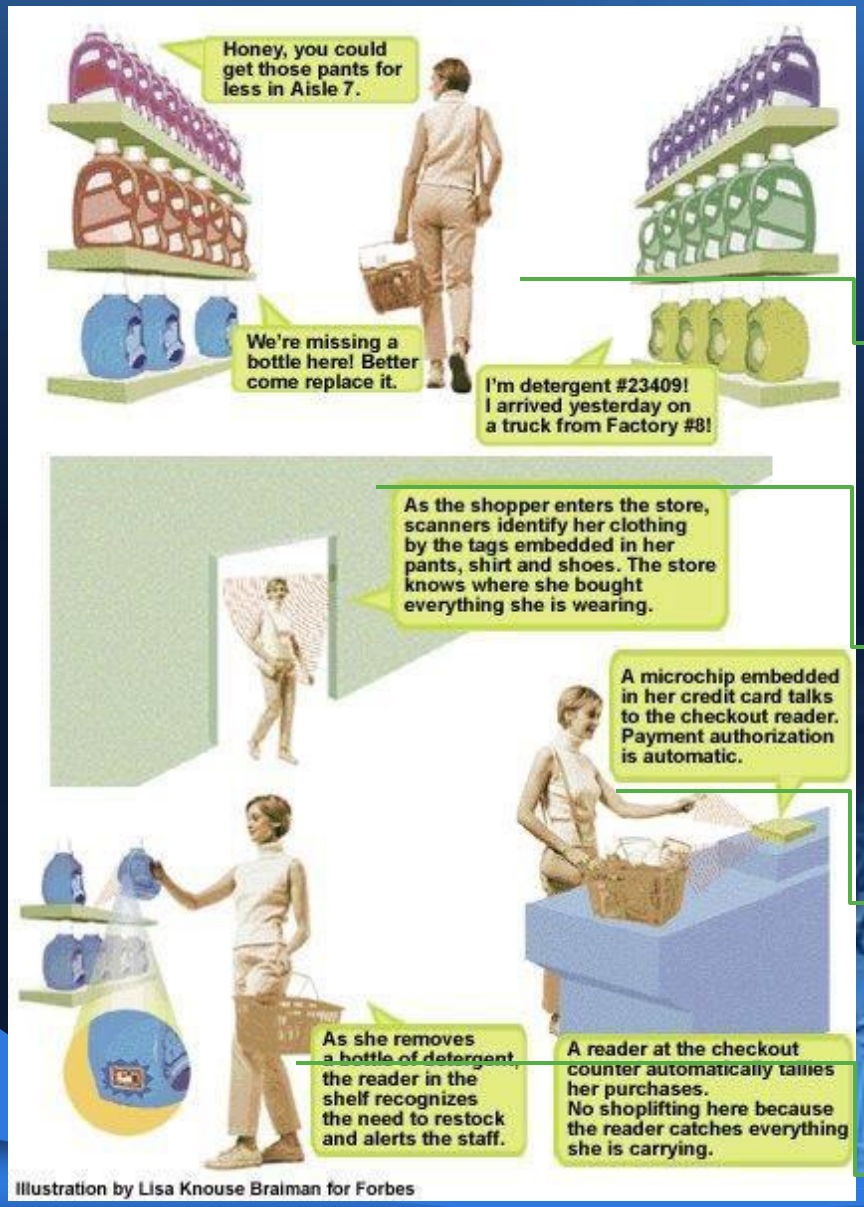
The application of IoT(5)

Scenario: Intelligent Home





The application of IoT(2)



Scenario: shopping

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

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

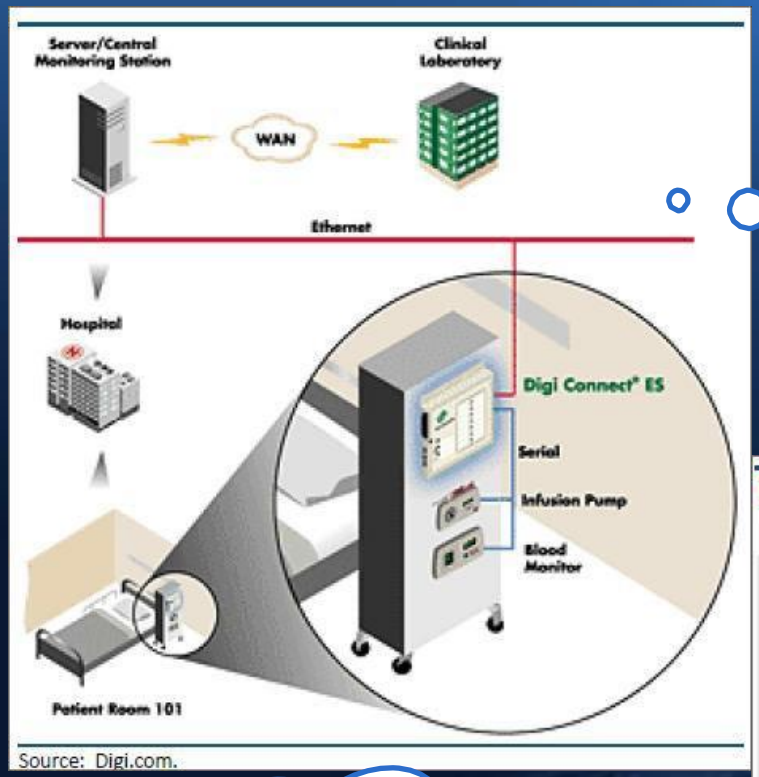
(4) When paying for the goods, the microchip of the credit card will communicate with checkout reader.

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

The application of IoT(4)

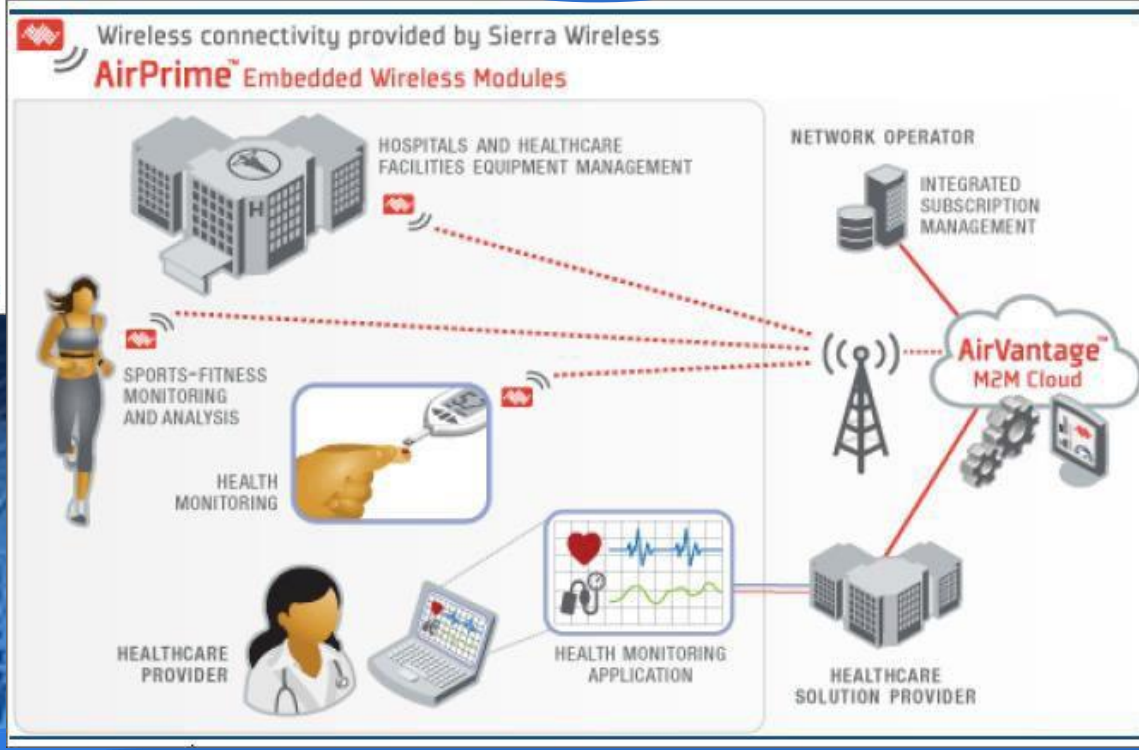
Scenario: Health Care

illustration below from Sierra Wireless describes how a health care provider could theoretically use real time data collected from hospitals, wearable devices, home health monitoring devices, and elsewhere to provide better service



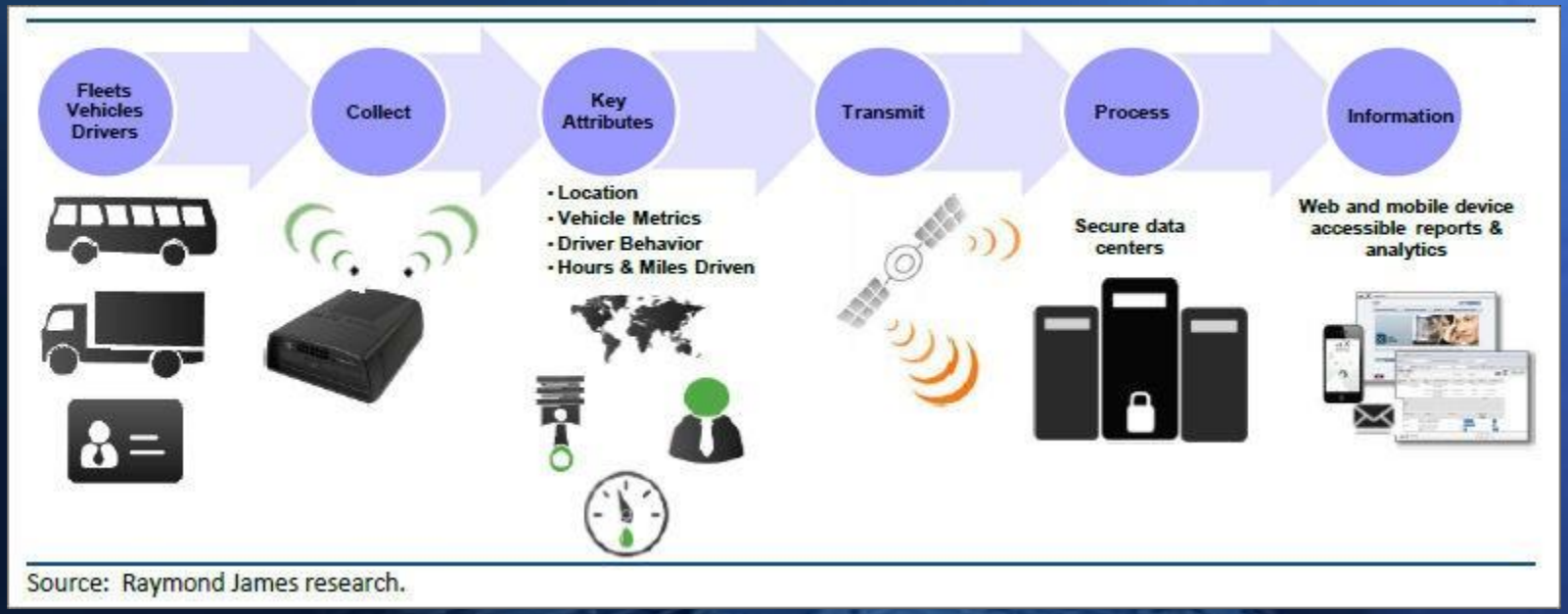
Source: Digi.com.

illustration of a solution allowing for remote monitoring of bedside diagnostics, which is just one application for the Internet of Things within the health care environment



The application of IoT(6)

Scenario: Transportation

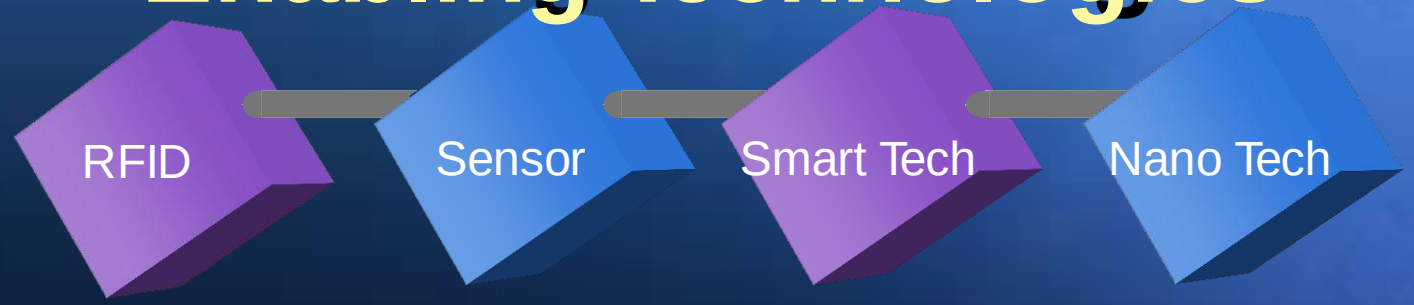


+200 variables on each truck

5% market penetration

State of the Art of IoT

Enabling Technologies



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 devolving processing capabilities to different part of the network.	To make the smaller and smaller things have the ability to connect and interact.

Sensor technology

Sensors are the magic of IoT

- The ability to detect changes in the physical status of things is essential for recording changes in the environment.

- Wireless sensor technology play a pivotal role in bridging the gap between the physical and virtual worlds, and enabling things to respond to changes in their physical environment. Sensors collect data from their environment, generating information and raising awareness about context.

- Sensor Market includes : Micro-electromechanical systems (MEMS) - based sensors, optical sensors, ambient light sensors, gesture sensors, proximity sensors, touch sensors, fingerprint sensors and more

State of the Art of IoT

Research groups

1

MIT Auto-ID Lab & EPC Global.

Stanford University

Georgia Institute of Technology

Cambridge Univ

2

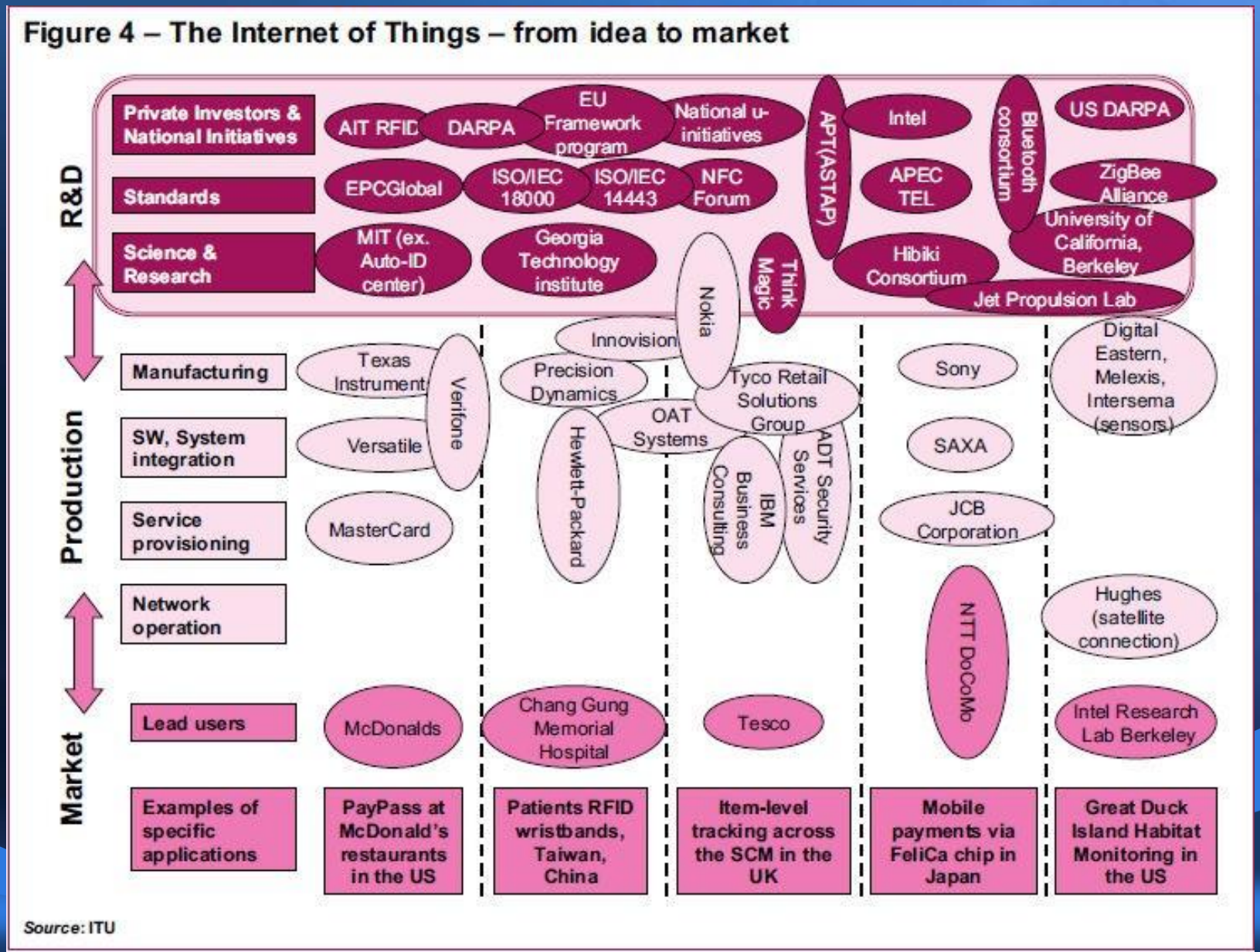
EPFL & ETH Zurich Information and Communication Systems Research Group

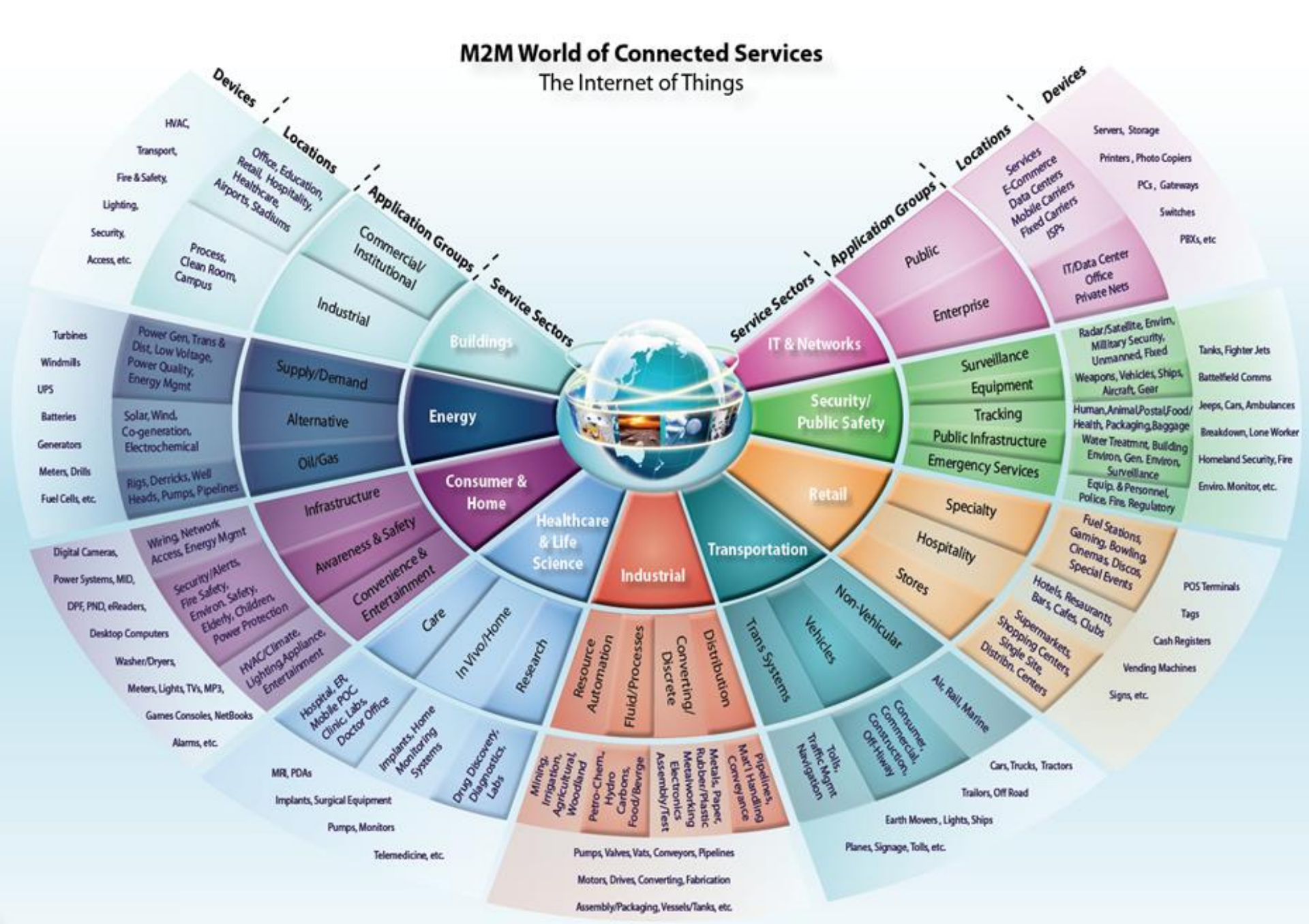
Chemnitz University of Technology VSR Group

3

Nokia SAP
IBM
GOOGLE
AMBIENT
Metro Group
Siemens
Sun
Cisco GE

State of the Art of IoT




M2M World of Connected Services
The Internet of Things
Devices
Locations
Application Groups
Service Sectors
Energy
Buildings
Commercial/ Institutional
Industrial
Supply/Demand
Alternative
Oil/Gas
Consumer & Home
Infrastructure
Awareness & Safety
Convenience & Entertainment
Healthcare & Life Science
Care
In Vivo/Home
Research
Industrial
Resource Automation
Fluid/Processes
Converting/ Discrete
Distribution
Transportation
Trans Systems
Vehicles
Non-Vehicular
Retail
Specialty
Hospitality
Stores
Security/ Public Safety
Surveillance
Equipment
Tracking
Public Infrastructure
Emergency Services
IT & Networks
Public
Enterprise
HVAC, Transport, Fire & Safety, Lighting, Security, Access, etc.
Office, Education, Retail, Hospitality, Healthcare, Airports, Stadiums
Process, Clean Room, Campus
Turbines, Windmills, UPS, Batteries, Generators, Meters, Drills, Fuel Cells, etc.
Power Gen, Trans & Dist, Low Voltage, Power Quality, Energy Mgmt
Solar, Wind, Co-generation, Electrochemical
Rigs, Derricks, Well Heads, Pumps, Pipelines
Digital Cameras, Power Systems, MID, DPF, PND, eReaders, Desktop Computers, Washer/Dryers, Meters, Lights, TVs, MP3, Games Consoles, NetBooks, Alarms, etc.
Wiring, Network Access, Energy Mgmt
Security/Alerts, Fire Safety, Environ. Safety, Elderly, Children, Power Protection
HVAC/Climate, Lighting,Appliance, Entertainment
Hospital, ER, Mobile POC, Clinic, Labs, Doctor Office
Implants, Home Monitoring Systems
Drug Discovery, Diagnostics, Labs
MR, PDAs, Implants, Surgical Equipment, Pumps, Monitors, Telemedicine, etc.
Mining, Irrigation, Agricultural, Woodland
Petro-Chem, Hydro Carbons, Food/Bevrge
Metals, Paper, Rubber/Plastic, Metalworking, Electronics Assembly/Test
Pipelines, Mat'l Handling, Conveyance
Pumps, Valves, Vats, Conveyors, Pipelines, Motors, Drives, Converting, Fabrication, Assembly/Packaging, Vessels/Tanks, etc.
Tolls, Traffic Mgmt, Navigation
Consumer, Commercial, Construction, Off-Hiway
Air, Rail, Marine
Cars, Trucks, Tractors, Trailors, Off Road, Earth Movers , Lights, Ships, Planes, Signage, Tolls, etc.
Hotels, Resaurants, Bars, Cafes, Clubs
Supermarkets, Shopping Centers, Single Site, Distribn. Centers
Fuel Stations, Gaming, Bowling, Cinemas, Discos, Special Events
POS Terminals, Tags, Cash Registers, Vending Machines, Signs, etc.
Radar/Satellite, Envirn, Military Security, Unmanned, Fixed
Weapons, Vehicles, Ships, Aircraft, Gear
Human,Animal/Postal/Food/ Health, Packaging,Baggage
Water Treatmnt, Building Environ, Gen. Environ. Surveillance
Equip. & Personnel, Police, Fire, Regulatory
Tanks, Fighter Jets, Battelfield Comms, Jeeps, Cars, Ambulances, Breakdown, Lone Worker, Homeland Security, Fire, Enviro. Monitor, etc.
Services, E-Commerce, Data Centers, Mobile Carriers, Fixed Carriers, ISPs
IT/Data Center, Office, Private Nets
Servers, Storage, Printers , Photo Copiers, PCs , Gateways, Switches, PBXs, etc

The IoT Hype (2015)

Source: Gartner, Aug 2014

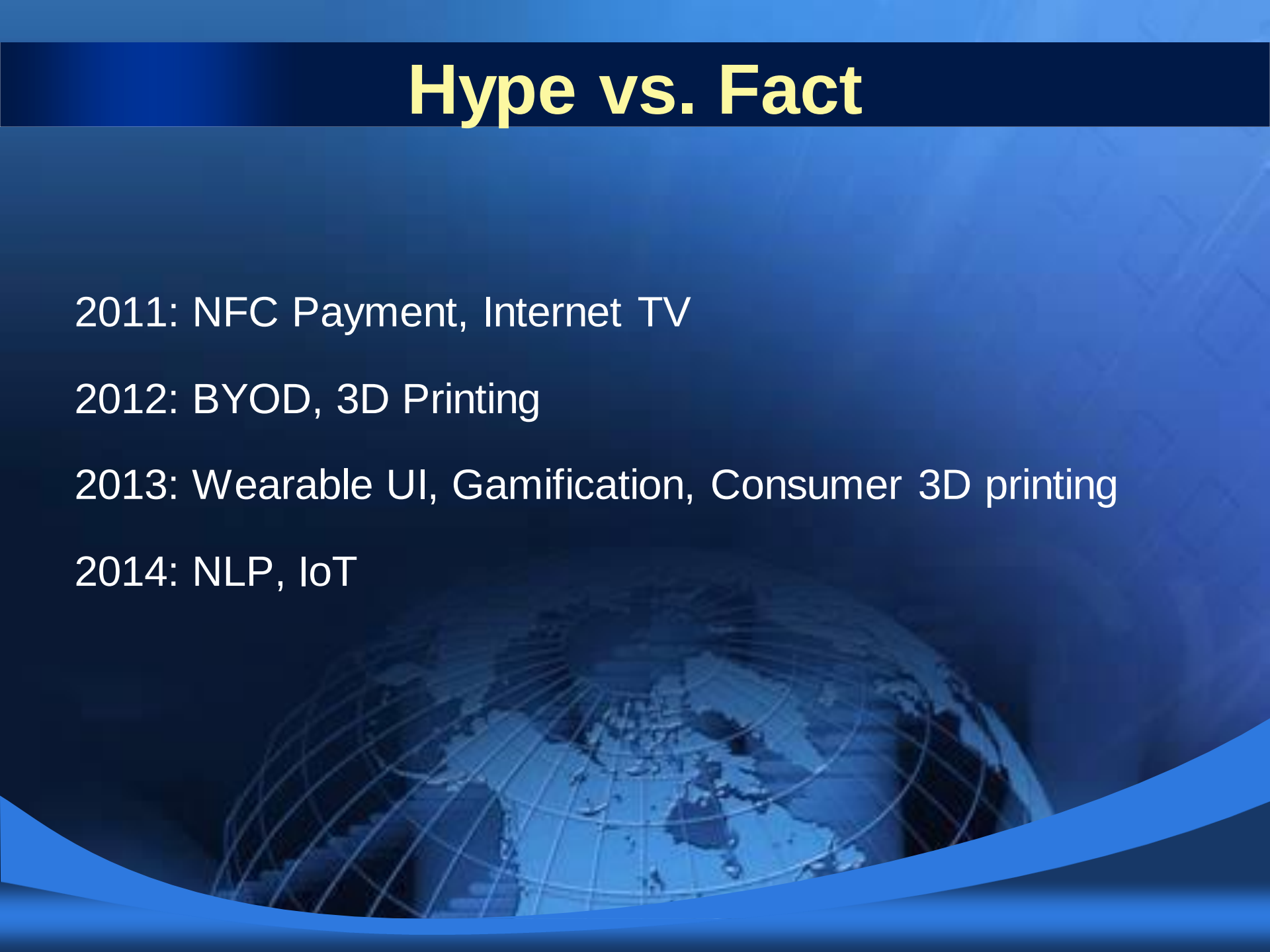
Hype vs. Fact

2011: NFC Payment, Internet TV

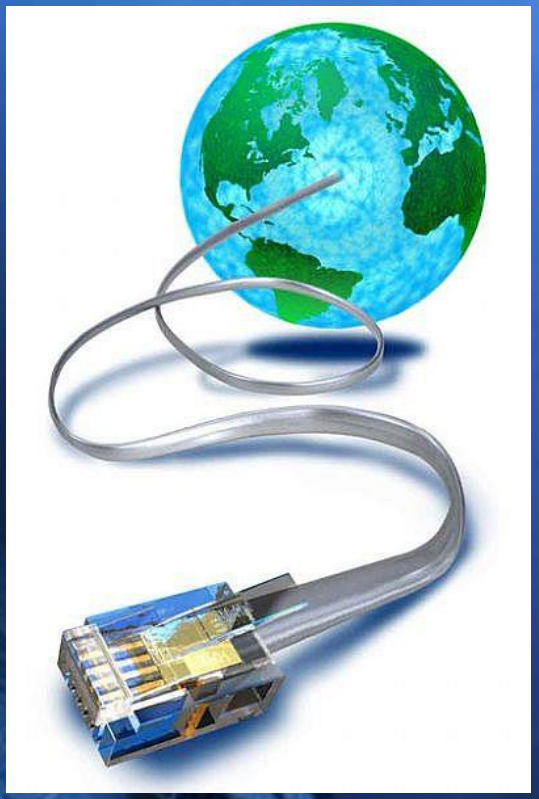
2012: BYOD, 3D Printing

2013: Wearable UI, Gamification, Consumer 3D printing

2014: NLP, IoT



The IoT Concept



Example 1

http://www.sprinkles.com/cupcake-atm

Cupcake Conveyor — Yes, an actual cupcake ATM that Davis called a "confectionery 3D printer." There are Sprinkles' cupcakes ATMs in several cities in the United States, including Beverly Hills, Chicago, New York and Atlanta.

Example 2

London's Heathrow Airport

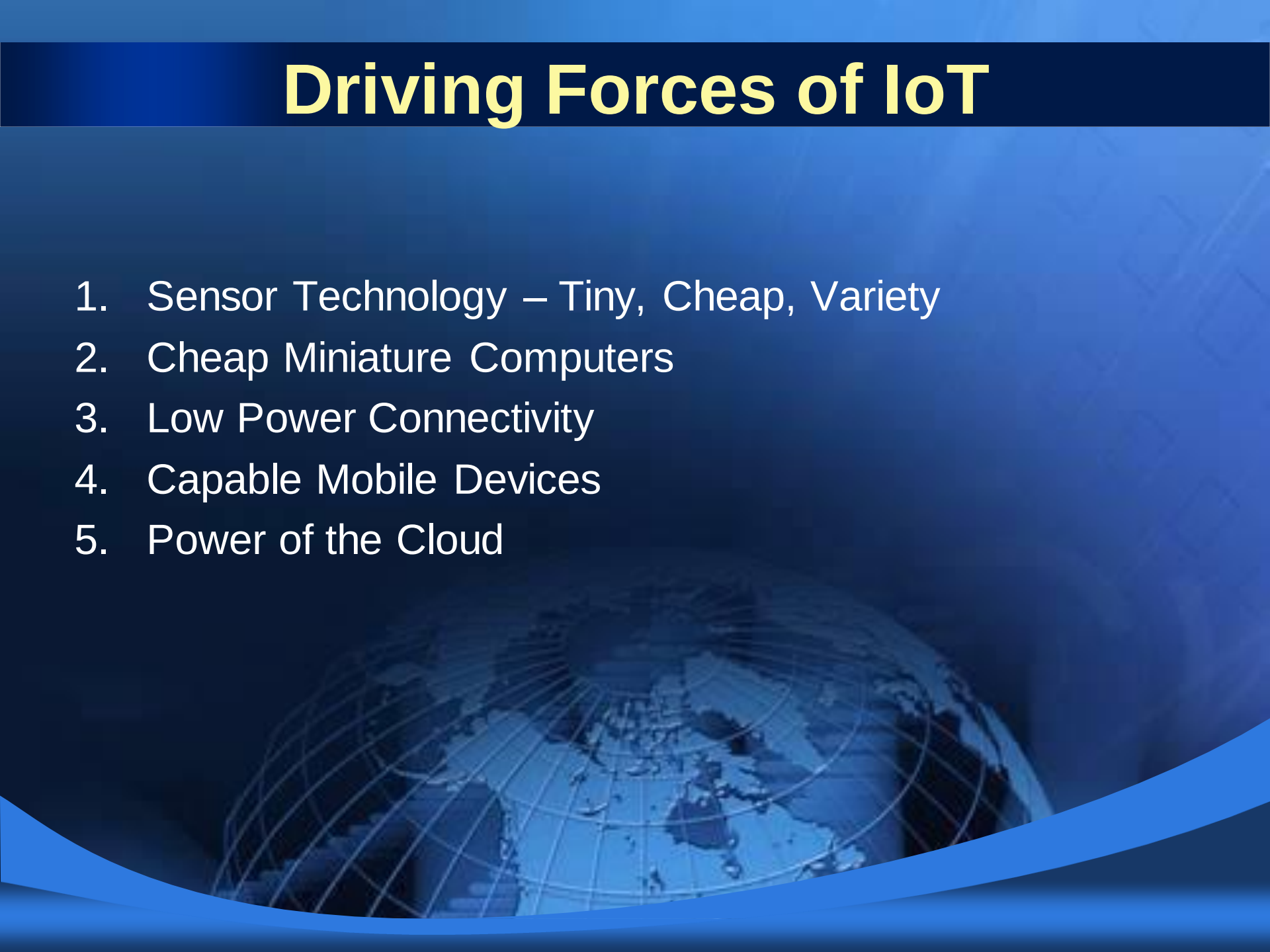
Smart Loos —

Found in Heathrow's Terminal 2, these smart loos have embedded sensors that track people's movement and bathroom flow, and can alert maintenance crews if there's a problem

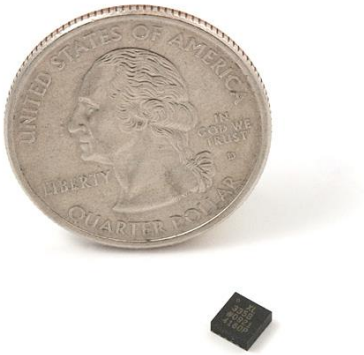
Let’s think of the similarities

Driving Forces of IoT

1. Sensor Technology – Tiny, Cheap, Variety
2. Cheap Miniature Computers
3. Low Power Connectivity
4. Capable Mobile Devices
5. Power of the Cloud



1. Sensor Technology



Accelerometer
(4mm diameter)

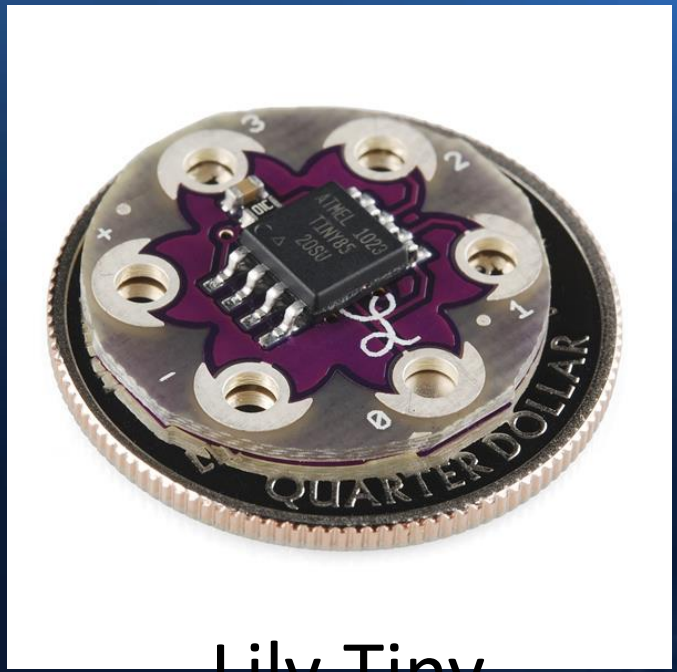
Force Sensor
(0.1N – 10N)

Pulse Sensor
$25

https://www.sparkfun.com/

https://www.adafruit.com/

2. Cheap Mini Computers



Lily Tiny

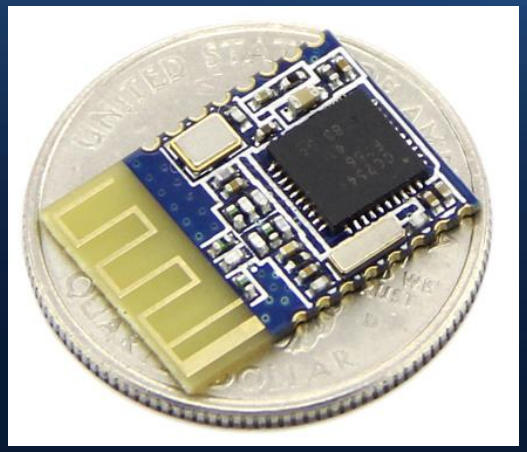
Guess the Price?

Key Parameters

Flash: 8 Kbytes
Pin Count: 8
Max. Operating Freq: 20 MHz
CPU: 8-bit AVR
Max I/O Pins: 6
Ext Interrupts: 6
SPI: 1
I2C: 1

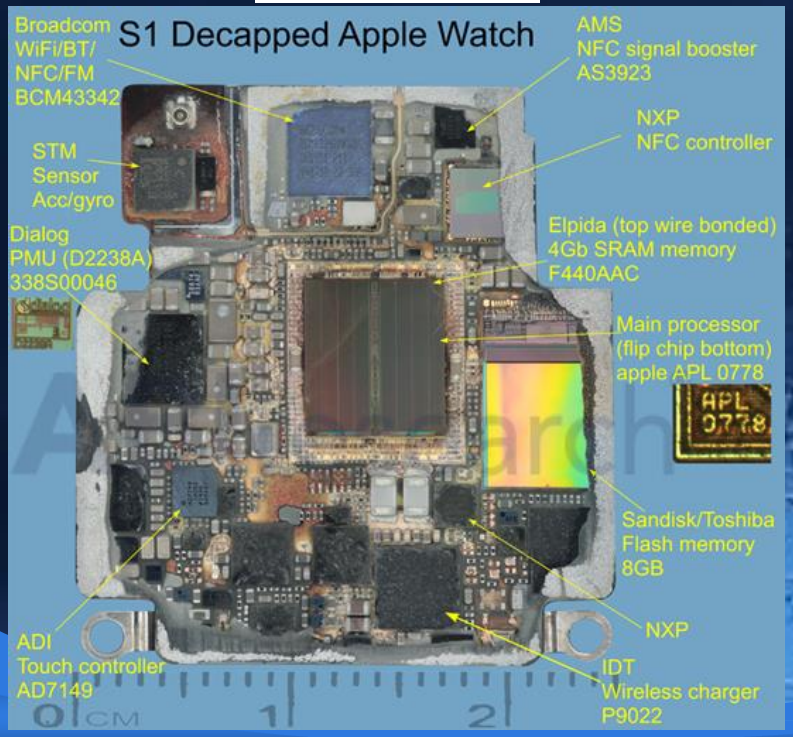
http://www.atmel.com/devices/ATTINY85.aspx?tab=parameters

3. Low Power Connectivity



Bluetooth Smart (4.0)
(Up to 2 years with a single Coin-cell battery)

4. Capable Mobile Devices



Quad Core 1.5 GHz
128 GB Internal Memory
3 GB RAM
16 MP Camera
2160p@30fps video
WiFI, GPS, BLE

5. Power of the Cloud

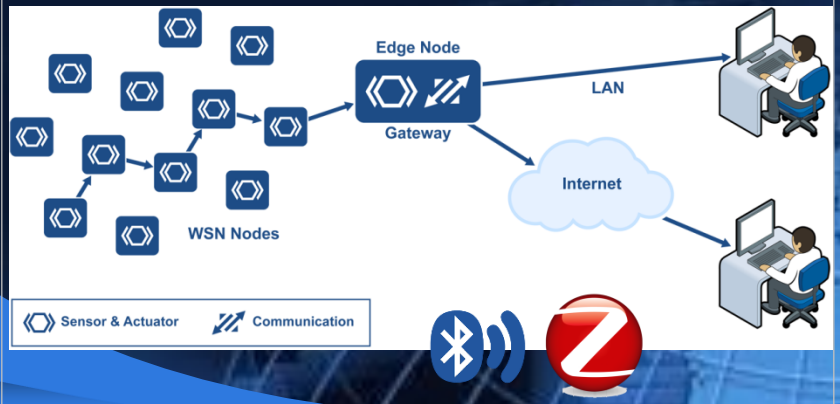
amazon web services™

ABCD's of IoT

Applications

Big Data Analytics

Connectivity and Communication



Devices – that are smart!

Photos – Libelium, Google Image Search

Applications

Ubiquitous Computing Applications

Cyber Physical Systems (CPS) Applications

Smart and Connected Health

Big Data Analytics

Map-Reduce

Frequent Item-sets

Similarity

Clustering

Dimension Reduction

Streaming Data

Connectivity

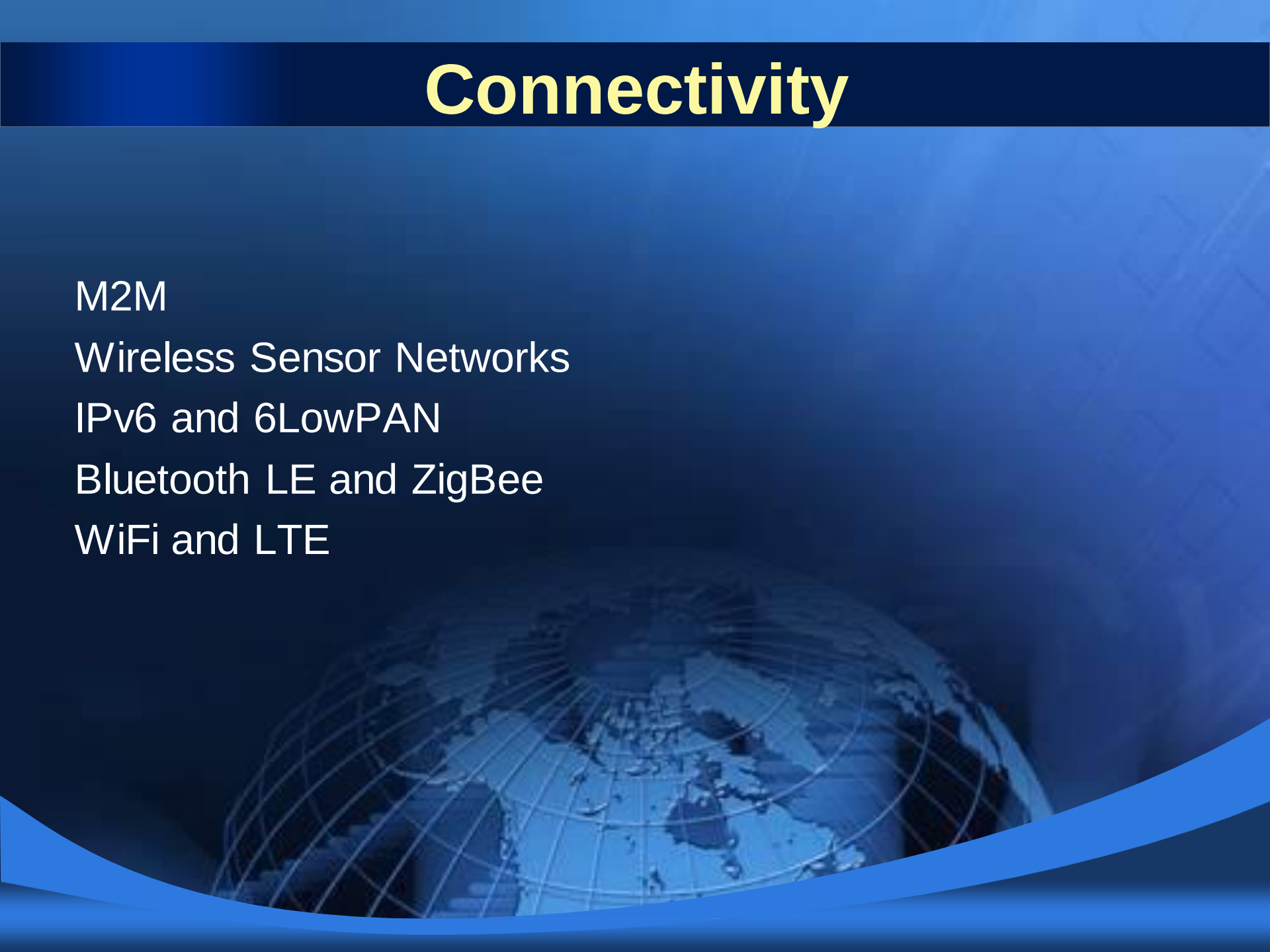
M2M

Wireless Sensor Networks

IPv6 and 6LowPAN

Bluetooth LE and ZigBee

WiFi and LTE



Devices and Platforms

Mobile Systems

Sensor Systems

Wearables

Energy Harvesting

Security and Privacy

IoT in the Research Community

Mobile Systems (MobiSys, MobiCom)

Sensor Systems (SenSys, IPSN)

Real-Time Systems (RTSS, RTAS)

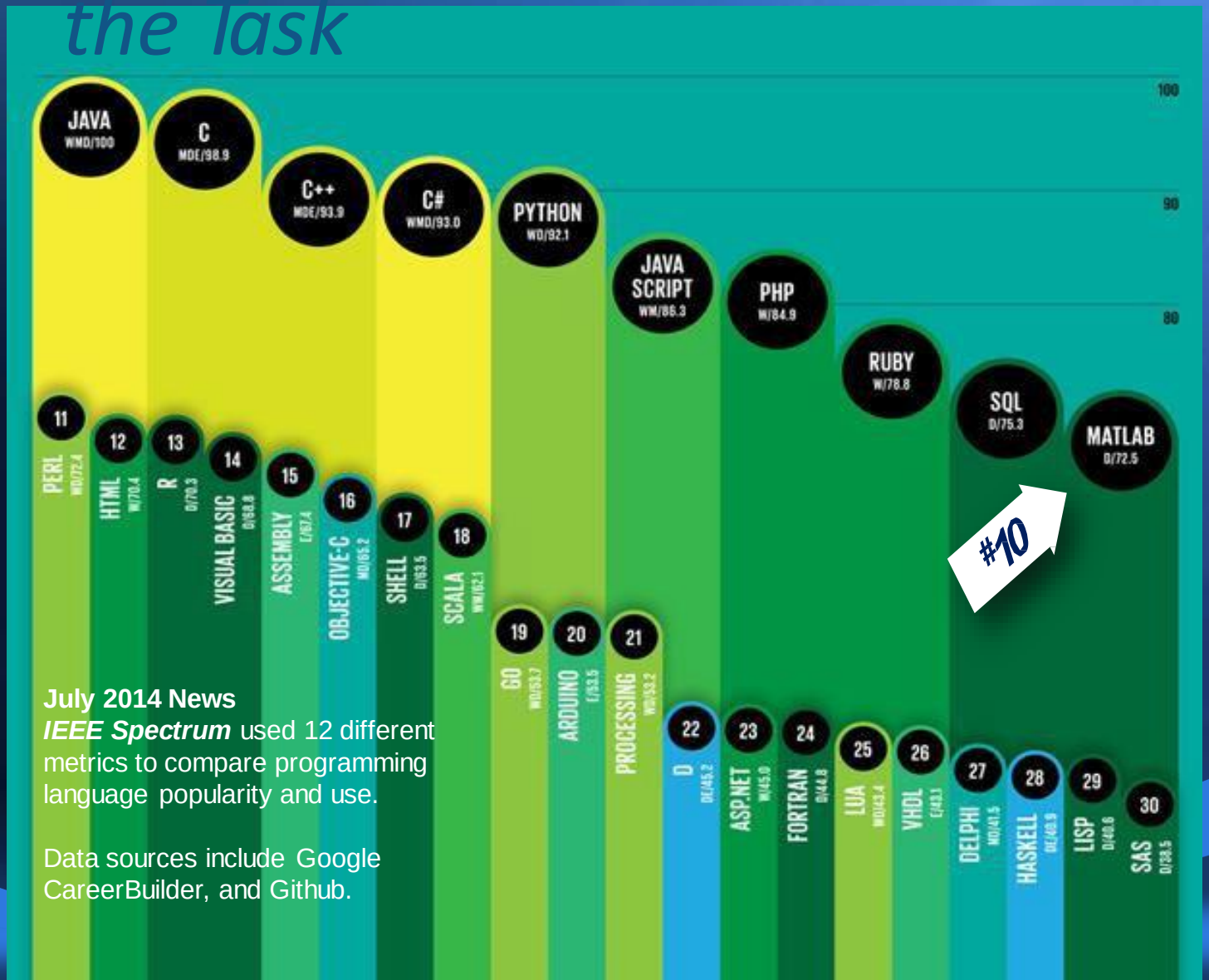
Human-Computer Interaction (CHI)

Applications (UbiComp, PerCom)

ML/Data Mining (ICML, KDD)

… and more

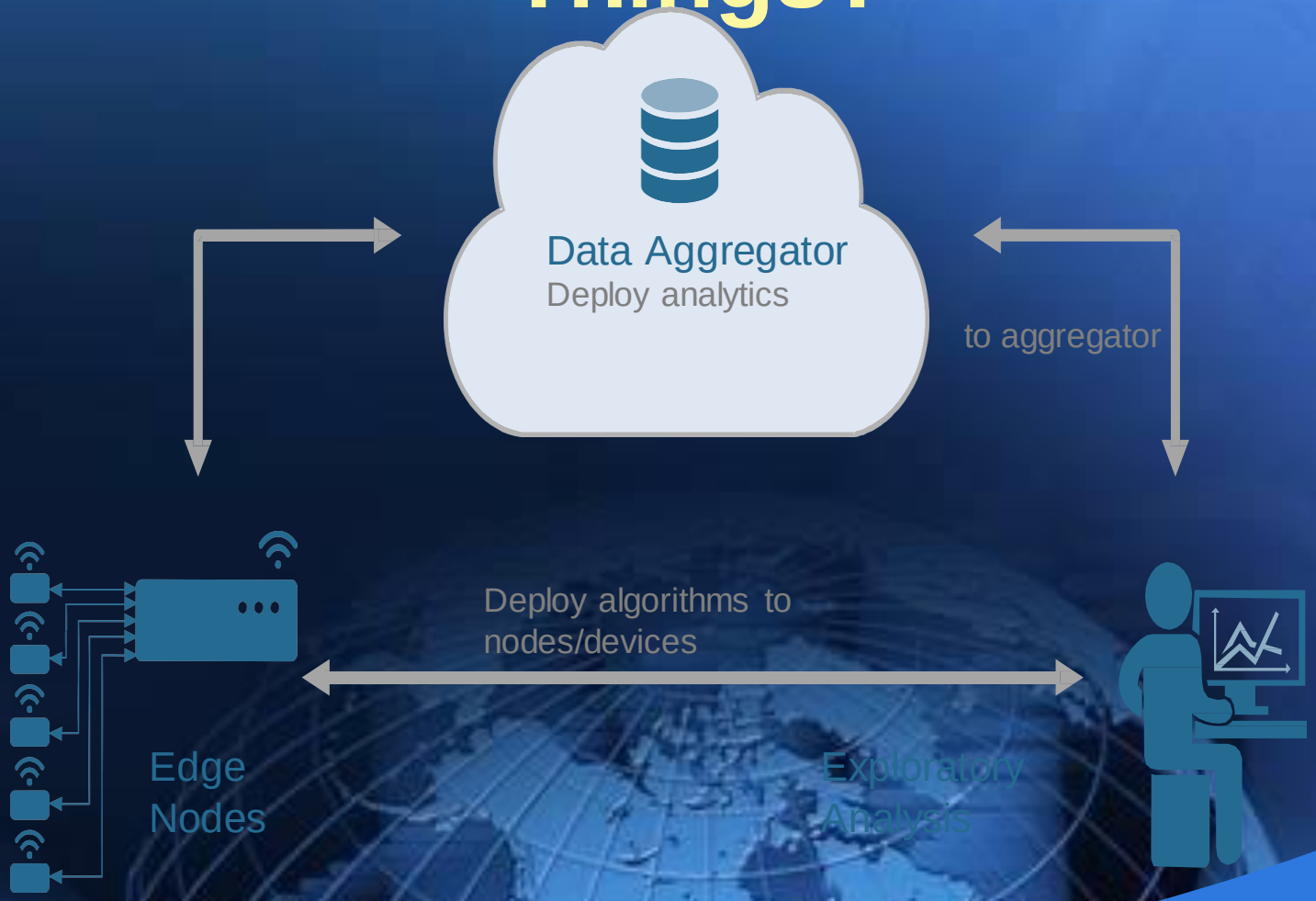
The Right Language for the Task



July 2014 News
IEEE Spectrum used 12 different metrics to compare programming language popularity and use.

Data sources include Google CareerBuilder, and Github.

What is the Internet of Things?



Internal

Key Industries

- **Aerospace and Defense**
- Automotive
- Biotech and Pharmaceutical
- Communications
- **Education**
- Electronics and Semiconductors
- Energy Production
- Financial Services
- Industrial Automation and Machinery

Markets Driving IoT

- Smart Cities
- Connected Cars
- Smart Meters
- Retail
- Wearables
  - Healthcare
  - Personal technology
- Industrial IoT
  - M2M
- Smart Agriculture

Market Situation

- IoT growing at 30% CAGR today
  - Multiple independent sources
- McKinsey Study 2015
  - IoT will be an 11.1 Trillion Dollar Market by 2025
  - On average,40 percent of the total value that can be unlocked requires different IoT systems to work together.
  - Most IoT data collected today are not used, and the data that are used are not fully exploited
- Nucleus Research 2016
  - Advanced analytics customers experience 2.2 times more ROI than traditional BI customers
  - Customers should be able to at least pilot an IoT solution within 9 months for a respectable payback period.

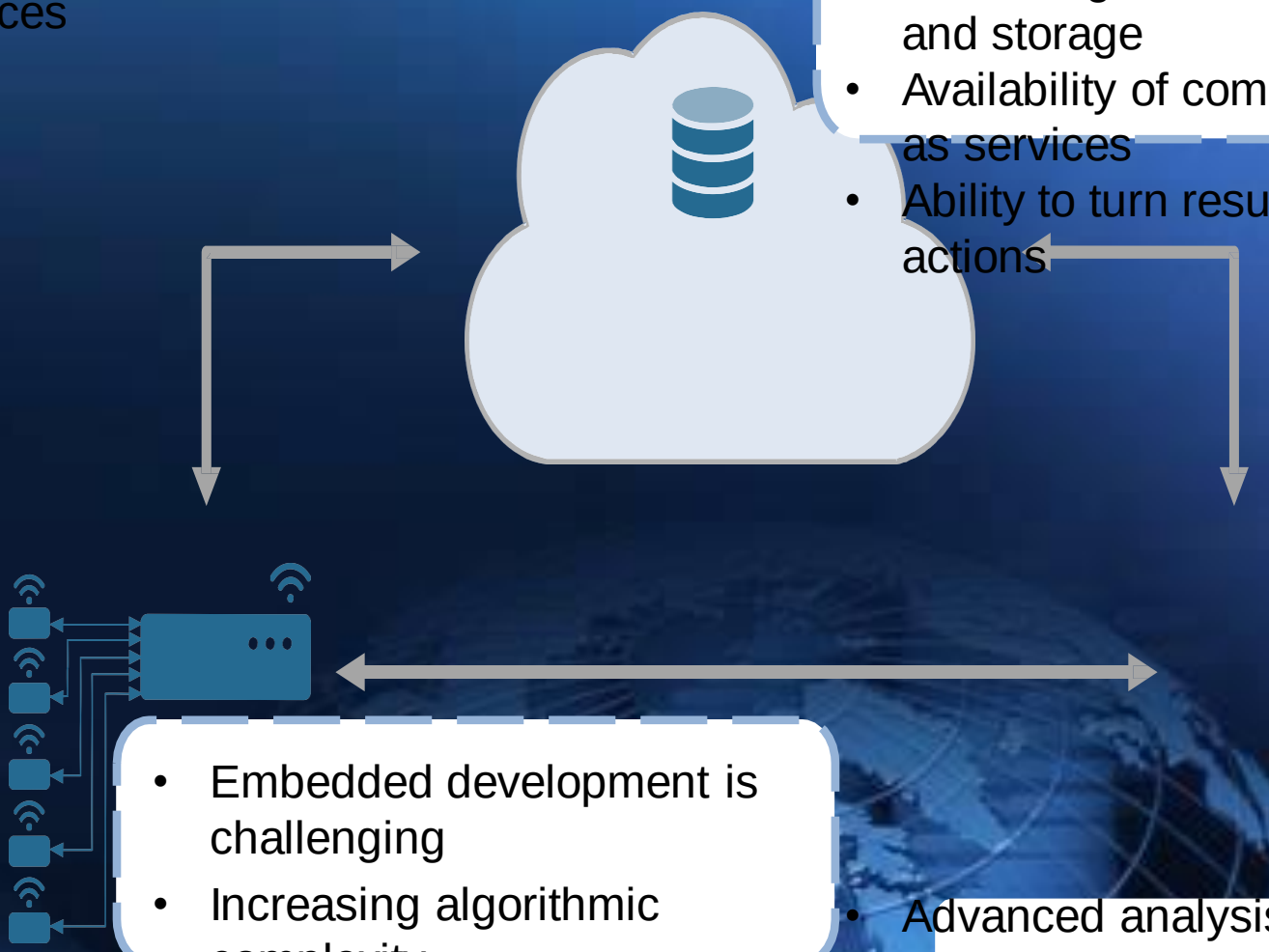
- **Analytics is key to getting value of IoT system**
- **Prototyping is hard**

Challenges of IoT

- Complex systems
  - Hard to get started
- No single vendor solutions
- Multiple expertise required to build a system
  - Firmware
  - Communications
  - Web/ IT
  - Data Science
- Lack of consolidation on Industry Standards

IoT Challenges

Need connectivity to cloud resources



- Streaming data management and storage
- Availability of complex analysis as services
- Ability to turn results into actions

- Embedded development is challenging
- Increasing algorithmic complexity
-

- Advanced analysis algorithms
- Tools for deployment and connectivity

What is ThingSpeak?

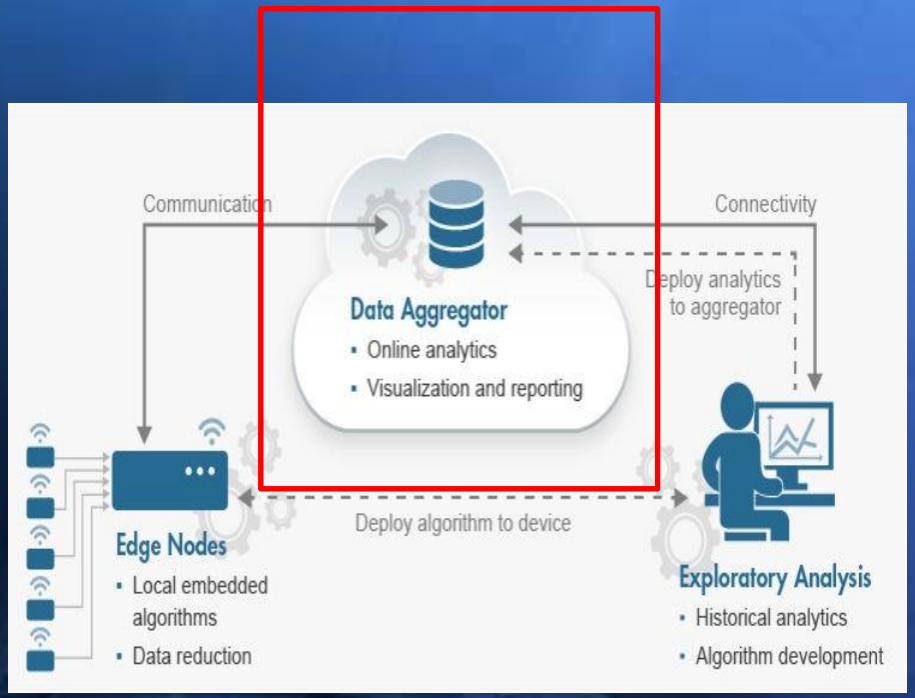
- Free online data aggregation platform
  - Typically used to collect data from sensors

("Things")

  - Provides instant visualization of the data
  - Popular for people experimenting in IoT
  - Has more than 50,000 users

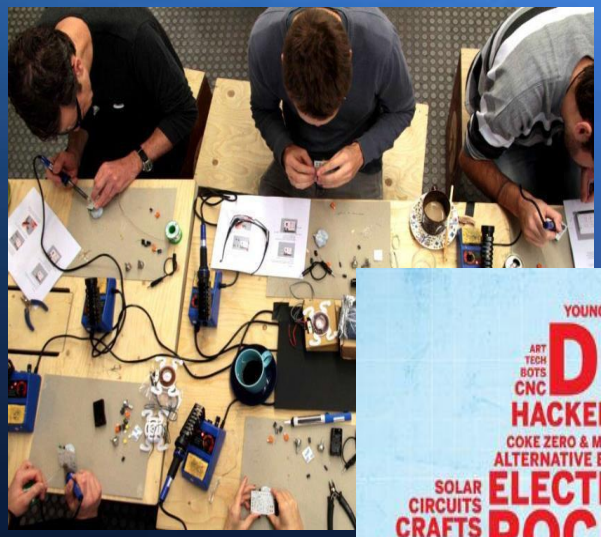
- Can be used to analyze data
  - New MATLAB integration allows users to run scheduled MATLAB code on data coming into ThingSpeak
- Can be used to act on data
  - E.g. Tweet a message when the temperature

in your backyard reaches 32 degrees



Who is ThingSpeak for today?

- Makers
- EDU
- Engineers prototyping



https://thingspeak.com/

Example 1: Monitoring Weather

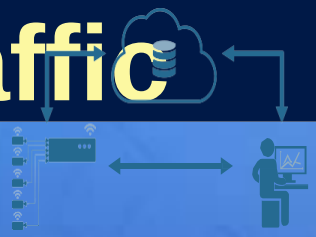
Objectives

- Measure, explore, discover weather patterns
- Provide niche weather service

Solution

- Arduino station with weather sensors
- Cloud-based aggregation and analysis
- Full exa
makerzo

Example 2: Monitoring Traffic

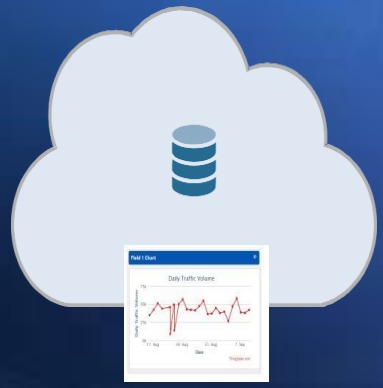


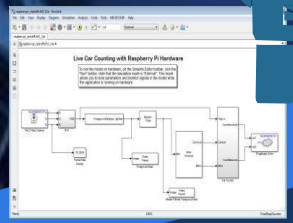
Objectives

- Measure, explore, discover traffic patterns
- Provide live local traffic information service

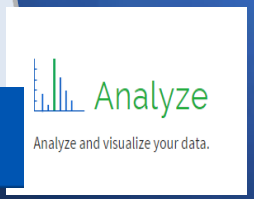
Solution

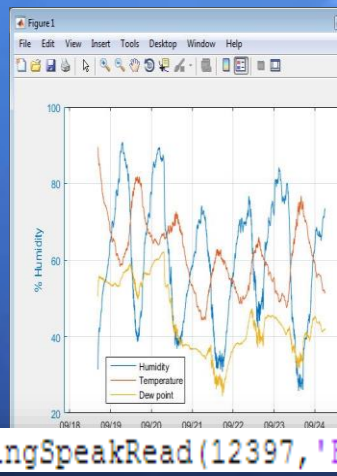
- RaspberryPi + webcam
- **Automated deployment of vision algorithms on embedded sensor**
- Full example makerzone.m[illegible]n



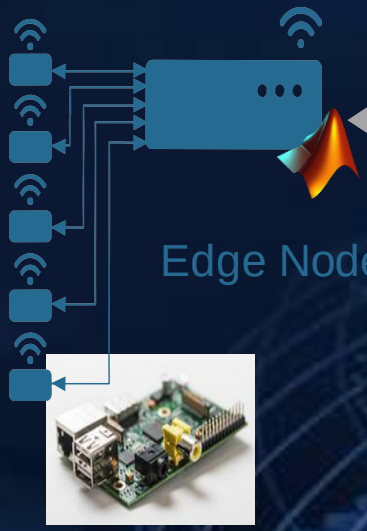


IoT Solutions Examples

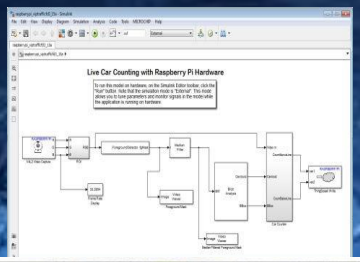





```
thingSpeakRead(12397,'
```



Edge Nodes

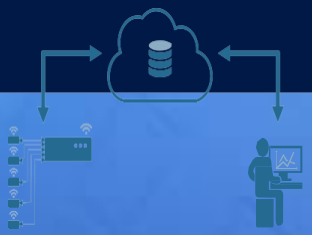


ploratory Analysis

- Historical analytics
- Algorithm development

Customer Study: BuildingIQ

Predictive Energy Optimization



Opportunity

- **Real-time, cloud-based system** for commercial building owners to reduce energy consumption of HVAC operation

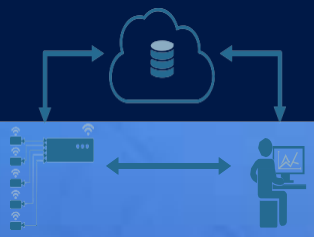
Analytics Use

- **Data:** 3 to 12 months of data from power meters, thermometers, and pressure sensors, as well as weather and energy cost, comprising billions of data points
- **Machine learning:** SVM regression, Gaussian mixture models, k-means clustering
- **Optimization:** multi-objective, constrained

Benefit

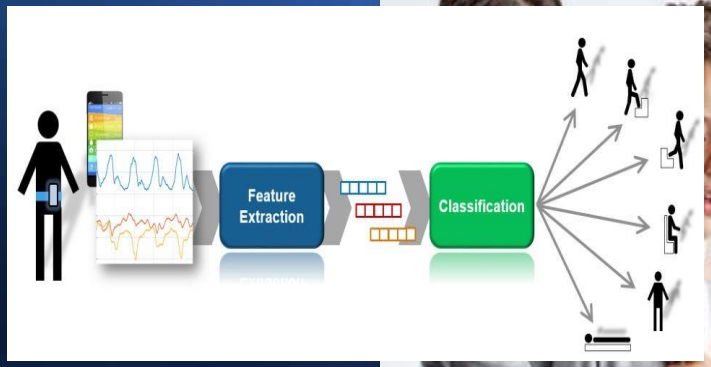
Customer Study: iSonea

Cloud and Embedded Analytics



Opportunity

•Develop an acoustic respiratory monitoring system
for wheeze detection and asthma management



Analytics in cloud and embedded

•Captures 30 seconds of windpipe sound and processes the data locally to clean up and reduce ambient noise

•Invokes spectral processing and pattern-detection analytics for wheeze detection on iSonea server in the cloud

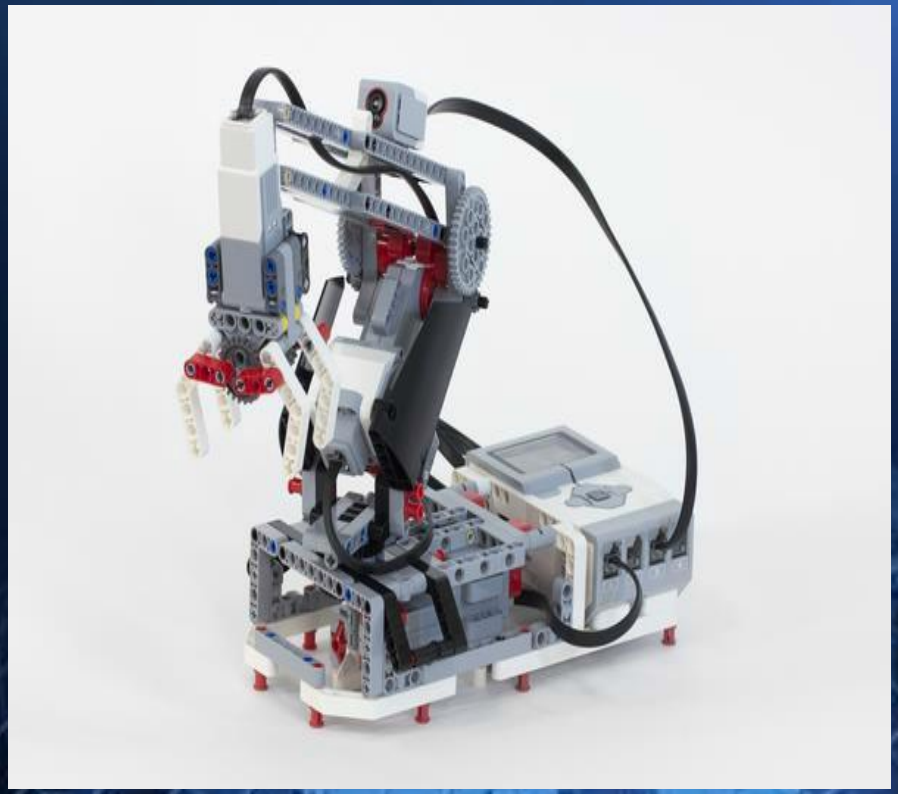
•Provides feedback to the patient on their smartphone

Benefit

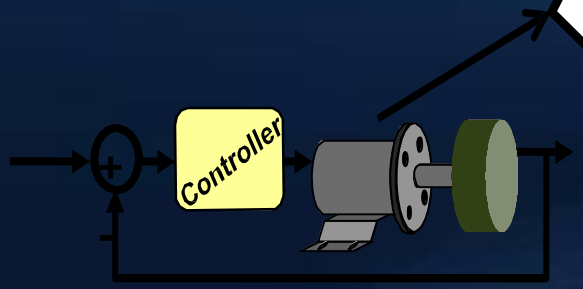
- Eliminates error-prone self-reporting and visits to the doctor

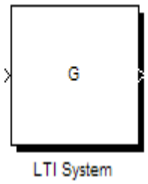
Example

DEMO: pick and place robot



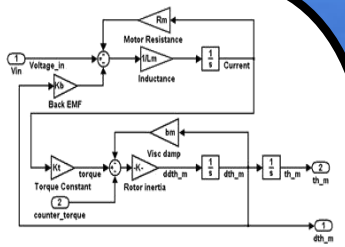
Different modeling approaches



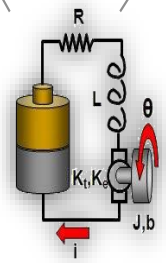


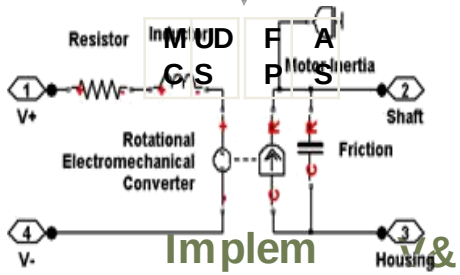
Modeling

DATA Driven



Simulink (Block diagram)





Implement

V&V

Physical Modeling (Schematic)

Internal

Simu

Run on targe re

Run Simulink models on low-cost target hardware

- With a click, your model runs on target hardware
- new – Support for Raspberry Pi®
- new – R2013a: Gumstix® Overo®
- –R2012b: PandaBoard
- –R2012a: Arduino®, LEGO® MINDSTORMS® NXT and BeagleBoard

BeagleBoard

PandaBoard

Arduino®

LEGO® MINDSTORMS® NXT

Gumstix® Overo®

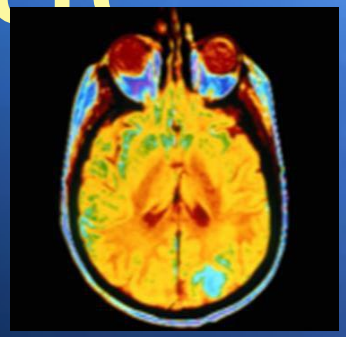
new

Raspberry Pi®

new

Machine Learning is Everywhere

- Image Recognition
- Speech Recognition
- Stock Prediction
- Medical Diagnosis
- Data Analytics
- Robotics







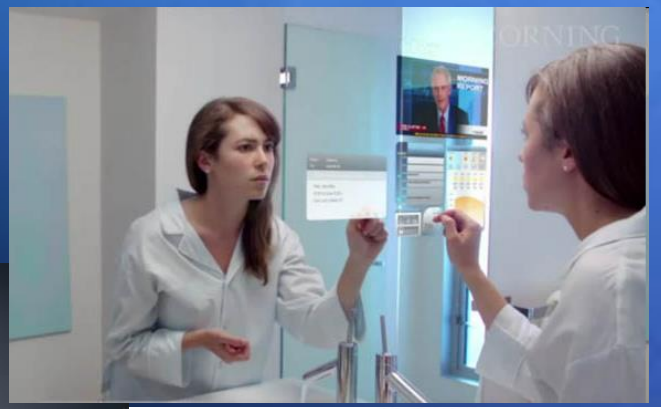
1 NEW DEFINITION IS ADDED ON urban
1,600+ READS ON Scribd
13,000+ HOURS MUSIC STREAMING ON PANDORA
12,000+ NEW ADS POSTED ON craigslist
370,000+ MINUTES VOICE CALLS ON skype
98,000+ TWEETS
320+ NEW twitter ACCOUNTS
100+ NEW Linked in ACCOUNTS
1 associatedcontent NEW ARTICLE IS PUBLISHED
THE WORLD'S LARGEST COMMUNITY CREATED CONTENT!!
6,600+ NEW PICTURES ARE UPLOADED ON flickr
50+ WordPress DOWNLOADS
695,000+ facebook STATUS UPDATES
125+ PLUGIN DOWNLOADS
79,364 WALL POSTS
510,040 COMMENTS
1,700+ Firefox DOWNLOADS
694,445 SEARCH QUERIES
168 MILLION EMAILS ARE SENT
60+ NEW BLOGS
1,500+ BLOG POSTS
70+ DOMAINS REGISTERED
25+ HOURS TOTAL DURATION
600+ NEW VIDEOS
100+ Answers.com
40+ YAHOO! ANSWERS
QUESTIONS ASKED ON THE INTERNET...
20,000+ NEW POSTS ON tumblr.
13,000+ iPhone APPLICATIONS DOWNLOADED
IN 60 SECONDS...
Google
Google Search
GO-Globe.com

Sensor devices are becoming widely available

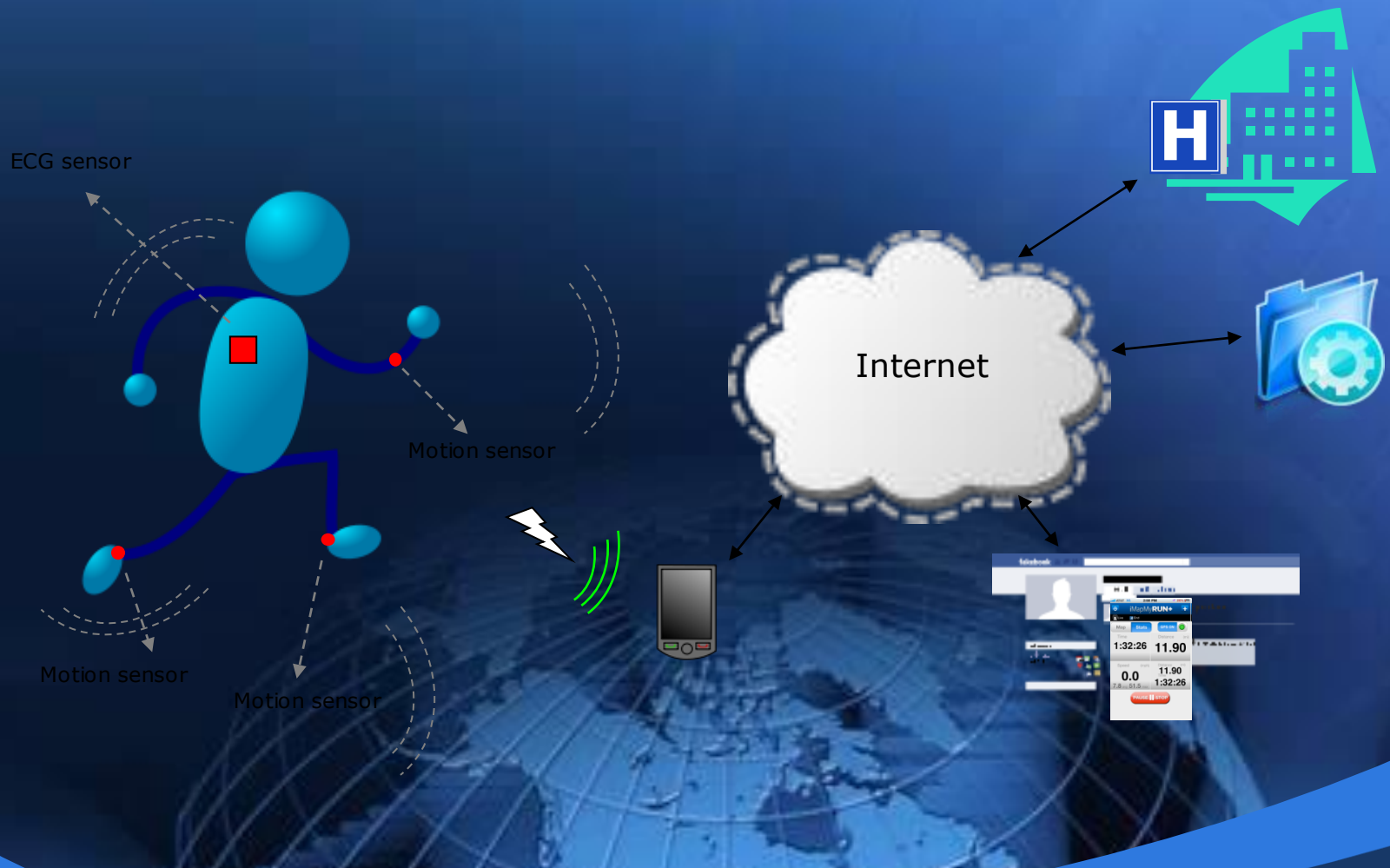
- Programmable devices
- Off-the-shelf gadgets/tools

More “Things” are being connected

Home/daily-life devices
Business and
Public infrastructure
Health-care
…



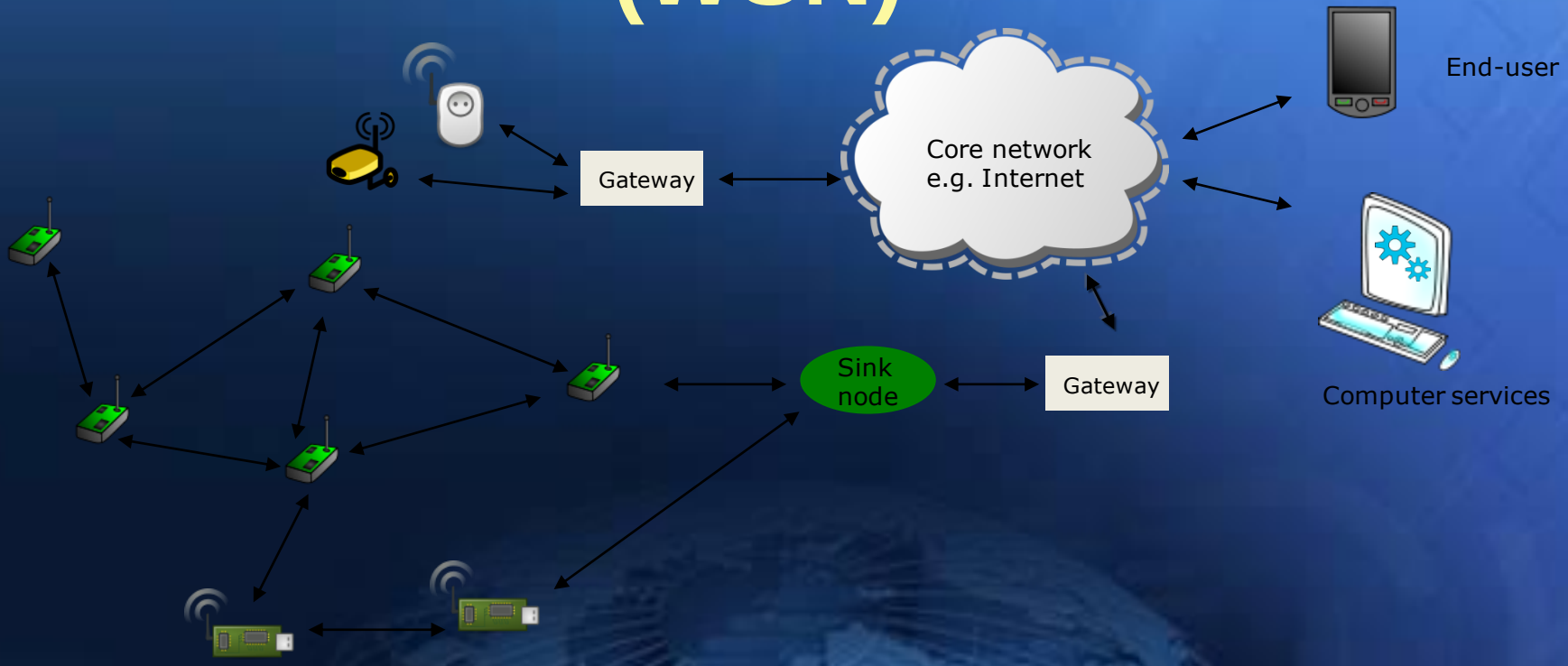
People Connecting to Things



Things Connecting to Things

- Complex and heterogeneous resources and networks

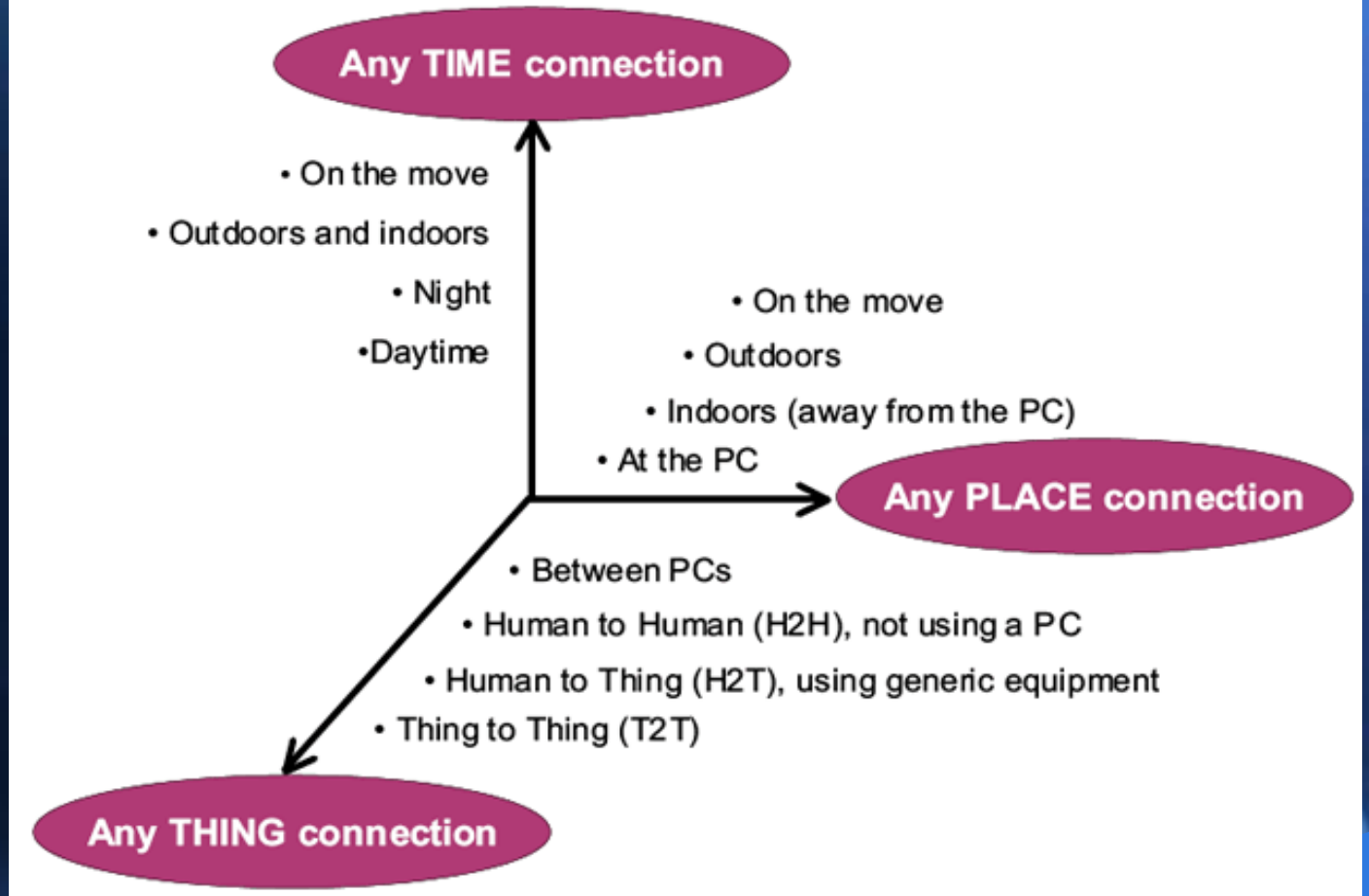
Wireless Sensor Networks (WSN)



- The networks typically run Low Power Devices
- Consist of one or more sensors, could be different type of sensors (or actuators)

How are the networks changing?

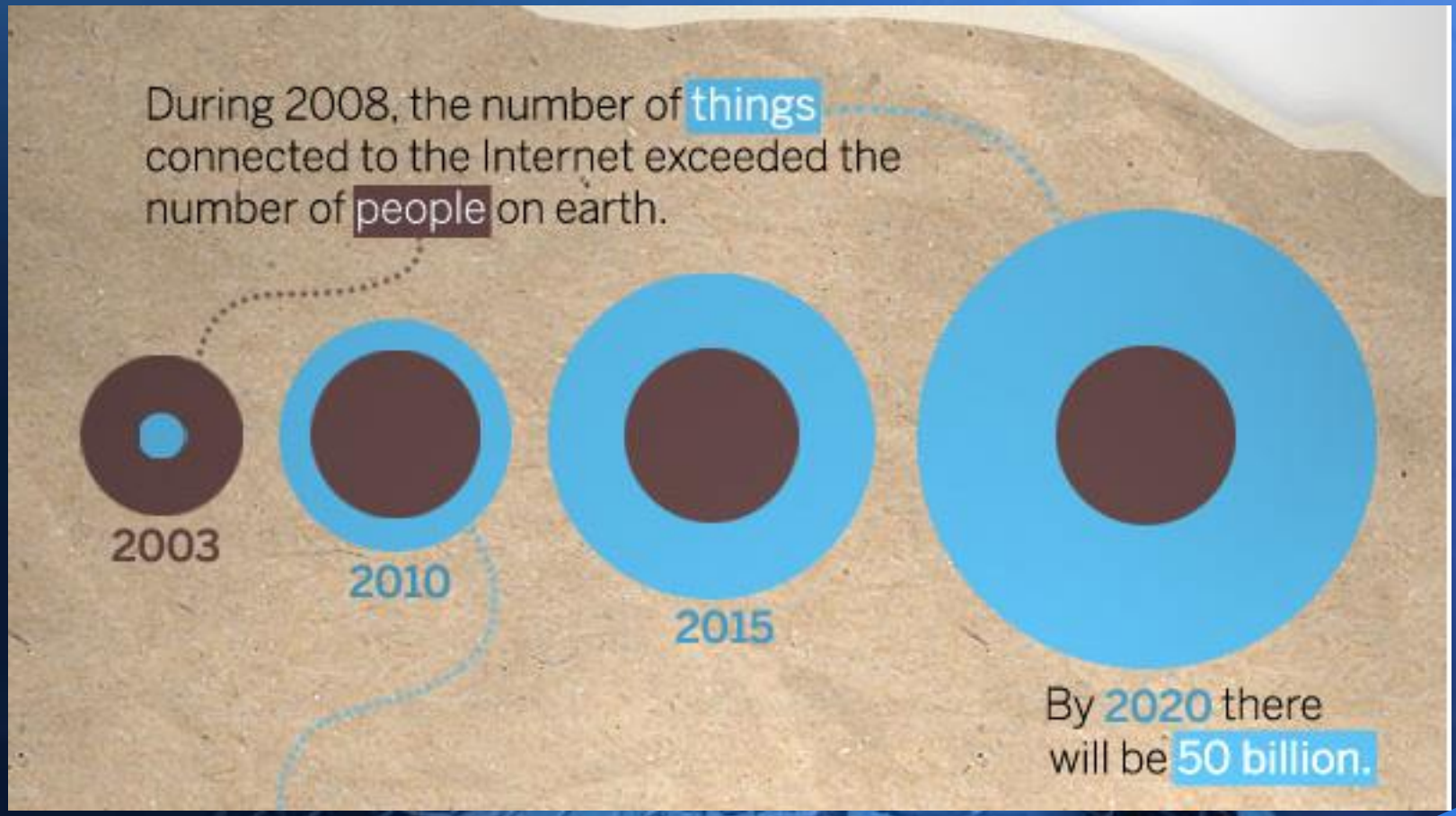
- Extensions
  - More nodes, more connections, IPv6, 6LowPan,...
  - Any TIME, Any PLACE + Any THING
  - M2M, IoT
    - Billions of interconnected devices,
    - Everybody connected.
- Expansions
  - Broadband
- Enhancements
  - Smart networks
  - Data-centric and content-oriented networking
  - Context-aware (autonomous) systems



Source: ITU adapted from Nomura Research Institute

73

“Thing” connected to the internet



Sources: Cisco IBSG, Jim Cicconi, AT&T , Steve Leibson, Computer History Museum, CNN, University of Michigan, Fraunhofer

Image Courtesy: : CISCO

74

Internet of Things (IoT)

Extending the current Internet and providing connection, communication, and inter-networking between devices and physical objects, or "Things," is a growing trend that is often referred to as the *Internet of Things*.

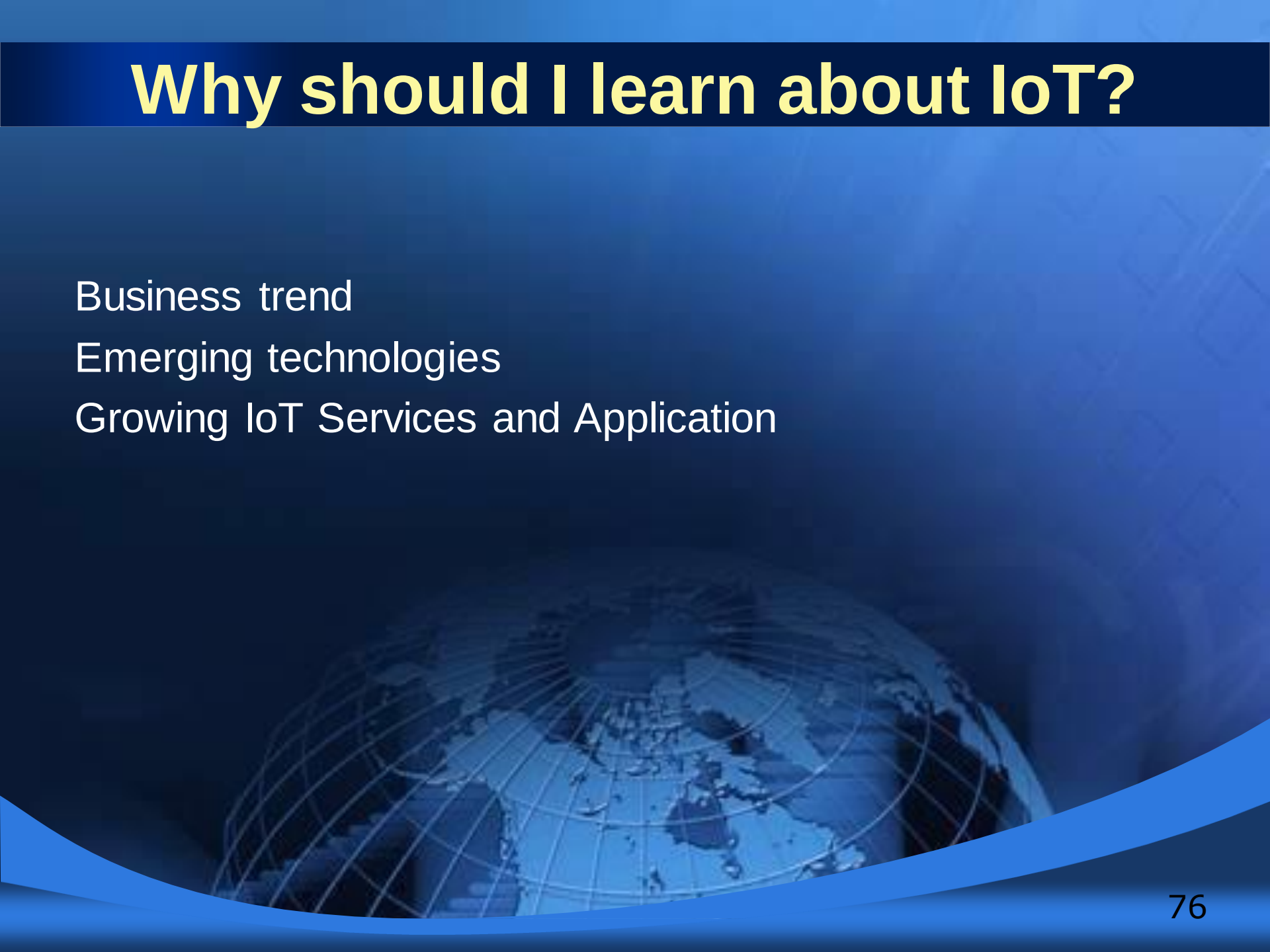
“The technologies and solutions that enable integration of real world data and services into the current information networking technologies are often described under the umbrella term of the Internet of Things (IoT)”

Why should I learn about IoT?

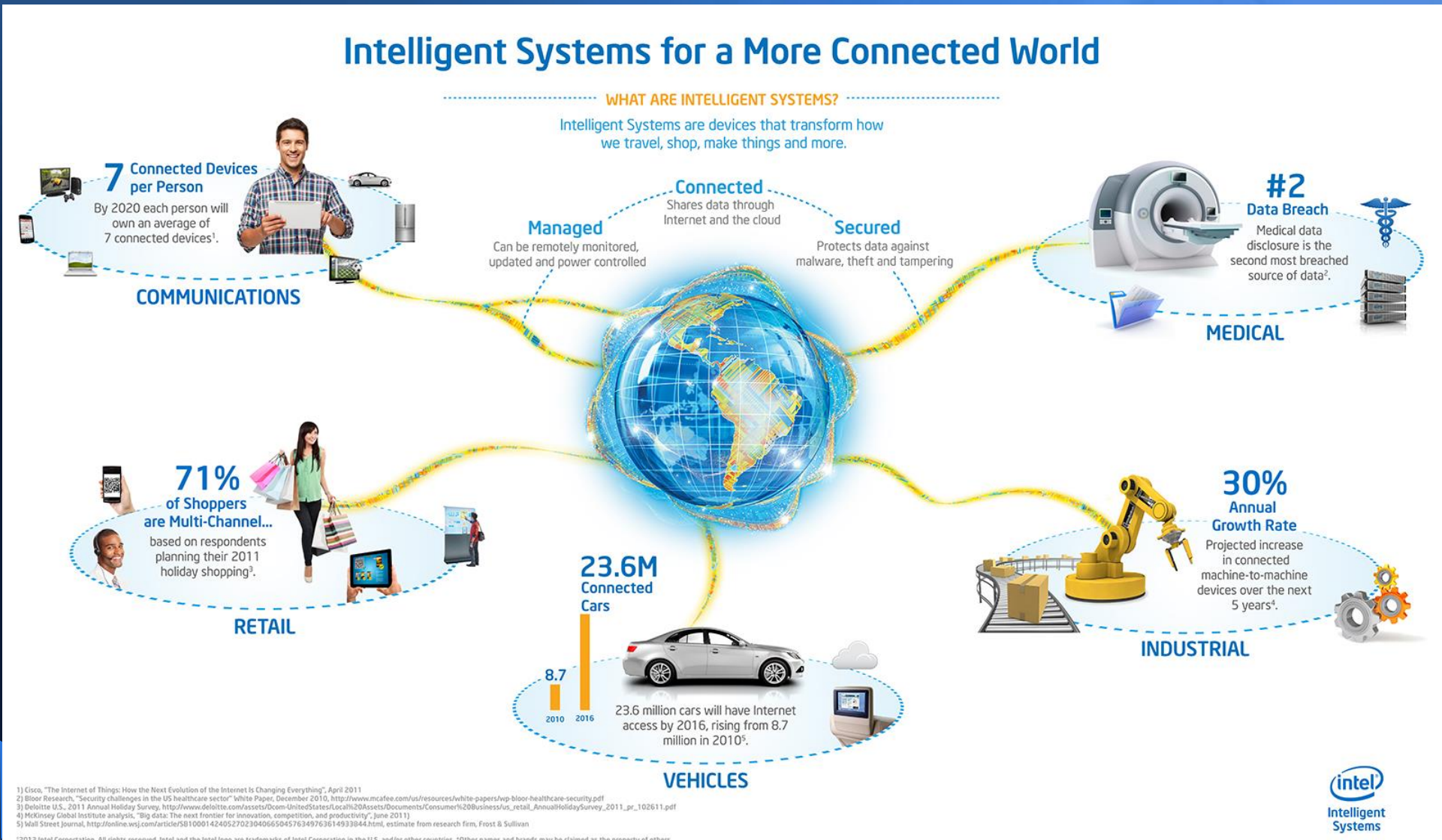
Business trend

Emerging technologies

Growing IoT Services and Application

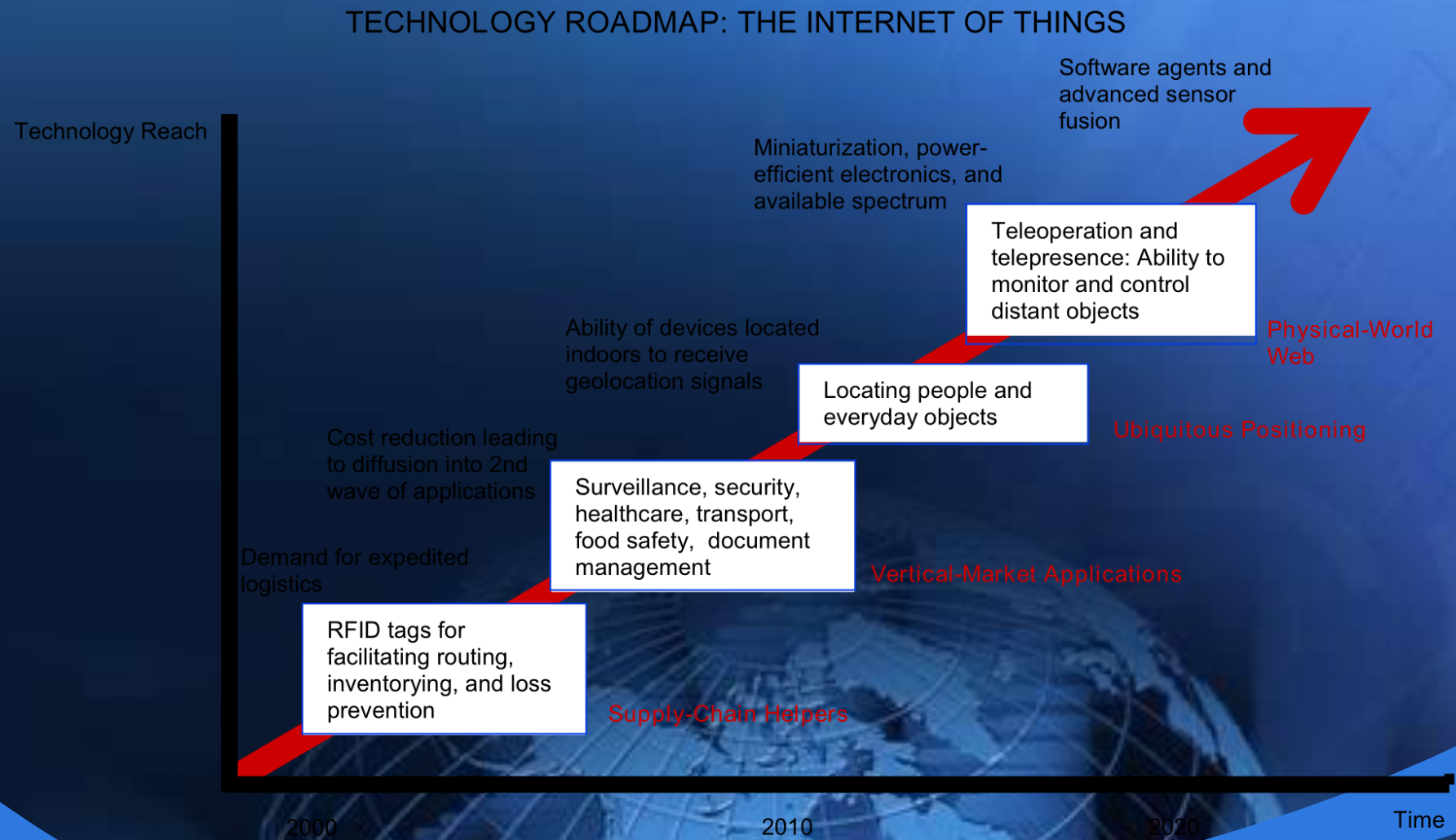


Opportunities



Source: http://blog.trentonsystems.com/internet-of-things-crosses-business-personal-boundaries/

Technology trend



Source: SRI Consulting Business Intelligence

Market growth

"According to a study conducted by Frost & Sullivan in 2011, the global RFID market of $3 billion to $4 billion (in 2009) will grow by twelve percent per year through 2016 and reach a volume of approximately $6.5 billion to almost $9 billion."

80 percent of all households in the European Union are expected to have intelligent power meters by 2020.

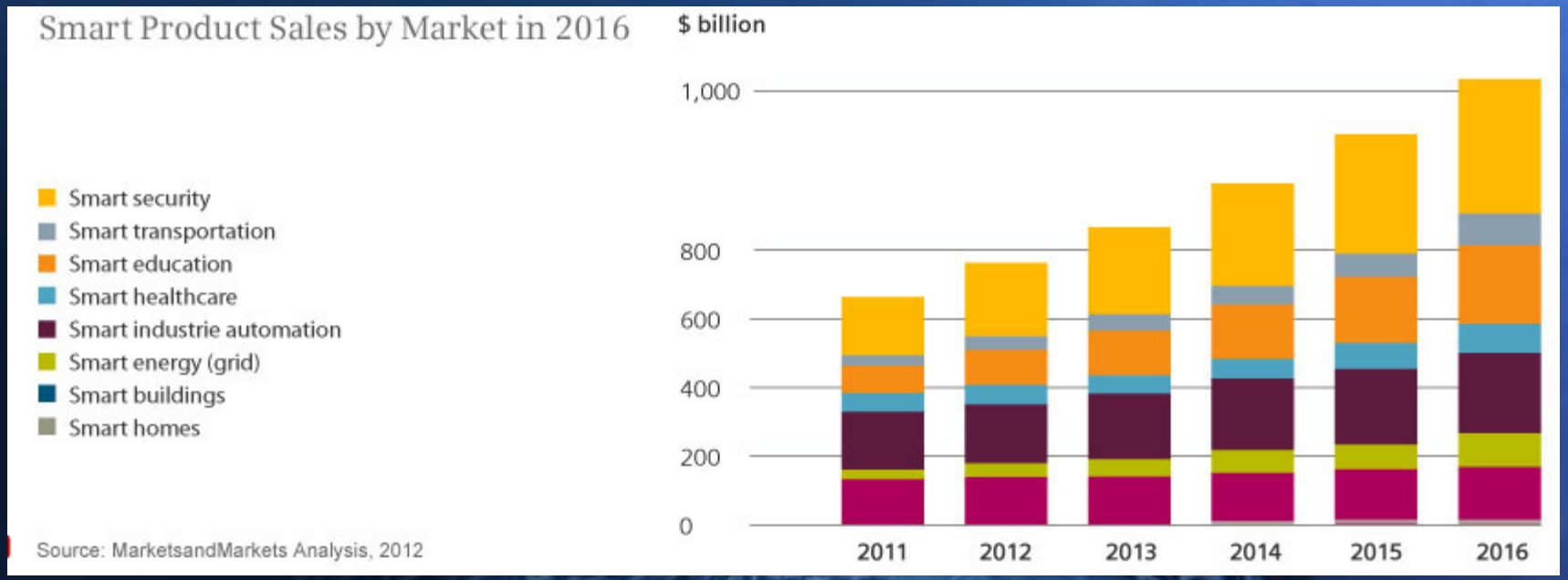
A building's energy management can then be monitored and administered remotely via a smartphone or a PC. Market experts predict that this global market, which represented $5.3 billion in 2010.

In February 2012 the Chinese government therefore decided to set up a fund of approximately $775 million to support this field in the next five years. It will grow to $11 billion by 2015.

This sector is expected to grow to $116 billion by 2015, according to a report published by the Xinhua News Agency in late 2010.

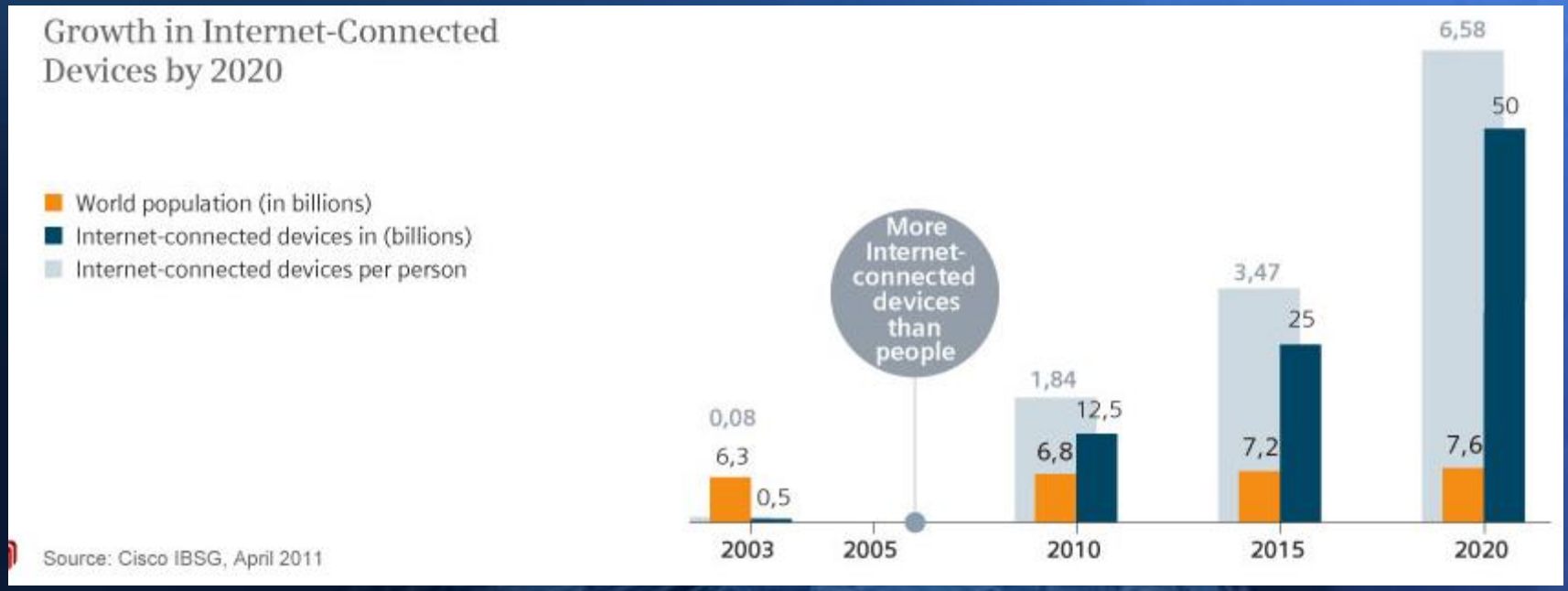
Source: Siemens, http://www.siemens.com/innovation/apps/pof_microsite/_pof-fall-2012/_html_en/facts-and-forecasts-growth-market-of-the-future.html

Smart product sales



Source: Siemens, http://www.siemens.com/innovation/apps/pof_microsite/_pof-fall-2012/_html_en/facts-and-forecasts-growth-market-of-the-future.html

Internet Connected devices



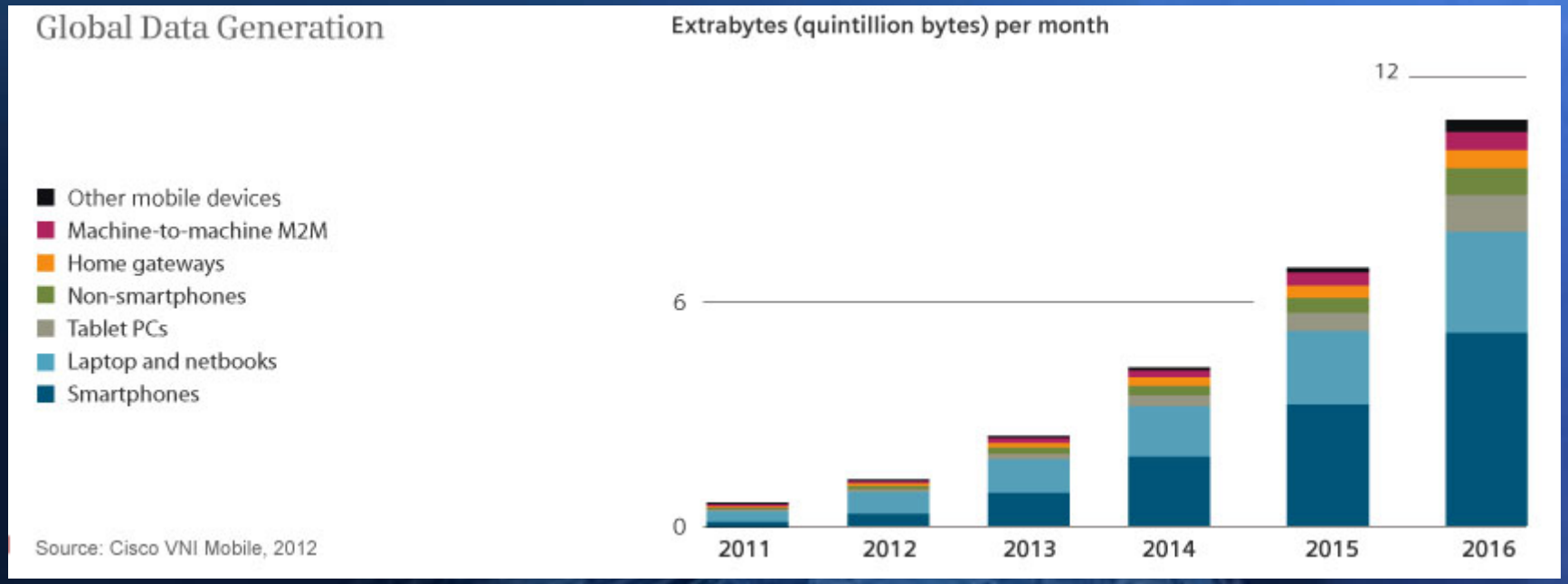
Source: Siemens, http://www.siemens.com/innovation/apps/pof_microsite/_pof-fall-2012/_html_en/facts-and-forecasts-growth-market-of-the-future.html

Global Data Generation

- Everyday around 20 quintillion (10^18) bytes of data are produced (Source: http://www-01.ibm.com/software/data/bigdata/).

- This data includes textual content (unstructured, semi-structured, structured) to multimedia content (images, video and audio), on a variety of platforms (enterprise, social media, and sensors).

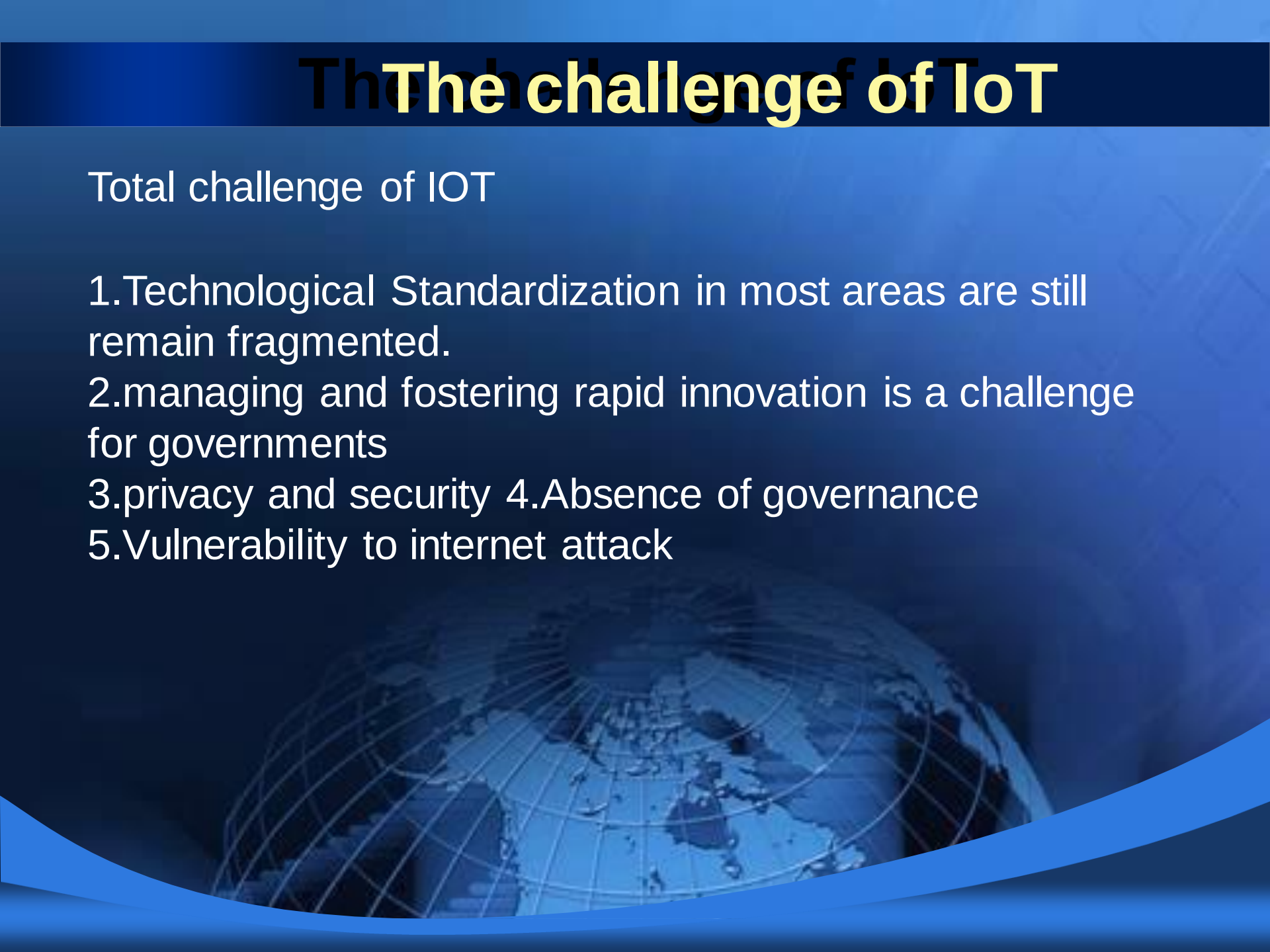
Data Generation



The challenge of IoT

Total challenge of IOT

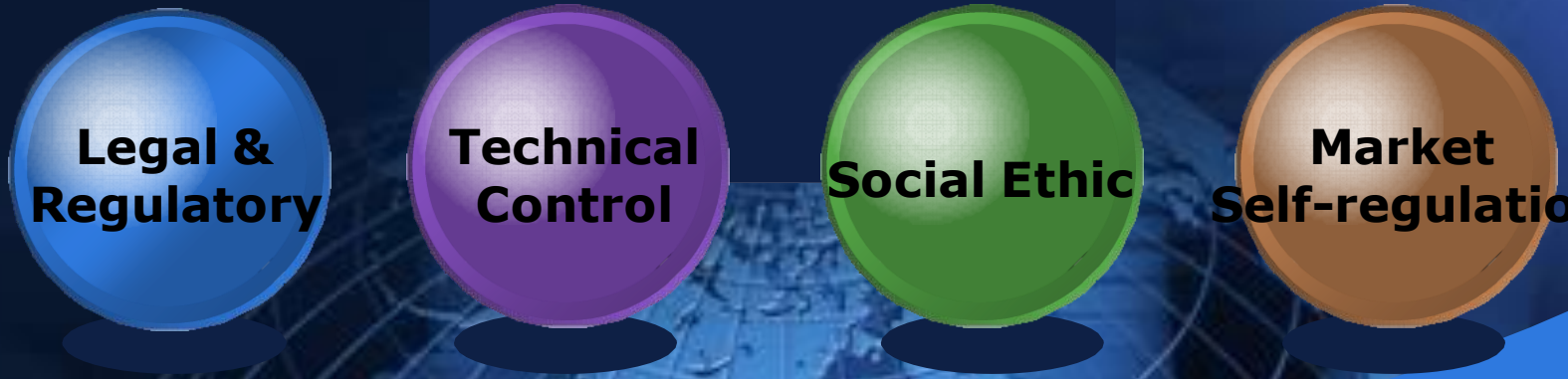
1.Technological Standardization in most areas are still remain fragmented.
2.managing and fostering rapid innovation is a challenge for governments
3.privacy and security 4.Absence of governance
5.Vulnerability to internet attack



The challenge of IoT

How to convincing users that the IoT technology will protect their data and privacy when tracking

Potential Solutions



The challenge of IoT

Solution of the main challenge: Education and Information

Central aspects for the success of the upcomming IoT

- **Capacity building programs**
- **Breadth and depth engines**
- **Strategic communication Plan**
- **Opportunities Vs Threats of the IoT**

The challenge of IoT

Solution of the main challenge: Legislation

Two approaches :

- The real law
- The Cyberlaw

Lack of legal instruments

1. Privacy
2. Intellectual property rights
3. Security
4. Data Protection
5. Cybercrime

The challenge of IoT

Limitation of IoT

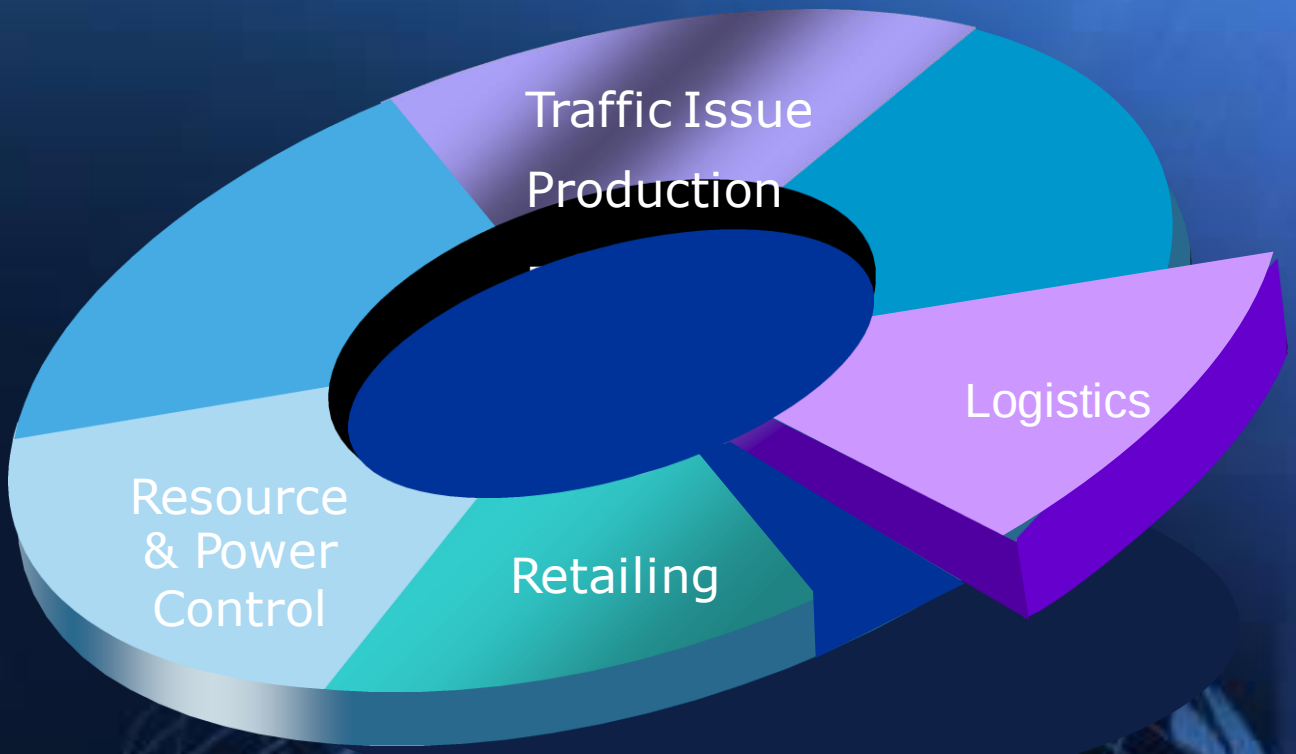
The application of IoT in extreme situations are still not tested (outer space, very hot or cold area)

Standardization and Interoperability

Legal instruments

Technical limitation in some cases

Future of IOT



Future of IOT

There are three core sectors of the IoT :

- enterprise,
- home, and
- government,

with the Enterprise Internet of Things (EIoT) being the largest of the three. By 2019, the EIoT sector is estimated to account for nearly 40% or 9.1 billion devices

Future of IOT

Size considerations

The Internet of objects would encode 50 to 100 trillion objects, and be able to follow the movement of those objects. Human beings in surveyed urban environments are each surrounded by 1000 to 5000 trackable objects

Space considerations

Internet of Things, things are able to take actions on their own initiative, this human-centric mediation role is eliminated, and the time-space context that we as humans take for granted must be given a central role in this information ecosystem. Just as standards play a key role in the Internet and the Web, geospatial standards will play a key role in the Internet of Things

Criticism and controversies

While many technologists tout the Internet of Things as a step towards a better world, scholars and social observers have doubts about the promises of the ubiquitous computing revolution

Privacy, autonomy and control

Future of the IoT

Peter-Paul Verbeek, a professor of philosophy of technology, Netherlands, writes that technology already influences our moral decision making, which in turns affects human agency, privacy and autonomy. He cautions against viewing technology merely as a human tool and advocates instead to consider it as an active agent.

Justin Brookman, of the Center for Democracy and Technology, expressed concern regarding the impact of IoT on consumer privacy, saying that "There are some people in the commercial space who say, 'Oh, big data — well, let's collect everything, keep it around forever, we'll pay for somebody to think about security later.' The question is whether we want to have some sort of policy framework in place to limit that

Editorials at WIRED have also expressed concern, one stating 'What you're about to lose is your privacy. Actually, it's worse than that. You aren't just going to lose your privacy, you're going to have to watch the very concept of privacy be rewritten under your nose

With IoT, you dont need to go online because your environment is already there serving you….

So if we dont need to be online than IoT will eliminate the Internet online

Internet of Things Module

Image courtesy: Wilgengebroed


Thank You !
CIC