

اولین نشست تخصصی همگرایی اینترنت اشیا، داده های حجیم و پردازش ابری

Internet Of Things

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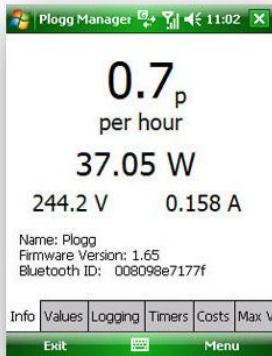
Agenda

- Internet Growth
- What is the IoT
- IoT in Business
- IoT Architecture
- IoT Challenge
- IoT Application
- WoT
- Convergence



Sensor devices are becoming widely available

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



Linker Intel Group



Image Sensor Device

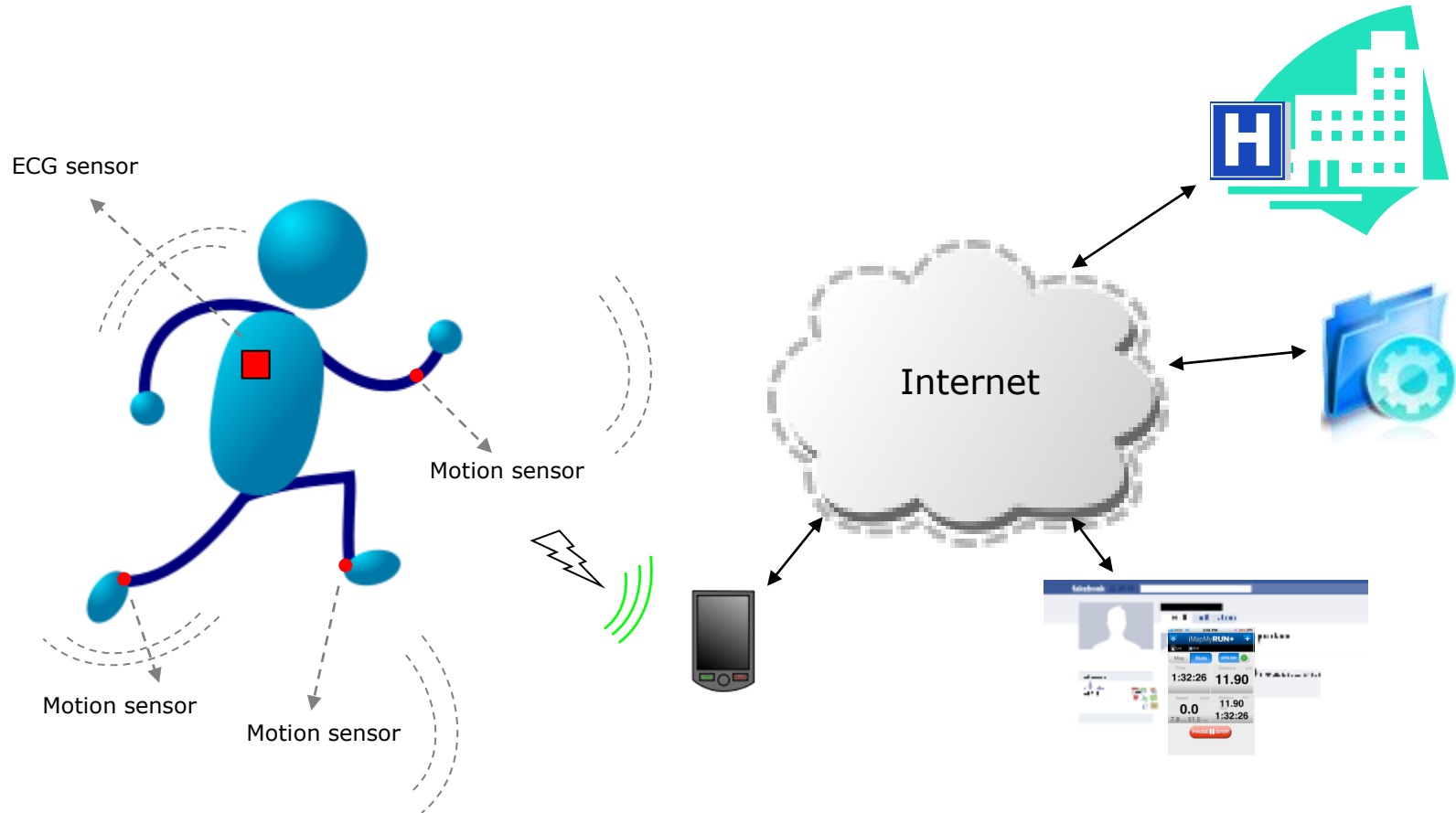


More “Things” are being connected

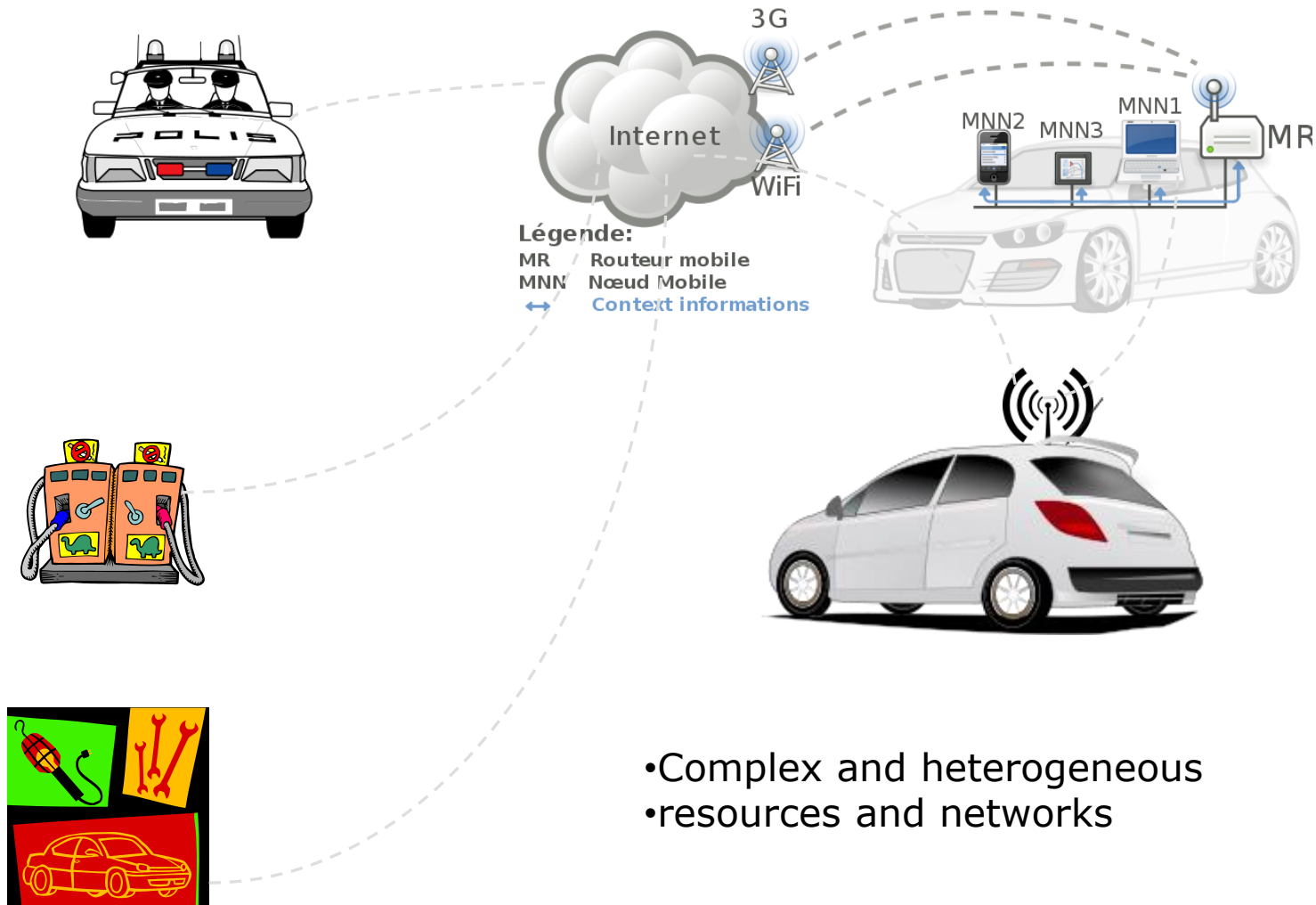
Home/daily-life devices
Business and
Public infrastructure
Health-care
...



People Connecting to Things

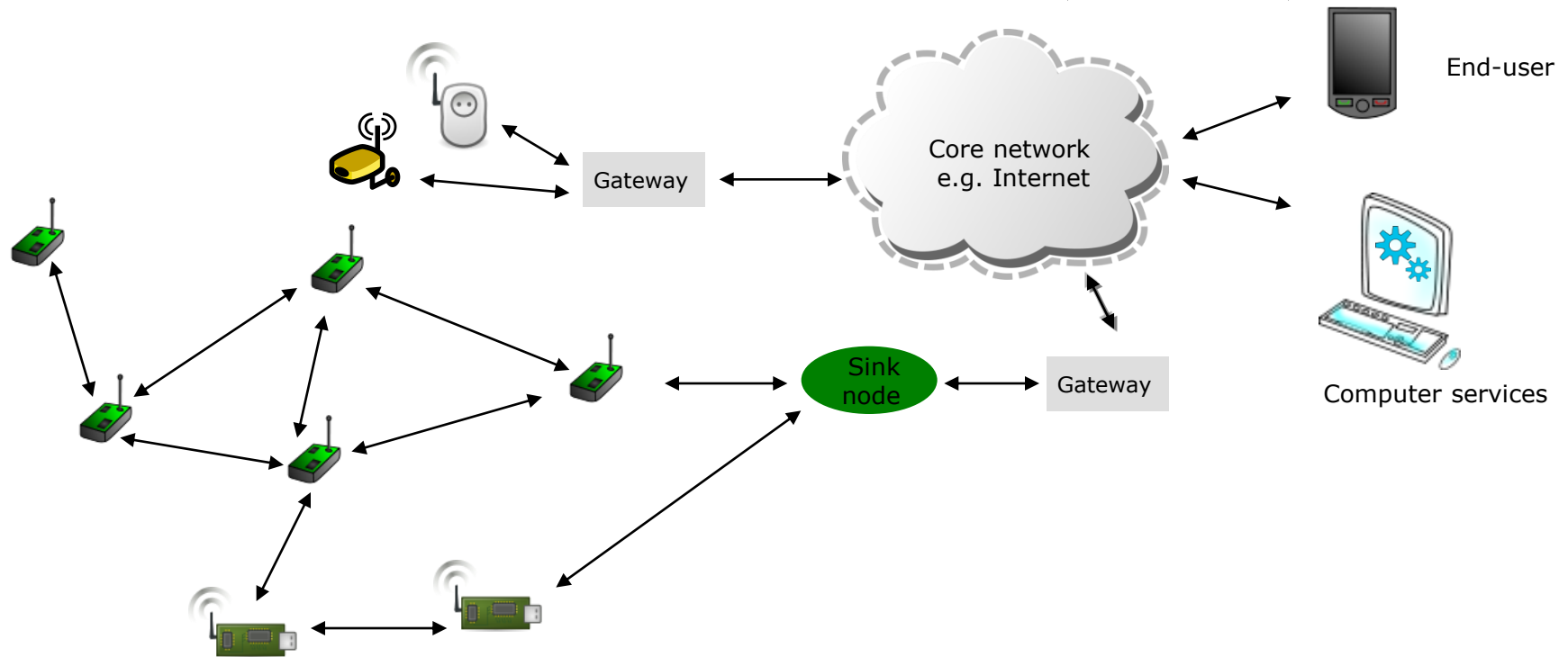


Things Connecting to Things



- Complex and heterogeneous
- resources and networks

Wireless Sensor Networks (WSN)

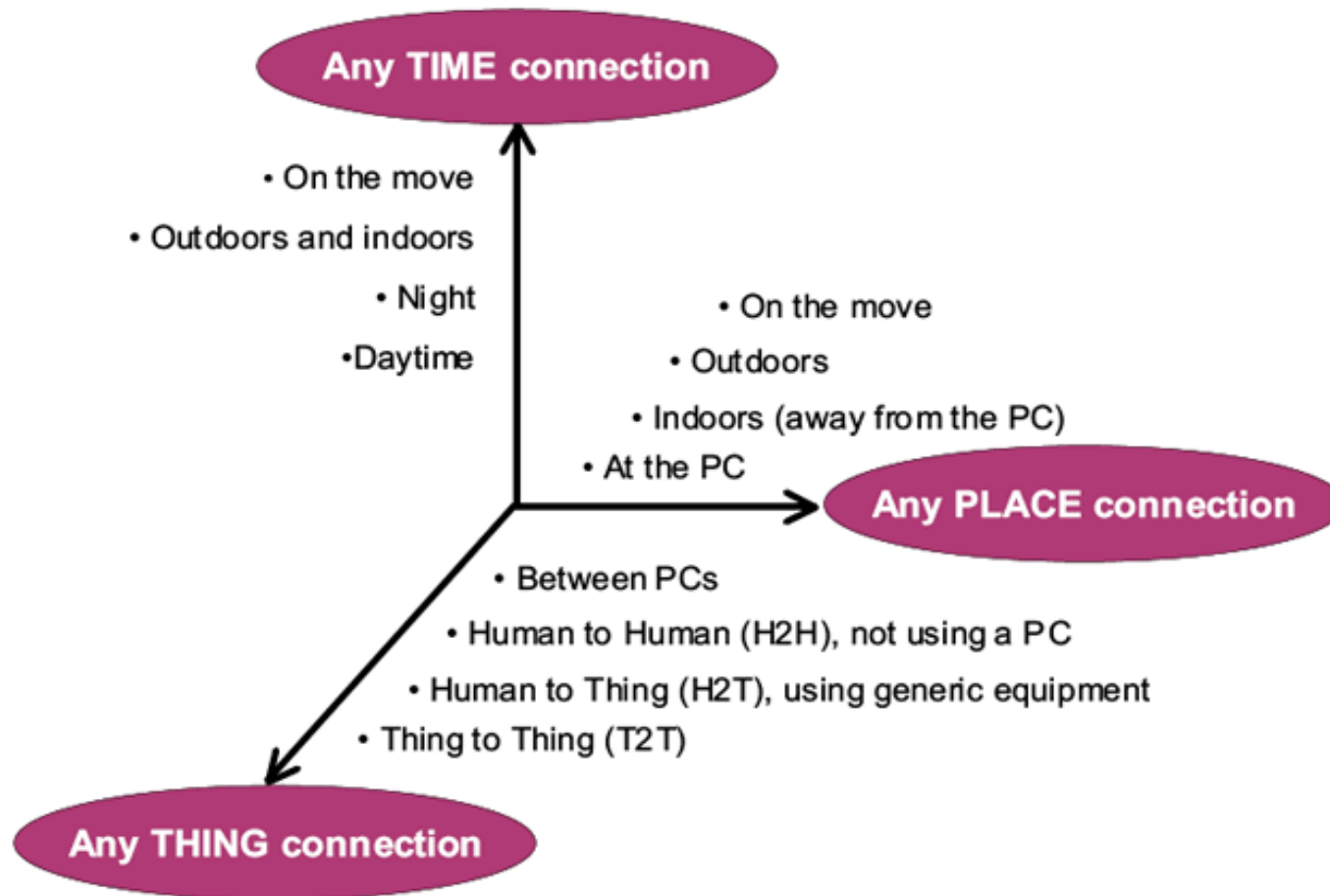


- The networks typically run Low Power Devices
- Consist of one or more sensors, could be different type of sensors (or actuators)

How are the networks changing?

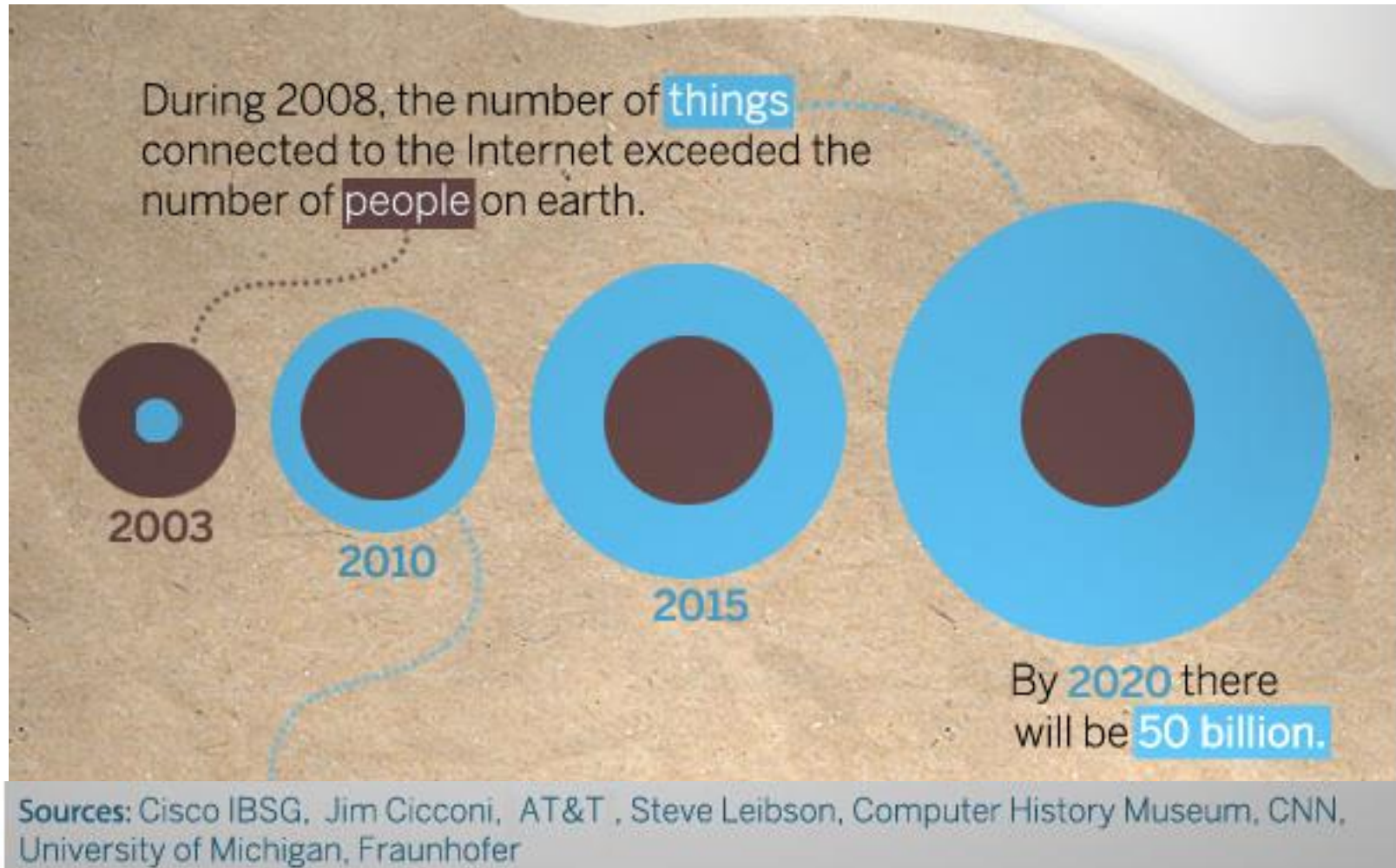
- Extensions
 - More nodes, more connections, IPv6, 6LowPan,...
 - Any **TIME**, Any **PLACE** + Any **THING**
 - M2M, IoT
 - Billions of interconnected devices,
 - Everybody connected.
- Expansions
 - Broadband
- Enhancements
 - Smart networks
 - Data-centric and content-oriented networking
 - Context-aware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

Future Networks

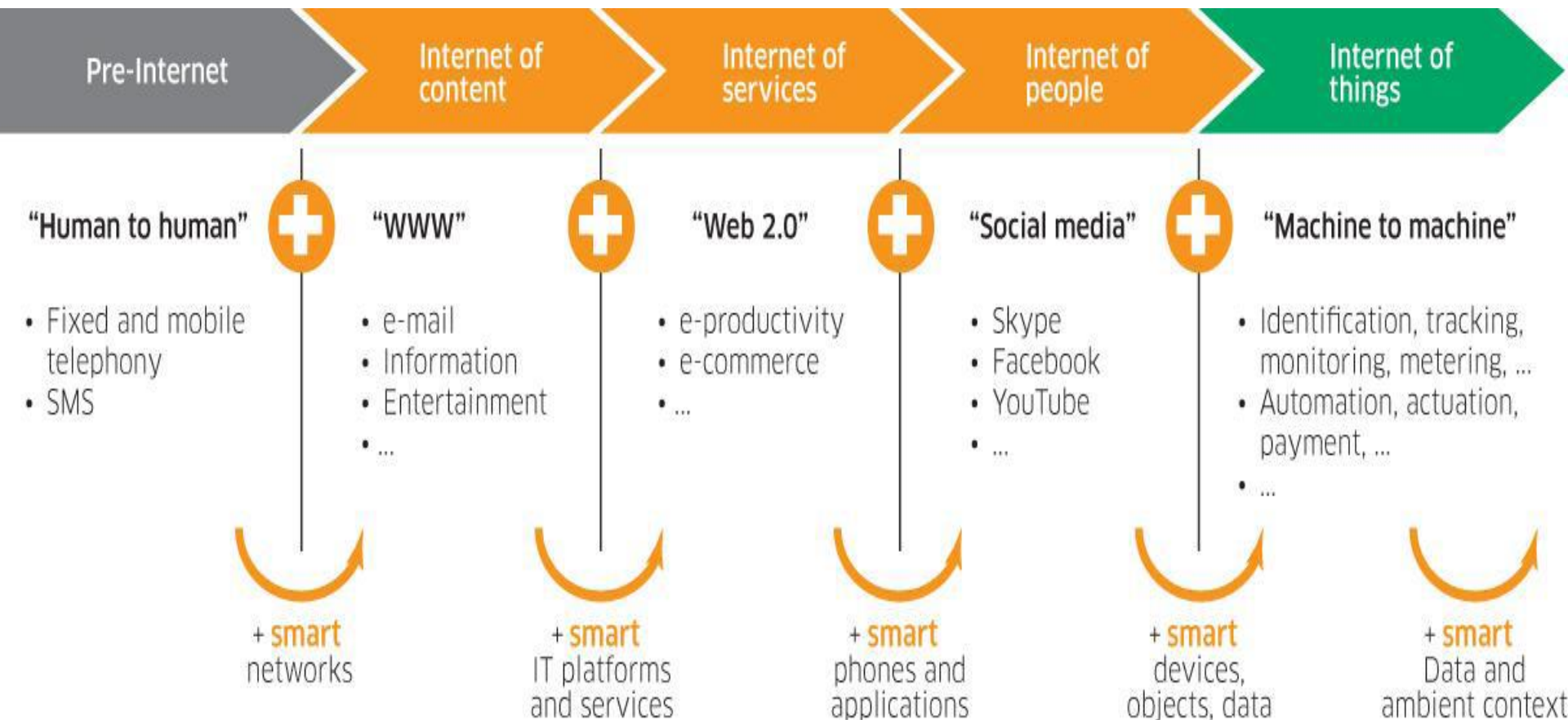


Source: ITU adapted from Nomura Research Institute

“Thing” connected to the internet



Internet Growth and Internet of Things



What is the Internet of Things?



- Internet connects all people, so it is called “the Internet of People”
- IoT connects all things, so it is called “the Internet of Things”

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.

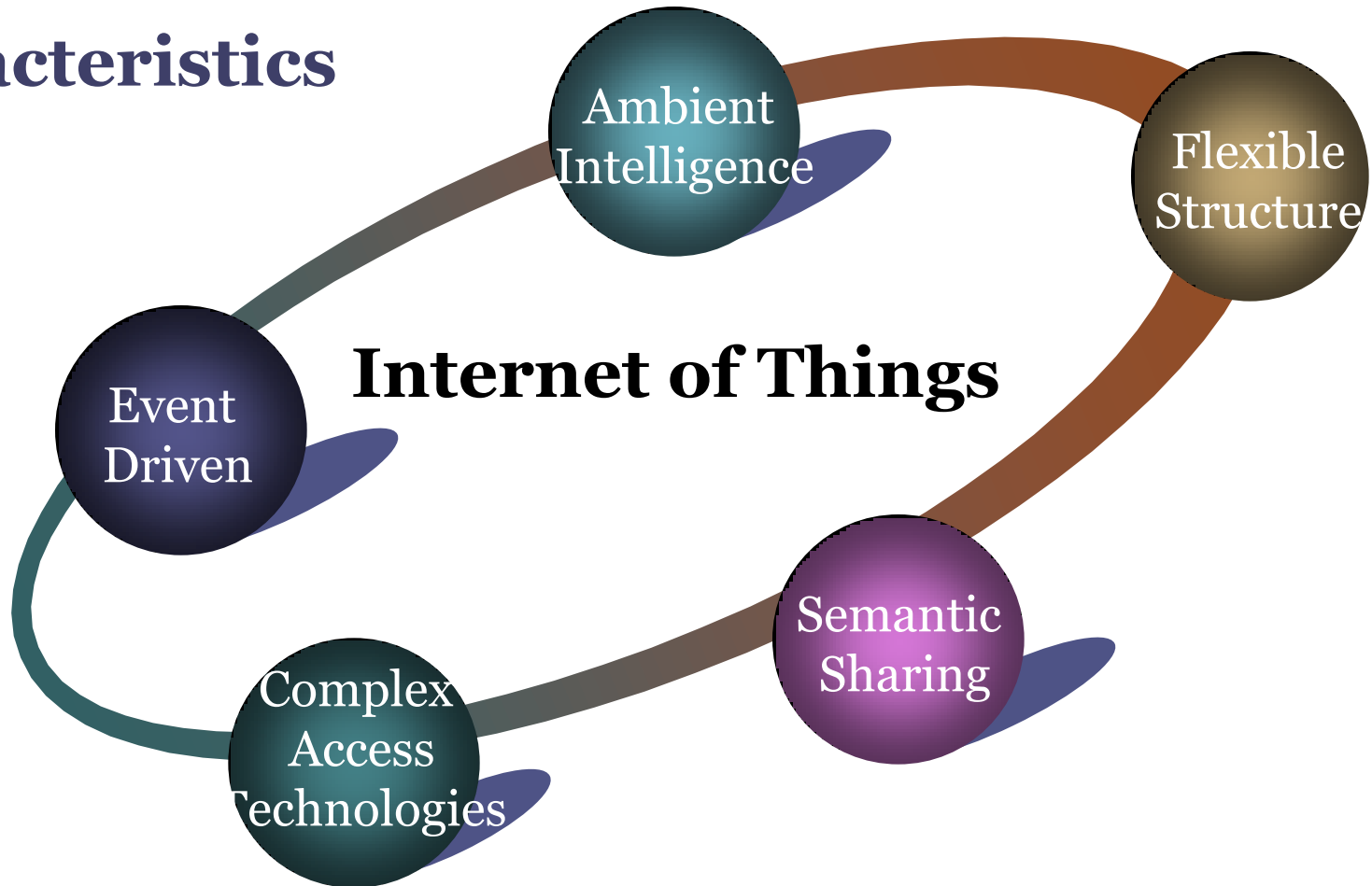
-----IoT 2008

(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

What's the Internet of Things

Characteristics



Why Internet of Things

- ➔ Dynamic control of industry and daily life
- ➔ Improve the resource utilization ratio
- ➔ Better relationship between human and nature
- ➔ Forming an intellectual entity by integrating human society and physical systems

Why Internet of Things (ii)

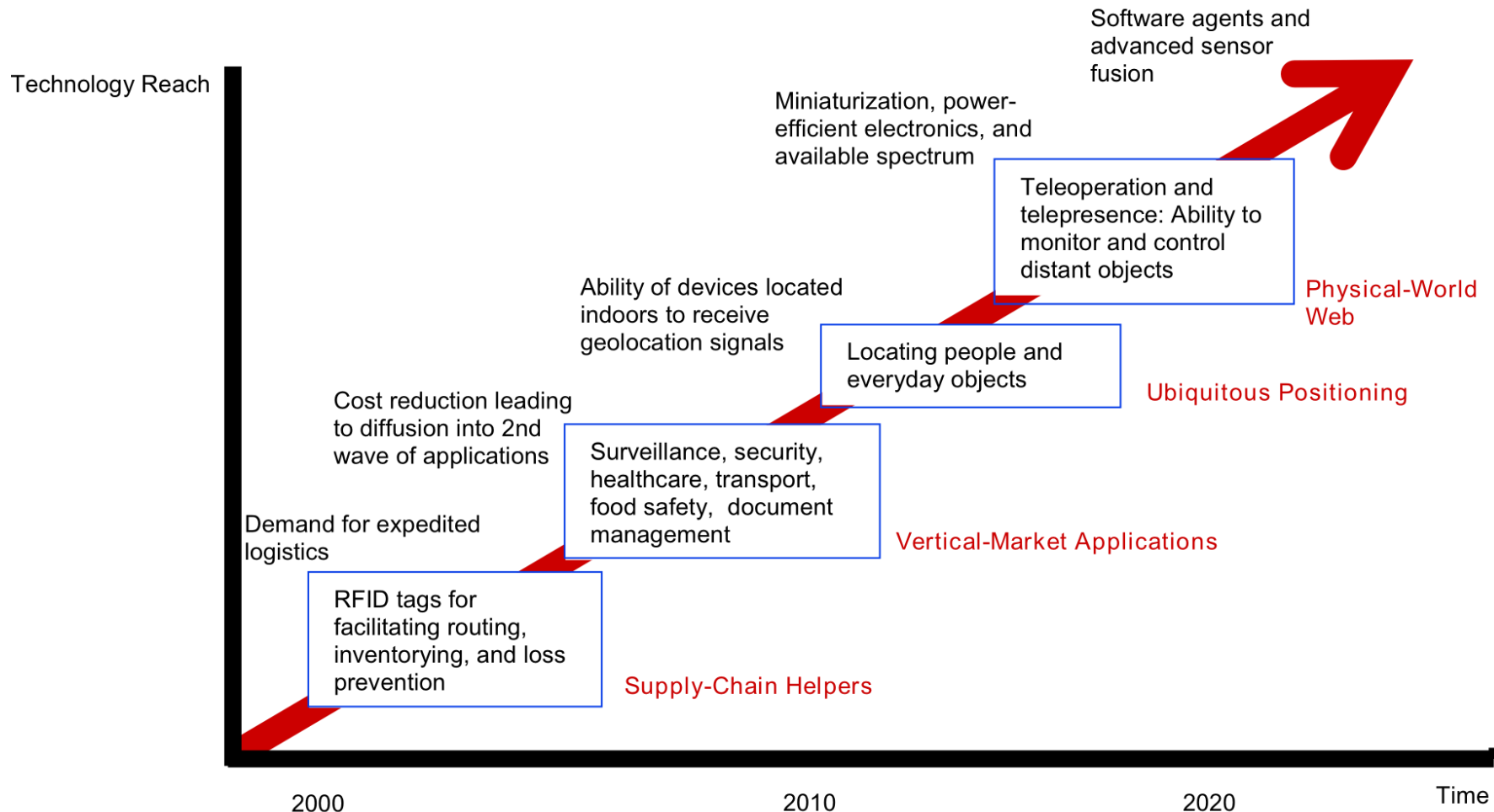
- ➔ Flexible configuration, ...
- ➔ Universal transport & internetworking
- ➔ Accessibility & Usability?
- ➔ Acts as technologies integrator

Why should I learn about IoT?

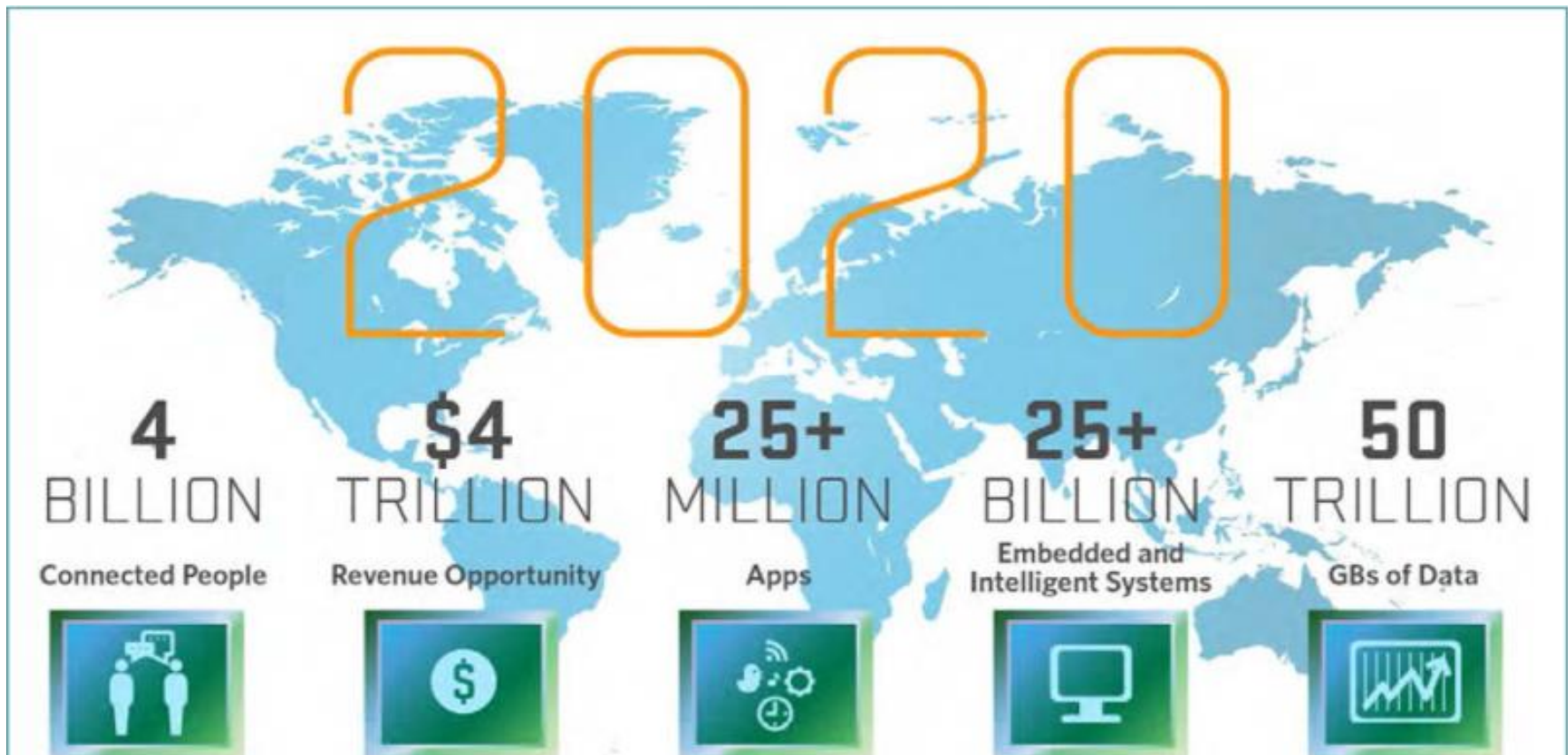
- Business trend
- Emerging technologies
- Growing IoT Services and Application

Technology trend

TECHNOLOGY ROADMAP: THE INTERNET OF THINGS



Market Growth



Source: Mario Morales, IDC

By 2020, the Internet of Things will have achieved “critical mass”. Linking enormous intelligence in the cloud to billions of mobile devices and having extremely inexpensive sensors and tags embedded in and on everything, will deliver an enormous amount of new value to almost every human being. The full benefits—in terms of health, safety and convenience—will be enormous.

Things and Value



28.1 BILLION

"UNITS" IN 2020

\$7.1 TRILLION

GLOBAL SOLUTION
REVENUES BY 2020

Source: IDC, May 2014

Gartner

26 BILLION

"UNITS" BY 2020

\$300 BILLION

SERVICES REVENUES
IN 2020

\$1.9 TRILLION

GLOBAL ECONOMIC
VALUE IN 2020

Source: Gartner, March 2014

**Machina
Research**

25 BILLION

M2M "CONNECTIONS"
BY 2022

OF WHICH

2.6 BILLION

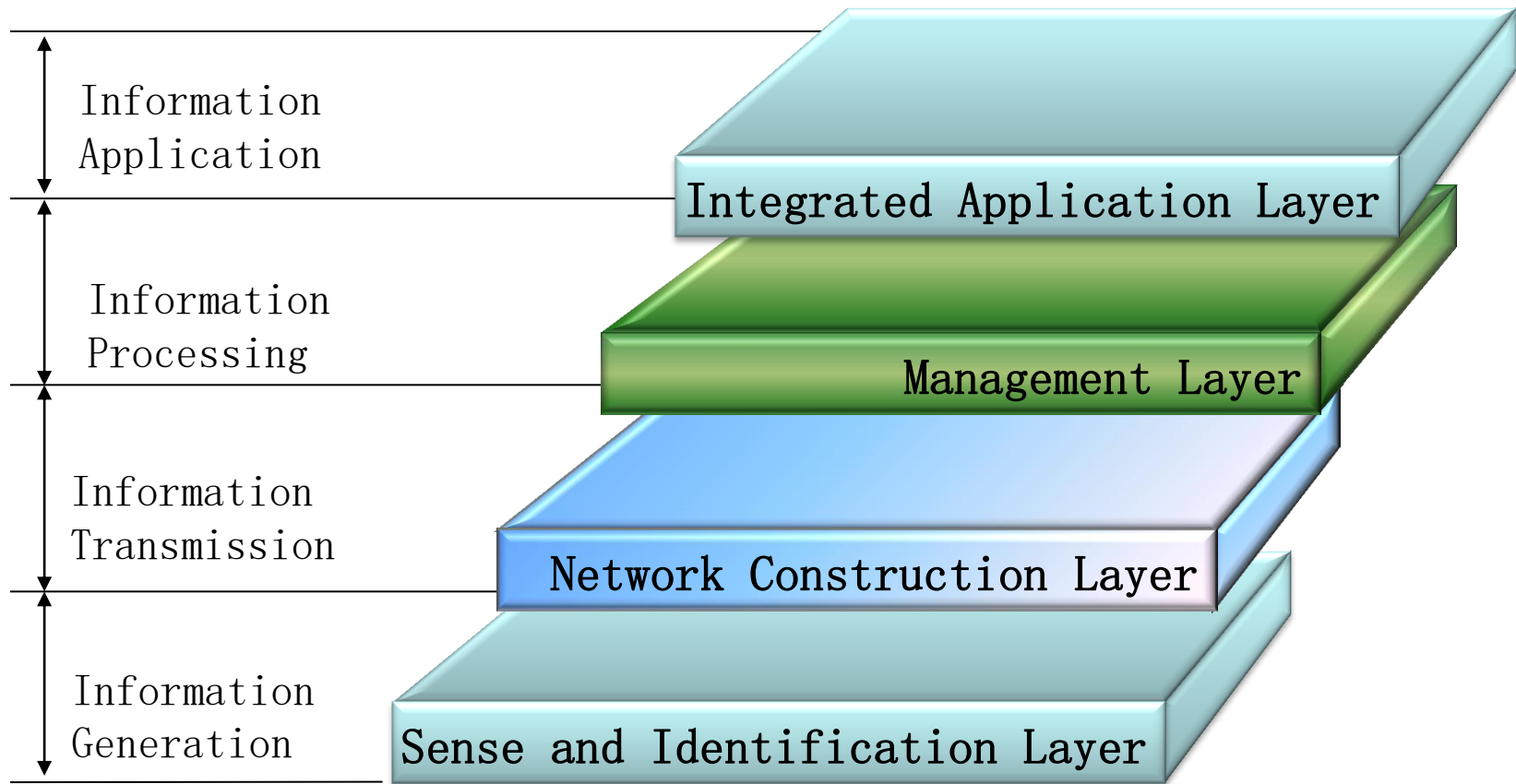
ARE CELLULAR

\$1.2 TRILLION

GLOBAL OPPORTUNITY
BY 2022

Source: Machina Research, January 2013

4 Layers Model for IoT



More on 4 Layers Model

Integrated Application



Smart
Logistic



Smart Grid



Green Building



Smart Transport



Env. Monitor

Information Processing



Data Center



Search
Engine



Smart Decision

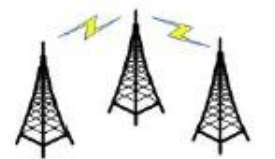


Info. Security



Data Mining

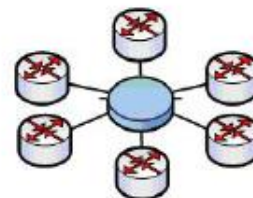
Network Construction



WWAN



WPAN



Internet



WMAN



WLAN

Sensing and Identification



GPS



Smart Device



RFID

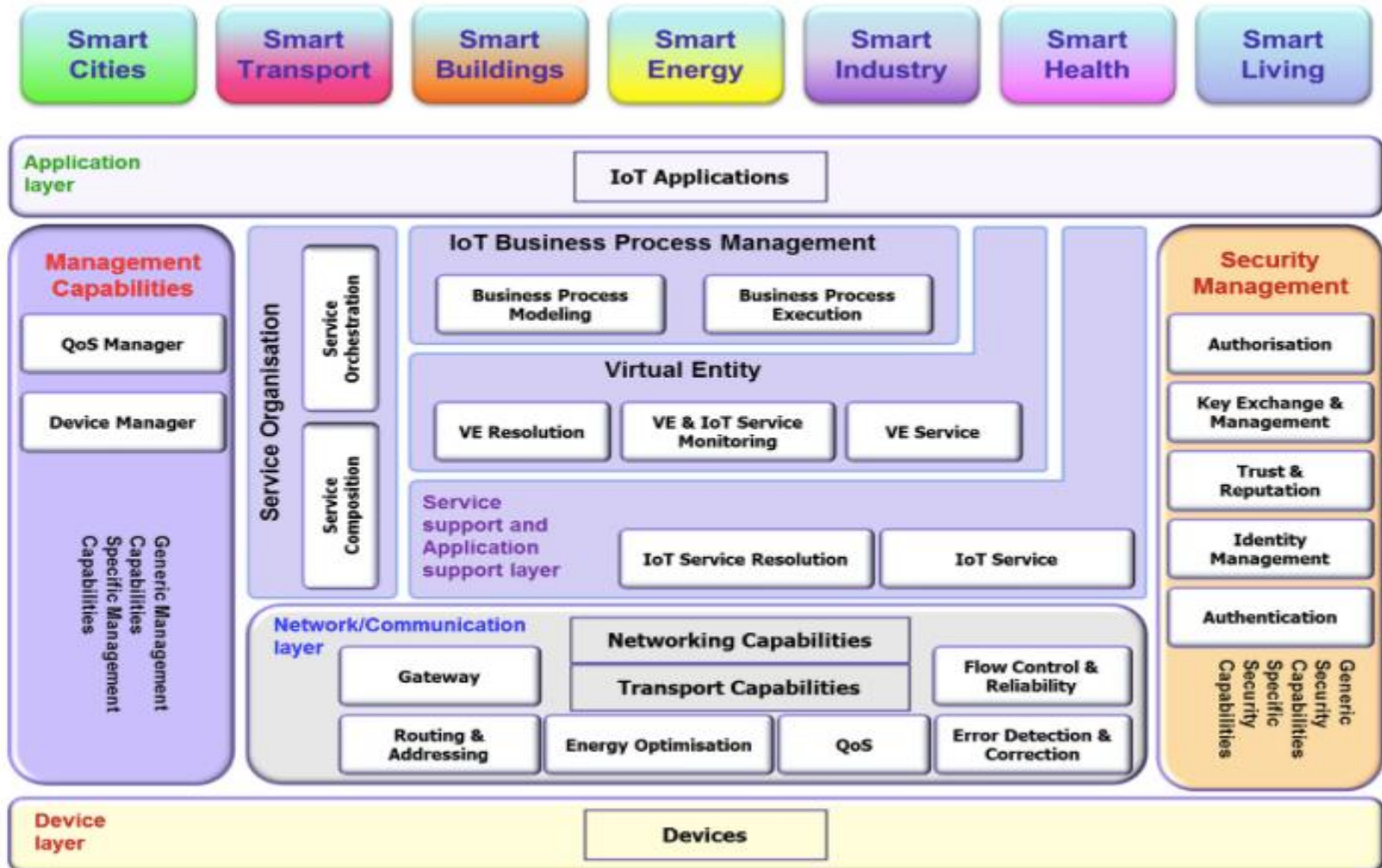


Sensor



Sensor

IoT Architecture



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

The Challenge of IoT

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

Potential Solutions

**Legal &
Regulatory**

**Technical
Control**

Social Ethic

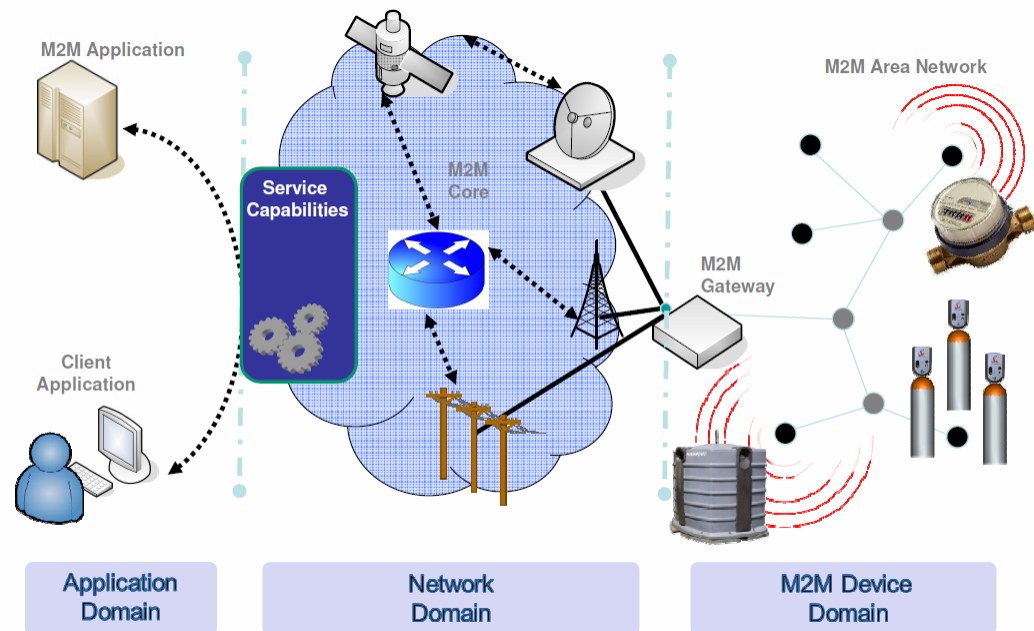
**Market
Self-regulation**

Machine-to-Machine

- **Machine-to-Machine (M2M)** communications represent technological solutions and deployments allowing **Machines, Devices** or **Objects** to communicate with each other, with **no human interactions**.

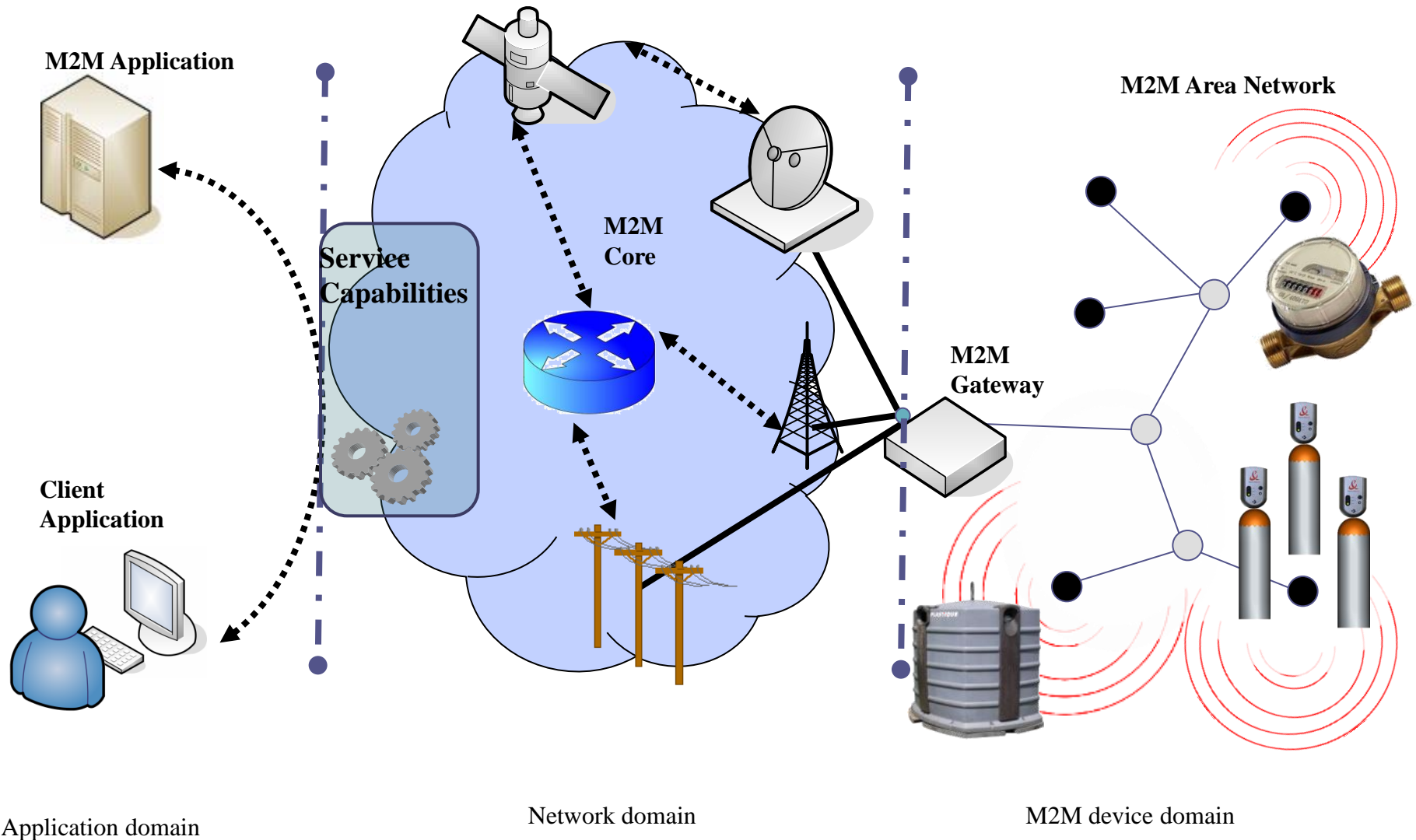
[source EU FP7 Exalted project]

- M2M system – Key features
 - Support of a huge number of devices
 - Seamless operability across multiple domains
 - Autonomous operation
 - Self organisation
 - Power efficiency



Source: ETSI

M2M Architecture (ETSI)



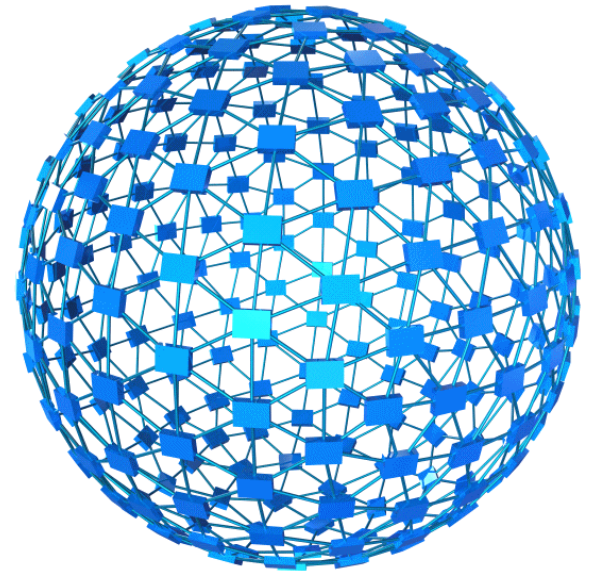
The Internet of Things

- Diversity range of applications
 - Interacting with large number of devices with various types
 - Multiple heterogeneous networks
 - Deluge of data
 - Feedback and interaction mechanisms
- (Actuation)



Web of Things

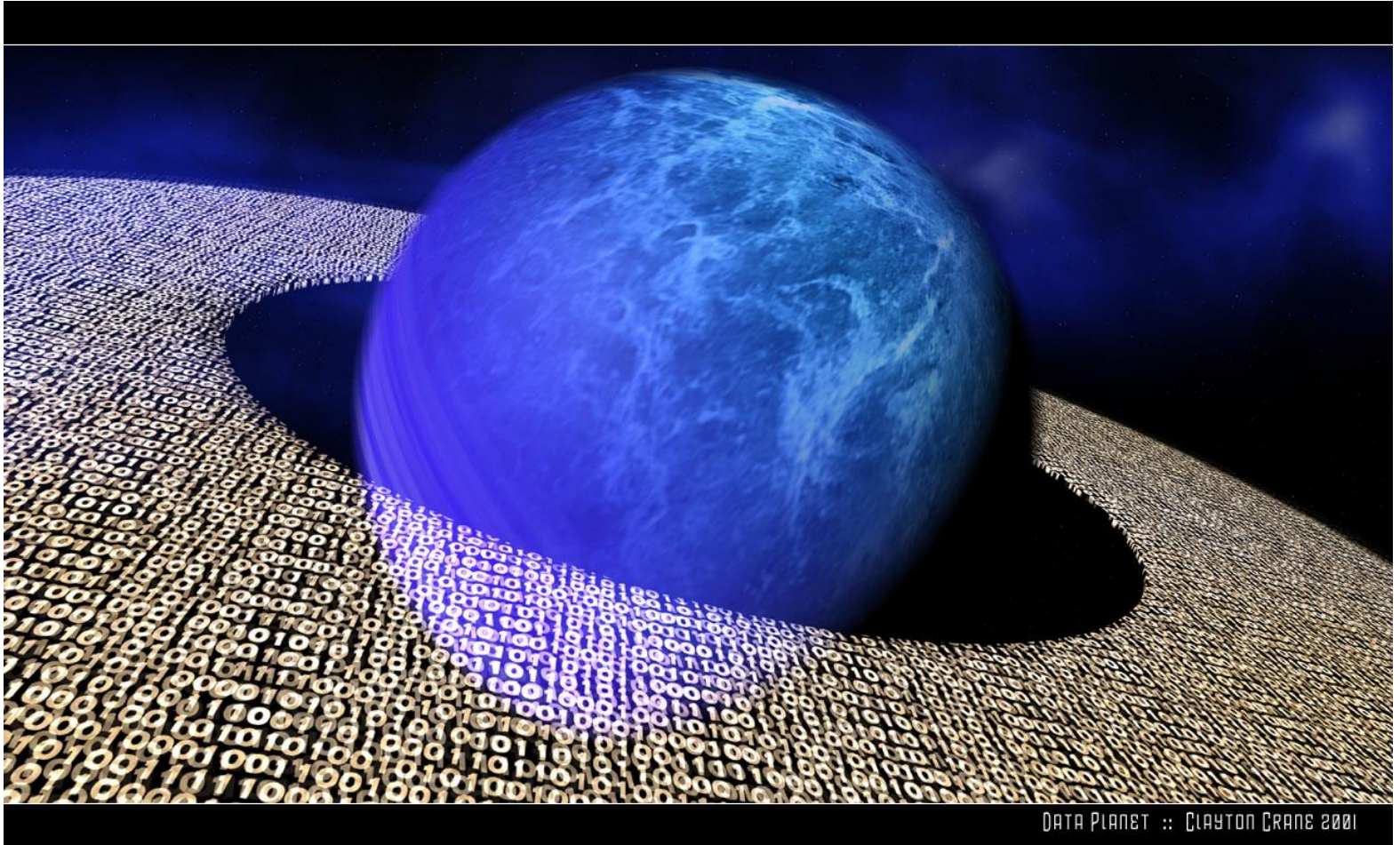
- Integrating the real world data into the Web and providing Web-based interactions with the IoT resources is also often discussed under umbrella term of “**Web of Things**” (WoT).
- WoT data is not only large in scale and volume, but also continuous, with rich spatiotemporal dependency.



Web of Things

- Connecting sensor, actuator and other devices to the World Wide Web.
 - “Things’ data and capabilities are exposed as web data/services.
- Enables an interoperable usage of IoT resources (e.g. sensors, devices, their data and capabilities) by enabling web based discovery, access, tasking, and alerting.

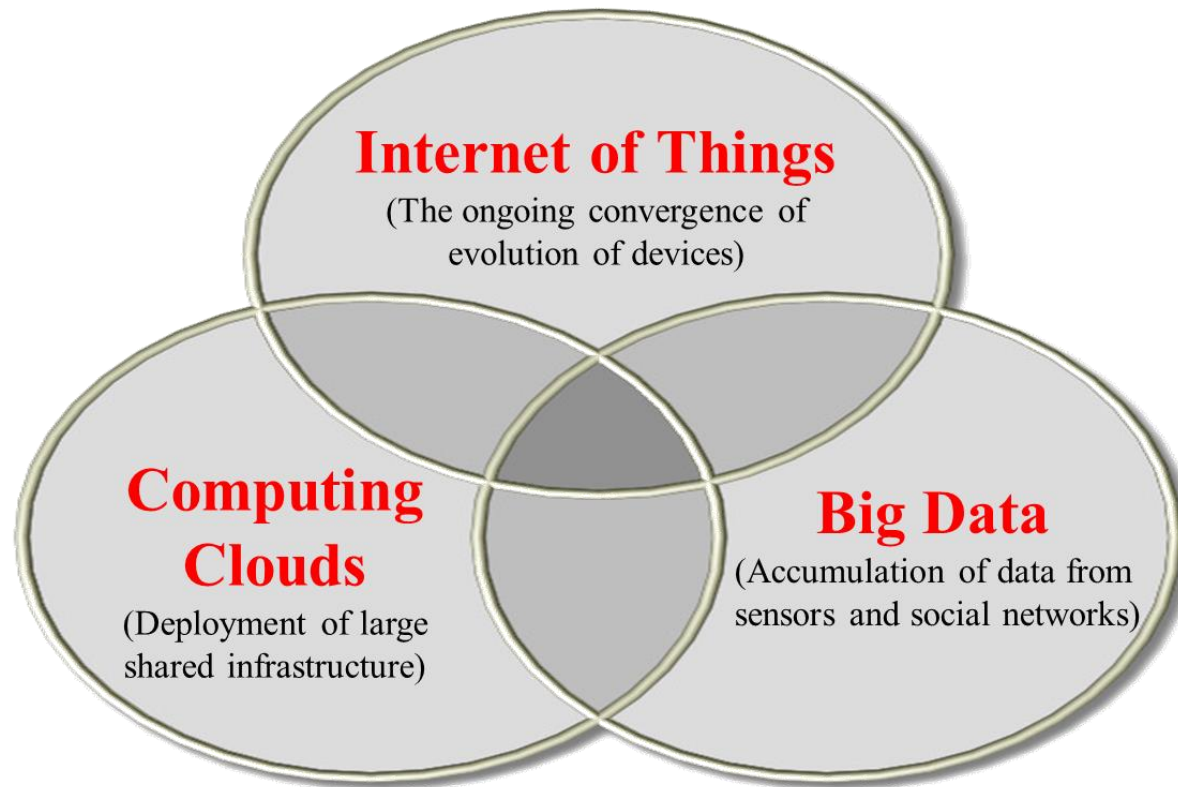
Things, Data, and lots of it



DATA PLANET :: CLAYTON CRANE 2001

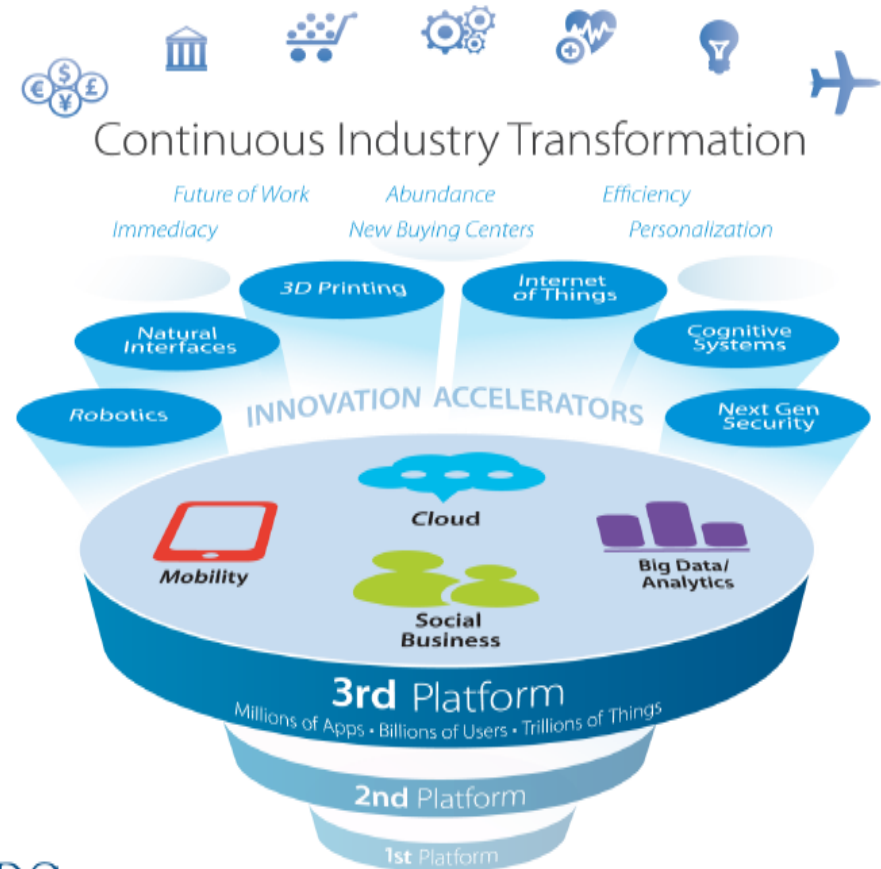
Convergence

Exciting new challenges



Convergence in EVERYWHERE

- Convergence of technology
- Convergence of business and ecosystem
- Convergence of people, application, things, data, devices, etc.

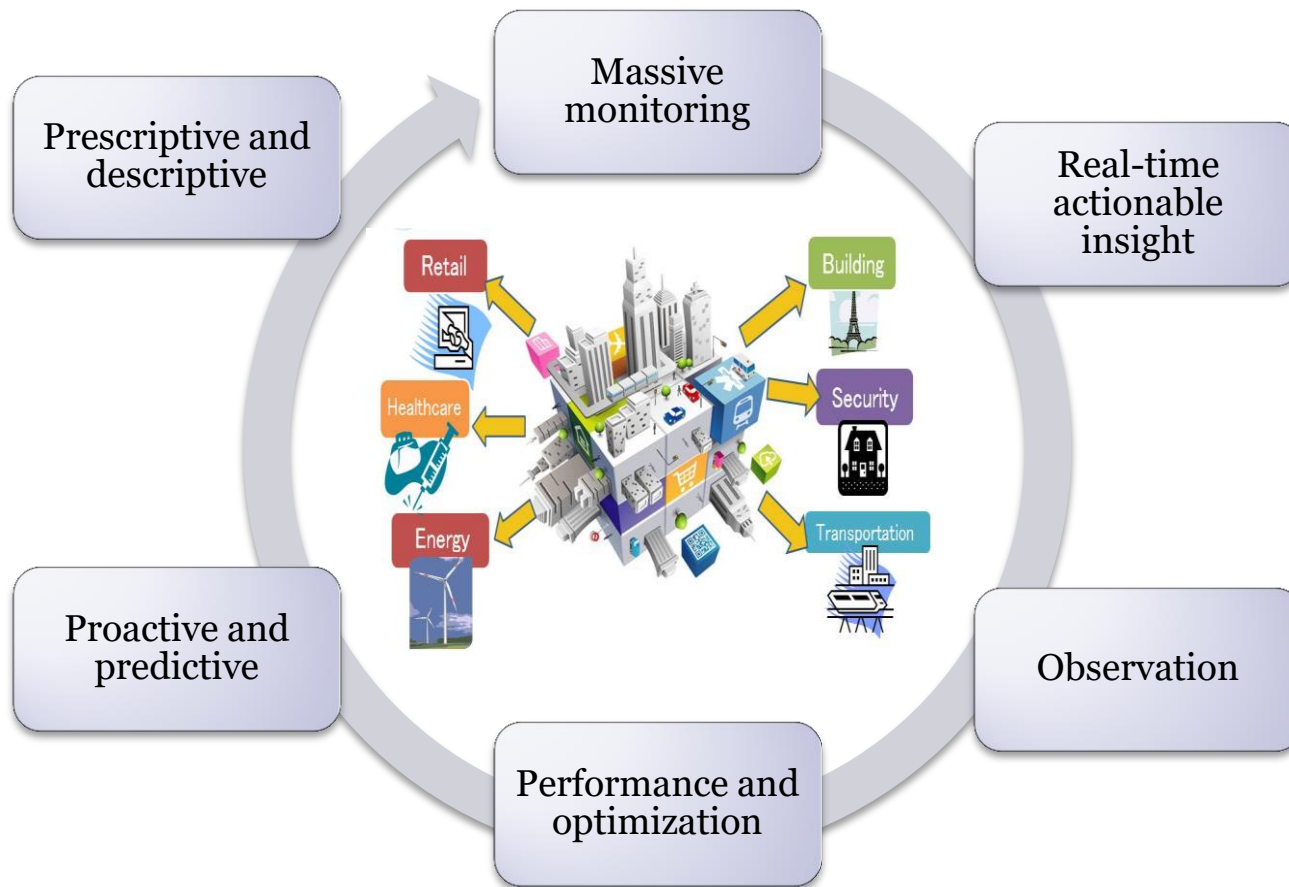


Source: IDC

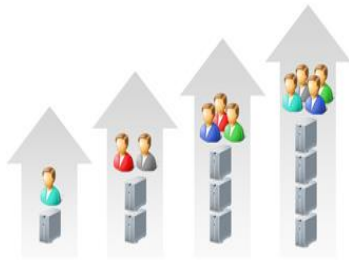
Convergence of IoT, big data and cloud

- For IoT, number of billions of connected devices is an indicator of IoT. The **connectivity is just an enabler but the real value** of IoT is on **data** (business insight/data-driven economy)
- For Big Data, *data collection* is one of the main concern, and IoT can play an important roles for data collection and data sharing
- For Big Data, data is nothing without real business value insight
- Cloud offers *Everything as a Service* business model for IOT and big data.
- **IoT is a King, Big data is a Queen and Cloud is a Palace**

Cloud-based IoT Big Data applications



Key requirements of IoT-Big data platform



Scalable

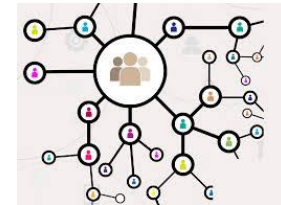


Real-time

**Security and
privacy**

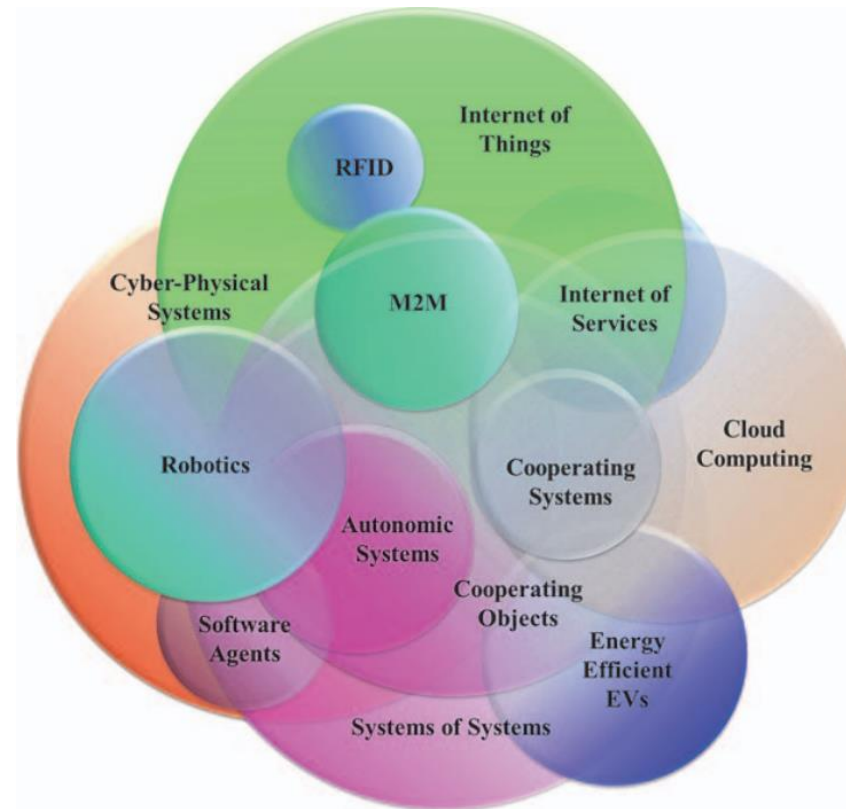


**Intelligent and
dynamic**



**Distributed and
decentralized**

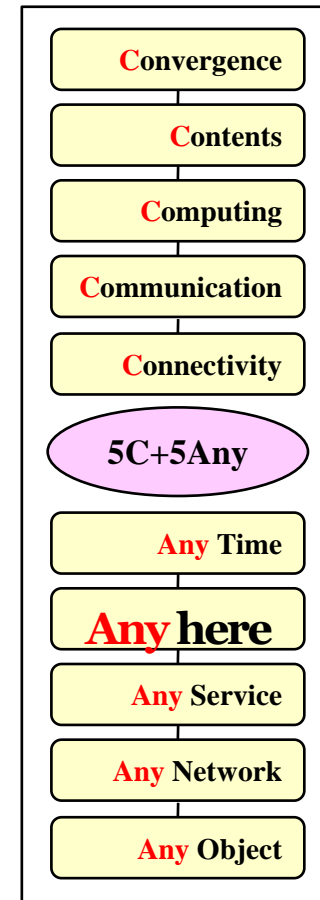
Technology Convergence



Source: Ovidiu Vermesan "Internet of Things – Converging technologies for smart environments and integrated ecosystems" Riverpublishers, 2013.

Clouds, Big data considering the IoT

- Data **stored** in the “Cloud”
- Data **follows** you & your devices
- Data **accessible** anywhere
- Data can be **shared** with others

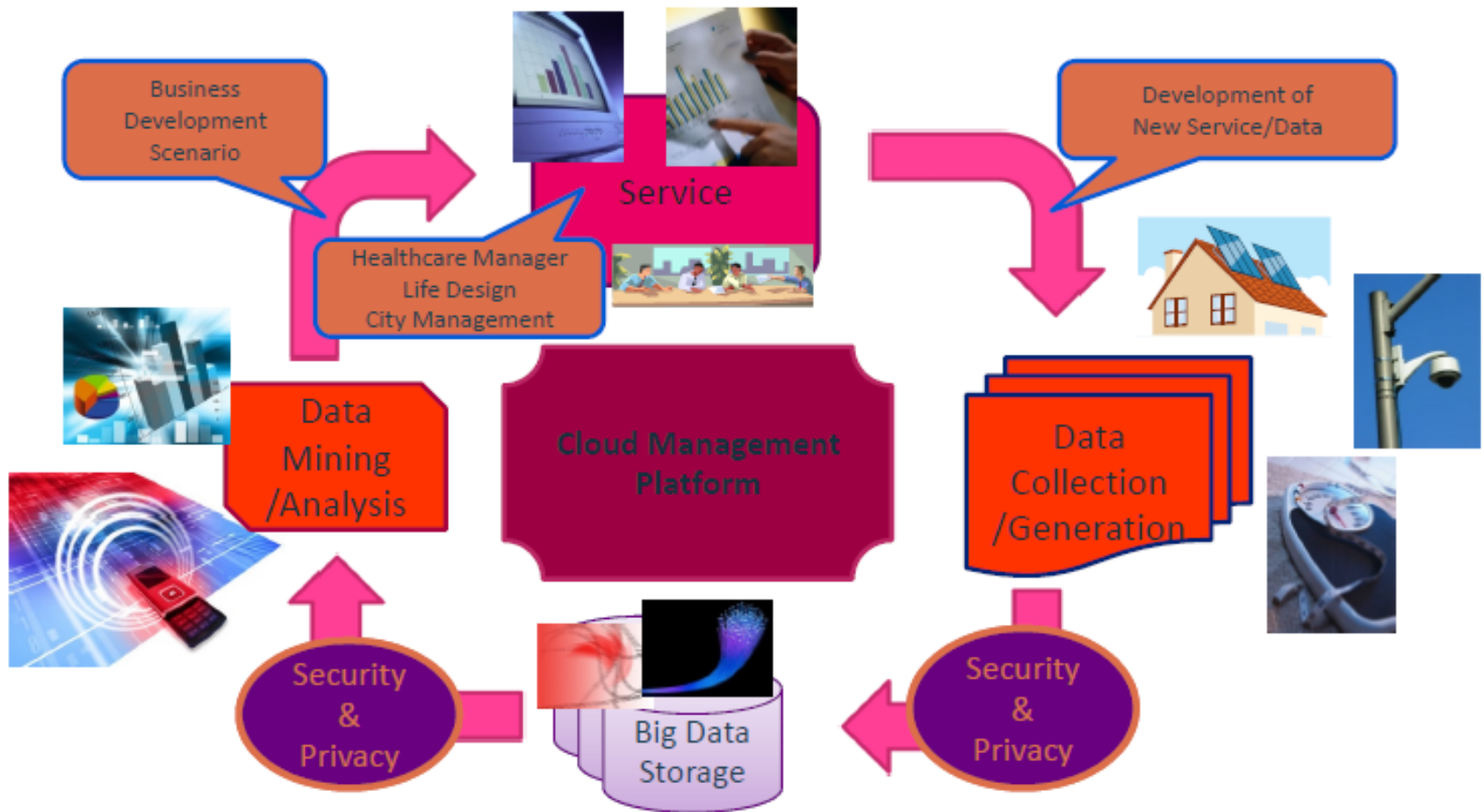


Why Convergence

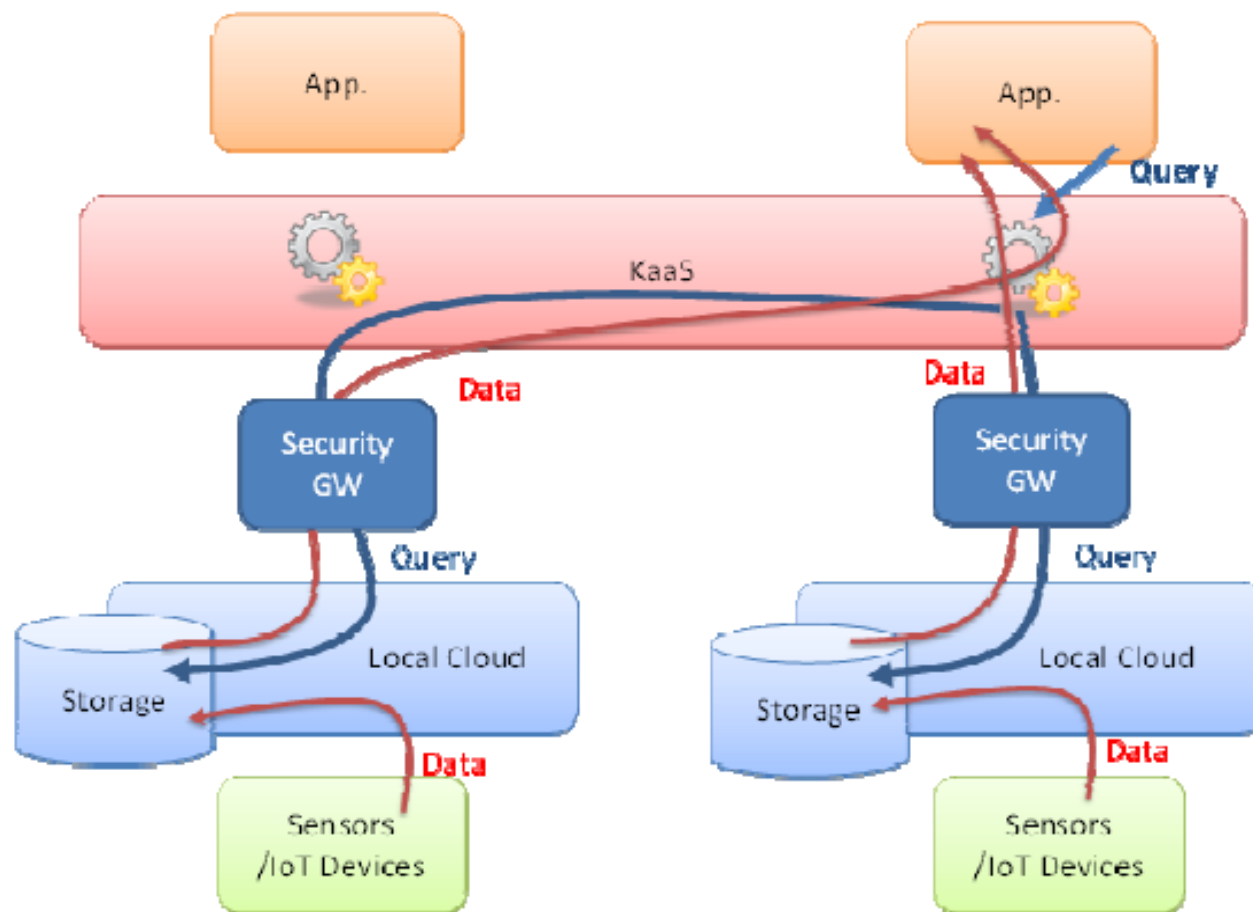
IKaaS

Intelligent Knowledge as a Service

IKaaS



IKaaS



Thanks for listening!
Any questions?

