CS596 IoT
IoT Introduction

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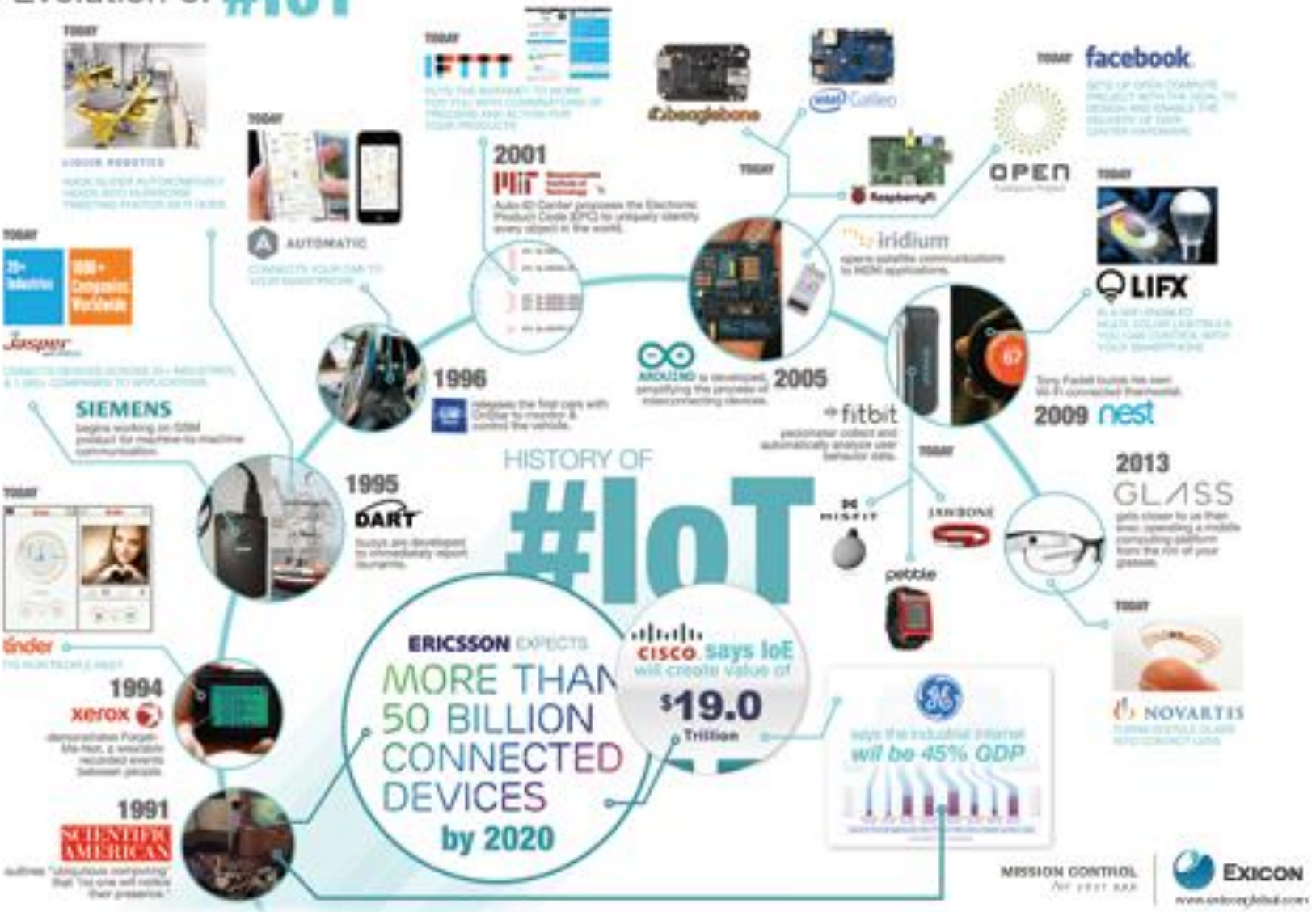
Class-1 Outline

- What is IoT
- IoT Concepts
- IoT Definitions
- IoT Perspective
- IoT Applications – Big Picture
- IoT Adoption
- IoT Examples
- IoT Market
- IoT EcoSystems
  - Who is the players
- IoT Devices
- IoT Platforms

What is IoT

- 26 to 50 billion connected devices will live on our global networks by 2020
- There will be three times as many Internet-connected things on Earth as there are humans within the next 10 years
- For every Internet-connected PC or handset there will be 5-10 other types of devices sold with native Internet connectivity
- The term was coined in 1999 by Kevin Ashton from MIT
- ⊙ Concept has been discussed since 1991

The Evolution of #IoT

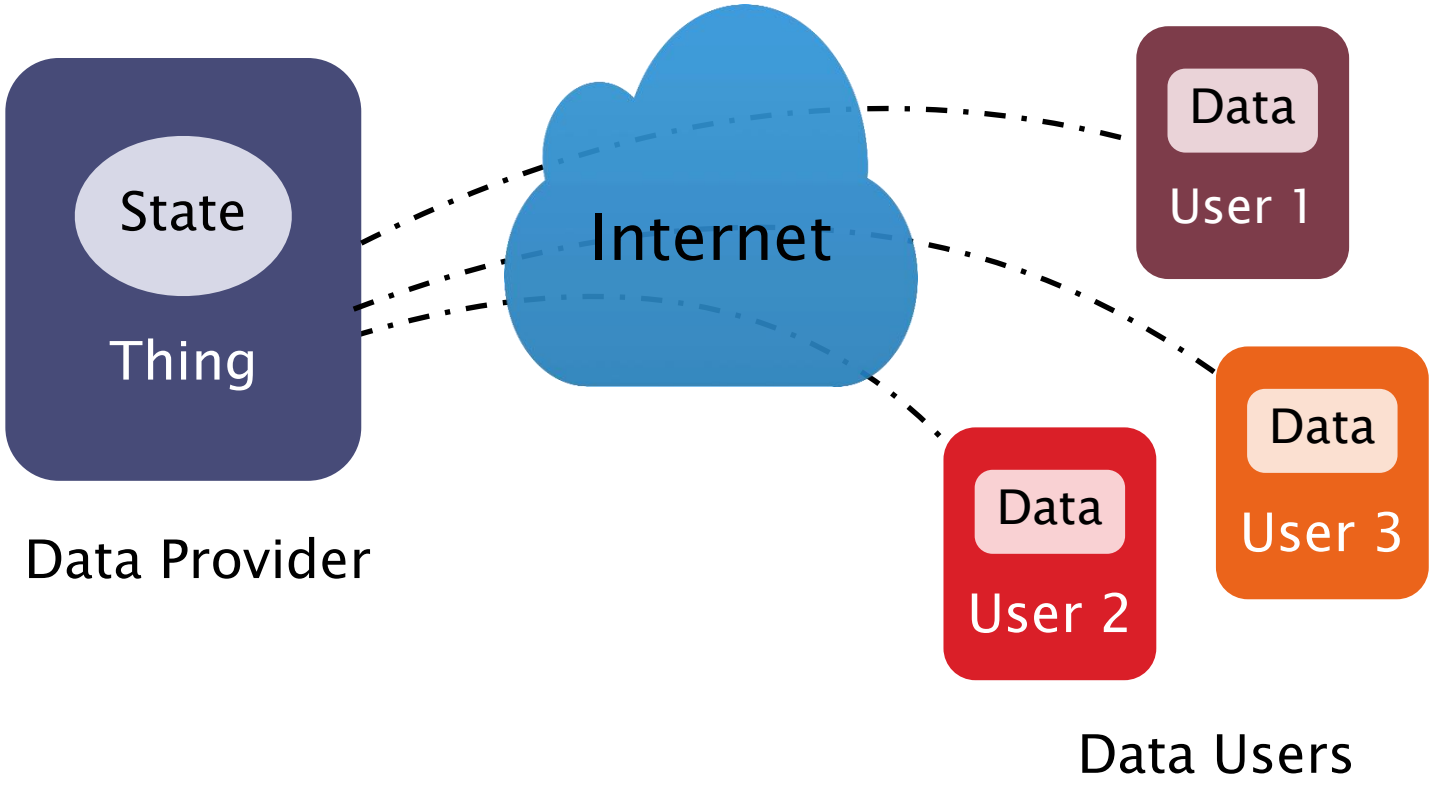


IoT Concepts

- M2M
- IoT
- IoE
- Smart Objects
- Web of Things
- Cloud manufacturing
- Network of Everthings

The Internet of Things

Internet to Bridge Data Providers and Users

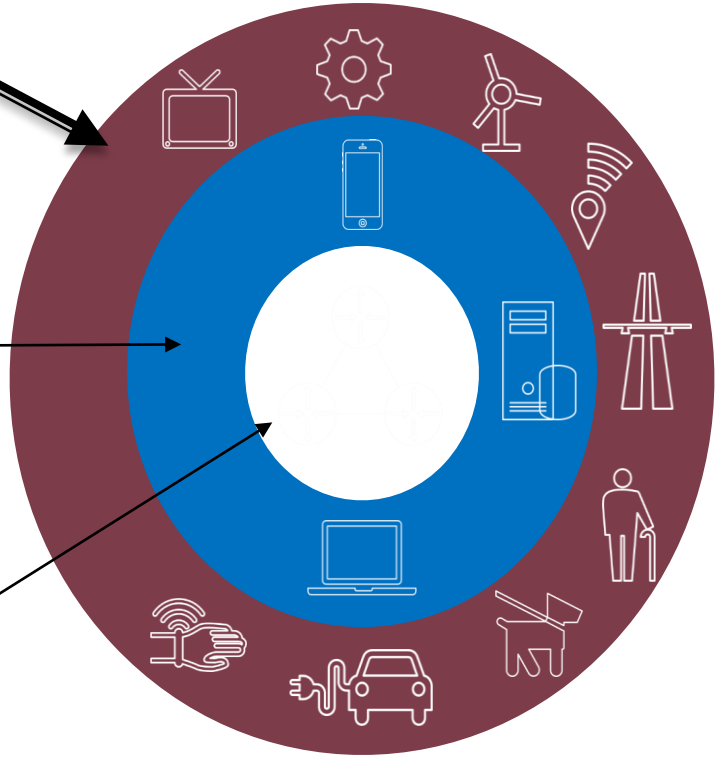


The Internet Evolution

Internet of Things
Trillion nodes
Sensors, Objects

Internet Fringe
Billion nodes
Computers, mobiles

Internet Core
Million nodes
Routers, Servers



IoT Applications Requires Lots of Devices


Smart Cities


Smart Water


Industrial Control


Smart Grid


Smart Farming

Smart Homes


Smart Environment


Smart Retail


eHealthcare


Safety and Security

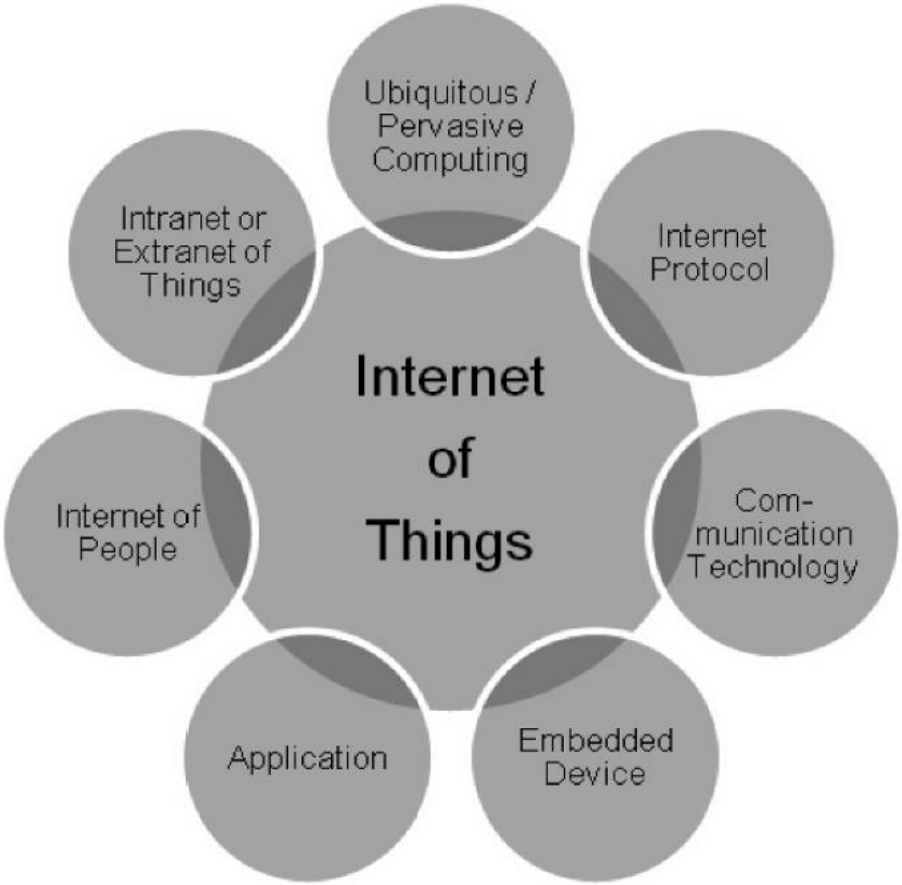

Smart Logistics


Customer Service

IoT Definitions

- The **Internet of Things** (**IoT**)[1] is the network of physical objects or "things" embedded with electronics, software, sensors, and connectivity to enable objects to collect and exchange data.[2]
- The Internet of Things allows objects to be sensed and controlled remotely across existing network infrastructure,[3] creating opportunities for more direct integration between the physical world and computer-based systems, and resulting in improved efficiency, accuracy and economic benefit.[4][5][6][7][8]
- Each thing is uniquely identifiable through its embedded computing system but is able to interoperate within the existing Internet infrastructure.
- Experts estimate that the IoT will consist of almost 50 billion objects by 2020

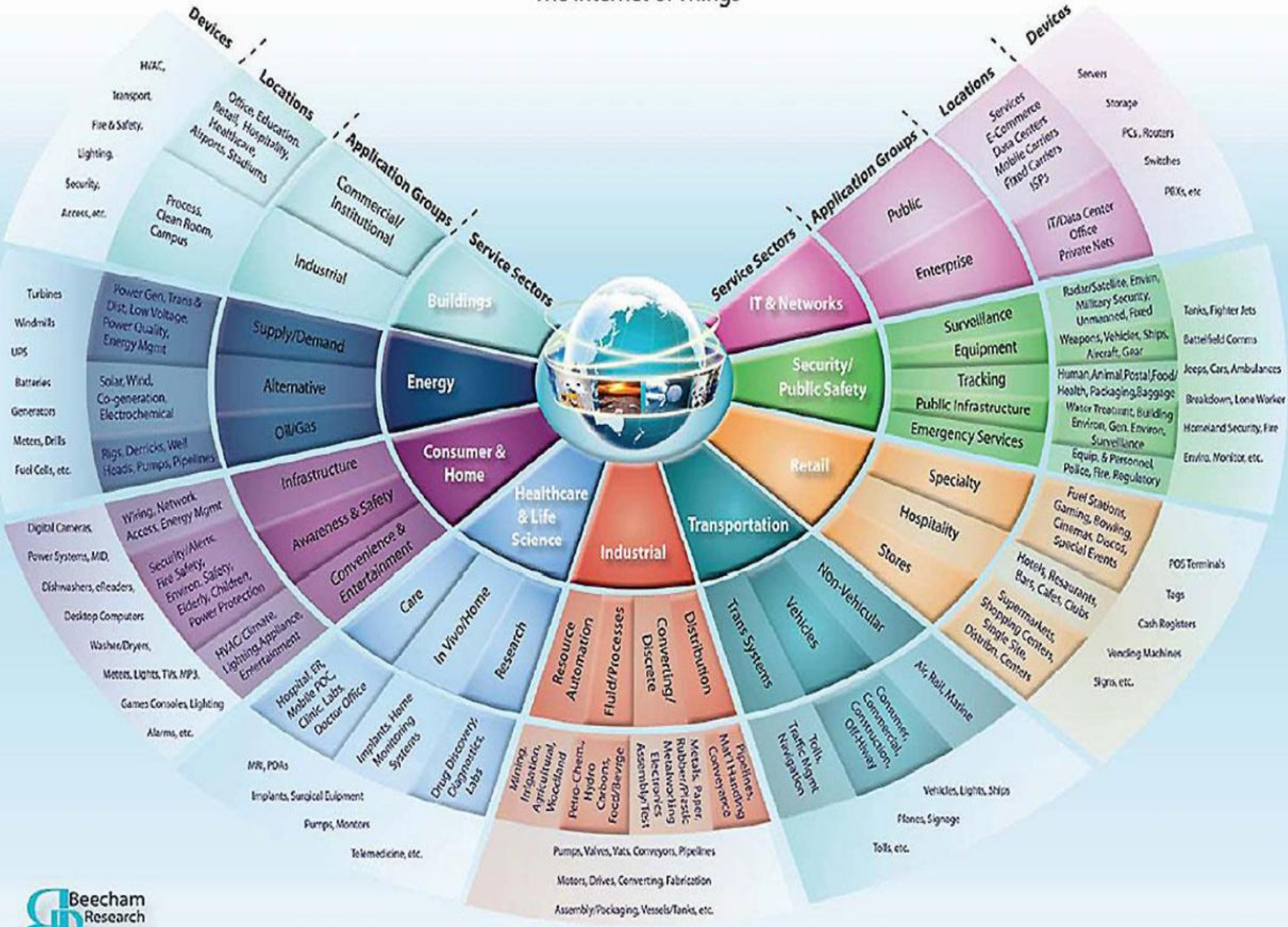
IoT Perspective



IoT Applications

- Home Automation
- Smart Building
- Environmental Monitoring
- **Infrastructure management**
- **Manufacturing**
- **Energy management**
- **Medical and healthcare systems**
- **Building and home automation**
- **Transportation**

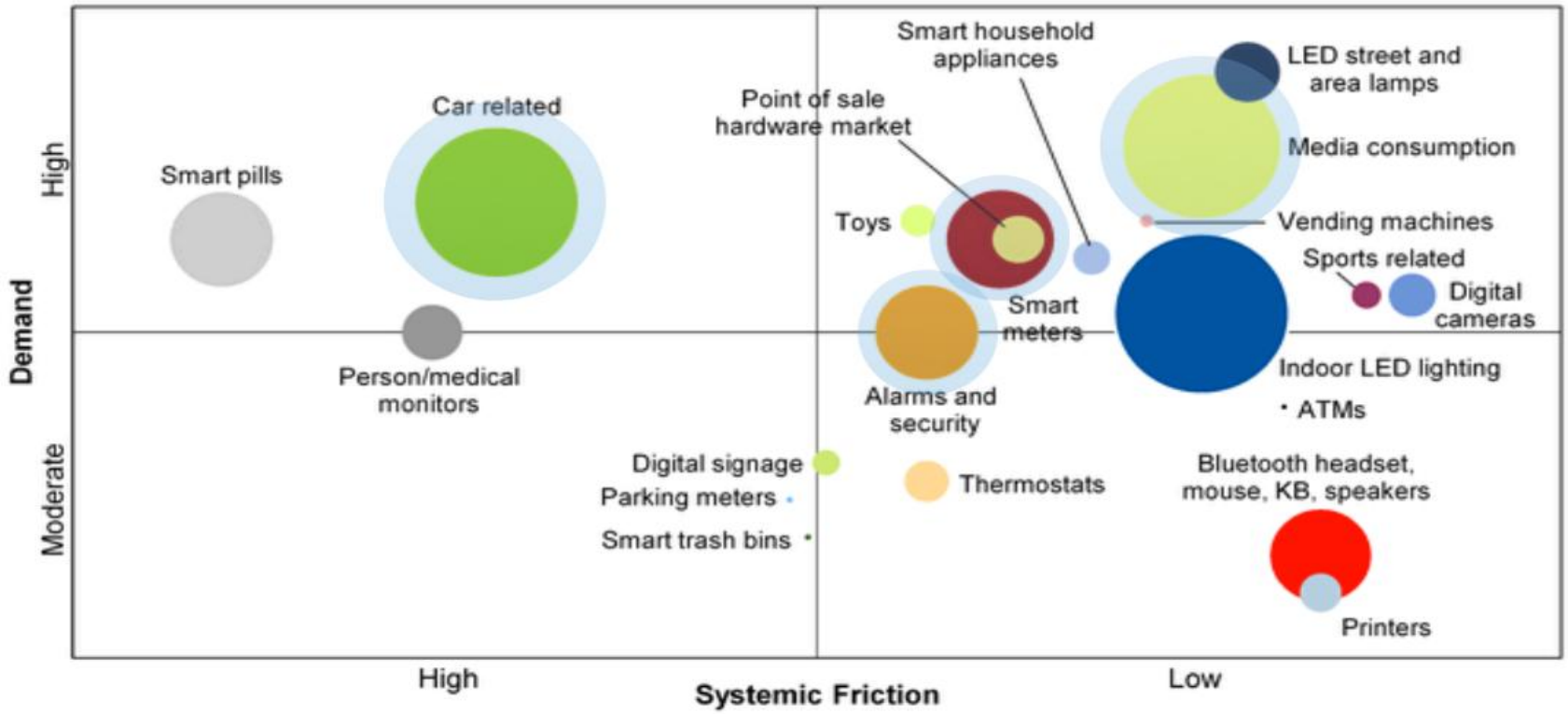
The Internet of Things



Beecham Research

IoT Adoption

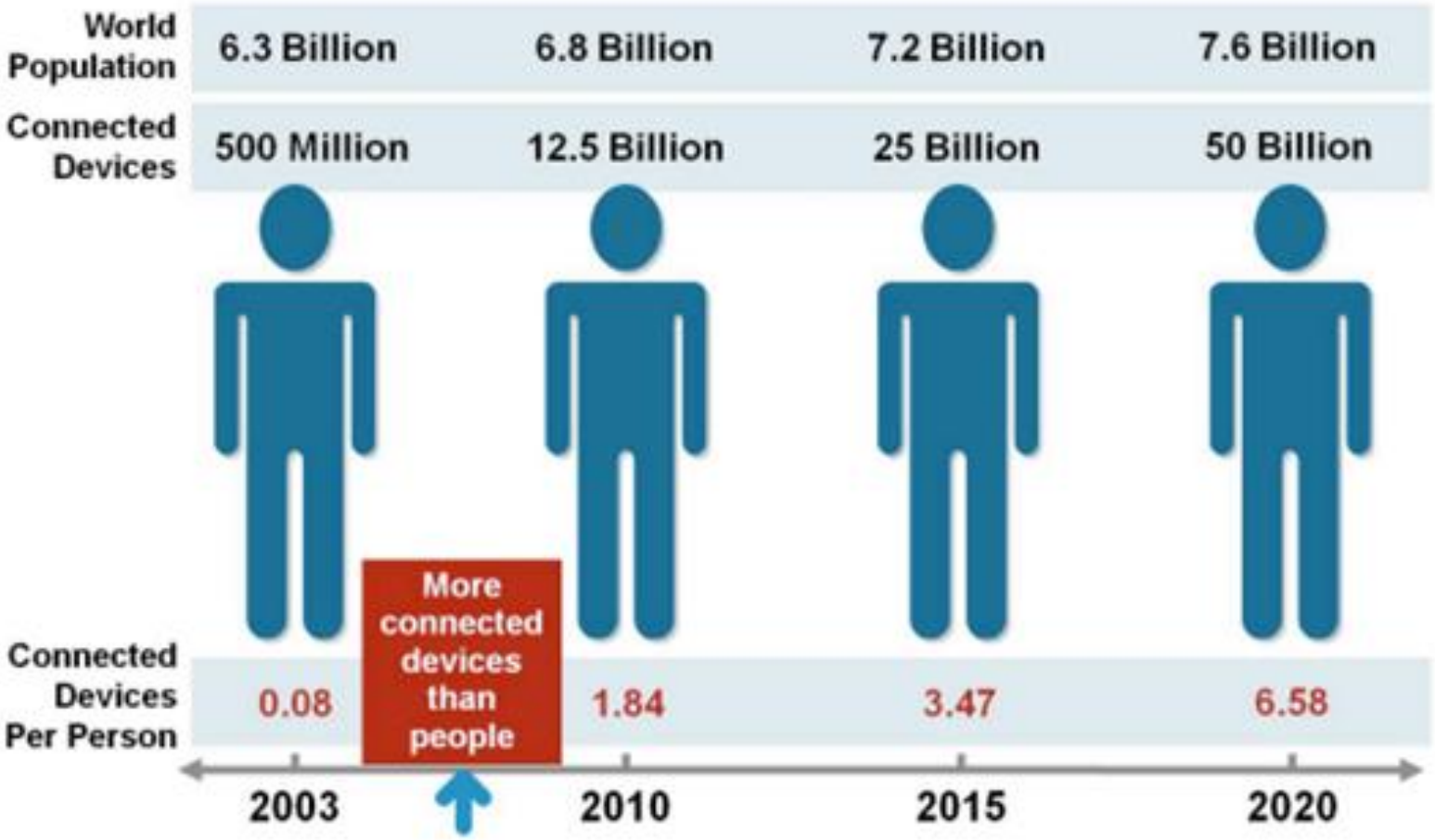
- IoT adoption will occur at different rates. Adoption of car related, smart meters and
- security IoT solutions are some of the largest opportunities on the IoT landscape.



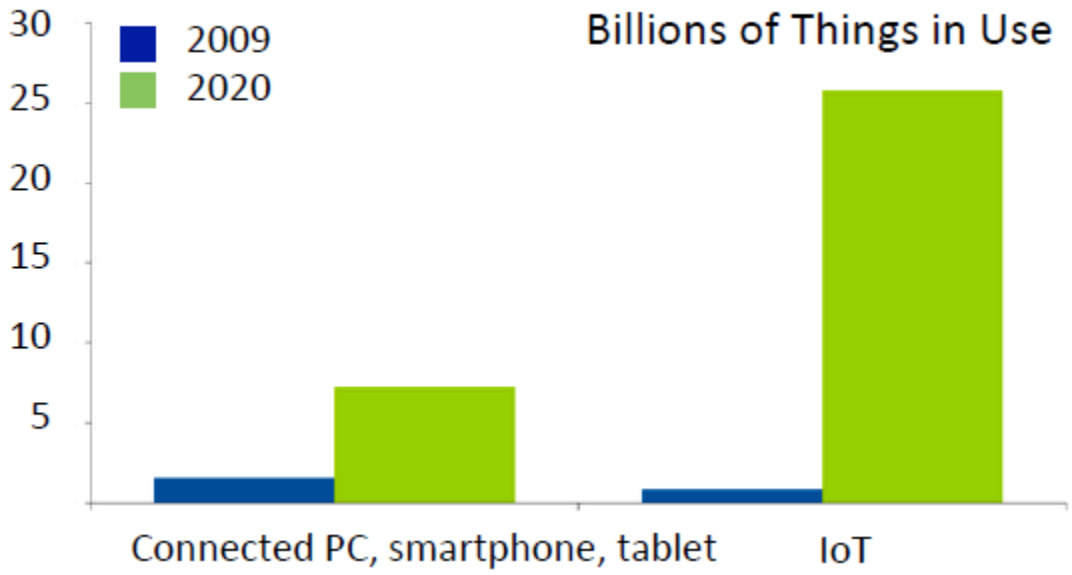
IoT Examples

- Wireless Sensor Networks
- Internet-connected wearables
- Low power embedded systems
- RFID enabled tracking
- Use of mobile phones to interact with the real world
- Devices that connect via Bluetooth enabled mobile phones to the
- Internet
- Smart Homes
- Connected Cars
- etc.

Internet Usage and Population Statistics



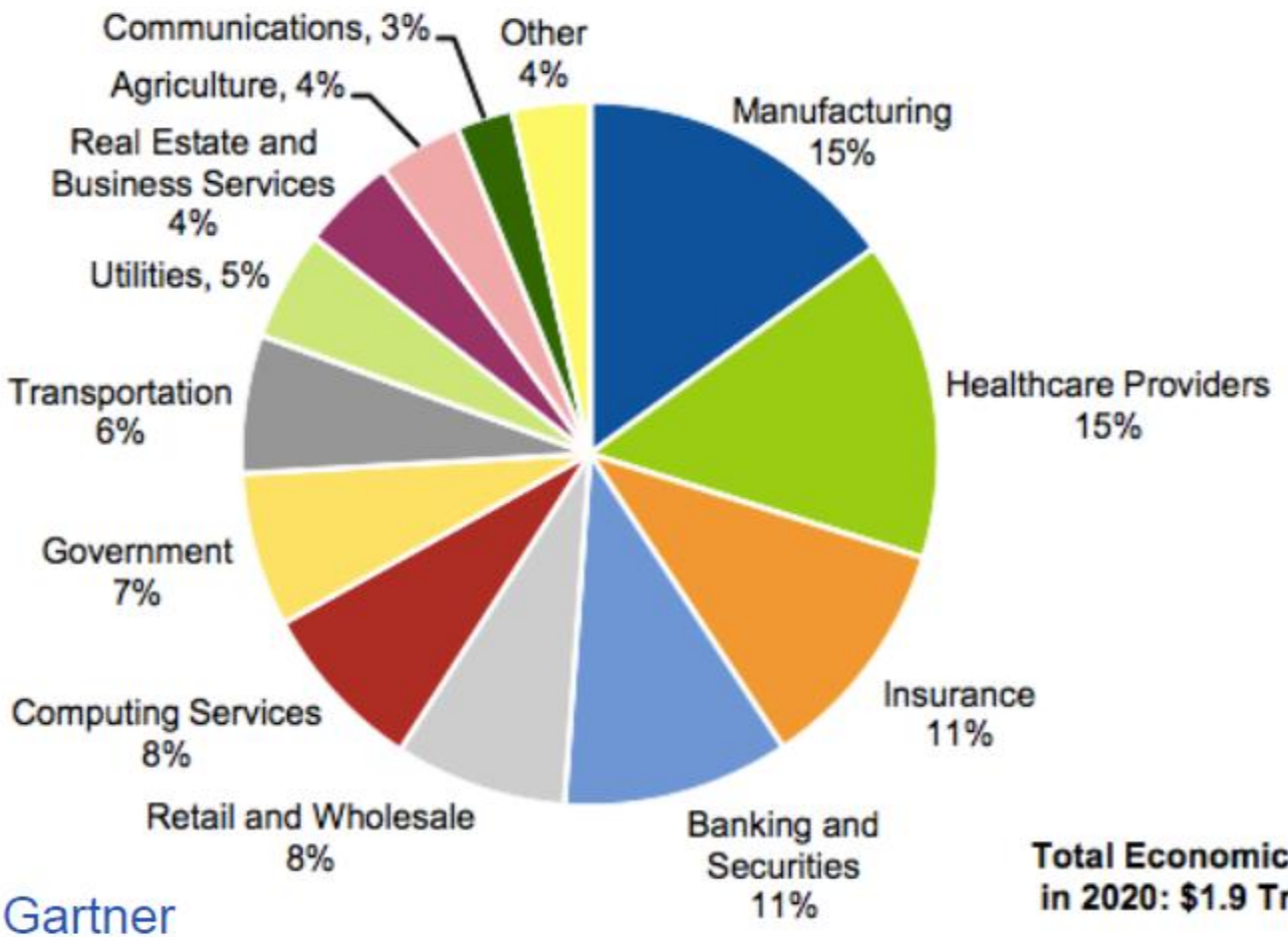
Source: Cisco IBSG, April 2011



26bn devices connected to the Internet by 2020

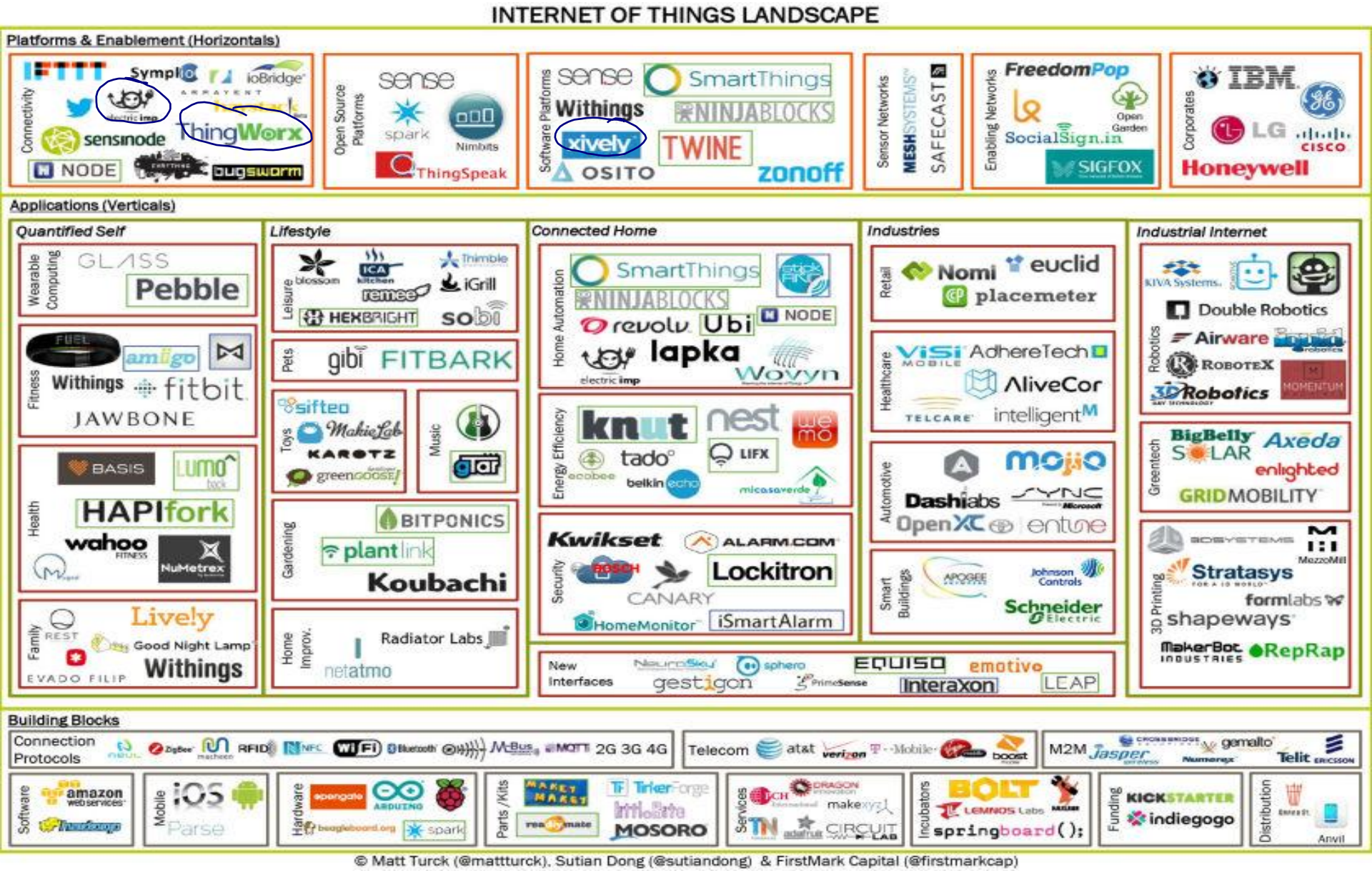
Gartner estimates the global economic value add of IoT as a result of increasing sales and decreasing inputs and costs to be $1.9 trillion by 2020.

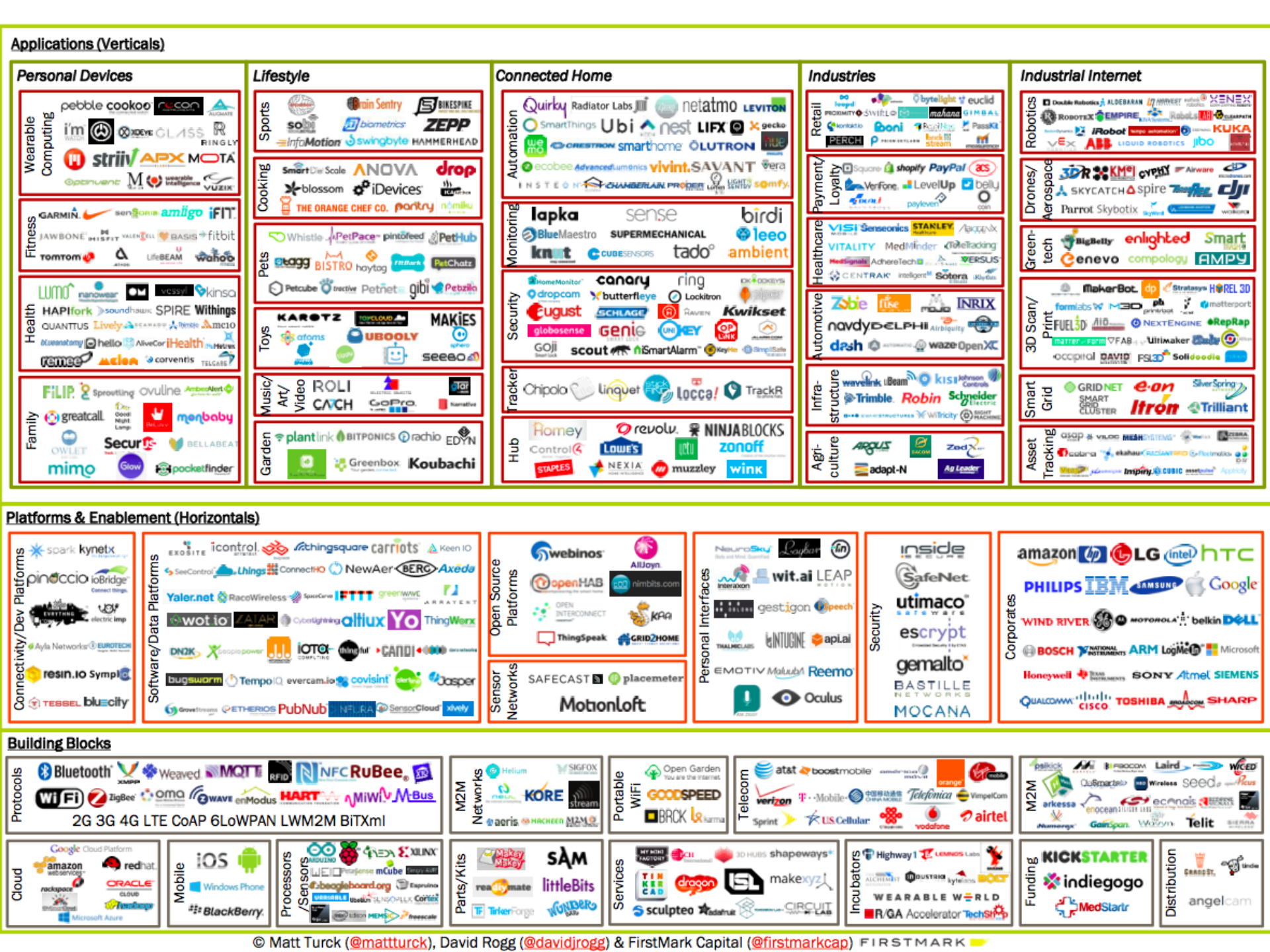
	2014	2015	2016	2017	2018	2019	2020
Value Add ($T)	0.4	0.5	06	0.8	1.0	1.4	**1.9**
Growth (%)	25	26	27	29	31	34	**39**



Source: Gartner

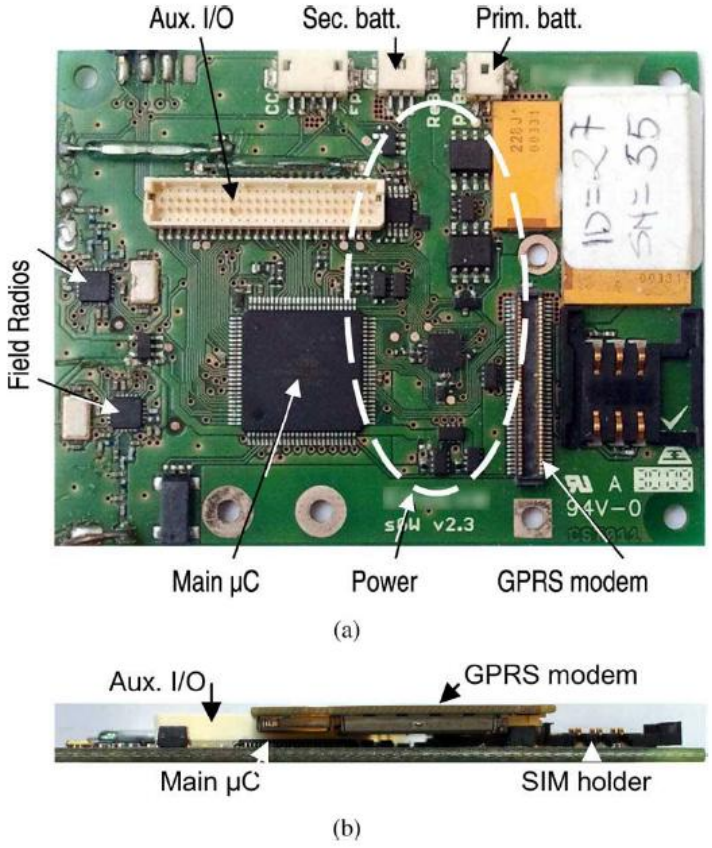
IoT Ecosystem





IoT Sample Device

PCB of the gateway node for environmental monitoring: (a) top view and (b) side view with the GPRS modem mounted on top (scale 1:1 aprox.).



Home & Building Automation

- Bringing intelligence, convenience and lifestyle




Smart Energy

- Adding power awareness to products and helping to save energy




Multimedia

- Wireless audio streaming and advanced remote controls



Security and Safety

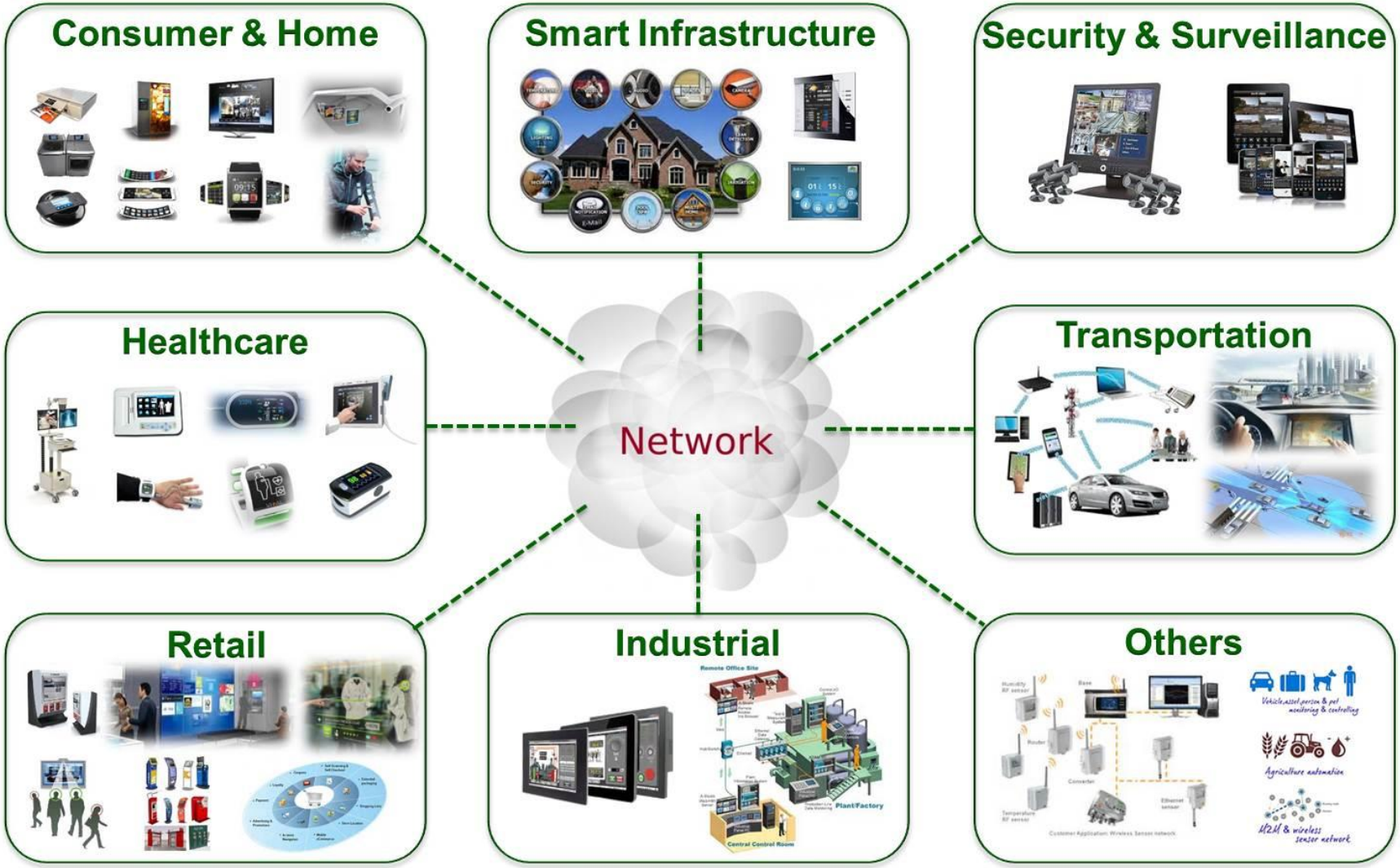
- Improving remote control and home monitoring




Industrial M2M Communication

- Internet enhanced M2M communication using existing Wi-Fi infrastructure

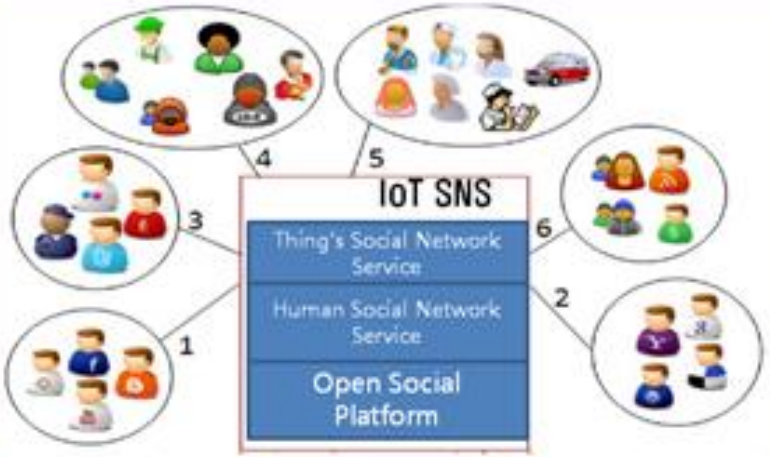




IoT Solutions Platform / Solutions

- Realtime Data Logging
  - Jasper Technologies, Inc.
  - Xively
- Software development environments
  - Tibbo Systems
  - AggreGate Platform
  - Arrayent
  - B-Scada
  - Carriots
  - EVRYTHNG
  - Exosite
  - IoT-Ticket.com
  - nPhase
  - Raco Wireless
  - ThingWorx

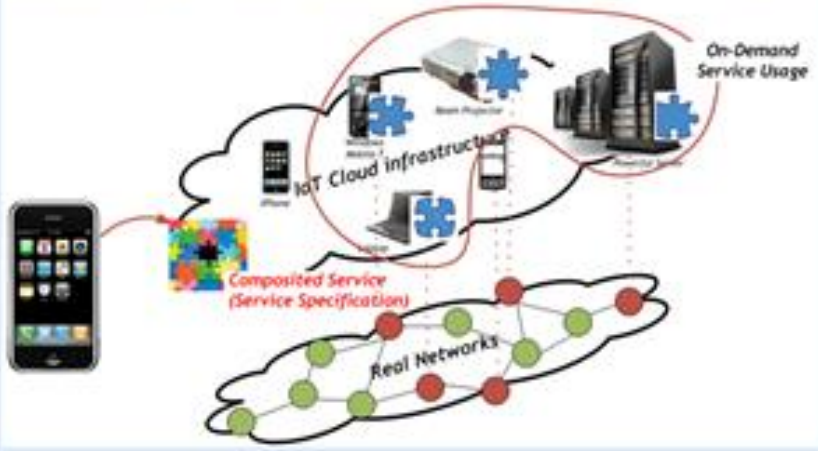
Crawling things' Information over the world



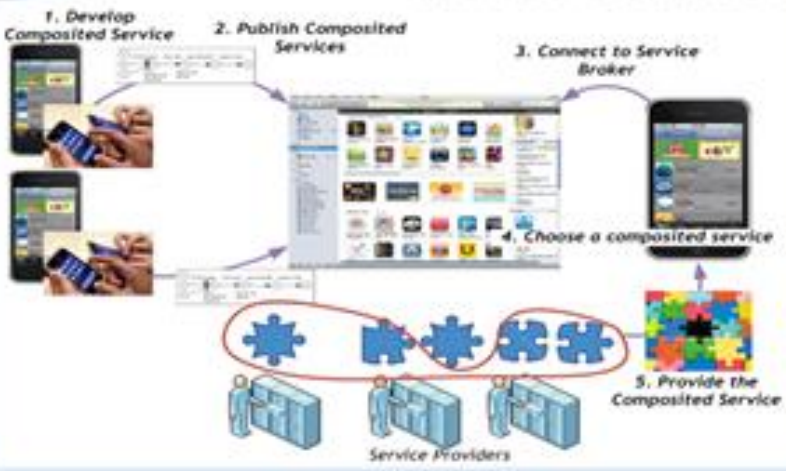
Connecting things through social network

Internet of Things

Service Provisioning through IoT Cloud



Interactive Programming for IoT Services



IoT Architecture Overview