# Internet of Things: 50 Billions Devices Jam

Prabhas Chongstitvatana
Chulalongkorn University
July 2015

IoT = Internet of Everything

• M2M

Next information revolution

- 1% of physical world is connected to Internet
- Huge potential

- Potentials
- innovative business process
- operational efficiency
- new customer services

#### What is IoT

Network of Physical Objects

- embedded systems with electronics, software, sensors
- enable objects to exchange data with manufacturer, operator, other devices through network infrastructure

- allow remote control
- direct integration computer + physical world

Result: automation in all fields

#### **Applications**

- Media
- Environmental monitoring
- Infrastructure management
- Manufacturing
- Energy management
- Medical and health care systems
- Building and home automation
- Transportation

#### A bit of history

- The term "Internet of Things" is coined by Kevin Ashton 1999.
- Early example, 1982, Coke machine at Carnegie Mellon University was connected to internet: report its inventory and temperature

#### Applications (cont.)

- Media IoT + Big Data
  - = target advertisement to customized content
- Infrastructure management
  - monitoring structural condition, scheduling maintenance
- Waste management
- Safety management
- Example: German Airport Problems

### Applications (cont.)

- Manufacturing
  - monitoring product demand
  - real-time manufacturing production
  - manage supply chain network

#### Large Scale examples

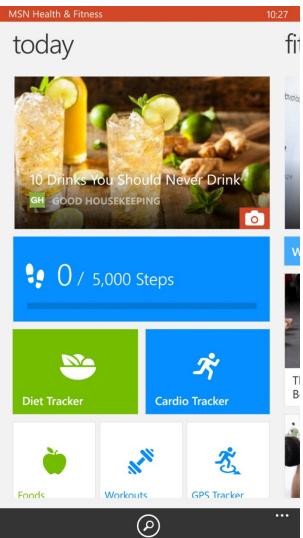
- Smart city
- Songdo, South Korea
- Santander, Spain
  - 10,000 sensors: parking search, environmental monitoring etc.
- San Francisco Bay area
- wireless sensors data network
- New York waterways

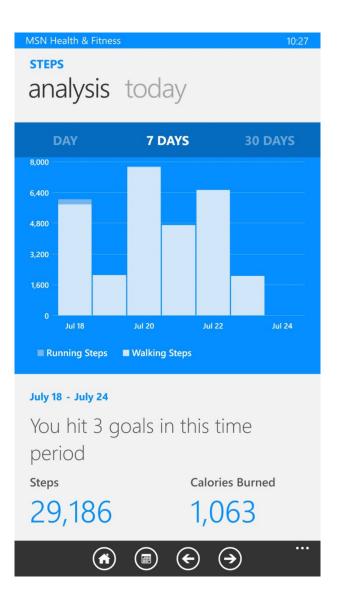
#### Detailed examples

Padova Smart City Project, Italy

• wearable: Pedometer data







## Berlin Brandenburg International Airport

- 600 million euros project
- schedule to be opened in June 2012, now expected to be completed in 2017
- "Just months before the scheduled June 2012 opening, the terminal was a mess. Careless workers stepped on and shattered glass being installed by other companies. Heavy equipment rolled across the terminal floor, scratching expensive tiles. Tempers flared; small contractors complained they weren't getting paid and threatened to walk off the job."

### Technology roadmap

- 50-100 Trillion objects,
- each person carries 1000-5000 trackable objects
- computer manage and inventory objects and people
- transform daily life
- bottom up, convergence of data from IoT into applications, web-of-things

#### **Impact**

- Civic engagement
- Privacy, autonomy and control
- technology <> just tools
- technology = active agent
- IoT = Human augmentation (Tim O Reilly)
- data-driven decision making

#### Impact (cont.)

- Security
- cyber attack in Physical world
- spy on people in their own homes

Increase in electronics waster 10x

## Trending

- Cisco IoT Grand Challenge
- IoT World Forum in Dubai

#### References

- Zanella, Andrea; Bui, Nicola; Castellani, Angelo; Vangelista, Lorenzo & Zorzi, Michele. "Internet of Things for Smart Cities". IEEE Internet of Things Journal, VOL. 1, NO. 1, FEBRUARY 2014.
- https://en.wikipedia.org/wiki/Internet of Things
- http://www.bloomberg.com/news/features/2015-07-23/how-berlin-s-futuristic-airport-became-a-6-billionembarrassment
- this presentation link
- http://bit.ly/1IlLNoe
- Or search: "Prabhas Chongstitvatana"