



Everything that can be automated will be automated.

Lecturer: Bui Ha Duc  
Email: [ducbh@hcmute.edu.vn](mailto:ducbh@hcmute.edu.vn)



# Course Objectives

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## ❑ Provide the fundamentals of IoT

- Architecture, Wireless technologies, Communication Protocols, Cloud services

## ❑ Hand-on IoT system design



You practice and you get better. It's very simple

# Order of Instruction

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## Course Introduction

- Course content, Assessment, References,

## Introduction to Internet of Things

- Historical background
- Trends and Applications

## IoT Architectures

- IoT layers

# Order of Instruction

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## Communication Protocols

- Between devices
- Over the Internet

## Web server and Database

- Storing, processing, displaying online

## Data Analysis and Cloud services

- AWS, Google cloud, Microsoft Azure

# Assessments

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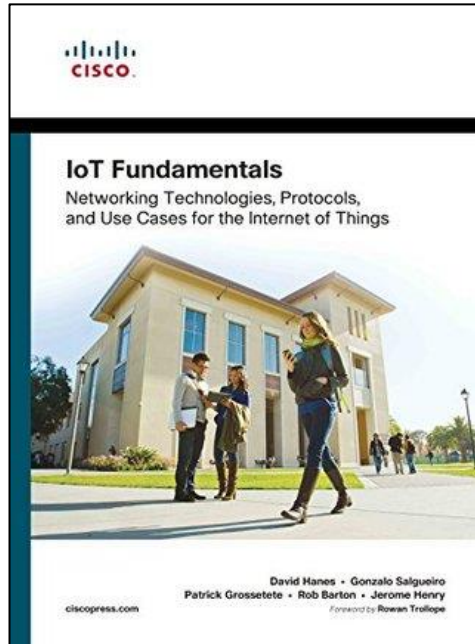
❑ In-class assignments – 50%

❑ Final Project – 50%

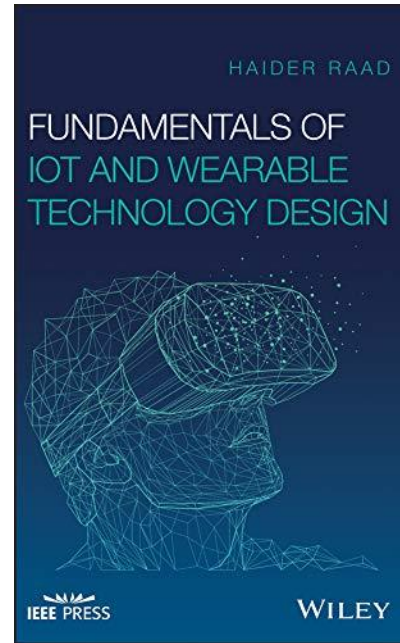


# References – Textbook

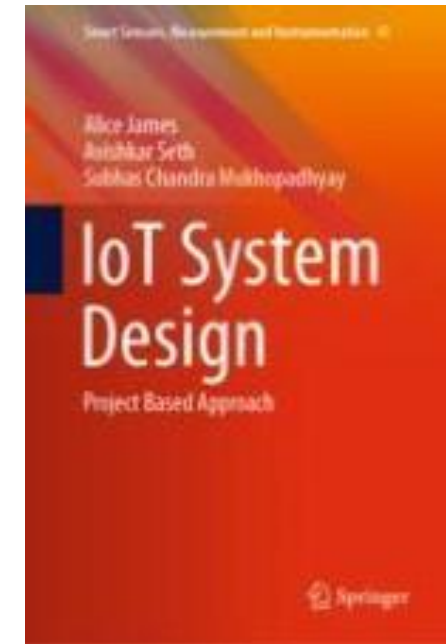
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**IoT Fundamentals:  
Networking Technologies,  
Protocols, and Use Cases for  
the Internet of Things – Cisco  
Press, 2017**



**Fundamentals of IoT and  
Wearable Technology Design  
– Wiley, 2021**



**IoT System Design  
– Springer, 2022**



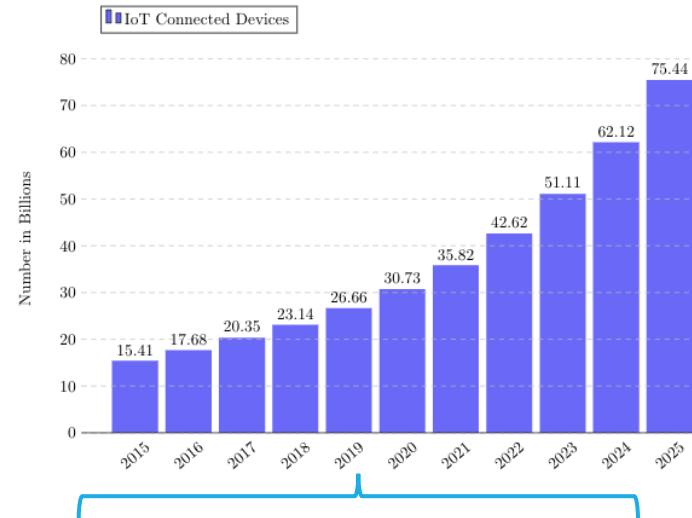
# Internet of Things

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- ❑ IoT is **an ecosystem** of **internet connected devices** with the ability **to collect and transfer information** over a network to **provide automated decision making**
- ❑ IoT focuses on **connecting “things”**
- ❑ IoT is prime enabler for **digitization**



# IoT: Historical background



**1901**

Invention of Radio communication



**1950s**

Inception of computers



**1983**

The born of Internet



**1999**

Kevin Ashton invented the term "Internet of Things"





# IoT: Historical background

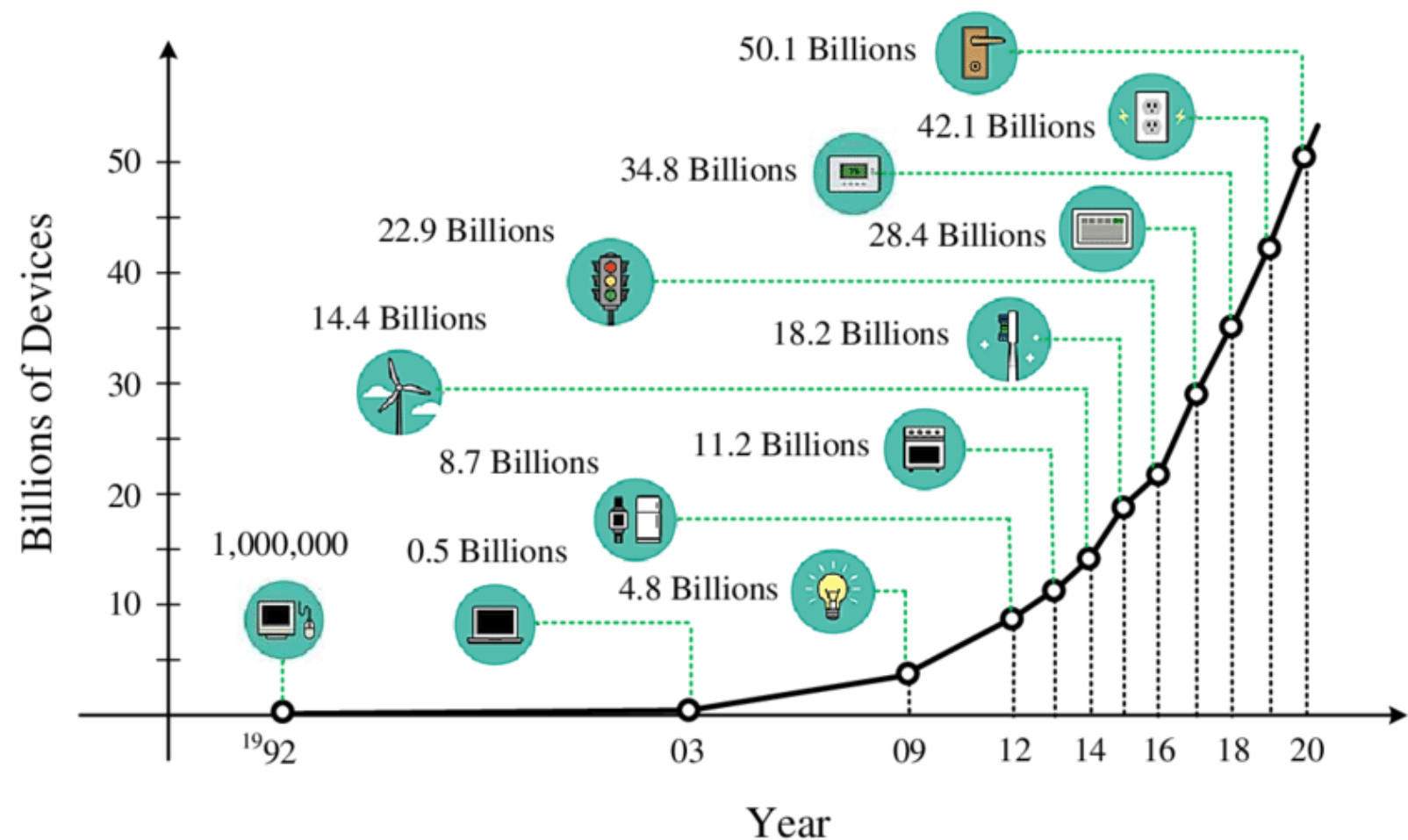
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“ Today computers, and, therefore, the Internet, are almost wholly **dependent on human beings for information...** The problem is, **people have limited time, attention, and accuracy.** All of which means they are not very good at capturing data about things in the real world. If we had **computers that knew everything there was to know about things, using data they gathered without any help from us,** we would be able to track and count everything and greatly **reduce waste, loss and cost.** We would know when things needed replacing, repairing or recalling and whether they were fresh or past their best. ”

*Kevin Ashton, 1999*

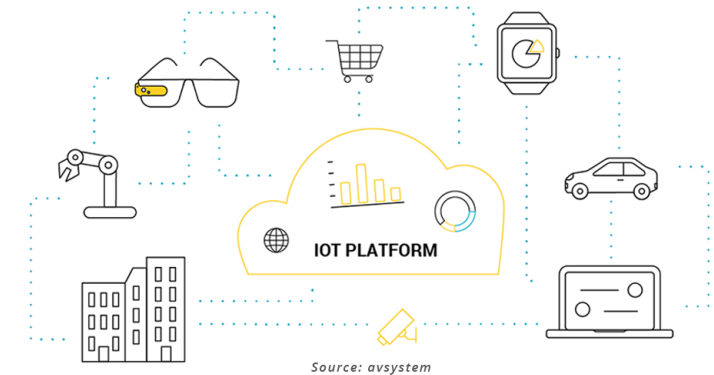


# IoT: Historical background



Number of connected devices to the Internet  
from Cisco and Ericsson report

# IoT: Historical background



## 2010 First IoT network

**Nest** smart thermostat network



## 2014 IoT devices

- Google Inc. acquires Nest
- Google's Smart home devices
- Google's Self-driving car
- Amazon's Echo, a voice-controlled devices

## 2016

- GM invested in self-driving car
- Apple's HomeKit platform
- Google released Google Home

## 2017 IoT Platform

- Microsoft launched Azure IoT
- Google released Cloud IoT Core

# IoT Trends

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- ☐ AI and IoT (AIoT) 
- ☐ Edge Computing 
- ☐ Massive IoT 
- ☐ Industrial Internet of Things (IIoT) 
- ☐ Healthcare - Internet of Medical Things (IoMT)
- ☐ Supply Chain
- ☐ Smart Cities & Utilities

# IoT Challenges

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## ☐ **Infrastructure gap**

- "Internet gap" and "AI gap"

## ☐ **Security and Privacy**

- Sharing individual information

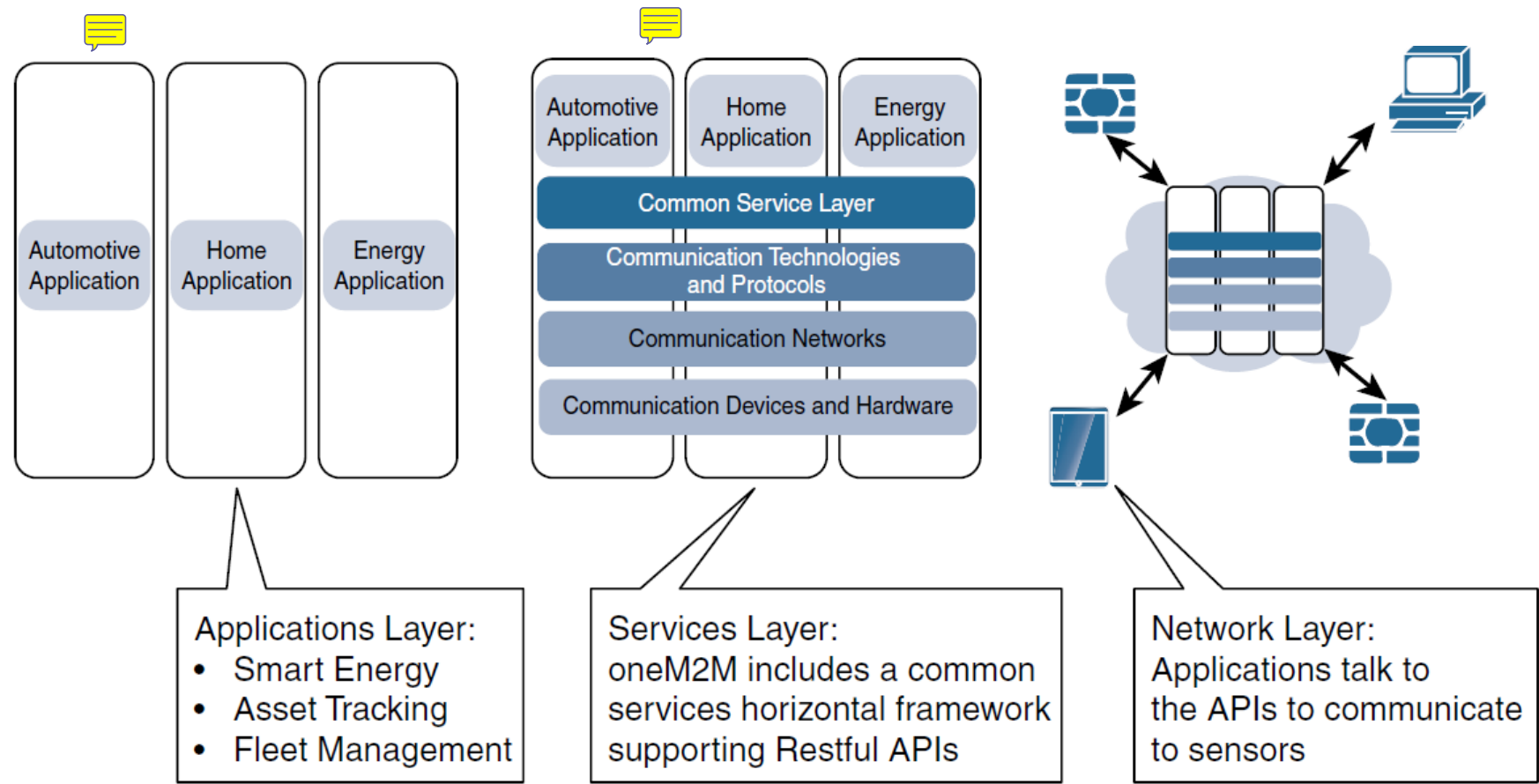
## ☐ **Big data and data analytics**

- Massive amount of data

## ☐ **Inter-Operation**

- Various protocols and architectures in the market

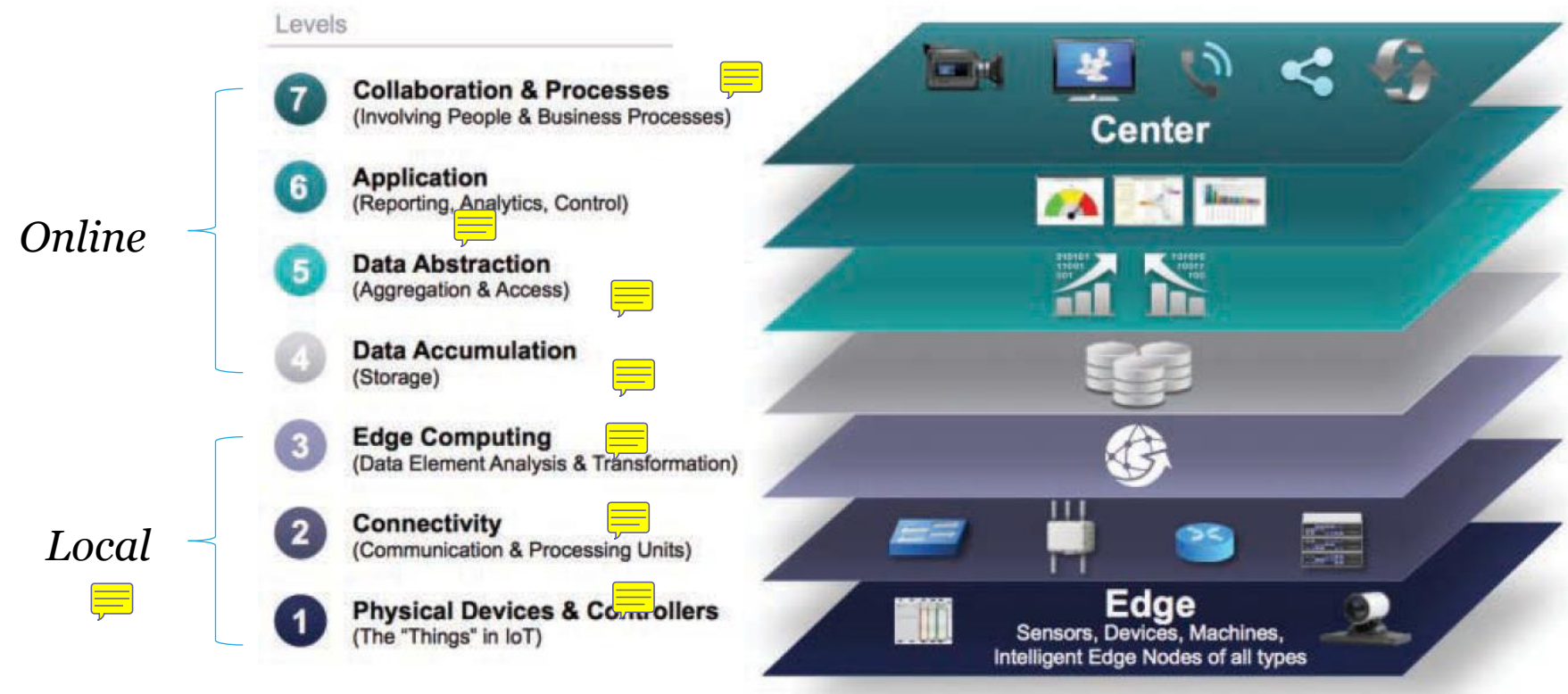
# IoT Architecture



oneM2M IoT Architecture - 2012



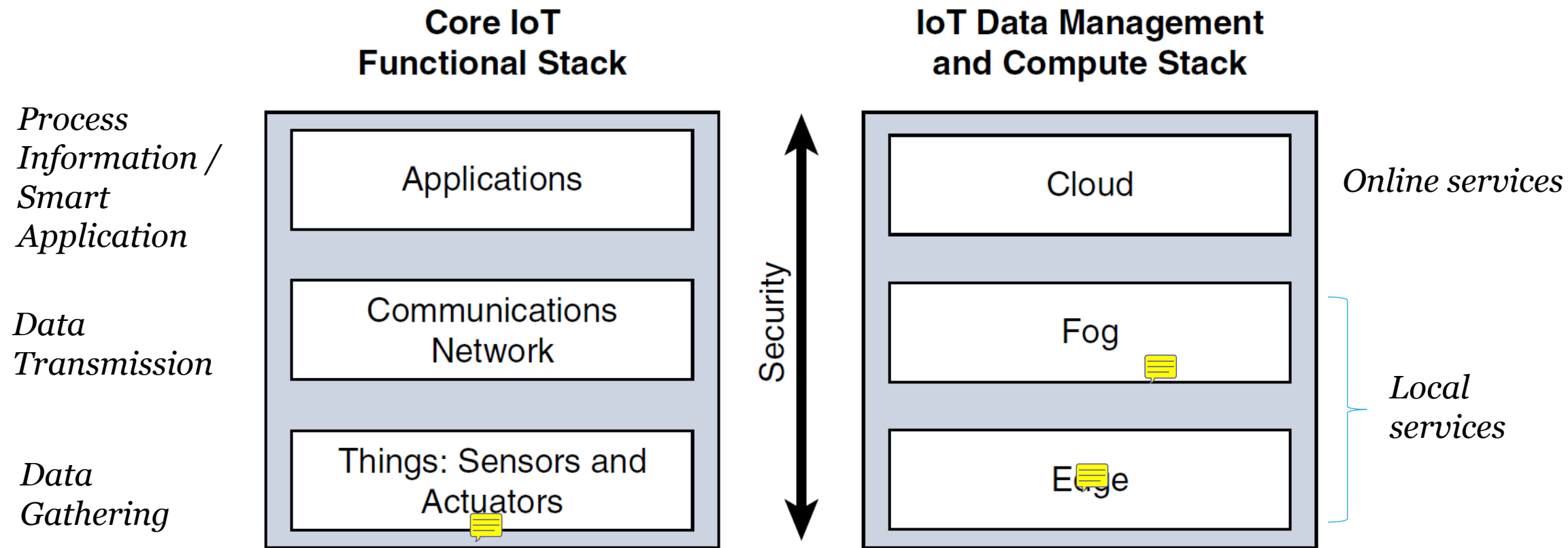
# IoT Architecture



IoTWF IoT Architecture - 2014



# IoT Architecture



Simplified IoT Architecture