Advanced Topics in Service-Oriented Computing and Cloud Computing

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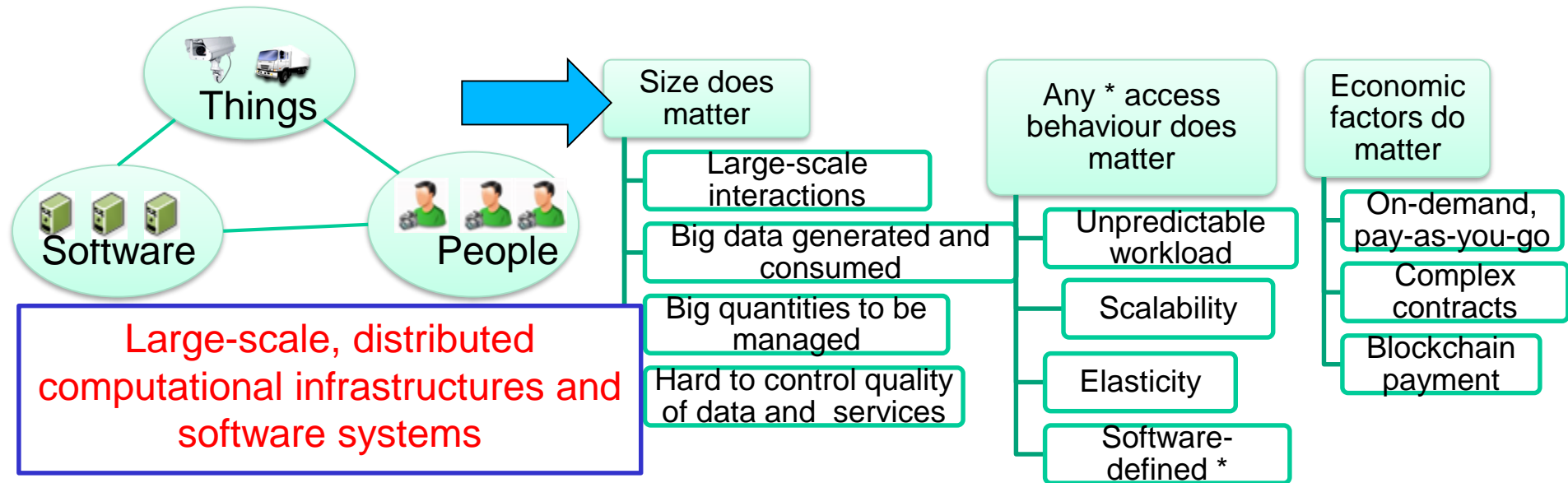
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Outline

- Why do we need this course?

- What is the course about?

- Course administrative information

Services Computing

- Services offer well-defined interfaces for consumers to

    - access resources: *contents, things, machines, and people*

    - provide functions*: computation, networking, sensing, actuating, analytics, etc.*

    - offer diverse types of business models: *pay-per-use, and subscription*

- Services are associated with and characterized by scalability, reliability, elasticity, etc.

- Services are provisioned in distributed systems of IoT, edge/fog and cloud infrastructures

Services computing

Things

Software

People

Large-scale, distributed computational infrastructures and software systems

Size does matter

Large-scale interactions

Big data generated and consumed

Big quantities to be managed

Hard to control quality of data and services

Any * access behaviour does matter

Unpredictable workload

Scalability

Elasticity

Software-defined *

Economic factors do matter

On-demand, pay-as-you-go

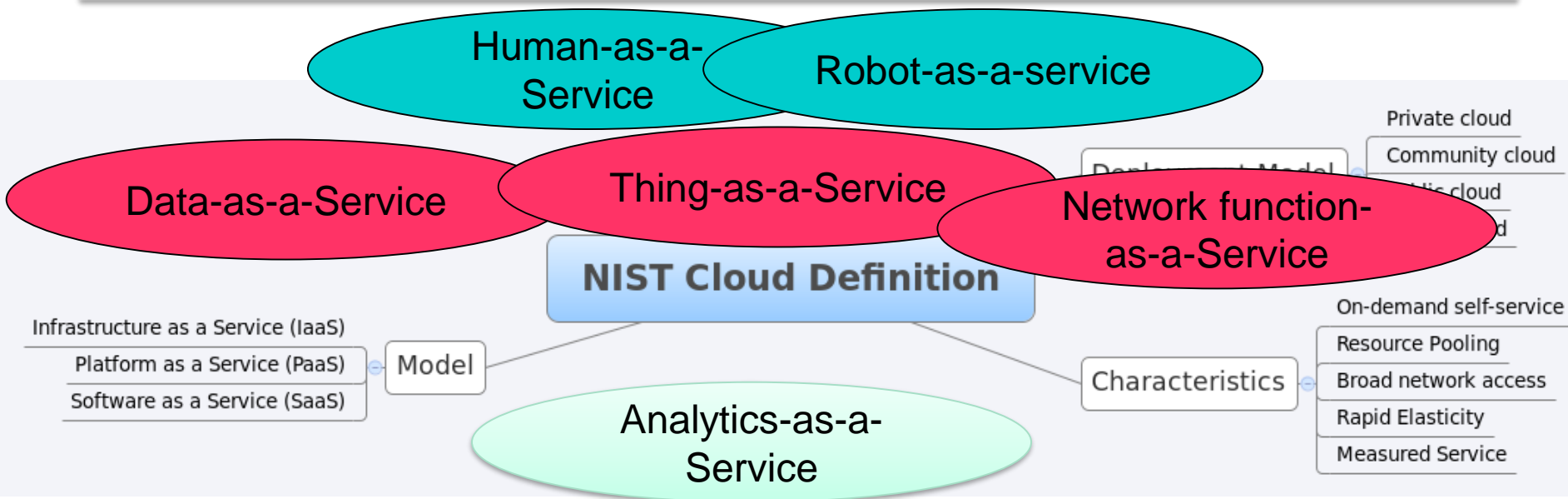Complex contracts

Blockchain payment

Cloud definitions

Original definition from NIST

"This cloud model promotes availability and is composed of five essential **characteristics,** three **service models**, and four **deployment models**."

Source: NIST Definition of Cloud Computing v15, http://csrc.nist.gov/groups/SNS/cloud-computing/cloud-def-v15.doc

Internet of Things (IoT)

- Things and Objects
    - Home
    - Shops
    - Official Business
    - Hospital
    - Factory
    - Infrastructure
    - Etc.

- How to make such things and objects being connected and interacting each other?

Source: http://www.control4.com/blog/2014/03/the-internet-of-things-and-the-connected-home

Current trends in SOC and Cloud

- Integration of Internet of Things (IoT)/cyber-physical systems, Cloud computing, and Fog/Edge-centric computing
  - Dispersed computing in cities
  - Cloud robotics
  - Connected Cars/Electronic Horizon
  - Autonomous cars/unmanned aerial vehicle (UAV)
  - Smart contracts with blockchain + IoT
  - IoT + Machine learning
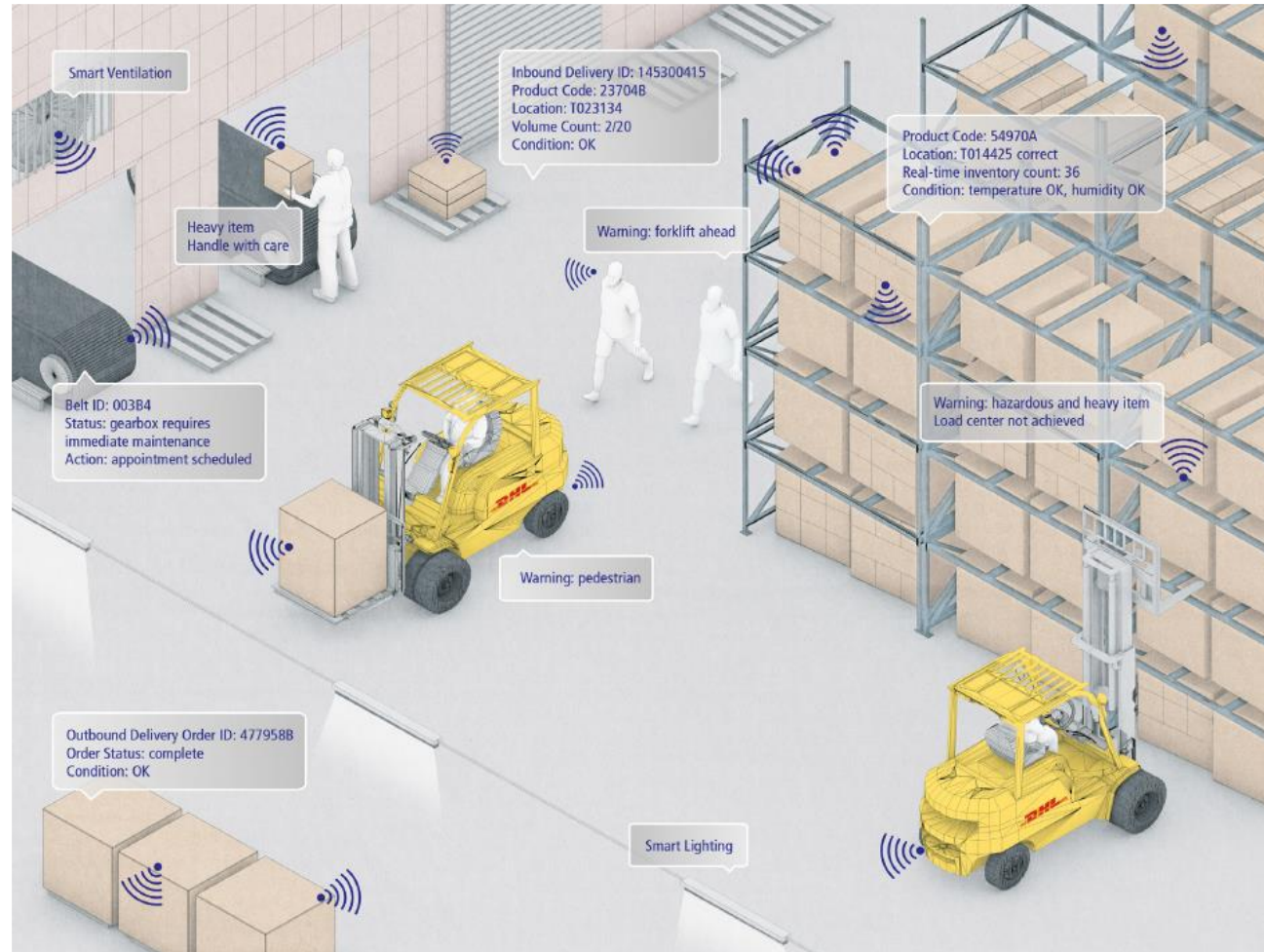
Current trends in SOC and Cloud

- Intelligences from human and machines
  - Analytics services atop big data infrastructures

  - Infrastructures for big data analytics + human interaction + artificial intelligence

  - Human-centric robotics

  - Predictive maintenance

  - Cloud manufacturing + business service integration
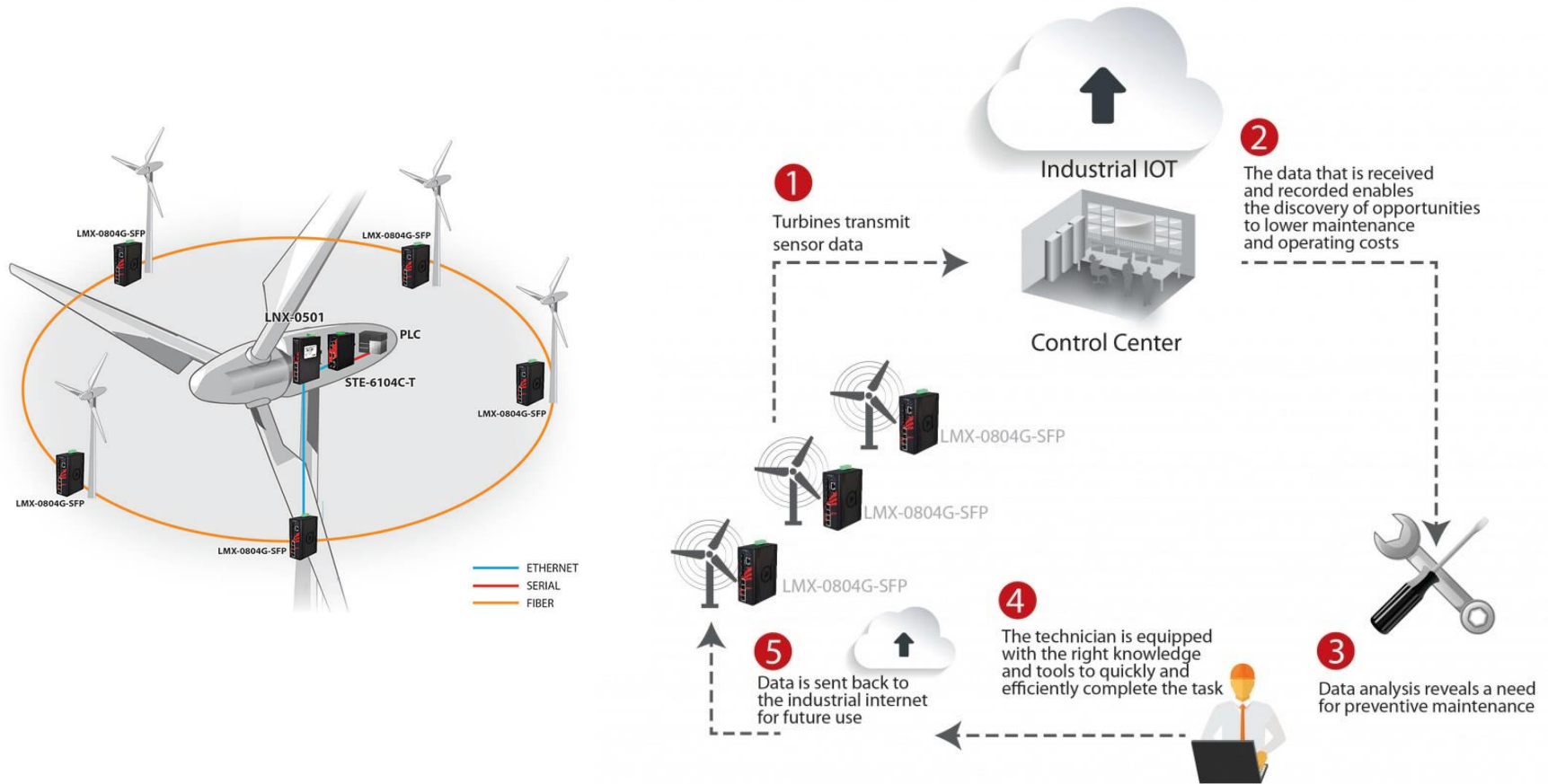
Complex requirements and SOCloud focus

- Some key issues
  - High availability, data sharding, geographical multi-cloud/ and fog-edge load balancing, automatic formation of on-demand data centers and of IoT/edge services, etc.
  - Horizontal scalability in big data, elasticity coordination in multi-cloud environments, elasticity algorithms for fog and network function virtualization (NFV)
  - Complex connectivity and execution models
  - Algorithms for large-scale data ingestion/big data.
  - Performance and reliability monitoring and analysis

- Gaps between theoretical concepts and practical applications of advanced algorithms and techniques

Logistics scenario from DHL

Figure source: DHL Trend Research & Cisco Consulting Services, INTERNET OF THINGS IN LOGISTICS, 2015

Industrial internet

Figures source: http://www.windpowerengineering.com/design/electrical/controls/wind-farm-networks/talking-turbines-internet-things/

Video analytics + business applications/public security
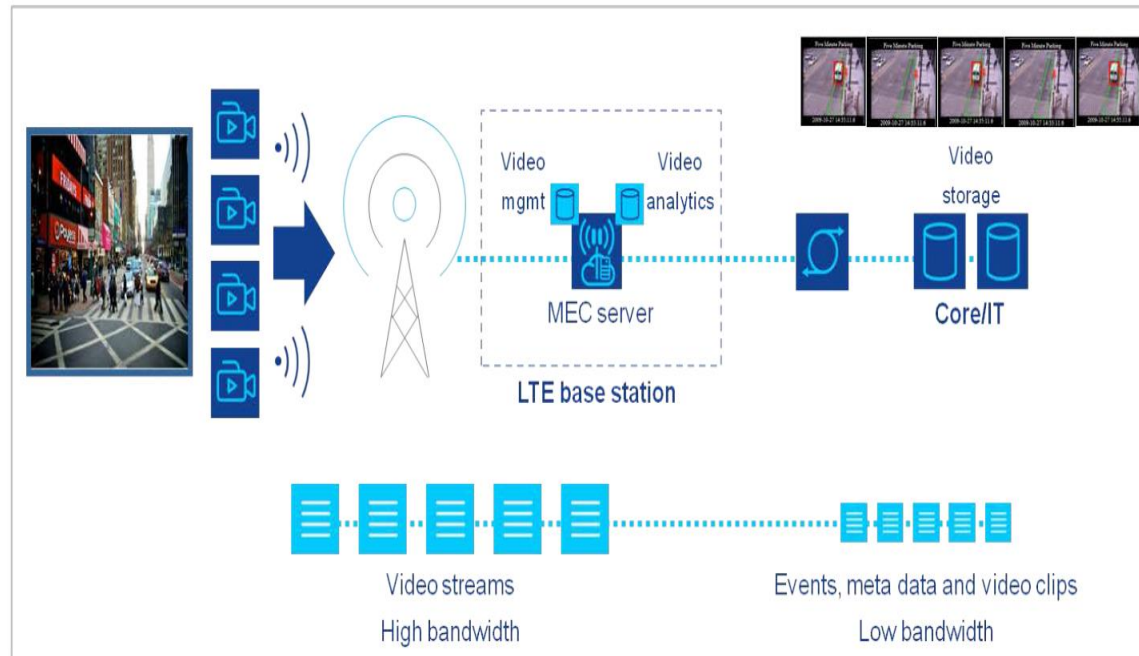
Use Case 3: Video Analytics

Figure 4: Example of video analytics

We study and explore complex algorithms and techniques in SOC, Cloud, Fog/edge, and Big data systems.

It is a kind of "advanced distributed systems and software systems" focused SOC, Cloud, and fog/edge environments.

SOCloud – relevant courses

- Advanced Internet Computing
  - Give you some advanced technologies about SOC, Cloud Computing and (business) processes/workflows

- Advanced Services Engineering
  - Focus on services engineering techniques atop IoT, big data and clouds

- Distributed Systems Technologies:
  - Give you fundamental distributed technologies and how to use them for complex software systems

Course administration (1)

- Lectures + participant's presentations + discussions
    - Held through the whole semester
    - But not every week – check the course website!
    - Make sure you reserve all slots for changes
- Who could participate in the course?
    - Master students in advanced stages (e.g., seeking for master thesis) in informatics and business informatics
    - PhD students: normal PhD track, PhD School of Informatics, and Doctoral Colleges
    - Students should have knowledge about fundamental distributed systems, internet computing and distributed computing technologies

Course administration (2)

- Learning methods
  - Discussion, individual and team work, literature and practical studies
- Evaluation methods
  - Assignments and a final examination
- Assignments
  - 4 home assignments resulting in some analysis summaries (presentations) and discussions
    - Each assignment: 10 points for presentation content and 10 points for answers/questions
- Oral final exam
  - Flexible – 30 minutes

Grades

- Assignments: 80 points
- Final oral examination: 20 points

Point	Final mark
90-100	1 (sehr gut)
75-89	2 (gut)
56-74	3 (befriedigend)
40-55	4 (genügend)
0-39	5 (nicht genügend)

Failed ? → retake the final oral examination part!

THANKS! ANY QUESTION?

Thanks for your attention

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