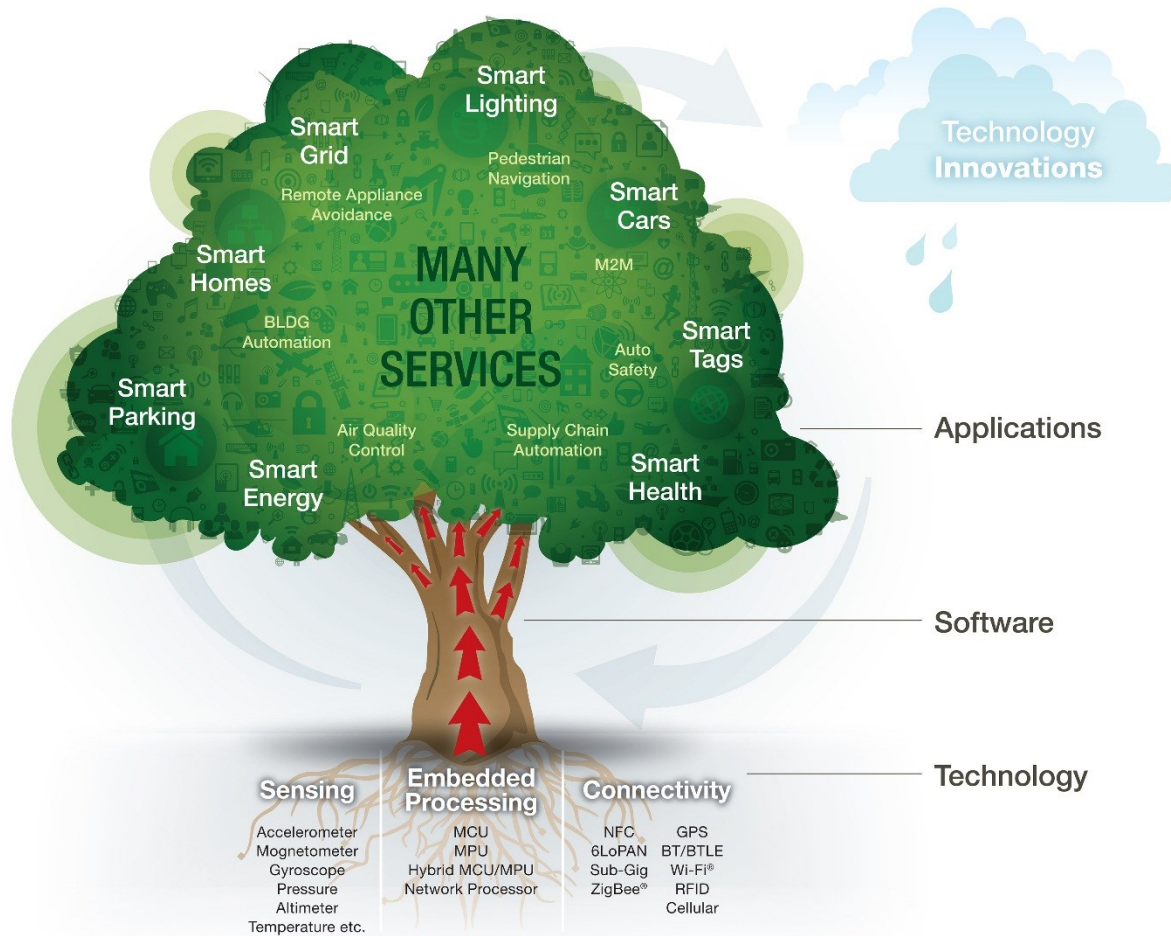# ISSA-DW 2016 Panel:
IoT Services for Critical Problems in Vietnam

Moderator:
Hong-Linh Truong
Distributed Systems Group, TU Wien
truong@dsg.tuwien.ac.at
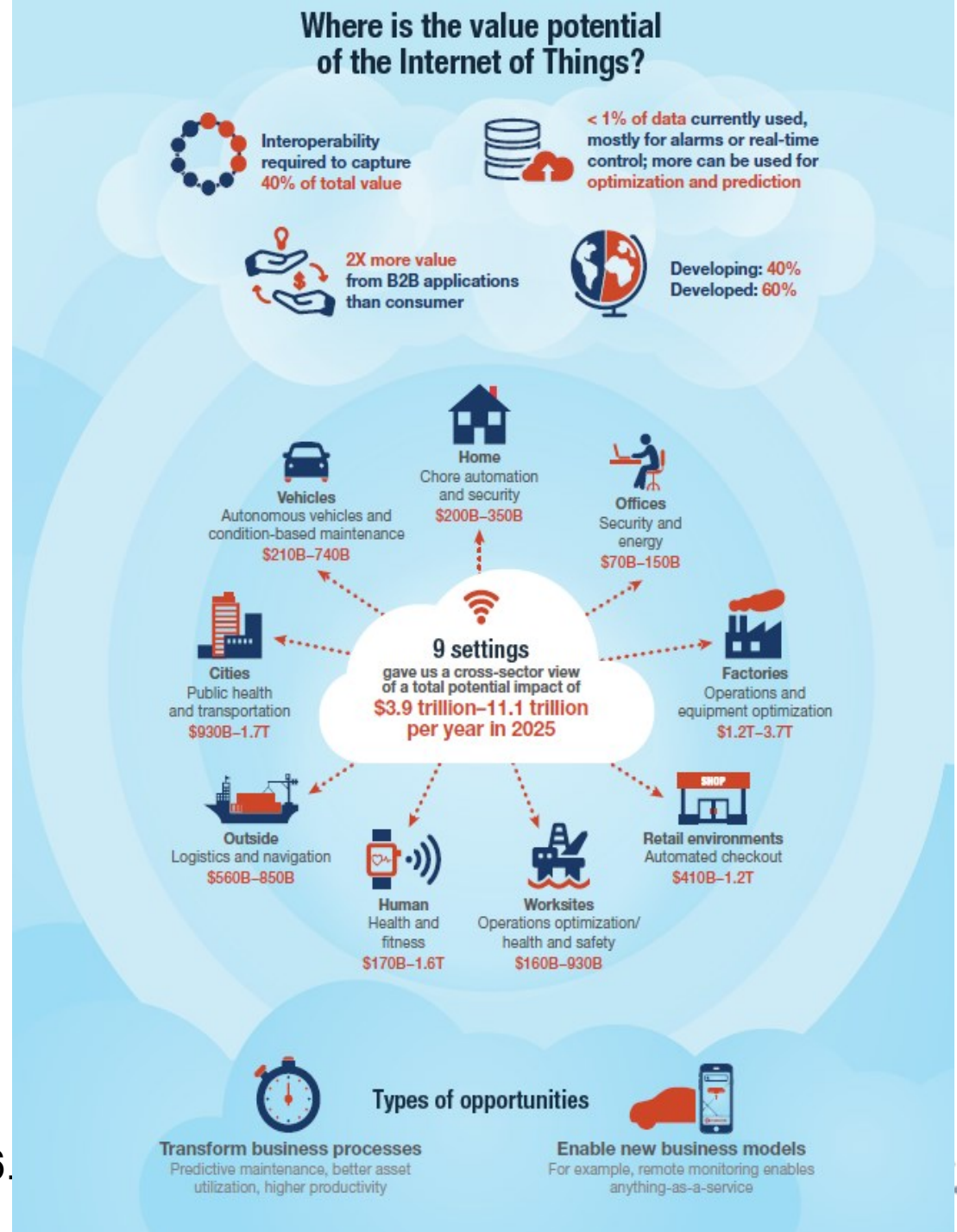
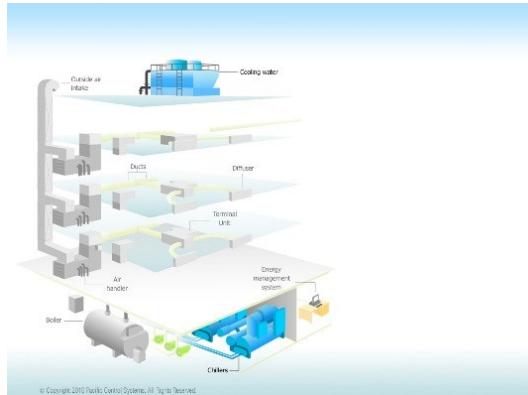http://dsg.tuwien.ac.at/staff/truong

DISTRIBUTED SYSTEMS GROUP

The IoT services tree

IoT

Figure source: McKinsey Global Institute: THE INTERNET OF THINGS: MAPPING THE VALUE BEYOND THE HYPE JUNE 2015 HIGHLIGHTS

ISSA-DW 2016, 4 Aug, 2016.

Where is the value potential of the Internet of Things?

Interoperability required to capture 40% of total value

< 1% of data currently used, mostly for alarms or real-time control; more can be used for optimization and prediction

2X more value from B2B applications than consumer

Developing: 40%
Developed: 60%

Home Chore automation and security $200B–350B

Vehicles Autonomous vehicles and condition-based maintenance $210B–740B

Offices Security and energy $70B–150B

Cities Public health and transportation $930B–1.7T

9 settings gave us a cross-sector view of a total potential impact of $3.9 trillion–11.1 trillion per year in 2025

Factories Operations and equipment optimization $1.2T–3.7T

Outside Logistics and navigation $560B–850B

Human Health and fitness $170B–1.6T

Worksites Operations optimization/ health and safety $160B–930B

Retail environments Automated checkout $410B–1.2T

Types of opportunities

Transform business processes Predictive maintenance, better asset utilization, higher productivity

Enable new business models For example, remote monitoring enables anything-as-a-service

IoT Services in Developed Worlds

Air Ecosystem, Pacific Controls

**Geo Sports: Picture courtesy
Future Position X, Sweden**

https://arrayofthings.github.io/
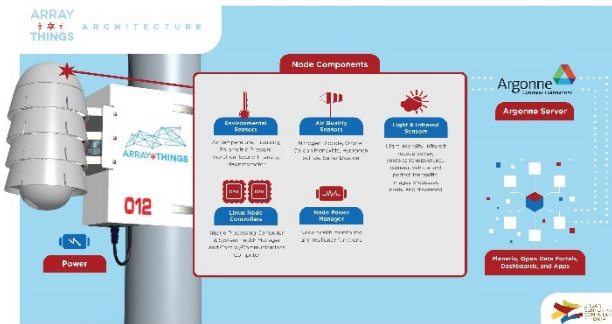
**Figure source: DHL Trend Research & Cisco
Consulting Services, INTERNET OF THINGS
IN LOGISTICS, 2015**

Source: Erik Christensen, http://www.sensorfish.eu/

ISSA-DW 2016, 4 Aug, 2016. Hanoi   4

DISTRIBUTED SYSTEMS GROUP

IoT Services & Developing Worlds/Vietnam

Source: http://english.vietnamnet.vn/fms/society/149411/transport-minister-vows-to-wipe-out-traffic-congestion-in-vietnam.html

Search here

Related links
· GEOGLAM
· CESBIO
· Sarmap
· TU Vienna
· RIICE
· ESA Data User Element (DUE)
· Copernicus
· Sentinel Data Hub portal

In depth
· TOPSAR processing

SENTINEL-1 SEES RICE PADDY DROP IN THE MEKONG DELTA

18 April 2016 Europe's Sentinel-1A satellite has shown that the Mekong River Delta – one of the world's major rice-growing areas – saw a significant drop in productivity over the past year, illustrating the effect of El Niño on food security.

Since the end of 2015, dry conditions associated with El Niño have strongly affected South East Asia, leading to severe drought, in particular in Vietnam's Mekong Delta.

Rice crop evolution in the Mekong Delta

More about this video

River water levels are at the lowest recorded in 90 years in many places, causing more severe and earlier salt water intrusion than previous years.

According to UN humanitarian response reports, local farmers are coping with the drought and increased water salinity by reducing their crop area.

The Sentinel-1 mission is helping to map and monitor rice production. It carries an advanced radar that can see through all weather conditions – essential in cloud-prone South East Asia – and is highly sensitive to changes in waterlogged ground such as rice paddies.

Source: http://www.esa.int

Vietnam seriously lacks water monitoring stations

14 February 2012 | 09:55:00 AM

In order to prevent the pollution for river valleys and minimize the sources that cause pollution, it's necessary to control the water quality with the water monitoring systems. Meanwhile, there are very few such systems.

The surface water of rivers, streams, ponds and lakes is quite rich, but it has been threatened by the depletion and pollution. Meanwhile, the environmental monitoring network is very poor, which badly affects the works of collecting and managing information and data to serve the management over the valuable natural resource.

Pollution everywhere

Vietnam has a dense network of rivers which accounts for about two percent of the total flow of the rivers in the world. The 13 major river systems alone cover an area of 10,000 square meters.
However, the water resources are facing big challenges, including the depletion and the pollution in a wide scale.
Nearly all the major rivers in Vietnam, including the Red River in Hanoi, the Cam River in Hai Phong, Lam River in Nghe An, Huong River in Hue City, Han River in Da Nang, Saigon River in HCM City, Tien River in Tien Giang and Hau River in Can Tho, have the pollution levels exceeding the allowed levels by 1.5-3 times.

http://www.vacne.org.vn/vietnam-seriously-lacks-water-monitoring-stations/e1414.html

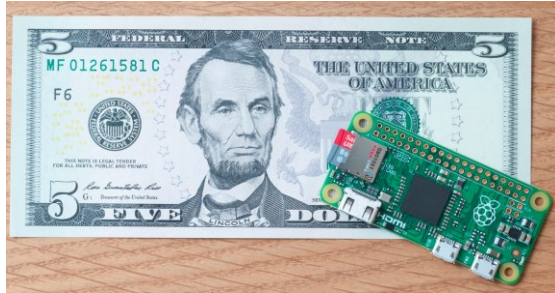## Vietnam blames toxic waste water from steel plant for mass fish deaths

Taiwanese firm Formosa Plastics that owns the plant says it will pay $500m towards clean up and compensation

Dead fish lie on the shore in Quang Trach district, Quang Binh province, Vietnam. Photograph: Chi Nam/AP

Source: https://www.theguardian.com

ISSA-DW 2016, 4 Aug, 2016. Hanoi

5

DISTRIBUTED SYSTEMS GROUP

IoT Services & Developing Worlds/Vietnam

https://www.raspberrypi.org/products/pi-zero/

Anthony Bourdain @Bourdain · May 23
Total cost of bun Cha dinner with the President: $6.00 . I picked up the check .
#Hanoi

"Young Vietnamese are diamonds in the rough that need polishing," Thai-Lai Pham, Source: https://www.ingwb.com/insights/articles/young-vietnamese-diamonds-in-the-rough

- Powerful datacenters?
- High throughput and reliable network?
- National data services for domain knowledge?
- Human skills?
- Long term research funding?

DISTRIBUTED SYSTEMS GROUP

The Questions

- Why IoT and analytics are important for Vietnam/developing countries?

- Where are our opportunities and challenges ?

- Which research directions we should focus?

- What should we do w.r.t. teaching and research?

- How should we collaborate?

DISTRIBUTED SYSTEMS GROUP

The Panel List

Tuyet-Trinh Vu, PhD
School of Information
and Technology
Hanoi University of
Science and
Technology

Tien-Dung Cao, PhD
School of Engineering
- Tan Tao University

Huu-Hanh Hoang, PhD
Hue University

Binh-Minh Nguyen, PhD
School of Information
and Technology
Hanoi University of
Science and
Technology

DISTRIBUTED SYSTEMS GROUP

Panel Discussion

Tuyet-Trinh Vu

HUST

why IoT and analytics : opportunities and challenges ?

- Opportunities
  - Information/thing everywhere
  - Every sources of information/thing
  - Every types of information/thing

available in IoT

- Challenges
  - Heterogeneity and diversity
  - Dynamicity and autonomy
  - Distribution
  - Spatial-temporal dimension
  - ❖ Toolkits for building/integrating IoT platforms/applications ?

Our focus and interest

- Teaching
  - Current status: some IoT related courses but not really specific

- Research (R&D)
  - IoT Cloud, cross-, integration, interoperability … platform
  - *pay-as-you-go* models in IoT (everything as a service ?)

- Application area
  - Transportation / traffic
  - smart environment (e.g. campus, farm/agriculture/)

Our collaboration

- Research
  - common interest/shared development/ join publication
  - Join projects

- Opportunities
  - Erasmus + (KA1, KA2)
  - H2020
  - MSCA
  - ASEA-UNINET
  - ….

IoT important for developing world

Tien-Dung Cao

The important of IoT for DW

- DWs are facing critical problems
  - pollution
    - industrialization and urbanization
    - lack of efficient methods for waste management
  - poverty
    - backward agricultural
    - productivity of agriculture is low caused by lack of knowledge, environment pollution and climate change (flood, drought)
  - food safety
  - traffic problem due to poor infrastructure, law respecting and culture
- IoT can monitor the environment pollution, improve agricultural productivity, manage efficiently resource, …

Our opportunities & challenges

- IoT solutions in developed worlds are not suitable due to
  - different culture
  - many problems exists unique in DW
  - ➡ we have opportunities for IoT research & development
- But
  - lack of infrastructure, human resource
  - no research and training program
  - lack of collaboration between computer scientist and domain experts

Research direction

- focus on
  - analytical services because nobody outside can do them exception ourselves
  - edge computing to solve the problem of poor infrastructure (framework or cloud requirements)
  - citizen science model to build knowledge bases (propose framework or solution to make motivation)

17

ISSA-DW 2016 – HUST, August 4th, 2016

PANEL SESSION

HOANG HUU HANH

HUE UNIVERSITY

18   IOT AND ANALYTICS

- **_Smart_** Agriculture is demanding for a better agricultural production in developing world

- IoT: connected "things"
  - [Raw] Data production → infrastructure and services are needed for representation, processing and visualisation

- Analytics
  - Inter-connecting "things"
  - Domain expert-based analytics
  - Discover relationships of information → better monitoring and prediction

19 RESEARCH ISSUES AND EDUCATION

- Focal areas:
  - Food production, Food quality
  - Environment
  - Urban life
  - Production cycle management
  - → Community health
- Education
  - More multi-disciplinary approaches in education → Joint international master programmes

20   FUTURE COLLABORATION

- Grouping according identified focal areas → leadership?

- Networking: nation-wide, North-South, North-South-South

- Fundings
  - E+ KA1(EU) → mobility and training programmes
  - E+ KA2 (EU) → capacity building
  - Newton (UK) → joint research inititatives
  - NAFOSTED (VN) → joint research initiatives

Panel Discussion

Binh Minh Nguyen

HUST

Why IoT and analytics are important for developing countries, where are our opportunities and challenges?

- Situations & Opportunities:
  - **Most developing countries depend on agriculture economy**
  - **Natural resources like water, land are exploited immoderately**
  - Number of the Internet users is still small but increases exponentially
  - IT infrastructures are behind the times but can deploy quickly new technologies ← **advantage**
- IoT and analytics impacts
  - Improve agricultural productivity
  - Keep track of the epidemiologic situation
  - Preserve natural resources (e.g. water, land)
  - Provide new added values (e.g. create applications for managing product life-cycle)

Which research directions we should focus? What should we do w.r.t. teaching and research?

- Research directions
  - IoT appliances are developed in small scopes (i.e. for each different case) and they can not extend
    - ➔ **lack of integration solutions**
    - ➔ many existing IoT products ➔ lack of standard, but standardization efforts do not gain consensus from almost producers/providers ➔ **the need of interoperability solutions**
  - **Lack of effective communication mechanism for IoT**
    - 5G technology is not an one-size-fit-all solution
- Role of teaching and research:
  - IoT manpower at Vietnam is quite little but they are young and able to learn new things quickly
  - Most ITers work on outsourcing industry
  - ➔Teaching can direct young people to work in IoT field during training process

How should we collaborate?

- Building research communities and virtual labs to share knowledge, consu
- Focus on local IoT problems
- Integrating IoT resources and publishing data to experiment and study together
- Seek fund from projects, enterprises