The trends of applications for smart cities in Vietnam

Nam Thoai
namthoai@hcmut.edu.vn

HPC Lab (http://www.hpcc.hcmut.edu.vn/)
Faculty of Computer Science and Engineering
HCMC University of Technology
http://www.cse.hcmut.edu.vn/

Contents

- Motivation & problems
- HCMC smart city plan
- What we do

Motivation of smart cities

- HCM city
  - Population: 9M (~14M)
  - Business central of Vietnam
  - Problems

    (1) Traffic jam

    (2) Urban flooding

    (3) Pollution: waster & air

    (4) Economic

    $\Rightarrow$ Prediction & planning

HCMC smart city plan

- The 1st Phase: 2017-2020
  - Building the core technologies
    - Data center
    - Operating center
    - Simulation, prediction & planning center
    - Cyber security center
  - Pilot projects in few areas
- The 2nd: 2021-2025
  - Applying in special tracks
- The 3rd phase: 2025 and future
  - Long-term strategy

Applications

- Transportation
- Healthcare
- Safety food
- Environment
- Flooding
- Human resource
- Cyber security
- e-Government
- Urban planning

ICT Research in Smart Cities & Industry 4.0

2018–2023

Internet of Things (IoT)

(Timothy Chou)

Do

Learn

Collect

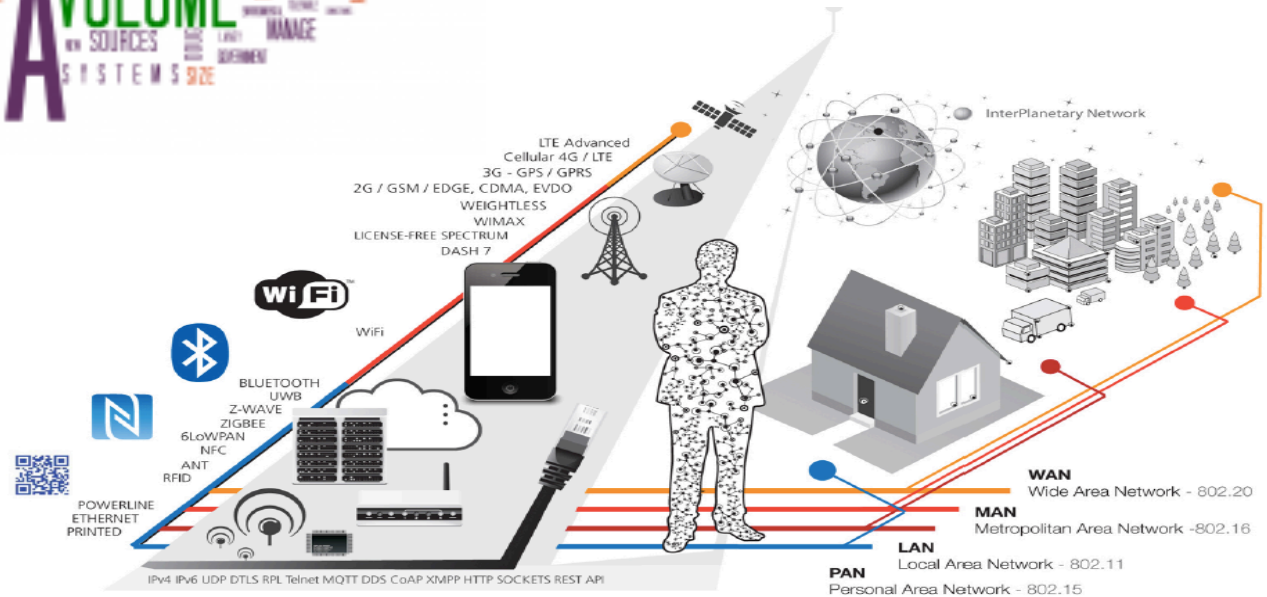
Connect

Things

Data collection

Connect

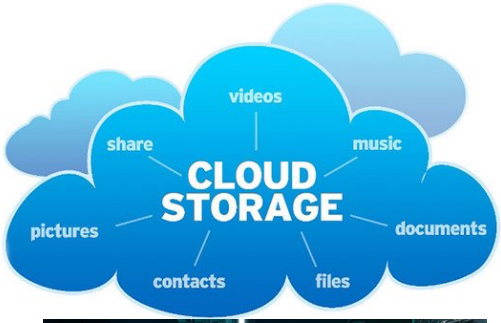
Things



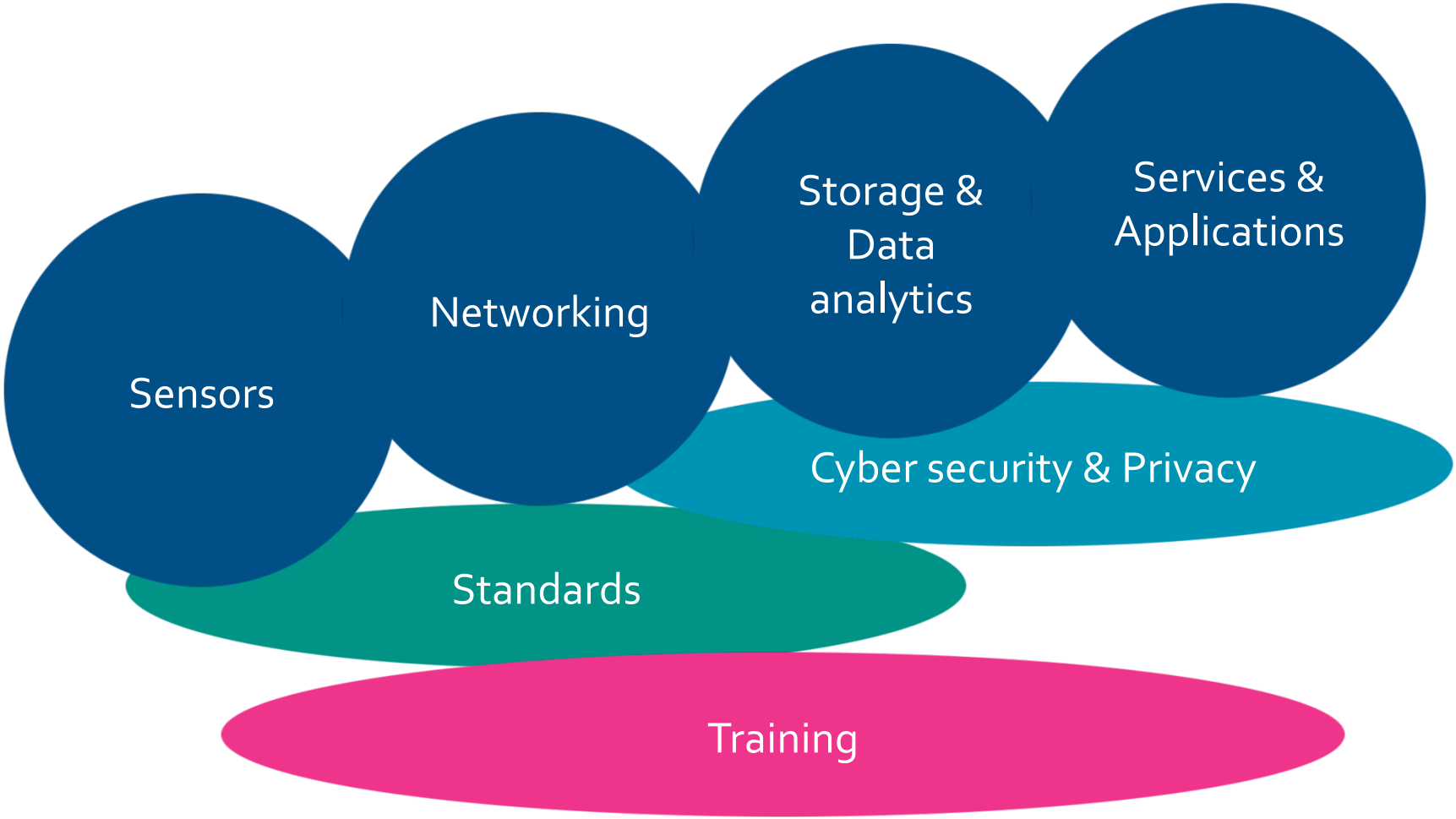
Data analytics

Learn

Collect



ICT Research in Smart Cities & Industry 4.0



Research plan 2018-2023

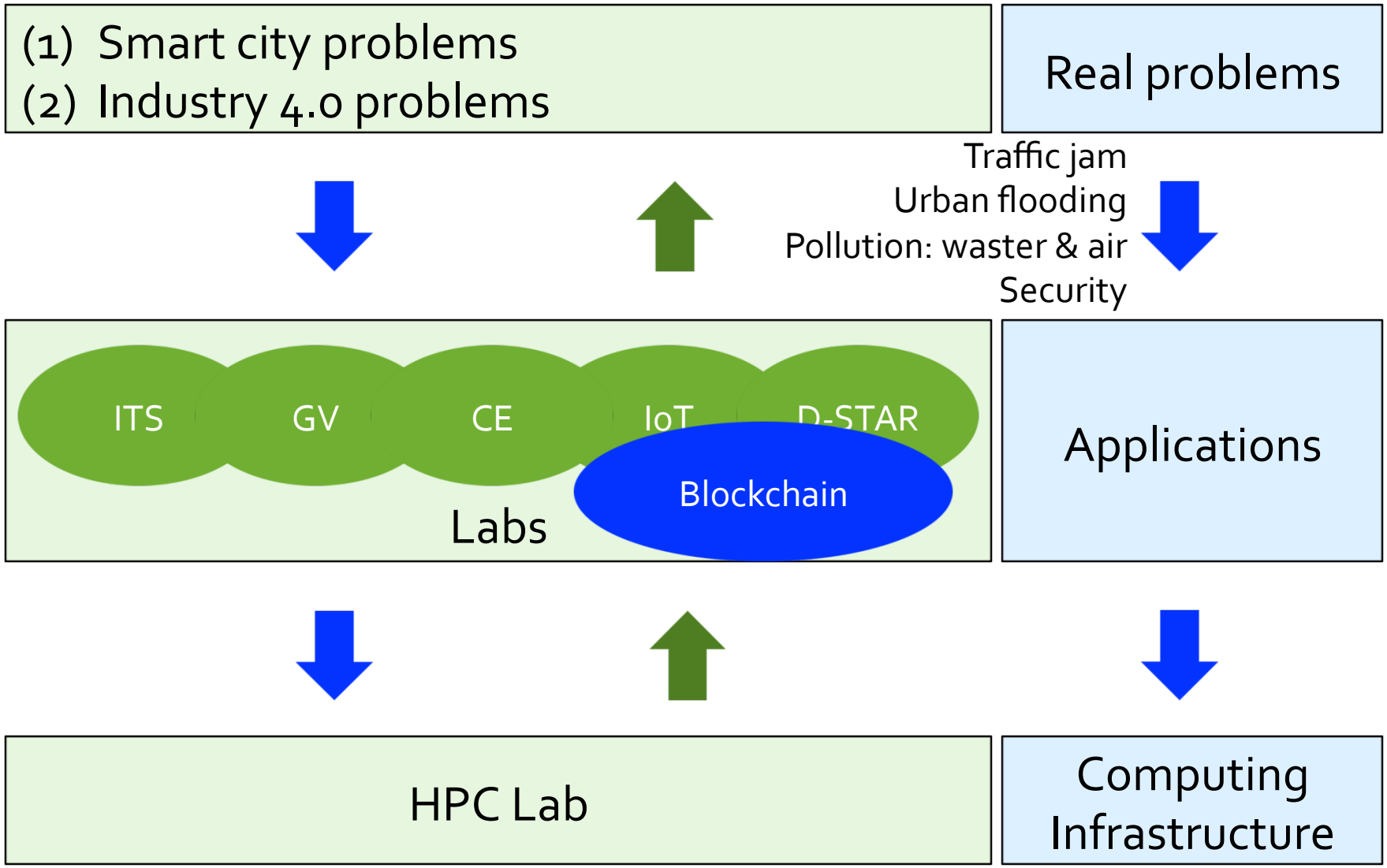
1. Testbed for Smart Cities & Industry 4.0
   - HPDA machine: HPC & data analytics
   - Storage
   - AI: Machine learning & Deep learning
   - Data mining
   - SDN
   - Fog/Edge computing
   - Sensor network
   - Security and privacy
   - Blockchain
2. Data
   - Data Warehouse
   - Open data

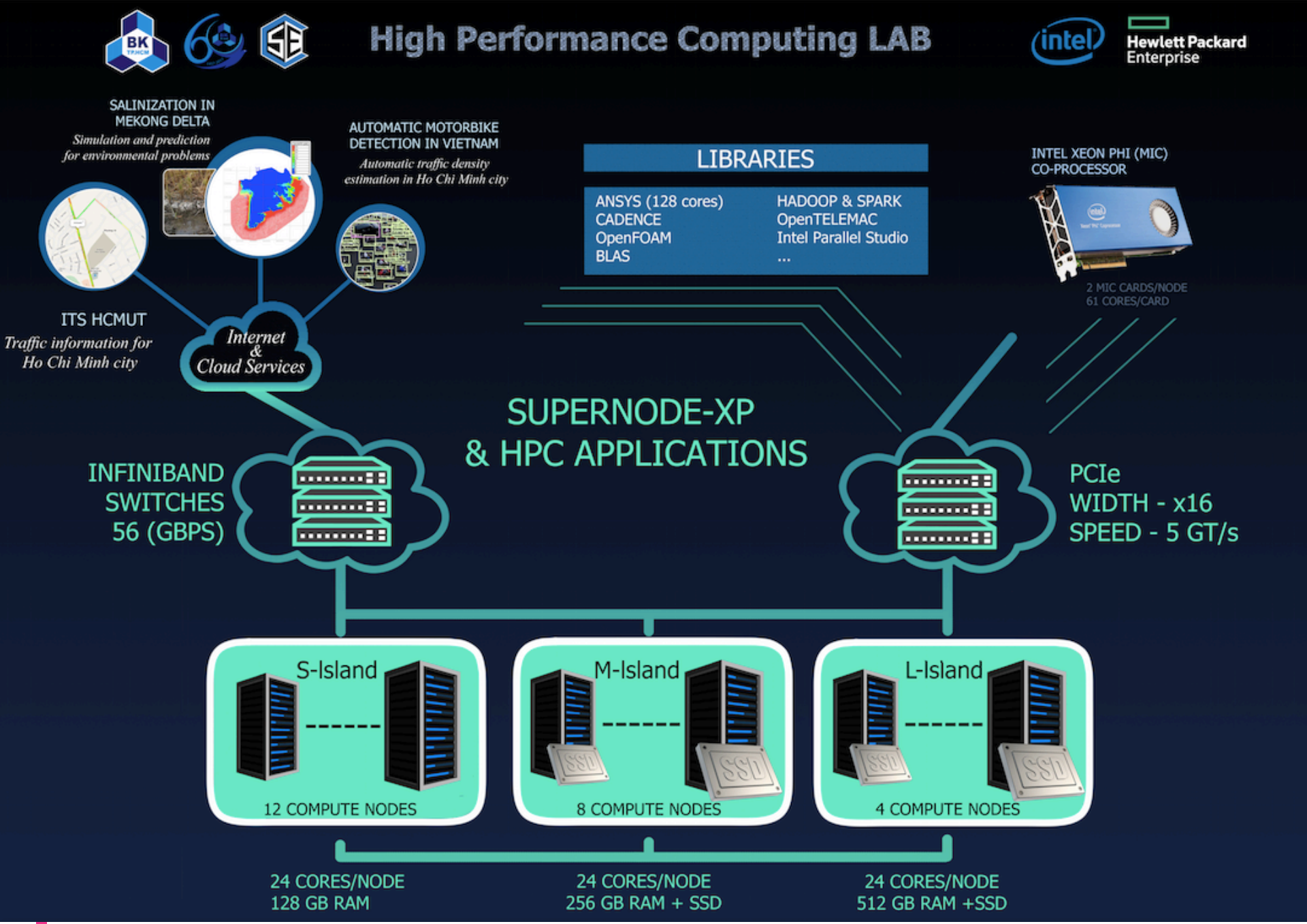
Research topics

3. Applications
   - Education
   - Transportation
   - Environment
   - E-Government
   - Healthcare
   - Agriculture
4. Smart Universities
   - Training for Industry 4.0, Smart cities
   - E-learning
   - Smart Lab
   - Data analytics

HCMUT activities

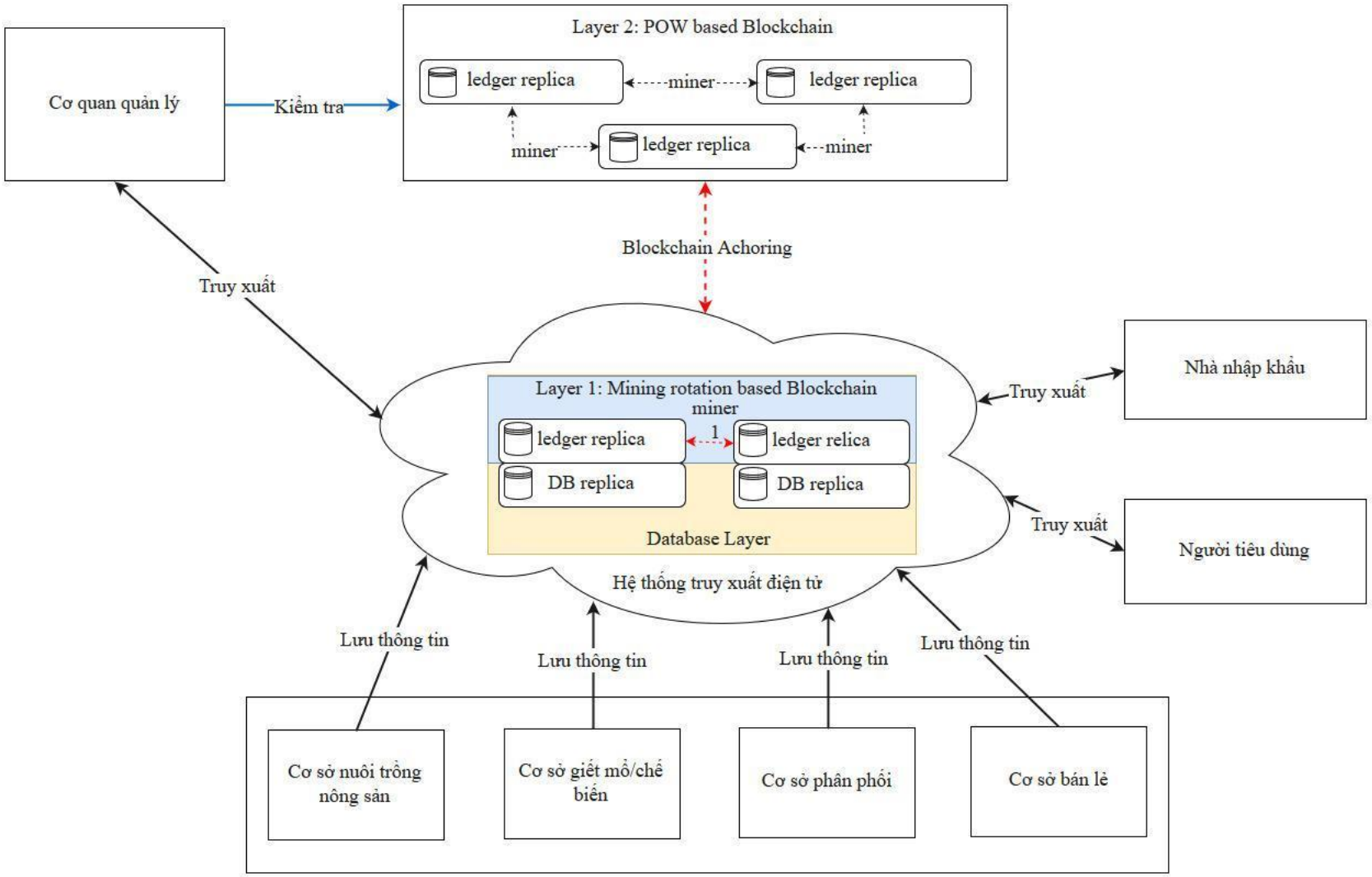
HCMUT


(1) Smart city problems
(2) Industry 4.0 problems
Real problems
Traffic jam
Urban flooding
Pollution: waster & air
Security
ITS
GV
CE
IoT
D-STAR
Blockchain
Labs
Applications
HPC Lab
Computing Infrastructure


High Performance Computing LAB
intel
Hewlett Packard Enterprise
SALINIZATION IN MEKONG DELTA
Simulation and prediction for environmental problems
AUTOMATIC MOTORBIKE DETECTION IN VIETNAM
Automatic traffic density estimation in Ho Chi Minh city
LIBRARIES
ANSYS (128 cores)
CADENCE
OpenFOAM
BLAS
HADOOP & SPARK
OpenTELEMAC
Intel Parallel Studio
...
INTEL XEON PHI (MIC) CO-PROCESSOR
2 MIC CARDS/NODE
61 CORES/CARD
ITS HCMUT
Traffic information for Ho Chi Minh city
Internet & Cloud Services
SUPERNODE-XP & HPC APPLICATIONS
INFINIBAND SWITCHES 56 (GBPS)
PCIe WIDTH - x16 SPEED - 5 GT/s
S-Island
12 COMPUTE NODES
M-Island
8 COMPUTE NODES
L-Island
4 COMPUTE NODES
24 CORES/NODE 128 GB RAM
24 CORES/NODE 256 GB RAM + SSD
24 CORES/NODE 512 GB RAM +SSD

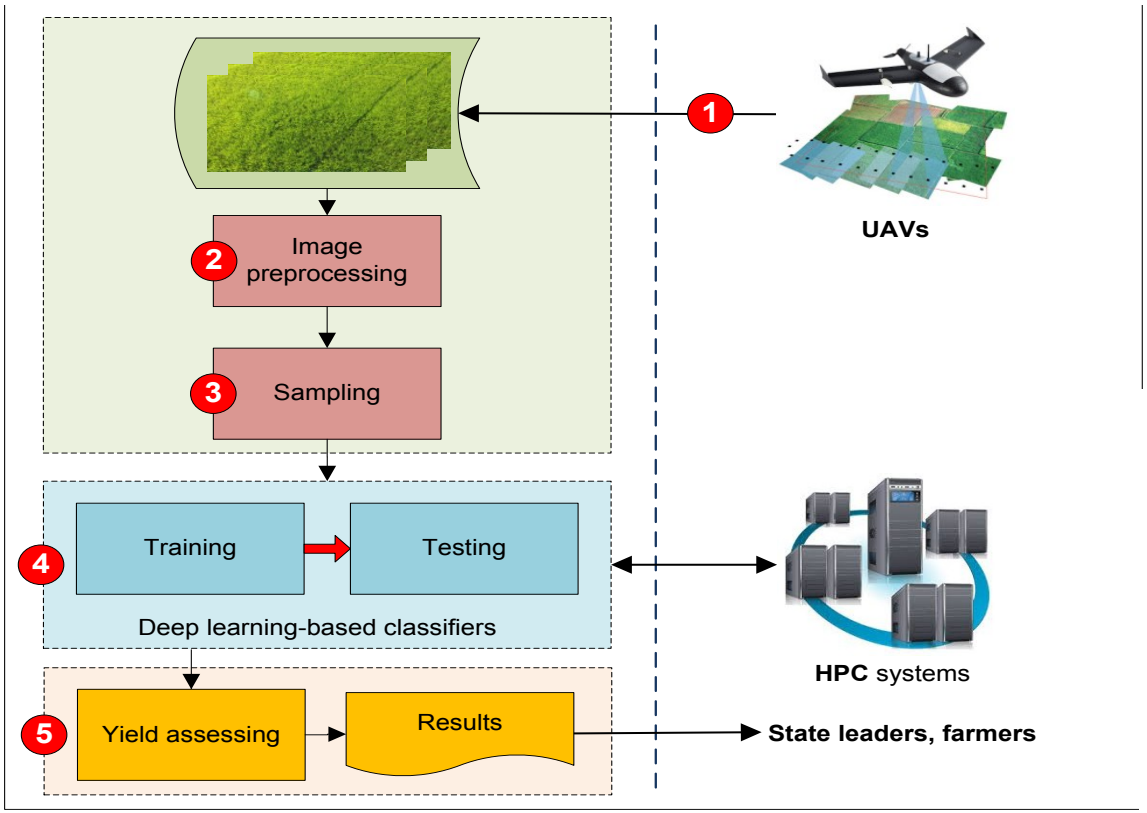
Agriculture: IoTs + Blockchain + HPC

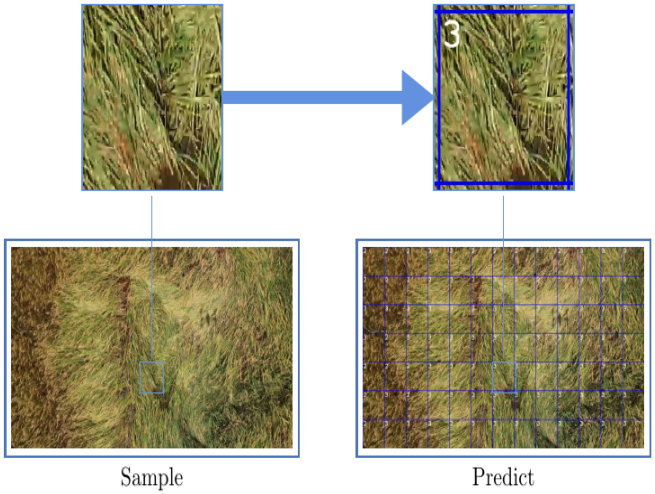
Pham Hoang Anh & Huynh Tuong Nguyen - IoT Lab



Agriculture: Deep learning

Nguyen Cao Tri – HPC Lab





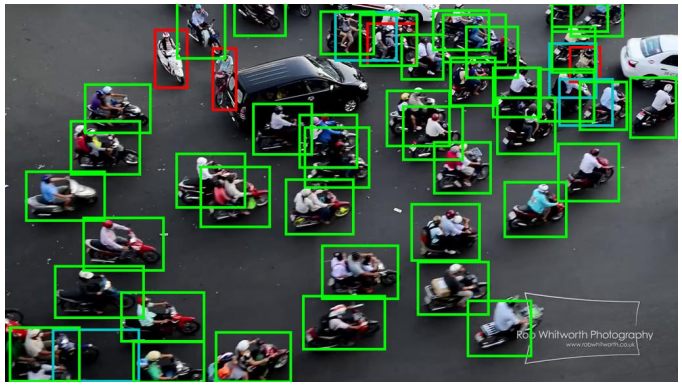
Graphics & Vision Lab

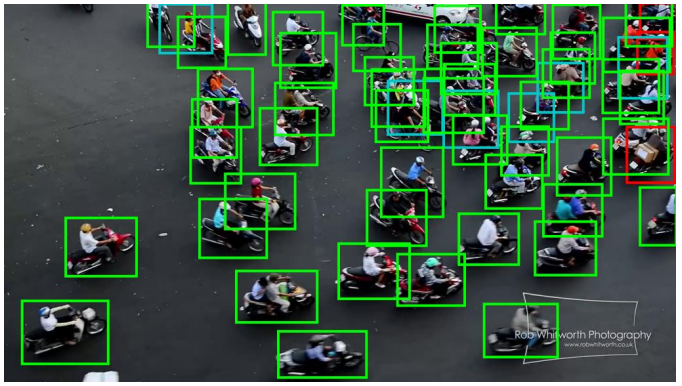
Le Thanh Sach – GV Lab

Automatic vehicle detection

- Deep learning, Machine learning -

- Object of interest: motorbike, car, bus, etc.
- Achieve an accuracy up to 95% in ideal conditions.
- Can predict correctly if there are around 60 vehicles per image or fewer.
- Can be reused in other problems (human counting, forest density estimation, etc.)





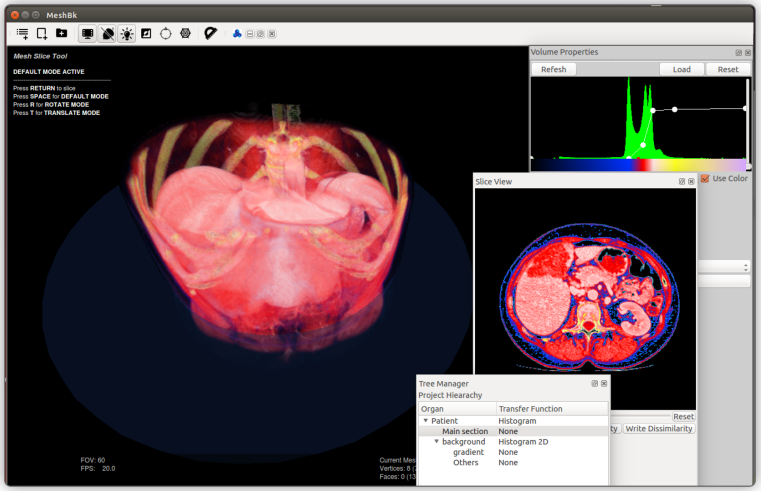
Graphics & Vision Lab (3)

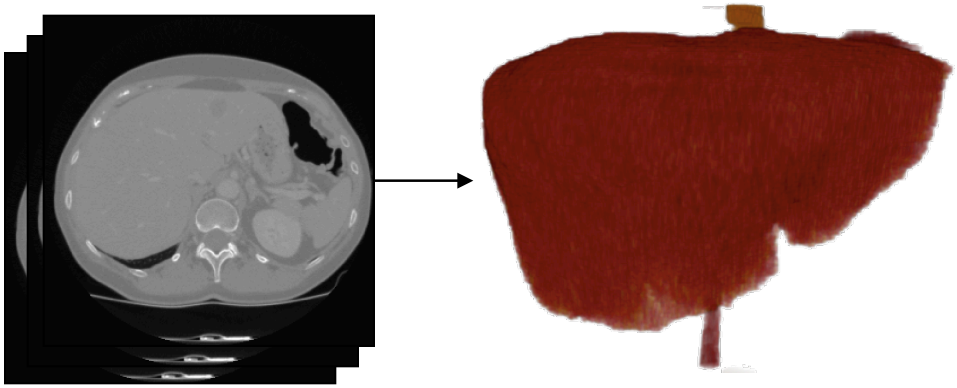
Le Thanh Sach – GV Lab

3D Liver segmentation and visualization

- Machine learning, 3D Image processing -

- Process stacks of 2D MRI/CT images to generate 3D model of vital organs (bone, liver, kidney, etc.)
- This could help doctors locating anomalies or disease faster.
- There are two workflow: semi automatic and fully automatic. Each has accuracy higher than 80%.

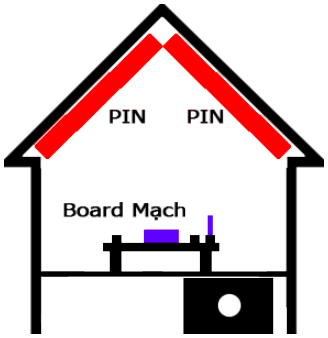


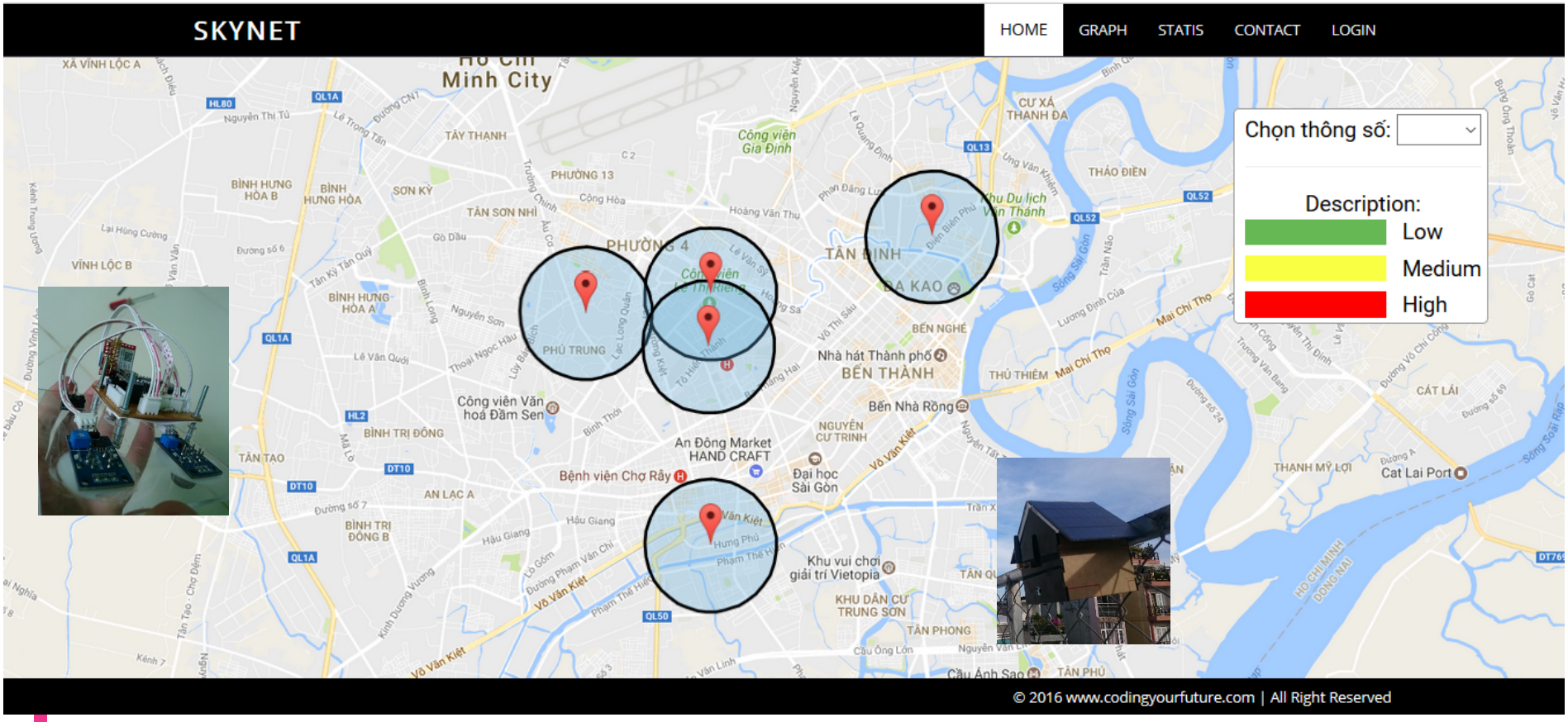


Air Quality Monitoring System

Pham Hoang Anh - IoT Lab

- **SKYNET** – A Monitoring System of City's Air Quality
  - CO, Temperature, Humidity, Dust, GAS
  - Solar Power and Rechargeable Battery.

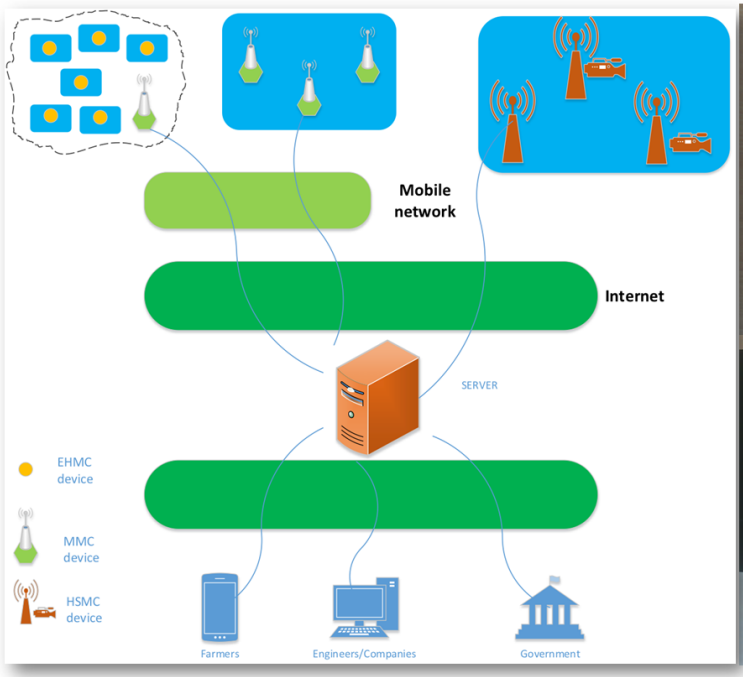


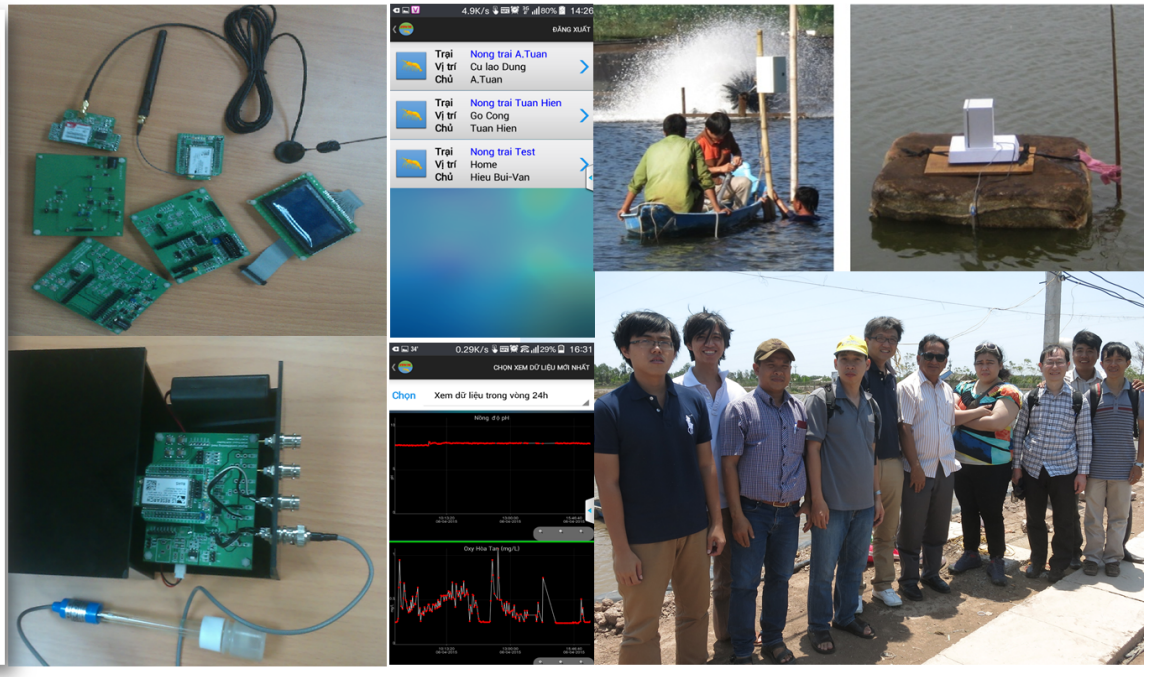


Shrimp Water Quality Monitoring System

Tran Ngoc Thinh – CE Lab

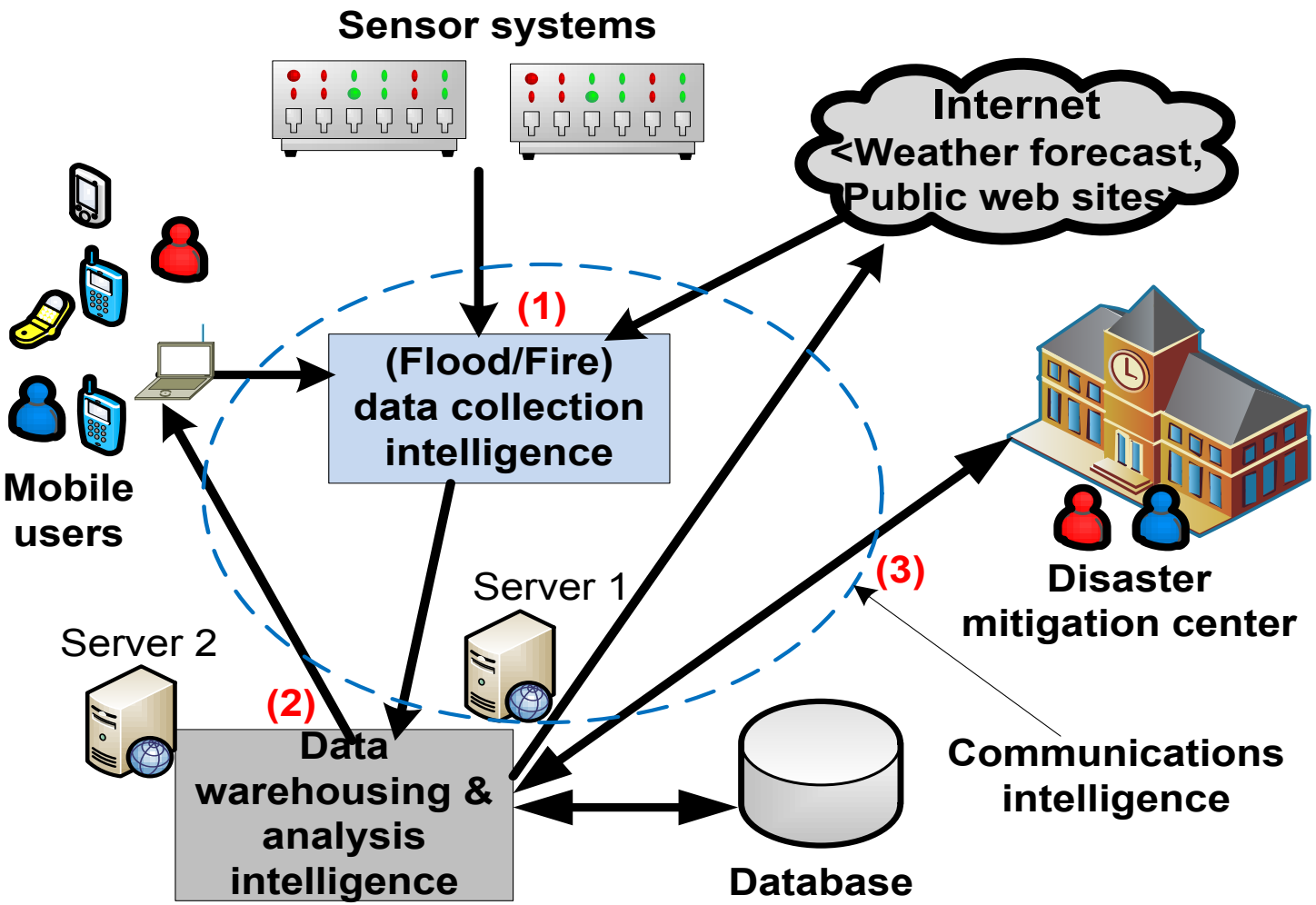
- Heterogeneous Wireless Sensor Network Monitoring Water Condition for Strengthening Aquaculture Industry in Vietnam
  - Collaborative Project with The University of Electro-Communications, Japan.





Urban flooding mitigation

Tran Minh Quang – IoT Lab



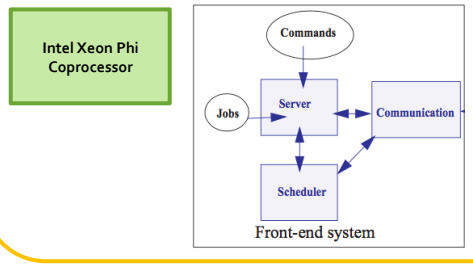
SCOUT & PBSpro

Nam Thoai – HPC Lab

Job Submitting Phase

Integrate Intel Xeon Phi Coprocessor into PBS Pro for centralized management

PBS Professional



SCOUT module
modify the process of queueing & scheduling

Dispatching Jobs

As a Hook module inside PBS Pro

CPU/Coprocessor-based Cluster

Summary

- There are very critical issues that need to be solved in Vietnam
  - Environmental problems are big problems
  - Environmental Computing is very hot
- HCMC Smart city project & ICT Research program for Smart cities & Industry 4.0
  - Many problems & applications
- Open Computing Platform at HPC Lab – HCMUT

  http://www.hpcc.hcmut.edu.vn
- Looking for collaborations

Thank you!

More information:

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