PTIT

HỌC VIỆN CÔNG NGHỆ BƯU CHÍNH VIỄN THÔNG
Posts & Telecommunications Institute of Technology

BỘ THÔNG TIN VÀ TRUYỀN THÔNG
MINISTRY OF INFORMATION AND COMMUNICATIONS

A Security Framework for IoT Networks

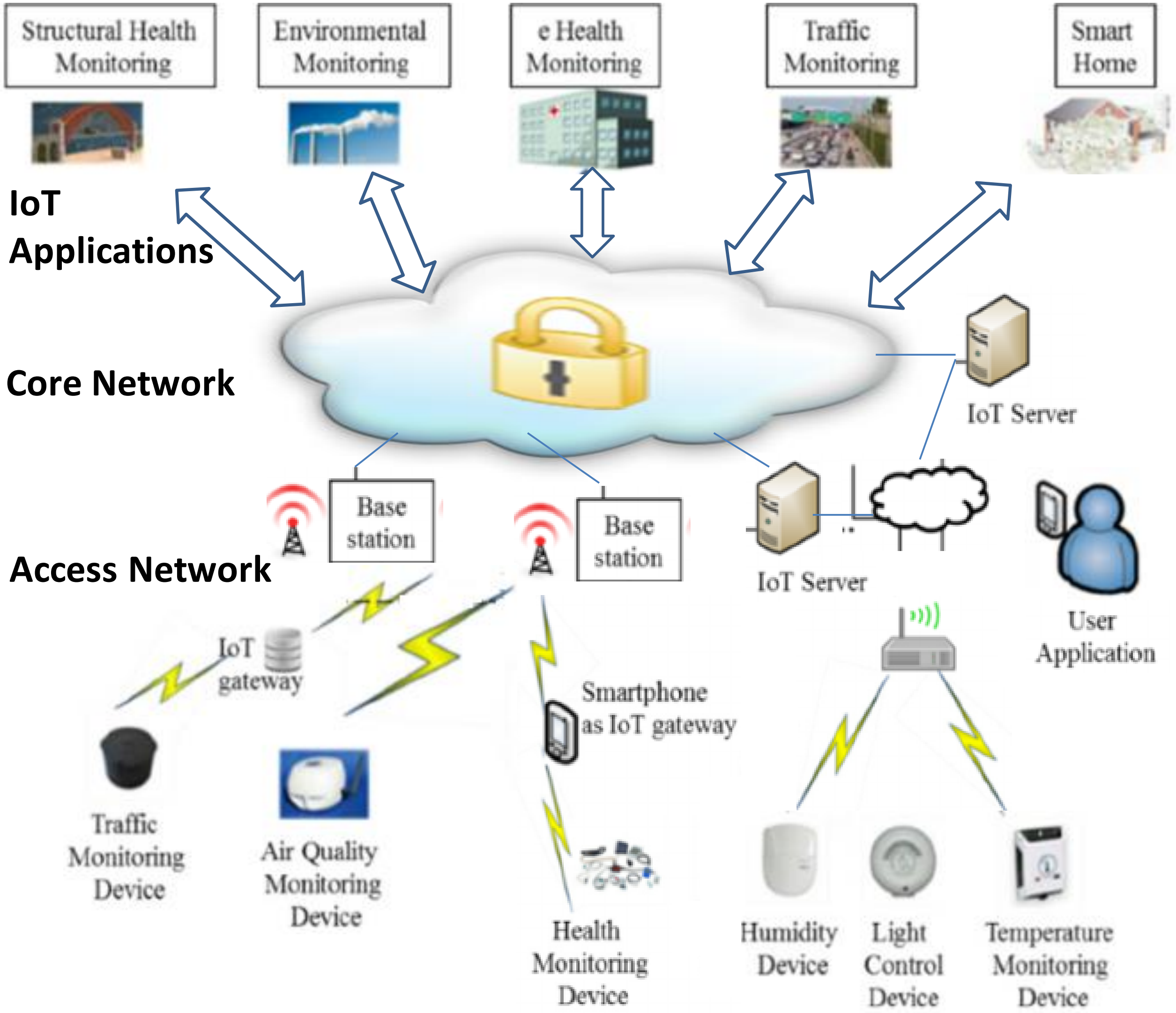
Objectives of this Research

- Developing a new comprehensive security framework for IoT Network.
- Building a Testbed for Monitoring/Detection/Visualization, Secure Communication for IoT devices. Case-study with a WSN.
- Creating an open collaboration between researchers of Japan and other ASEAN-IVO members (joint seminars, workshops, common paper publication).

Assoc. Prof. Dr.Hab. Dr.Ing HOANG Dang Hai
Hanoi, 24.11.2016

Motivation

- IoT = World of interconnected things (~50 billion devices by 2020)
- IoT = pervasive & ubiquitous network that enables monitoring/controlling physical environment by collecting, processing, analyzing data generated by sensors/smart objects
- IoT enables advanced applications like smart cities, smart society,…
- IoT is everywhere !



Security in IoT

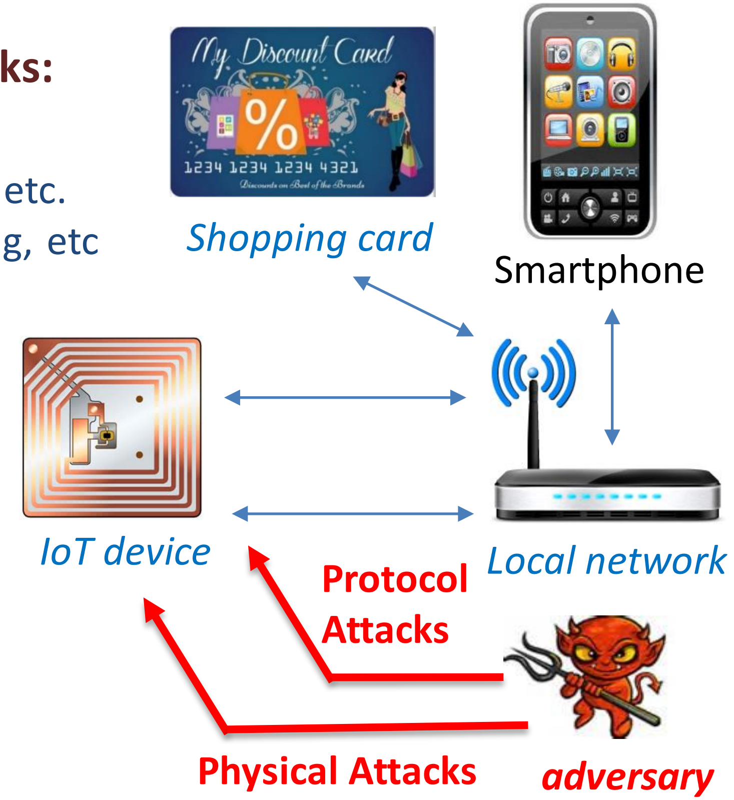
- **IoT has common security issues as in traditional networks:**

  All of the same issues we have with:
  - Malware, malicious applications, DoS/DDoS attacks, Hijacking, etc.
  - Access control, vulnerability management, patching, monitoring, etc
  - Security of the Cloud, Fog, etc.

- **Increasing growth of IP-based devices/applications**
- **IoT opens a completely new dimension to security:**
  - Attacks move from digital to physical world, from manipulating information to controlling actuation.
  - Issues: Physical tampering, Data Confidentiality & Data Authentication, Entity Authentication, Entity Confidentiality (=Privacy), Availability (Resist Denial-of-Service), Insecure communication channel, Identity, Trust, etc.
- **Other considerations: limited resources, processing, etc.**

Smarter security systems for IoT needed !

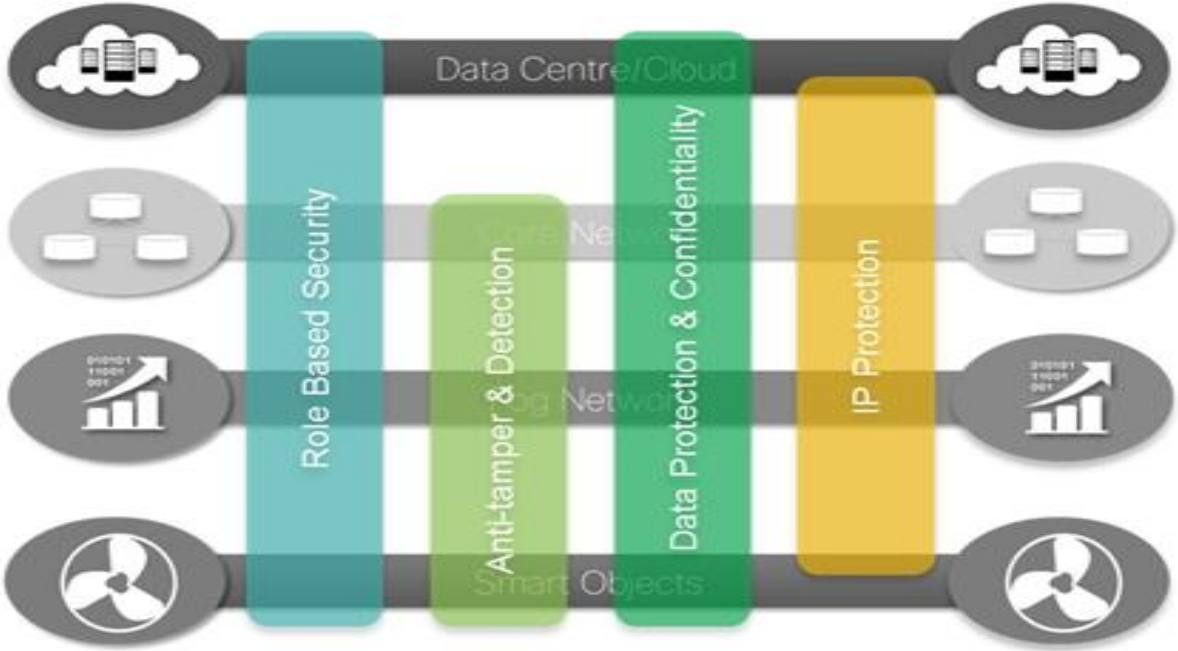
A comprehensive security framework for IoT



Hackers may take control and record you

Billing fraud in Smart Meter

A Security Framework for IoT Networks



Dynamic distributed intelligence

Distributed Analytics & Management

Network Enforcement/Segmentation

Authenticated Encryption

Connectivity Standards

Stateful application visibility

Auto enrolment & Provisioning

Device Classification

Standards for actuator & Sensors

Fig. (Source: Cisco)

What we need ?

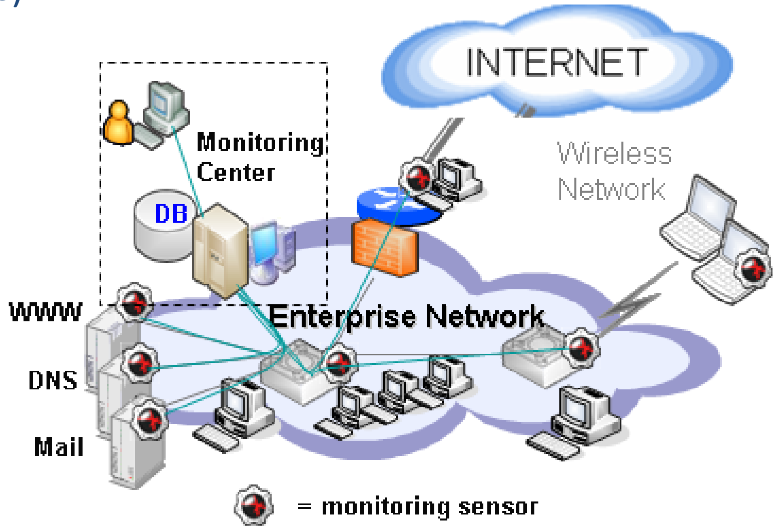
- Secure infrastructure (secure Fog)
- Effective device monitoring/attack detection system (visualization), network traffic anomaly detection
- Identity management, Trust authentication, secure data acquisition
- Lightweight encryption protocol
- Secure communication and data transport channels
- Etc.

A Security Monitoring System for IoT Networks

Building Components: (some our previous research results)

- Traffic data capture
- Network traffic anomaly detection
- Anomaly data processing & visualization

Data capture, Preprocessing , Attribute Attraction → PCA Analysis, Anomaly detection → Alerts, Visualization, Report



→ **New approaches for IoT**

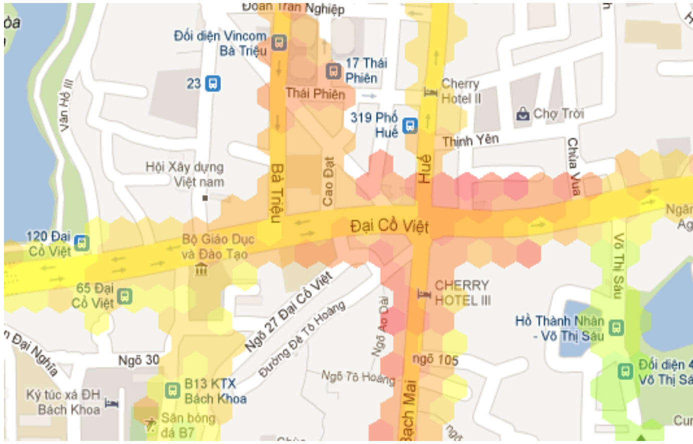
Building a Testbed for Monitoring / Detection / Visualization, Secure Communication for IoT devices. (some our previous research results. Experiences/Expertises from NICTER/DAEDALUS system)

→ **Further development for IoT**

Developing a dataset for attack detection on IoT networks

(some our previous research results. Experiences/Expertise from Kyoto Honeynet Project)

A Case-study: Testbed for WSN

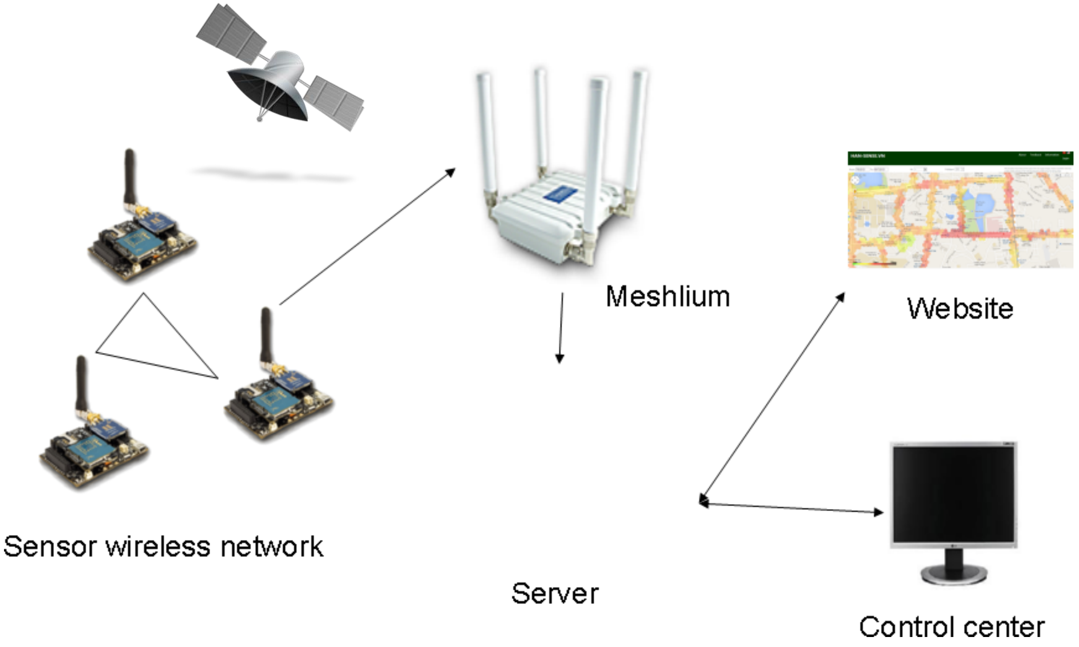


Our previous researches:

- Application of WSN for smart city: Traffic-generated pollution monitoring in Hanoi City
- Pollution data collection
- Data transfer / forwarding
- Data processing (calibration, clustering, etc.)
- Data visualizing based on google map services

Further study:

- Sensor identity management
- Secure data transfer
- Privacy & trust



Expected Collaboration

- **NICT from Japan:**
  Experiences/Expertises from NICTER/DAEDALUS system
- **Other institutions in Vietnam:**
  HUST-SoICT, HUST-FET, etc.
- **Other institutions from ASEAN-IVO member states:**
  NECTEC (Thailand), MTI (Indonesia), CSYU (Myanmar), etc.

Thank your !