Cybersecurity Cooperation between France and Japan

intermediate Workshop
online version

<WG6> Network Cybersecurity interim update: a Focus on IoT

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Co-chair (FRA): Grégory Blanc-Nguyen (Telecom Sud-Paris)

Keio University, October 29th/30th 2018

WG6: Topics of Interest

- Next-Generation Networks
  - Information Centric Networking, NDN, SDN/NFV
- Network Measurements
  - Internet Traffic Measurements, Anomaly Detections, Monitoring
- Security Education and Training
  - CROND/CyTrONE
- Internet of Things
  - Security testbed, systems and countermeasures
- Not exhaustive…
- Overlapping topics with other WGs
  - Privacy (WG5): ICN
  - IoT (WG4), etc.

Ongoing Work

- Visiting
  - 1 Associate Prof. visiting NAIST (5 months)
  - 2 x IMT Students at NAIST (summer 2018)
  - 1 Student at IIJ (Summer 2018)
  - 1 Prof. at NII, Univ. of Tokyo & TiTech
- Ongoing Projects
  - 2018: JSPS Kakenhi, RIPE NCC, H2020 x2, ANR x1
- Fra-Jpn Project proposals
  - PHC SAKURA program
  - Exploration France
  - Exploration Japon

Ph.D. Supervision

- Université de Lorraine - Loria/Inria
  - Supervision between Shibaura IT and UL/Loria/Inria
  - Topic: *Cybersecurity of Information-Centric Networking*
  - ANR Project (2014 – 2018) *Securization of new network functionalities in virtualized environment*
  - Thesis Defense on **December 2018**
- 2015: Internship at the University of Tokyo (2015/2016)
- 2018: Short-term visit at NII in January 2018 (3 weeks)

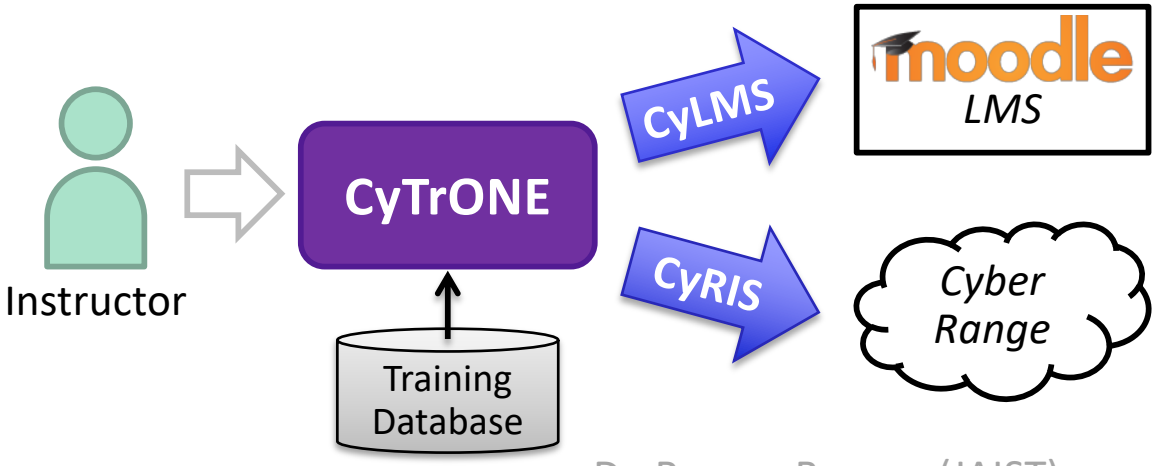
CROND overview

- **CROND** = Cyber Range Organization and Design
  - NEC-endowed chair @ Japan Advanced Institute of Science and Technology (JAIST)
- Created in April 2015
  - Extended until March 2021
- Members
  - 2 Research Assoc. Prof. + 3 Adviser Prof.
  - 9 MSc students + 1 PhD
- Mission
  - R&D on fundamental technologies for cyber ranges, e.g, virtual environments for cybersecurity training
  - Development of related educational materials
- Cybersecurity Education and Training

サイバーレンジ構成学
CROND
Cyber Range Organization and Design

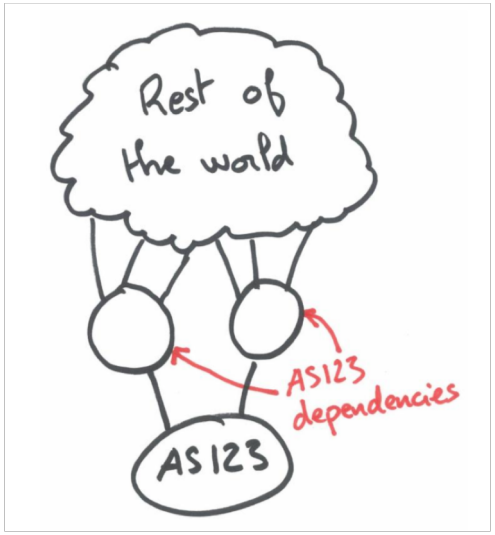
Technical training activities

- Developed the integrated training framework **CyTrONE** and several related tools
  - Open source => low cost & extensible solution
    `https://github.com/crond-jaist`
- Simplify the deployment for training activities
  1. Easily modify and add new training content
  2. Automatically create and manage the training environment

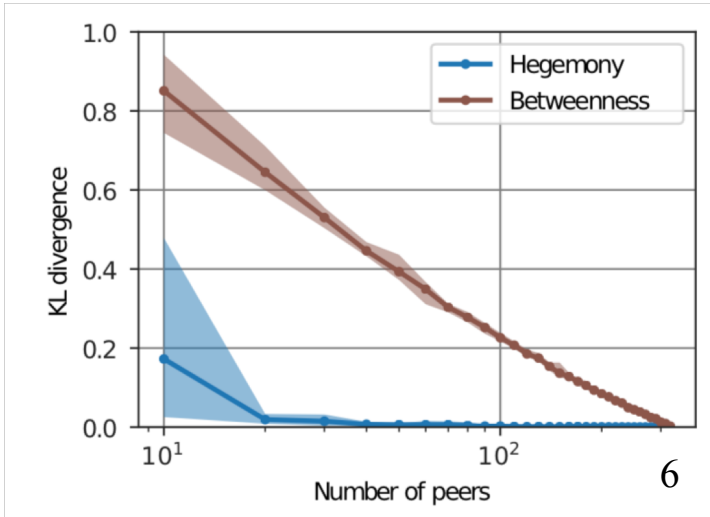


Internet Measurement: AS Hegemony

- AS connectivity depends on other ASes
- *AS Dependency*: likelihood of an AS to lie on paths between two other Ases
  - Dependency changes may reveal **routing anomalies**



- Computation based on Betweenness Centrality is not adapted to BGP data
  - Not all AS paths are known
- **AS Hegemony**
  - new metric for AS Dependency
- Monitoring tool for AS Dependencies
  - RIPE NCC Funding Recipient 2018



Information-Centric Networking

- Future Internet Architecture
  - Named-Data Networking
  - Content-centric vs. Host-Centric
- Security of novel Networking Architecture
- Names (e.g. URL) convey critical information
  - Information-leakage from NDN network
- Name-filtering algorithms
  - NDN Firewall

IoT Quickfacts

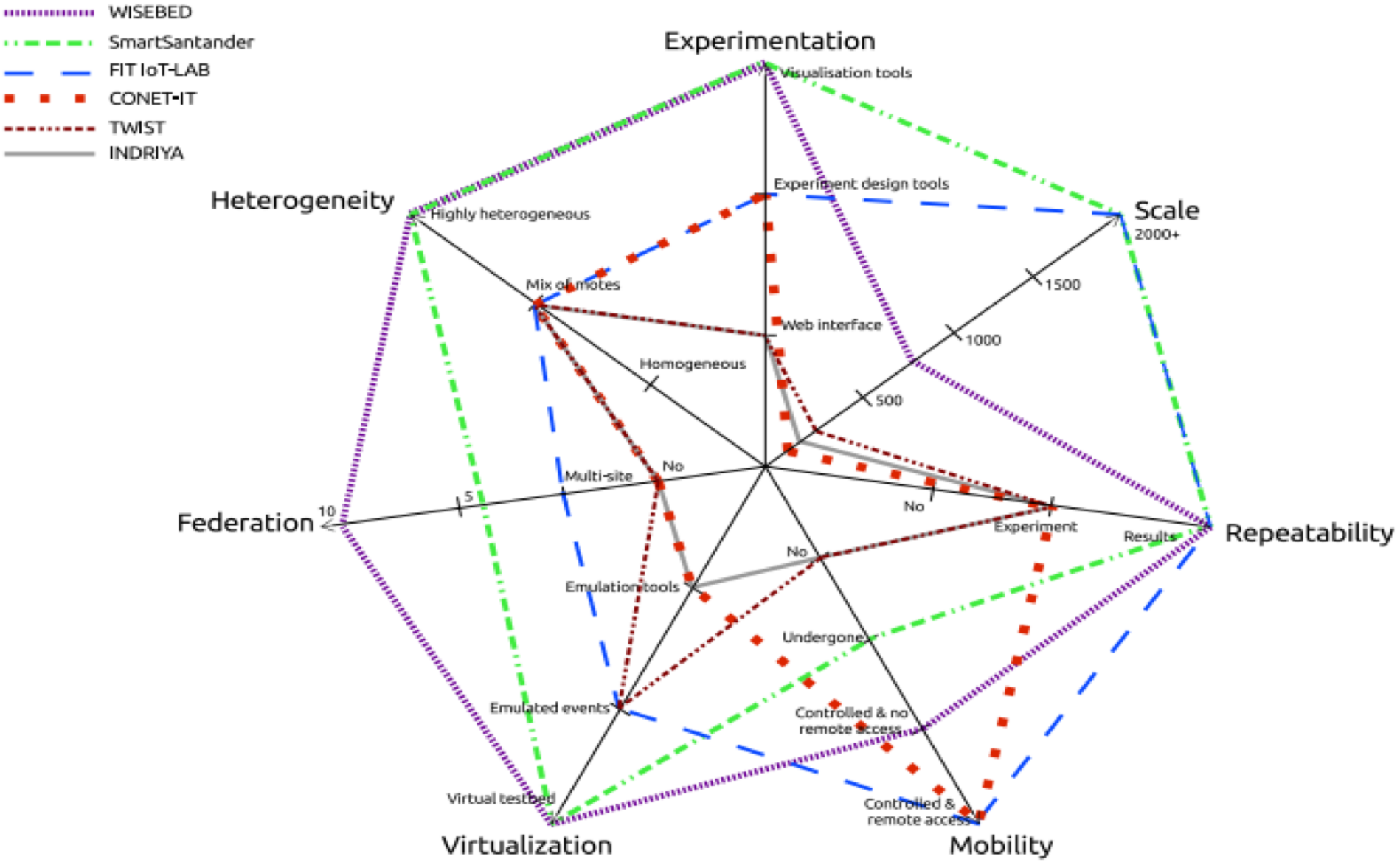
- Ericsson Mobility Report (June 2017)
  - 29 Billions devices by 2022
    - 18 B for IoT (3x world population)
  - IoT devices to surpass Mobile phones by 2018 (Nov. 2016)
    - 23% increase by year
- Cisco Visual Networking Index (2016-2021)
  - 3.5 connected devices / people by 2021
  - 63% of IP Traffic from Wireless/Mobile devices
- Application Domains
  - Healthcare, Transportations, Industry, Agriculture, Smart House, Vehicles, WBAN, SmartGrid, Smart Supply Chain, etc.

IoT Testbed

- Wide range of IoT application domain
  - « Designing a system that can efficiently support such a large range of applications and be compliant with a plethora of often contradicting requirements as well as integrating all required components and technologies is a complex task » [1]
- Simulations/Models
  - Synthetic results
  - accuracy/scalability for large scale systems
- IoT Testbed
  - Technical evaluation under realistic condition (large-scale, real environments, etc.)
  - users and scenarios (usability, performances)
  - Scale / Heterogeneity / Repeatability / Federation / Concurrency, etc.

[1] A Survey of Facilities for Experimental IoT Research, IEEE Comm. Mag., Nov. 2011

IoT Testbed

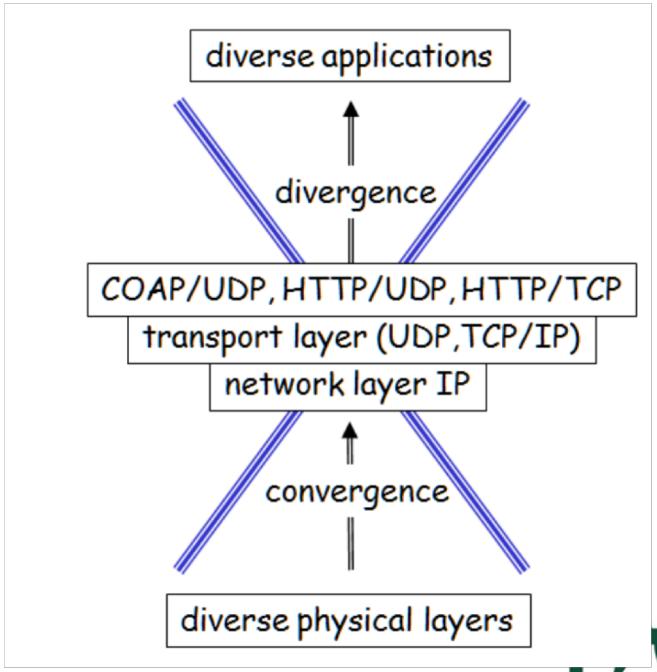


How to choose an experimentation platform for wireless sensor networks?

Elsevier Adhoc networks, Elsevier, 2015

IoT Cybersecurity

- More challenging than Network Security
  - Wide range of devices, protocols, standards, application-domain
- Encryption
  - Limited capabilities
- Monitoring
  - Scale, heterogeneity, interoperability, etc.
- Billions devices on the Internet
  - Impact on infrastructure
  - New security threats
    - Hardware/systems/communications



[A Systems of Systems perspective on The Internet of Things]
J. Lukkien, Sigbed Rev. Vol. 13, Num. 3 June 2016

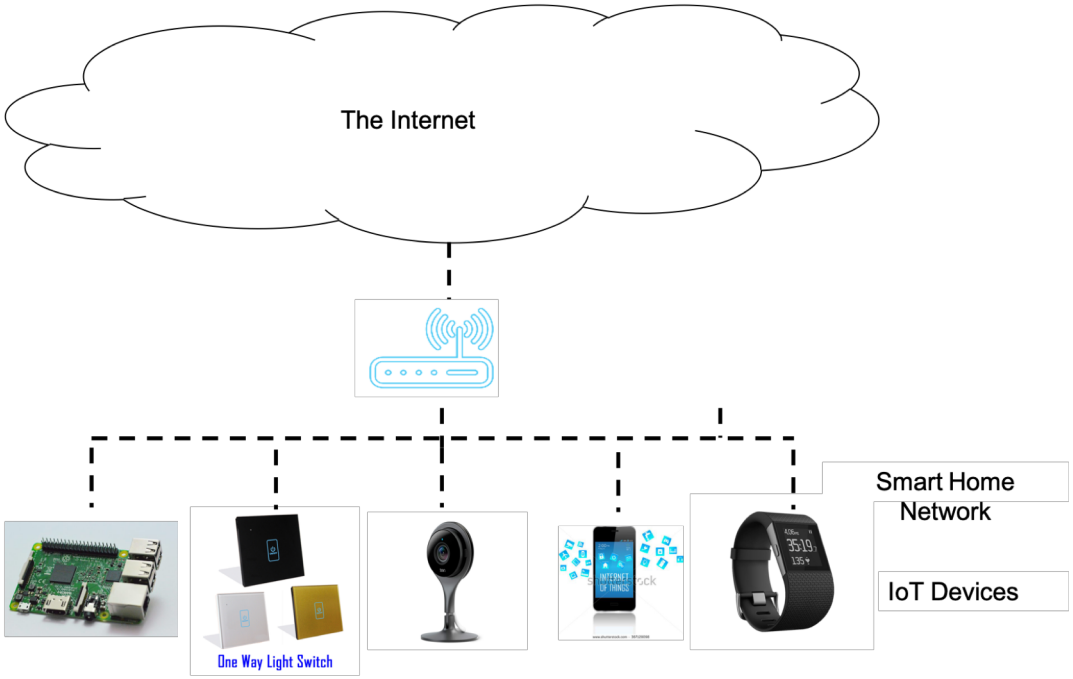
Penetration Testing Testbed for IoT

- Security tests : Vulnerability / Penetration testing
  - Security and Privacy for IoT devices
    - Sensing data, always connected
- Comprehensive security testing and analysis
  - Real conditions, Reproducibility
  - Heterogeneous devices
    - Various application domain: Smart home, Wearable, etc.
- Penetration testing
  - Exhaustive test on all devices
    is unfeasible at large-scale
    - Not adapted

Cybersecurity IoT Plateform

- Identify novel security threats
- Monitoring tools & Countermeasures
- IoT Traffic and Impact on the Internet

Partners: TSP (Fra) and SIT (Jpn)



Dr. Grégory Blanc-Nguyen (TSP)
Dr. Thomas Silverston (Shibaura IT)

Exploration France/Japan

- French Embassy in JPN
- Researchers Mobility

- Deadline: Oct. 12th 2018

- Deadline: **Nov. 16th 2018**

https://jp.ambafrance.org/article13722

IOT4Health

- **Reliable and Secure IoT for Health**
  - IEEE Infocom 2019 Workshop
  - **April 29th** – May 02nd 2019, Paris, France
- Health applications and connected smart objects
  - medicine, electronics, networking, data science/deep learning and artificial intelligence
- Steering Committee
  - Lila Boukhatem, Paris Saclay, Paris-Sud University/CNRS, France
  - Megumi Kaneko, National Institute of Informatics (NII), Tokyo, Japan
  - Naceur Malouch. Sorbonne Universitý, Paris, France
  - Maria Potop-Butucaru, Sorbonne University, Paris, France
  - Natalya Rozhnova, Nokia Bell Labs, France
  - Thomas Silverston, Shibaura Institute of Technology, Tokyo, Japan
  - Sébastien Tixeuil, Sorbonne Universitý, Paris, France

6th Casper Workshop

http://plus.shibaura-it.ac.jp/conf/casper2019/

- **Crowd-Assisted Sensing Pervasive Systems & Communications**
  - In conjunction with IEEE PERCOM 2019
  - March 11th - 15th 2019, Kyoto, Japan
- Crowdsensing, crowdsourcing, participatory sensing, IoT
  - Big Data in Crowdsensing/sourcing, Data integrity, Privacy, Trust, IoT, Sustainability, Human-centric, etc.
- General Chairs:
  - Thomas SILVERSTON – Shibaura Institute of Technology – Japan
  - Yu WANG – University of North Carolina in Charlotte - USA
- Program Chairs:
  - Luke DICKENS – University College of London – United Kingdom
  - Imre LENDAK – University of Novi Sad (UNS), Serbia and Eötvös Loránd University (ELTE), Hungary

Shibaura Institute of Technology

- Top Global University (MEXT)
- Mobility of Students: JPN <=> FRA
- Course Taking Program:
  - Bachelor/Master Students
  - Validation of Credits by local institution
  - Mobility Grants
- Research Exchange Program: Laboratory Internship Prgm.
  - Master/PhD students
  - Grants
- MOU: Memorandum of Understanding

https://www.shibaura-it.ac.jp/en/prospective/index.html

21th French Research Day in Japan (J·FR 2018)

- **Organizers:**
  - French Embassy in Japan, Scientific & Technology Service (SST)
  - Maison franco-japonaise, French Institute for Research on Japan (UMIFRE 19)
  - Sciencescope, the French Researchers organization in Japan
- **Partners**: CNRS Tokyo, ABC, ABSCIF
- **Date:** Dec. 12th 2018 at Maison franco-japonaise (Ebisu)
- **15 years of French-Japanese program PHC Sakura**
- **>200 attendees**, 16 presentations, 26 posters
  - All research topics (S, SHS), all citizenships (*French-speaking*)
- **Panel:** FRA-JPN program PHC Sakura *(chair: French embassy)*

association sciencescope étudiants et chercheurs francophones au japon

http://www.sciencescope.org/jfr2018

Thank you

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