

Software Defined System for Disaster Management and Environmental Monitoring

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Contents

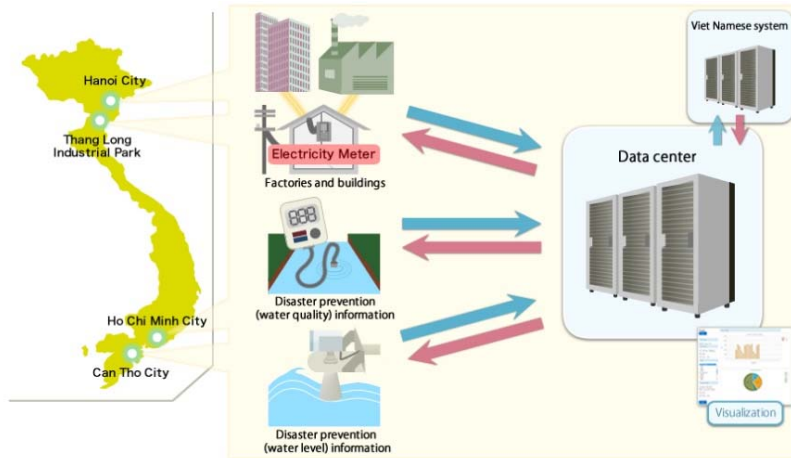
- Needs for IT-supported solutions in ASEAN region
- Target technologies of research in the ASEAN IVO
- Partner projects
- Platforms for research by NICT

Background

- ASEAN countries
 - Large-scale cities and rural areas severely impacted by **disaster or environmental events**
 - Disasters often affect or are similar in several countries thus **benefitting from collaborative transnational solutions.**
- Address issues
 - Understanding phenomena of nature
 - Transnational software-defined cyber infrastructure (CI)

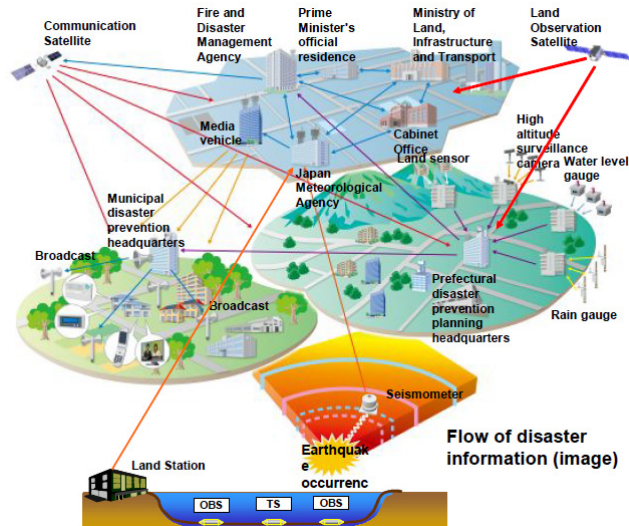
IT-supported solutions

- Environmental monitoring



http://www.soumu.go.jp/menu_seisaku/ictseisaku/asean_smartnetwork/en/environment.html

- Disaster management



http://se.nec.com/en_SE/global/solutions/safety/disaster/index.html

- Smart cities



(The solutions above are mere examples.)

<http://www.smartcity-planning.co.jp/en/approach/index.html>

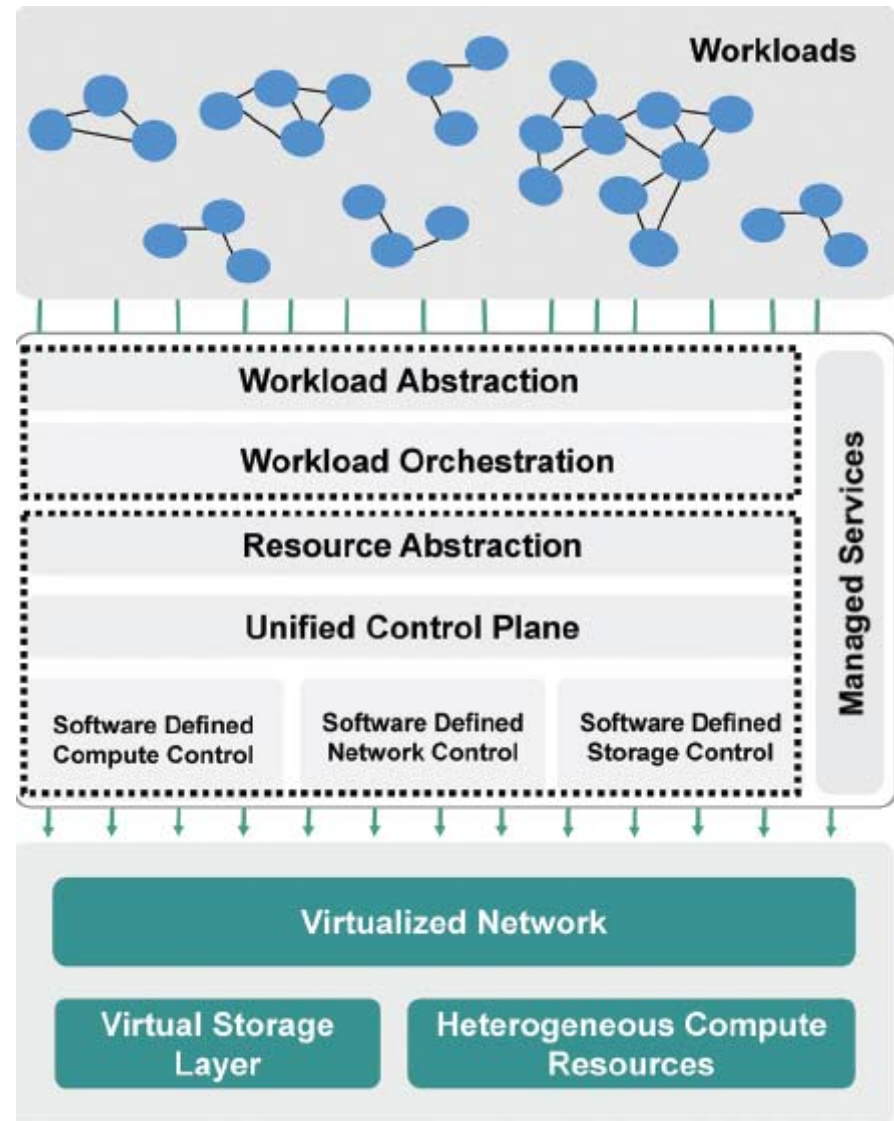
Software defined systems

- Software definition of system configuration/behavior via management interfaces
 - Computing, networking, storage resources
- Improving performance
- Flexible and easy deployment

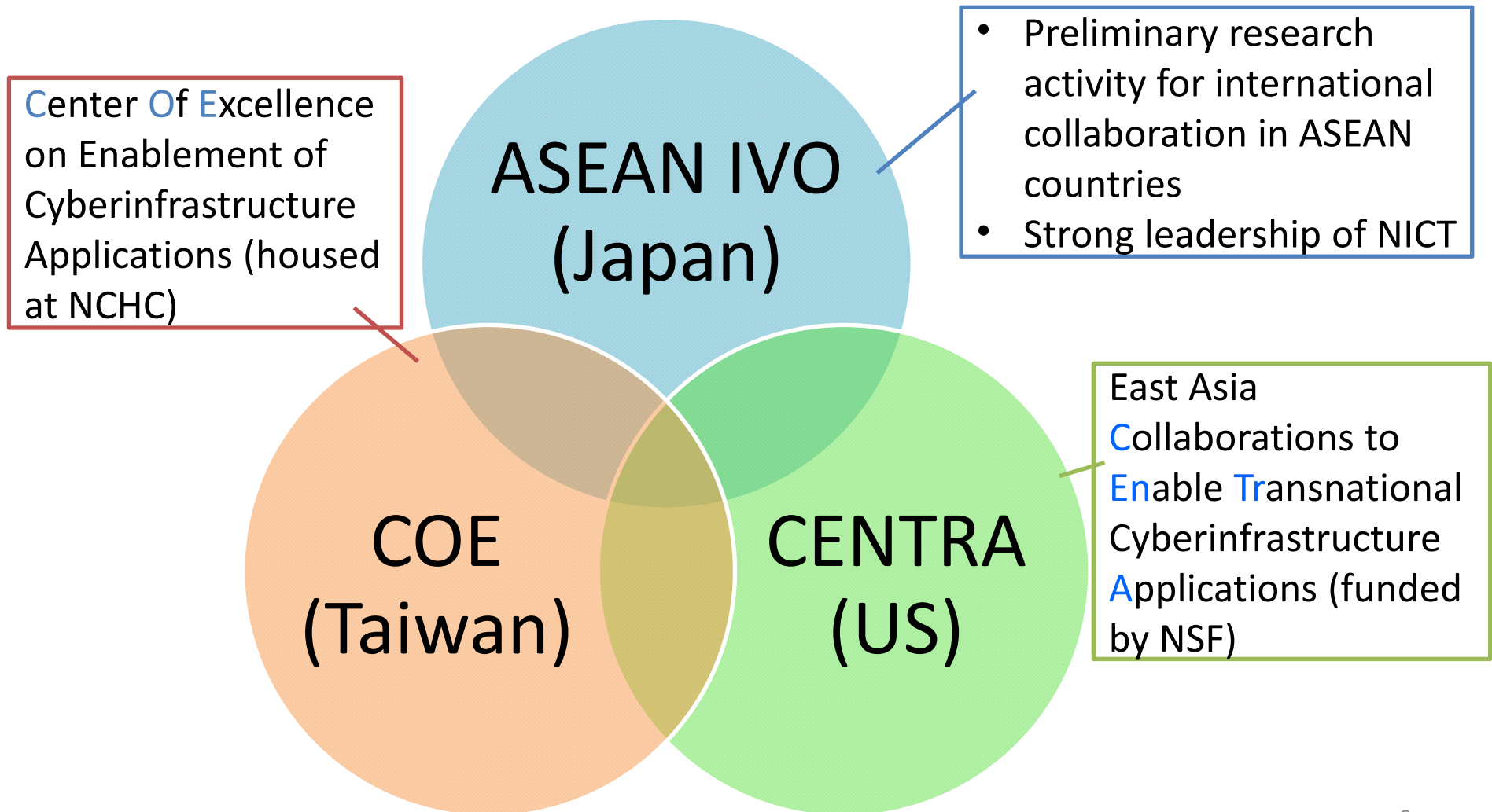


Examples:

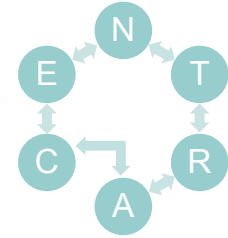
- Specialized communication protocol
- Application-specific workloads
- Business continuity plan



Partner projects



CENTRA



- US—East Asia Collaborations to Enable Transnational Cyberinfrastructure Applications
 - Housed at Advanced Computing and Information Systems Laboratory (ACIS) of University of Florida (UF)
- Key goals:
 - Scientific advances in
 - Application domains: environmental monitoring (EM), disaster management (DM), smart cities (SC)
 - Software-defined systems: data-sharing, middleware interoperability, coordination
 - Creation of next generation of international collaboration networks (of people)
 - Creation of a framework for persistent collaboration among centers/groups in US-EA

CENTRA middleware scope

- Environments and corresponding frameworks and IT stacks that CENTRA research will consider (with examples)

Environment	Frameworks	Stacks/platforms	Examples
HPC, HTC	Batch scheduling, parallel processing and management, machine learning.	MPI, HTCondor, HDFS, Pegasus, Torque, Lustre, Hadoop, Infiniband	Ocean/lake modeling, MPI applications
Social nets, ad-hoc systems	Online social networks, overlay networks.	SocialVPN, Jitsi, IPOP	Location-based cooperation
Big-data stores data management	Distributed unstructured stores, structured databases, index/search systems	Spark, Hadoop, Elastic Search, Riak, Ceph, HBase, PostgreSQL	iDigBio
Big data, analytics, visualization	Batch and stream processing, machine learning, distributed data processing	OpenStack, Apache Spark Hadoop/YARN.	Lifemapper
Sensor data processing and communication	Real-time stream processing, data synchronization, compression	Apache Storm, Apache Kafka, Zookeeper, Piix [Yoshida08]	JOSE testbed

Research platforms by NICT

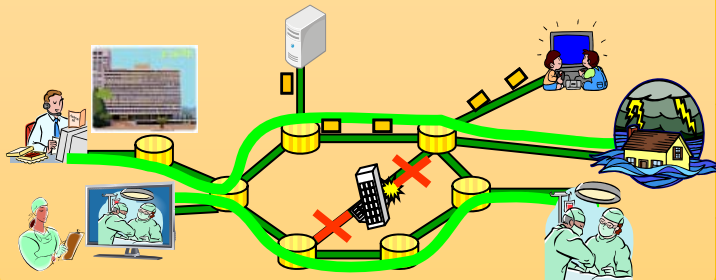
- Research platforms that are possibly utilized for ASEAN IVO research.

Platform	Description
Resilient ICT Research Center	Resilient ICT research collaboration among NICT, Tohoku Univ., and industries
JOSE	Testbed with a large number of wireless sensors, SDN capabilities and distributed “CLOUD” resources.
RISE	Wide-area SDN testbed , which users can control the networks using their OpenFlow controllers
PRAGMA-ENT	International collaboration of wide-area network testbeds

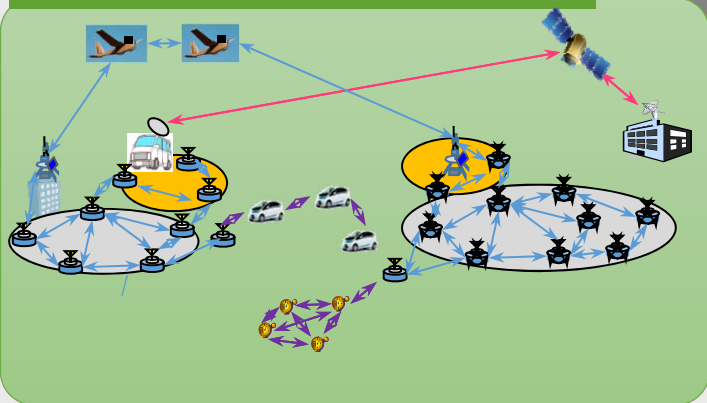
Resilient ICT Research Center in NICT

Collaboration among NICT, Tohoku Univ. and Industries

① Robust Photonic Network Platform



② Dependable Wireless & Satellite Network



③ Disaster Information Distribution Platform

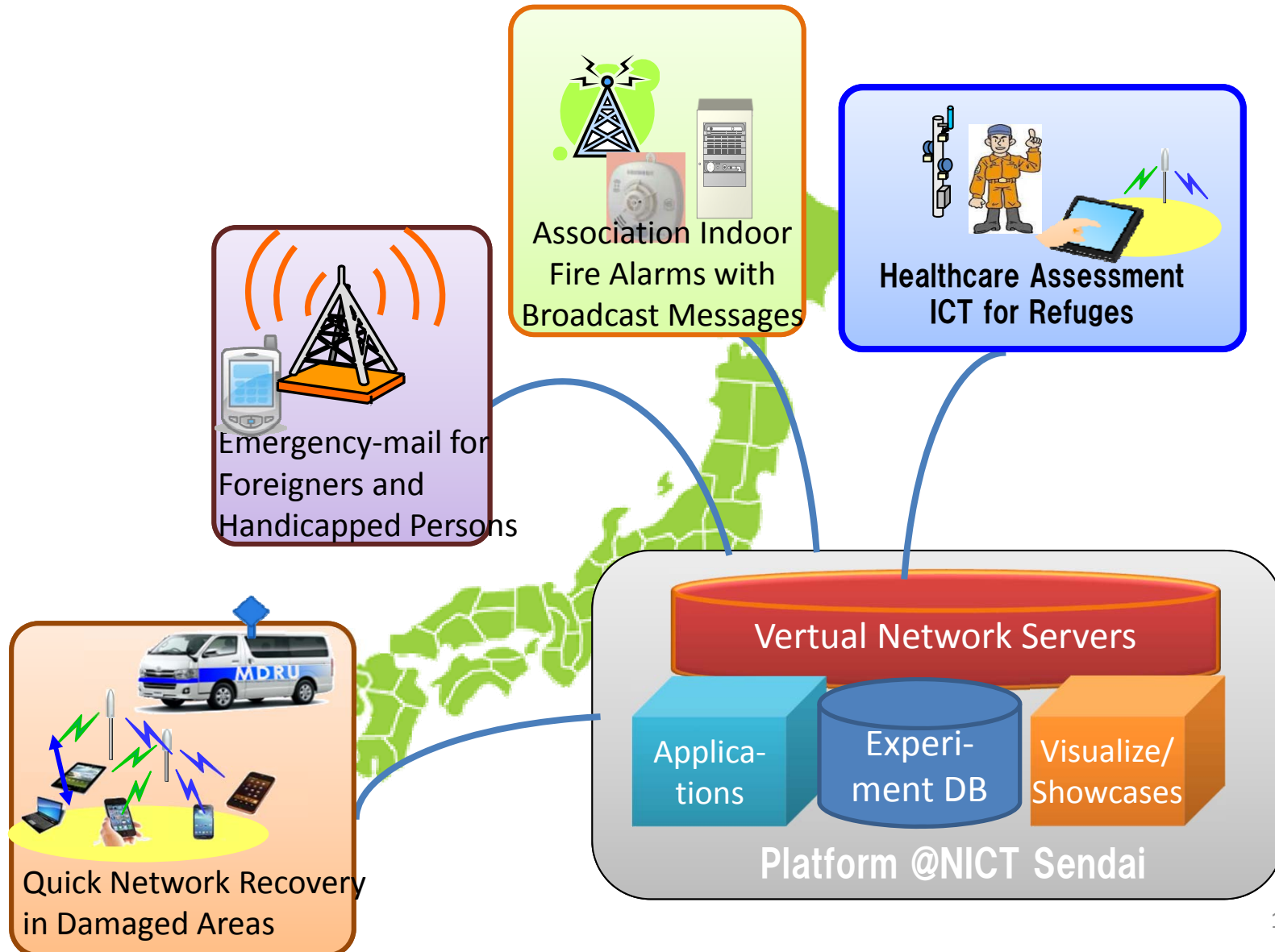


Resilient ICT Research Center @Sendai

Universities and Industries

Test Bed System

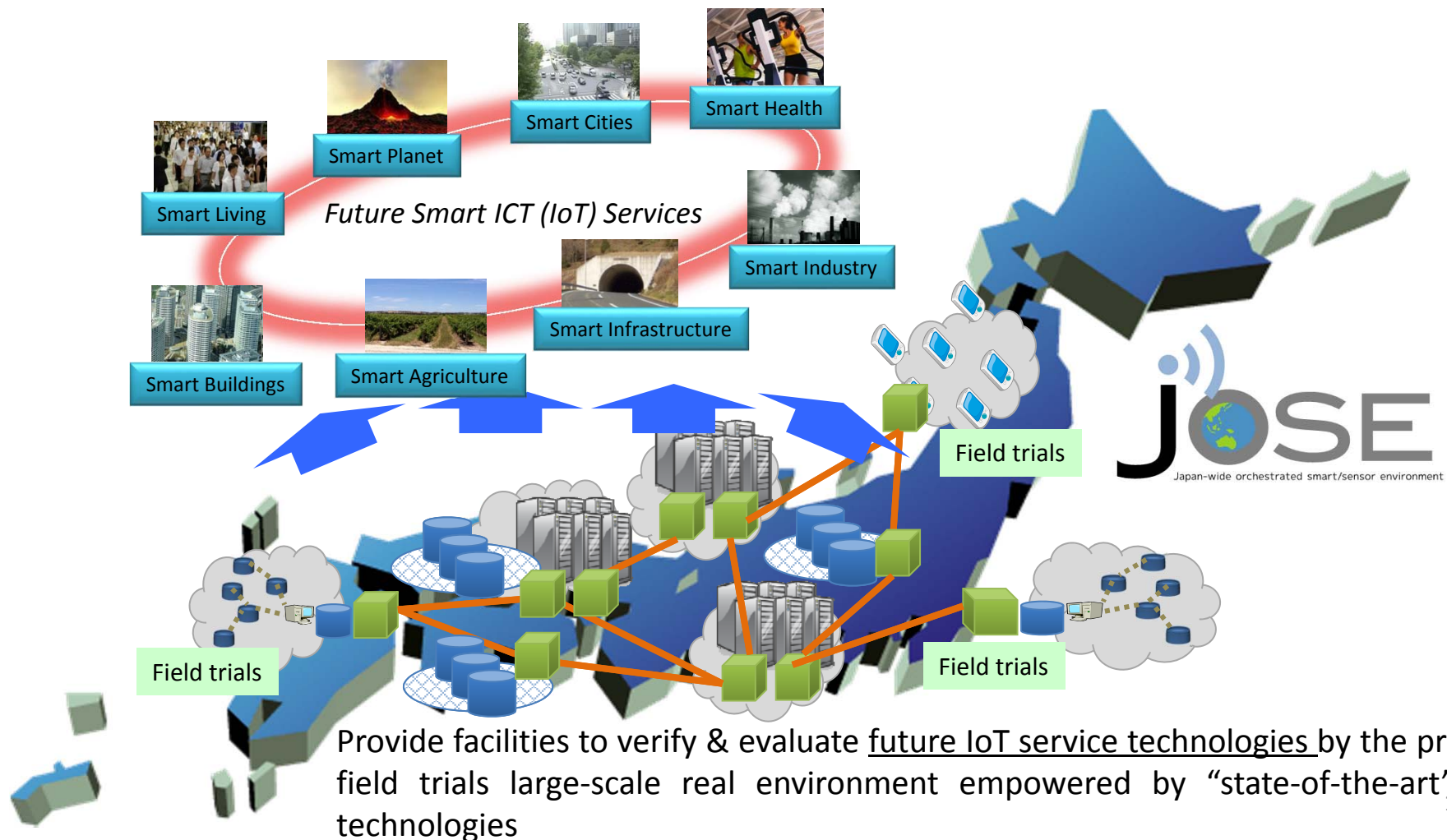
Field Experiments of “Disaster Information Dissemination and Communications” in SIP (Strategic Innovation Promotion Programs)



Overview of JOSE (Japan-wide Orchestrated Smart/Sensor Environment)



JOSE provides a Japan-wide *open* testbed, which consists of a large number of wireless sensors, SDN capabilities and distributed “CLOUD” resources. The facilities of JOSE are connected via high-speed network with SDN feature . JOSE will accelerate field trials of “*large-scale smart ICT services* “ essential for building future smart societies.



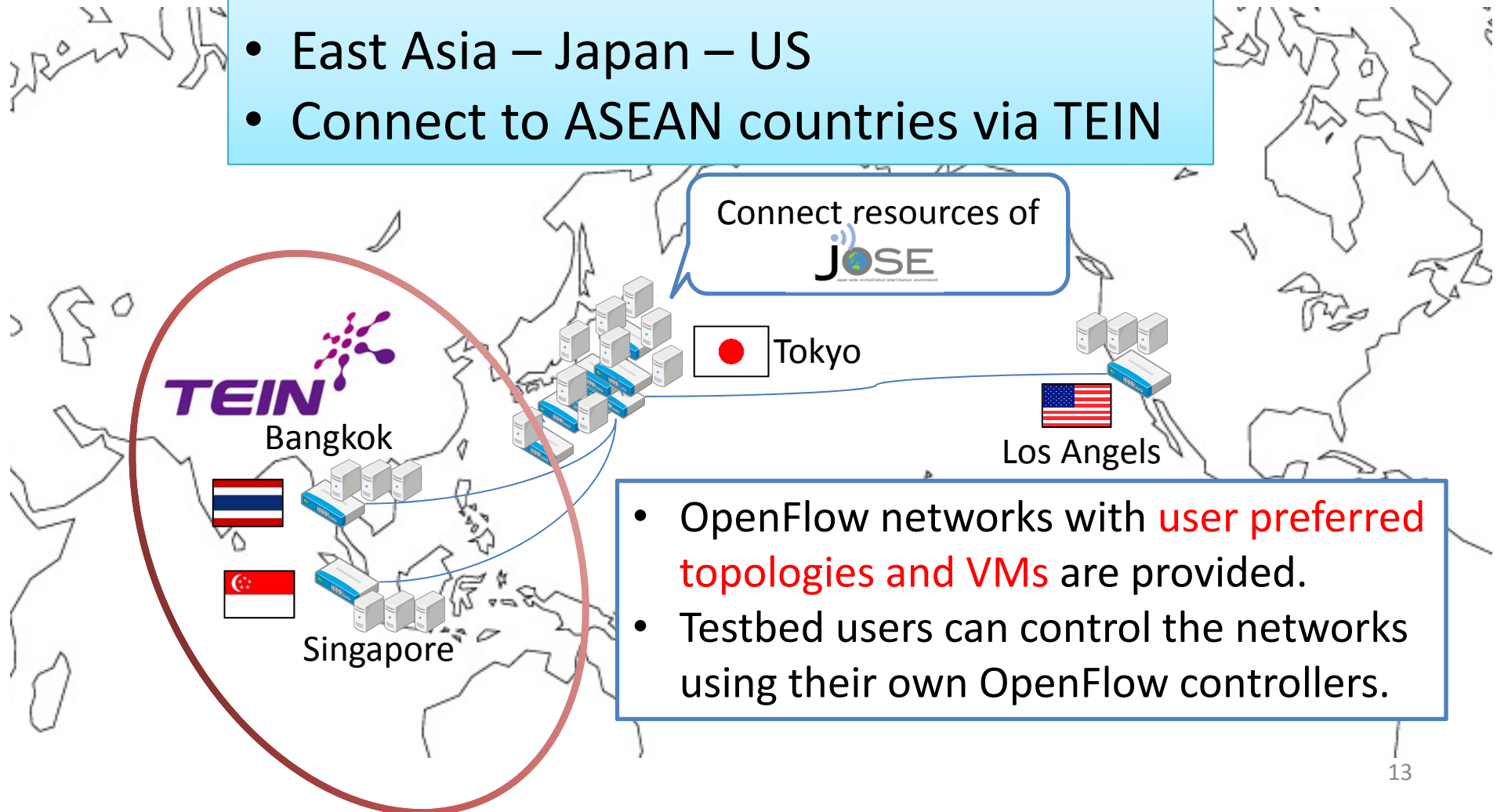
Provide facilities to verify & evaluate future IoT service technologies by the practical field trials large-scale real environment empowered by “state-of-the-art” SDN technologies

RISE (Research Infrastructure for Large-Scale Network Experiments)



Wide-area SDN testbed

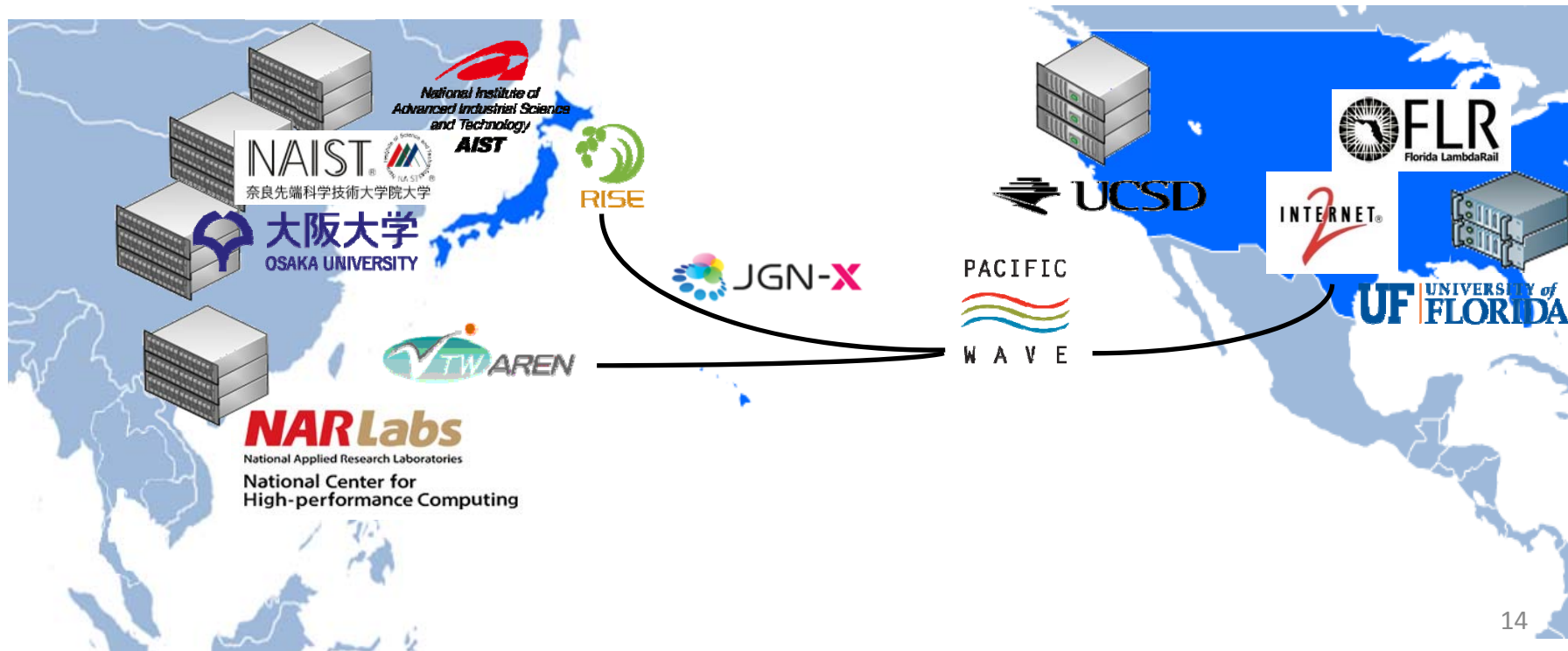
- East Asia – Japan – US
- Connect to ASEAN countries via TEIN



- OpenFlow networks with **user preferred topologies and VMs** are provided.
- Testbed users can control the networks using their own OpenFlow controllers.

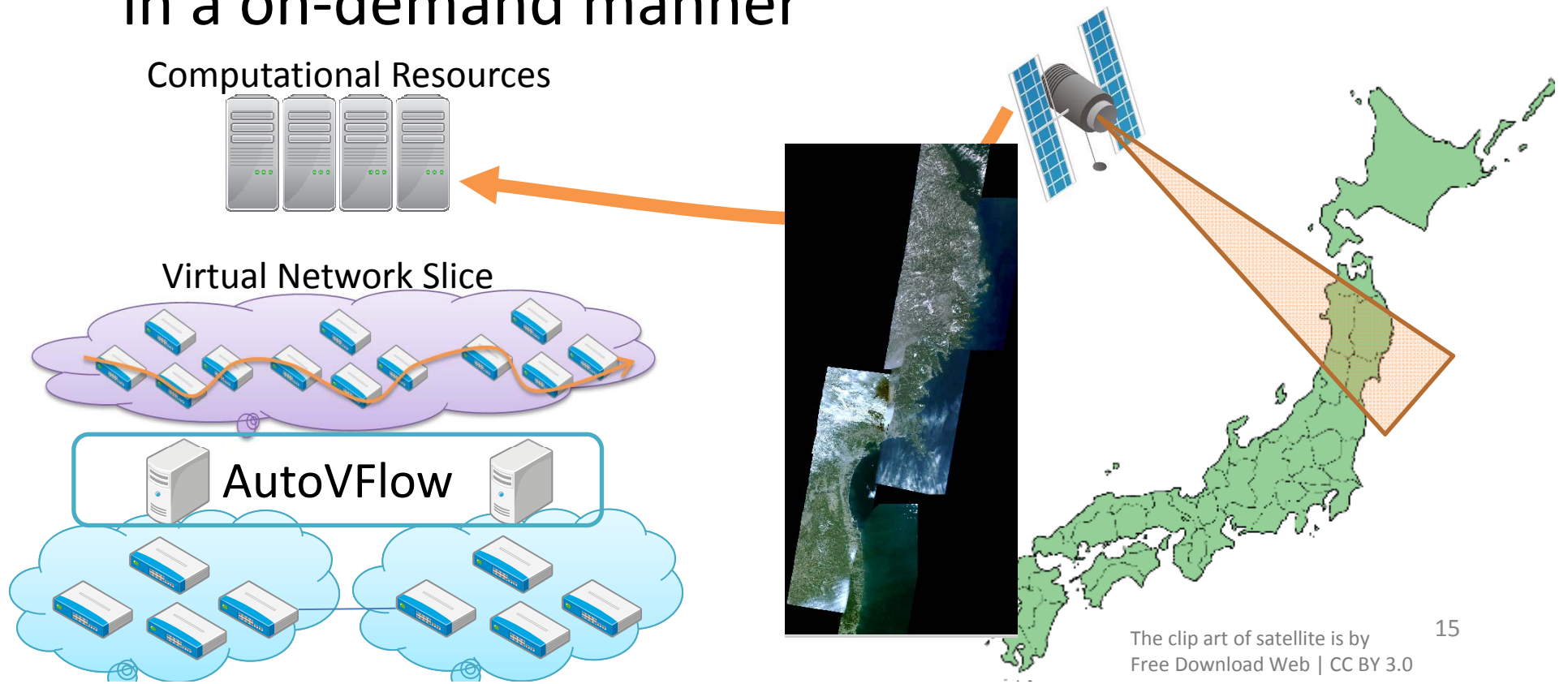
PRAGMA-ENT (Experimental Network Testbed)

- International collaboration of testbeds
- Goals
 - Build a testbed to explore for use by PRAGMA researchers
 - Facilitate collaborations as demonstrated by use of testbed in papers and presentations



PRAGMA-ENT usecase: Satellite Image Sharing between Taiwan and Japan

- For rapid response to natural disasters, high-speed dedicated network needs to be established in a on-demand manner



Initial plan

ASEAN IVO invites researchers to

- help conceptualize international collaborative projects.
- participate in international teams.

Identify research challenges and requirements for testbeds

Create collaboration research projects launched in near future

Identify participants with same interests in CENTRA and COE

International collaboration research in ASEAN countries

Scheduled Meetings

Dec. 7—11
2015

SEIAP 2015, hosted by COE (Taiwan)

Jan. 27—29
2016

PRAGMA/APAN meeting (on 27th Joint Meeting
for Disaster Management Workshop)

Feb. 2016
(planned)

ASEAN workshop for Software Defined System
for Disaster Management and Environmental
Monitoring, hosted by ASEAN IVO (Japan)

Mar. 2016
(planned)

CENTRA Workshop, hosted by CENTRA (US)

Initial participants for ASEAN IVO (partial)

	Name	Institute, country	Position	Role in activity
	Lee Bu Sung	SINGAREN, Singapore	Vice President	Software-defined networks
Representative	Hong Hoe ONG	MIMOS, Malaysia	Senior Director	Software-defined systems
	Jing Yuan LUKE	MIMOS, Malaysia	Senior Staff Engineer	Software-defined systems and resilience
	Dr. Kanokvate Tungpimolrut	NECTEC, Thailand	Deputy Director	Disaster management
	Dr. Chalernpol Charnsripinyo	NECTEC, Thailand	Laboratory Director	Software defined IT
	Hiroaki Yamanaka	NICT, Japan	researcher	Software-defined experimental networks
	Shinji Shimojo	NICT, Japan	director of testbed R&D promotion	Software-defined networks and system
	Yasuhiro Murayama	NICT, Japan	Director of Integrated Science Data Research Lab.	Global data sharing
	Hiroshi Kumagai	NICT, Japan	Vice Director of	Resilient ICT research
	Toshiyuki Miyachi	NICT, Japan		Large-scale simulation/emulation environment

Conclusion

- IVO for transnational research in ASEAN countries
 - Software defines systems
 - Applications: environmental monitoring, disaster management, smart cities
- Partner projects: CENTRA (US), COE (Taiwan)
- Research platforms of NICT possibly utilized for ASEAN IVO
- ASEAN IVO invites researchers for transnational collaboration researches.