

Open and Global ICT Innovation Platform
for Future Smarter Communication World
IoT Challenges @NICT: National Institutes of
Information and Communications Technology

October, 2016

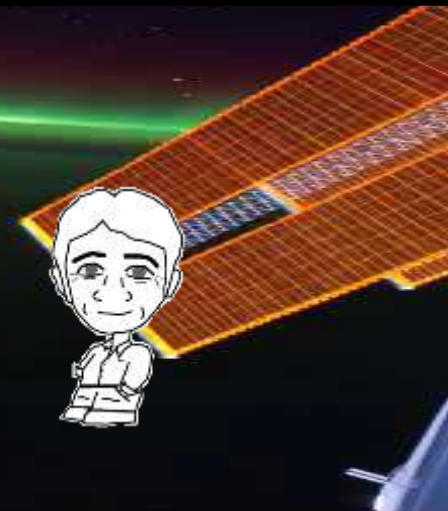
Fumihiko “Tom” Tomita, Dr. Sci.
Chief Research & Strategy Officer,
Vice President, NICT, Japan

Open and Global ICT Innovation Platform for Future Smarter Communication World

***IoT Challenges @NICT: National Institutes of
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National Institute of Information and Communications Technology

The sole national research institute in the field of ICT in Japan

- Promoting its own research and development
- Cooperating with and supporting industry and academia

- Public Services
- Japan Standard Time
 - Space Weather Forecast...



Industry/Academia/Government
Innovation Platform

Budget :

~ 27 Billion Yen + α / yr
(~\$260 Million + α / yr)

Personnel: ~1000

(Researchers: ~550,
PhDs: ~460)

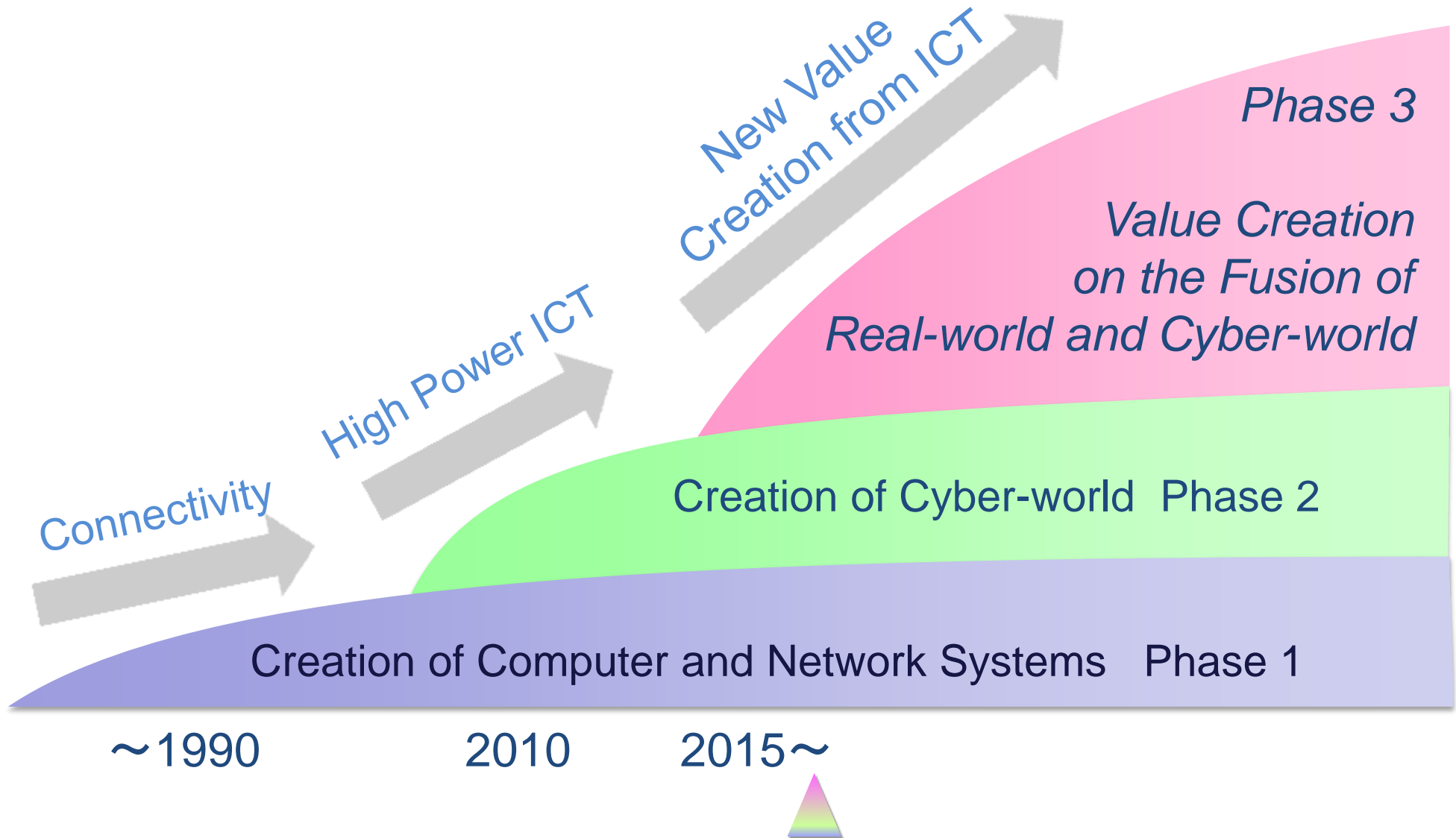
as of Apr. 2016

1. Strategic Research and Development
2. Open Innovation
3. Global deployment

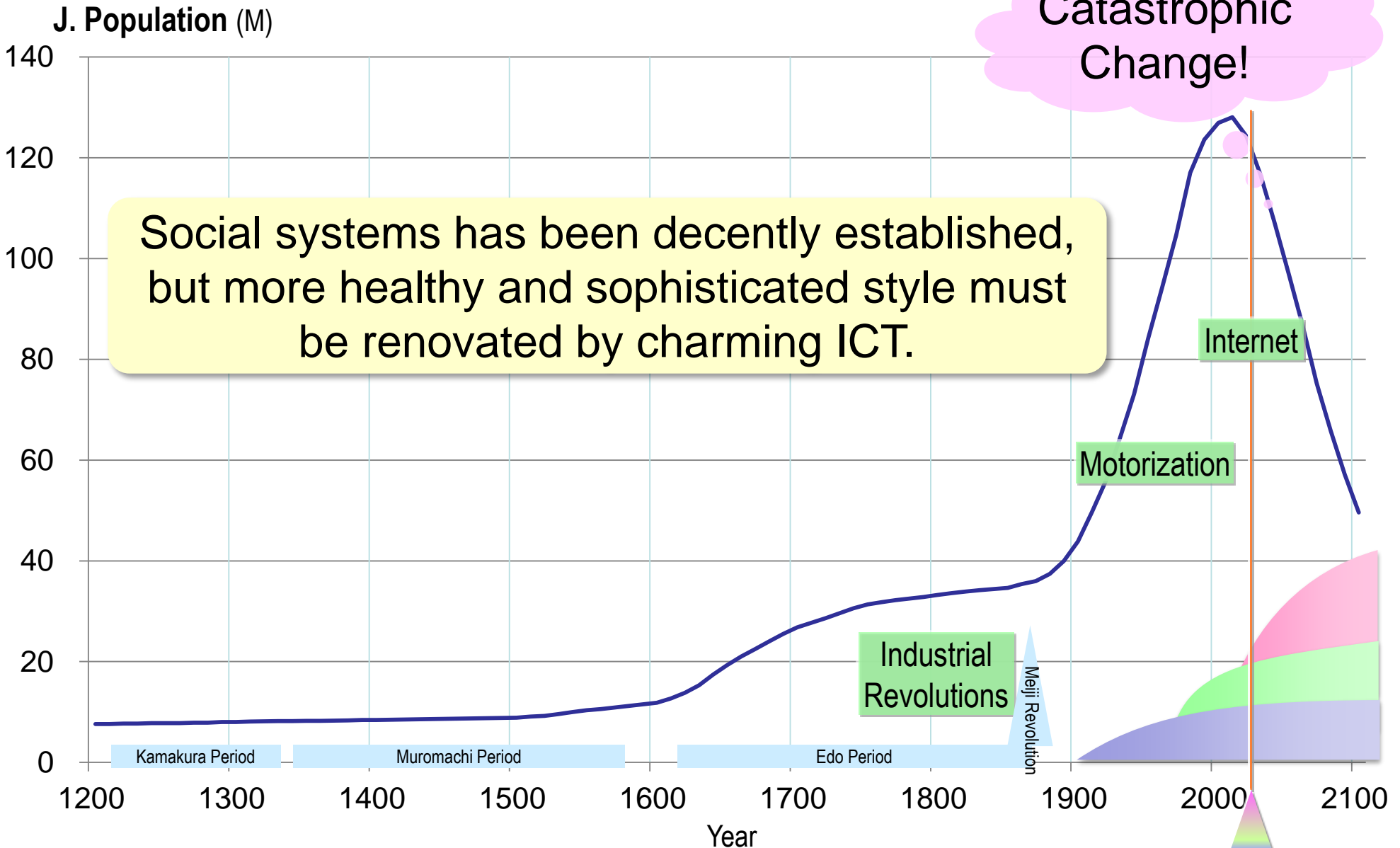


President
Dr. Sakauchi

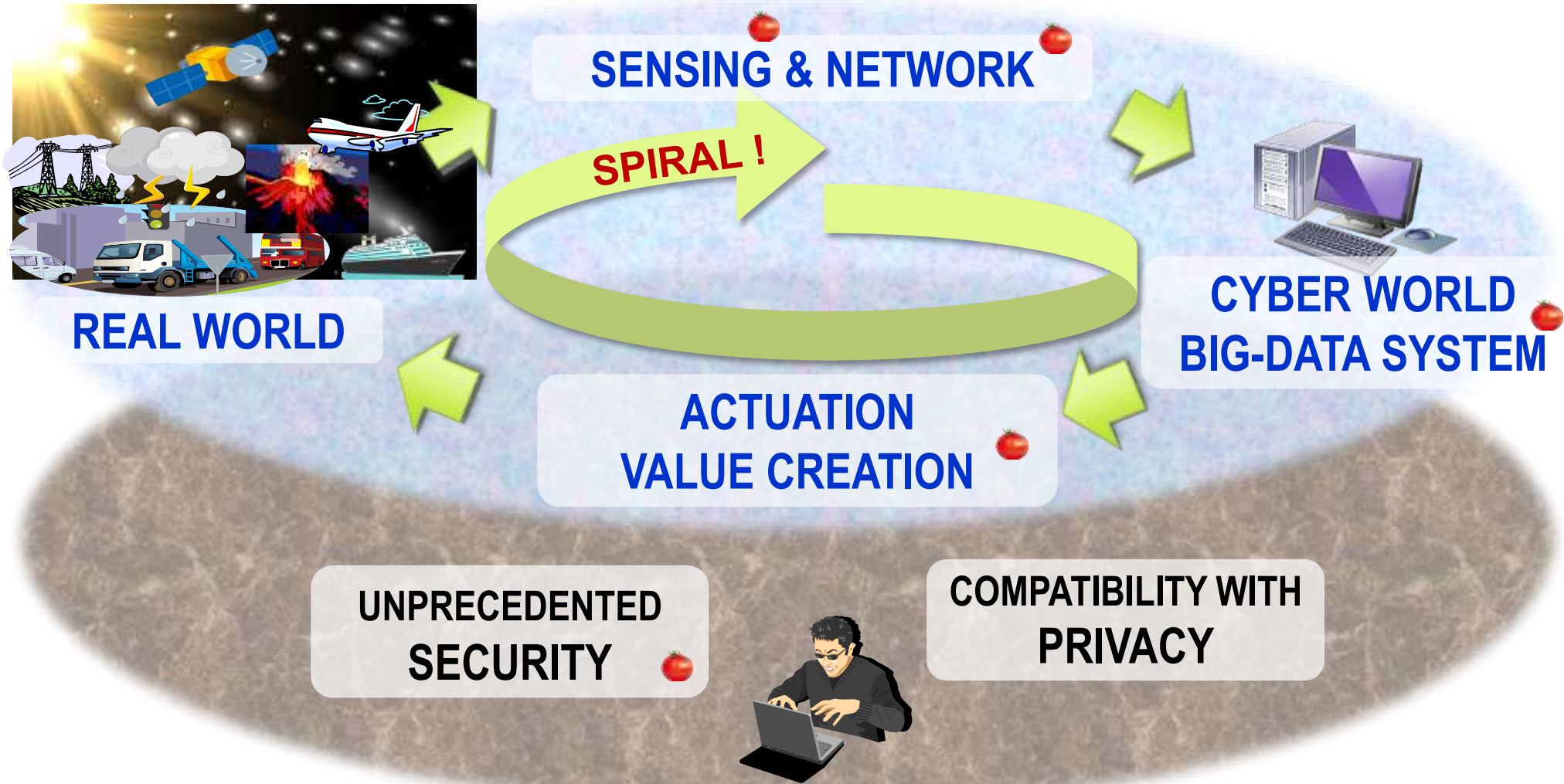
History and 3rd Paradigm of ICT



Social Renovation – Urgent issue in Japan -

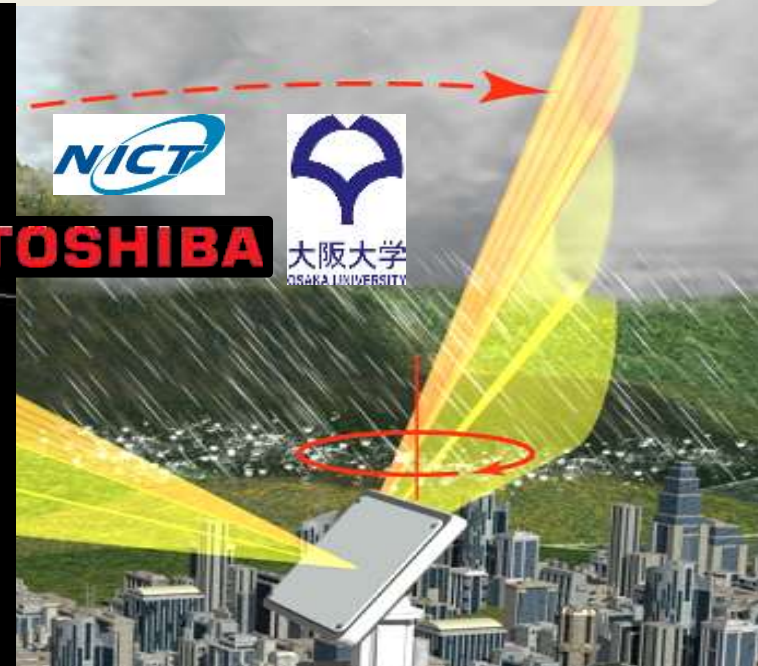
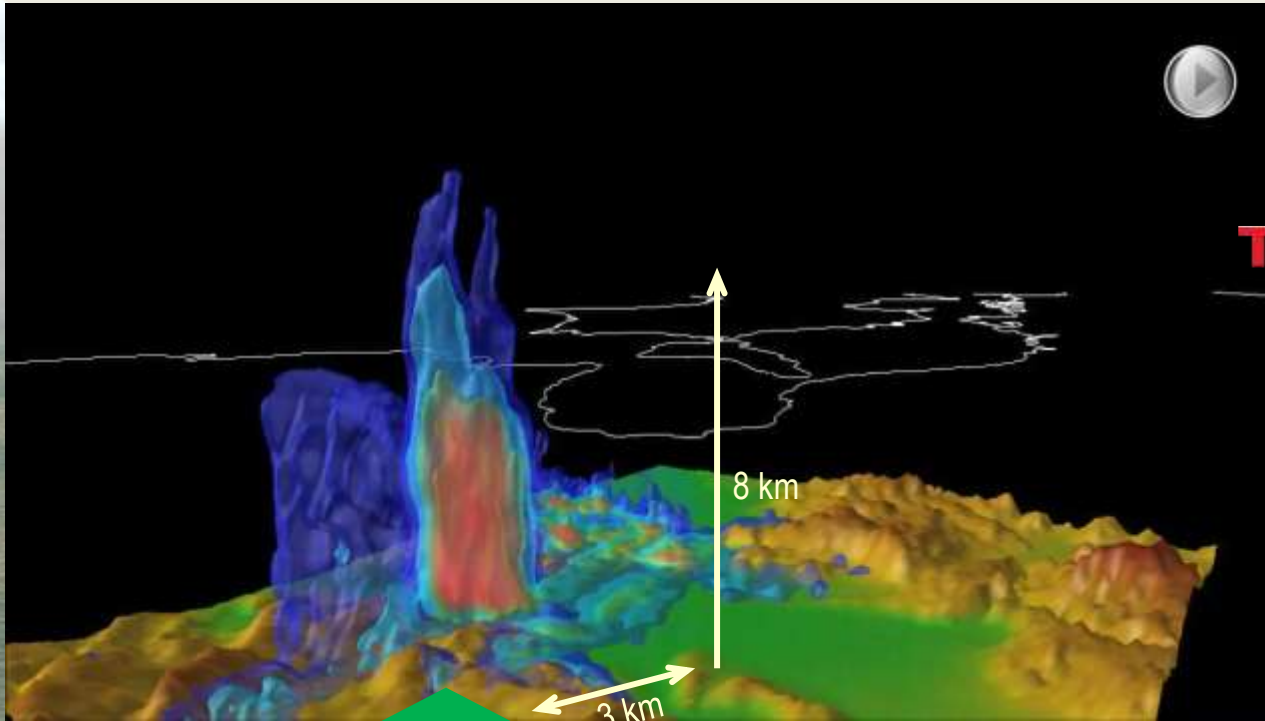


Data Driven Innovation for Quality of **S**ocial Life

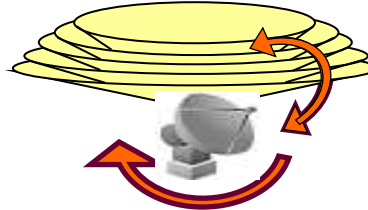


Next-Generation Phased Array Weather Radar

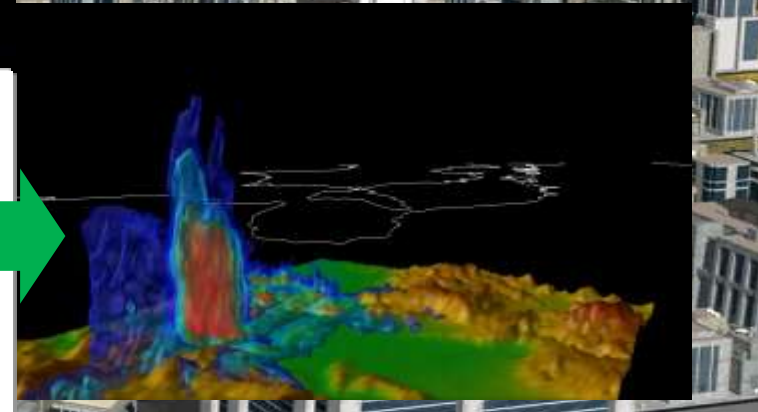
- 3D heavy rainfall and tornadoes at a spatial resolution of 100m **within 30 secs.**
- Prediction of sudden and localized meteorological phenomena



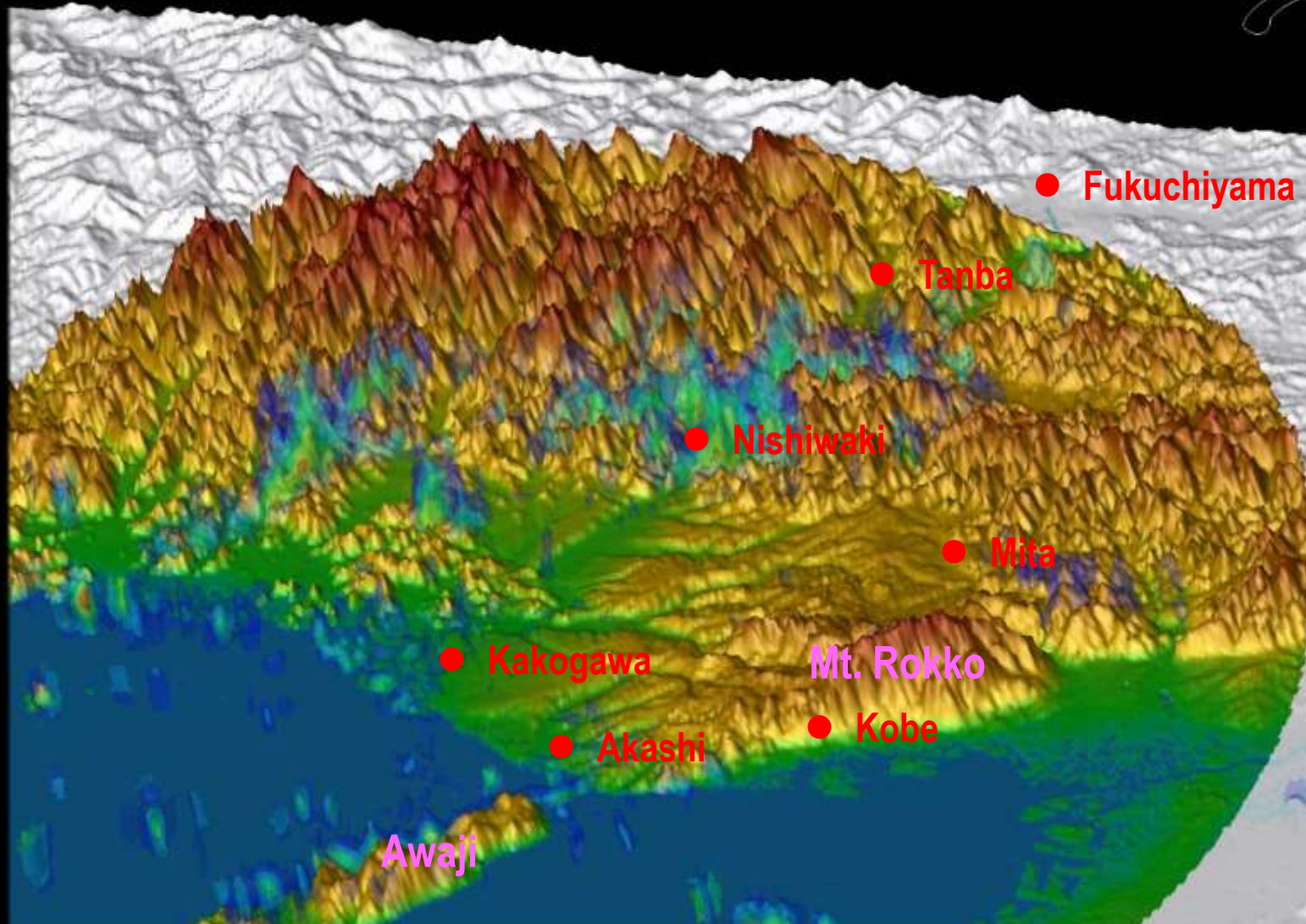
Phased Array Radar:
10-30 sec.



Parabolic antenna:
5-10 min.



Unexpectedly Localized Heavy Rain: 2014 Aug.16,21:00 - 17,05:00 (300x speed)

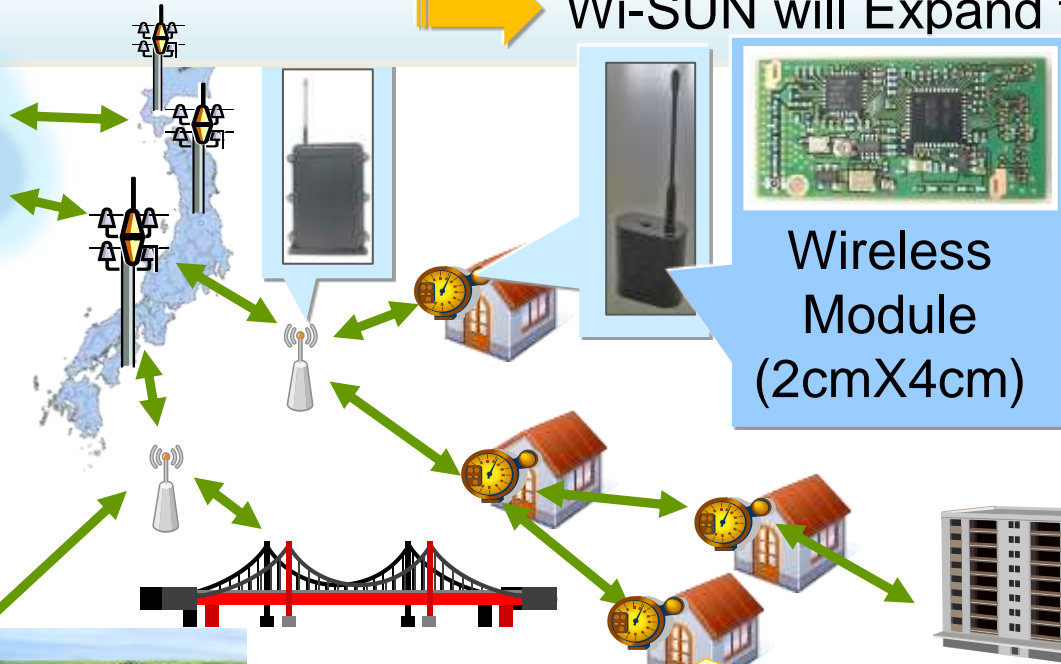


Wireless Smart Utility Network (Wi-SUN)



World's First Small-Sized and Low-Power "Radio Device" Compliant with Smart-Meter Standards of "ECHONET Lite" and "Wi-SUN"

➔ Wi-SUN will Expand to the Sensor Network World



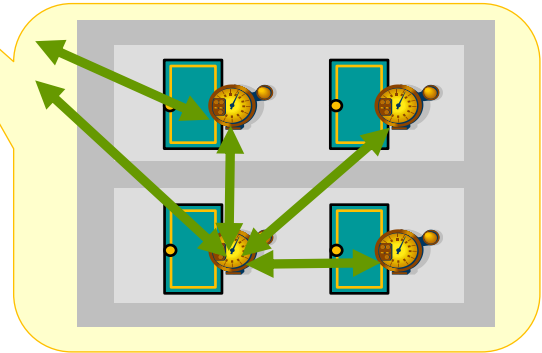
Wireless Module (2cmX4cm)

More than 10-year operation driven by an AA battery

Communication range is automatically expanded by multi-hop transmission



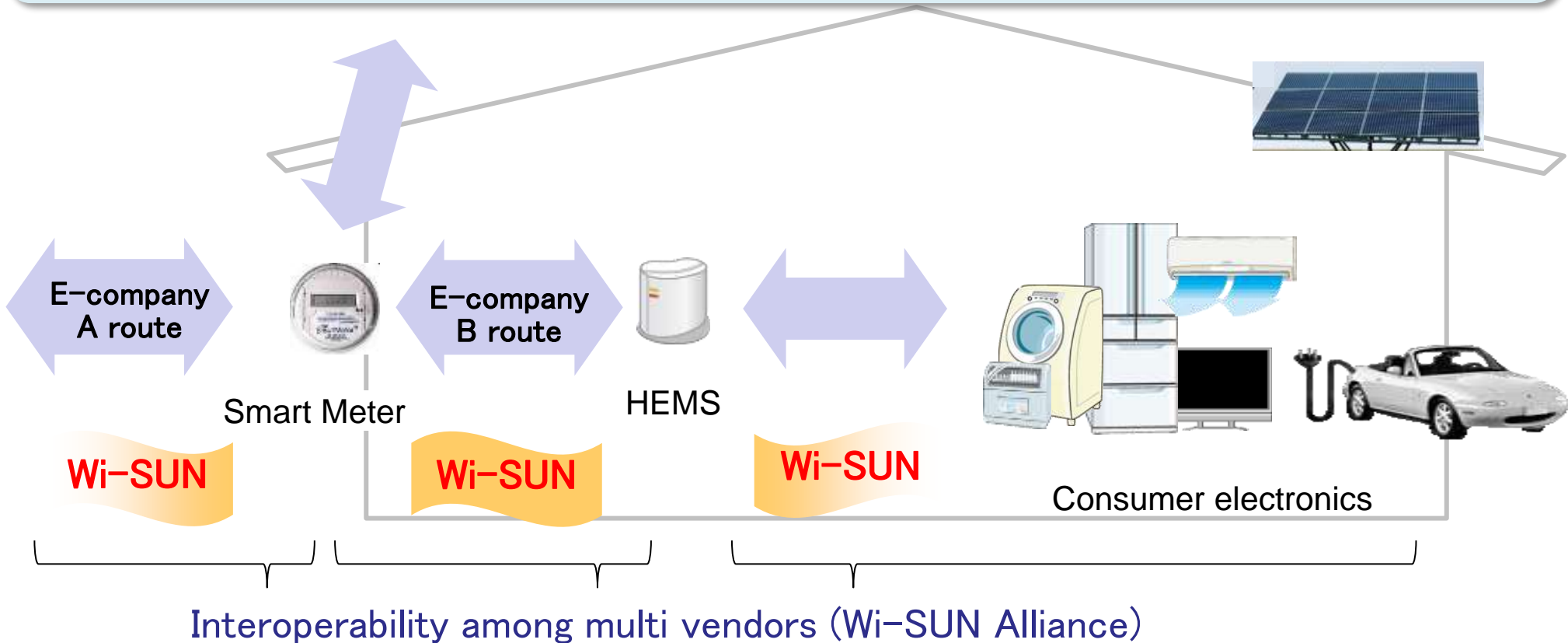
More than 50B Sensors



Wi-SUN will expand to Sensor Network World

Wi-SUN has been accepted all (10) major electric companies and gas companies in Japan (over 80M houses).

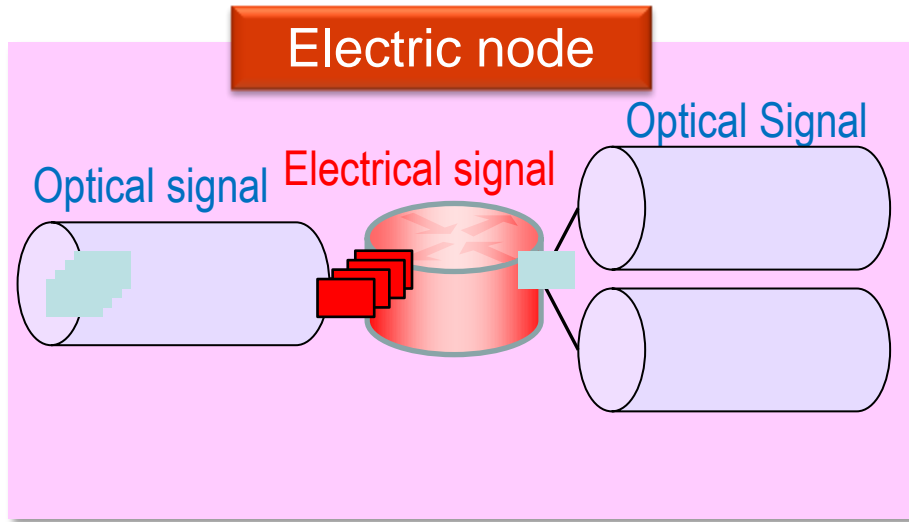
Now expanding to the **Home Area Network** and will expand to the other **SENSOR NETWORK** world.



Hybrid (Laser and Radiowave) Space Communication System is an Inevitable Future !

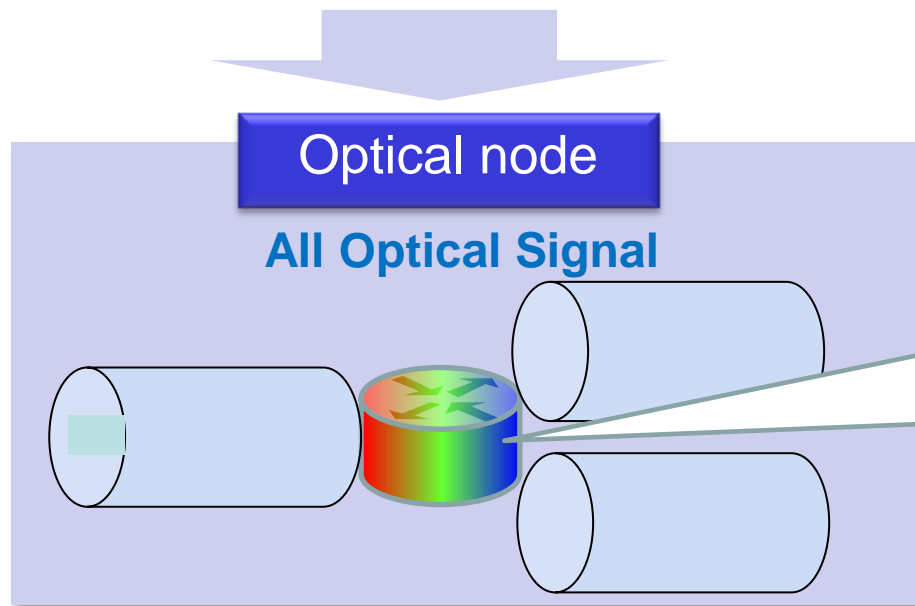
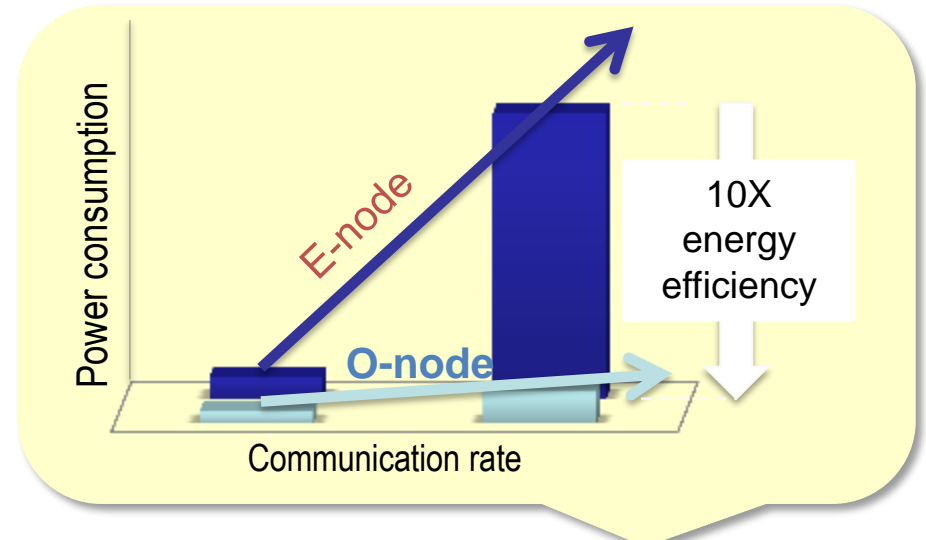


All Photonic Network; Power-saving and Low-latency Node



World Record ! High-speed optical node

- Large capacity : 12.8 Tbit/1 terminal
- Power consumption: 1.4kW



Cybersecurity

DAEDALUS

Direct Alert Environment for
Darknet And Livenet Unified Security



● Darknet-based real-time alert system

● Detecting internal malware infections by darknet

● Sending alert to infected organizations

Cyber-security Collaborations in NICT

● Domestic Collaborations

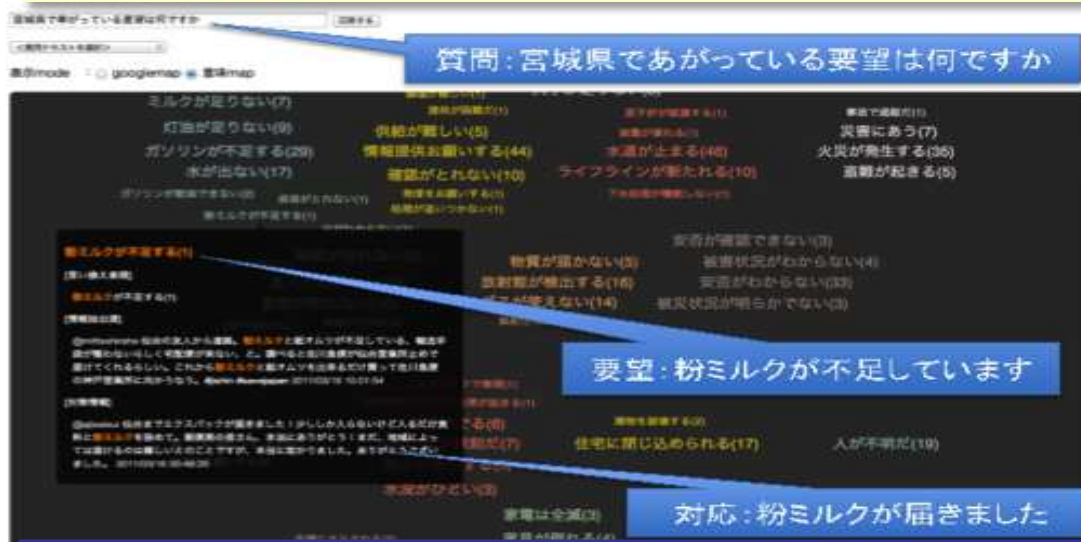
- ✓ Global darknet monitoring environment (240,000 addresses) with Japanese universities and enterprises
- ✓ Over 600 Japanese local governments (total;1700) joined DAEDALUS
- ✓ Information sharing with security related organizations (e.g., NISC, JPCERT/CC, IPA, etc.)

● International Collaborations

- ✓ In JASPER (Japan ASEAN Security PartnERship) project, DAEDALUS sends alerts to ASEAN countries
- ✓ Overseas deployment of darknet sensor for Asia, Oceania and European countries with mutual data exchange
- ✓ R&D collaborations and researcher exchange

AI based Disaster Information Distribution Platform

- Basically, a real-time **QA system**
- Provide **big pictures** of damages and rescue activities to rescue workers and victims, and also provides the list of answers to a question, mainly based on **SNS and WEB**
- **2014.4 twitter data award winner (6/1300)**
- Available to the general public in 2014 > **“DISAANA”** based on **“WISDOMX”** (~Japanese Watson! @ IBM)



automatically lists the problems and requests in an area; makes rescue activity more efficient



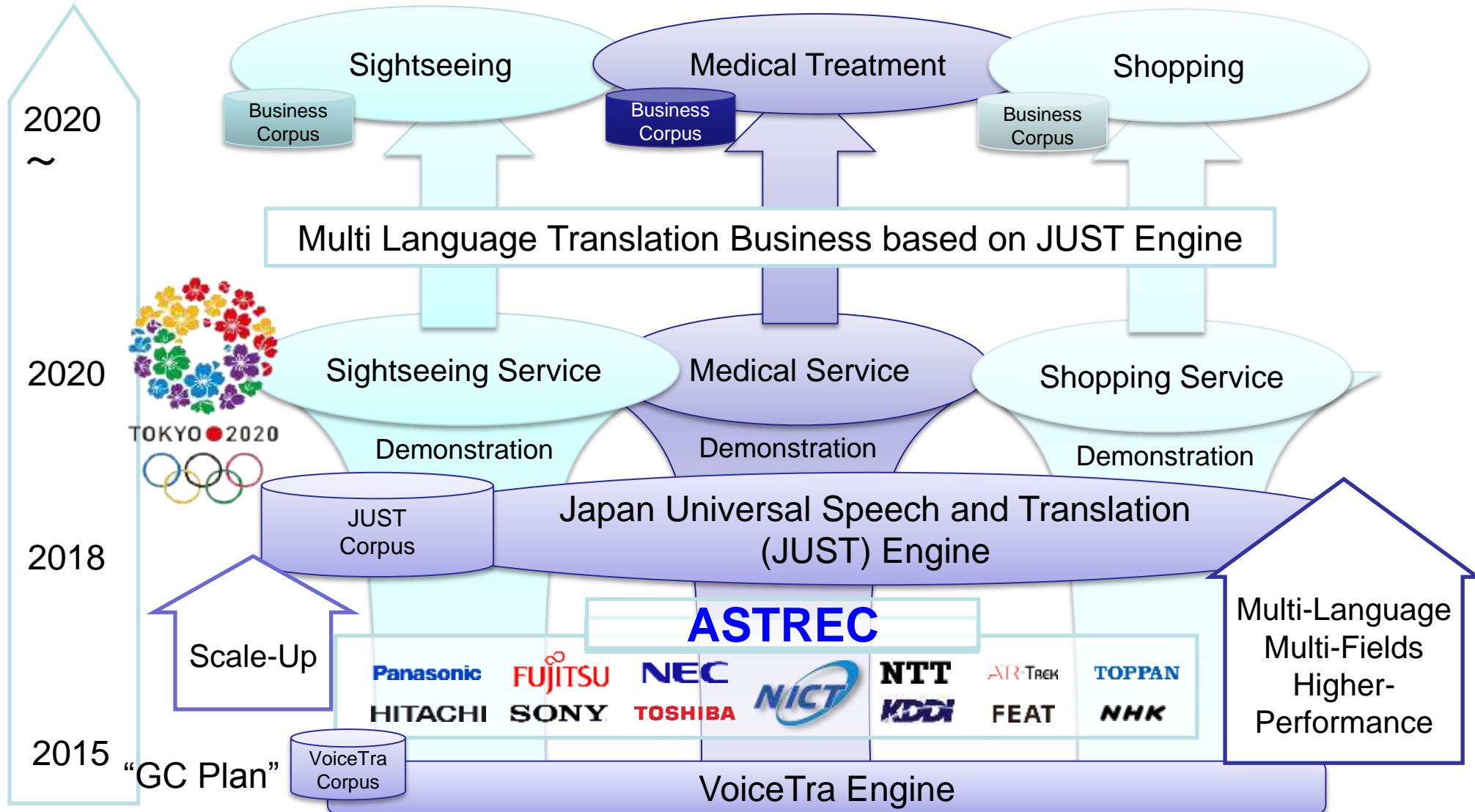
answers on a map, on smartphones

Universal Speech Translation Advanced Res. Consortium (U-STAR)

AI and Network-based speech-to-speech translation with the aim of breaking language barriers around the world. Over 30 research Institutes in 23 countries



Innovation Platform; Overcome the Boundaries of Language Speech-to-Speech Translation for 2020 Tokyo Olympic Paralympic






Preparation Office for Integrated Promotion of Artificial Intelligence Research

Enhancing collaborations with NICT's AI Project cluster

- Newly-established Data-driven Intelligent System Research Center
- Multilingual Translation Engine (Voice recognition, machine translation)
- Research in Neural information processing

Strengthening AI research collaboration with 3 government offices

- 
- 
- 
- Institute of Physical and Chemical Research: Advanced Integrated Intelligence Platform Project (RIKEN AIP)
 - National Institute of Advanced Industrial Science and Technology (AIST); New Energy and Industrial Technology Development Organization (NEDO): Artificial Intelligence Research Center

Human Visual Experiences and **Brain** Activity

(Nishimoto et al., 2011 *Current Biology*)

Presented clip

Brain activity



Decoding Human Visual Experiences from **Brain** Activity

(Nishimoto et al., 2011 *Current Biology*)

- Decode natural perception in brain (with certain accuracy).
- Future : Decoding imagination in brain to help communication.
One of the solutions for aging society problems.

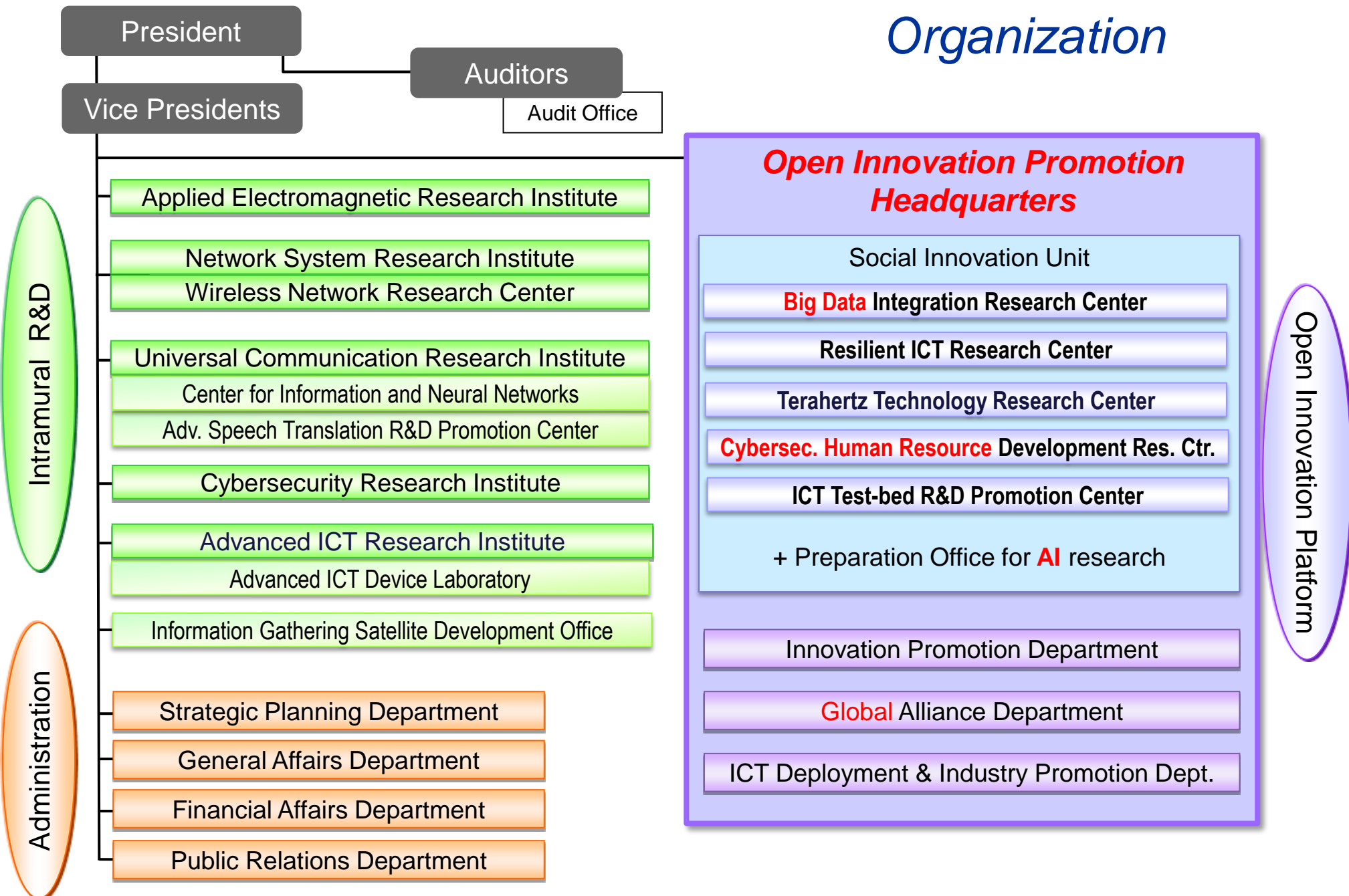
Presented clip



Clip reconstructed
from brain activity



Organization



President

Auditors

Vice Presidents

Audit Office

Applied Electromagnetic Research Institute

Network System Research Institute
Wireless Network Research Center

Universal Communication Research Institute
Center for Information and Neural Networks
Adv. Speech Translation R&D Promotion Center

Cybersecurity Research Institute

Advanced ICT Research Institute
Advanced ICT Device Laboratory

Information Gathering Satellite Development Office

Strategic Planning Department

General Affairs Department

Financial Affairs Department

Public Relations Department

Open Innovation Promotion Headquarters

Social Innovation Unit

Big Data Integration Research Center

Resilient ICT Research Center

Terahertz Technology Research Center

Cybersec. Human Resource Development Res. Ctr.

ICT Test-bed R&D Promotion Center

+ Preparation Office for AI research

Innovation Promotion Department

Global Alliance Department

ICT Deployment & Industry Promotion Dept.

Intramural R&D

Administration

Open Innovation Platform

Social ICT R&D and Global Collaboration

【□】 Funding / Collaboration

- 【Disaster Prevention】
- 【Medical / Health Care】
- 【Smart City】
- 【Preservation】
- 【Education】
- 【Agriculture / Food】

【○】 Mobile Wireless Test Bed

- 【Disaster Prevention】
- 【New Business】
- 【Preservation】
- 【Agriculture / Food】

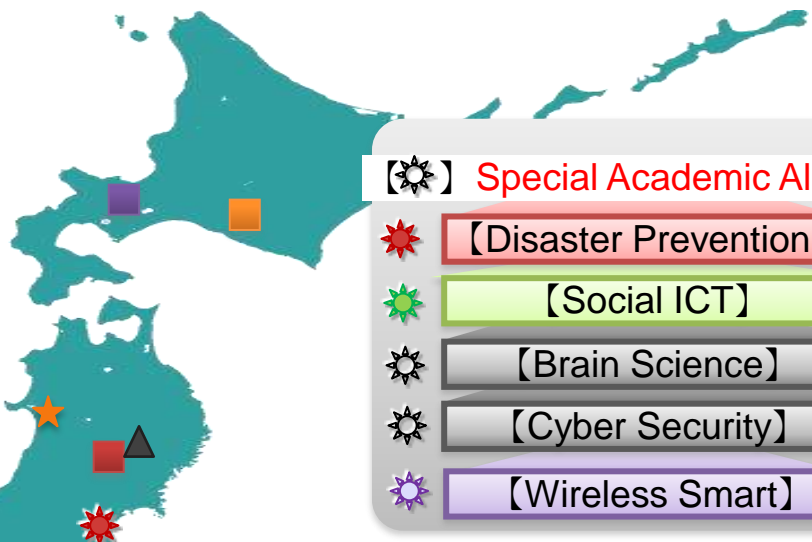
【☀】 Special Academic Alliance

- ☀ 【Disaster Prevention】
- ☀ 【Social ICT】
- ☀ 【Brain Science】
- ☀ 【Cyber Security】
- ☀ 【Wireless Smart】

【☆】 G-Space Platform

- ★ 【Disaster Prevention】
- ★ 【Agriculture / Food】

【△】 Local Government Collaboration



- EU R&D co-funding Cooperation
- US NSF co-funding Joint Research Program
- ASEAN ICT Virtual Organization

Open ICT Innovation Platform



***For World Human Happiness
and Endurable ICT***

***Let's Start
Friendly Communication for
Cooperative Innovation***

**Thank you very much
For your kind attention**

ご静聴感謝いたします

<http://www.nict.go.jp/en/>