

Social Renovation by ICT at the Entrance of the Smarter Communication World

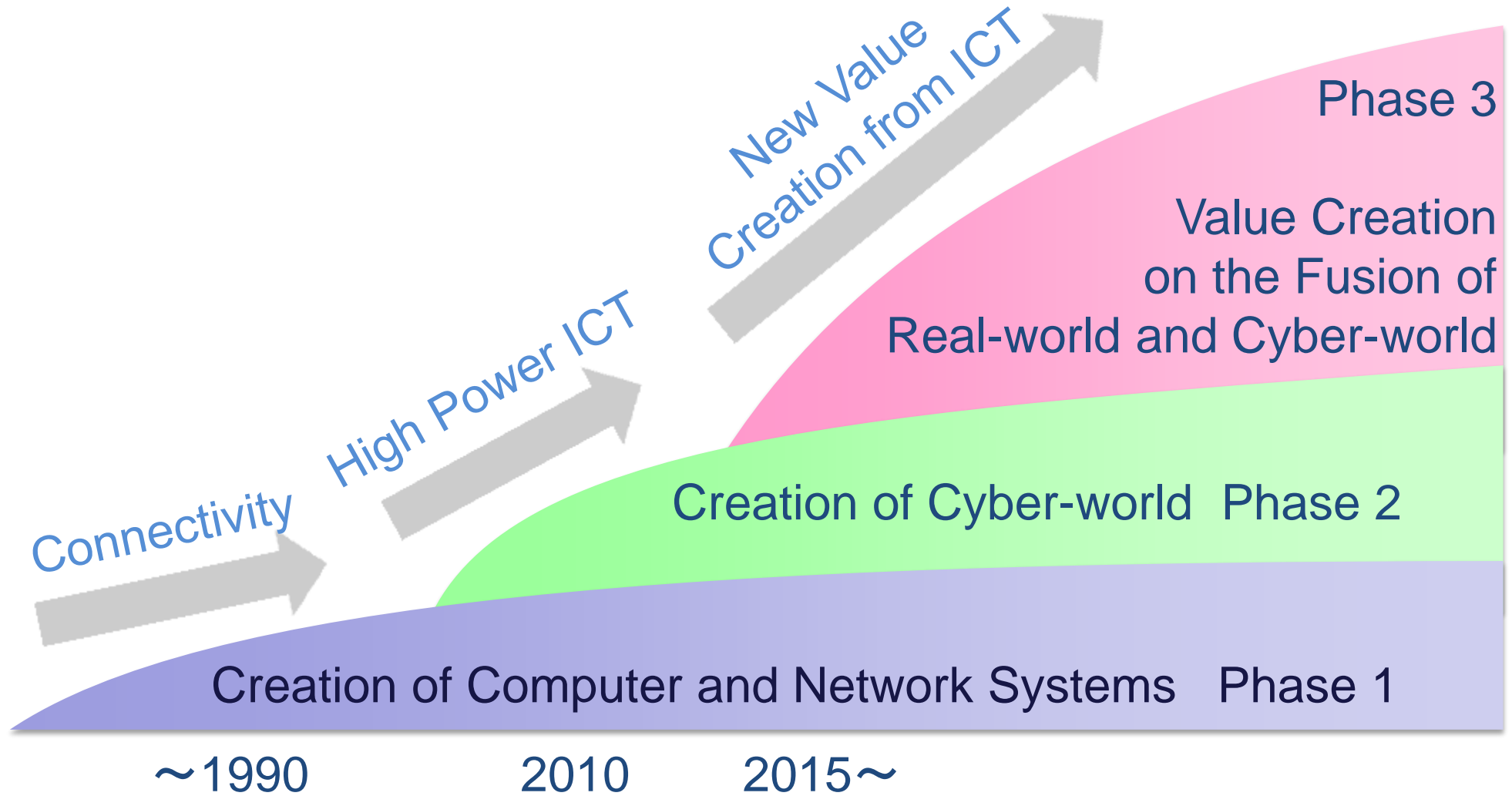
***NICT: National Institutes of
Information and Communications Technology***

October 12, 2015

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

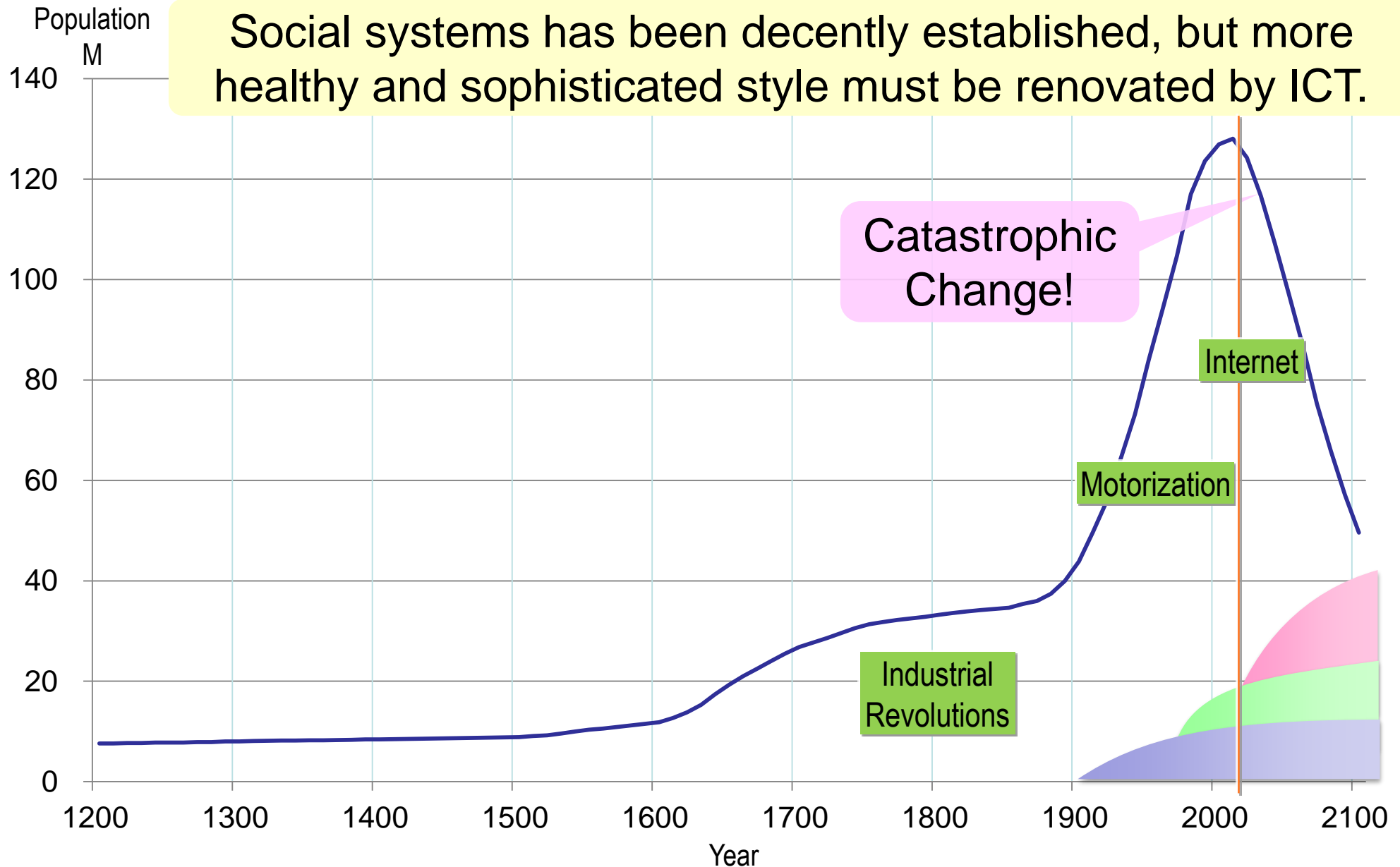


History and 3rd Paradigm of ICT

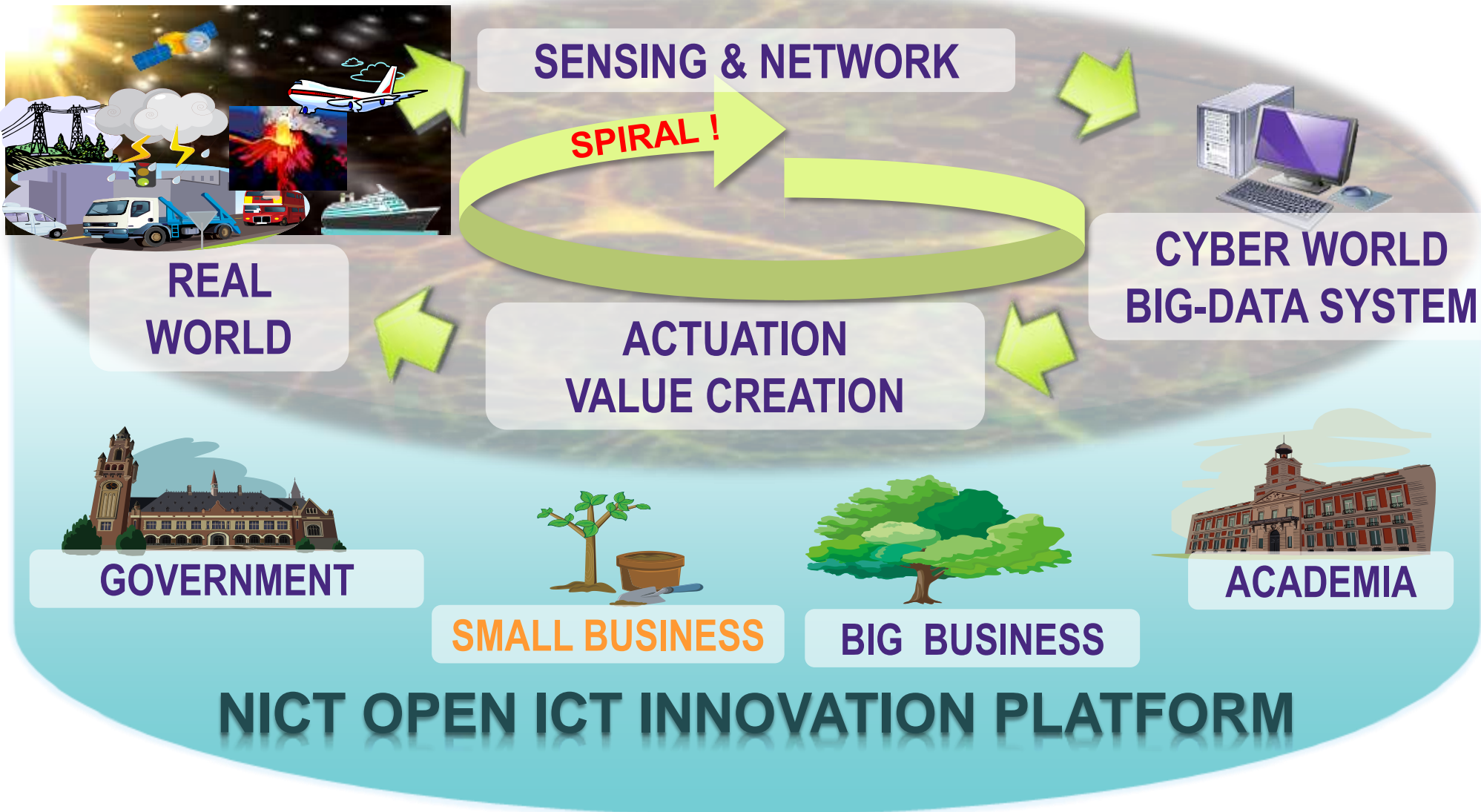


Social Renovation – Urgent issue in Japan -

Social systems has been decently established, but more healthy and sophisticated style must be renovated by ICT.



Data Driven Innovation for Quality of *Social Life*



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** Round Table, Virtual Organization

Topics of NICT Research and Development

**Sensing and
Network
Technologies**

**Security
and Privacy**

**Information
Analysis
Big data system**

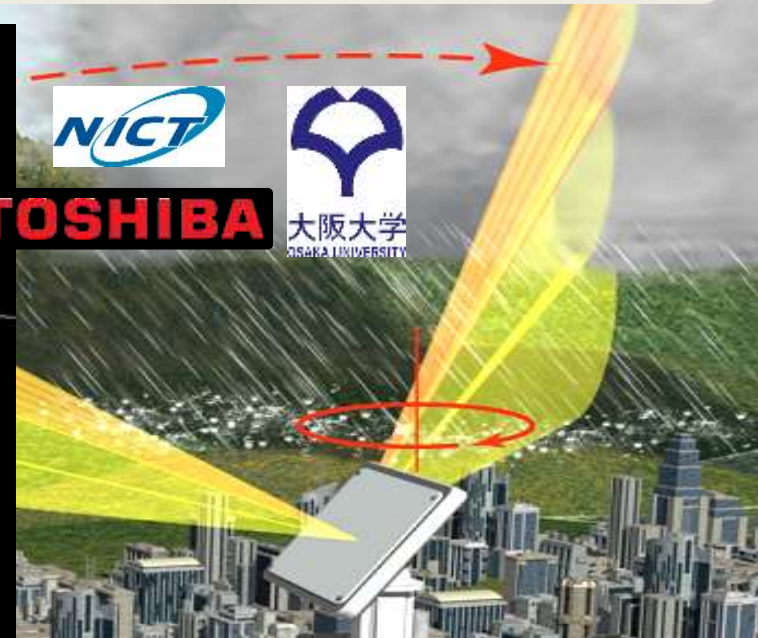
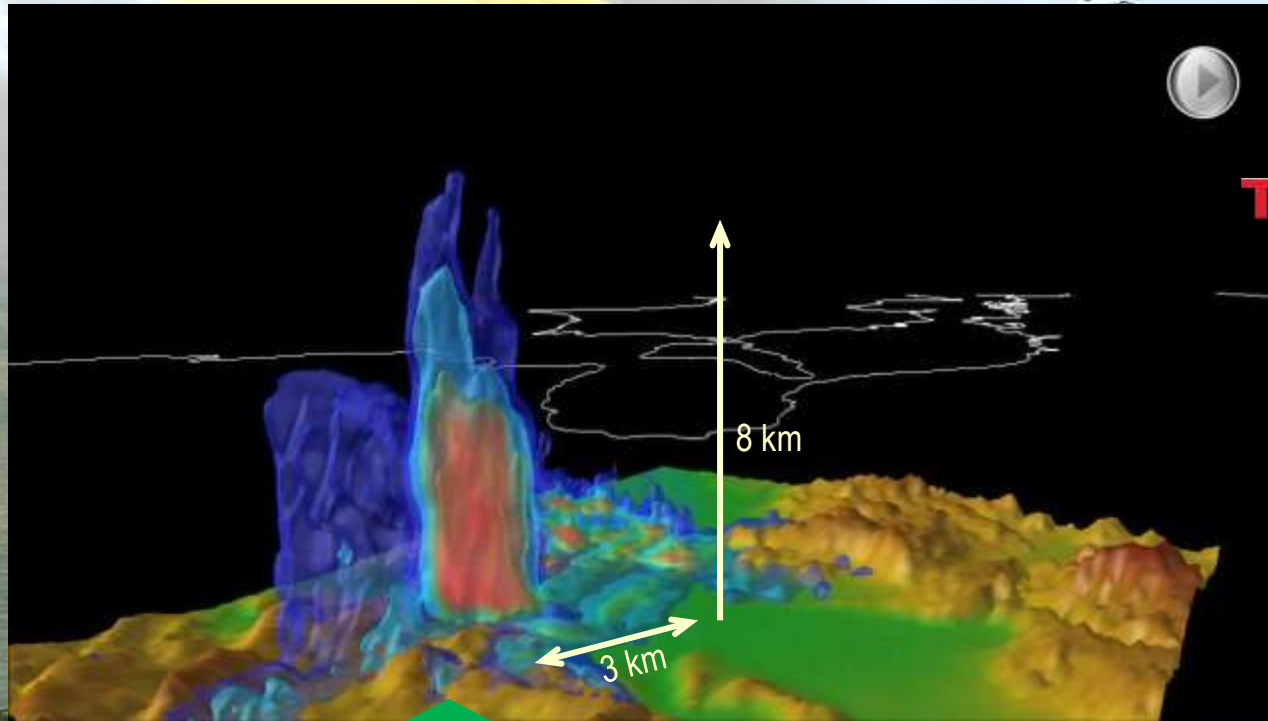
**Advanced ICT
(Future ICT)**



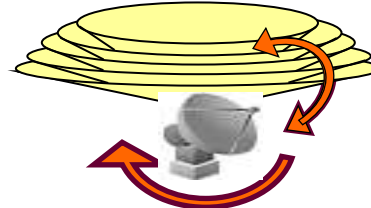
~ Amoeba Model of Research Institution

Next-Generation Phased Array Weather Radar

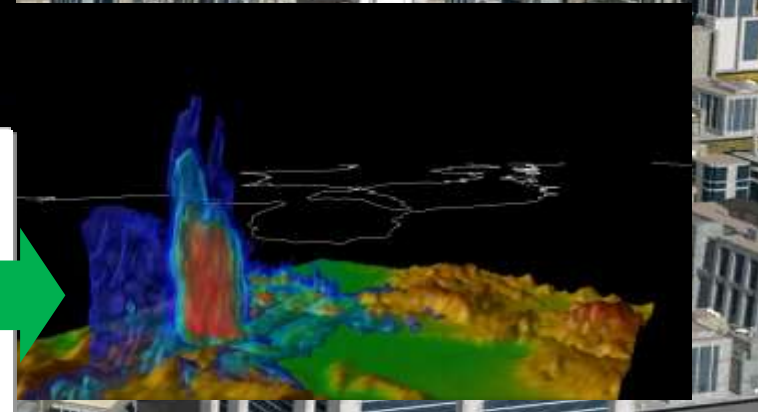
- 3D heavy rainfall and tornadoes at a spatial resolution of 100m **within 30 secs.**
- Prediction of sudden and localized meteorological phenomena



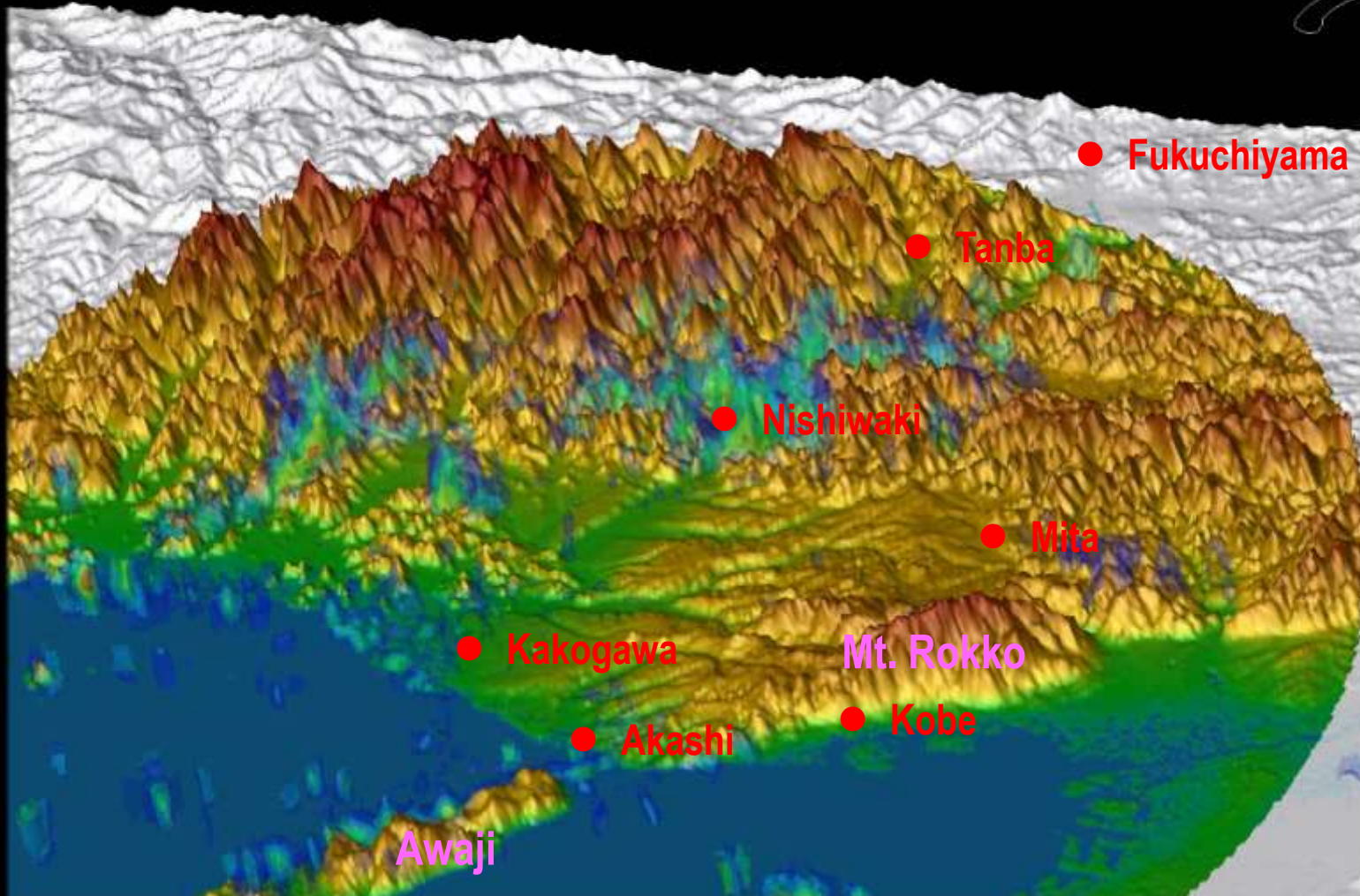
Phased Array Radar:
10-30 sec.



Parabolic antenna:
5-10 min.

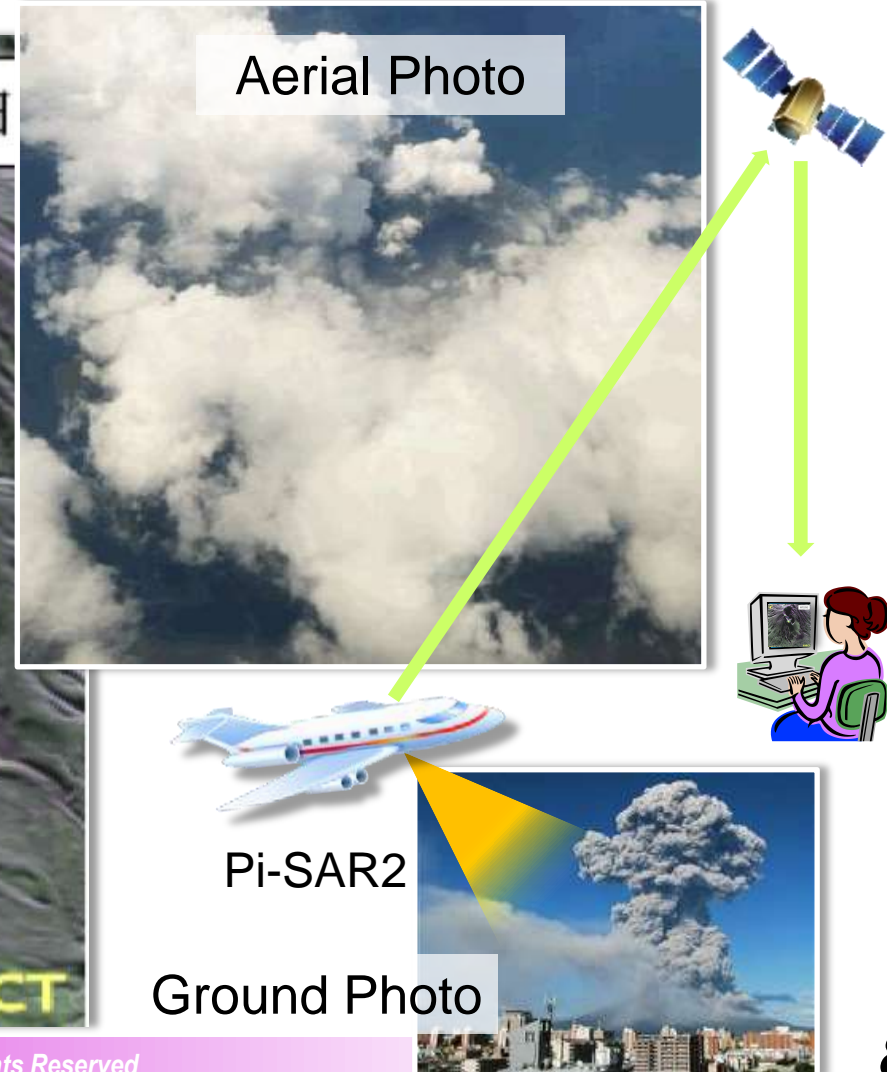
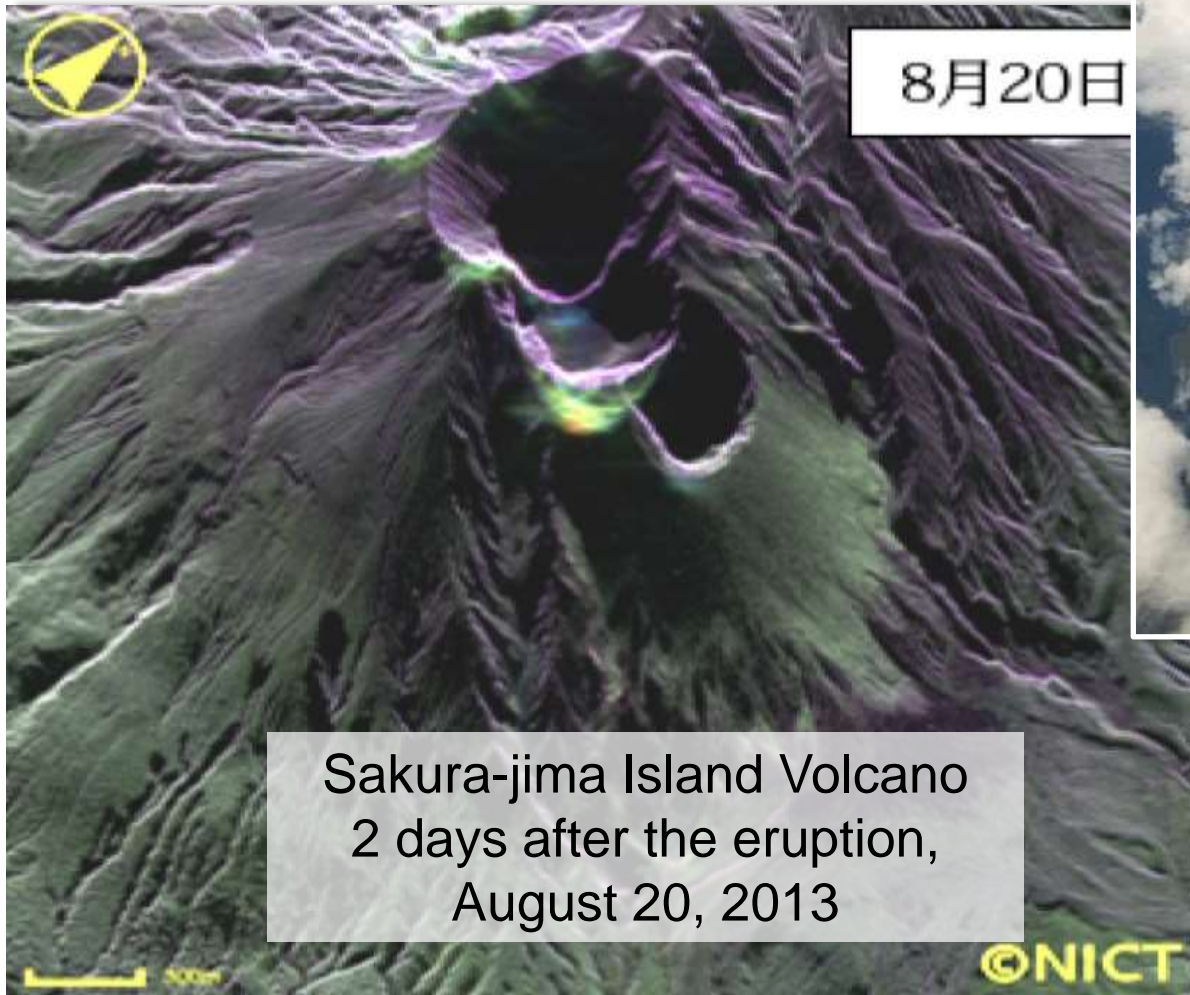


Unexpectedly Localized Heavy Rain: 2014 Aug.16,21:00 - 17,05:00 (300x)

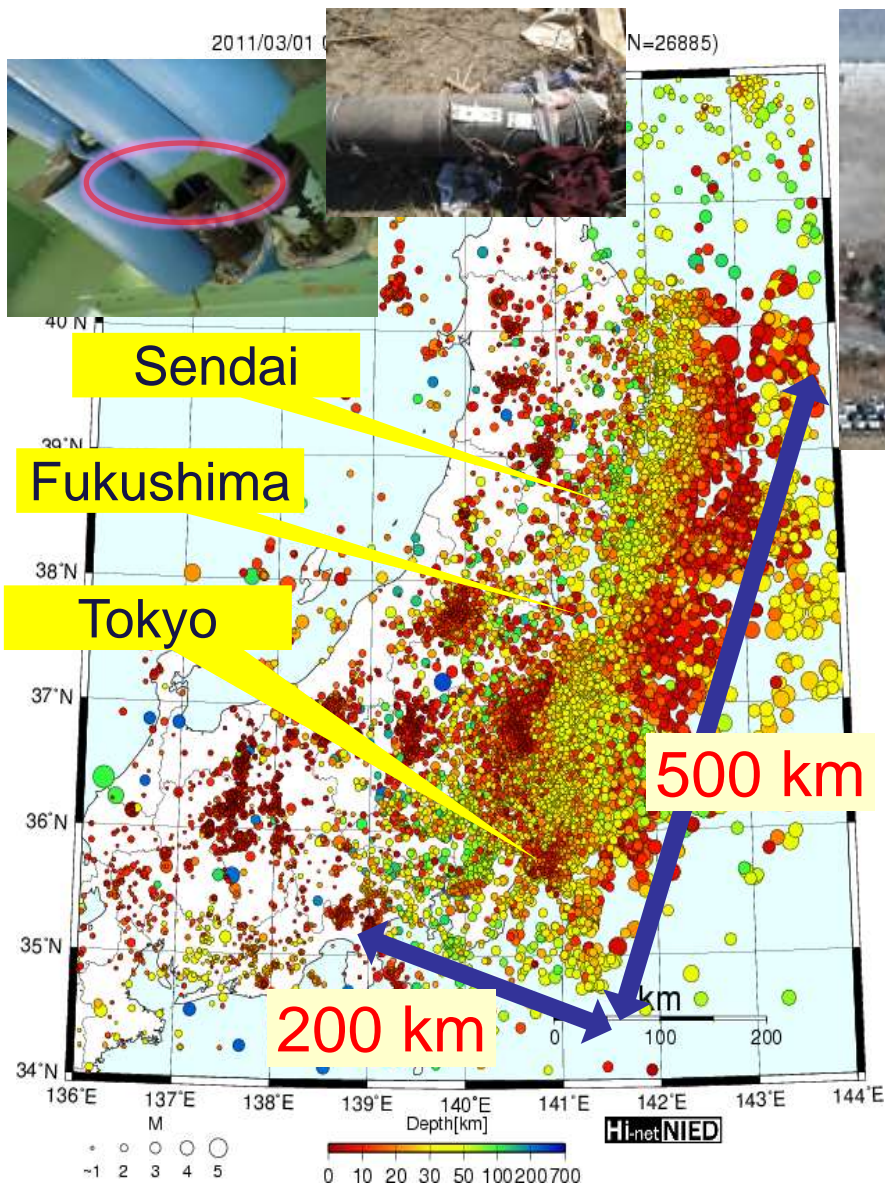


Volcano Eruption Observation by Pi-SAR2

Precise (30cm) polarimetric color image (through clouds, day and night) can be transferred to the ground in near real-time (**10 mins.**)



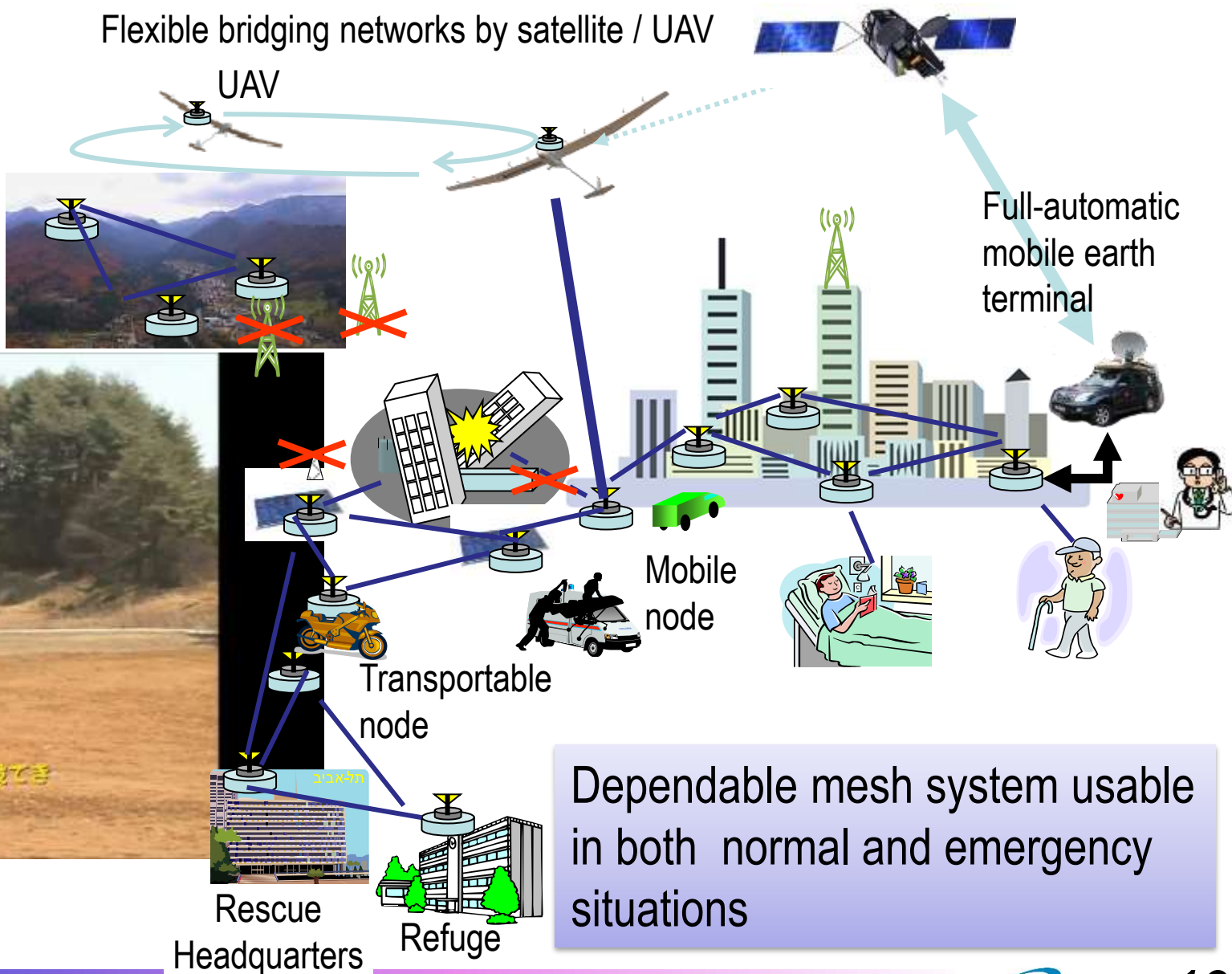
2011 Disaster and Endurable ICT



Dependable Wireless Mesh / Satellite Networks

Flexible bridging networks by satellite / UAV

Connecting isolated areas



Dependable mesh system usable in both normal and emergency situations

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”**

質問: 宮城県であがっている要望は何ですか

要望: 粉ミルクが不足しています

対応: 粉ミルクが届きました

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

宮城県気仙沼市で卒がっている要望

回答: 粉ミルクが届きました

answers on a map, on smartphones

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

Social Cloud

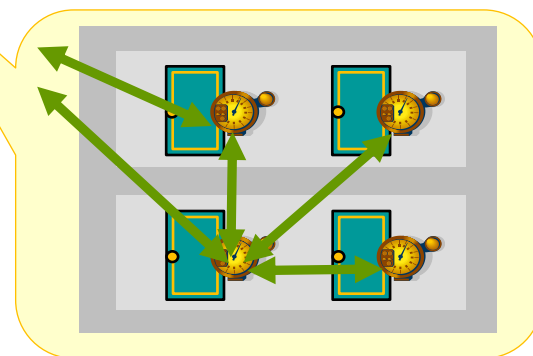


Wireless Module (2cmX4cm)

More than 10-year operation driven by an AA battery

Communication range is automatically expanded by multi-hop transmission

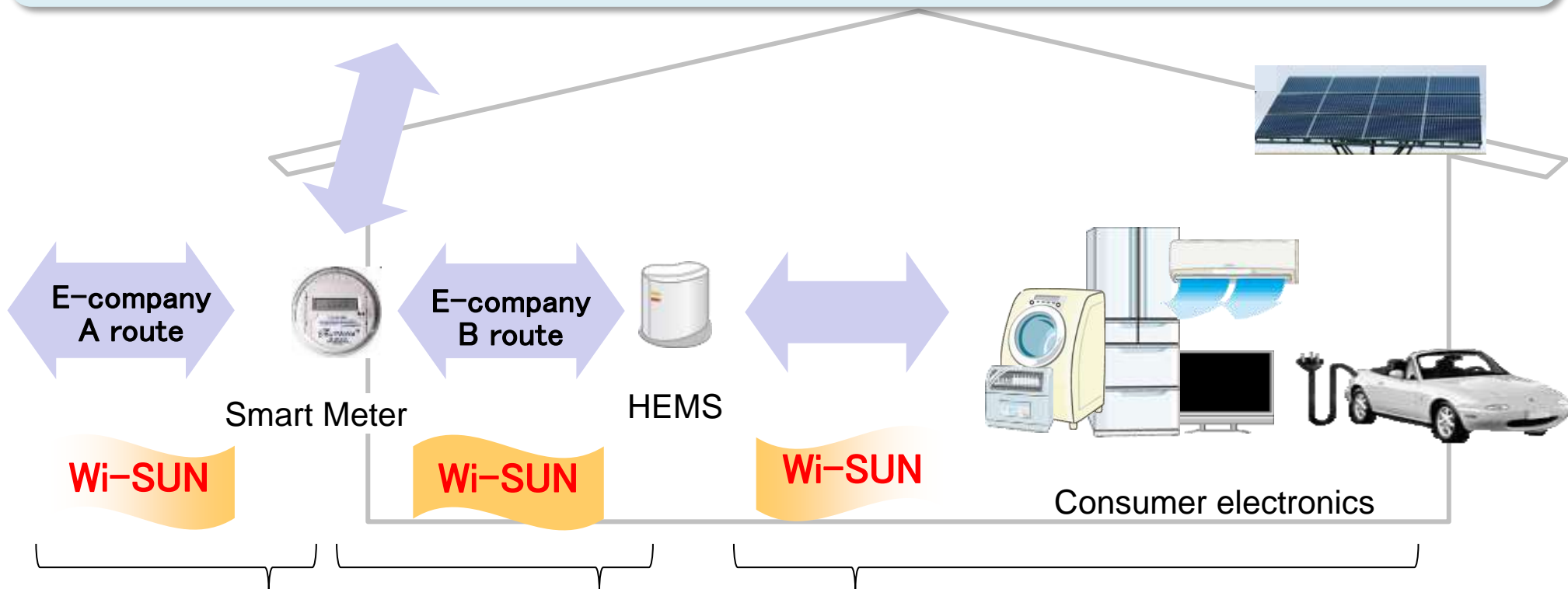
More than 50B Sensors



Wi-SUN will expand to Sensor Network World

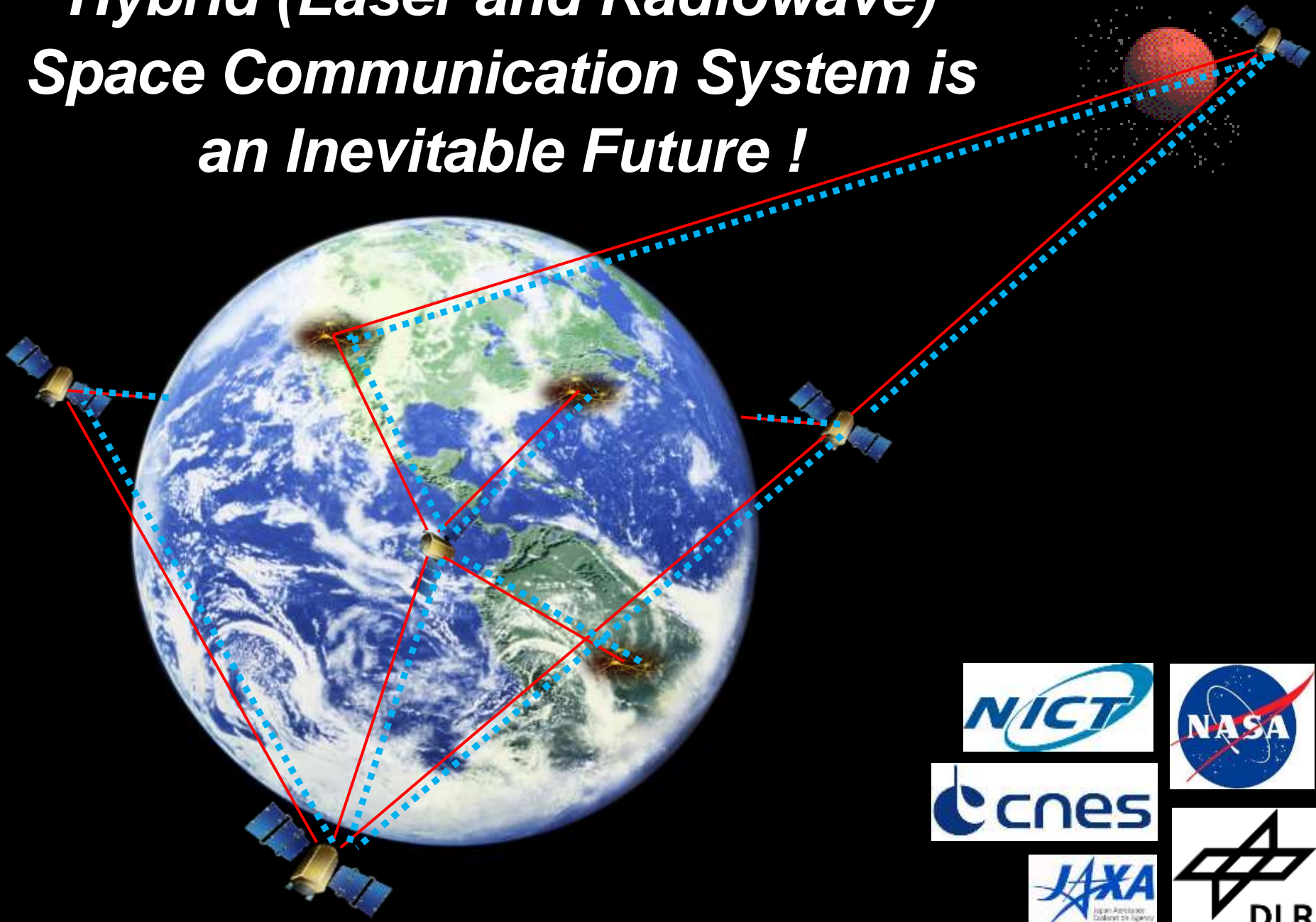
Wi-SUN has been accepted all (10) major electric companies and gas companies in Japan.

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

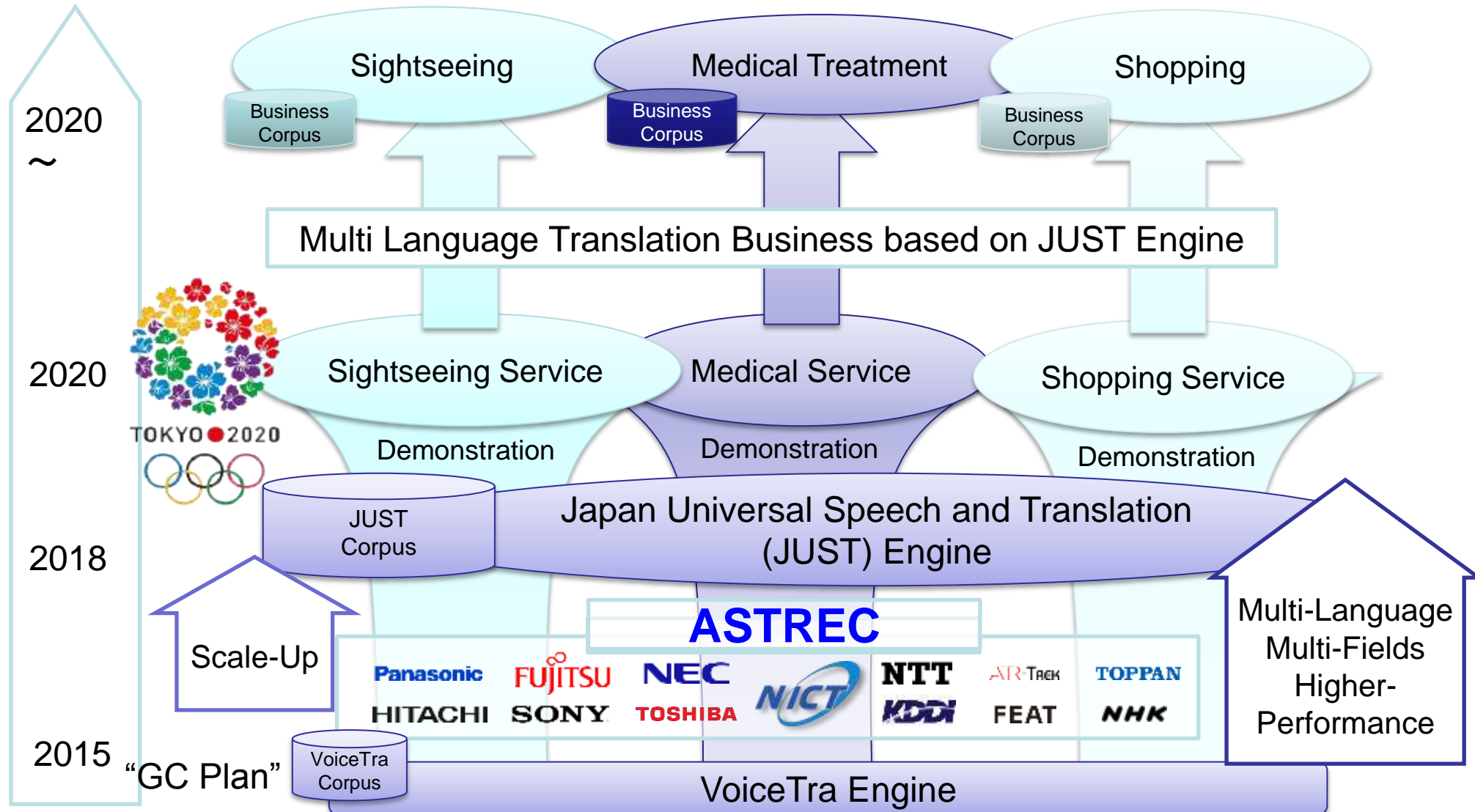


Interoperability among multi vendors (Wi-SUN Alliance)

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



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





Network Incident analysis Center for Tactical Emergency Response

The screenshot shows a software interface with a globe as the central element. The globe is overlaid with various colored dots (red, blue, green) representing data points. In the top right corner, there is a blue "NICT" logo. In the bottom right corner, the word "NICTER" is displayed in a large, white, stylized font. In the bottom left corner, there is a small terminal window with the following text:

```
TCP_SYN_ACK  
TCP_RST  
TCP_PUSH  
TCP_OTHER  
TCP
```

- Large-scale darknet (unused IP address) monitoring
- Fully automated malware analysis
- Grasping root causes of Cyberattacks

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

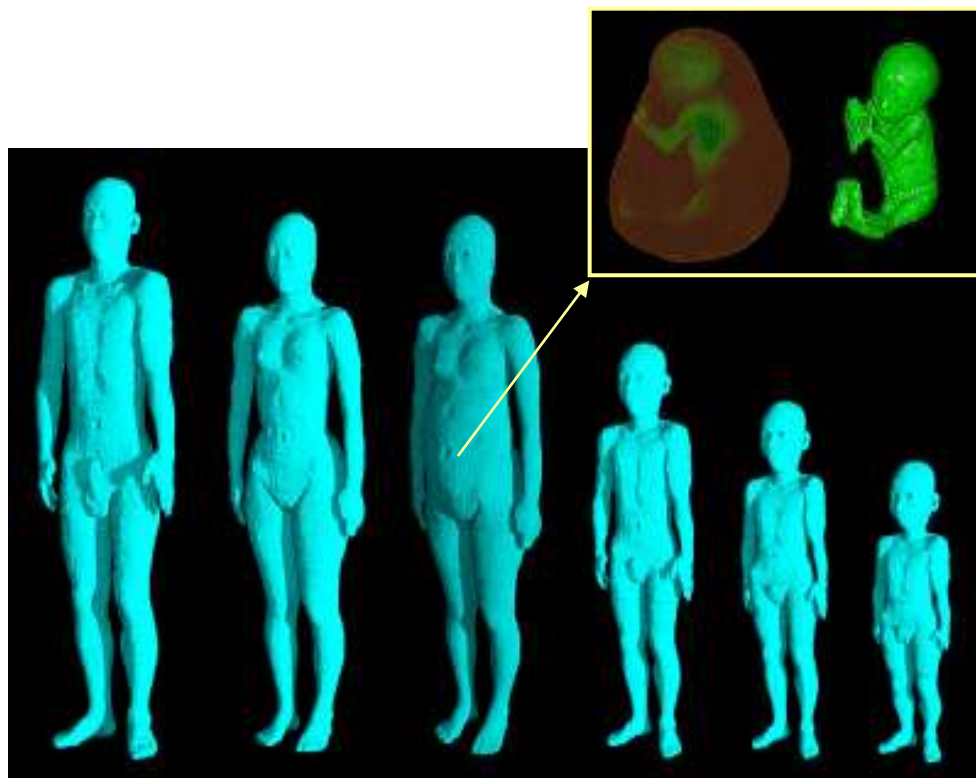
- ✓ Global darknet monitoring environment (240,000 addresses) with Japanese universities and enterprises
- ✓ Over 200 Japanese local governments joined DAEDALUS
- ✓ Information sharing with security related organizations (e.g., NISC, JPCERT/CC, IPA, etc.)

● 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

Biomedical EMC

- Numerical human-body models with the aim of evaluating the safety of radio waves with respect to the human body
- This voxel human model databases are available to the public http://emc.nict.go.jp/bio/model/index_e.html



Proceedings of the IEEE



Review of Computational Anthropomorphic Anatomical and Physiological Models

History, latest advances, current challenges and future prospects for computer models of anatomy and physiological functions are addressed in this review.

By HABIB ZAIDI, Senior Member IEEE, and BENJAMIN M. W. TSUI, Fellow IEEE

ABSTRACT | The widespread availability of high-performance computing and accurate and realistic computer simulation techniques has stimulated the development of computational anthropomorphic models of both the anatomy and physiological functions of humans and laboratory animals. These simulation tools have been applied to different medical imaging modalities including ultrasound, single photon emission computed tomography, positron emission tomography, X-ray computed tomography, magnetic resonance imaging, optical imaging, and multimodality imaging with various combinations of the above. This paper reviews the fundamental and technical challenges and future directions of developing computational models of anatomy and physiological functions and their applications to biometry calculations, the computer-generated radiation sources and through biological systems, and physics of accurate and realistic radiation dose that obtained from clinical studies. These simulate increasingly important biomedical imaging and

1. INTRODUCTION

The development of advanced methods for the design of computational models that represent the human and laboratory animal anatomy and physiology has been one of the most active areas of research in molecular imaging and radiation dosimetry [1]. Such computational models are used extensively to derive dose conversion parameters in



Fig. 4. Variable posture and size development from a statistically realistic voxel model in with upright standing posture (© courtesy of T. Nagasaki, National Institute of Information and Communications Technology, Japan).

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



***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/>

