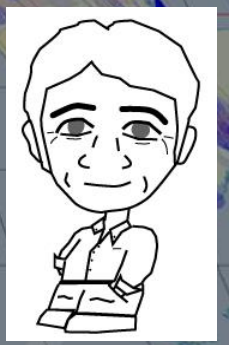
NICT
National Institutes of Information and Communications Technology

- At the Entrance to the Smarter Communication World -

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



OUTLINE OF NICT (MOVIE)

Role of the National Institutes of ICT

ICT for Sustainable World Human Happiness

Sole national research institute in the field of information and communications technologies (ICT) in Japan

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

President
Dr. Sakauchi

National ICT Policy

Industry /Academia/Government Collaboration

Public Services
Japan Standard Time,
Space Weather Forecast,
Wireless Equipment Testing
& Calibration

History

National Laboratory

1896
Radio Research Laboratory
In the Ministry of Communications

1952
Radio Research Laboratory

1988
Communications Research Laboratory

2001
Communications Research Laboratory

Incorporated Administrative Agency

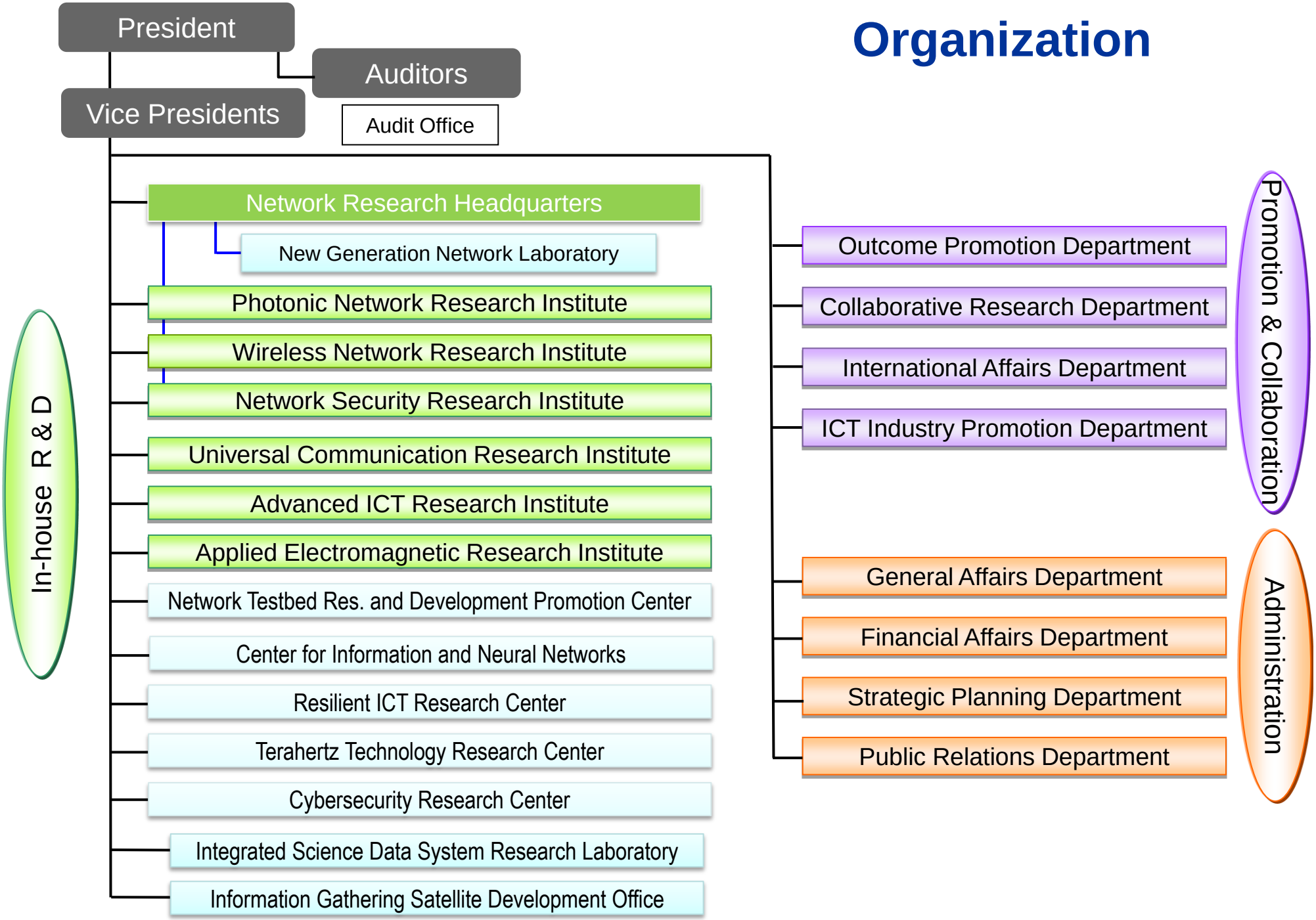
1979
Telecommunications Satellite Corporation

1992
Telecommunications Advancement Organization

Certified Institution

2004
National Institutes of Information and Communications Technology

Organization



Domestic Facilities

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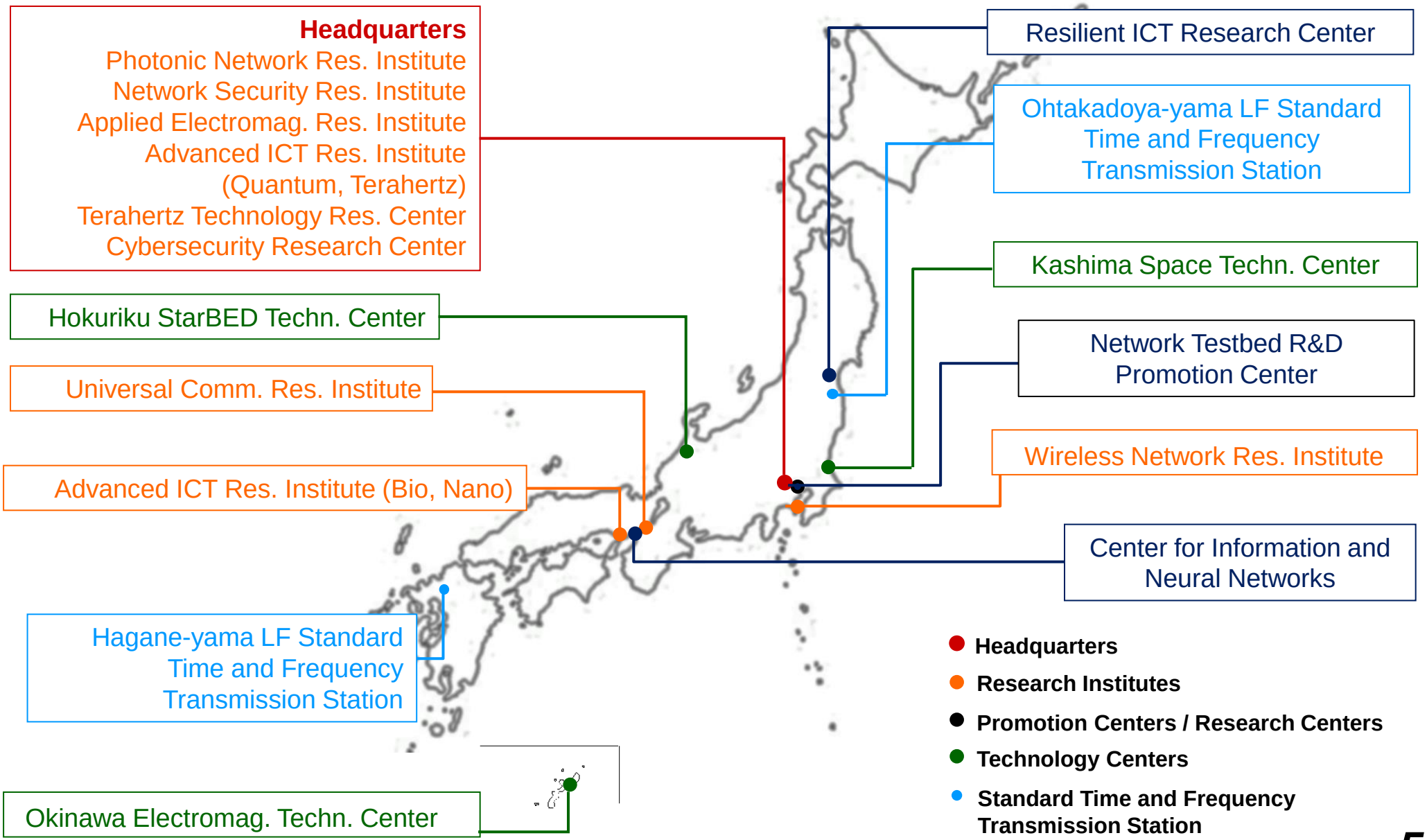
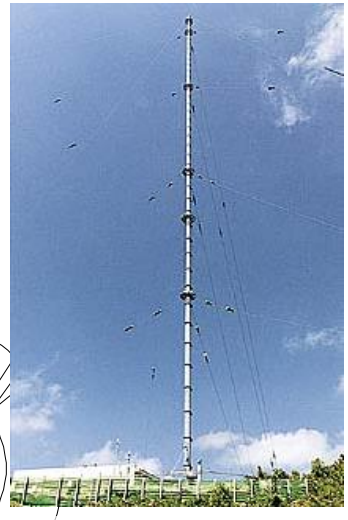
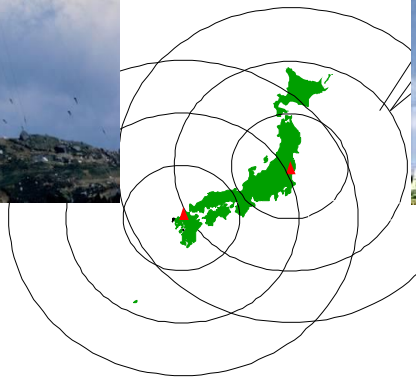


Oversea Centers

Public Services

Generation of Frequency Standard, Transmission of Standard Frequency and Dissemination of Japan Standard Time



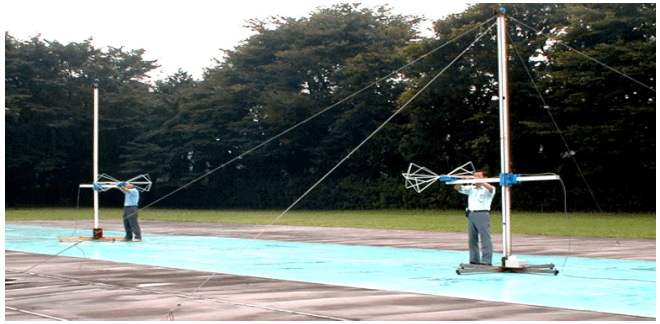


Hagane-yama Station (60 kHz)

Ohtakadoya-yama Station (40 kHz)

Observation about radio propagation and the Space Weather Forecasts

Test & Calibration of Wireless Equipment



- 85M Radio controlled clocks & watches
- >180M Access/day Internet Standard Time / NTP Service

R&D Targets

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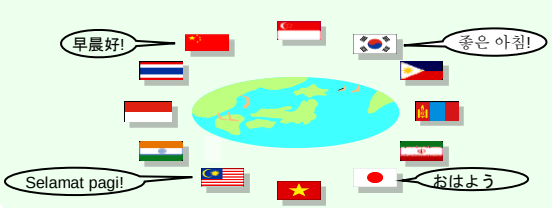
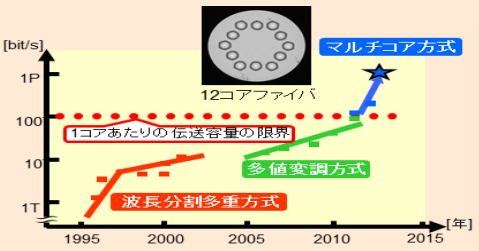
Universal Communications Technologies

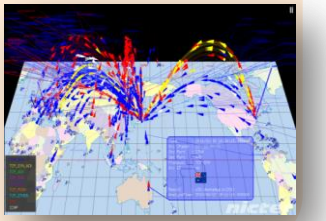
Multi-lingual and ultra-realistic communication technologies to overcome the language barrier and contribute to a comfortable lifestyle



Network Technologies

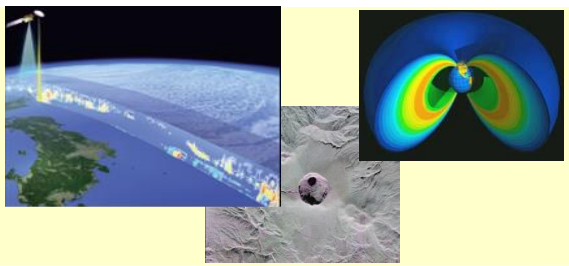
Photonic and wireless network and network security technologies to build a New Generation Network with large capacity, high reliability, high security and low environmental impact

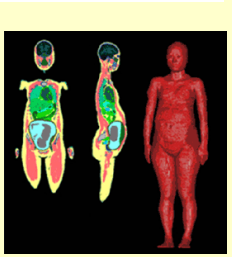




Applied Electromagnetic Technologies

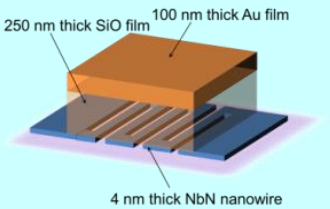
Space-time standards, EM compatibility, and EM sensing technologies to promote the safe use of radio waves and the precise earth and space observations





Advanced ICT

R&D of bio, nano, quantum and terahertz ICT, to create new concepts for future information and communication technologies.



Photonic Network Research Institute

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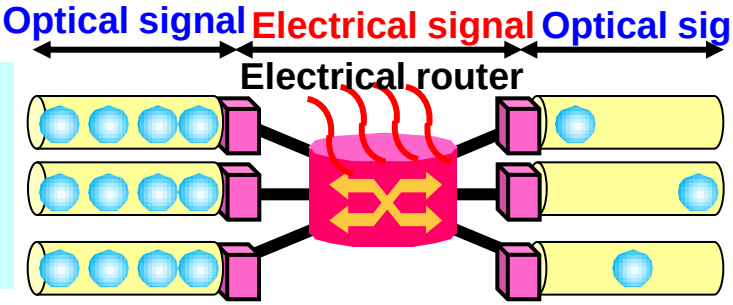
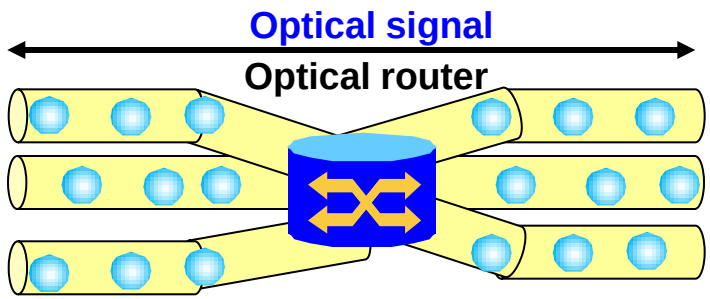
Network architecture and optical network hardware towards the realization of new-generation networks

large-capacity, power-saving, low-latency, highly reliable network





Network Architecture Technology
Establishing a network architecture that integrates optical packet switching and circuit switching, and developing autonomic mechanisms for network resources adjustment and network management.

Photonic Network System Technology
Focusing on R&D of photonic network systems aiming to surpass the functionality, capacity and efficiency achieved by conventional physical layer system.

Lightwave Devices Technology
Conducting R&D of component and device technologies to realize next generation high-speed optical communications.

The world's first Optical Packet and Circuit Integrated Network node

100Gbit/s DSP
400G DSP

Limit of SMF 100Tbit/s
1Pbit/s Multi Core F

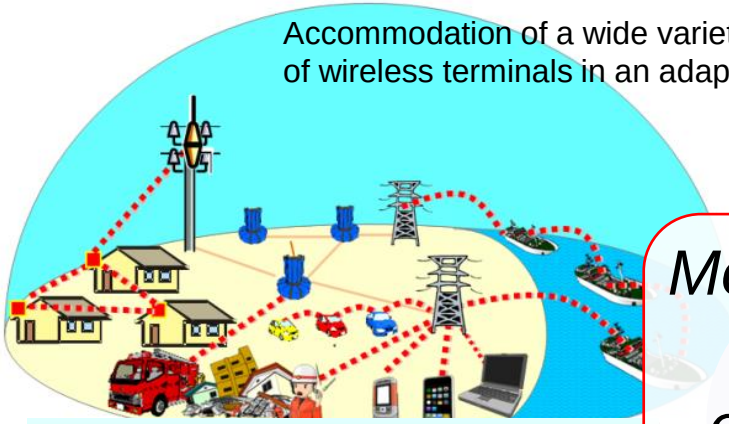
DSP: Digital Signal Processor
SMF: Single Mode Fiber

Wireless Network Research Institute

ICT for Sustainable World Human Happiness

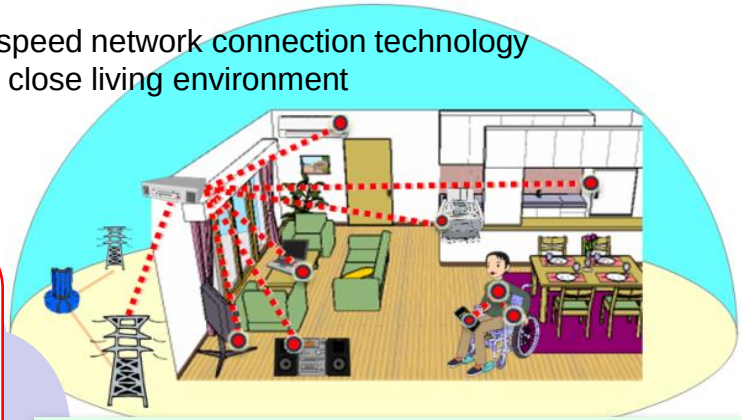
Technologies that realize more scalable, dependable and broadband wireless communication systems for expanding network coverage and applicability.

Accommodation of a wide variety of wireless terminals in an adaptive way



Scalable Wireless Networks

High-speed network connection technology in our close living environment

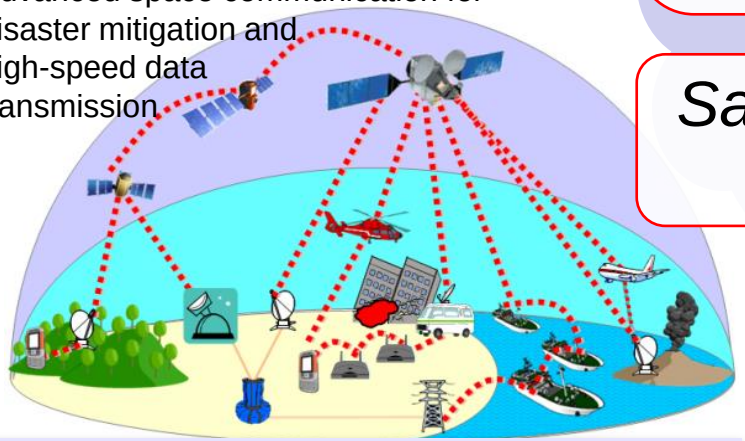


Broadband Wireless Networks

More efficient use of our limited energy/frequency resources

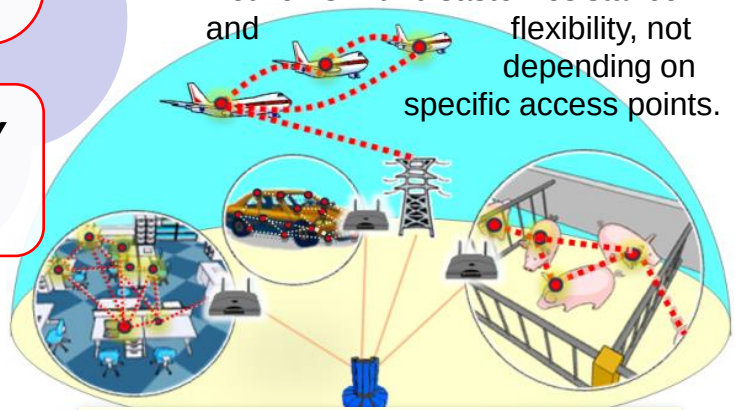
Safety and security in our society

Advanced space communication for disaster mitigation and high-speed data transmission



Space Communication Networks

Networks with disaster resistance and flexibility, not depending on specific access points.



Autonomous Distributed Wireless Networks

World's First Portable Tablet Terminal in TV White-space

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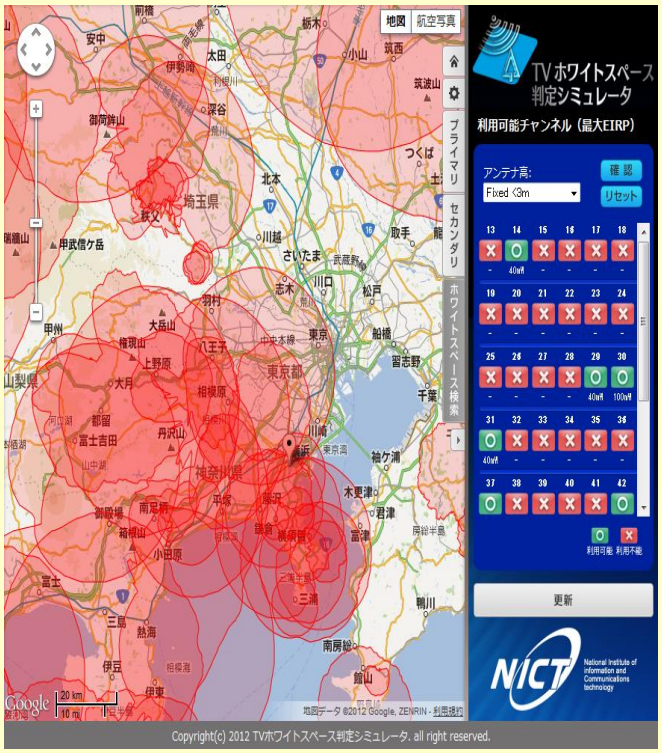
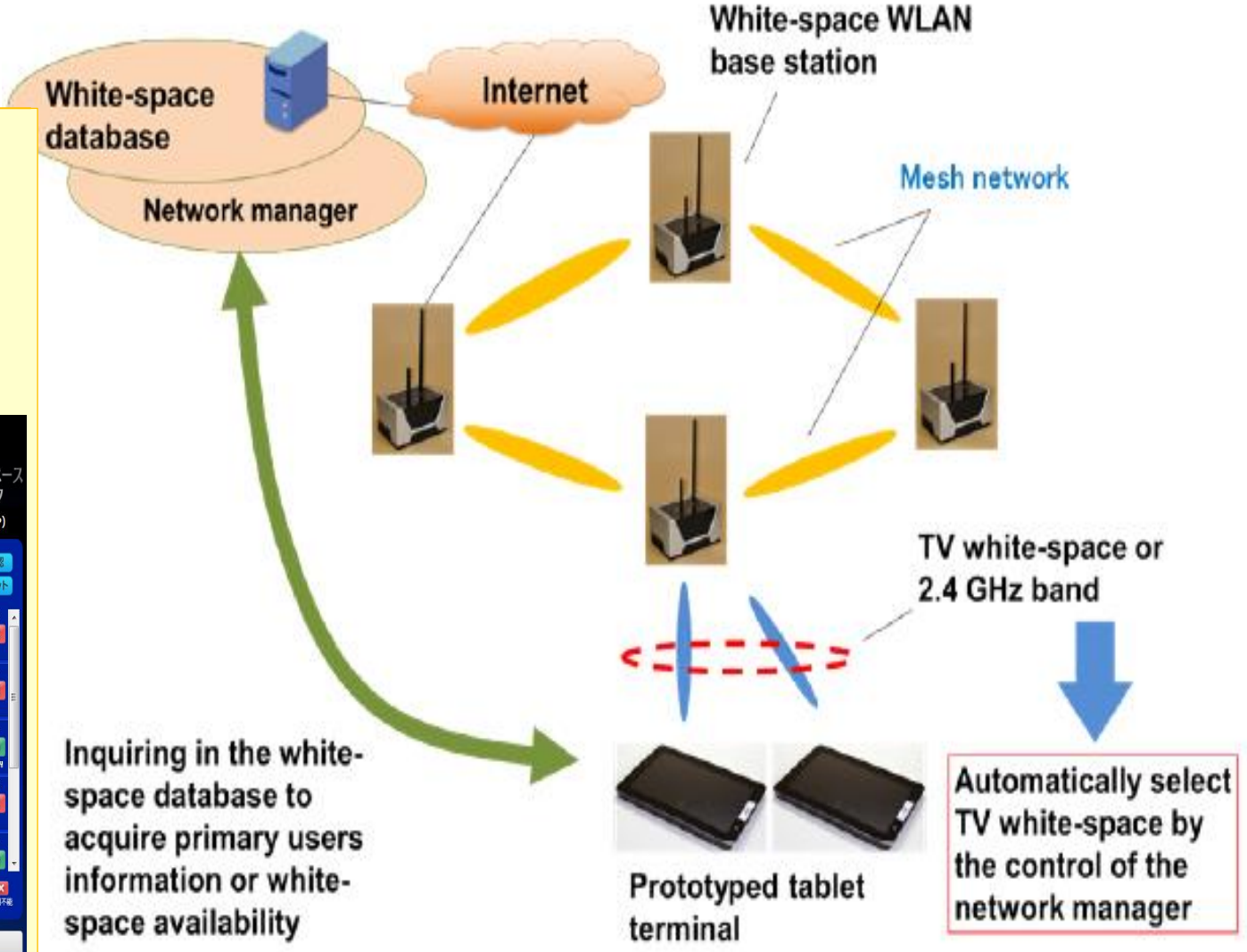
Available channels or frequencies as white-spaces for secondary users.
Applicable to any countries' rule.





Wireless Smart Utility Network (Wi-SUN)

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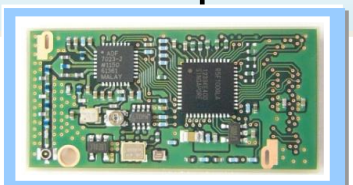
World's First Small-Sized and Low-Power "Radio Device" Compliant with Smart-Meter Standards of "ECHONET Lite" and "Wi-SUN“

Wi-SUN will Expand to the Sensor Network World

Social Cloud

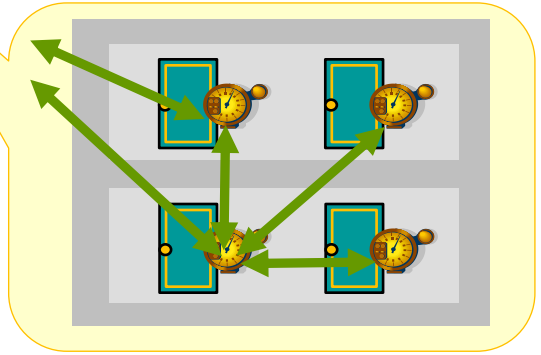
More than 50B Sensors



Wireless Module (Full-Scale)

More than 10-year operation driven by the AA battery

Communication range is expanded by multi-hop transmission



Space Broad-Band and Ocean Broad-Band

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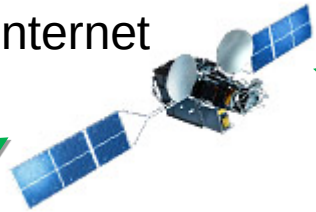
Collaborative team of JAMSTEC and NICT succeeded ROV (Remotely Operated Vehicles) remotely operated test from land using high-speed satellite communication for the first time in the world.

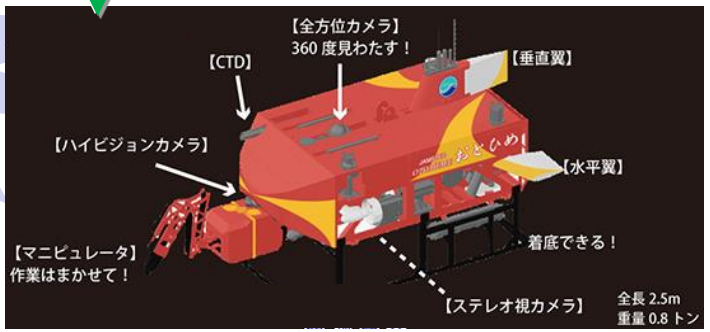
WINDS: High-Speed Internet Satellite ～1.2Gbps



Hi-Vision Real-time monitoring

Underwater Operations Vessel “KAIYO” ©JAMSTEC

Space BB
Ocean BB



Deep sea remotely operated vehicle OTOHIME ©JAMSTEC

Real-time Operations

Sakura-jima Island Volcano Observation by Pi-SAR2

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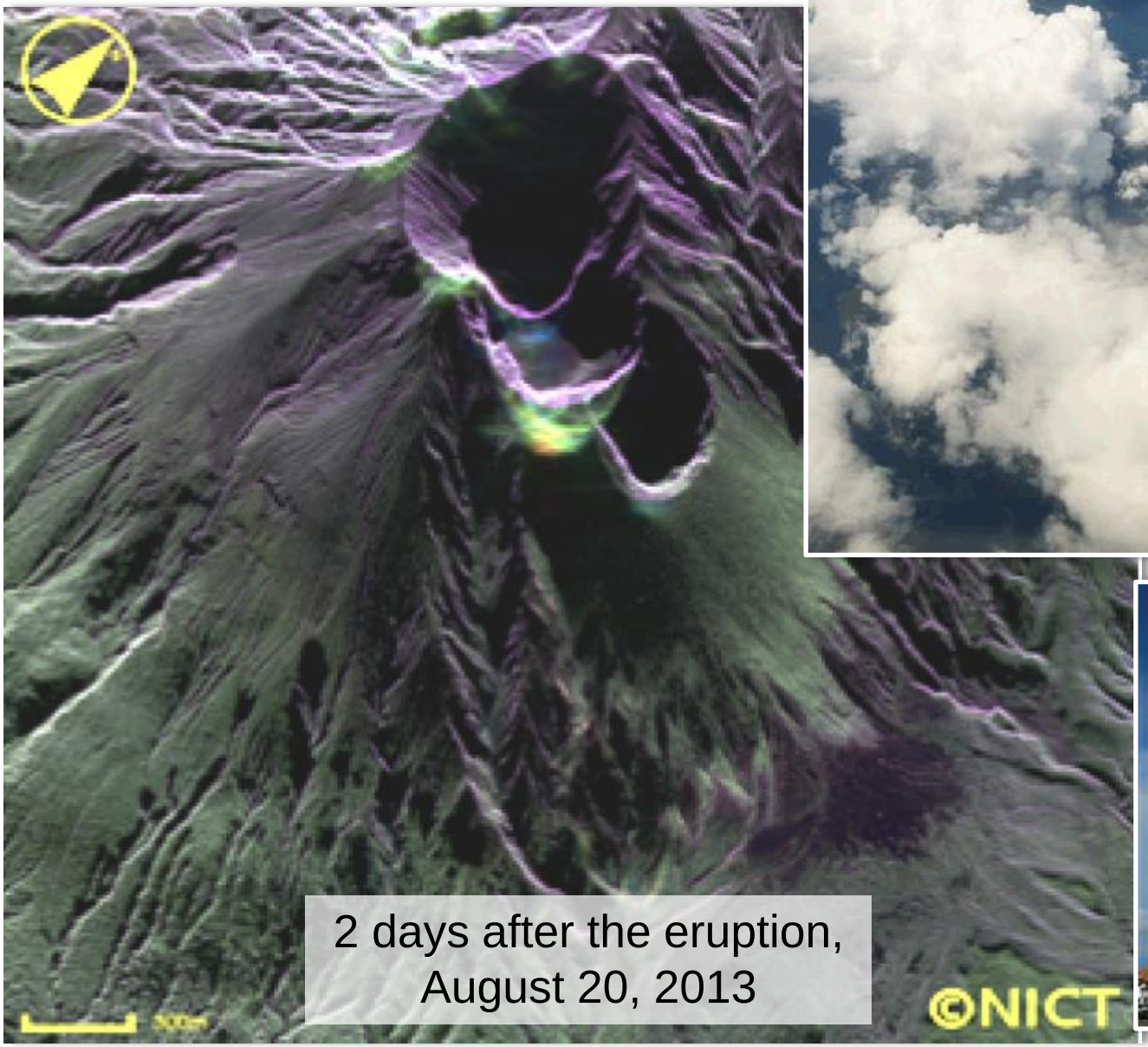

2 days after the eruption,
August 20, 2013

Aerial Photo
August 20, 2013

Ground Photo
August 18, 2013

Real-time Monitoring for Social Security

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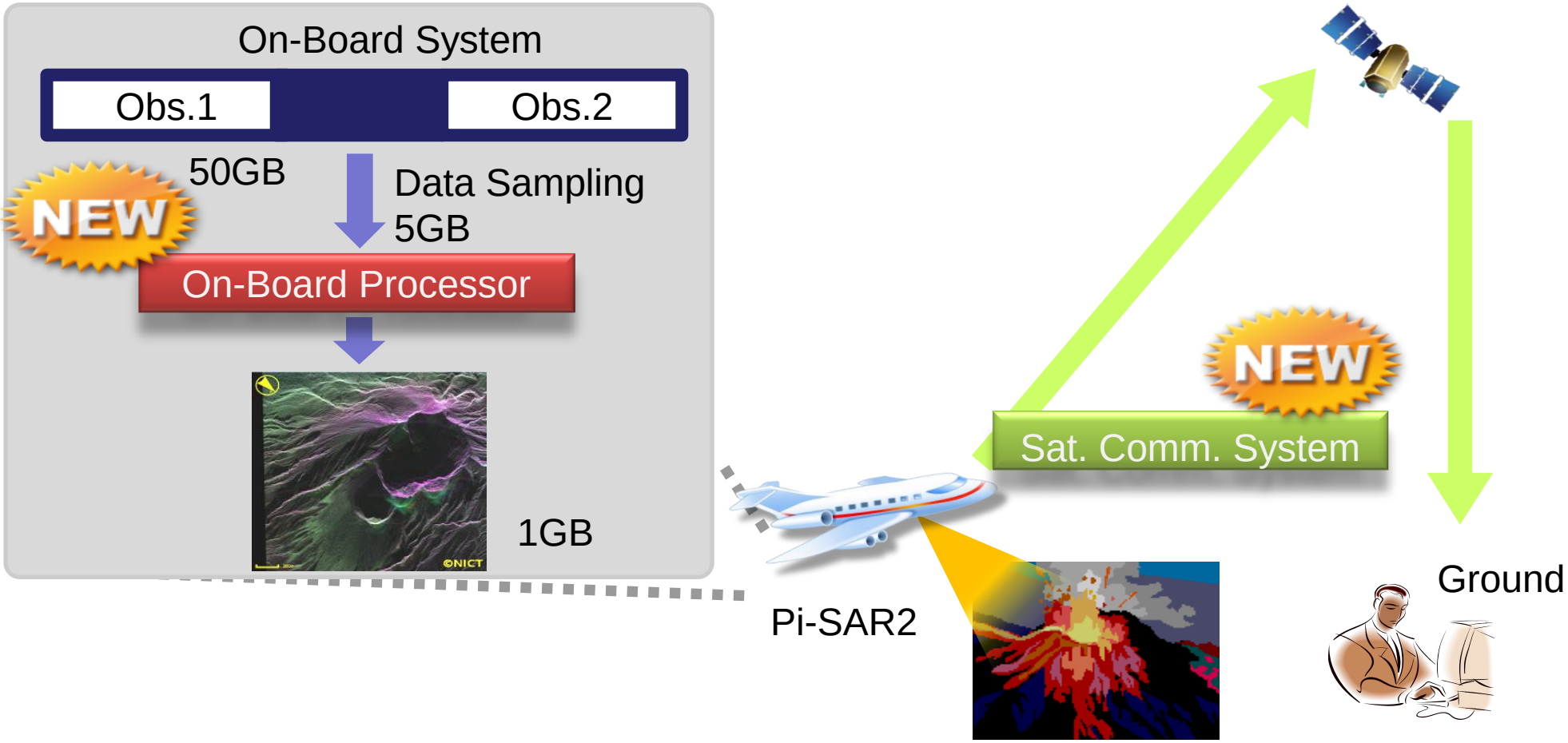
Polarimetric color image data can be transferred to the ground facility in **10 min.** with new onboard data processor and satellite data link for Pi-SAR2.

It used to be several hours after the observation.



Network Security Research Institute

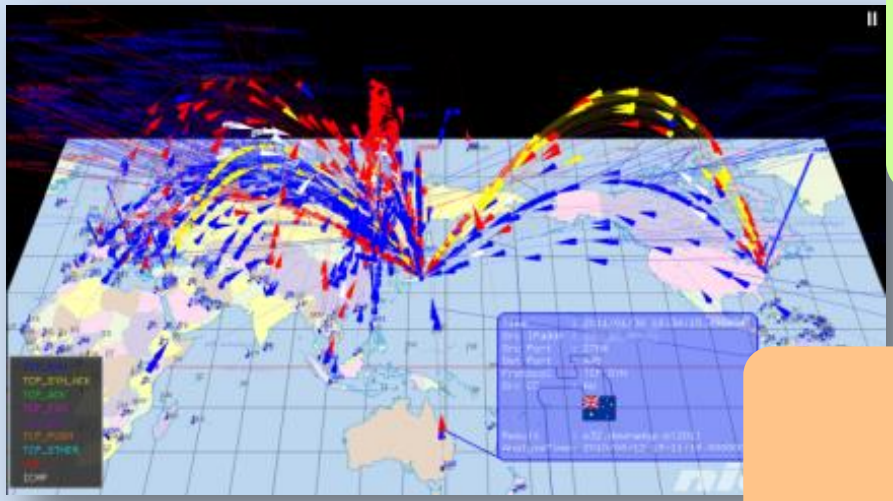
ICT for Sustainable World Human Happiness

Theoretical and practical network security to counteract cyber attacks and provide a safe and secure ICT environment.

Collaboration with security organizations

Cybersecurity Technology

Establishing a technical basis for leading-edge cyber attack monitoring, analysis, response, and prevention to solve security problems



【NICTER】

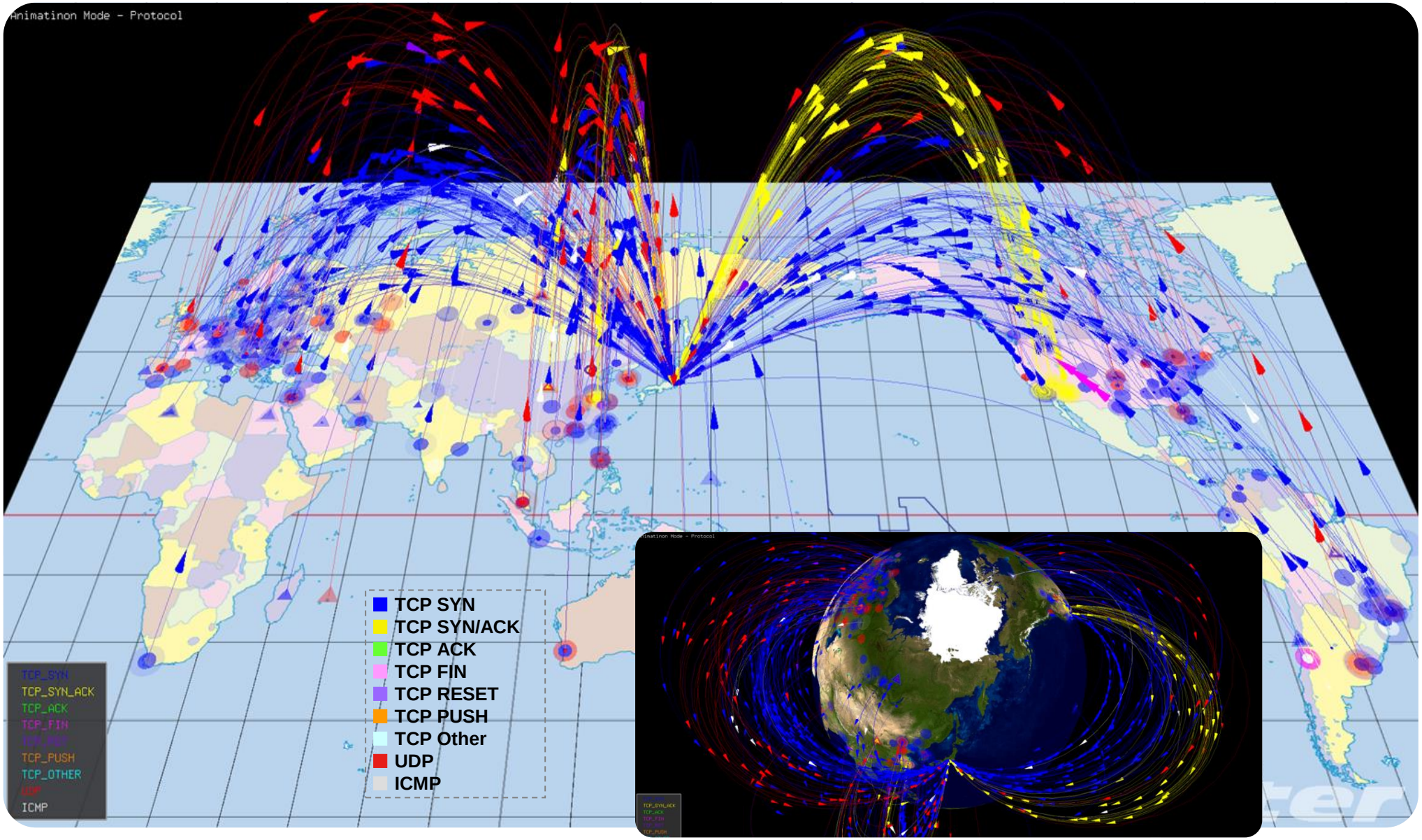
Security Architecture Technology

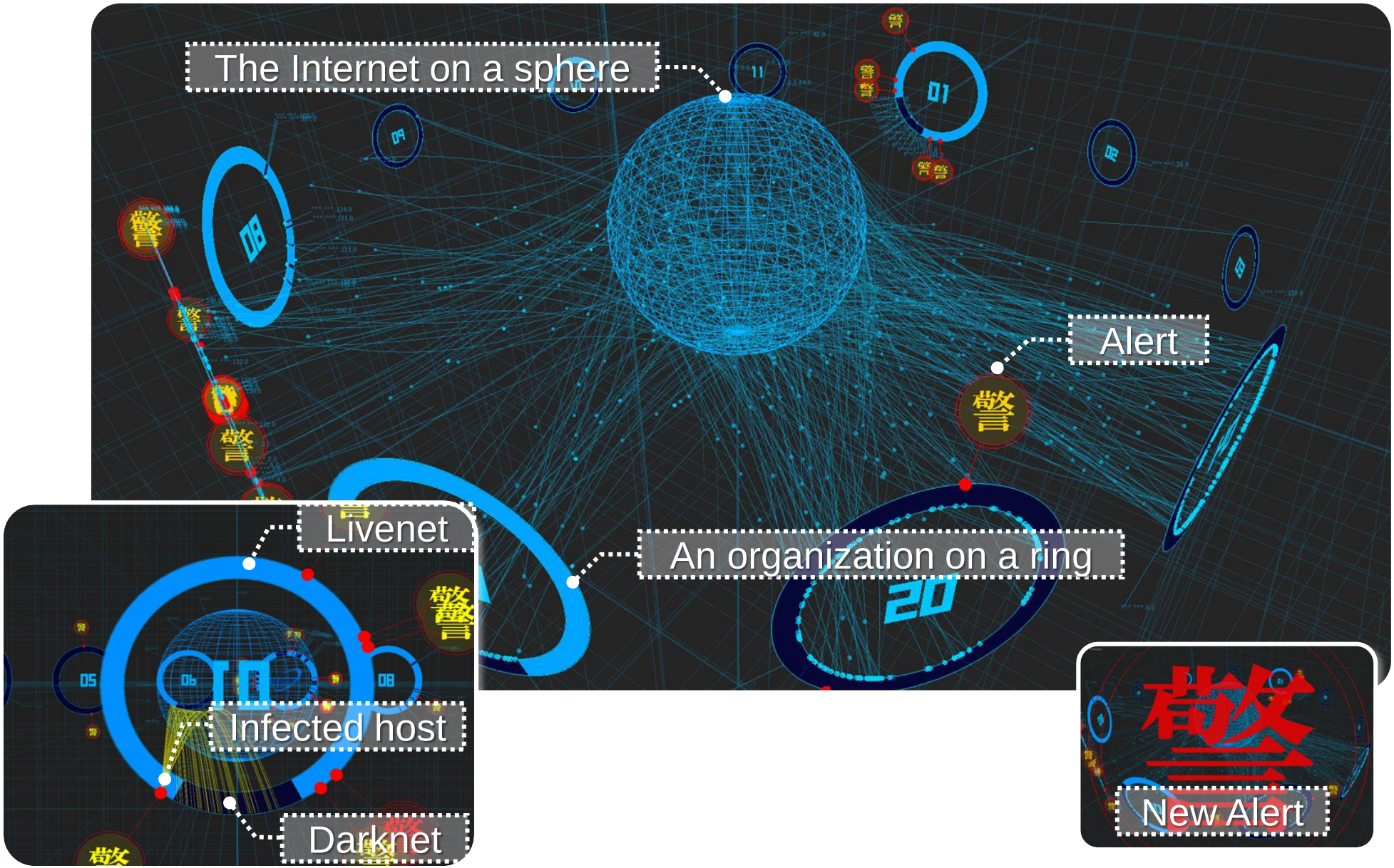
Establishing techniques for optimized configuration and evaluation of secure networks including mobile, cloud, and new-generation networks

Security Fundamental Technology

Establishing next-generation cryptographic technologies ranging from modern cryptography to quantum security

Design and implementation of secure new generation networks


Animatinon Mode - Protocol
TCP SYN
TCP SYN/ACK
TCP ACK
TCP FIN
TCP RESET
TCP PUSH
TCP Other
UDP
ICMP
TCP_SYN
TCP_SYN_ACK
TCP_ACK
TCP_FIN
TCP_PUSH
TCP_OTHER
UDP
ICMP


The Internet on a sphere
Alert
An organization on a ring
Livenet
Infected host
Darknet
New Alert

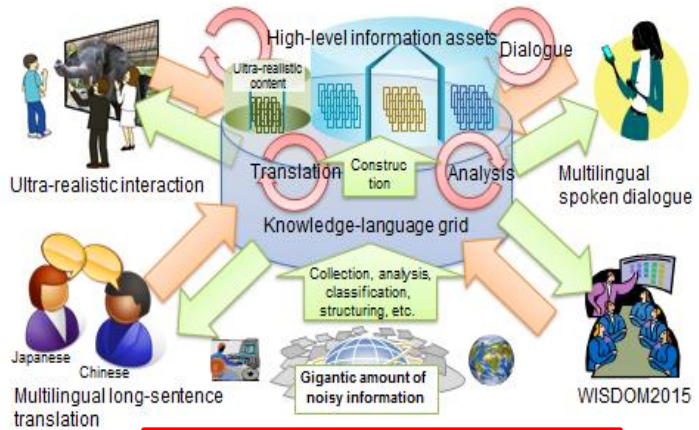
Universal Communication Research Institute

ICT for Sustainable World Human Happiness

Harmonious communication in which people and society can truly interconnect by means of cutting-edge technologies involving speech, language, knowledge, images and multi-sensory data.

Asia Information Hub

Information Analysis



Contents Analyses

Focusing on R&D projects whose outcomes benefit society

Basic Technologies for Universal Communications

Multilingual translation

Translation of Travel Phrases (2010)

Extension to various fields & longer phrases

Higher accuracy by 2015

Multilingual Dialogue

Translation Services for Tourists

Analysis of Foreign Industrial Information

Multilingual Communication

Ultra-realistic media

200 inch glasses-free 3D TV

Holography

Ultra-realistic Communication

Multi-sensory Information

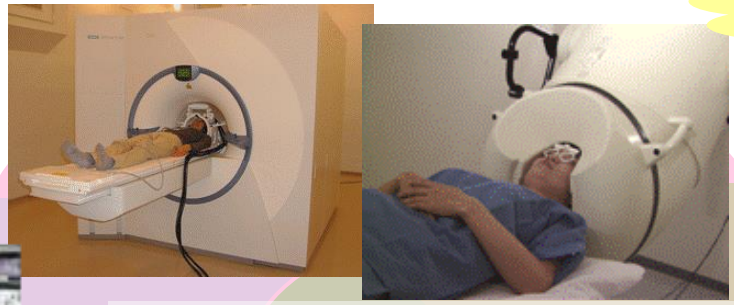
Advanced ICT Research Institute

ICT for Sustainable World Human Happiness

- Flexible and efficient information communications by applying brain and biological functions.
- Ultimate security and efficiency by means of quantum mechanics.
- Device performance by taking advantage of new materials and nanotechnology.

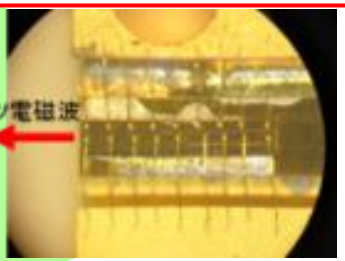
Brain information communications

Brain and biological functions



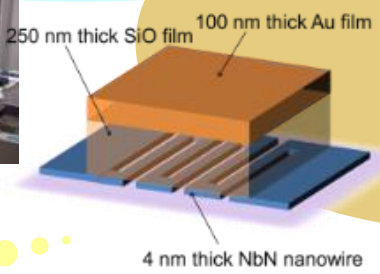
Application of Terahertz technology

Terahertz and Millimeter waves ICT



Bio ICT

Creation of new information communication concepts and technologies



Nano ICT

New materials and nanotechnology

Quantum ICT

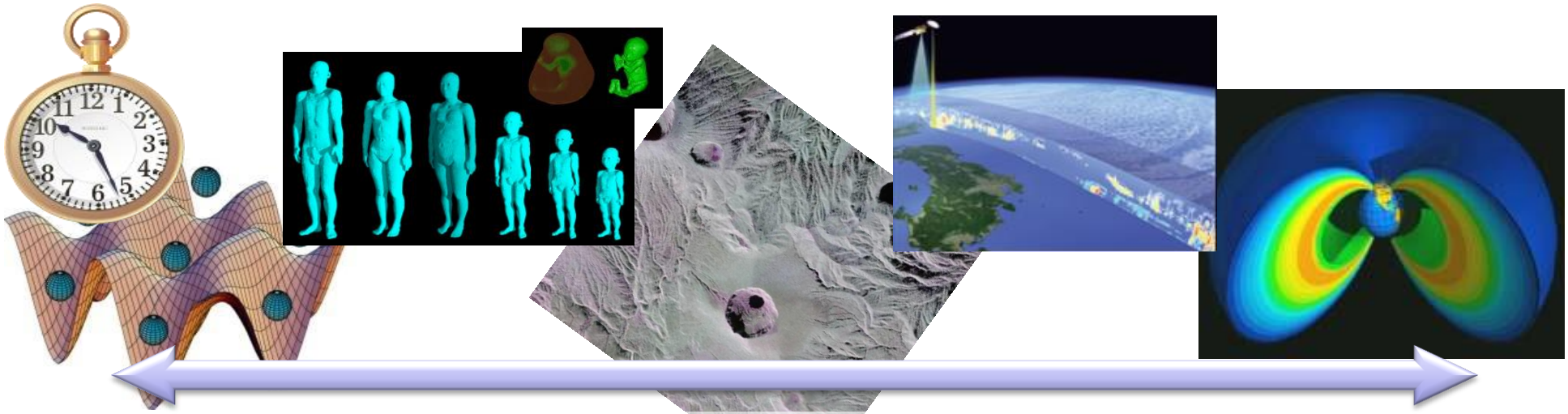
Quantum key distribution technology

Applied Electromagnetic Research Institute

ICT for Sustainable World Human Happiness

Technologies that measure various objects, from atomic levels to cosmological scales, taking advantage of electromagnetic waves and their characteristics.

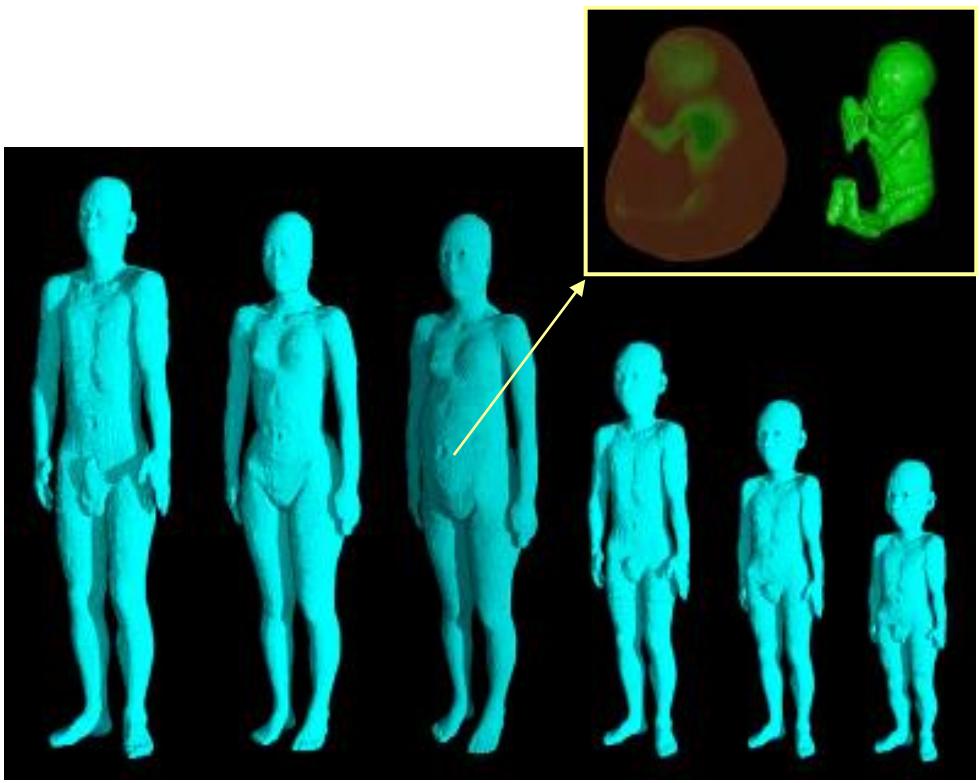
- Creation and provision of Japan standard time and the development of related technologies.
- Electromagnetic wave utilization technology friendly to both people and information communication equipment.
- Technology to monitor the global and space environments.



Measuring objects from atomic levels to cosmological scales using electromagnetic waves and making use of the information.

Biomedical EMC

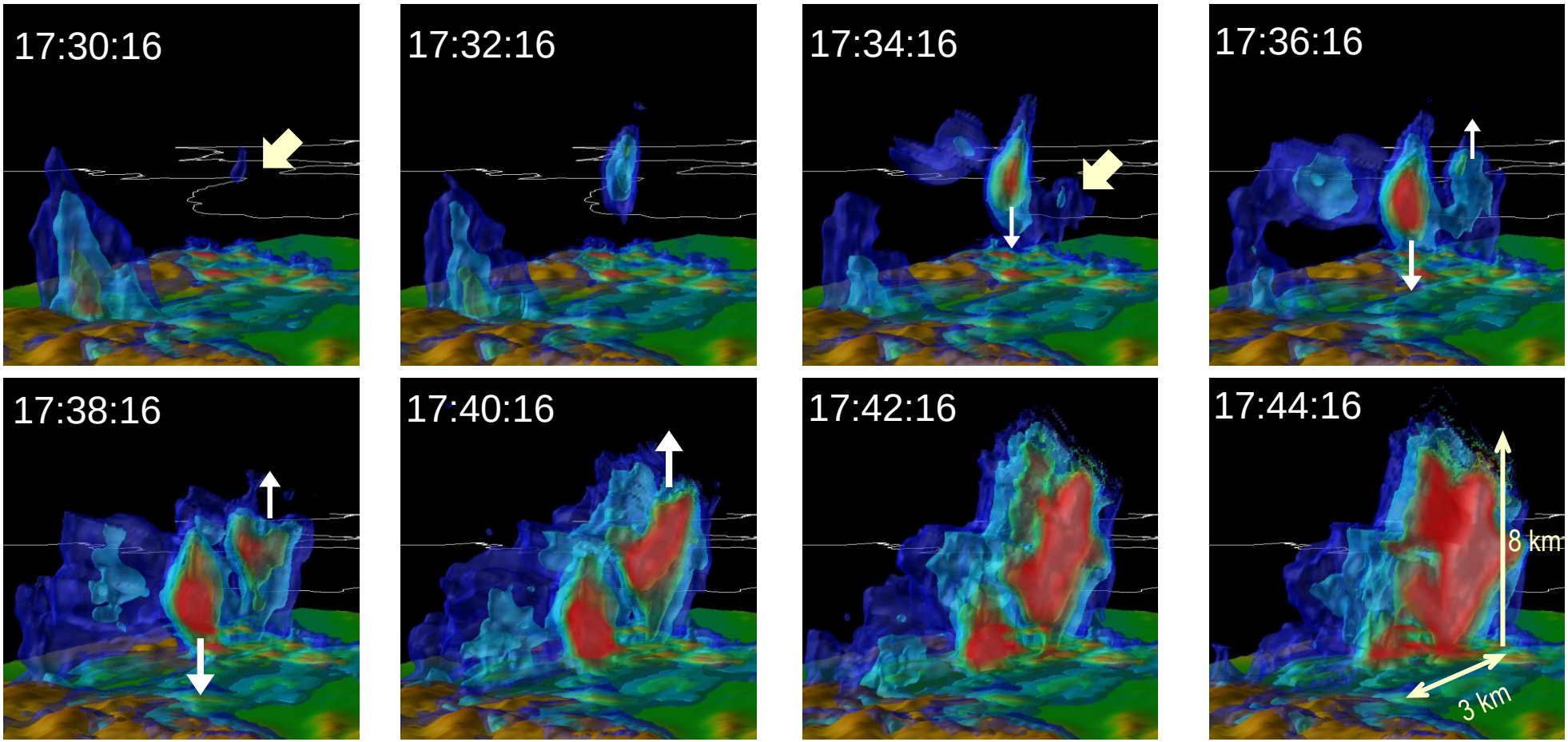
- Numerical Human-body models with the aim of evaluating the safety of radio waves with respect to the human body
- This voxel human model databases are available to the public
- http://emc.nict.go.jp/bio/model/index_e.html



Next-generation Phased Array Weather Radar

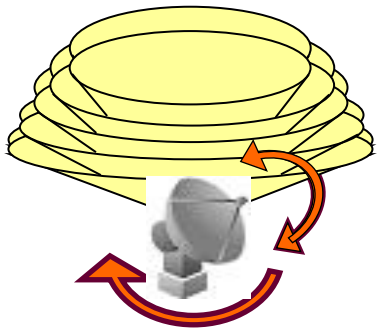
ICT for Sustainable World Human Happiness

- 3-D structure of heavy rainfall, and tornadoes at a spatial resolution of 100m within 10 sec.
- Prediction of sudden and localized meteorological phenomena



NICT commissioned R&D project to Toshiba Co. and Osaka Univ.

This Phased Array Radar system will be introduced by Japan Meteorological Agency from 2014.



Parabolic antenna:
5-10 min.

Phased Array Radar:
10-30 sec.

Supplementary Slides

ICT for Sustainable World Human Happiness

Human happiness and
Doko-demo-Door
“The Door to anywhere you like.”
One of the DORAEMON tool

Virtual and Realistic Communications

New Mobility System

The mobile phone expansion around 2005 could be expected in 1985 ?

Basic Research

Applied Research

New Business

Mobile Phone 2005

Shoulder Phone 1985

Mobile Phone in Science Fiction ~1965

Fully networked and semi-autonomous new mobility business may be expected in 2013

Basic Research

Applied Research

New Business

Autonomous Driverless cars in Science Fiction ~1990

Keio Univ. 2010

Waseda Univ. 2010

…

2030

PRT System 2011

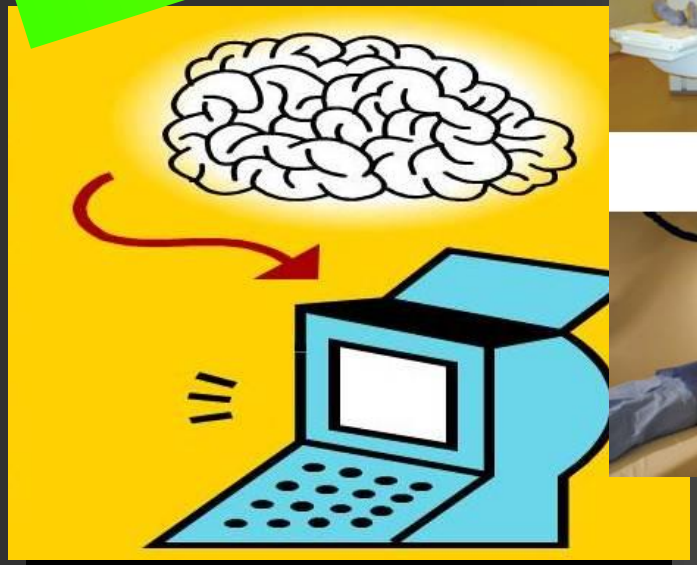
PRT: Passenger Rapid Transport

Non-invasive Brain-Machine Communication may be expected in 2013

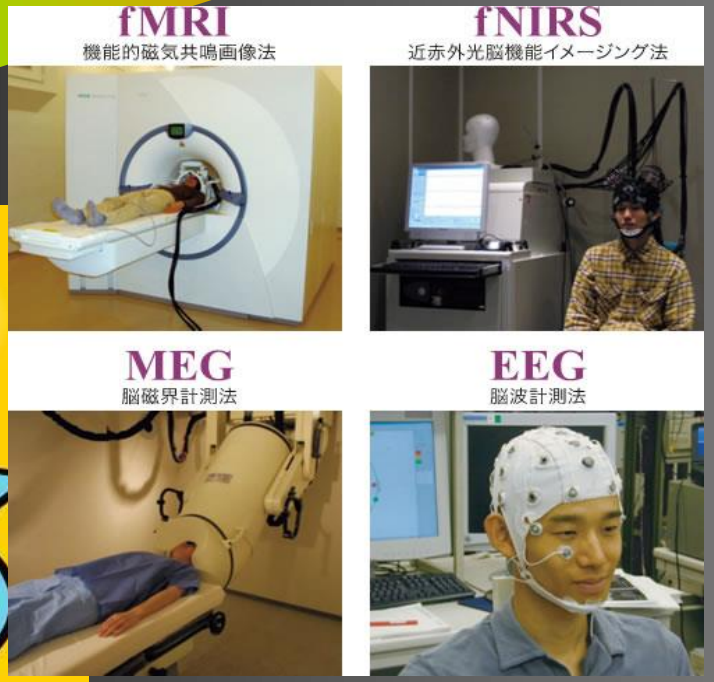
Basic Research

Applied Research

New Business



Brain Communication in Science Fiction ~1990



NICT 2013

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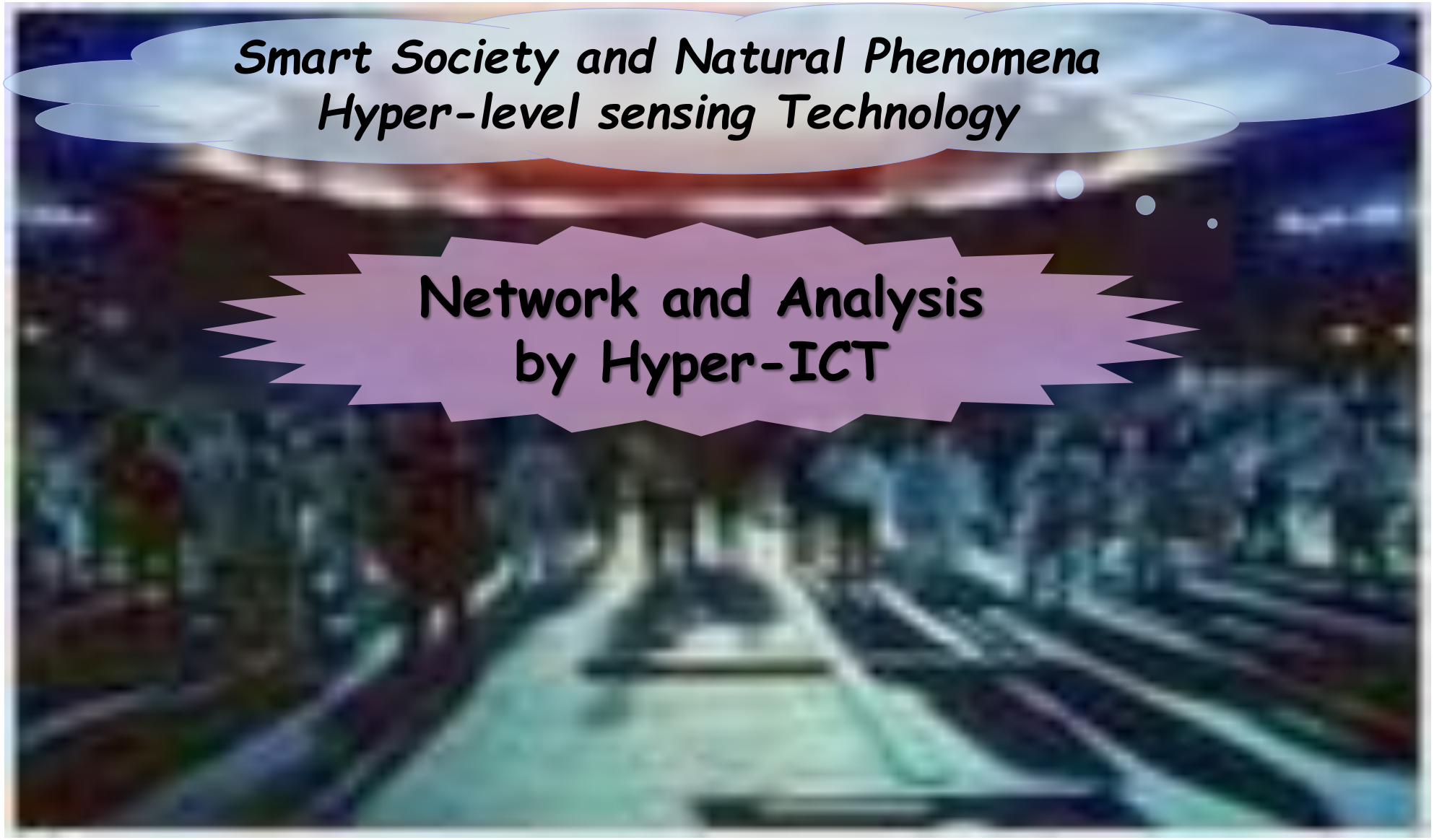
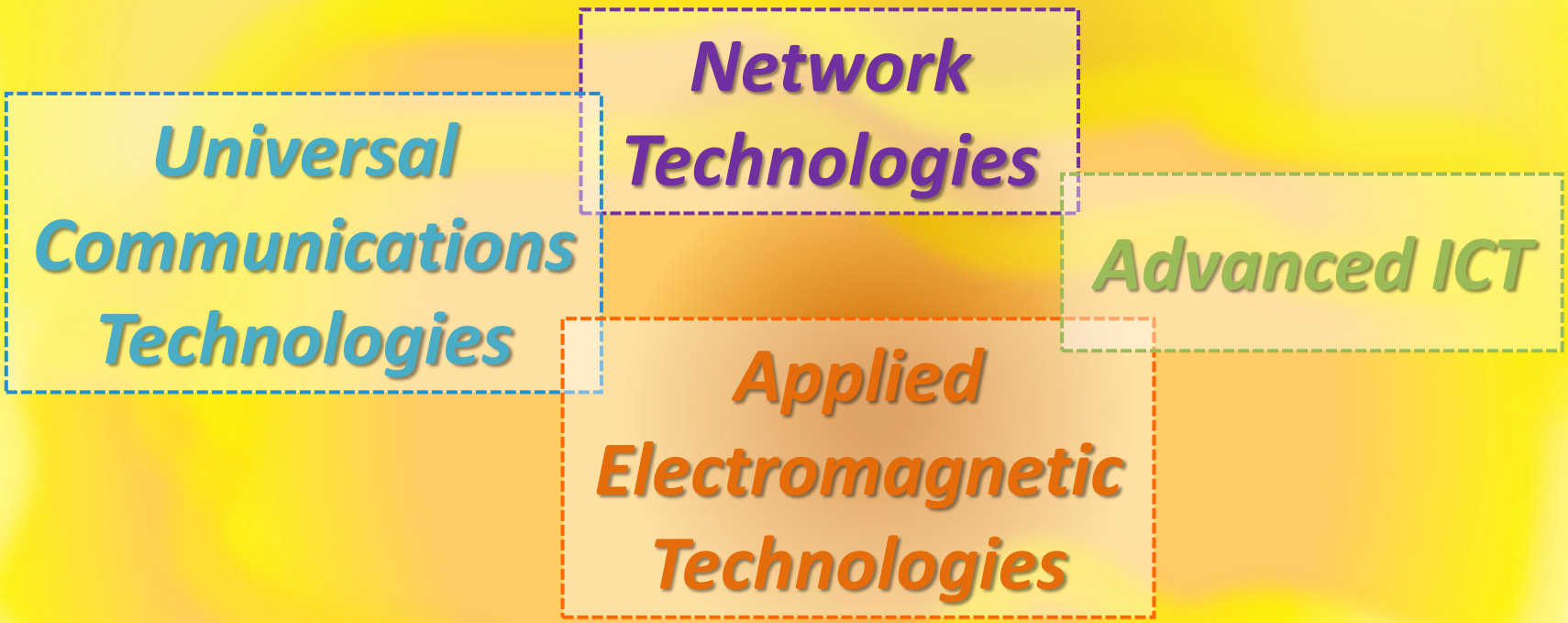
2040

We are now in front of "Social Big Data"
未知遭遇



NICT R&D Target Areas

Important ! External Interaction
Academia and Industry, Domestic and International



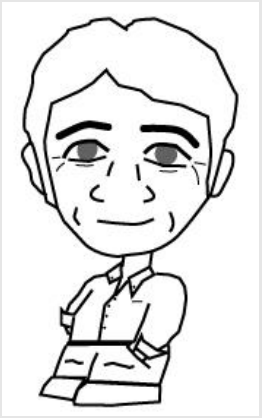
～ *Amoeba Model*

For World Human Happiness
and Endurable ICT

Let's start
Friendly Communication for
Cooperative Innovation

ご静聴感謝いたします

Thank you very much



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