MIC
Ministry of Internal Affairs and Communications

Achieving Quality Infrastructure through the ICT of Japan

February 2017

Ministry of Internal Affairs and Communications, Japan

World's Demand for Infrastructure and Investment in ICT

1. Great demand for Infrastructure

■ Total Amount of Demand for Investment in Infrastructure during 2015-2025

Entire world → **33 trillion US Dollars (4,100 trillion yen)**

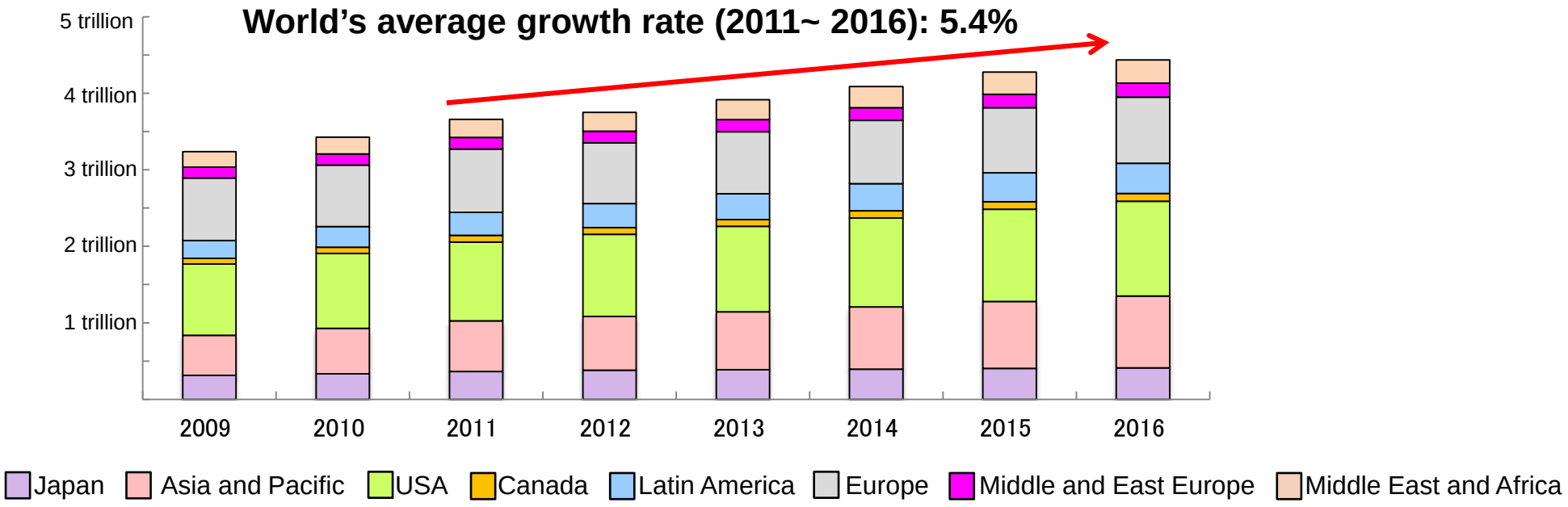
Asia → **14 trillion US Dollars (1,738 trillion yen)**

(Source) Mizuho Research Institute (2009)

2. World's investment in ICT

■ Prediction of world's ICT investment scale

(Unit: US Dollar)



(Source) 2012 WHITE PAPER Information and Communications

Contribution of ICT to Quality Infrastructure

1. ICT for Quality Infrastructure

- Adding quality-enhancing values such as durability improvement and demand – forecasting functions

  -Project: Railroads, aviation, roads, etc. with ICT components

  -Additional Cost scale for ICT components: *100 thousand ~ 100 million USD*

- Increasing the quality of new infrastructures

  -Project: Infrastructure for agriculture, education, medical care, etc. with ICT components

  -Cost scale: *100 thousand ~ 100 million USD*

2. Quality ICT Infrastructure

- Hardware based Infrastructure

  -Project: Optical submarine cable, terrestrial digital broadcasting, etc.

  -Cost scale: *1 million ~ 1 billion USD*

- Software based Infrastructure

  -Project: Cyber security, etc.

  -Cost: *100 thousand ~ 100 million USD*

Advantages of Japan's ICT

1. Outstanding technical capabilities / Security management reliability

- Japanese enterprises have outstanding technical capabilities in ICT for disaster prevention, optical submarine cables, satellites, etc.
- The reliability of "made in Japan" is universally accredited and an advantage in such areas as data centers where "security management" is essential.
- See **cases [1]**, **[4]**, **[5]**, **[7]**, **[8]**, **[9]**, **[10]** and **[11]** of the next slide.

2. Human resource development

- Japan has been developing human resources in partner countries for terrestrial digital broadcasting and security measures
- HRD is a great advantage attached to the projects offered by Japan, which enables effective, efficient and sustainable operation of the infrastructure system.
- See **cases [6]** and **[12]** of the next slide.

3. Proposal for "combined packages of infrastructure and ICT"

- Japan has a lot of experience in promotion for "combined packages of infrastructure and ICT" through interagency and inter-enterprise cooperation.
- See **cases [2]** and **[3]** of the next slide.

Areas where Japan's ICT has an Advantage

ICT for Quality Infrastructures

Public transportation	Aviation	Roads and bridges	Energy	Disaster prevention	Agriculture	Finance	Education	Medical care	...
Traffic control	Air traffic control	Durability examination Case [2]	Power management	Information analysis Early warning Collecting information Case [1]	Shipment support	Customs clearance Case [4] Settlement	Teaching material digitization	Remote medical care	...
Charge collection Case [3]-2	Entry / Exit management	Traffic management Case [3]-1	Smart meters		Growth management		School affairs computerization	Medical office computerization	

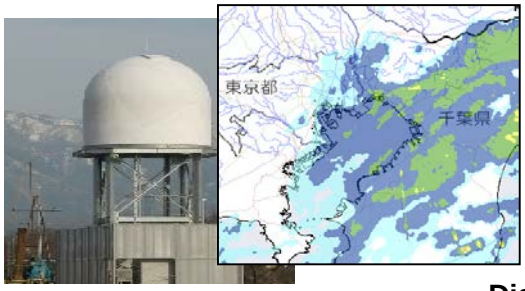
Quality ICT Infrastructures

Software based infrastructure	Big data analysis	Biometric authentication Case [5]	Cyber security measures Case [6]	...		
Hardware based infrastructure	Submarine cable Case [7]	Wireless communication Case [8]	Satellites Case [9]	Data Center Case [10]	Supercomputer Case [11]	Digital broadcasting Case [12]	...

Case [1]: ICT for Disaster Prevention (Part 1)

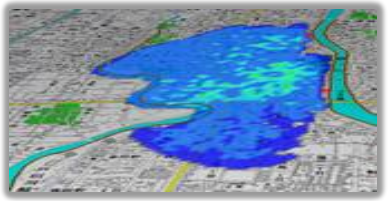
- The disaster prevention ICT systems of Japan are based on Japan's know-how and many years of experience. This makes it possible to collect, analyze and distribute accurate disaster information.
- The systems can be classified into (a) information observation and collection, (b) information analysis and accumulation and (c) information distribution. Appropriate systems can be deployed according to the situation and needs of each destination country.

Observation and collection | Analysis and accumulation | Distribution

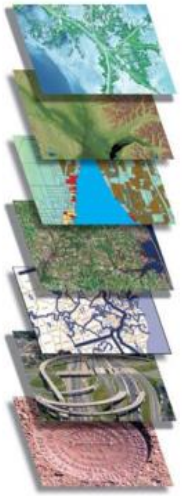


Solid-state weather radar
India (Toshiba)

Disaster information management system
Philippines (NEC)
Indonesia
-ODA grant (under preparatory survey)
-Jakarta Special Capital Region (Fujitsu)



Flood simulation
Vietnam (Hitachi)



(Source:
Federal Geographic Data Committee)

National spatial data infrastructure
Indonesia (NTT Data)

ICT disaster prevention unit
Philippines (NTT Com, Panasonic)

Emergency warning broadcasting
Peru (ITOCHU)

Case [1]: ICT for Disaster Prevention (Part 2)

➢ Japan can advise necessary ICT solutions for disaster prevention from the following “ICT Overall Solution Map”.

		Observation and collection	Analysis	Accumulation	Distribution
Terminal On-site Equipment		• Sensors (earthquake, water level, rainfall, wind speed, landslide, and others) • Weather radars • Cameras (permanent, mobile, helicopter) • Satellite observation (image and position information)			• Broadcast receiving terminals (IP announcement terminals, PCs) • One-segment broadcasting terminals • Speakers • Small satellite earth stations
Applications		• Meteorological information collection systems • Damage information collection systems • Safety and evacuation information collection systems • Image monitoring and analysis systems	• Weather analysis systems • Geographic information systems • Shelter and evacuee management systems • Supplies management systems	• Damage prediction systems	• Emergency information transmission systems • Evacuation information and issuance management systems
		Japan’s nationwide warning system (J-Alert)			
Platforms		• Sensor information collection and control infrastructure	• Disaster management information systems • Crisis management information systems • Spatial data infrastructure systems • Infrastructure management systems • Police and fire command and control systems	• Cloud base and big data analysis	• Emergency alert broadcasting • Cell broadcast
		Japan’s local warning system (L-Alert)			
Communications infrastructure	Disaster prevention use	• Administrative radio systems for disaster use (mobile) • Satellite communications			• Administrative radio system for disaster use (public address announcement / mobile) • Satellite communications • ICT disaster prevention units
	General use	• Satellite communications • Wireless communications networks (FWA, WiFi, microwave, TVWS) • Submarine cables and others			

Case [2]: Public Infrastructure Monitoring System

- Various sensors installed in public infrastructure are used to measure the state of the infrastructure in real time continuously.
- Obtained data is utilized on maintenance work support related to the disaster damage and the infrastructure deterioration.

Bridge monitoring system in Vietnam (part of ODA loan aid (NTT Data))

Data to be collected

- Distortion
- Vibration
- Inclination
- Movement
- Ambient (temperature/Rainfall)
- Wind direction/Wind velocity
- Monitoring image

Utilization

- Anomaly detection
- Conservation planning
- Overload detection


Accelerometer


Meteorological Sensor


Strain gauge


High accuracy GPS


Displacement gauge

* Managed by Can Tho Bridge Operation and Management Company.

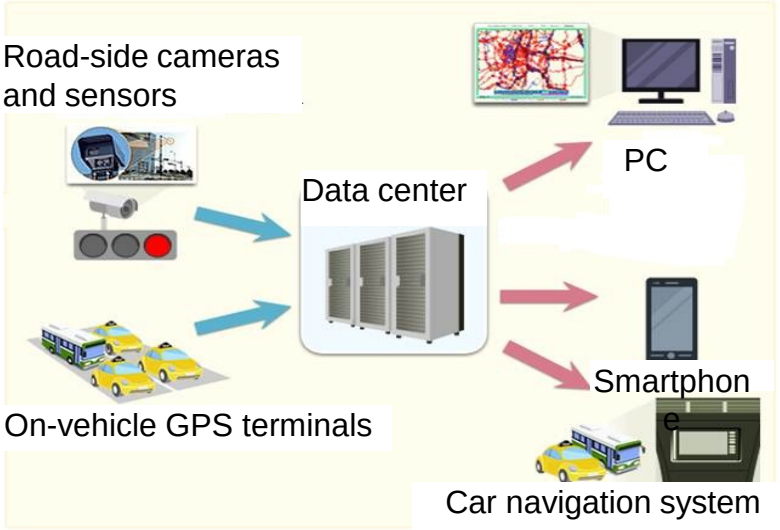
Case [3]: Improvement in User's Convenience (Part 1)

➢ Users' convenience is improved by IC cards or similar tools carried by the users, and public infrastructures are improved by collecting and analyzing that information.

[Case 3-1-1]

Bangkok Intra-city traffic information collection and distribution system (Toyota Tsusho Electronics)

- Around 10,000 taxis have been equipped with GPS terminals after the pilot project conducted by Toyota Tsusho Electronics under the commissioning of MIC, which contributes to the reduction of congestion and the distribution of evacuation route information in times of disaster.



[Case 3-1-2]

Collection of probe information over the smartphone and analysis of traffic congestion by the data center (Makassar, Indonesia) (Fujitsu)

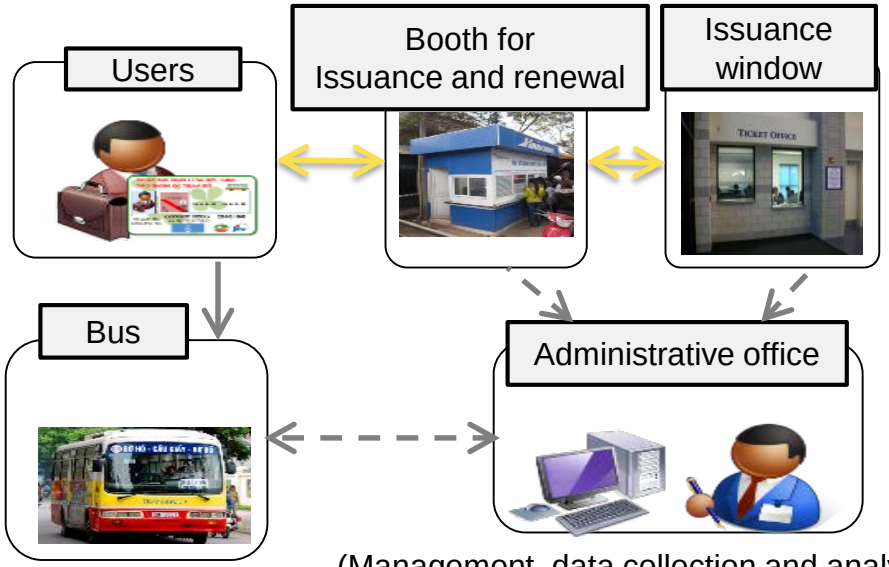
- The data center collects position information of the smartphones in patrol cars and analyzes the congestion situation.
- Effective for congestion alleviation and use of detours by providing traffic information.

Case [3]: Improvement in User's Convenience (Part 2)

[Case 3-2]

Hanoi's bus commuter passes (The IC card type)
(ODA technical cooperation (Sony, NTT Data, and Dai Nippon Printing))

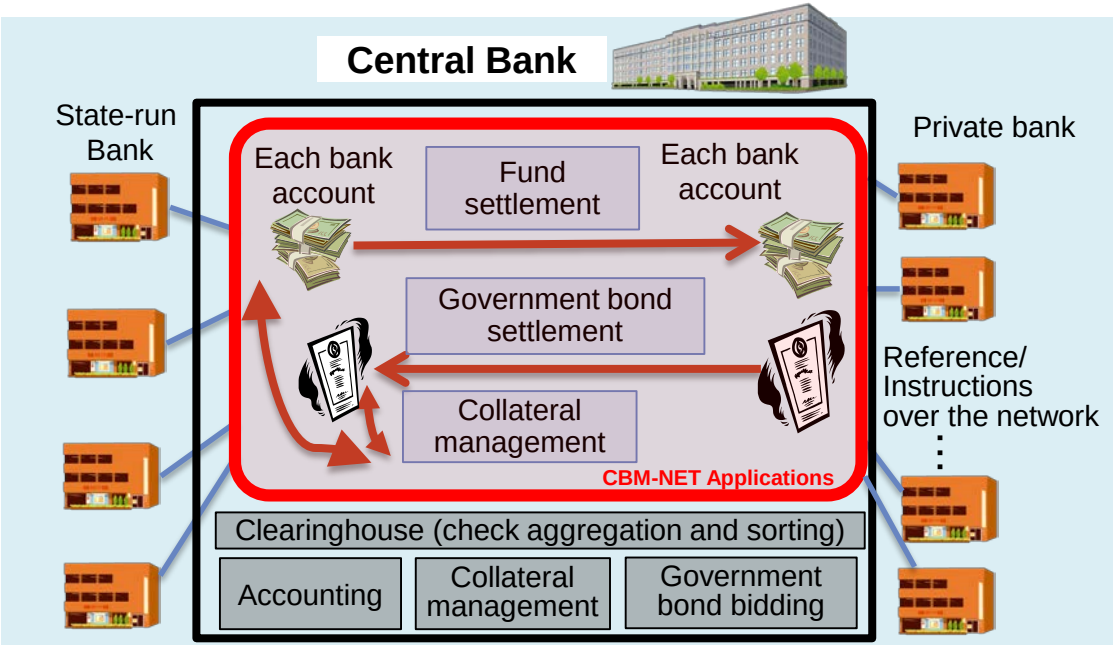
- Around 200,000 IC cards have been distributed in order to analyze data on the number of passengers getting on and off and the rate of utilization, for future bus-route planning.



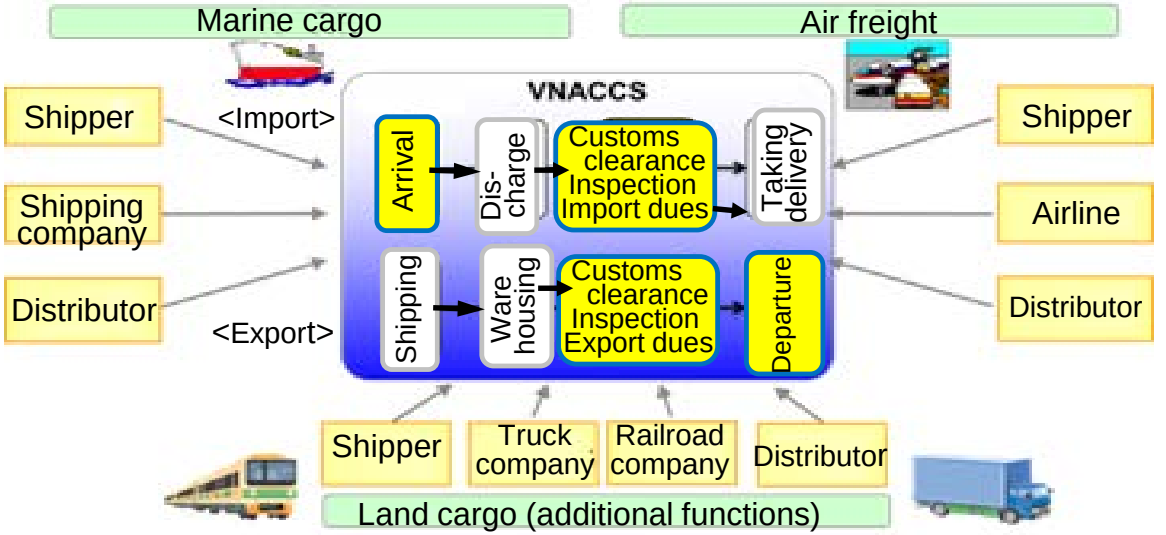
Case [4]: Financial System and Customs Clearance System

[Case 4-1 / 4-2]
(ODA grant-aid) (NTT data)

- **Financial system (Settlement)**
  (Myanmar)



- **Customs clearance system and Trade procedures**
  (Myanmar, Vietnam)



Case [5]: Biometric Authentication

- Providing accurate and prompt personal authentication solutions using biometric technology. (fingerprint authentication, face authentication, etc.)
- Contributing to prevention of double registration and various illegal acts.

<Examples>
Issuance of national IDs and passports, Issuance of driver's licenses, Reception of pensions, Reception of unemployment insurance, Voter registration, Immigration control, Criminal investigation

[Case 5] **(NEC)**

- Multi-purpose national ID
- Passport issue and emigration and immigration management
- Voter registration

Case [6]: Cyber Security Measures for ICT Infrastructures

- Cyberattack tends to be sophisticated and diverse, and causes enormous amounts of damage.
- Japan's cyber security measures result in the following effects.
  - Achieving a safe social infrastructure by appropriate response to cyberattacks.
  - Updating and sharing intelligence for response to the actual methods of attack.
  - Reducing economic losses by the preservation of confidential national assets.
  - Preventing the spread of attacks to third party countries using the own country's ICT assets as springboard.

[Case 6]

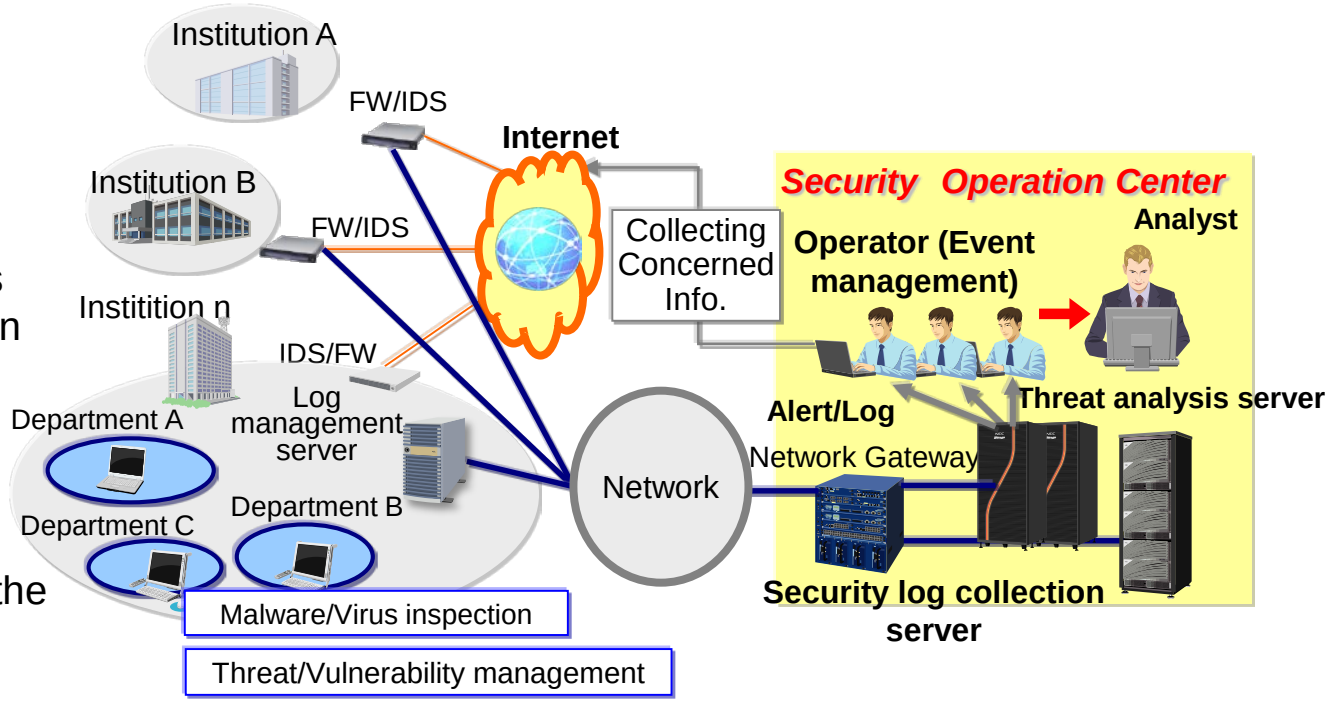
Singapore (NEC)

(1) INTERPOL Digital Crime Centre

NEC provided products and solutions amounting to approximately 7.6 million euros and dispatched advisors in cooperation with partner enterprises.

(2) Security operation center

NEC gave support to construction of the center and gives human resource development.



Case [7]: Optical Submarine Cables (Part 1)

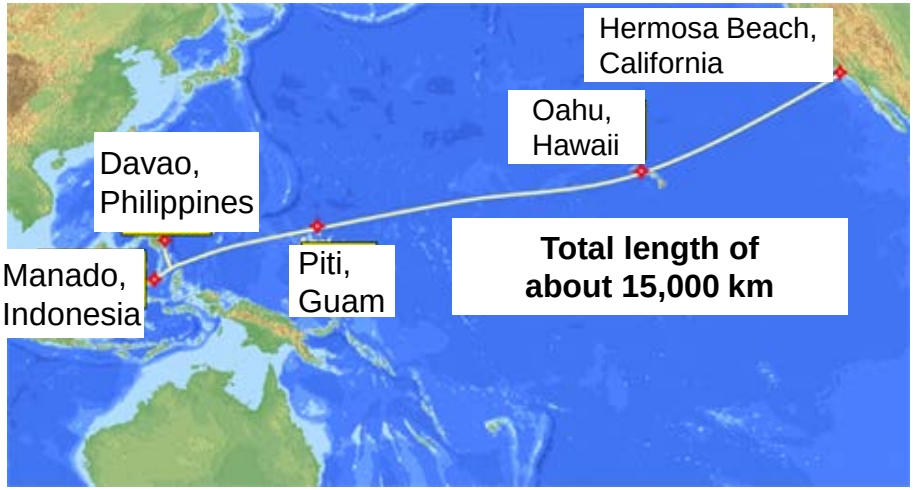
- Currently Optical submarine cables are used for 99% of international communications.
- Two out of four major companies that supply submarine cable systems are Japanese companies, i.e., NEC and Fujitsu.

[Case 7-1-1]

Submarine cable between South East Asia – United States (NEC)

Scheduled for completion in 2016

- This cable has the largest communications capacity (up to 20 Tbps) in the world among those connecting the two regions directly.

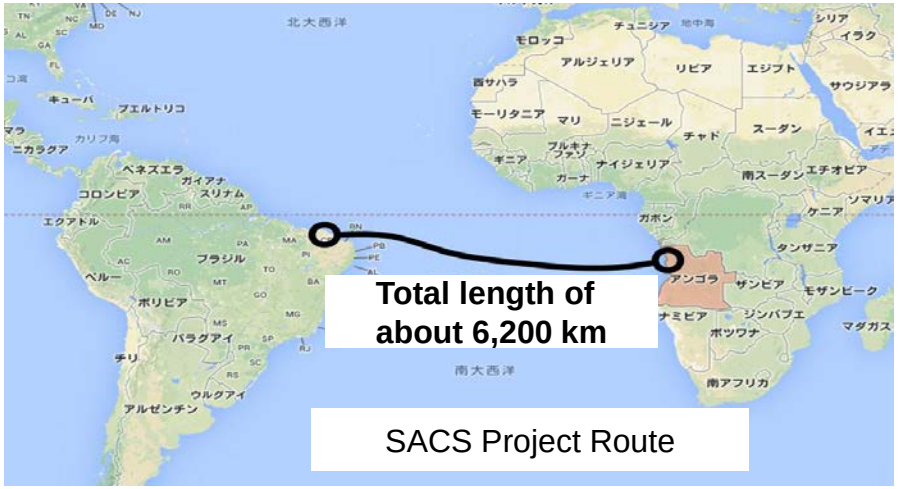


[Case 7-1-2]

South Atlantic Cable System (NEC)

Scheduled for completion in 2017

- This directly-connected cable will greatly contribute to improvements in the ICT environment between the two continents.



Case [7]: Optical Submarine Cables (Part 2)

[Case 7-2-1]

Asia submarine cable express (Fujitsu)

Completed in August 2012

- The project applies 100-Gbps digital coherent transmission technology, and is utilized by communications carriers' high-quality, low-latency dedicated lines for their cloud services.

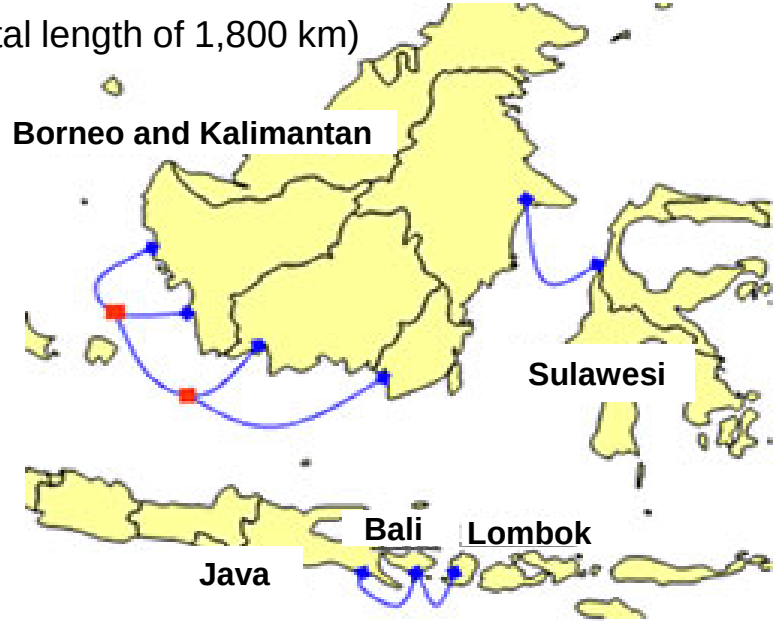
[Case 7-2-2]

Indonesian domestic submarine cable (Fujitsu)

Completed in May 2010

- This is Indonesia's first marine cable system allocated to an increasing communications network demand with the remarkable economic growth.

(Total length of 1,800 km)

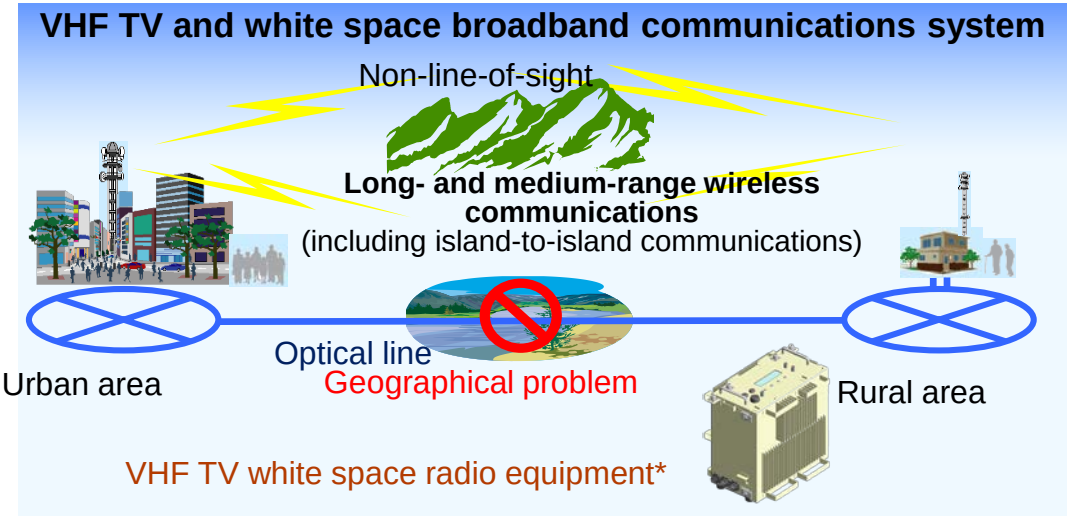


Case [8]: Bridging the Digital Divide by White Space Utilization

- This project introduces communications systems making use of the vacant frequencies of the VHF bands to bridge the digital divide.
- The frequency bands used for the systems are relatively low and not adversely affected by forests, hills, or other obstacles, and achieve medium-range communications.
- The systems are effective for the development of a relatively inexpensive broadband network of reliable communication quality.

[Case 8] **Indonesia (plot project) (Hitachi Kokusai Electric)**

- This project conducted a demonstration experiment in cooperation with the Ministry of Communications and Information Technology of Indonesia.
- The systems make a variety of services through the Internet available, and are expected to expand nationwide by the digital divide elimination fund (ICT fund) of the government of Indonesia.



*This equipment was developed by the national Institute of Information and Communications Technology (NICT)

Case [9]: Satellite-employed Data Collection (Part 1)

- The communications satellites secure communication lines even if landlines are disrupted in times of disaster.
- Earth observation satellites are utilized for countermeasures against disaster and climate changes.

[Case 9-1-1]

Two communications satellites from TÜRKSAT* (Mar. 2011) (Mitsubishi Electric)

(*) The state-owned telecommunications provider of Turkey

- TÜRKSAT has been utilizing the satellites for broadcasting and Internet access.
- Project covers the launching cost and a technology transfer contract.

Turksat-4A and Turksat-4B (Images)

[Case 9-1-2]

One communications satellite from Es'hailSat (Sept. 2014) (Mitsubishi Electric)**

(**) The state-owned telecommunications provider of Qatar

- The satellite is utilized by broadcasting stations, such as Al Jazeera, as well as government agencies for their communications services.

Es'hail2 (Image)

Case [9]: Satellite-employed Data Collection (Part 2)

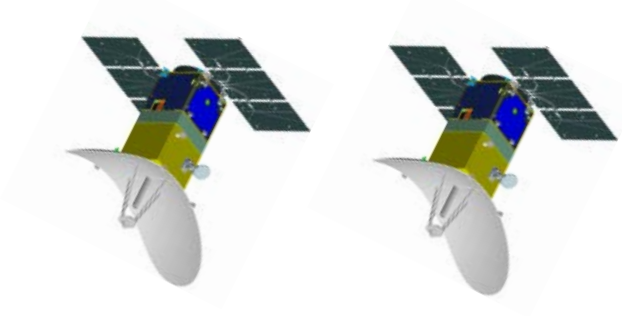
[Case 9-2]

Disaster Prevention using Earth Observation Satellites in Vietnam

(ODA loan aid (STEP) 7.227 billion yen)

Scheduled for completion in 2021

- Purpose: To establish a supporting system by
  - -providing facilities necessary for the development and utilization of earth observation satellites
  - -technology transfer for the sustainable management of the facilities.
- Content: (1) Two small-scale earth observation satellites (radars)
  - (2) Facilities and equipment (constructed inside Hoa Lac High-Tech Park)
  - (3) Consulting services (satellite observation data utilization technology and technical assistance related to satellite development)
- Technologies from Japanese enterprises are expected to contribute to the project.

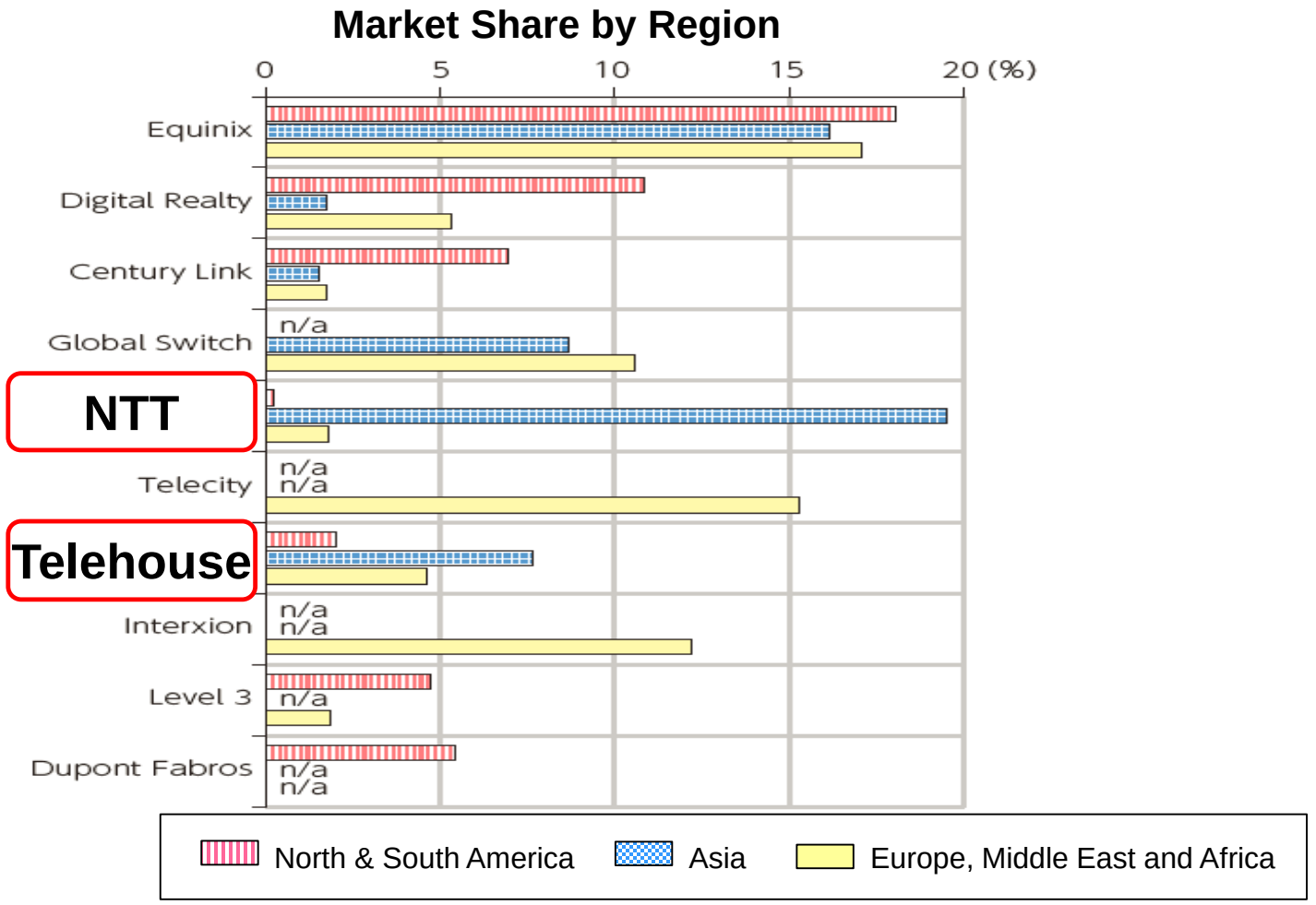


Radar satellite (image)

Vietnam National Satellite Center (VNSC)

Case [10]: Data Center

- NTT has the largest market share in Asia.
- Telehouse, the data center of KDDI, has a higher share in Asia and Europe compared to in North and South America.



(Source) 2015 WHITE PAPER Information and Communications

Case [11]: Supercomputer

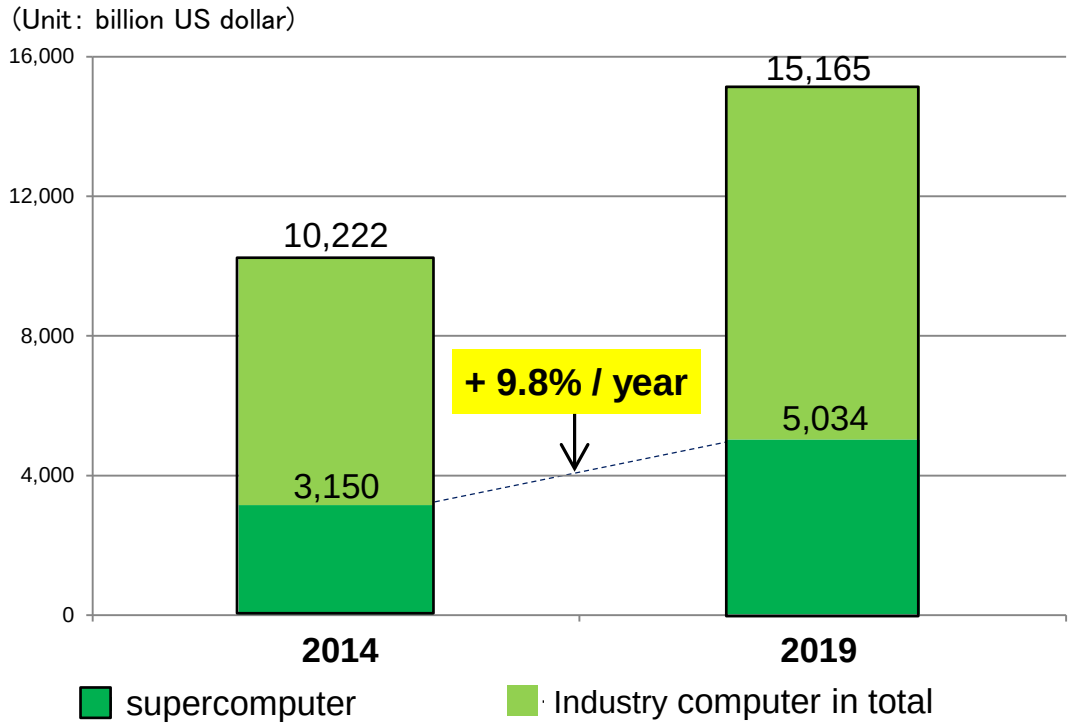
- "Big data analysis" has emerged as a new area to which supercomputers are applied in addition to the area of "simulation".
- "K computer" developed by RIKEN and Fujitsu ranks No.1 in "The Graph 500 List" (Nov. 2015). This ranking indicates computer performance evaluated by efficiency in data analysis*.

(*) "K computer" keeps No. 4 in "Top 500 List" (Nov. 2015), which indicates the performance evaluated by efficiency in simulation.

[Emerging Big data analysis]

- Digital data in global distribution is predicted to jump from 988 exabytes in 2010 to around 44 zettabytes, 40 times as much, in 2020.
- New solutions utilizing big data are being embarked on as new businesses.
- Japan's supercomputer technology, which ranks No.1 in efficiency in data analysis, creates new business opportunities.

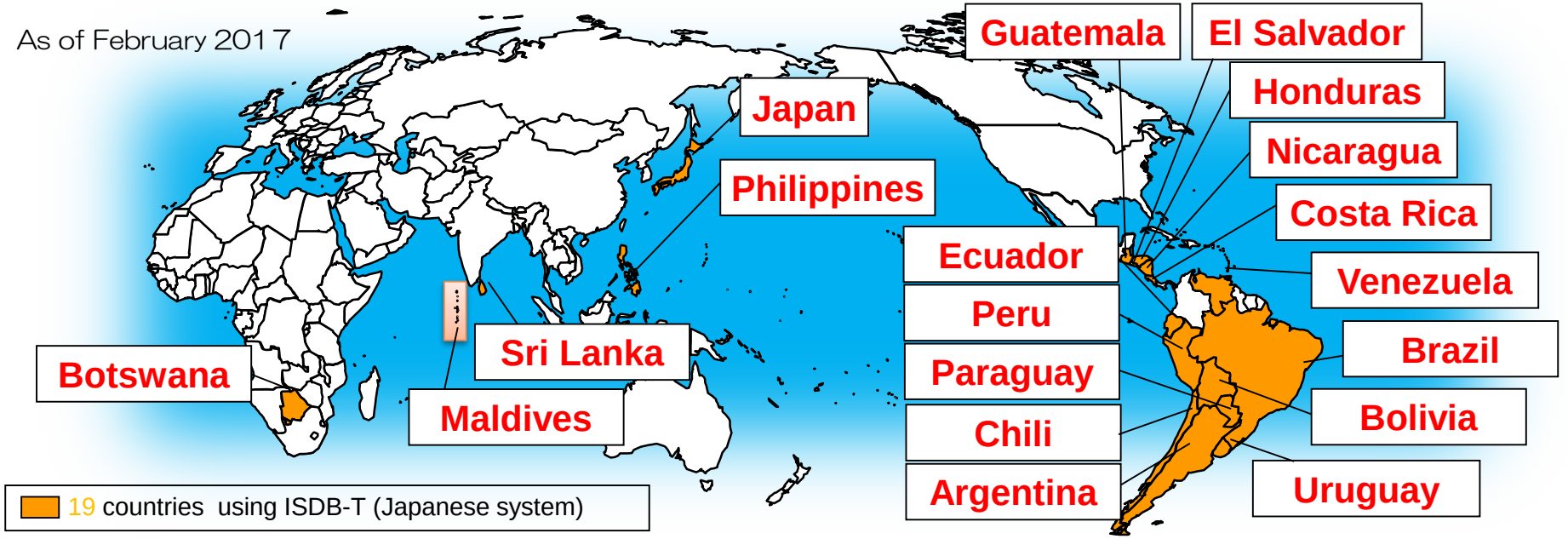
Worldwide Industry Computer Market Shipments Forecast



(Source) Report from International Data Corporation

Case [12]: Cooperation in Terrestrial Digital Broadcasting Projects

- Currently, 19 countries (including Japan) are using ISDB-T to cover approximately 660 million people.
- To reinforce and expand the cooperation established in the terrestrial digital broadcasting projects across to the ICT field.



- Expanding cooperation across to the ICT field through proposals for “combined packages of infrastructure and ICT”.
  - -Support for the introduction of disaster prevention ICT on terrestrial digital broadcasting (as a platform)*.
    (*) Refer to Case [1] .
  - -Usage of ICT to address social issues: ICT with geospatial information to contribute to the advancement of disaster prevention ICT systems, and ICT to achieve ITS (transportation), Smart-agriculture, Tele-education, etc..

Contact

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- For inquiries about this casebook,
  please contact (*):
  ict_strategy_atmark_ml.soumu.go.jp

  * In order to avoid spam, “@” is shown as “_atmark_”.
  Replace “_atmark_” with “@” to send an email.

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