



Beyond 5G Promotion Strategy 2.0 for AI Society in the 2030s

Mr. FUSEDA Hideo

Director-General, Global Strategy Bureau

Ministry of Internal Affairs and Communications, Japan

Promoting Technology Policy in the Field of ICT

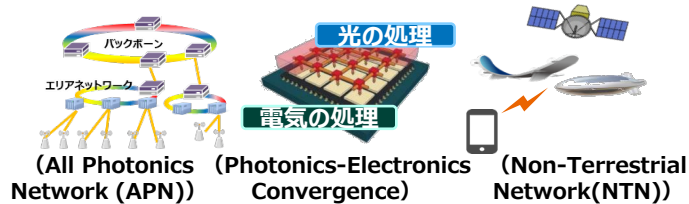
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Strategically promoting R&D, Intellectual Property, and international standardization in advanced fields, such as **Beyond 5G**, **AI**, **space**, **quantum communication**, and **cybersecurity**, to enhance international competitiveness, ensure economic security, and build a resilient and sustainable society.

Promoting R&D in priority areas

Beyond 5G

Developing next-generation ICT infrastructure that enables innovative, high-speed, high-capacity, low-latency, low-power, and wide-area communication



- ✓ **Beyond 5G (6G) Fund Program**
- ✓ **Promoting the development and deployment of APN**

Space

Establishing of the Space Strategy Fund by four ministries and agencies to promote the development of ICT technologies in the space sector



- ✓ **Space Strategy Fund Program**
- ✓ **Initiatives to enhance the autonomy of satellite communications through satellite constellations**

AI

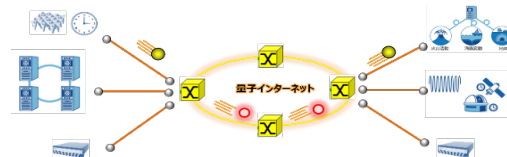
Enhancing Japan's capabilities in generative AI development, advancing conventional AI technologies (e.g., real-time interpretation), and pursuing brain-inspired next-generation AI based on neuroscience



- ✓ **Developing and expanding of high-quality Japanese language datasets**
- ✓ **Promoting initiatives to strengthen R&D in brain-inspired information and communication technologies**

Quantum Communication

Realizing quantum cryptography for secure communication and the quantum internet to connect quantum computers, sensors, and other devices



- ✓ **Initiatives toward the early social implementation of quantum cryptography networks**
- ✓ **Initiatives toward the realization of the quantum internet**

※NICT (National Institute of Information and Communications Technology)

Promoting initiatives led by the NICT

It is the only public research institute in Japan dedicated to the ICT field.

Conducting fundamental and foundational R&D from a medium- to long-term perspective



Support for ICT Startups

End-to-end support for ICT start-up and budding researchers from R&D to commercialization



- ✓ **Start-up and Budding Researchers Support Program**

Promotion of Intellectual Property and International Standardization

Strategically promoting IP acquisition and standardization activities to enhance Japan's global competitiveness

Examples of de jure standards



Examples of forum standards



Background on Beyond 5G Promotion Strategy

June 2020

“Beyond 5G Promotion Strategy” (MIC)

January 2021

Amendment of the NICT Act, establishing Beyond 5G R&D Fund on NICT (for 2 years)

June 2022

Interim Report by the Information and Communications Council

December 2022

Amendment of the NICT Act, establishing **Beyond 5G R&D Fund on NICT**

(permanently operated fund)

March 2023

The Beyond 5G R&D Fund started

June 2024

Final Report by the Information and Communication Council

August 2024

“Beyond 5G Promotion Strategy 2.0” (MIC)

Progress of Beyond 5G Initiatives

MIC/NICT initiative

Beyond 5G R&D fund

- The **Beyond 5G R&D fund** was established in March 2023.
- **15 new projects** were selected in FY 2024.
- The fund totals 167 billion Yen.



Global initiative

Developing an international vision of Beyond 5G/6G

- The 2023 “G7 Digital and Technology Ministerial Declaration” endorsed the “**G7 Vision for Future Networks in the Beyond 5G/6G Era.**”



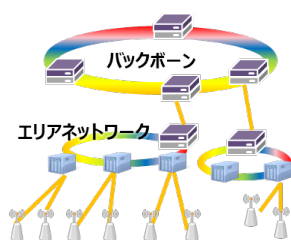
2023 G7 Digital and Tech Ministers' Meeting, in Takasaki, Gunma, Japan

Transition from **the initial phases** to the phase of **social implementation**

Beyond 5G/6G R&D Challenges

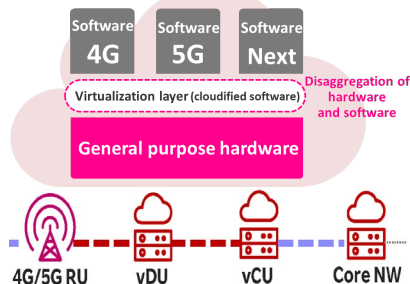
Challenge 1

All photonics network technology



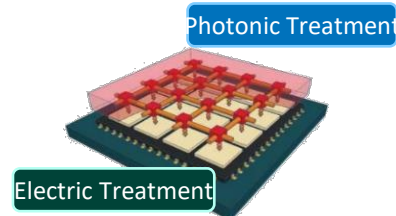
Challenge 2

Open network technology



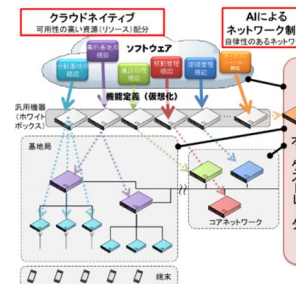
Challenge 3

Device technology



Challenge 4

Network orchestration technology



Challenge 5

Wireless network technology



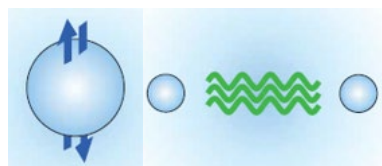
Challenge 6

NTN (HAPS/satellite network) technology



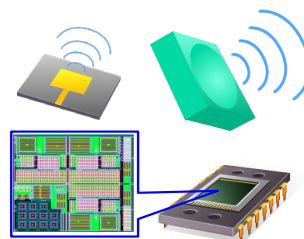
Challenge 7

Quantum network technology



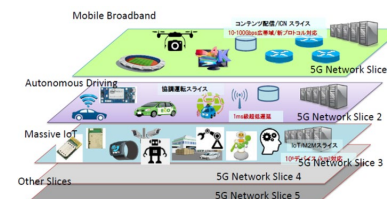
Challenge 8

Terminal and sensor technology



Challenge 9

E2E virtualization technology



Challenge 10

Beyond 5G service and application technology



Three Strategic Areas of Beyond 5G Promotion Strategy 2.0

All-Photonics Network (APN) field

- Support for **R&D, testbed development, and standardization** toward the deployment of APN in Japan in 2030.

Non-Terrestrial Networks (NTN) field

- To introduce HAPS in 2026 in Japan, fostering R&D and adapting the legal framework
- Regarding **satellite communications**, fostering R&D and harmonizing global technology standardization for the smooth **introduction of world-wide services** in Japan

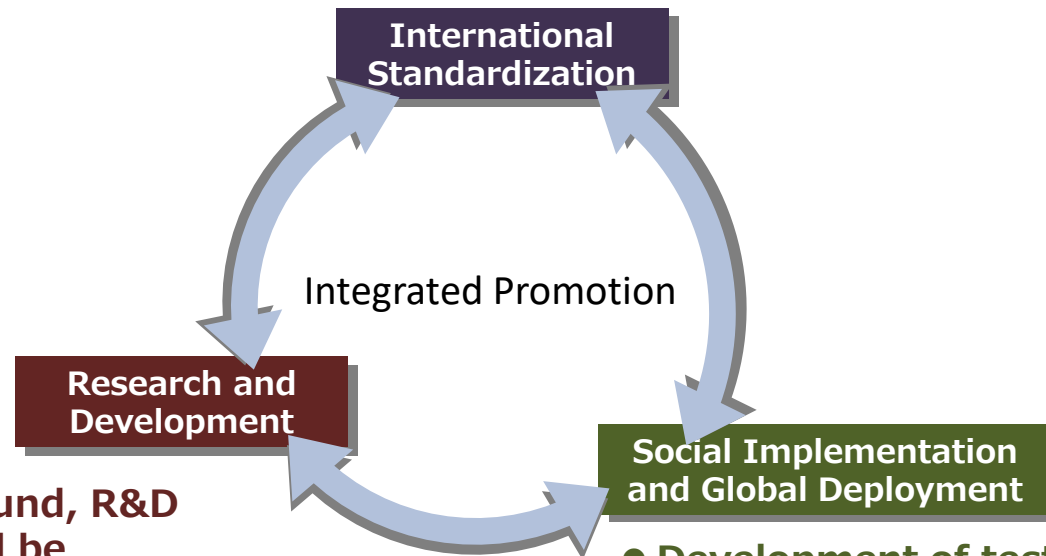
Radio Access Network (RAN) field

- Promoting utilization of **Sub-6 GHz and millimeter waves**, and **advancing adoption of 5G Standalone (SA)**
- Promoting **R&D to secure frequencies and optimize RAN operation with AI** in order to meet future growth of traffic demand

Future Direction of Initiatives Toward the Early Realization of Beyond 5G/6G 6

- To accelerate the early realization of Beyond 5G/6G, Japan will promote initiatives related to R&D, international standardization, social implementation, and global deployment in the strategic areas in an integrated manner.

- Support for private companies' international standardization activities will be strengthened to reflect the outcomes of R&D and domestic implementation in international standards.



- By utilizing the Beyond 5G R&D Fund, R&D projects by private companies will be continuously supported.

- Development of testbed environments and other infrastructure for validation of R&D outcomes will be promoted.
- Support for global deployment, including in Europe, the United States, and the Global South, will be enhanced.

➡ Beyond 5G/6G is expected to be fully implemented in Japan by around 2030.

Projects That Are to Be Funded for Standardization

1. All-Photonics Network (APN)	
①	R&D on DSP circuit implementation technology for 1T+ optical transport (NTT Ltd.)
②	R&D on ultra-large capacity and high-quality optical network node technology (NTT Ltd.)
③	R&D on bandwidth-expanded optical node technology to realize ultra-high-speed, large-capacity networks (Fujitsu Ltd., Furukawa Electric Co., Ltd.)
④	R&D on compact, low-power wavelength conversion and format conversion technologies aimed at reducing power consumption in optical networks (NEC Ltd.)
2. Non-Terrestrial Networks (NTN)	
⑤	R&D on flat panel antenna technology for ground stations for LEO/MEO satellites (Sharp Ltd.)
3. Secure Virtualization and Integrated Network	
⑥	R&D on communication control and data communication processing software technology for Beyond 5G (6G) networks (NEC Ltd.)
⑦	R&D on high-functionality, high-performance, high-reliability, and low-power consumption technologies for radio stations Beyond 5G (6G) (NEC Ltd.)
⑧	R&D on advanced edge cloud technologies for next-generation communications (Rakuten Mobile, Inc.)

- Through these projects, we actively promote global standardization in IOWN GF, 3GPP, and ITU.
- International R&D projects promote not only R&D to realize Beyond 5G-like APN technology but also to enhance the relationships with partner countries.

Japan-EU Joint R&D

Theme : R&D project on AI-Native Network to realize User-Centric Communication
Term and budget: In April 2025~ (for up to three years)/Up to 100 million yen per year
Project name: 6G MIRAI-Harmony (The University of Tokyo and ERICSSON FRANCE)
(※) The EU team uses the fund of Horizon Europe Framework Programme (HORIZON) to proceed with the joint R&D project.

Japan-Germany Joint R&D

Theme : R&D project on digital twin architecture and data model for All-Photonic Network (APN)
Term and budget: In June 2025~ (for up to three years)/Up to 100 million yen per year
Project name : Secure Hybrid Digital Twin Network Infrastructure with Knowledge-based Analytics (SHINKA) (Fujitsu Ltd. And Adtran Networks SE)
(※) The German team will use the German fund to proceed with the joint R&D project.

Japan-US Joint R&D

Public call for proposals has closed.
The joint R&D projects will begin in April 2026 (for up to three years).
Budget: Up to 144 million yen per year
(※) US teams will use the fund of Verticals-enabling Intelligent Network Systems (VINES) to proceed with the joint R&D project.

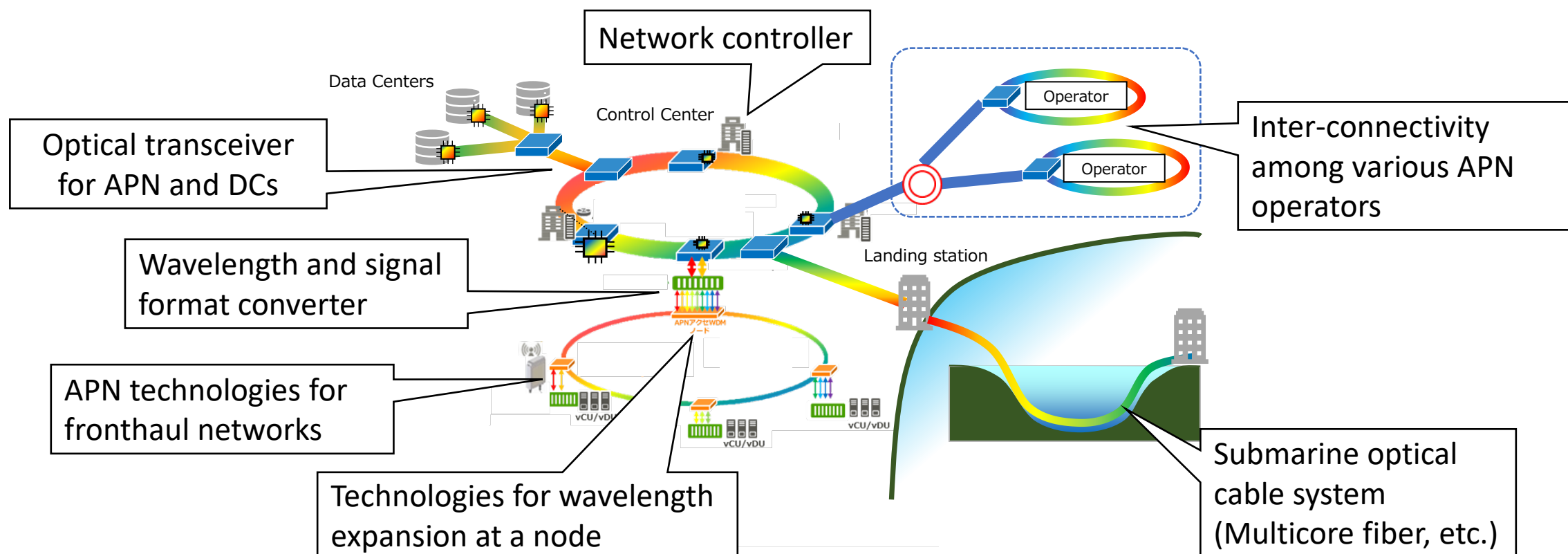
Japan-Singapore Joint R&D

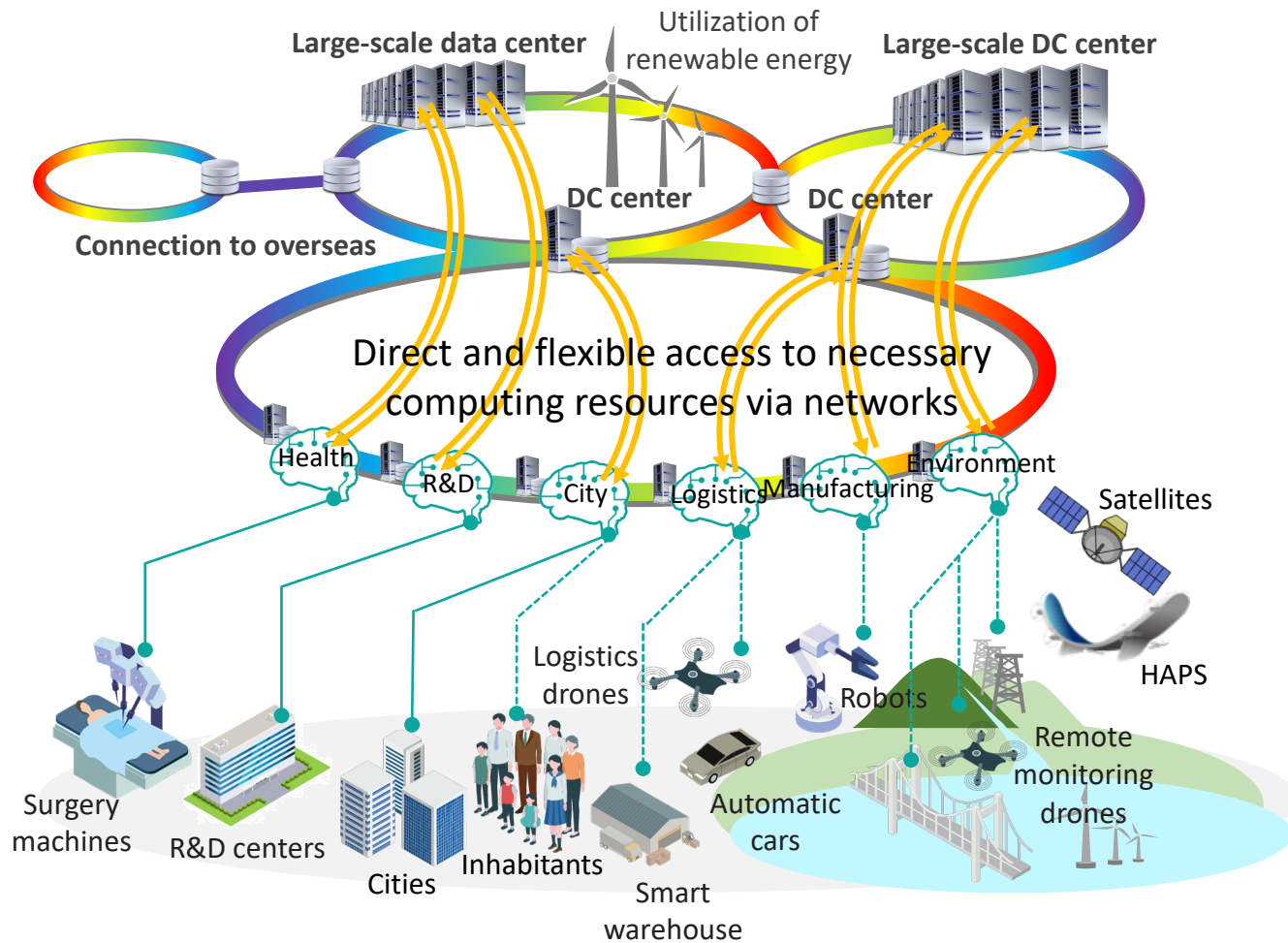
NICT and SUTD (Singapore University of Technology and Design) signed an MoU in May 2025 are conducting R&D programs on 5G/Open RAN, Beyond 5G, and NTN.
(※) NICT: National Institute of Information and Communications Technology

R&D Support through the Beyond 5G R&D Fund Program

- Accelerating social digital transformation (DX), including the use of AI, is essential for driving innovation and achieving economic growth in Japan.
- The MIC is supporting strategic R&D projects aimed at realizing Beyond 5G through a fund established at the NICT, with a strong focus on social implementation and global deployment.
- This fund focuses its investments on three key areas: the **All-Photonics Network (APN) Technologies**, **Non-Terrestrial Network (NTN) Technologies**, and **Network Virtualization Technologies**.

Beyond 5G R&D overview on All-Photonics Network Technologies





A next-generation information and communication infrastructure (**Beyond 5G**) should be **extensively connecting** on multi-layered networks (**RAN** and **NTN**) and **all-photonics networks (APN)**:

- **A wide variety of users**
- **Objects and sensors**
- **Numerous small and distributed AIs** specialized in individual fields
- **Computing resources**, such as **data centers** where **renewable energy** can be utilized

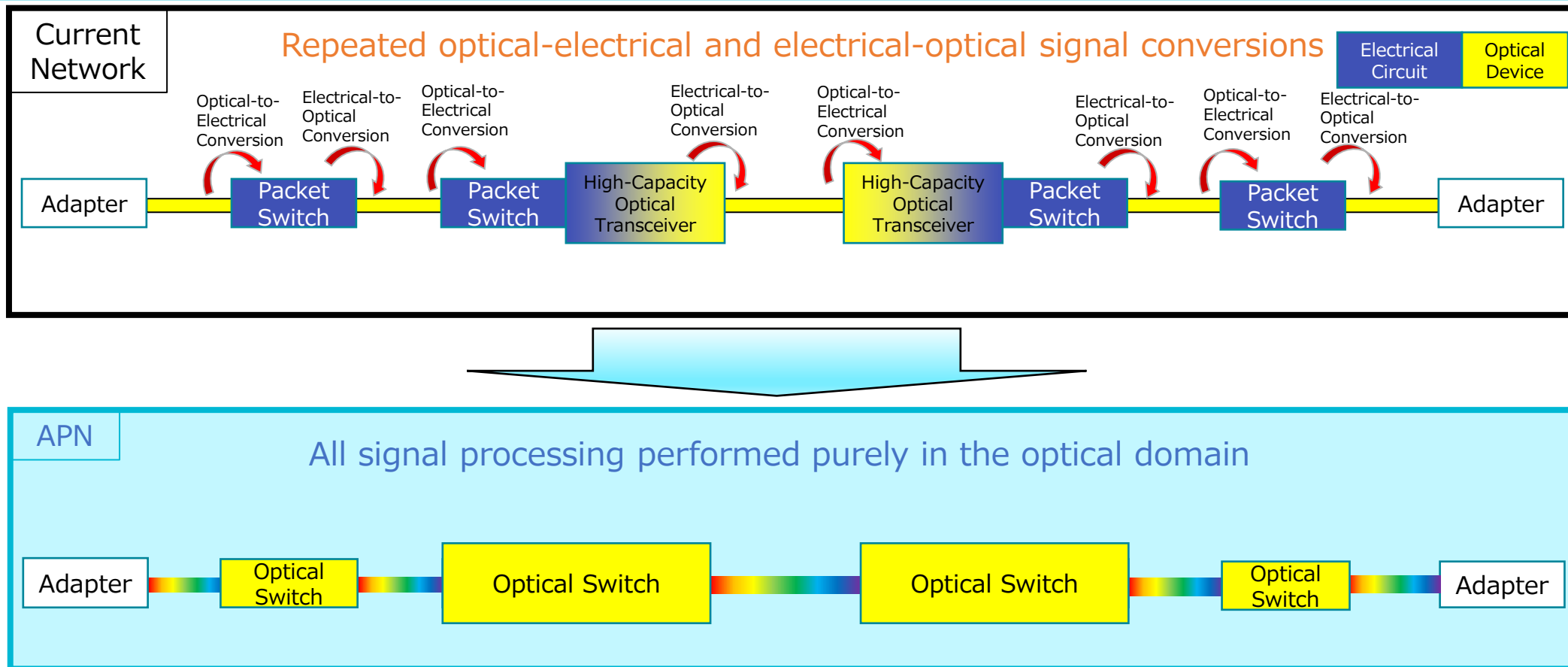
Accelerate innovation that resolves social issues

by providing **green, safe, secure, and reliable AI** to **all of society** through **Beyond 5G**

All Photonics Network (APN)

10

- Current networks transmit data by relaying packets, like passing buckets, to enable long-distance communication.
- While optical fiber is widely used for transmission paths, signal processing at switching points is still performed by electronic circuits. As a result, signals must be repeatedly converted between optical and electrical forms.
- This leads to increased latency and slower speeds when traffic surges, as well as higher power consumption due to repeated signal conversion and processing.



It achieves the following significant improvements:

① Energy efficiency ② Transmission capacity ③ End-to-end latency reduction

Promoting the development and deployment of All-Photonics Network (APN) technologies

- To accelerate the social implementation of APN, an essential foundation of AI-driven societies, Japan is **building the APN Innovation Hub**. This hub will introduce cutting-edge technologies in stages and allow diverse stakeholders to test and validate real-world applications and product developments.
- By leveraging this environment, Japan aims to **accelerate the commercialization cycle of its advanced optical communication technologies, foster innovation through industry-academia-government collaborations, and enhance international competitiveness.**

Establishing of an APN Innovation Hub with a view to social implementation

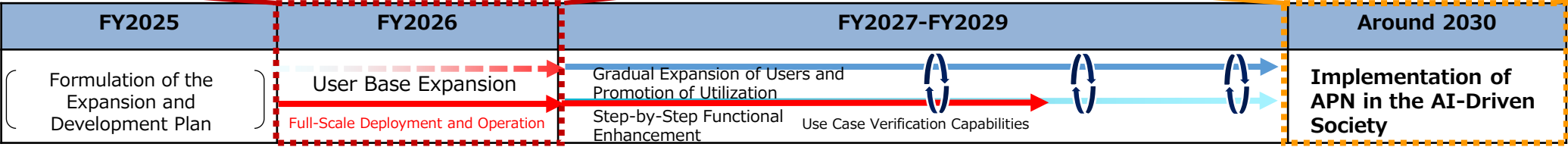
- It enables verification of product behavior under conditions similar to real-world APN deployment
- It facilitates interoperability testing of multiple vendors' products in a neutral environment through public-private collaborations
- It accelerates the creation of new AI-driven businesses through the participation of a diverse range of industry players

End-to-end configuration simulating real-world environments

***Based on the Expansion and Development Plan formulated in FY2025, a foundational multi-vendor interoperability testing environment will be established.**

All-Photonics Network (APN) for AI Development and Utilization

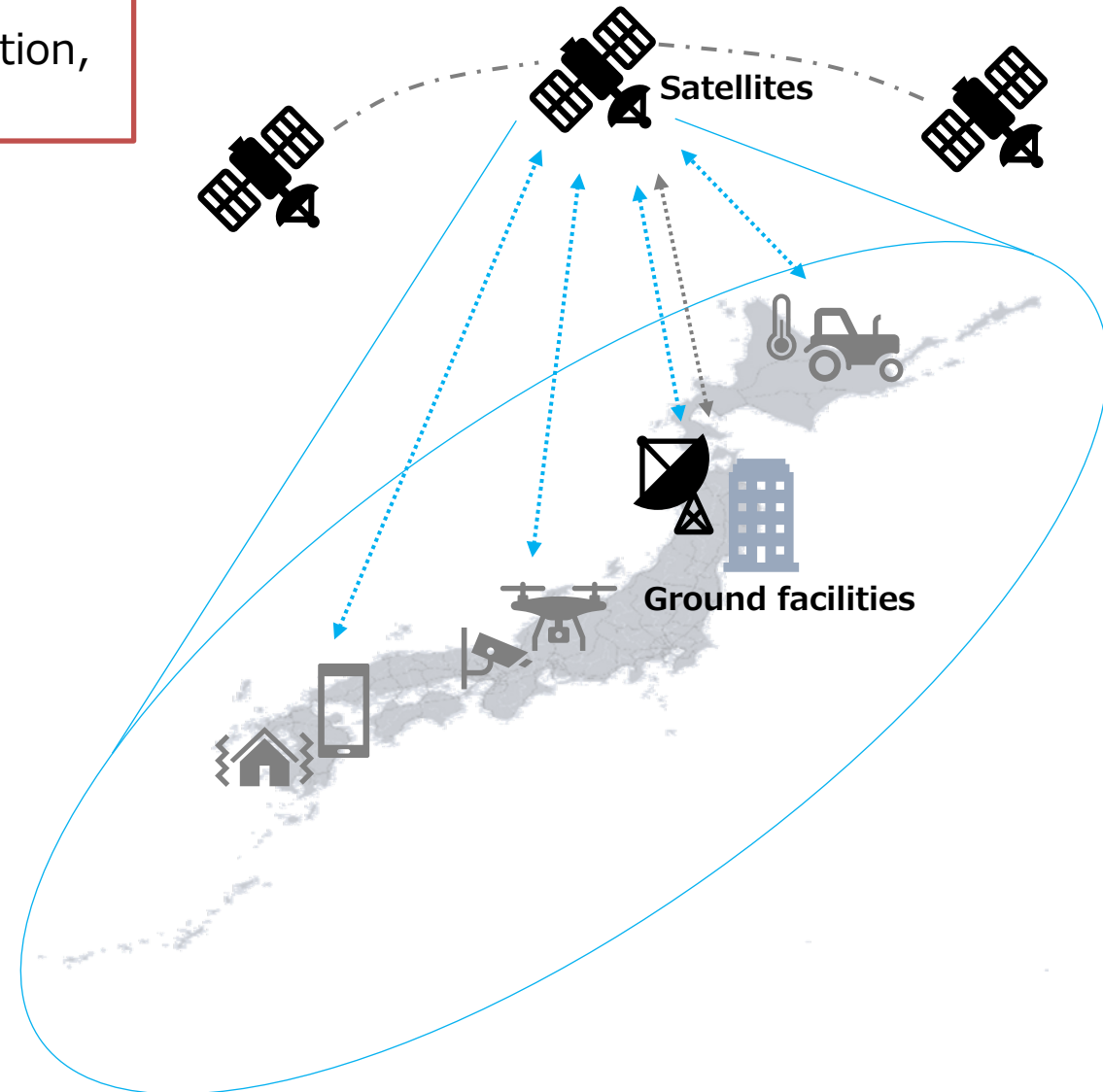
- A low-latency All-Photonics Network enables flexible and virtualized connections between distributed data centers (computing resources), making advanced AI development and utilization possible. Social implementation is targeted for around 2030.



Low-Earth Orbit (LEO) Satellite Infrastructure Development for Securing Autonomy

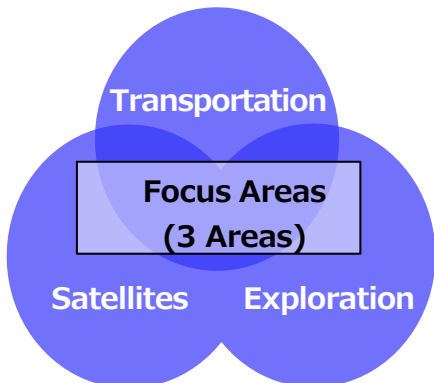
12

- Promoting autonomous LEO satellite communications as a vital nationwide solution, including during emergencies



- To enable private companies and universities to boldly engage in long-term R&D efforts, Japan has established a new fund to strongly support the development, demonstration, and commercialization of advanced technology, led by these entities.
- The goal is to provide prompt support of one trillion yen. At the same time, the initiative aims to encourage players to enter the space sector, promote the creation of new space-related industries and businesses, and strengthen and accelerate support for private companies developing technology, including startups and academic institutions.
- In addition, the government will secure anchor tenancy to foster a virtuous cycle for private-sector business expansion.

Scheme of the Program

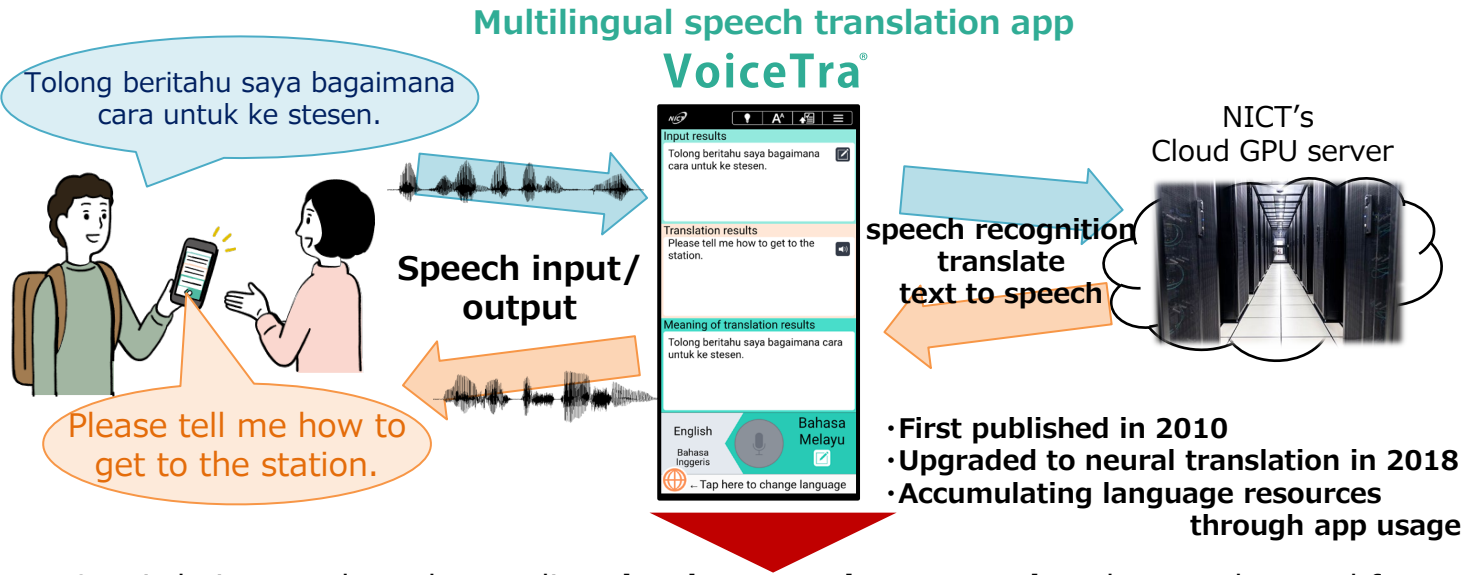


Overall Project Goals (Three Objectives)

- **Expansion of the Space-Related Market (e.g., from ¥4 trillion to ¥8 trillion in the early 2030s)**
 - Support for Technology Development Aimed at Market Expansion and Enhanced Global Competitiveness
- **Contribution to Solving Global and Societal Challenges Through the Use of Space**
 - Support for R&D that Creates Social Value and Public Benefits
- **Advancement of Scientific Exploration and Strengthening of Fundamental Technologies in Space Sector**
 - Support for R&D Leading to the Creation of Breakthrough Future Technologies

AI multilingual translation technology in Japan

- **Ministry of Internal Affairs and Communications (MIC)** and **National Institute of Information and Communication Technology (NICT)** have conducted **research on multilingual translation technologies** over a long period of time(since 1980's) and **accumulated multilingual Language corpus**.
- As for sequential translation, practical level of translation accuracy has been achieved **mainly in Asian languages**. Technology has been transferred to private companies and implemented as various services.
- We are also conducting R & D to **realize simultaneous interpretation**.
- **Sequential translation and simultaneous interpretation** using these technologies were **demonstrated in Expo 2025**.



R & D is being conducted to realize **simultaneous interpretation** that can be used for discussions at business and international conferences, etc.

Research period : 2020 to 2024 (total budget: 8.8 billion yen)



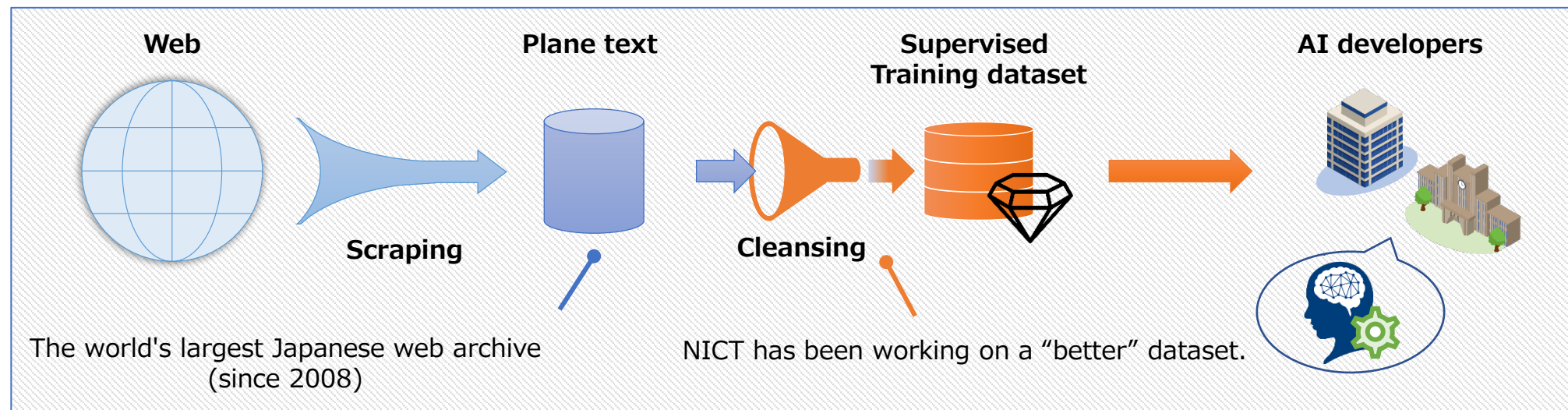
Supported Languages (31 Languages)	
Priority Languages	
Japanese	Spanish
English	Brazilian
Chinese	Portuguese
Korean	Filipino
Thai	Arabic
Indonesian	Italian
Vietnamese	German
Myanmar	Hindi
French	Russian
	Ukrainian
Khmer Nepali Mongolian	
Urdu Dutch Sinhala	
Danish Turkish Hungarian	
Portuguese Malay Lao	

Development of Japanese Large-Scale Language Models (LLMs)

- NICT is one of the few research institutes in Japan that can independently maintain **a large-scale computing environment, collect and construct datasets, and training LLM.**
- Construction of multiple types of LLM with different learning datasets and hyperparameter settings (13B, 40B, 179B, and 311B parameters models※)

※**311B parameters model is one of the largest Japanese LLM in Japan**

- NICT has developed and expanded a large supervised training dataset, mainly Japanese, in order to foster the basic development capability of large-scale language models (LLM) in Japan, and provided it to private companies and academia.
 - Based on data collected from the Web, cleansing work such as deleting HTML tags and extracting "Authentic sentences such as those in books" has been carried out to create "large supervised Japanese training data."
 - Considering domestic laws and regulations such as Copyright Act and Act on the Protection of Personal Information



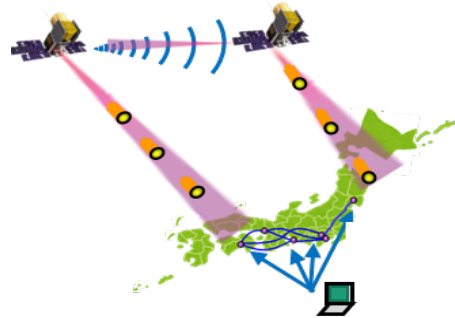
Ministry of Internal Affairs and Communications (MIC) and National Institute of Information and Communications Technology (NICT) are, with private sector and academia, promoting R&D, verification on testbed, international standardization, human resource development of quantum communications technologies, such as quantum key distribution (QKD) and quantum network, with the aim of early implementation of those technologies into society.

R&D

Quantum cryptography (QKD)

Satellite quantum communication

Quantum internet



Promoting R&Ds of quantum cryptography, satellite quantum technology, and quantum internet, with collaboration among industry, academia, and government.

Standardization

- Promotion of international standardization
- Establishing evaluation and certification framework



Human resource development

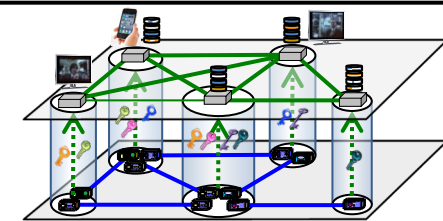
- NICT Quantum Camp (NQC)
- Young Challenge Lab
- Practical program through industry-academia-government collaboration
- Nurturing quantum natives

Test bed

Tokyo QKD network (NICT)

Since 2010

- Verification and demonstration
- Industry-academic-government-cooperative environment
- Technology transfer to private sectors



QKD equipment commercialization

Japanese companies commercialized QKD products with top-level performance, which has been deployed in testbeds in many countries & in commercial network in a country.

【Toshiba】



【NEC】



Innovation shall be fostered and sustainable economic growth pursued through the development and enhancement of digital infrastructure, alongside the promotion of digital transformation.

Thank you!



Ministry of Internal Affairs
and Communications, JAPAN