NICT NEWS

National Institute of Information and Communication Technology

No.4
2026
Vol.518

FEATURE

New

The New NICT Launches

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NICT NEWS 2026 No.4 Vol.518
National Institute of
Information and Communications Technology

In April 2026, NICT launched a new five-year plan, the 6th Medium- to Long-term Plan, under the new president's leadership and the new organizational framework.
Check out the new NICT as it takes a step forward into the future.

FEATURE

New

The New NICT Launches

INFORMATION

New

Message from the New President

I am honored to assume the position of President at the National Institute of Information and Communications Technology (NICT) and look forward to working closely with our partners across Japan and around the world.

As Japan's sole public research institute specializing in information and communications technology (ICT), NICT is dedicated to driving innovation; we promote the full spectrum of ICT research and development (R&D) from fundamental research to practical implementation, delivering impactful outcomes back to society through close collaboration with universities, industry, local governments, and domestic and international research institutions.

Today, ICT is no longer merely a standalone technological discipline; it constitutes the very social infrastructure that underpins public safety and security, directly impacting Japan's national competitiveness and economic security. Recognizing its vital role, Japan has designated ICT as one of its 17 strategic growth fields, establishing it as a foundational infrastructure for all industries.

Around the world, nations are rapidly accelerating their investments in science and technology, treating them as core pillars of national strength. In particular, the rapid advancement of artificial intelligence (AI) is fundamentally reshaping the landscape of R&D and generating revolutionary impacts across society and the economy. Coupled with a drastically shifting geopolitical environment, it has become an urgent priority for Japan to secure technological sovereignty and strengthen Japan's indispensable position in key domains.

For Japan—which also faces ongoing challenges such as natural disasters and climate change—increasing competitiveness and realizing a sustainable, resilient society is paramount. To achieve this, we must drive the advanced integration of cyber and physical spaces while ensuring robust security. As a leading institute in the ICT field, NICT bears a profound responsibility to spearhead this integration.

Under our 6th Medium- to Long-term Plan, NICT is tasked with comprehensively advancing strategic fields such as AI and communications, Beyond 5G, quantum ICT, and cybersecurity. We are also charged with managing cross-domain R&D, funding, and crucial public services, including maintaining Japan Standard Time and providing space weather forecasts. A critical element of this mission is embracing an "architect's perspective"—one that maintains a high-level overview of individual technologies in order to design and integrate holistic systems.

To make this perspective truly effective, two foundational capabilities are vital: a strong intelligence capability to continuously monitor and accurately assess global developments, and the agility to respond flexibly and expeditiously to rapid environmental changes. By organically combining this architect's perspective with intelligence and agility, NICT will fulfill its role as the core hub supporting Japan's ICT landscape.

Furthermore, as an R&D hub for ICT, NICT aims to build a dynamic platform that brings together diverse stakeholders from industry, academia, and government to foster co-creation. In partnership with universities and private enterprises, NICT will also contribute to building new foundations for R&D and talent development—notably by offering secure, off-campus testing sites and collaborative functions.

Moving forward, NICT will continue to tackle challenges strategically and flexibly, while remaining responsive to an ever-changing environment. Our ultimate goal remains to contribute to the safety, security, and sustainable development of society through the power of ICT.

I sincerely appreciate your continued understanding and support.

President
The National Institute of Information
and Communications Technology
Dr. OHNO Hideo

New

Mid- to Long-Term Plan Begins

NICT's 6th Mid- to Long-Term Plan began in April 2026. This major plan sets out the research and activities that NICT will conduct to contribute to Japan and its society during the five years from FY2026 to FY2030.

Changes in Society and Technologies

At present, the following changes are taking place in Japanese society and in the world of technology.

Changes in Japanese society

- The number of working people is decreasing.
- The number of visitors to Japan is increasing.
- Energy consumption is dramatically increasing.
- Large-scale natural disasters are increasing.
- Crime and trouble on the internet are increasing.

Changes in technologies

- The use of generative AI is spreading rapidly and transforming lifestyles and working styles.
- Ultra-fast and highly reliable communications (e.g., All-Photonics Networks) have come into practical use.
- Research in emerging fields, such as quantum technologies, is progressing.
- Risks in cyberspace are becoming increasingly complicated.

Under such circumstances, NICT is expected not only to conduct research but also to ensure that research outcomes are effectively implemented in society.

NICT's Strengths

NICT has the following strengths:

- NICT has conducted research specializing in the information and communications field over the years, and has high technological capabilities and extensive experience.
- NICT has taken the initiative in establishing all-Japan structures for joint research among universities and companies and has steadily endeavored to make use of research outcomes in society.

Future Challenges

At the same time, NICT needs to address several key challenges:

- To strengthen NICT's social implementation functions, mechanisms to properly link its technologies and knowledge to universities and companies so they can actually utilize them
- To enhance NICT's external collaboration functions to support innovation in industry by leveraging its facilities, data, and knowledge
- To foster and attract researchers who can respond to rapidly changing fields, such as AI and cybersecurity, as well as experts who can bridge research and society
- To review NICT's organization for delivering technology to society as a whole in a way fit with the times

Expected Roles of NICT in the Coming Five Years

Based on this background, the Ministry of Internal Affairs and Communications presented the 6th Mid- to Long-Term Objectives for the five years starting from FY2026 to NICT, in which the expected roles of NICT were stated as follows.

1. To positively make contributions to achieving Japan's key policies—such as strengthening international competitiveness and ensuring national and economic security—which are described in the Science, Technology, and Innovation Basic Plan and other strategies of the national government, from the perspective of information and communications
2. To strengthen NICT's roles as a central nexus for industry-academia-government collaboration by formulating and sharing a mid- to long term national vision and advancing coordinated efforts from fundamental research through to social implementation.
3. To offer support to companies and startups as an innovation platform by leveraging NICT's research facilities and knowledge
4. Under Acts relating to NICT, to continue the dissemination of Japan Standard Time, engaging in space weather forecasting, and calibrating wireless devices in a stable manner, which will fundamentally support social economic activities

Key Points of the 6th Mid- to Long-Term Plan

Based on the 6th Mid- to Long-Term Objectives presented by the Ministry of Internal Affairs and Communications, NICT formulated its 6th Mid- to Long-Term Plan, which specifically shows how NICT will achieve the presented objectives. The key points are as follows.

1. Promotion of four strategic fields

NICT will strongly promote the development of technologies in four strategic fields, namely, AI and communication, Beyond 5G, quantum ICT, and cybersecurity, as technology fields essential for achieving Japan's key policies, in a cross-sectoral and strategic way, through unified efforts by universities, companies, and the national government.

2. Promotion of R&D themes in five priority areas and those supporting innovation

NICT will deal with R&D themes in the five priority areas, which are fundamental and foundational ICT areas that support Japanese society—advanced electromagnetic technology, innovative networks, cybersecurity, universal communication, and frontier science—as well as R&D themes supporting innovation from a medium- to long-term perspective.

3. Enhancement of social implementation and external collaboration

In order to maximize research outcomes, NICT will promote each stage from fundamental research to social implementation in a unified fashion through cooperation among universities, companies, and the national government. For that purpose, NICT will further strengthen its roles as an innovation hub and its capacity for external collaboration.

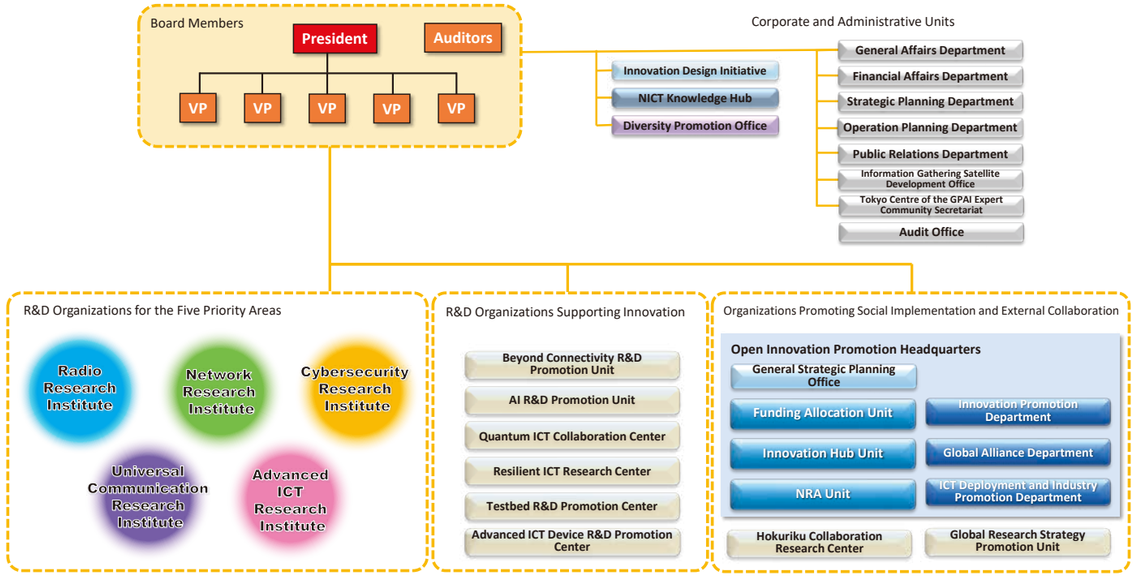


Figure 1 NICT's Organizational Structure for Proceeding with the 6th Mid- to Long-Term Plan

New Organizational Structure for Implementing the 6th Mid- to Long-Term Plan

Figure 1 shows NICT's organizational structure for implementing the 6th Mid- to Long-Term Plan. Under the leadership of the President, NICT comprises five research institutes responsible for R&D in the five priority areas, as well as two R&D promotion units and four centers that promote R&D supporting innovation. Furthermore, NICT includes organizations promoting social implementation and external collaboration, together with corporate and administrative units that support the institute's overall operations.

To strengthen social implementation and external collaboration functions, the Open Innovation Promotion Headquarters was reorganized, and three new units were established:

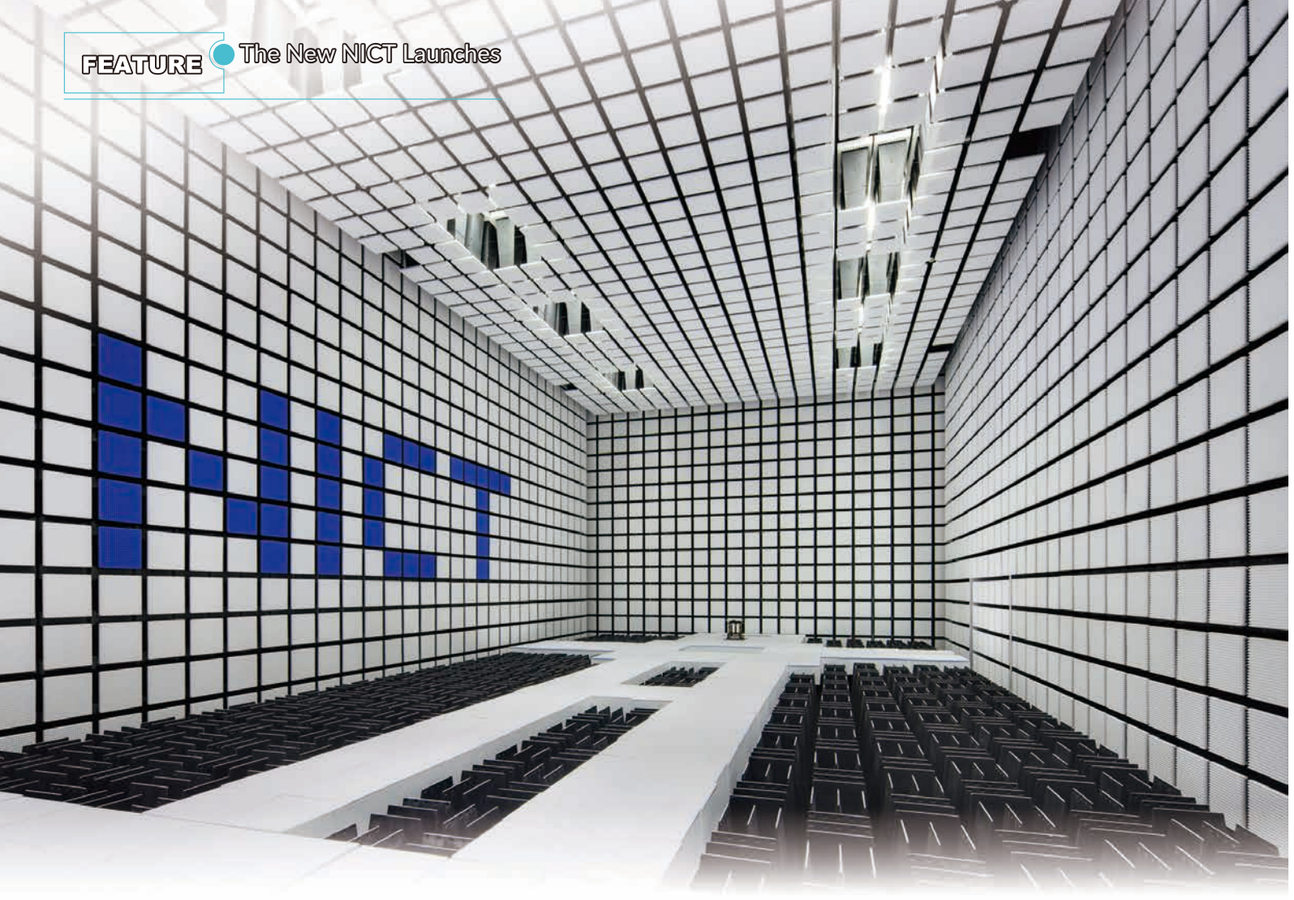
- Funding Allocation Unit (FA Unit)
- Innovation Hub Unit
- NICT Research Administrators Unit (NRA Unit)

Functions for supporting universities and companies that conduct R&D on next-generation ICT were integrated into the Funding Allocation Unit (FA Unit). In addition, the Innovation Hub Unit was established to promote the social implementation of research outcomes through collaboration with companies and universities, leveraging NICT's facilities and data. The NRA Unit was also created to foster experts who bridge research outcomes and society, referred to as NICT Research Administrators (NRAs). Furthermore, the Global Research Strategy Promotion Unit was also launched to formulate strategies and plans for promoting NICT's research activities and to support the implementation of these strategies and plans while closely watching global trends.

Vision for Society in the 2030s

The 6th Mid-to Long-Term Plan, which NICT launched this April, is a five-year plan up to the end of FY2030. NICT will promote R&D on ICT with the aim of achieving a society with the features described below in the 2030s.

- A resilient society in which people can live safely even in the event of large-scale disasters
- A digitally secure society in which everyone can safely benefit from ICT
- A sustainable and vibrant society that is supported by environmentally friendly energy and digital technologies
- A human-centric AI society that promotes productivity improvement



NEW

Radio Research Institute

Electromagnetic Waves Connecting Nature, Space, and Society

The Radio Research Institute uses electromagnetic waves, including radio waves and light, on the state of the Earth and space and to promote research on infrastructure technologies that support people's everyday lives and society, such as ICT, disaster prevention, and measurement.

For example, the RRI observes movements of rain and clouds and how they change over time by utilizing radars and artificial satellites, and uses the data for disaster prevention and weather forecasting.

The RRI also focuses on research of hologram technologies utilizing wave optics, such as studying precision measurement that leverages light interference and developing new microscopic techniques that enable non-contact observation of living cells.

Moreover, the RRI engages in space weather forecasting that predicts the effects of solar activities on the Earth's environment and communications to support the stable operation of social infrastructures.

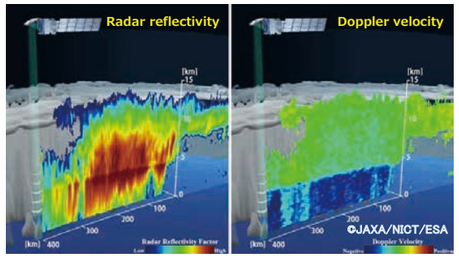
In addition, the RRI provides a foundation for accurate and reliable "time" to society through research on atomic clocks that are indispensable for generating and supplying Japan Standard Time. At the same time, the RRI identifies and evaluates the electromagnetic environment, which is becoming increasingly complex as communication and electronic devices become more sophisticated, and conducts research to contribute to the realization of a society where electromagnetic waves can be used safely and securely.

By scientifically elucidating the properties and mechanisms of electromagnetic waves and returning the research outcomes to society, the RRI will contribute to building a sustainable and reliable future.

NICT's Latest Research at a Glance

Remote Sensing Technologies for the Earth's Health Checkups

Remote sensing is technology that literally performs "sensing" (measurement) from a "remote" place. NICT conducts R&D of technologies for monitoring the Earth's environment from the ground, from the sky, and from space, by using electromagnetic waves. For example, a Multi-Parameter Phased Array Weather Radar (MP-PAWR) observes the three-dimensional structure of rain clouds extremely accurately in only 30 seconds, and it can speedily capture drastically changing phenomena, such as sudden thunderstorms. In addition, a cloud profiling radar (CPR) mounted on the EarthCARE satellite launched in 2024 observes clouds that are important for predicting climate change from space. In this way, remote sensing is significant technology that conducts the Earth's health checkups by using electromagnetic waves.

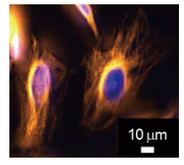


Clouds and rain observed by the EarthCARE/CPR

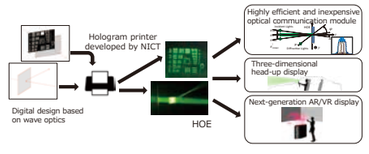
Measuring with Light, Creating with Light — Holography and Technologies for Optical Elements

NICT develops precision measuring technologies using light by applying hologram technology (technology that displays a three-dimensional image). It has developed a technology capable of measuring microscopic roughness of approximately 1 μm (1/1000 of 1 mm) by utilizing a phenomenon called "light interference." Further, through technologies to record and reproduce weak light, such as fluorescence, and natural light as holograms, the hologram technology is anticipated to be applied to a new type of holographic microscopy that measures living cells and delicate, heat-sensitive materials.

In addition, NICT advances development of digital technology for producing ultra-compact, high-performance diffractive optical elements. In particular, optical elements called holographic optical elements (HOEs) are expected to be applied to a wide range of fields, including highly efficient and inexpensive optical communication modules that support the Beyond 5G era, three-dimensional head-up displays, and next-generation augmented reality (AR) and virtual reality (VR) systems.



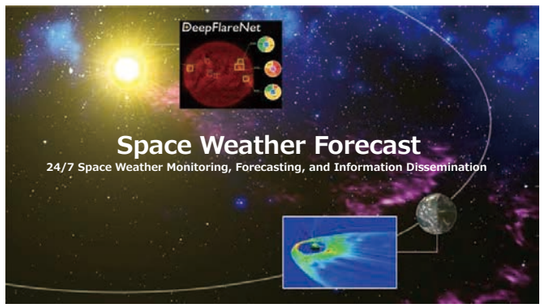
Hologram of living cells



HOE printing using a hologram printer

Space Weather Forecasts Becoming Ever More Familiar to Us

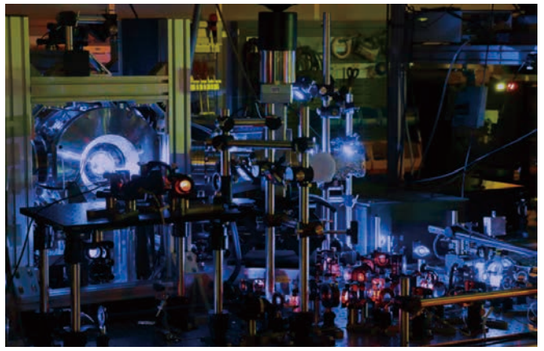
In outer space just outside the Earth, the space environment may be greatly disturbed due to a sudden increase in clouds of electrically charged gas or electromagnetic waves, such as X-rays, that are ejected from the Sun in line with solar flares—an explosive phenomenon on the Sun's surface. Such disturbances may also affect systems that support our social activities on the Earth, such as causing radio communication interferences, substantial GPS errors, or artificial satellite failures. NICT observes such changes in the space environment, or "space weather," 24 hours a day and 365 days a year, and performs space weather forecasting, predicting the time and scale of any effects on the Earth, based on the obtained data. NICT also conducts R&D of observation and prediction technologies, and works to provide related information to users in an easy-to-understand manner. Space weather forecasting is research that will become increasingly important in future society where drone delivery, autonomous driving, and space travel will become commonplace.



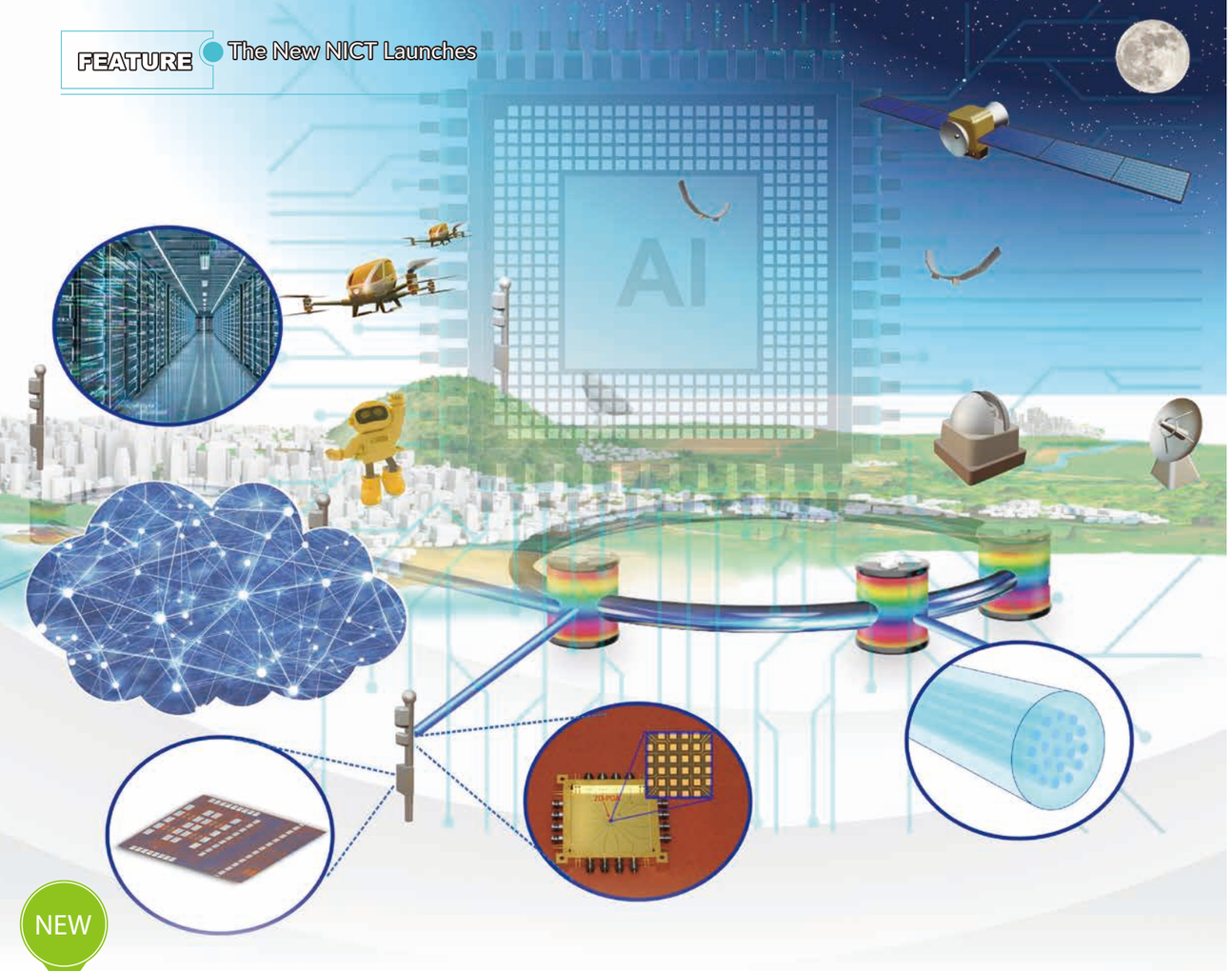
24/7 Space weather monitoring, forecasting, and information dissemination

Japan Standard Time and Atomic Clocks —Ultimate Research to Generate One Second

NICT generates Japan Standard Time and supplies it to society 24 hours a day and 365 days a year. As numerous social infrastructure systems in Japan operate based on this standard time, its accuracy is vitally important. Thus, in order to realize the length of "one second" that serves as the reference for the standard time with extremely high accuracy, NICT uses atomic clocks based on the inherent frequency of atoms, which stays constant regardless of time or place. The highest-accuracy atomic clock operated by NICT is the strontium optical lattice clock. Developed through R&D over about 15 years, the strontium optical lattice clock has been operated once a week for maintaining and sophisticating the standard time since 2021 to calibrate the length of one second, thereby maintaining and enhancing the standard time.



Strontium optical lattice clock NICT-Sr1



NEW

Network Research Institute

Delivering Security and Comfort Through Networks

The Network Research Institute (NRI) conducts R&D on five network fundamental technologies to deliver sustainable and robust safety and comfort to people, with an aim to achieve wide-ranging connections from the ground to space and to realize high-speed and reliable transmission of information and data. In network architecture technology, the NRI seeks to integrate communications with computing and AI, thereby enabling automated network configuration with high reliability in a wide area, and flexibly maintaining and extending functions of such networks. In photonic network fundamental technology, the NRI works to not only meet the future data traffic demand, but to also achieve effective utilization, stable operation, and high reliability of optical networks. In optical and radio wave convergence fundamental technology, the NRI aims to attain improved efficiency in electricity and resources consumed and stable data transmission through integration and convergence of functions to opto-electronic devices. In next-generation wireless technology, the NRI strives to use the limited frequency resources wisely without waste and build a future wireless system infrastructure that is both highly efficient and reliable, in order to meet diverse demands. In space communication fundamental technology, the NRI works to enhance the extensibility and speed of wide-area networks from the ground to space, and to ensure that communications are not interrupted anywhere at any time.

NICT's Latest Research at a Glance

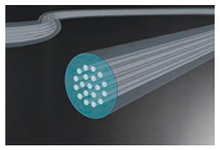
Novel Network Architectures Realized Through AI

In today's society, vast amounts of data are generated, exchanged, and processed in real time by advanced ICT applications such as AI. The Network Architecture Laboratory aims to contribute to the realization of an "AI/data-driven society" in which data can be used safely and with trust by everyone. To sustainably support such a society, a highly reliable, flexible, and intelligent network infrastructure is essential. The laboratory studies novel network architectures that tightly integrate networking, AI, and computing. Specifically, the laboratory's R&D focuses on the following themes: *advanced ICT infrastructure management and control technologies* for performing automated configuration and control of networks at various scales and for a wide range of uses, while ensuring high reliability; and *highly reliable in-network computing technologies* that improve communication efficiency by in-network computing, such as distributed AI inference, while enabling rapid failure recovery and flexible extension of network functions.

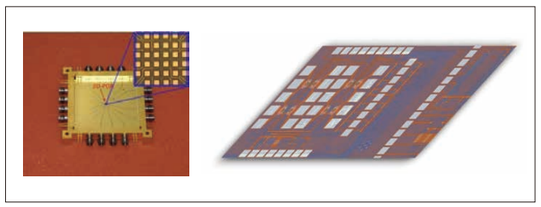
These technologies contribute to significantly improving the reliability and safety of social infrastructure by, for example, enabling stable maintenance of communication infrastructure and secure transmission of emergency information.

Using Both Light and Radio Waves to Achieve High-speed and Stress-free Communications

When exchanging a large volume of data, communications using optical fibers play an important role. In order to increase the capacity of optical fiber communications in the future, NICT conducts R&D on new types of optical fibers that have multiple light paths in a single optical fiber and methods of transmitting multiple lights of different wavelengths within a single optical fiber. NICT also develops methods to measure the conditions of optical fibers being used from a remote place to monitor them for any anomalies, and takes on the challenge to develop new communications that optically connect satellites in space at high speeds. Meanwhile, wireless communications using radio waves are convenient when exchanging data while moving, as in the case of smartphones. To enable users to communicate without stress, NICT develops more convenient communication methods that use both light and radio waves in their effective ways, and studies opto-electronic devices for realizing more compact communication equipment that consumes less power. By combining these technologies, NICT aims to build a higher-speed, more stress-free communication environment.



New type of optical fiber



Opto-electronic devices

Intelligent Wireless Communications That Will Support Everyday Lives in the Future

In the near future, not only smartphones and robots, but all kinds of equipment and vehicles around us, including autonomous driving cars and flying cars, will be connected by radio waves and will operate in coordination while exchanging information with each other. However, if such equipment and vehicles continue to increase, communication delays and congestion may occur, or they may interfere with each other, causing them to malfunction.

Accordingly, NICT is advancing research on a "next-generation wireless communication network" that identifies the conditions of radio waves and communications while the equipment or vehicle is being used, and intelligently adjusts their conditions. It is next-generation communication infrastructure that supports a future where people can remotely move their avatar robots at will and flying cars can fly safely in the sky.

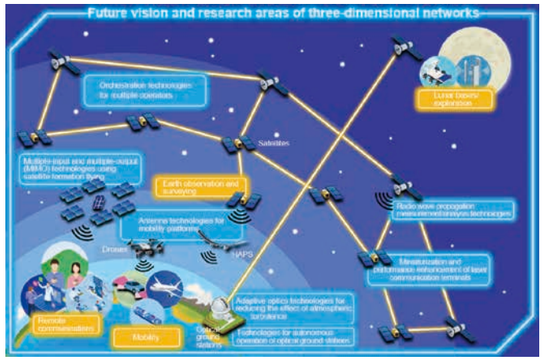
Smartphone Can Be Used Anywhere at Any Time! A Three-dimensional Network Expanding to Space!

The smartphones we use every day are connected to the internet by exchanging radio waves with nearby base stations. However, when we go to places where no base stations are installed, such as in mountains or at sea, we will be cut off from the network. A solution to this problem is a "three-dimensional network." A three-dimensional network is a new network that enables exchange of information anywhere, by expanding the communication mechanism to cover not only the ground level, but also various altitudes, such as the sky and space.

This new network performs communications via high-altitude platform stations (HAPS), which are base stations using unmanned aircraft vehicles that fly in the stratosphere of 20 km, twice the altitude of passenger aircraft routes, or via satellites in space at an even higher altitude of 100 km or more.

NICT conducts research for connecting these HAPS and satellites by communications through radio waves or laser, and building three-dimensional networks that take advantage of their respective features.

As this technology makes it possible to exchange information stably in places where radio waves did not reach in the past, it is expected to be utilized for diverse purposes, including remote communications, Earth observation and surveying, and infrastructure restoration after disasters.



NEW

Cybersecurity Research Institute

Protecting Japan and Its Future from Cyberattacks

The Cybersecurity Research Institute collects large volumes of information on a wide variety of cyberattacks that are actually taking place on the Internet and conducts practical R&D on cybersecurity, such as applying artificial intelligence (AI) to the analysis of this information, developing visualization techniques that help people understand it, and automating measures for protecting organizations and individuals. The Institute also engages in R&D that constitutes the fundamentals of information security, including the development of new cryptographic technologies and security evaluations of such technologies. In addition, the Institute promotes efforts to enhance security measures for IoT devices by surveying vulnerable devices connected to the Internet in Japan and alerting their users. The Institute also implements a cybersecurity human resource development program.

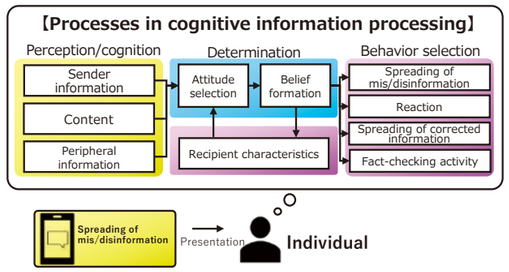
Furthermore, as a core hub for industry-academia-government collaboration, NICT leads initiatives to improve Japan's self-sufficiency in cybersecurity and its cybersecurity response capabilities by publishing analyses of the latest cyberattacks, providing an open platform for human resource development, and evaluating domestic security products.

In the "WarpDrive" project shown in the opening image, the Institute provides, free of charge, security software for PCs and Android smartphones featuring Tachikoma, a character from the anime "Ghost in the Shell: SAC_2045." Through this project, the Institute is building a user-participatory observation network, clarifying the actual nature of attacks carried out through websites and browsers, and conducting R&D on technologies to counter them.

NICT's Latest Research at a Glance

Finding Hidden Traps—Truth Behind Lures in Social Media

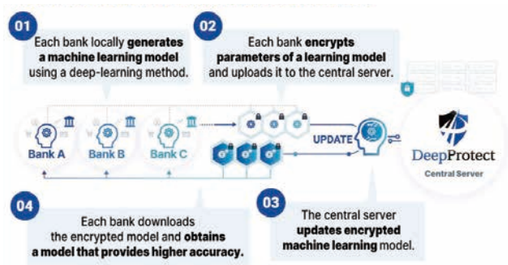
Have you ever come across such alluring posts as "high-paying job: earn several tens of thousands of yen in a day"? In fact, they contain a risk of being involved in a crime or lured into a fraud. We analyzed tens of thousands of illegal posts on social media, and thoroughly investigated how to distinguish them. It turned out that posts involving a crime tend to use specific place names or similar wording repeatedly, whereas posts for luring into a fraud tend to emphasize the type of person they are seeking and include many mentions. These characteristics serve as clues for finding malicious posts. Furthermore, we delved into the mechanism of "why people fall into believing mis/disinformation." The survey of several hundred people revealed that the factors behind believing mis/disinformation are not singular, but rather multiple factors that are intricately intertwined. It was also clarified that the percentage of people who believe mis/disinformation changes significantly by the order of information presented and how information is corrected on social media. Frauds and mis/disinformation on the internet evolve day by day. In order to counter their devious tricks, we are advancing R&D from the perspectives of both data and psychology.



Elucidating processes in human cognitive information processing

Passing on a Reliable Digital Society to the Next Generation—Addressing Threats in a Quantum Era Through Cryptographic Research

We are able to shop and exchange messages online without concern because "cryptographic technologies" protect us behind the scenes. Modern cryptography is a technology that protects data safely by converting it mathematically. However, some widely used cryptographic algorithms may be broken once quantum computers come into practical use in the future. Therefore, NICT conducts security evaluations and R&D on "post-quantum cryptography (PQC)" that can withstand quantum computers. In addition, NICT carries out security evaluations of end-to-end encryption (E2EE) that is used in Zoom and LINE, and research on privacy-preserving federated learning technologies, such as "DeepProtect," which enables multiple organizations to collaboratively train machine learning models while keeping sensitive data private and without directly sharing it among participants. Moreover, NICT is engaged in the development of diverse cryptographic technologies for protecting future communications, including cryptographic circuits that enable secure communications even in space.



Example of fraud detection in financial transactions using DeepProtect

Frontier of Security in the AI Era

With the rapid adoption of services such as ChatGPT, AI has substantially changed our everyday lives. On the other hand, cyberattacks against AI have also become more sophisticated, which makes the security of AI itself a critical issue. NICT promotes R&D based on the following three pillars: "AI for Security"— protecting cyberspace with AI technologies; "Security for AI"—verifying and evaluating the security of AI itself; and "Trustworthy AI"—presenting AI's decision basis in a form understandable to humans. In particular, for large-scale language models (LLMs), NICT has developed a platform for evaluating the security of AI from multiple perspectives, such as the safety and the risk of malicious use in cyberattacks, and works to visualize the risks and the reliability of AI. In addition, NICT also works on "explainable AI" which can explain the determination process leading to AI's responses in a manner understandable to humans, and aims to support the security of AI utilization.

Three pillar of R & D promoted by the Center for Research on AI Security and Technology Evolution

Development of Security Human Resources for Protecting the Future

As cyberattacks become more sophisticated and complex, there is a serious global shortage of experts capable of responding to such attacks. Since cyberattacks have become an everyday threat, securing personnel capable of responding appropriately is a serious challenge shared by many organizations. As a program for developing security operators, NICT provides the practical cyber defense exercise program "CYDER," in which participants can experience a series of response procedures in a cyberattack scenario through role-playing. The program is aimed at personnel from national government bodies, local governments, and critical infrastructure sectors. NICT conducts in-person exercises nationwide and also provides online exercises so that trainees from anywhere in the country can participate, thereby contributing to strengthening Japan's capacity to respond to cyberattacks. Furthermore, NICT provides "RPCI," a more advanced practical cyber exercise program based on the same concept. In addition, NICT provides "SecHack365," a security innovator development program that enables young people aged 25 years or younger to acquire creativity and practical skills over a period of one year, thereby fostering young talent who will lead the future.

SecHack365 event

NEW

Universal Communication Research Institute

Future AI for Overcoming Differences

The Universal Communication Research Institute conducts R&D on AI technologies for overcoming not only language differences, but also diverse "communication barriers" including cultural, situational, and spatial barriers as well as the divide between the physical and virtual spaces. The R&D focuses on two core technologies: large language models (LLMs) that deeply understand the Japanese language and Japanese cultural and social contexts, and the infrastructure required to utilize them, as well as multimodal communication technologies that comprehensively process diverse forms of information, including audio, image, video, and sensor data.

When people seek to understand a conversation or situation, they rely not only on words but also on contextual factors such as their surroundings, the other person's movements and facial expressions, and their social and cultural backgrounds to interpret them.

Using this nature of human understanding as a model, NICT aims to establish AI infrastructure technologies that can flexibly interpret contexts and situations by integrating diverse data from both the physical world and digital spaces.

Through these technologies, NICT seeks to support human decision-making and actions, while enabling richer communication that includes non-verbal information even in remote environments. At the same time, for AI to be used safely in society, not only performance but also alignment with culture and values is essential for trust. NICT conducts R&D on mechanisms that enable AI systems to evaluate and improve their own behavior through collaboration with diverse AI models. Through these efforts, NICT aims to address societal challenges with safe, secure, and trustworthy AI originating from Japan.

NICT's Latest Research at a Glance

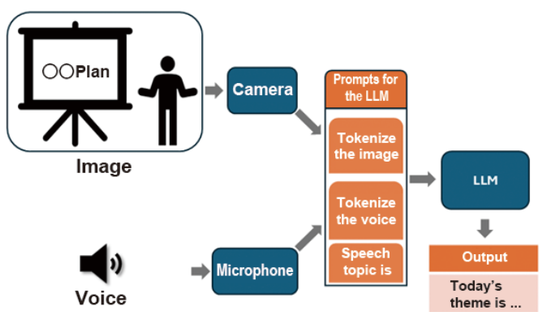
Examining Whether an LLM Can Be Appropriately Used in Japan

AI performs various tasks in response to user requests when text, audio, or image data are provided as input. LLMs such as ChatGPT are a type of AI that is increasingly used in various settings. However, because many LLMs are created overseas, it remains unclear whether they provide balanced outputs that respect Japanese cultural values and perspectives. For example, it is not desirable for an LLM to present only a specific opinion on issues for which opinions differ across countries. If such an LLM is used, there is a concern that our own views may become biased without our awareness. Therefore, NICT conducts R&D on a platform that uses AI to dynamically evaluate LLMs.

Using an "AI composite technology," capable of simply and efficiently combining various AI systems and LLMs developed so far, the platform automatically generates "tricky questions" to reveal the characteristics of an LLM, poses these questions to the LLM, and automatically evaluates its responses. Further, based on the evaluation results, the platform automatically creates training data to supplement the knowledge and common sense which the LLM lacks, and provides support so that the LLM can be used with greater confidence.

Multimodal Speech Recognition Systems for Fast and Accurate Transcription

Large language models (LLMs) use AI to predict the next word or "token" based on context. For instance, a model can predict that "er" follows "today we have nice weath" or that "ball" follows "my favorite sport is base." Researchers have developed new methods to make such predictions faster and more accurate. Building on these advances, NICT has developed a highly accurate multimodal speech recognition system that generates transcripts not only from audio signals, but also from visual information such as presentation slides. By integrating multiple sources of information, the system can recognize speech more accurately than conventional speech recognition systems. One of the next challenges is to enable AI to understand not only spoken words, but also non-verbal information conveyed through speaking style, intonation, and facial expressions. NICT is currently applying these technologies to develop next-generation AI-powered simultaneous interpretation systems.



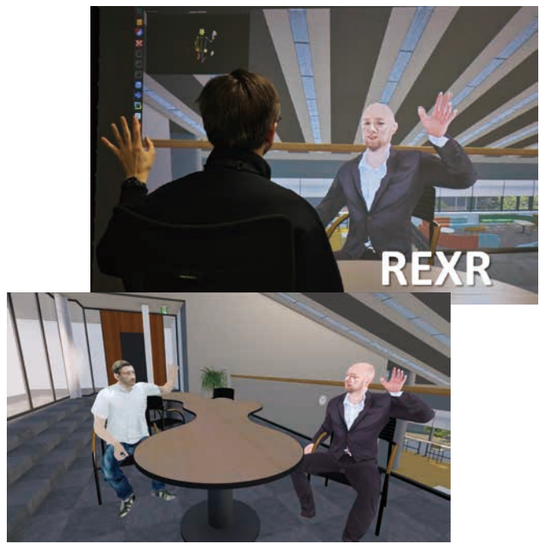
High-Accuracy Speech Recognition Enhanced by Text Information in Images

Connecting Various Data in Society to Predict the Future

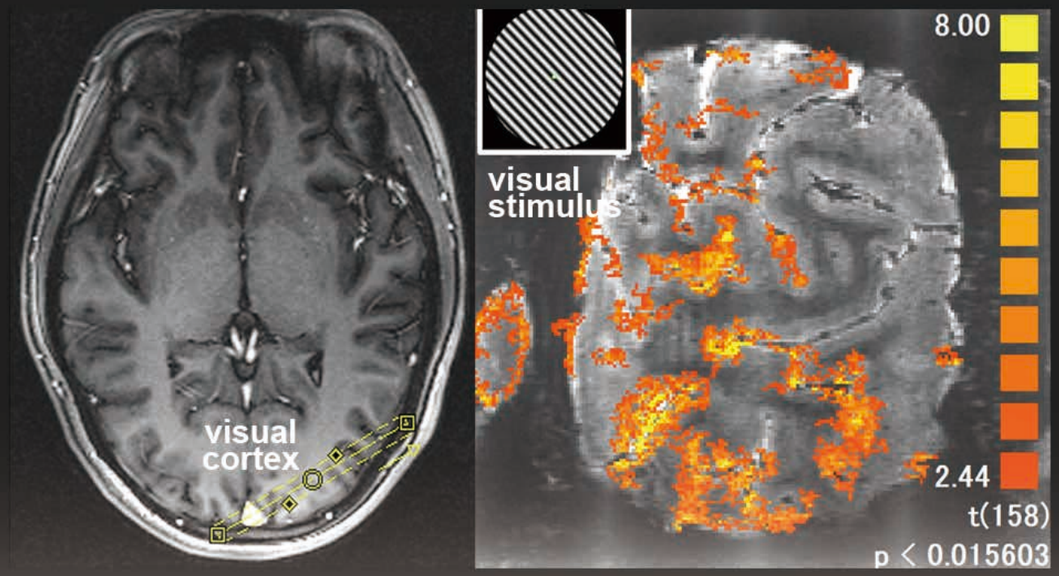
NICT conducts research on AI that combines data generated across various sectors of society to predict hazardous events or support people's actions. For example, by combining video data from a dashcam (dashboard camera) mounted on a car with other data sources such as vehicle sensor data and the driver's heart rate, it will be possible to detect or predict accidents and near-miss incidents more accurately. As such data contain various types of personal information and confidential information, NICT is also studying "federated learning" technology, which trains AI without sharing private information. Through this research, NICT aims to build AI systems that will be useful across a wide range of fields, including transportation, manufacturing, healthcare, and disaster prevention, to achieve a safer and more sustainable society.

Realize Remote Communication Through Your Own Realistic 3D Avatar!

REXR (Realistic and EXpressive 3D avataR), developed by NICT, is a technology that creates a realistic 3D avatar of yourself from 2D images captured by a single webcam and reproduces your facial expressions and body movements on the avatar in real time with high fidelity. Even when communicating remotely, REXR enables people to share a 3D space as if they were face-to-face, and effectively conveys nonverbal information such as facial expressions, gestures, and eye gaze, thereby fostering mutual understanding and trust. In the future, we aim to realize remote shared experiences and collaborative work through avatars within digital twin environments that digitally replicate the real world in cyberspace.



REXR Communication System



adapted from Liu et al., Magnetic Resonance in Medicine, 2025.
https://doi.org/10.1002/mrm.30569

NEW

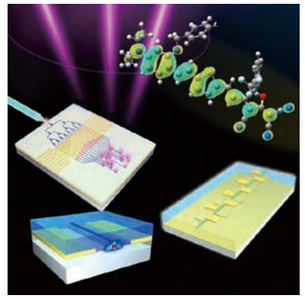
Advanced ICT Research Institute
Pioneering the Future of ICT

Based on the principle of "Pioneering new frontiers in ICT research," the Advanced ICT Research Institute undertakes cutting-edge and fundamental research themes relating to devices, materials, quantum technology, biotechnology, and neuroscience technology. By continuously creating new groundbreaking technologies, we promote the formation of new concepts and frameworks that will serve as the basis for ICT supporting a prosperous, safe, and secure future society. While the development of ICT has enriched our lives, many challenges that need to be tackled have also come to light. The challenges include, for example, creating ICT systems capable of handling the diversification of information distributed on information and communication networks and a rapid increase in the amount of such information, an associated increase in power consumption, expansion of security risks, and supply of scarce resources. In order to fundamentally resolve these challenges, it is necessary to conduct research for creating novel technologies, materials, techniques, and innovations beyond that are not just the extensions of currently used technologies, but are based on completely new approaches or scientific principles, in a broad and phased manner from a long-term perspective. With such awareness, NICT conducts R&D aimed at creating an innovative ICT paradigm in a future society in 10 or 20 years' time.

NICT's Latest Research at a Glance

Organic Electro-Optic (EO) Polymers That Create the Speed of the Future

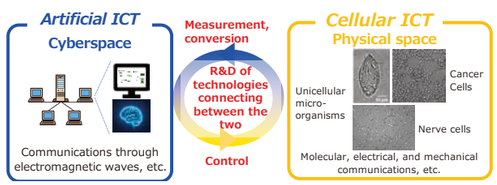
We are able to view videos or send messages on our smartphones and PCs without stress, thanks to "optical communication" where light is transmitted at an ultra-high speed in an optical fiber. However, the original information is in the form of electric signals, so it cannot be sent through optical fibers as it is. What is needed is a device called an "optical modulator," which converts electric signals into optical signals. The higher the performance of the optical modulator, the faster the communication speed is. Current optical modulators, which use inorganic materials, such as silicon, are beginning to show signs of limits in speed and efficiency. Therefore, the Nano-scale Functional Assembly ICT Laboratory is developing organic EO polymers in order to exceed these performance limits. Organic EO polymers have a property in which their refractive index changes when voltage is applied, and are capable of performing efficient and ultrafast control of light. In addition, organic materials allow a high degree of freedom in combination of atoms, and their performance can be finely adjusted according to use. By using organic EO polymers, it is possible to further increase the speed and reduce the power consumption of optical communication. Moreover, the laboratory develops a three-dimensional display that manipulates light to create a realistic three-dimensional image and a new communication technology that converts terahertz wave signals (ultra-high frequency radio signals) into optical signals.



Organic EO molecule structure and ultrafast light control devices using organic EO polymers

Technologies for Learning and Utilizing the Mechanisms of Cellular Communication

"Cells," the fundamental units of living organisms, gather information from the surrounding environment, make decisions, and convey the processed information to other cells. Cells conduct such information communications naturally and with small energy consumption. However, their mechanisms have not yet been fully understood and remain far from being effectively utilized in ICT. Therefore, the Bio-ICT Laboratory is advancing R&D on technologies for measuring the information communications between cells and converting the obtained data into digital information. The laboratory has also ventured into creating components of robots that "feel, think, and move by themselves," using new cell-derived materials. It is a cutting-edge research field essential for creating new ICT, which will open up the future of healthcare and robots.

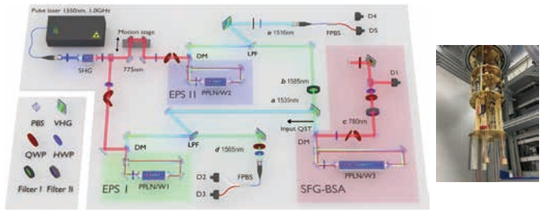


R&D on technologies connecting between information communications conducted by artificial ICT and those conducted by cells

Pursuing the Further Potential of Quantum ICT Toward Communications Secure Against Eavesdropping

The Quantum ICT Laboratory conducts research aimed at realizing new communication technologies that take advantage of the unusual characteristics of "quantum mechanics" which govern the microscopic world. Research on secure quantum communications between satellites and ground that are said to be impossible to eavesdrop on in principle is nearing the phase of practical use. However, for achieving further development, it is important to further develop technologies that enable the effective use of "quantum bits (qubits)."* In quantum optics research, the laboratory is developing technologies to manipulate photons that can be treated as qubits, so as to enable communications with the highest level of "reliability" and "security." In addition, in research on trapped-ion qubits, the laboratory aims to realize "quantum memories" that store information transmitted through quantum communications. Moreover, in research on superconducting qubits, the laboratory strives to achieve advanced qubit manipulation to expand the limits of computations and communications required in finance and public security. In this way, the Quantum ICT Laboratory is building an infrastructure that supports the future information society through realization of quantum communications and research on fundamental technologies underpinning their development.

* A unit of information that can have not only either 0 or 1, but both 0 and 1 at the same time



Technologies for exchanging and processing information in a world governed by "quantum mechanics"

Changing the Future with an Artificial Brain That Understands People's Feelings

When we see or hear something, we can feel "It's fun!" or "I'm happy!," or consider other people's feelings. All of these are our brain's activities. The Center for Information and Neural Networks (CiNet) is trying to elucidate the mechanism of the brain, and create an "artificial brain" that can think and feel like humans. For example, the CiNet has developed a technology called "CiNet Brain" which can predict how people will feel when they see a photograph or a video. As the CiNet Brain can tell which design will be accepted more favorably by people, it is actually being used in making video advertisements. Going forward, the CiNet aims to create an artificial brain that can consider other people's feelings even more, not only based on information seen or heard, but even based on smell or taste.

Artificial brain that sees and feels like humans

Spring 2026 Conferment of Medals

Medal with Purple Ribbon

(Achievements in Invention and Improvement)

SUMITA Eiichiro

NICT Fellow

Recipient's Comment

I am deeply honored to have been give this opportunity at this time in recognition of the research achievements in language technologies, particularly automation of translation, made over the years at IBM, ATR, and NICT. The research on corpus-based translation, which we have worked on from its early days, subsequently evolved to statistical machine translation, and further to neural machine translation, generating significant results both in research and social implementation. I believe a major step forward at NICT was that we were able to develop the "Translation Bank," a framework for parallel corpus accumulation, and promote this framework in tandem with social implementations, such as speech translation "VoiceTra" and text translation "TexTra." These could not have been accomplished without the continuous support of the respective organizations and the cooperation of joint researchers and other persons concerned inside and outside NICT. I would like to express my deep appreciation to all those who were involved.

Spring 2026 Conferment of Medals

Medal with Purple Ribbon

(Achievements in Invention and Improvement)

HARADA Hiroshi

Research Executive Director
Wireless Network Research Center, Network Research Institute

Recipient's Comment

It is an undeserved honor to receive a Medal with Purple Ribbon.

Research and development of Wi-SUN, for which the medal was awarded, began with NICT's early achievements in wireless communication technologies for the Internet of Things (IoT) as its core.

As a Japan-originated system, the standardization process for Wi-SUN was proceeded inside and outside Japan, mainly by the US Institute of Electrical and Electronics Engineers (IEEE), and Wi-SUN was successfully introduced to electricity smart meters. Further evolution has been driven by the accumulation of research results by Kyoto University, expanding to lifelines beyond electricity, such as gas, and to the smart city field. Wi-SUN has now been commercially introduced on a global scale. This achievement is the result of the continuous support by a large number of researchers, interested parties, and companies. I would like to extend my heartfelt gratitude to them. Going forward, I will devote myself to further studies and work toward developing safe and secure wireless communication technologies of public nature that serve the public interest.

Tsushinbunka Association

71st Maejima Hisoka Award

Description: Leading research on bio-electromagnetic compatibility by realizing experimental high-precision exposure assessment in the terahertz-frequency region

MIZUNO Maya

Chief Research Manager
Electromagnetic Compatibility Laboratory, Electromagnetic Advanced and Infrastructure Research Center, Radio Research Institute

Recipient's Comment

I would like to express my sincere gratitude to everyone who has made this award possible. I am honored to have been able to contribute to the research and development of measurement technologies in the fields of electromagnetic environments and terahertz science. In appreciation of the warm guidance and support I have received from so many people, I will continue to devote my efforts to the further advancement of these two fields. I would greatly appreciate your continued support.

Tsushinbunka Association

71st Maejima Hisoka Award

Description: Development of DeepProtect—a privacy-preserving federated learning system

DeepProtect Development Team (Group Award)

MORIAI Shiho, KANAMORI Sachiko, KUROKAWA Takashi, NOJIMA Ryo, OHKUBO Miyako, PHONG Le Trieu, PHUONG Tran Thi, SHINOHARA Naoyuki, TAMURA Chiyo, TOKUDA Aya (IDI), WANG Lihua, YAMAMOTO Shuntaro

Recipients' Comment

We believe that this award reflects the steady progress achieved by the Security Fundamentals Laboratory and would not have been possible without the dedication of the many members who contributed to this effort.

The DeepProtect project involved multiple demonstration experiments that required careful coordination among all the parties involved. We would like to extend our sincere gratitude to the financial institutions that participated in the project despite the considerable coordination required, as well as to the universities and companies that collaborated with us, and to everyone who supported the project.

Going forward, we will continue to pursue research and development that contributes to the security and safety of society.

NICT NEWS 2026 No.4 Vol.518
Published by Public Relations Department, National Institute of Information and Communications Technology
Issue date: Jul. 2026 (bimonthly)
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184-8795, Japan
E-mail: publicity@nict.go.jp
URL: https://www.nict.go.jp/en/
@NICT_Publicity
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ISSN 2187-4050 (Online)