

**FEATURE**

## Accelerate NICT Open Innovation —For the further co-creation stages—

**Interview**

## Making Cutting-edge Technologies New Social Value through Open Innovation

**OPEN INNOVATION**

FEATURE

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**Cover Photo:**  
This photo represents the creations achieved by open innovation, including the research and development that the NICT is conducting with other organizations.

**Upper left Logo:**  
The word “oi” stands for open innovation. The first letter ‘o’ in NICT blue with the top not closed indicates the NICT’s openness to society. The second letter ‘i’ represents humans (similar to the Chinese character meaning a person). The dot at the top of the letter means creating unique ideas. The color of the letter ‘i’ is orange, which is the organization color of the Open Innovation Promotion Headquarters. The colors of ‘o’ and ‘i’ contrast with each other. The word “oi” thus means that the NICT, which has the most advanced ICT, forms tight bonds with people and society, complementing each other, to create new values.

FEATURE Accelerate NICT Open Innovation  
—For the further co-creation stages—



Interview

## Making Cutting-edge Technologies New Social Value through Open Innovation

Open Innovation Promotion Headquarters

NAKAZAWA Junichi

Senior Executive Director / Headquarters Chairman of Open Innovation Promotion Headquarters

Entered Ministry of Posts and Telecommunications (currently MIC; Ministry of Internal Affairs and Communications) in 1990. Engaged in radio policy, information and communication policy, he became Director of Land Mobile Communications Division in MIC. In NICT, he served as Secretary General of Open Innovation Promotion Headquarters. Current position since July 2019.

Society 5.0, AI, IoT, and Beyond 5G / 6G ... the world of information and communication technology (ICT) is developing rapidly. When creating new values from these cutting-edge technologies, collaborations play a key role.

We interviewed NAKAZAWA Junichi, Headquarters Chairman of the Open Innovation Promotion Headquarters, about the open innovation initiative being conducted by the NICT.

— What is the background of the open innovation initiative being promoted by the entire NICT?

NAKAZAWA ICT is evolving rapidly, so we need to create new values by not only using the outputs of our in-house research and development, but also collecting various technologies and ideas from outside. The NICT must improve technologies by working with other organizations in various fields and then deploy them in society, in other words, it must carry out innovation in an open manner. And this process must be done quickly due to international competition. Therefore, the goal of this open innovation initiative is to maximize the outputs from NICT R&D.

— What is the policy of open innovation?

NAKAZAWA By effectively using our lat-

est technologies, human resources, and research infrastructure such as testbeds, we are promoting industry-academia-government, international, and local collaborations. Through these collaborations, the process enters stages of social demonstration and social implementation, while properly recognizing social issues and user needs, while keeping an eye on the market and business, as well as developing seed technologies. In this process, it is crucial to establish an appropriate system and structure for collaborations. It is an important fact that the NICT has neutrality as a National Research and Development Agency, and this neutrality allows the public to tackle common issues through these collaborations.

This challenge is new for us, so it is very important to repeatedly practice and learn while receiving feedback.

■ Cultivating seed partnerships

— How do you cultivate specific local and industry-academia-government partnerships?

NAKAZAWA We have many divisions doing various types of work. One of them is the Strategic Program Produce Office. They identify social and local issues and needs by regularly swapping information with people who understand local issues, holding ideathons with local universities and organizations, and introducing our seed technologies to let people know about the research results of the NICT. The people at the headquarters jointly develop and support collaborations with external organizations through research. And we have some bilateral co-funding R&D programs among Japanese universities.

## Making Cutting-edge Technologies New Social Value through Open Innovation

— **There are plenty of testbeds. Are they frequently used by the private sector?**

**NAKAZAWA** Testbeds play an important role in collaborating with external organizations. As for integrated testbeds, we have built environments for ultra-high-speed networks and large-scale simulations, and IoT service infrastructure. They are used by many companies, as well as universities and research institutes in various stages from development to commercialization. They are very useful for checking product specifications and service performance in a large-scale testing environment before release.

In addition, the AI Science R&D Promotion Center has organized an AI data testbed and provides data for developing AI technology. This is a new form of testbed for promoting data-driven open innovation.

— **What open innovation is being done at the Resilient ICT Research Center, Big Data Integration Research Center, and Terahertz Technology Research Center?**

**NAKAZAWA** The Resilient ICT Research Center is conducting R&D and demonstrations for building a resilient society based on wired and wireless networks, and information exchanged through those networks. For example, they are performing open tests of the DISAANA and D-SUMM systems that can rapidly analyze huge numbers of posts on Twitter and summarize disaster information. These systems are currently being used by municipalities as well.

The role of the Terahertz Technology Research Center is to carry out R&D, and to standardize the terahertz band, which will be one of the fundamental technologies for Beyond 5G / 6G. They also operate a laboratory

for prototyping advanced devices for a wide range of wavelengths including light, terahertz and millimeter wave, and the lab is used by external organizations too for promoting open innovation.

The Big Data Integration Research Center carries out research and development on human behavior modification through prediction using data linkage among environmental, traffic, health, and other sensing data and development of an analysis platform. The platform is now being demonstrated in Japan and overseas before being introduced into society.

— **We heard there is a plan to create a system or structure for social implementation.**

**NAKAZAWA** Social issues are diverse, ranging from everyday life including disaster prevention and medical, education, security and monitoring, to those in manufacturing, sightseeing, agriculture, etc. We have strengthened collaborations using the current commissioned research scheme of the NICT. As the next step and beyond, we are working to establish a system and structure for promoting collaborations.

For example, in the field of wireless communication, to ensure stable communication in a factory, we have established a body called FFPA\*1 with companies for standardizing and deploying the technology based on the results of an R&D project conducted by the NICT. This technology allows production lines to be changed flexibly and improves productivity. It can help solve common issues in manufacturing including the auto and machinery industries.

Regarding machine translation, we run the Translation Bank for accumulating translation data from all over the nation to help

improve the accuracy of translation. This ecosystem receives bilingual data from companies and provides (licenses) machine translation technology with improved accuracy in return. It is used in the pharmaceutical, financial, and auto industries among others.

### ■ Promoting global standardization and international joint research

— **What is strategic standardization?**

**NAKAZAWA** We are working hard to standardize the outputs of our R&D internationally. For example, we have succeeded in standardizing quantum key distribution technology, which is important for quantum cryptography, and have succeeded in securing the terahertz frequency band for wireless communication. Both of these are included in ITU\*2 recommendations (standard). These are important fields for Japan and this success came through collaborations with the related companies.

— **What international research partnerships do you have?**

**NAKAZAWA** The NICT has been conducting open innovation through international partnerships. We have been working on several international projects with government organizations in the U.S. and Europe, and now are focusing on partnerships with Southeast Asian countries. We have built a research platform, ASEAN IVO\*3, with universities and research institutes in ten countries to help solve their respective issues as well as common issues in the region.

— **What are the main issues in ASEAN countries?**

**NAKAZAWA** Since this region has high population densities and frequently suffers natural disasters, there are many projects dealing with food problems including agriculture and fishery, environmental protection and building resilient telecommunication networks. They are also working on a project for using the IoT to make society safer.

### ■ Using the knowledge and human resources of the NICT

— **Social implementation includes cybersecurity training and surveys.**

**NAKAZAWA** The training is conducted under the program for developing human resources in the field of security. The NICT has gained much knowledge on cyber threats through its research on cybersecurity. Exploiting this knowledge, testbeds and other infrastructures, we are conducting an exercise called CYDER\*4 targeting the engineers who manage the information systems of governmental and municipal organizations.

Regarding surveys, we have been testing IoT devices with improper password settings all over the nation. This survey is conducted in collaboration with the Ministry of Internal Affairs and Communications, internet service providers and so on.

— **Are there any initiatives for supporting young people to turn their ideas into reality?**

**NAKAZAWA** Developing young human resources in ICT is also one of our important roles. Targeting entrepreneurial university and high school students, we hold contests called “Entrepreneur Koshien” and “Entrepreneur Exhibition” to support their activities.

As a hackathon in security, our SecHack365 program helps to develop excellent software engineers and researchers as well.

### ■ Next stage of open innovation

— **What is your plan for society after COVID-19?**

**NAKAZAWA** ICT makes remote working and learning possible, and promotes a contactless lifestyle as the new normal. Concerning this role of ICT, we held a special online symposium, “Form of Society after COVID-19” on June 12 with panelists including NICT researchers, and specialists in medicine and economics (see pp.10-11). Our R&D outputs will underpin society during and after COVID-19, and open innovation will also play an important role.

— **What are the future prospects for open innovation at the NICT?**

**NAKAZAWA** As a National Research and Development Agency, it is increasingly important to collaborate with other organizations in order to create cutting-edge technology and turn them into social values. We will continue promoting open innovation. During strategic efforts in the fields of Beyond 5G / 6G, quantum communication, data exploitation including AI, and cybersecurity, both a global perspective and business attitude will become more important.

I hope that the philosophy and know-how developed in the NICT will expand our collaborations and challenges and lead us to the next stages of co-creation.



\*1 FFPA: Flexible Factory Partner Alliance  
\*2 ITU: International Telecommunication Union  
\*3 ASEAN IVO: ICT Virtual Organization of ASEAN Institutes and NICT  
\*4 CYDER: Cyber Defense Exercise with Recurrence

This interview was held remotely.

## Connecting Inside and Outside of the NICT to Realize Innovation

### Strategic Program Produce Office

Collaboration is an important key to realize open innovation. Because research institutes such as the NICT do not face social issues that the public has, in general, then they should hand over their technologies to the public for solving the social issues. The Strategic Program Produce Office conducts various activities to use the NICT's research results to realize innovation by teaming up with industry, academia, and local communities.



Hackathon "Future of Kita Kyushu City to be developed by IoT," held on December 1-2, 2018.

The Strategic Program Produce Office is a unique organization that serves as a hub connecting the inside and outside of the NICT. Its functions include investigating social issues in the public, disseminating the NICT's research results, developing human resources for carrying out sustainable innovation, and conducting research and development to solve social issues. The rest of this article describes three efforts toward these functions.

#### Technical Consulting Service

The Technical Consulting Service was initiated in March 2018, in which skilled NICT researchers provide solutions to various technical questions and issues asked by the public. The NICT has many researchers including leaders in their fields of research, as well as those teaching at universities, and those on government committees for discussing technical standards. It is a technological version of a legal information center, which

offers legal advice. Through this service, the NICT answers various questions from domestic companies and research institutes and has earned an excellent reputation from clients.

#### NICT SEEDs

The NICT's research results are published in academic journals and the proceedings of academic conferences. However, it is difficult to know whether these documents help people outside the NICT to solve their problems. Therefore, we have been issuing NICT SEEDs since 2019 to widely present research results to those people. NICT SEEDs helps to find results that best match real-life needs. There was a total of 2,400 downloads by the end of March 2020 and there have been many inquiries.

#### Ideathons and hackathons for developing local human resources

There are many social issues in local com-

munities, and it is important to solve them using information and communication technology (ICT). Therefore, the NICT trains staff in addition to conducting research and development. The NICT has held seven ideathons and hackathons since 2018 in Kanazawa and Sendai, where the NICT's local branches are located, and also in Kita Kyushu City and Shiojiri City. Local companies, universities, corporations, NPOs, etc. joined as participants, and also as mentors and advisors to mix and combine different technologies and share their know-how, as well as strengthen partnership with the NICT.

To implement the results of research and development in society, the Strategic Program Produce Office will promote innovation with ICT by connecting the inside and outside of the NICT.

## Open Innovation Promotion Headquarters



## Social Demonstration Using the NICT ICT Testbed

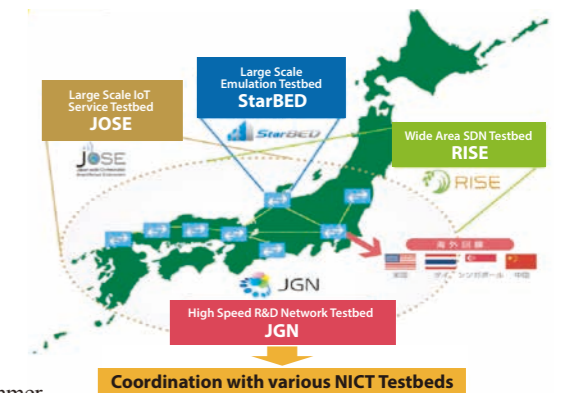
### ICT Testbed Research and Development Promotion Center

This Center has built the NICT ICT Testbed for technical and social demonstrations of the results of research and development at the NICT and other organizations, and is promoting the emergence of open innovation by leveraging the results. The following are three cases of social implementation resulting from the Testbed.

Case 1: Practical realization of wireless modules through verification of the security functions for the 920 MHz band wireless network, using Large Scale IoT Service Testbed JOSE. With the servers and sensors of JOSE, the network service access authentication, communication frame protection assuming time synchronization, accelerated parent assignment,

and other functions were verified. The commercial products are used for systems that remotely monitor the soundness of structures such as roads, bridges, and truss towers.

Case 2: Development of a new data access monitoring engine using Large Scale Emulation Testbed StarBED. The engine is designed to detect abnormalities and their signs in WiFi access points, etc. The architecture was verified and the performance was evaluated using 100 servers of StarBED. A detection and notification service was developed by using machine learning and is practically leveraged to manage WiFi access points. It learns waveforms and identifies unusual phenomena, which helps reduce alerts including misdetection and find



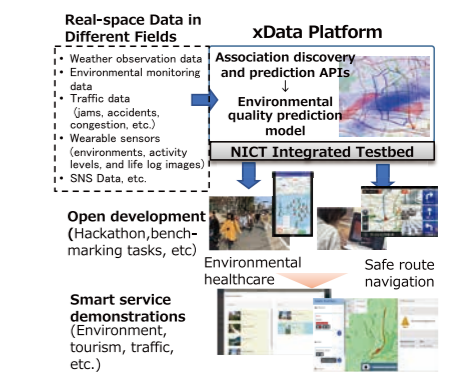
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## Building Smart Services Using Environmental Quality Prediction Based on Cross-data Analysis

### Big Data Integration Research Center

To contribute to the achievement of the SDGs by solving local environmental problems with Society 5.0, the Big Data Integration Research Center is conducting R&D for predicting various risks in daily life affected by the local environment such as extraordinary weather and air pollution based on association analysis between environmental and societal sensing data in different domains such as weather, atmosphere, traffic, and health. We are also developing a system to enable smart services for earlier use of the prediction results. The Event Data Warehouse extracts and collects real-space event information from sensing data by various sources,

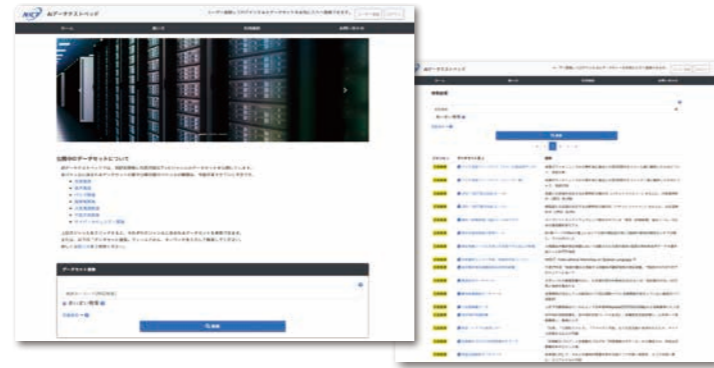
and archives them in a common format for cross-data analysis. The xData Platform is being developed on the NICT Testbed, which implements cross-data analysis functions based on data mining and machine learning for discovering and predicting associations in the Event Data Warehouse. Currently, the xData Platform provides 25 TB of event information in 11 fields, including NICT remote sensing data, as well as the APIs and tools for open data science and smart service experiments. Using the platform, hackathons have been held in Fukuoka City and Tokyo, where local citizens, engineers, and students design and prototype smart services,



including help for outdoor activities, taking into consideration the health risks due to air pollution and navigation for avoiding traffic disruption due to bad weather. Extending the results of these activities for practical use, we are conducting collaborative R&D with universities and companies in Vietnam and the Philippines because of their high awareness of environmental problems. Applying local data collected at the information portal of their smart cities, the environmental quality prediction models on the xData Platform are customized for their own smart services such as smart tourism, mobility and healthcare.

## Construction and Operation of AI Data Testbed

AI Science Research and Development Promotion Center



With AI technologies immensely transforming society today, the value and importance of data are drawing attention. NICT has focused on the importance of data from an early stage and has been accumulating various types of data from many research fields. The collection includes valuable data suited for constructing data sets to train AI models, which can be provided to industry, academia, and government to accelerate the research and development of AI technology and its implementation in society.

Since May 2019, the AI Science Research and Development Promotion Center has been operating the AI Data Testbed, which

accommodates NICT's collection of data assumed to be useful for AI development in 7 categories: language processing, speech processing, bio ICT, brain information, atmospheric environment, space weather, and cyber security. The Testbed is made available for researchers and engineers from NICT as well as other parties to download and utilize NICT's data. As of today, 48 data sets among the 7 categories have been released and are being used for open innovation. The BERT model, a machine learning model for natural language processing released in April 2020, recorded about 800 external downloads in just two and a half months, indicating high

public interest and expectations for the Testbed. The Translation Bank, which accommodates data collected not only by NICT but also by industry, academia, and government, is gaining attention as a new form of Testbed. We will continue to increase the amount of data and add new features to make improvements to the AI Data Testbed to turn this into the core infrastructure for NICT's data-oriented open innovation.

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## Focusing on Research and Social Implementation

Resilient ICT Research Center



Utilization of NICT systems in disaster management drills of local governments

ICT plays essential roles in the modern society, as it is sometimes compared to humans' neural networks. The 2011 off the Pacific coast of Tohoku Earthquake greatly disrupted information and communications systems, which made it extremely difficult to assess the damage, to reach refugees, and thus to effectively carry out recovery and rescue activities. Based on the lessons learned from the disaster, this center was established in April 2012. This research center features its focusing on research on resilient ICT and the promotion of social implementation of research outcomes, while collaborating with universities, companies, and public organizations.

The research themes include technologies

to enhance the resilience of optical networks, network technologies applicable even with severely limited network resources, and disaster information analysis technologies based on massive social intelligence on SNS.

To social implementation, the developed technologies via disaster management drills technical presentations at symposiums and exhibitions. In the drill of Kochi Pref. in 2019, we demonstrated a new technology to maintain network connection throughout the area, including where the public mobile network is unavailable. To realize this, vehicles fitted with newly developed network nodes traveled in and around the disaster area. In Konan City, Kochi Pref., a new municipal information sys-

tem using this technology is being introduced. We are also conducting nationwide disaster management drills via a network, in which we prepare remote support systems by computerizing unorganized disaster information. DISAANA and D-SUMM, which automatically analyze massive amounts of disaster information posted on SNS, have been open to the public on our website for test use and their software has been licensed to several companies. Moreover, a chat-bot, SOFDA, which actively collects and sends disaster information from/to local citizens, was jointly developed with other research institutes and companies. SOFDA was utilized by several municipalities when typhoons attacked in 2019.

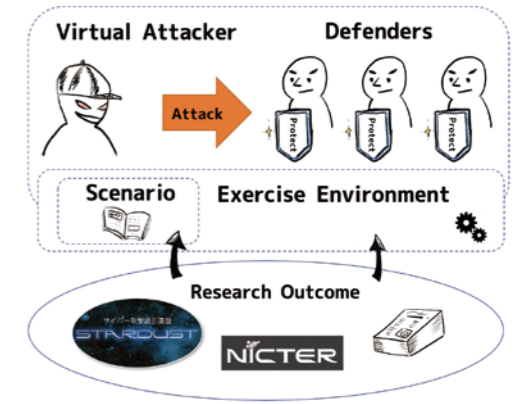
## Social Implementation of NICT Research Results through CYDER

National Cyber Training Center

CYDER is an exercise hosted by the NICT to strengthen the ability to respond to security incidents and accidents. Held in all 47 prefectures in Japan based on real-life scenarios, the exercise improves the security incident response of the entire nation.

The most important part of the exercise scenario is the "Introduction" part. Reflecting the latest trends in cyberattacks observed by NICTER, operated by the Cyber Security Research Institute of the NICT, the "Introduction" part enhances the effectiveness of the exercise. The findings from STARDUST, which observes the attackers of targeted attacks, etc. in environments that precisely

simulate government bodies and companies, make the scenario more realistic, providing real-life "incident experience" which enables a "prepared" reasonable response to an incident. The exercise scenario of CYDER is composed of and accumulated in multiple parts, which are being improved to enable scenarios to be generated automatically. The technology for automatic construction and operation of a virtual environment, which is an output of NICT research, has been implemented in CYDERANGE, an exercise environment on StarBED, which supports a busy schedule of more than 100 exercises targeting 3,000 people every year.



Recently, many people are forced to stay home due to the COVID-19 pandemic. To cope with this situation, the Center has publicized past exercise scenarios with additional descriptions, which were very popular. To respond to high needs, we will continue reviewing how we provide the exercises and their contents.

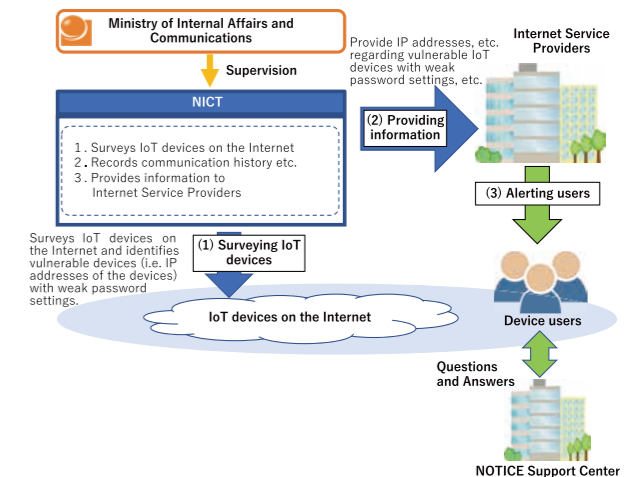
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## Survey of Vulnerable IoT Devices

National Cyber Observation Center

In recent years, cyberattacks have been tending to exploit the vulnerabilities of IoT devices, and so users need to take appropriate security measures for them. In response, the Act on the National Institute of Information and Communications Technology (NICT) (Act No.162 of 1999) was amended in 2018 (temporary measure for five years) to include the survey of vulnerable IoT devices with weak password settings as a function of the NICT. Since February 2019, the Ministry of Internal Affairs and Communications (MIC) and the NICT, in cooperation with Internet service providers (ISPs), have conducted the "NOTICE"

(National Operation Towards IoT Clean Environment) project to survey vulnerable IoT devices and to alert users to the problem. Specifically, the National Cyber Observation Center (NCO Center), which was established within the NICT in January 2019 to conduct these surveys, has been identifying IoT devices directly connected to the Internet with weak password settings and providing the IP addresses of these identified vulnerable IoT devices to the ISPs. Last fiscal year, the NCO Center investigated 110 million IP addresses allocated by 50



ISPs which had completed the application process for participation in this project by March 2020. As a result, a total of 2,249 devices were detected as vulnerable ones with weak password settings and ISPs have been notified.

## Advanced ICT Device Lab Open innovation platform

### Terahertz Technology Research Center

The Advanced ICT Device Lab, which operates three facilities, the Photonic Device Lab and Millimeter-Wave Research Facility at Koganei (Headquarters), and the Clean Room at Kobe Branch, is a research facility serving as an open innovation hub for researchers both inside and outside the NICT, to contribute to collaboration among government, industry, and academia. As the demand for ICT is rapidly developing, these facilities have advanced technologies for hardware development, for designing, prototyping, implementing, and evaluating devices. The purpose is to create fundamental technologies for innovative information and communication devices by fusing technolo-

gies for various electromagnetic wavelength ranges including light waves, millimeter waves, and terahertz waves. These facilities are used not only by NICT researchers, but also external institutions including companies and universities. In fiscal 2019, with 162 researchers from 36 organizations (29 universities and 7 companies) registered to conduct joint research with the NICT, these facilities contributed to the development of advanced device technologies and education of young researchers and engineers. To encourage innovation in device technology and to provide a venue for joint innovation among industry, academia, and government, we hold an Advanced ICT Device Lab Workshop



A trainee from an external institute receiving operational training

every year. At a workshop held in January 2020, there were 47 poster presentations and a total of 98 participants. In the poster presentations, there were lively discussions on technical areas ranging from basic to applied social implementation. The workshop served as an open innovation hub for promoting the exchange of information between users. In addition, we are preparing a new “Process library” which will standardize the device fabrication process in the laboratory. The library can also be used for a fee by those who are not participating in joint research with the NICT, and the number of users is expected to increase.

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## Use of Intellectual Property, Commissioned Research, and Personnel Exchanges to Maximize Research Results

### Innovation Promotion Department

To ensure that patent applications are made for inventions resulting from ICT research, this department offers advice to researchers. Submitted invention notifications will be examined and processed by a patent office, and a patent application will be filed. We also judge whether an overseas patent application is required, whether further review is required, and whether it is necessary to maintain the patent after acquisition, in order to ensure that patents are effectively used. Since the purpose of maintaining patents is to help research results be used in society, we introduce our patents to industry and license them.

In addition, if integration with the research conducted by the NICT is more efficient, research is commissioned to other institutes such as universities and companies who have applied for specified research themes and contents. An NICT researcher controls the commissioned research as a project officer. For evaluating commissioned research, an evaluation committee consisting of external experts has been established to conduct the prior evaluation, evaluation of adoption, intermediate evaluation, final evaluation, and post evaluation. Moreover, to develop open-minded and highly skilled specialists, we accept researchers



Sample Application of NICT Research Results  
(Water sterilizer using a deep-ultraviolet light-emitting device)

A small, high-output light source was realized by significantly improving the light extraction efficiency of a deep-ultraviolet LED. It is expected to replace the mercury lamps used in sterilization systems.

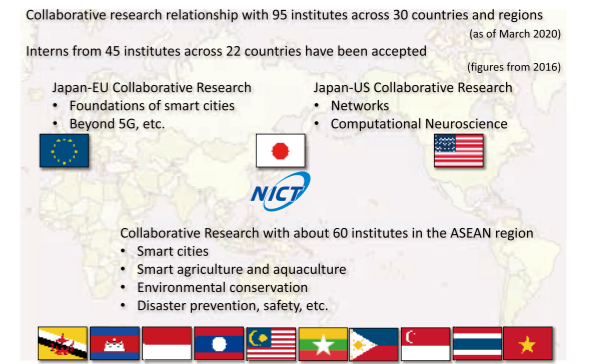
from institute and graduate students from home and abroad, and they gain skills by participating in NICT R&D. We encourage exchanges between researchers, including inviting external researchers to educate and advise NICT staff. We are also carrying out the “Matching Research Support Project” to conduct feasibility studies on new research themes with universities. In addition, we conduct R&D commissioned by government institutions, and then feedback the research results to society through international standardization. This maximizes the value of research results.

## Innovation and Social Implementation through Global Cooperation

### Global Alliance Department

In today’s world, where national borders are no barrier to the movement of people and business development, people from across the globe now come together to solve the world’s problems, leading to innovation and societal development. NICT works with nearly 100 institutions in 30 countries and has been actively promoting personnel exchanges, research partnerships and running international cooperation programs. To stimulate innovation, we have teamed up with the NSF to solicit international research projects in a new networking technology supporting IoT, and in computational neu-

rosience, which is a new approach in brain research. A project of the former program has demonstrated a new communication protocol over Japan-US networks. The latter has led to a multinational program, including participants from Germany, France, Spain and Israel. NICT are working with MIC and the EU in conducting programs for developing information and communications technology, and post-5G technology for smart cities. Cooperation between companies and universities in Japan and Europe has produced technology that has been proposed to an international standardization body.



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## Economic and Social Innovations with ICT: Supporting Startups

### Deployment Promotion Department

ICT has been changing society and the economy, and video streaming and social networking services (SNS) through the Internet are now commonplace. Most of these services have been created by startup companies. The NICT supports ICT startups and the entrepreneurs behind them. 1. Entrepreneur Koshien/Exhibition Every year, the NICT and the Ministry of Internal Affairs and Communications co-host the Entrepreneur Koshien/Exhibition, which is a national competition among teams of promising students and young entrepreneurs who have won business contests, etc. held throughout Japan. The participating

teams present their business plans which they have created with guidance from mentors who have knowledge of ICT startups. In fiscal 2019, the Hokkaido student team and the Kansai entrepreneur team received the Minister for Internal Affairs and Communications Awards. 2. Training in Silicon Valley Every year, students who participate in the Entrepreneur Koshien join training at Silicon Valley in the U.S., the center of startups. 3. Assisting Participation in Large-Scale Exhibitions The teams participating in the Entrepreneur Exhibition are given a chance to partici-

For societal development, we have established a joint research organization with around 60 institutes in the 10 ASEAN countries, and carried out nearly 30 projects in the fields of agriculture and aquaculture, environmental protection, disaster prevention, and safety and security, which are common issues for all the participating countries. Multi-language translation data, in nine languages, was created based on NICT research. The development and demonstration of environmental monitoring technology and farming assistance systems is currently under way, which are also expected to contribute to UN SDGs.



# Online symposium “What is your new normal since COVID-19?”

## Report on the Online NICT Special Open Symposium

In response to the State of Emergency Declaration on COVID-19 issued on April 7, the NICT Open House 2020 in Koganei, which had been scheduled to be held on June 12 and 13 as announced in the past issue (NICT NEWS 2020 No.2, Vol.480) in late April, has been cancelled. Instead, an on-

line NICT Special Symposium, titled “What is your new normal since COVID-19?” was held on June 12.

In view of the serious impact of the spreading COVID-19 pandemic on socioeconomic activity, this symposium had three sessions targeting different periods

(Figure 1), “Present: Pandemic growing,” “In about five years: Pandemic controlled,” and “In about five to 10 years: After pandemic leveling off,” NICT researchers and external experts discussed various matters in each session.

### Session 1

While the COVID-19 pandemic is still spreading throughout the world, there are growing expectations for the use of ICT to counteract infection clusters and hospital-acquired infections (e.g. contact-tracing apps). On the other hand, it is still important to ensure cyber security when using ICT in such situations. In Session 1, titled “How ICT Can Help Fight COVID-19,” the panelists listed in Figure 2-1 discussed the roles and issues of ICT as a countermeasure against COVID-19. The discussion pointed out the importance of promoting research and development to ensure that technologies that help emergency medical care are always available.

### Session 2

As each country has started to resume economic activity while on the lookout for the second and third waves of COVID-19 infection, people have expectations for ICT in taking measures against infection while maintaining socioeconomic activity. In Session 2, titled “Socioeconomic innovation based on COVID-19 measures,” the panelists listed in Figure 2-2 discussed possible strategies for maintaining socioeconomic activity while protecting people’s lives. The panelists proposed a social structure that avoids the three Cs (closed spaces, crowded places, and close-contact settings), and expected the NICT to conduct research and development while taking socioeconomic factors into consideration.

### Session 3

The future socioeconomic world after the Covid-19 pandemic (society after Covid-19) could be different from normal expectations. In Session 3, titled “What is your new normal since Covid-19?,” the panelists listed in Figure 2-3 discussed the form of society after Covid-19 and how we should realize it by changing conventional socioeconomic activity including the way of working, and designing a society and economy with true digital transformation (DX).

The panelists emphasized that tomorrow is not yesterday and we should do everything that we can do.

At the end of the symposium, President TOKUDA concluded that NICT will help innovate society and economy with ICT and will help create new industries and services through advanced R&D on ICT and implementing the results in society, to build a resilient and digitally transformed society after Covid-19.

The programs, distributed video, and presentations are available at:

<https://www2.nict.go.jp/publicity/open-symposium/>

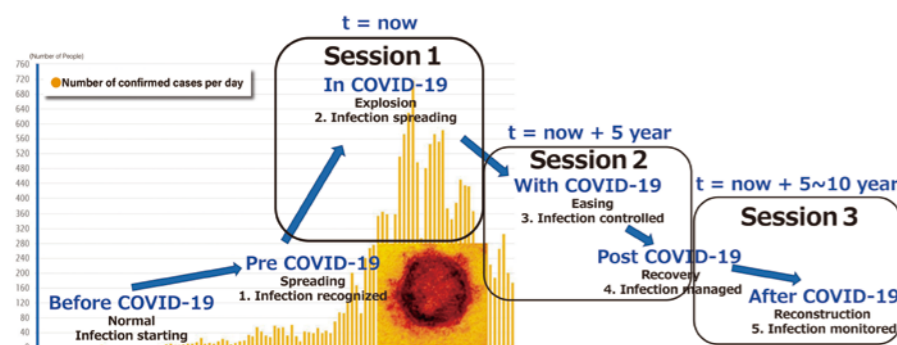


Figure 1 Target of Each Session

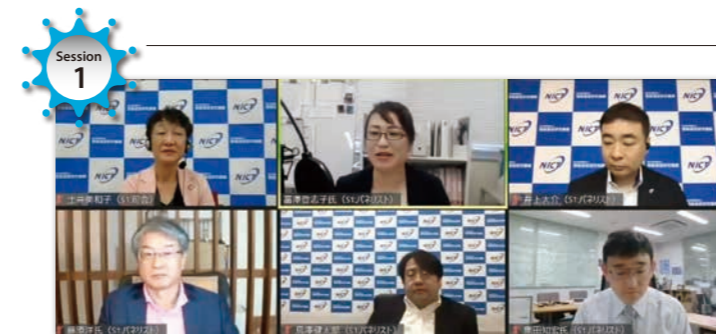


Figure 2-1

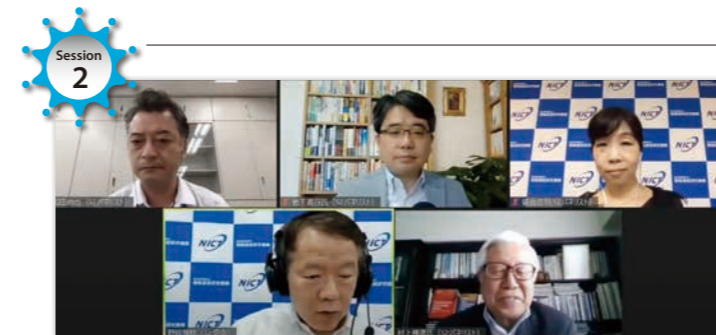


Figure 2-2

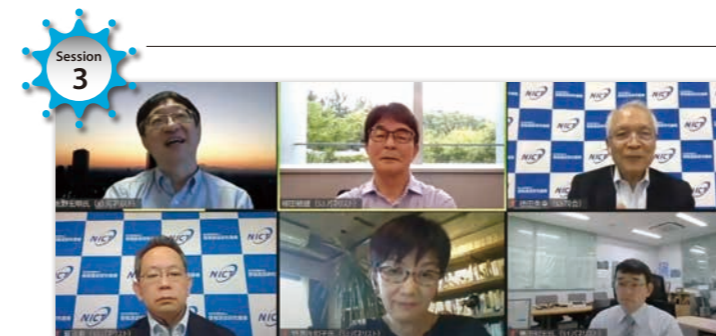


Figure 2-3

### Panelists (by order of presentation) and their presentation titles

- TOMISAWA Toshiko**, Professor, Department of Nursing Science, Graduate School of Health Sciences, Hirosaki University  
In/With COVID-19: Considerations to prevent the collapse of the health care system
- KURODA Tomohiro**, Professor, Medical Information Technology & Administration Planning, Kyoto University Hospital  
How does Kyoto University Hospital combat with COVID-19 using ICT?
- FUJIWARA Hiroshi**, President and CEO, Internet Research Institute, Inc.  
Chairman, President & CEO, BroadBand Tower, Inc.  
Development of system for preventing hospital-acquired infections of COVID-19
- INOUE Daisuke**, Director of Cybersecurity Laboratory, Cybersecurity Research Institute, NICT  
Light and dark sides of COVID-19 and ICT
- TORISAWA Kentaro**, Fellow, Director General, Data-driven Intelligent System Research Center, NICT  
Natural language processing technologies for defending against COVID-19

Moderator: **DOI Miwako**, Auditor, NICT  
Floor Editor: **KASAI Yasuko**, Executive Researcher, Terahertz Technology Research Center

- MURAKAMI Teruyasu**, Director, Research Institute for Industrial Strategy  
Innovating social and economic systems under COVID-19 measures
- IWASHITA Naoyuki**, Professor, Kyoto University School of Government  
How should we prepare to live with COVID-19?
- MORIAI Shiho**, Executive Researcher, Cybersecurity Research Institute and Managing Director of Strategic Planning Department, Strategic Planning Department, NICT  
Privacy-Preserving Data Analytics
- WADA Naoya**, Director General, Advanced ICT Research Institute, NICT  
Issues and clues to solutions while taking COVID-19 measures

Moderator: **NOZAKI Masatoshi**, Vice President, Member of the Board of Directors, NICT  
Floor Editor: **KIDAWARA Yutaka**, Executive Director of Unit, Social Innovation Unit, NICT

- KITANO Hiroaki**, President & CEO, Sony Computer Science Laboratories, Inc.  
Toward Resilient Society
- NOHARA Sawako**, President, IPSe Marketing, Inc.  
Project Professor, Graduate School of Media and Governance, Keio University  
Digital transformation (DX) for creating a society after COVID-19
- KURODA Tomohiro**, Professor, Medical Information Technology & Administration Planning, Kyoto University Hospital
- HOSAKO Iwao**, Director General, Wireless Networks Research Center, NICT  
Fusion between cyber space and real space – Beyond 5G (6G)
- YANAGIDA Toshio**, Director General, Center for Information and Neural Networks, NICT  
Cyber world generated with brain information and xR

Moderator: **TOKUDA Hideyuki**, President, NICT  
Floor Editor: **IDE Shinji**, Senior Manager, Strategic Planning Department, NICT

# Artificial Intelligence and Multimedia Technologies in Environmental Quality Analysis



**● Biography**  
 1974 Born in Vietnam  
 1995 Graduated University of Science, Vietnam National University, Ho Chi Minh City  
 2000 Graduated Graduate School of Information Technology, Vietnam National University, Ho Chi Minh City  
 2005 Received Ph.D at The University of Trento, Italy  
 2007 Postdoctoral Fellowship for Foreign Researchers at Osaka University(JSPS)  
 2010 Researcher at The University of Trento, Italy  
 2013 Joined NICT, as a Researcher  
 2015 Senior Associate Professor at Brunei Institute of Technology  
 2018 Senior Researcher at NICT

## DAO MINH SON

Senior Researcher  
 Big Data Analytics Laboratory  
 Big Data Integration Research Center  
 Ph.D. (Information Science)

**● Awards, etc.**  
 2017 Research Excellence Mid-Career Academic Special Mention – Staff Excellence Award – Brunei University of Technology  
 2019 The distinctive mention for “their highly innovative and challenging task that directly addresses an important issue for people and society” awarded by MediaEval 2019 organizers

### Q&As

**Q What are you currently interested in outside of your research?**

**A** Deep learning and application in the non-cognitive domain

**Q What do you think is your worst personal failure to date?**

I got addicted to Neural Networks since I was a master student. Unfortunately, I abandoned my research to switch to other machine learning research directions (e.g., genetic algorithm, support vector machine). Recently, the neural networks have arisen surprisingly and dominated in AI. I should not have changed my research direction.

**Q What advice would you like to pass on to people aspiring to be researchers?**

**A** Passion, curiosity, hard work, perseverance, and ambition of discovery in science is the key of researchers.

People and the environment collaborate, evolve, and mutually influence each other instinctively. To positively help people improve their environmental awareness, we introduce a multimedia-based participatory sensing framework.

Image-2-AQI and 3D-CNN algorithms have developed to predict personal environmental exposure from images captured by a personal device and to aggregate various invisible environmental sensing data into time series of multilayer raster images, respectively. Image-2-AQI realizes the correlation among visual features and AQI data by a crowdsensing mechanism. 3D-CNN improves environmental-aware event recognition based on superpixels, data fusion, and CNN algorithms.

MM sensing is a flag-ship application enabling vision-based personal AQI prediction utilized Image-2-AQI and 3D-CNN. It is being evaluated and deployed to ASEAN countries such as Vietnam (Dalat city), Brunei, Philippines (Cauayan city), under BIDAL-NICT, and ASEAN-IVO projects. It aims to complement and enhance the con-

ventional environmental monitoring network based on expensive observation stations with popular smartphone-like camera devices.

The research has reached scientific and academic-industry-government communities. The former (e.g., MediaEval) applies theory and practices of open data science to environmental quality predictive modeling using cross-data analytics. The latter

(e.g., ASEAN-IVO project) promotes open data science activity in environmental quality prediction. Researchers are welcome to these communities to raise challenging problems and provide innovative solutions that directly impact people and their surrounding environment.

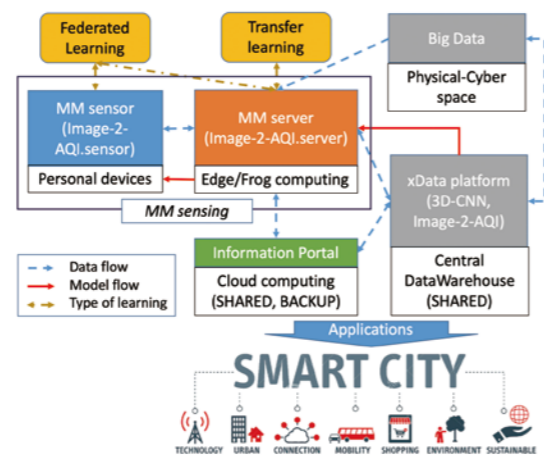


Figure The Overview of Environmental Quality Analytics System

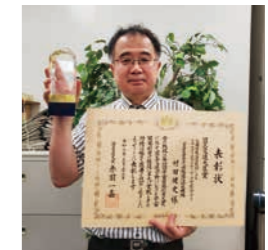
The Minister of Education, Culture, Sports, Science and Technology Award is given to persons who have made remarkable achievements in the research, development, and understanding of science and technology. On the Radio Wave Day and the Communications Promotion Month, the Award is given to individuals and entities who have contributed to the use of radio waves or the development of communication, and to persons who are expected to create outstanding digital contents. The Space Development Utilization Grand Prize is given to successful cases of major contributions to the promotion of space development and utilization, praising their achievements, to promote progress in Japan's space development and utilization and people's recognition and understanding of these activities.

\* The affiliations and positions are those at the time of winning the awards.

### Minister of Land, Infrastructure, Transport and Tourism Award 4th Space Development and utilization Grand Prize

- NAKAJIMA Teruyuki, **Solar Radiation Consortium**
- MURATA Takeshi, **National Institute of Information and Communications Technology**
- MORITA Kiyoteru **Weathernews Inc.**

- Offered by the Ministry of Land, Infrastructure, Transport and Tourism
- Date: March 23, 2020
- Offered for a real-time Himawari data visualization applet using advanced communication technology



MURATA Takeshi

### FY2020 The Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology

#### Prizes for Science and Technology, Development Category

- **GOTOH Kaoru**, Research Manager, Electromagnetic Compatibility Laboratory, Applied Electromagnetic Research Institute, NICT
- **MATSUMOTO Yasushi**, Executive Researcher, Applied Electromagnetic Research Institute
- **YAMANAKA Yukio**, Manager, Electromagnetic Compatibility Laboratory, Applied Electromagnetic Research Institute, NICT
- **Wu Ifong**, Senior Researcher, Electromagnetic Compatibility Laboratory, Applied Electromagnetic Research Institute, NICT
- **ISHIGAMI Sinobu, Professor**, Department of Information Technology, Faculty of Engineering, TOHOKU Gakuin University

- Date: April 7, 2020
- Offered for Development of a novel technique for evaluating statistical characteristics of electromagnetic noises for protecting wireless communication services from interference

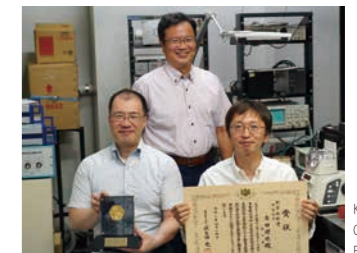


Wu Ifong, GOTOH Kaoru, MATSUMOTO Yasushi, YAMANAKA Yukio

#### Prizes for Science and Technology, Research Category

- **FURUTA Ken'ya**, Senior Researcher, Frontier Research Laboratory, Advanced ICT Research Institute, NICT
- **KOJIMA Hiroaki**, Executive Researcher, Advanced ICT Research Institute / Principal Investigator, Frontier Research Laboratory, NICT
- **OIWA Kazuhiro**, Distinguished Researcher, Advanced ICT Research Institute and Center for Information and Neural Networks, NICT

- Date: April 7, 2020
- Offered for Research on novel molecular motors developed on the basis of protein motors' function



KOJIMA Hiroaki (left), OIWA Kazuhiro (Center), FURUTA Ken'ya (right)

### Awards for FY2020 Radio Day and Info-communications Promotion Month

#### Minister of Internal Affairs and Communications Award (Group)

- **Council for Global Communication Development and Promotion**

Chairman: SUDO Osamu  
 Professor, Faculty of Global Informatics, Chuo University  
 Project Professor, Graduate School of Interdisciplinary Information Studies, The University of Tokyo

Secretariat: National Institute of Information and Communications Technology

- Awarded by the Ministry of Internal Affairs and Communications
- Date: June 1, 2020
- Awarded for establishing an industry-academia-government collaboration platform to promote the Ministry of Internal Affairs and Communications' Global Communication Plan and for making great contributions to the improvement of multilingual speech translation technology and realization of products and services using the technology, prior to the year 2020.



#### Awards for FY2020 Radio Day and Info-communications Promotion Month SHIDA Rinzaburo Award (Personal)

- **TORISAWA Kentaro**, Director General, Data-driven Intelligent System Research Center, Universal Communication Research Institute, NICT

- Awarded by The Council for Info-Communication Promotion Month
- Date: June 1, 2020
- Offered for Developing world-leading natural language processing technology, such as the large-scale Web information analysis system and disaster SNS information analysis system, and making great contributions to the development of natural language processing technology in Japan.







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TEL: +81-42-327-5392 FAX: +81-42-327-7587

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