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Interview with New President Dr. SAKAUCHI Masao

Towards a center for all research and development creates new values

—Please tell us about your hopes as President.

Information communications technology is now a fundamental technology of our daily lives, as typified by the Internet. However, because it has become so familiar, researchers from other fields have started to comment that “there’s no more need for further research. Leave the rest up to the ICT industry.” This is quite disappointing to me, for I have been engaged in the field of information communications for many years. Just when I was feeling the need to do something about this apathy, I received an offer for the presidential position of NICT and accepted it.

Information communications technology is a base that generates new innovation. Recently, so-called green innovation and life innovation are drawing attention: for example, green innovation requires the use of smart grids, and life innovation realizes detailed health care in the household by connecting various sensors through a network to a hospital system.

In such various fields, information communications technology plays a vital role with the many issues that must be researched and developed. In order to solve these issues and create social value that will generate innovation efficiently and effectively, it is highly important that the public institute NICT becomes a platform of research and development and that we continue coordinating with various stakeholders in the field of information communications. I would like to make NICT a center for all research and development in Japan that advances information communications.

—What future role do you think information communications technology should play?

I am clearly aware that information communications is entering a new age, the “third paradigm”. Looking back on the history of information communications, the mission of the first paradigm was how to build computers and connect hardware, software, and applications. And in the second paradigm, it was the phase of how to build the Internet—the so-called cyber world—and make the most of it.

Now we are in the third paradigm where new values are created with the fusion of cyber space and the real world we live in. For example, during a disaster such as an earthquake or tsunami, we must accurately assess the damage situation in each area, make appropriate decisions, and act. To do this, it is necessary to collect a vast amount of information quickly and find ways to control it most appropriately by taking a bird’s view of information, and finally send feedback to the real world.

In real world information gathering, there are two ways to collect information: one is to acquire information automatically through numerous sensors, and the other is to use information transmitted by people through communication terminals such as smartphones. The new role expected of information communications is to derive valuable information that can be used in the real world from the vast amounts of data—called big data—which we are now aiming to do.

—Please tell us about what NICT is working on in order to generate new value.

At NICT, we have undertaken much research. We have striven for a large amount of research on at NICT, one of which is factual research using mobile-wireless testbeds. There is still underutilized information from social infrastructures—with much room for improvement and that are directly linked to our lives—such as energy, roads, bridges, and running water, and industries like disaster prevention, medical care, and agriculture, forestry, and fisheries. In order to gather data on and analyze what is happening right now and to deliver information valuable to the real world, clouds would ideally gather information distributed throughout various data centers and an environment would be setup where users could smoothly access desired information through a network. However, in order to use and apply this kind of data, we must resolve security and privacy issues. It is necessary to actually create a system and conduct practical verification in order to answer how to provide a comfortable and secure system. It is important to create a testbed for this purpose and have it implemented in an actual project.

3 “O”s that NICT will promote in order to become an organization with global presence

One NICT
First, the organization will be united. NICT research institutes are scattered throughout Japan and span a wide range of research fields. In order for NICT to become a core information communications research center, it is necessary for us to be united as one organization and produce a synergy effect on research, which must further accelerate all research.

Open NICT
In order to establish globally competitive technology, NICT would not be able to make it come true by oneself. It requires collaborating with a wide range of industry-academia-government stakeholders such as universities, private businesses and other public institutions and the enhancement of their respective specialized areas. As a platform for this collaboration, NICT will prepare itself to become an open organization that can cooperate and compete on a global level.

Outstanding NICT
Also, in order for NICT to function as such a core platform in the field of information communications, we need just as much centripetal force. Our research activities must be unique and appealing. I would like to continue advancing high-quality research and development to make staffs in NICT more confident.

Furthermore, the more data usage advances, tougher measures must be implemented in security. With existing technology, it is extremely difficult to handle the advanced, latent malware that has been used technologically in cyber attacks of recent years that target government institutions and private businesses. Even in Western countries, measures against cyber attacks are an urgent issue. In order to establish technology that promptly detects this kind of malware infection with high-accuracy and to create a network environment that users can use at ease, we are promoting security research at NICT and already have research that has produced steady results, such as nicter*. In this way, security in information communications is an issue that will also involve national security. I hope to make efforts, fully utilizing NICT’s intermediary position and aiming to make NICT a core, international base of network security research and development with highly integrated theory and practice.

Additionally, establishing a network infrastructure that supports this enormous amount of data distribution is also an urgent issue. In order for the realization of networks to support data distribution growing year after year as communication capacity becomes increasingly tight, it is necessary to promote research and development on network infrastructure technology and international standards that enable flexible network establishment and operations such as preferential transmission of highly-urgent data. At NICT, we are conducting research and development in industry-government collaborations on ultrafast, high-capacity optical networks. Its achievements were taken over by contract research under the direct control of the Ministry of Information and Communication, whose developed LSI accounts for the majority of the international market. Because the field of optical communications, an intensively competitive, international field, is research that involves the foundations of information communications in Japan, I would like to continue accelerating research and development in order to strengthen global competitiveness more than ever.

In addition to this, we are now working on advancing wide-ranging research and development including research on wireless fields such as new wireless domain cultivation—which includes terahertz waves— and White Space utilization, as well as universal communication such as a speech translation system, and innovative communication information research learned from brain functions..

—Lastly, what kind of organization do you hope to make NICT in the future?

I want to help make NICT an organization that can exhibit an even greater global presence and competitive power.

In order to do this, first, it is important that we enhance the internal synergy effect of research and development within NICT. We must connect physically separated research institute employees and work as one organization.

Although it can be said for any organization, even at a research institute, people matters. Ideas are polished and higher quality research produced is precisely because various professionals exchange different ideas amongst each other. And so, I hope to create an environment where people can have pleasant debates, or rather, a place where everyone can enjoy researching while maintaining a professional atmosphere.

Furthermore, we must strengthen coordination with industry, academia, and government, this is because in comparison with Western countries where network construction and expansion between those are flourishing, Japan is still falling behind. In order to mediate between fundamental research results and application and contribute these results to society, it is desirable that NICT becomes a more open research and development center. For that to happen, NICT research and development and activities must have cohesive power. By aptly utilizing NICT’s funding ability and expanding research unique to NICT, I hope that we can consolidate research and development related to information communications technology research and development fields and continue to press forward in strengthening collaboration with universities and private businesses.

Global competition in information communications will become fiercer in the future. I hope to continue building a center where technology highly valuable to society is born so that many people can enjoy the benefits of information communications technology as NICT accelerates collaborations with industry-academia-government and optimizes and speeds up research and development.

—Thank you for your time today.

SAKAUCHI Masao

Profile

Full-time lecturer of Faculty of Engineering, Tokyo University, April 1975. Director General of Institute of Industrial Science, University of Tokyo, April 1998. Deputy Director General of National Institute of Informatics (NII), Japan, July 2002. Executive Director of Research Organization of Information and Systems, Director General of National Institute of Informatics (NII), Japan, April 2005. Emeritus Professor, the University of Tokyo, July 2007. President, National Institute of Information and Communications Technology since April 2013. Ph.D. (Electronics Engineering).

* nicter
nicter (Network Incident analysis Center for Tactical Emergency Response) is a composite system for promptly determining various security threats that occur on the Internet and introducing deriving effective countermeasures. nicter analyzes information obtained from monitoring network attacks and collections of malware and determines its causes.

The Latest Achievement from Research and Development in Innovating of Optical Communication Infrastructure

—The role of NICT in increasing worldwide expectations—

AWAJI Yoshinari

Research Manager, Photonic Network System Laboratory, Photonic Network Research Institute

After completing a doctoral course, AWAJI joined Communications Research Laboratory, Ministry of Posts and Telecommunications (CRL; currently NICT) in 1996. He has been mainly researching optical signal processing, optical amplifiers, and optical packet switching. He was engaged in information security strategies at the Cabinet Secretariat from 2004 to 2006. Ph.D. (Engineering).

Research background

At the dawn of optical communications, Optical Time-Division Multiplexing: OTDM helped improve communication speed. This was primarily achieved by speed improvement of electronic circuits in transmitters / receivers and considered to follow the so-called Moore's Law because of its technical similarity. Eventually, with the appearance of Wavelength-Division Multiplexing (WDM) that allows for the simultaneous transmitting / receiving of multiple wavelength optical signals using a single optical fiber, the availability of optical fiber bandwidth immediately increased with the contribution of the commercialization of optical amplifiers which enable simultaneous amplification of multiple wavelength channels, and the optical communication capacity achieved an astonishing annual rate of twice, responding to the exploding traffic demand of the Internet which was expanding worldwide at the time (Figure 1).

As a result, the known available bandwidth of optical fiber was instantly completely in use. In order to respond to the demand of increasing traffic with an annual rate of 40 percent, it was considered an urgent issue for researchers and developers to explore a new source of wavelength, or to improve efficiency of frequency through a coherent detection. However, we have found an unexpected limiting factor: optical fiber has a power insertion limit. In order to expand wavelength channel or to improve spectral efficiency, it requires an increase in the optical signal's power. However, when the total amount of optical power increases, this has been shown to cause waveform distortion (known as the nonlinear optical effect) and fiber burnout (known as fiber fuse phenomenon). Therefore, we were physically stuck in research because finding a new source of wavelength or developing an efficient, coherent method would not lead to the drastic expansion of transmission capacity per single optical fiber.

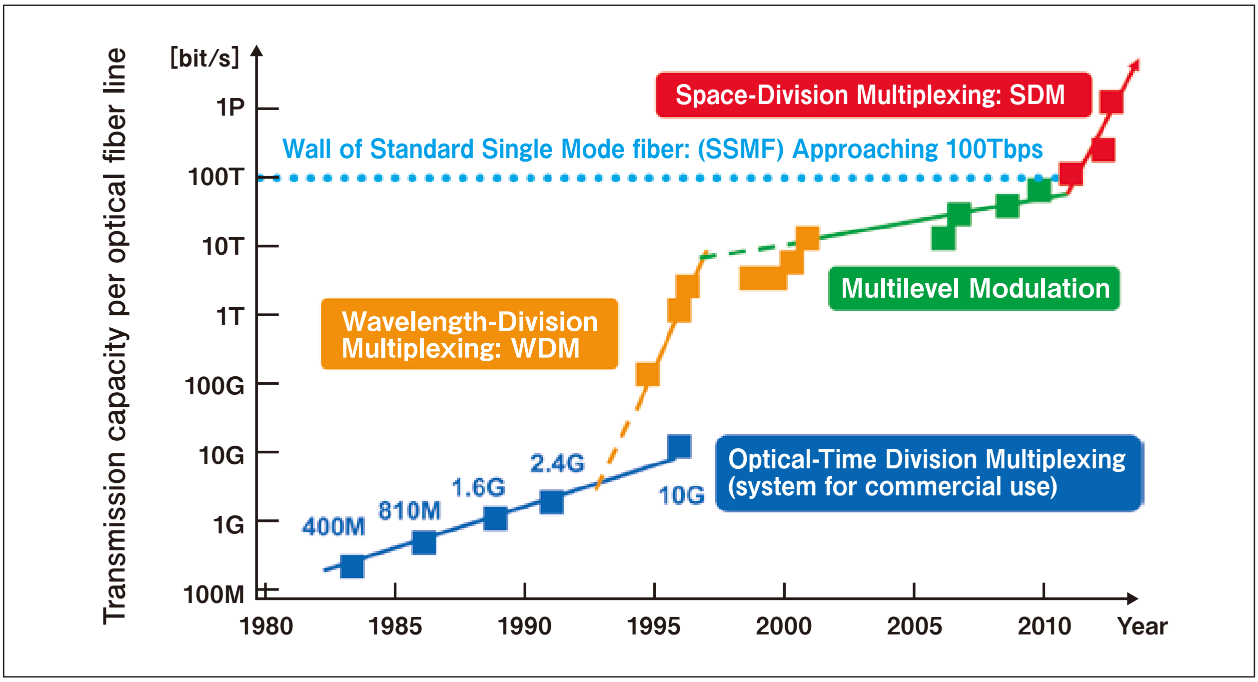


Figure 1 Surpassing physical limits by Space-Division Multiplexing: SDM

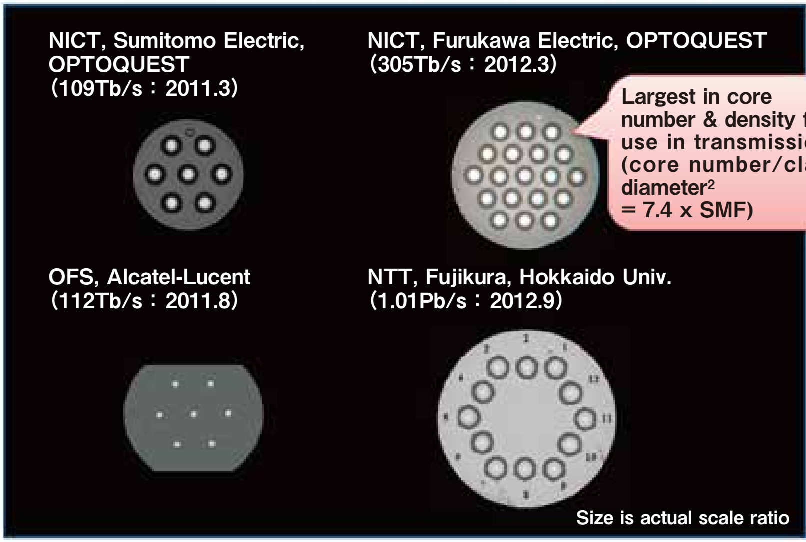


Figure 2 The progress of multi-core fiber

Limitation breakthrough with Space-Division Multiplexing: SDM

In 2008, we sat at the table of EXAT, a study group on EXtremely Advanced Optical Transmission Technologies, initiated by NICT with industry-academia-government collaboration, with a question arising from the newly discovered limiting factor: whether we should increase fiber network within the existing scope of technology, or to fundamentally reexamine the optical communication system from its infrastructure. There is hope that the innovation should be found in optical fiber itself, given that a physical limit exists within it. The Standard Single Mode Fiber: SSMF we use today has a history of 30 years since its implementation, and has a well established position as a practical system. At the EXAT Committee, participants concluded that taking on Space-Division Multiplexing: SDM in full-scale using space as new multiplexing was essential for the future of optical communication. On the other hand, in most academic gatherings, people were skeptical of it. At the NICT Photonic Network Research Institute, by revitalizing multi-core fiber (MCF) that had been half-forgotten or used for rudimentary prototype and conceptual modeling, we used 7-core MCF and surpassed 100 terabits/second per optical fiber in March 2011, which had been considered the limit of SSMF (refer to NICT News, March 2012, “Innovation of Optical Fiber Communications Infrastructure”). Since this achievement, SDM has become a major topic in international conferences, and intense international competition has been brought about.

Proving scalability over capacity, a progressive approach to international competitions

By conducting the transmit/receive experiment with 7-core MCF, we have proven that (1) MCF is capable of long-distance transmission of several tens of kilometers when experiments with MCF produced uniform results in longitudinal direction, (2) in principle, breakthroughs of 100 terabits/second are possible with SDM by overcoming the power insertion limit of SSMF. In March 2011 at the post-deadline session of the Conference on Optical Fiber Communication 2011 (OFC2011) we presented the result of the above experiment, while other research institutes also reported on SSMF transmission experiments stating that its limit is likely close to 100 terabits/second, hinting that we would represent the next generation of technology.

Concurrently, NICT started the commissioned research, “Research and development of innovative optical fiber technology” from FY2010, aiming to cultivate a new paradigm for optical fiber centered around MCF. This research development has succeeded in making MCF technology in Japan more competitive internationally.

The next mission for NICT Photonic Network Research Institute was directing the future advancement of technology. Rather than facing competition against one another in the research field of transmission capacity, we attempted to experiment with 19-core MCF. Shifting from a 7-core experiment to 19-core fibers was a bold challenge, aiming for scalability with a challenging number of core fibers rather than doing the commonly-accepted practice of increasing total transmission capacity. As a result, we succeeded in a transmission experiment with 19-core fibers in March 2012, leading the extrinsic result of 305 terabits/second, which broke the world record for the second time (Figure 2). When we presented the research paper in the post-deadline session of OFC2012, March 2012, the chairman referred to it as “crazy results”, astonishing researchers worldwide.

Facilitating implementation and technological innovation

In FY2011, NICT started the commissioned research, “Research and development of innovative optical fiber communication technology” using optical devices suitable for MCF, and integrating them into the advancement of MCF transmission technology. In this research development, just one year and a half after its initiation, we succeeded in achieving 1 petabit/second in September 2012 using a sophisticated transmit/receive system and 12-core MCF specialized in removing interference that overcomes problems in the 19-core MCF layout.

Global competition among researchers and developers continues today, but Japan successfully achieved promoting its competitiveness by a collaborative effort among industry, academics and government. This year, as we kick off the NICT commissioned research, “Research and development of innovative optical fiber for practical use”, we at the Photonic Network Research Institute would like to blaze a trail in research and development in advancing the breakthroughs of physical limits.

Development of Next Generation Wind Profiler Radars

−Increasing altitude and resolution with a view to forecasting turbulence on air routes−

KAWAMURA Seiji

Senior Researcher, Radiowave Remote Sensing Laboratory, Applied Electromagnetic Research Institute

After completing his doctorate at a graduate school, KAWAMURA served as a JSPS fellow on the Postdoctoral Fellowship program of the Japan Society for the Promotion of Science (Communications Research Laboratory (currently NICT)) and then joined the NICT in 2006. He has been engaged in research related mainly to atmospheric physics and radar systems.　Ph.D. (Information Science).

Introduction

In December 2012 at NICT Headquarters (Koganei City, Tokyo), we conducted intensive atmospheric observation including GPS Sonde launching (Figure 1 is a photo taken during observations). GPS Sonde—a small observation instrument for measuring temperature, humidity, atmospheric pressure, and wind velocity—performs observations attached to a balloon launched into the air. From the GPS Sonde that is driven away with the balloon, observation data is sent to the ground via radio waves. Eventually, the balloon bursts under increasing atmospheric pressure and Sonde drops into the Pacific Ocean most of the time.

At NICT, in collaboration with Research Institute for Sustainable Humanosphere (RISH), Kyoto University and Meteorological Research Institute, Japan Meteorological Agency, we have been conducting research titled “Development of turbulence detection and prediction techniques with next generation wind profiler for aviation safety” since 2011 commissioned from Japan Railway Construction, Transport and Technology Agency. The primary goal of this GPS Sonde observation is to validate the ability and performance of the Wind Profiler Radar (abbreviated as WPR below) that we produced in this research and development.

Figure 1　GPS Sonde launching
We launched a balloon attached with an observation instrument (December 2012).

WPR—a radar that observes winds from the ground up to several kilometers above—was expanded throughout Japan by Japan Meteorological Agency from 2001 as the Wind Profiler Network and Data Acquisition System (WINDAS). This observation data from 33 locations is used for weather forecasting. After 10 years since the first implementation of WINDAS, this research began as a collaboration among three institutes with the aim of developing WPR with new technology with a view on the renewal of WINDAS. One of the objectives of the research is to develop detection/prediction techniques on turbulence that causes aviation accidents, and in order to do so, we are aiming at developing a device that allows observation of higher altitudes.

Wind Profiler Radar (WPR)

WPR is radar that transmits pulsed radio waves into the air and estimates wind velocity/direction in the atmosphere from the reflected waves. The radio wave reflector is the atmosphere itself. Radio waves, although faint, are scattered and return all over due to refractive-index changes with temperature and water vapor variations. From the Doppler shift[*1] of these reflected waves, we can estimate wind directions and velocities. While wind observation using GPS Sonde can only be conducted a few times a day, we can observe wind direction and velocity continuously over time using WPR. Furthermore, because the WPR observed amount called Doppler spectral width becomes a turbulence index, it is expected that useful information for aviation safety can be obtained if we observe up to the operating altitudes of aircrafts.

Production of a Next-Generation WPR prototype

In our research, we first incorporated and renovated two existing WPRs and produced one WPR (alias: LQ-13). Figure 2 is a photo of LQ-13 installed at NICT Headquarters. Due to

＊1　Doppler shift
A phenomenon of varying the frequency of radio waves or sonic waves with the moving speed of transmitting point, reflecting object, or receiving point. This phenomenon can be observed in the change in sound of a siren when an ambulance vehicle is approaching and leaving. In the case of WPR, the speed at which the atmosphere, the reflector, is moving (wind velocity) can be estimated.

Figure 2 Prototype of next-generation wind profiler (LQ-13)

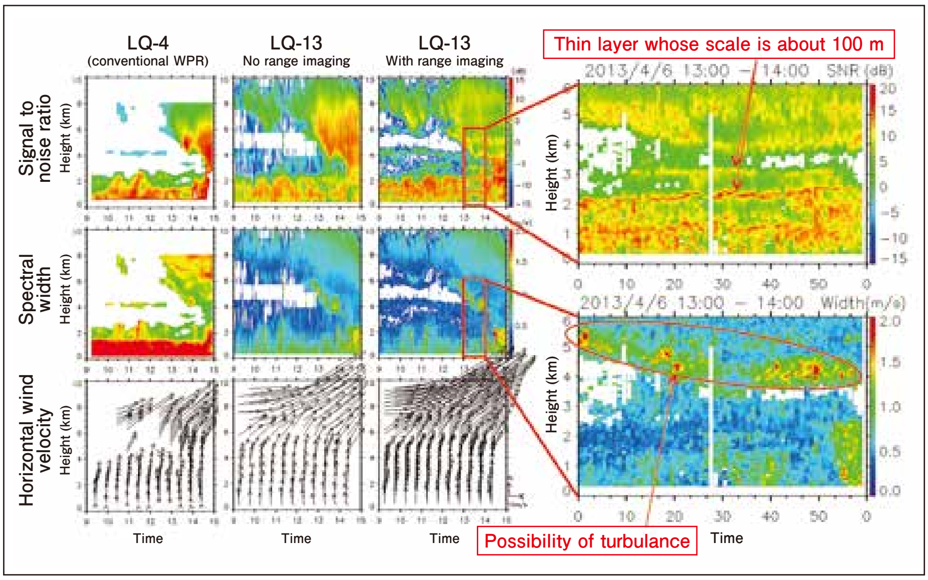


Figure 3 Example of observation results

From the left: observation data of LQ-4 (small WPR without range imaging), LQ-13 (without range imaging), and LQ-13 (with range imaging). From the top: time-height variation of SNR*3, spectral width, and horizontal wind velocity (observation results for 6 hours). In the right-side enlarged figure, we see that range imaging is resolving a layer of 100m scale in the atmosphere.

incorporation and renovation, transmission power and transmitting and receiving antenna size doubled approximately, and observation up to farther high-altitudes became possible. If we lengthen the pulse width of transmission radio waves in order to increase the transmission power, observation altitude limits increase,, but observation height resolution deteriorates. In order to solve this dilemma, we introduced technology called range imaging in our research.

Range imaging observation

Whereas normal WPR uses one frequency, range imaging observation uses multiple frequencies. In LQ-13 that we developed this time, it is possible to switch between five frequencies per pulse transmission. We can obtain even finer height resolution than that corresponding to transmission pulse width by using the phase differences of each frequency. In our research, we realized range imaging observation by adding a new receiver that uses a software-defined radio*2 technique. Figure 3 shows one case of the observation results. In order from far left, observation data is shown from LQ-4 (traditional small WPR), LQ-13 (without range imaging) and, LQ-13 (with range imaging), with part of the observation data with range imaging shown enlarged on the right side. While LQ-4 uses short pulse widths equal to 100 m height resolutions, LQ-13 uses long pulse widths equal to 600 m height resolutions. For example, looking at horizontal wind velocity, we clearly understand that LQ-13 can observe higher altitudes than LQ-4 can do. This is due to the effects of power increasing and the long pulse of LQ-13 (limits of observable altitude is largely dependent on weather conditions, but the number of examples where observation is possible beyond aircraft cruise altitudes of 10 km has increased). Furthermore, large differences in height resolution can be seen between the data with range imaging and without. Looking at the enlarged figure on the right, in the data with range imaging, a thin layer of approximately 100 m depth is resolved despite using long pulses of 600 m resolution. Because range imaging enables more precise observation of Doppler spectral width—the index of turbulence—, it is expected that the accuracy of turbulence detection is increased.

During intensive observation last December 2012, we launched GPS Sonde 67 times. Figure 4 is an example of comparative results between wind velocity obtained from GPS Sonde and that obtained by LQ-13 range imaging. Both results correspond very closely, validating the correctness of LQ-13 wind velocity measurements.

We are currently processing LQ-13 range imaging observation data in quasi-real-time and will further advance processing real-time, stability, and high-precision in the future.

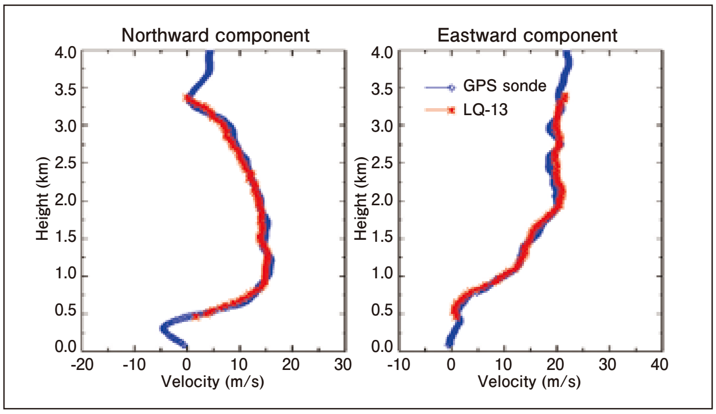


Figure 4 Example of wind velocity comparison results between LQ-13 range imaging and GPS Sonde.

Left panel shows northward component and right panel shows eastward component.

Future Prospects

At Japan Meteorological Agency, the renewal of WINDAS was decided in FY2013, which includes our results. The detailed Doppler spectral width observation results shown in the bottom-right enlarged plot in Figure 3 are expected to lead to highly-accurate turbulence forecasting by incorporating it into a numerical model. In the future at NICT, we plan to continue collaborative research with Research Institute for Sustainable Humanosphere (RISH), Kyoto University and Meteorological Research Institute, Japan Meteorological Agency and conducting research and development required for next-generation WPR such as turbulence forecasting that is useful for aviation safety.

*2 Software-defined radio
A technique to perform the major portion of control and signal processing on software. It can adapt to a wide variety of wireless communication systems without modifying the hardware, and thus its low cost and versatility are increasingly attracting interest in recent years.

*3 SNR
Signal-to-noise ratio. An intensity ratio of desired signals to noise, it is often used as a signal intensity index.

Technology seminar and exhibition specialized in the latest wireless communication technology and R & D

Report on WIRELESS TECHNOLOGY PARK 2013

Planning Office, Wireless Network Research Institute

In collaboration with the YRP R&D Promotion Committee and YRP Academia Collaboration Network, NICT held the WIRELESS TECHNOLOGY PARK (below, WTP) 2013 (May 29–31, 2013, Tokyo Big Sight http://www.wt-park.com/).

NICT booth crowded with many visitors

The WTP is a major professional event specialized in the research and development (R&D) of wireless technology with the aim to provide business opportunities for engineers and researchers/developers in its field. It consists of three areas: the “Exhibition” where the latest wireless technologies are shown, the “Seminar” that focuses on wireless communication trends, and the “Academia Session” where university research laboratories give presentations. This year, as we commemorate the 8th year of the event, many exhibitions drew the attention of visitors, such as the pavilion of “Wireless Technology Useful for Reliable Social Infrastructure,” which introduced results from R&D sponsored by the third supplementary budget for FY2011 under jurisdiction of Ministry of Internal Affairs, as well as the zone of “Wireless Power Transfer” that is raising expectations in the wireless-related market. NICT’s exhibit also introduced the Wireless Network Research Institute, Resilient ICT Research Center, Photonic Network Research Institute, and the Universal Communication Research Institute, and presented 11 of their latest, wide-ranging research results, which many visitors gave various comments and questions on.

Government-industry-academia professionals gave a total of 59 talks at the seminar composed of 12 courses. NICT presentations included “Medium to Long-Term Growth Resilient ICT Research and Development” by KADOWAKI Naoto, Director-General, Wireless Network Research Institute, “Research and Development Direction of Optical Space Communications and Future Prospects” by TOYOSHIMA Morio, Director of Space Communication Systems Laboratory, “Future Plans and Strategies in the Wi-SUN Alliance” by HARADA Hiroshi, Director of Smart Wireless Laboratory (Co-Chair, Board, Wi-SUN Alliance), and “ITU/WHO e-Health International Standardization and Portable Health Reverse Innovation” by KURODA Masahiro, Manager of Standardization Promotion Office, International Affairs Department. The high level of interest was evident as roughly half the seminars became fully booked shortly after advanced registration reception began. In addition, there were exhibitor presentations by five companies, 19 academic session presentations, and 22 presentations from 13 research laboratories of 8 universities at the poster session.

The number of WTP 2013 registrants reached a record-high of 10,616 over three days. Adding the number for Wireless Japan 2013, the total number of visitors was just over 43,000 people, clocking in at over five times the number of WTP 2012 last year. The NICT booth was a great success and at times so packed that visitors could not enter the booth. Next year, we plan to make efforts to hold the event with even more rich and interesting content.


Dr. KADOWAKI, Director General of Wireless Network Research Institute, giving a talk at the “Wireless Technology Pavilion Useful for Reliable Social Infrastructure” course


Dr. TOYOSHIMA, Director of Space Communication Systems Laboratory, giving a talk at the “Next-Generation Wireless Communication Systems” course


Dr. HARADA, Director of Smart Wireless Laboratory, giving a talk at the “Wi-SUN Alliance Outline and Introduction Examples” course


Dr. KURODA, Manager, Standardization Promotion Office, International Affairs Department, giving a talk at the “Digital Health” course

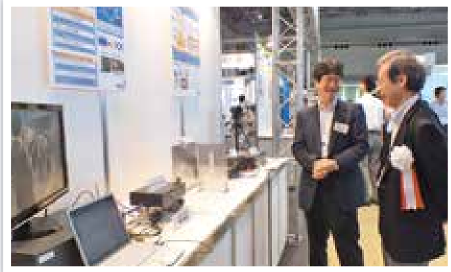
Exhibitions by NICT

●Constructing Wireless Communication Infrastructure Using Cognitive Radio/TV White Spaces

We held demonstrations on the "White Space Database" that provides information for the secondary use of the TV broadcasting band (470–710 MHz,) the "White Space Base Station" that can operate in conjunction with databases, and the "Cognitive Wireless Router" that provides optimal internet connections.

●Multi-Service-Responsive SUN Stack Constructing Technology

We exhibited small-sized and low-power 920 MHz Wi-SUN radio devices conforming to the international standard IEEE802.15.4g. In addition to the connection with radiation dosimeters, we also held a demonstration of Wi-SUN specifications, such as the power-saving MAC and error control, in which it can be selectively implemented depending on the intended use. Using the same radio equipment above, we also released the world's first working example with Wi-SUN-based radio devices conforming to the ECHONET Lite, the standard radio communication protocol for HEMS.



●60 GHz Millimeter-Wave Very High Throughput Wireless Image Transmission System

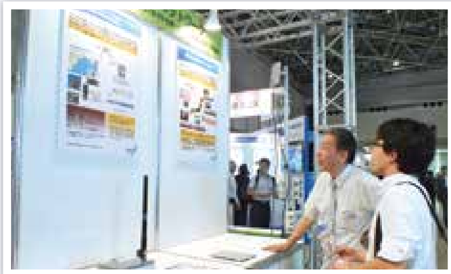
With communication devices that support 60 GHz multi-gigabit IEEE802.11ad-based wireless LAN, we demonstrated a Non-Line-Of-Sight (NLOS) high-speed video transmission system with developed beam-forming antennas.

●Space Optical Communication Technology that Realizes Advanced Satellite Communication Between Earth and Satellites

We introduced space optical communications that enables larger data transmission than radio waves in a minimal, power-saving, lightweight device with less communication interference. We also exhibited an operation simulator of the optical earth station.

●Satellite/Terrestrial Integrated Mobile Communication System (STICS) Helpful in Times of Disaster

We introduced the Satellite/Terrestrial Integrated Mobile Communication System that realizes the efficient use of frequencies and that simultaneously offers means of communications during a disaster. We also held a demonstration of the system with its communication simulator under the hypothetical situation of the breakout of a disaster.



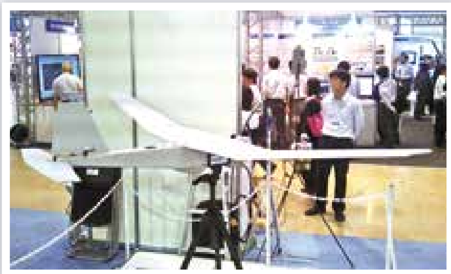
●Satellite Sensor Network

— Data transmission from buoys on the sea using ETS-VIII for the early detection of tsunamis—

We introduced technology and experimental results of the Satellite Sensor Network that allows the offshore installation of buoys in order to enable the faster detection of tsunamis by networking them with the Engineering Test Satellite VIII (ETS-VIII) "KIKU No. 8".

●Reliable and Survivable Wireless Networks Across Town

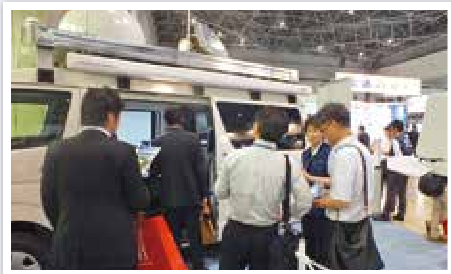
We introduced a resilient ICT research test bed of Wireless Mesh Networks that can maintain local communications without interruptions caused by partial destructions even when the connections with backbone networks are disrupted.



●Emergency Dispatch for Network Disruptions!

— Radio relay technology using a small unmanned aircraft system for connecting with isolated areas—

We exhibited a small unmanned aircraft system and onboard radio relay devices that can connect isolated networks.



●Mobile Base Station for Ka-band Satellite Communication

We exhibited and introduced an actual fully-automatic small mobile vehicle station effective during disasters that can establish a communication link, even while in motion, with the Wideband InterNetworking engineering test and Demonstration Satellite, "KIZUNA" (WINDS).

●Disaster Information Analysis System

We introduced the Disaster Information Analysis System that identifies connections between events by efficiently collecting a large amount of disaster-related information, which it then integrates and analyzes in a cross-sectional manner. It can be useful for exhaustive situational assessment at normal times or during disasters.

●Optical Network Technology that Responds to Large-Scale Disasters

In addition to technology that eases congestion while securing critical optical communication paths during disasters, we also introduced technology that realizes path switching and the prompt creation of emergent networks and technology for early recovery of damaged optical networks.

Report on ITU Kaleidoscope Conference 2013

–NICT presented its research outcomes to ITU experts–

Sulayman K Sowe, Researcher, giving a talk at the Kaleidoscope Conference

Mr. Malcolm Johnson, Director, ITU Telecommunication Standardization Bureau (right), being briefed on an ITU-T-standardized identification framework for future networks based on ID/Locator Split

The ITU Kaleidoscope Conference 2013, organized by the International Telecommunication Union (ITU), a United Nations specialized agency, was held on April 22–24, 2013 at Kyoto University (Kyoto City) with close to 200 delegates from roughly 20 countries. NICT introduced its latest research outcomes through lectures and exhibits. The conference aims to connect the research outcomes of universities and research institutes that produce innovative technologies with ITU standardization. It has been held around the world every year since 2008 and this is the first time the conference was held in Japan.

The conference theme for this year was "Building Sustainable Communities". Given what the host country, Japan, experienced in the Great East Japan Earthquake, many participants emphasized in their sessions the importance of building societies that are resilient against disasters. At the conference, Sulayman K Sowe, Researcher, Information Services Platform Laboratory, Universal Communication Research Institute, gave a talk on the importance of community building in cross-sectional use and application of big data and the infrastructure technology to support it.

At the showcase where universities, research institutes, and companies displayed their research and development products and services, NICT presented the following exhibits.

- A Large-scale Realtime Sensor Analysis Platform [New Generation Network Laboratory]
- The world's leading optical communication technology (Photonic Technology) [Photonic Network System Laboratory]
- HIMALIS – A New Generation Network Architecture based on ID/Locator Split [Network Architecture Laboratory]
- The world's first Wi-Fi prototype in TV white space based on the IEEE 802.11af Draft Standard [Smart Wireless Laboratory]
- A Step toward Practical Use of Next-Generation Cryptography [Security Fundamentals Laboratory]
- A Community Cloud Platform for Cross-Data Development Based on Open Source Model [Information Services Platform Laboratory]
- BAN Portable Health Clinic toward Affordable Healthcare M2M Service [International Affairs Department]

JGN-X, a new generation network testbed by NICT, was utilized to demonstrate some of the above exhibits. Not only the delegates but also Kyoto University students visited the showcase and engaged with us enthusiastically in question and answer sessions.

Views of the showcase venue (pictures provided by: ITU Association of Japan)

Awards

Recipient(s) ● **HARUNO Masahiko** / Senior Researcher, Brain Networks and Communication Laboratory, Center for Information and Neural Networks

◎Award Date: 2012/9/13

◎Name of Award:

Japanese Neural Network Society Best Paper Award

◎Details:

In recognition for the achievement of experimentally demonstrating that the firing rate of dopamine cells obtains the expected value of long-term rewards by learning the summation of multiple potential rewards.

◎Awarding Organization:

Japanese Neural Network Society

◎Comment from the Recipient(s):

I received this award in recognition for proving for the first time in the world the fundamental hypothesis of computational theory in which the firing rate of dopamine cells obtains the expected value of long-term rewards by learning the summation of multiple potential rewards. With the encouragement received from this award, I hope to continue more research and development related to the analysis in pleasant/unpleasant information in the brain to establish smooth, people-friendly information transmission and smooth communication that is increasingly important in the future.

Recipient(s) ● **KADOWAKI Naoto** / Senior Executive Director / Director General of Wireless Network Research Institute

◎Award Date: 2012/12/5

◎Name of Award:

2012 Satellite Communications Distinguished Service Award

◎Details:

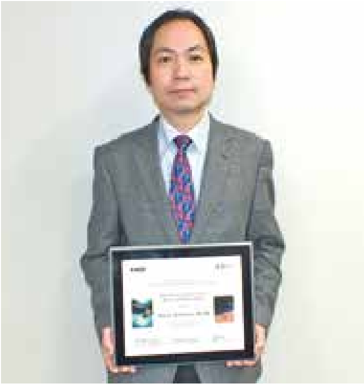
For contributions to research and development in the field of satellite communications.

◎Awarding Organization:

IEEE Communications Society, Satellite and Space Communications (SSC) Technical Committee

◎Comment from the Recipient(s):

I am extremely honored for being awarded and recognized by the IEEE Communications Society, Satellite and Space Communications (SSC) Technical Committee for development of WINDS and previous research and development achievements in the field of satellite communications. This is also the result of advice from my senior associates and the cooperation of many colleagues who worked with me on research and development, all for whom I am sincerely thankful. I will continue making efforts so that research and development in this field leads to major results in the future.



Introduction of NICT Fellow

NICT has bestowed the title of Fellow on those who have achieved particularly remarkable results in research and development at NICT. On April 17, 2013, the title was granted to OIWA Kazuhiro, Distinguished Researcher of Advanced ICT Research Institute.

Since joining the Communications Research Laboratory, Ministry of Posts and Telecommunications, OIWA, Distinguished Researcher, has consistently conducted biophysical research related to the structure and motion mechanism of protein motors and contributed to the development of the research in this area.

OIWA, Distinguished Researcher, has made large contributions to the “in vitro moving reconstruction experimental system” that reconstructs and analyzes protein motor functions in test tubes using minimal elements from a physical science standpoint and to the “single-molecule measurement method” that traps one protein motor molecule and measures its mechanics and enzymatic characteristics. By combining them with a structural analysis method, he has succeeded in analyzing widely from structure to function. His result was published in a number of prestigious international journals including Nature. In 2005, he also received the 23rd Osaka Science Prize in recognition of the importance of these results. Furthermore, by taking the protein motor as a functional material, he is advancing interdisciplinary research for engineering protein motors for sensors, micro-drives, testing new developments of protein motor research fields, and even generating a new global trend by advocating “molecular communication”, a new concept of information and communications.

SAKAUCHI Masao, President (left) and OIWA Kazuhiro, Distinguished Researcher of Advanced ICT Research Institute (right)

Facility Open House 2013

Advanced ICT Research Institute

Admission free

—Experience the future of information communications!!—

Venue: Advanced ICT Research Institute
588-2 Iwaoka, Iwaoka-cho, Nishi-ku, Kobe, Hyogo 651-2492 Japan
http://www2.nict.go.jp/advanced_ict/plan/ippankoukai/2013/index.html

Date: Sat, July 27, 2013 10:00-16:00 (reception closes at 15:30)

Additional Information: Parking available, no appointment necessary

Facility Open House held in 2012(Advanced ICT Research Institute)

"Watch, Listen and Learn" — a research symposium was held

Participants experienced birefringence and polarization by making 3D glasses and polarization boxes using polarization sheets

Experiment for extraction and observation of Broccoli DNA

Commentary on the marvelous structure of the brain

Visualization Screen Showcase of Cyber Attack Alert System "DAEDALUS"

The cyber attack alert system researched and developed by NICT, Direct Alert Environment for Darknet And Livenet United Security (DAEDALUS), is now on public display at The National Museum of Emerging Science and Innovation (Miraikan) (Tokyo) and Knowledge Capital, Umekita Plaza (Osaka).

Direct Alert Environment for Darknet And Livenet United Security (DAEDALUS) is a system being researched and developed by NICT's Network Security Research Institute based on Network Incident analysis Center for Tactical Emergency Response (nicter)' s large-scale dark-net observation network. It can rapidly detect malware infections within observed organizations, attacks towards exterior organizations, DoS attacks from exterior organizations, and also can send alerts after detection. This system is one of NICT' s research achievements of the technology transfer to the private sector that it is advancing. We hope this offers an opportunity for also the public to see this system.

Exhibition at The National Museum of Emerging Science and Innovation (Miraikan)

Opening date: Wed, May 1, 2013
For details such as opening times, please visit Miraikan website (http://www.miraikan.jst.go.jp/).

Venue: The National Museum of Emerging Science and Innovation (Miraikan) (2-3-6 Aomi, Koto-ku, Tokyo) Information Lobby, 1st Floor

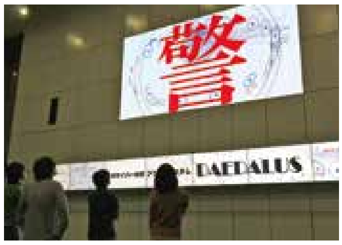
Content: Past cyber attack detection cases will be re-enacted and shown approximately five minutes per hour.

Exhibition at Knowledge Capital, Umekita Plaza

Period: Fri, April 26–Sun, September 1, 2013
For details such as opening times, please visit THE Sekai Ichi Ten website (http://the-sekai1.jp/about/).

Venue: Knowledge Capital, Grand Front Osaka, Umekita Plaza 3-1 Ofuka-cho, Kita-ku, Osaka
We will introduce the system of "THE Sekai Ichi Ten —Captivating Technology and People of Japan—" held in "The Lab".

Content: A movie will be on continuous display showing the detection screen of past cyber attacks.



Showcase at The National Museum of Emerging Science and Innovation (Miraikan)
(Photo provided by: Miraikan)

Exhibition at Osaka Knowledge Capital

Information for Readers

The next issue will feature NICT technology being used at the Atacama Large Millimeter/sub-millimeter Array (ALMA), an astronomical interferometer of radio telescopes in Chile, South America.

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〈Recycled Paper〉