

Report on NTT R&D Forum 2018 Autumn

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Abstract

NTT R&D Forum 2018 Autumn was held at NTT Musashino R&D Center November 26–30, 2018. (November 26 and 27 were set aside solely for the press and NTT Group employees.) This article provides an overall summary of the forum.

Keywords: R&D forum, smart world, digital transformation

1. Forum overview

The NTT Group, as *Your Value Partner*, aims to resolve social issues in collaboration with its partners. We believe that being able to resolve social issues will help to make a smart, digital society a reality. At NTT R&D Forum 2018 Autumn, lectures and exhibits were held on the latest research results designed to help create this emerging society. The concept of the forum was Transforming Your Digital Visions into Reality.

2. Lectures and workshops

On November 28, NTT President and Chief Executive Officer Jun Sawada gave a keynote address entitled “Bringing the Smart World to Life” (**Photo 1**). He declared that NTT would work with its partners to bring about the emergence of a *smart world*. These efforts are designed to resolve local issues from a global perspective (thus, *glocal* activities) through digital transformation.

He then introduced current NTT activities in different industries: promotion of the smart city in the City of Las Vegas using leading-edge technologies in collaboration with Dell Technologies; smart entertainment, an endeavor with SHOCHIKU Co., Ltd. to integrate traditional performing arts with information

and communication technology (ICT); the smart manufacturing of JSR Corporation, which is improving the productivity of its industrial complex, a venture in which we are partnered with Accenture Japan Ltd.; and smart mobility, which includes collaboration with Toyota Motor Corporation in the development of basic technologies for automated driving and collaboration with Nippon Yusen K.K. and MTI Co., Ltd. in the development of an Internet of Things (IoT) platform for the shipping industry.

In connection with the NTT Group’s Medium-Term Management Strategy called Your Value Partner 2025, President Sawada described the NTT Group’s global business growth strategy, which has been designed to strengthen the group’s global competitiveness. He announced that NTT will support its customers to evolve their businesses, undertake innovative creation, and strengthen and globalize its research and development (R&D). He ended his address with a declaration that NTT will make all-out efforts to achieve its own digital transformation goals and become Your Value Partner.

The president’s keynote address was followed by a speech delivered by NTT Senior Vice President, Head of Research and Development Planning, Katsuhiko Kawazoe (**Photo 2**). With the title “Making the World Smart and Technology Natural,” he stated that NTT’s R&D policy of developing *natural* technologies was

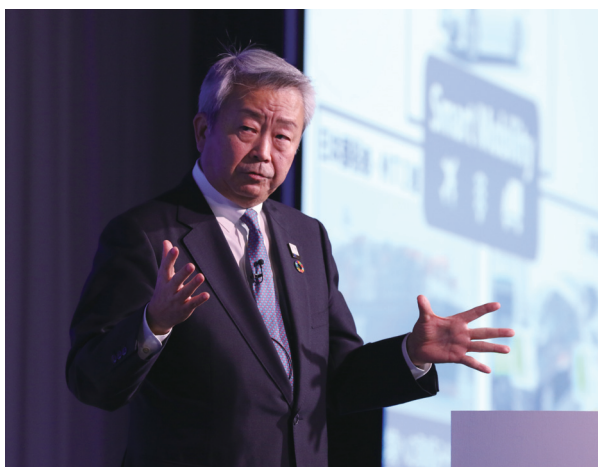


Photo 1. Keynote address by Jun Sawada, President and Chief Executive Officer, NTT.



Photo 3. Special session by Debra Bordignon, Chief Technology Officer, Dimension Data Australia.



Photo 2. Keynote address by Katsuhiko Kawazoe, Senior Vice President, Head of Research and Development Planning, NTT.

motivated by the desire to create a world in which people can engage in human-centric activities while technologies provide an environment that is friendly to both people and the earth. As an activity symbolic of this initiative, he announced his plan to launch a new project called Point of Atmosphere. The aim of the project is to help create a world in which things surrounding a person work together autonomously and interact with the individual in a natural manner.

He then introduced NTT's activities related to "R&D for a SMART WORLD." NTT intends to

achieve a smart world by working with partners to solve issues associated with the digital transformation of both society and industry using technologies that have grown out of its R&D and to generate "the world's best, the world's first, and the world's amazement."

Finally, he presented three R&D measures to accelerate innovation: global utilization of R&D results, globalization of research targets, and establishment of research organizations outside Japan. He announced that based on these measures, three laboratories specializing in basic research will be established overseas: NTT Φ Laboratories, which will study quantum computing science; NTT CIS Laboratories, which will work on cryptography and information theory; and NTT MEI Laboratories, which will address biological information processing.

Two special sessions were held at this forum, the first on November 29 and the second on November 30. First, Debra Bordignon, Chief Technology Officer, Dimension Data Australia, introduced activities at the Client Innovation Centre (CIC) designed to create new value with partners in Australia under the title of "Co-Innovating to Accelerate Transformation and Create New Value" (Photo 3). In collaboration with Deakin University, FLAIM Systems, and Dimension Data, CIC incorporated the NTT-developed hitoe™ material into FLAIM Trainer™, a firefighter training simulator that uses virtual reality to enable training in a situation similar to an actual fire. Use of firefighters' physiological data collected via hitoe has made it possible to train firefighters effectively without

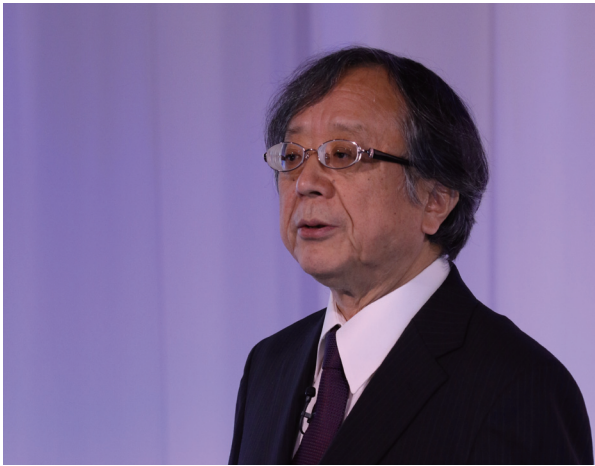


Photo 4. Special session by Dr. Tatsuaki Okamoto, NTT Fellow.



Photo 5. Special session by Dr. Pratish Datta, NTT Secure Platform Laboratories.

exposing them to danger.

Following her lecture, Dr. Tatsuaki Okamoto, NTT Fellow, gave a talk entitled “Diversity and COE—Cryptologic Research in NTT: Talk with Dr. Datta, a Visually Handicapped Researcher” (**Photo 4**). Dr. Okamoto explained that NTT Secure Platform Laboratories is a center of excellence (COE) with a global reputation in the field of cryptography and that diversity is the key to this excellence. Since 1988, when the Laboratories first invited researchers from outside NTT, each year they have accepted many researchers from both inside and outside Japan. If we count only those since 2015, 55 researchers from more than 20 countries have resided there.

Then, Dr. Pratish Datta went to the podium and spoke of his first encounter with Dr. Okamoto, the research environment of NTT, and his life at the Laboratories (**Photo 5**). He explained that he is able to conduct his research in an excellent environment with top-notch cryptography researchers from around the world and that they voluntarily help each other out. Dr. Datta, who has visual and hearing disabilities, added that he has been receiving sufficient support for his research activities and that he will continue his research at NTT to develop theoretically and practically refined cryptography.

The next day, under the title of “Leading in the Age of Digital Disruption,” Marc Alba, Chief Disruption Officer at everis, elaborated on his perception that all industries in the world today, from banking, medical care, automobiles, to retailing, are in the process of reinventing themselves, and that what is needed is



Photo 6. Special session by Marc Alba, Chief Disruption Officer, everis.

disruptive innovation for solving core issues rather than improvement of existing technologies (**Photo 6**). Based on this perception, he proposed that, as part of its disruptive innovation initiatives, the NTT Group create new businesses by returning the ownership of personal data—which have traditionally been entrusted to service providers—to individuals and then using such personal data.

The lectures were an introduction to the activities of NTT R&D and the NTT Group, and were warmly received by the audience.



Photo 7. Media and UI.

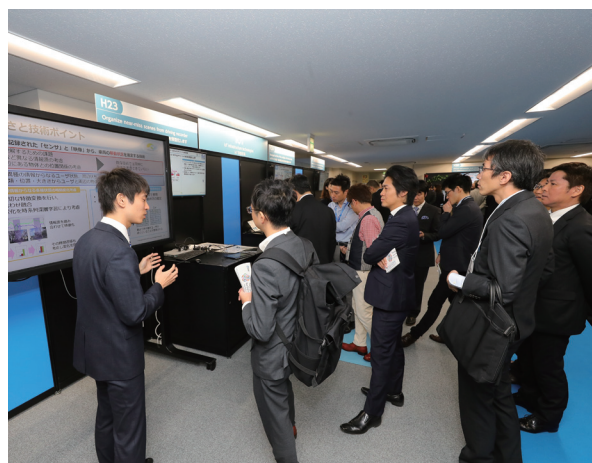


Photo 8. AI.

3. Exhibition of research results

At the forum venue, 124 of the latest research results were on display under six categories: media and user interface (UI), artificial intelligence (AI), IoT, network, security, and basic research. Thus, the exhibition covered a wide range of research findings, from technologies being developed by the NTT Group to outcomes resulting from collaboration with partner companies, and from basic research to already commercialized technologies.

To enable visitors to see the results of R&D more effectively, we created for the first time an exhibition site dedicated to introducing smart world-related activities that cut across different exhibit themes, in addition to the exhibition sites dedicated to specific topics. At these sites, visitors were able to see well-designed demonstrations and exhibits.

3.1 Media and UI

(1) Media technology for providing new user experience

The ultra-realistic communication technology Kirari! was introduced in a lineup of four presentations, each adapted to a specific usage, along with associated elemental technologies. The first and main one was a theater-type exhibit aimed at creating a whole new level of excitement. The second was “Kirari! for Arena,” which transmits images of an entire competition space and enables the audience at a remote site to view the space from all directions in real time. The third was a highly realistic reception window. The fourth presentation featured broadcast-

ing of sports on a wide screen using synthesized and economized four 4K video streams (**Photo 7**).

(2) UI technologies targeted at 202X

An introduction was given of technology enabling low-cost collection and updating of barrier-free information needed by elderly or handicapped people for walking, as well as walking guide technology, with a view to achieving diversity navigation, which makes daily-life activities safe and convenient for those with mobility issues. In addition, technology that enables robots to present information more naturally was on display.

3.2 AI

(1) AI that supports people

The following technologies were introduced: Totto, the interviewer robot, which accurately recognizes what someone is saying and engages in a natural dialogue; RexSense®, an engine that recognizes non-verbal information (a speaker’s attributes, feelings, and intentions) from speech; and technology that understands a conversation between a customer and an operator, infers the customer’s situation from their responses, and extracts predefined key issues such as the subject matter and the customer’s reason for calling, in real time (**Photo 8**).

(2) AI that supports society

Also on display were AI technologies able to perform optimal control based on the numbers and flows of people in and out of a site. They included technology that uses AI to control air conditioning of a large

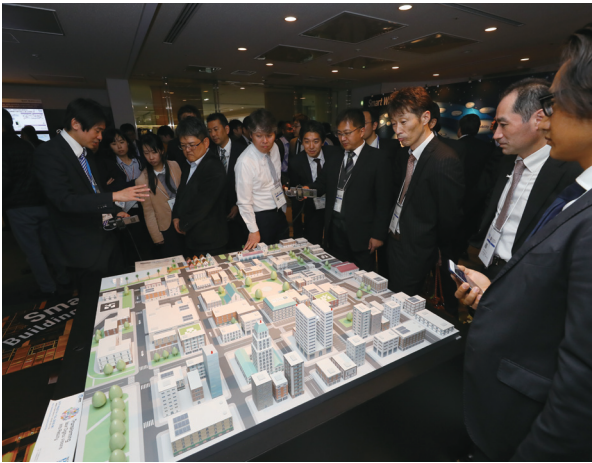


Photo 9. IoT.



Photo 10. Network.

commercial facility with an unspecified number of people coming in and out in order to reduce air conditioning costs while keeping the facility comfortable, and technology that uses a learning simulator to predict flows of people and thereby generate a guidance plan for various places such as an event site, a tourist spot, or a transportation facility.

(3) Fundamental technologies

Also presented were fundamental learning technology to accelerate deep learning, technology that converts and compresses a large volume of spatial data into a group of images, and technology able to deliver AIs to appropriate points within a network and make them operate in coordination.

3.3 IoT

(1) Sense, connect and drive

Technologies that digitize and transmit data that are read out from various objects were introduced, for example, technology for the sensing fabric, hitoe, which is being employed in a wide range of fields including healthcare; and technology for reliably collecting data from sensors in places where reception of mobile radio waves is weak.

(2) Data and software logistics

On display were IoT data exchange technology that achieves high-speed data exchange between a variety of machines and applications in the fields of manufacturing, automobiles, and ships, and edge computing technology that achieves real-time distributed processing for handling a large volume of data with low latency.

(3) Analytics and prediction

The latest research results that combine big data analysis and deep reinforcement learning were introduced (**Photo 9**). They included a public security solution that quickly detects and deals with an incident through analysis at a micro-datacenter located in the vicinity of the monitored area and technology that predicts where and when incidents that require an emergency response are likely to occur and optimally allocates rescue teams.

3.4 Network

(1) Flexible and high-speed networks

A wide range of network technologies for increasing network capacity or for optimizing network functions to suit different service requirements were showcased (**Photo 10**). These included wireless transmission technology for the post-5G (fifth-generation wireless communication networks) era and network slice technology for generating a network suitable for different needs.

(2) Networks that rapidly restore and provide services

The following technologies were introduced: operation technology that maximizes the scope of zero-touch operations and planned maintenance by determining how to handle various operational events such as service applications from customers and faults, based on an SLA (service level agreement), and technology that uses Network-AI to assist operators in different phases, from monitoring, analysis, and control to recovery, with the aim that in the future it will



Photo 11. Security.



Photo 12. Basic research.

be possible to handle faults that occur in ICT systems automatically.

(3) Network/IT (information technology) solutions

Solutions that utilize network functions and technologies that can be employed immediately for service development were exhibited. They included the API (application programming interface) orchestrator, which supports the public security solution in Las Vegas, and solutions that were the result of collaborations with partner companies.

3.5 Security

Unknown cyber-attack detection technology and personal information anonymization technology were exhibited (**Photo 11**). These consist of leading security technologies—some defensive and some offensive—that strengthen measures against cyber-attacks and will lead to the early realization of a data-centric society.

3.6 Basic research

Results of leading-edge basic research aimed at creating new principles or concepts in the coming years were introduced (**Photo 12**). They included a

transparent battery that will enable researchers to create a device that is virtually invisible; child language development analysis technology, which identifies the characteristics of late talkers; middleware and applications for LASOLV, a quantum neural network that solves challenging problems at an extraordinary speed; and coating-type deterioration sensing technology, which detects anomalies in structures simply by coating them.

4. Conclusion of the forum

To enable many people, including those from abroad, to come to the forum, we moved the forum dates from spring, when it was formerly held, to autumn. Consequently, we were able to welcome more than 15,000 visitors. We believe that what lies behind this large number of visitors, many from overseas, is their high expectation for NTT's R&D. In fact, visitors to the exhibit sites and those who took the questionnaire survey clearly expressed the expectations they had for our R&D. To live up to their high hopes, we will redouble our efforts in all areas from basic research to the development and deployment of new technologies.



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