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National Institute of Information and Communications Technology





Special Discussion

New Years' Discussion: Toward the Realization of Universal Communications

Dr. Yasuharu Suematsu (Advisor of the National Institute of Informatics) and Dr. Makoto Nagao (President of NICT)

We are celebrating the first New Year's Day since the start of the 2nd Middle-Term Plan. The year 2007 will be, we hope, one in which we will make great strides in the realization of universal communications, a key focus of NICT in its vision for future progress in ICT.

On this occasion, we invited Dr. Suematsu, Advisor of the National Institute of Informatics, for a discussion with our President, Dr. Nagao.

At a number of points the conversation touched upon a range of suggestions and indications concerning the ways in which universal communications may come to be realized.

(* Titles omitted from names below)

Nagao: The National Institute of Information and Communications Technology (NICT) was established in 2004 as a comprehensive research organization involved both in research and funding operations.

In 2006, the 1st Middle-Term Plan was launched, under which we defined the concept of "universal communications" as the ideal future of ICT. In this project our efforts were devoted, broadly speaking, to the realization of a more affluent and convenient society overall.

Suematsu: Society is in fact demanding universal communications. I've looked over the Middle-Term Plan and I'm quite impressed. It's a well-designed plan, covering a wide range of research fields while still maintaining clearly orchestrated directions and goals.

Nagao: Thank you. I believe that with the rapid progress we're seeing in the integration of communications and broadcasting, we have to transform the Internet environment into one that can

handle the demands of the new info-communication society.

A Safe and Secure ICT Society

Suematsu: Certainly, with the increasing sophistication of technologies and significantly reduced manufacturing costs of computers and televisions with Internet connections, we'll see rapid growth in the dissemination of these technologies and devices among the general public. We will definitely need a highly reliable network. As it stands, the Internet can't be described as highly reliable, but nevertheless we've seen the generation of a wave of new Internet-based businesses—although this wave has been in a sense somewhat chaotic. Today, the term "network" is no longer restricted to technological contexts; networks are an essential part of the societal infrastructure. So it's essential that we establish a firm set of network rules. Too many aspects of the Internet are currently left completely unchecked. Of course, throughout society we see that extreme restrictions can cause activity to grind to a halt, so we'd have to establish consensus among the members of the network society to keep this from happening. I'm hoping that NICT will take the lead in these areas as well.

Nagao: NICT is carrying out research on strategies to create a healthy environment that will sustain network services while at the same time encouraging development; with these strategies in mind we've set up a network security center to help maintain a safe and secure network environment. We're also devoting efforts to securing lines of communication during large-scale disasters, using the network to ensure the safety of those affected. For example, one of the emergency-response technologies we're working on is the so-called "ad-hoc network," in which multiple radio units loaded onto motorcycles relay information to a final destination through selection of optimal route connections. Now it's possible to transmit a variety of information, even in video format, by skillfully integrating the cellular phone—the most commonly available wireless terminal—into the network.

Suematsu: Yes, especially in Japan, cellular phone services provide Internet connectivity, allowing users to access a wide variety of services. In this context, we're hoping that more focus will be placed on the development of technologies that will permit seniors and the handicapped to



Dr. Yasuharu Suematsu (National Institute of Informatics)

Dr. Suematsu has held the positions of President of the Tokyo Institute of Technology, Director-General of the National Institute for Advanced Interdisciplinary Research, and President of the Kochi University of Technology; after serving as Director General of the National Institute of Informatics from April 2001 to March 2005, he is now an Advisor to the Institute.



access networks conveniently, without struggling with buttons or a keyboard.

Nagao: One of the major issues that we can't ignore in the realization of a safe and secure environment is the question of the global environment. At NICT, we've initiated a new approach in which our electromagnetic-wave measurement technologies will be used to measure atmospheric pollution levels and issuing warnings to the public.

The technologies for measuring carbon dioxide and water vapor—which have a significant impact on the global environment—and the actual measurements that will help us protect the global environment—may also be regarded as a part of universal communications, in that these data and measurements provide a means of communication between man and nature.

Suematsu: These are called remote-sensing technologies, aren't they? Remote-sensing technologies are essential in the realization of any program in which the Earth is protected by ICT. Private businesses generally cannot conduct basic research in these and other areas that require long periods of time; it's not cost-effective. So the private sector must rely on the results of research conducted at national research institutes and on the support of these institutes in practical applications. I believe that these roles fall precisely within NICT's mission.

Use of Outside Knowledge and Collaboration with Regional Organizations

Suematsu: You have mentioned that NICT is not only a research institute, but that it's also a funding institute. It appears to me that in this area NICT is actively bringing outside knowledge into its scope of activity. Can you tell me a little more about this area?

Nagao: Beginning this fiscal year, NICT has begun to invite a broad range of experts as program directors, relying on their strong leadership in the respective research programs. We are seeing some of the results of this initiative now, with research conducted not only within NICT, but also through collaboration with researchers in external organizations and even with our promotion of contracted research in areas outside of our core strengths, and we seem to be seeing a number of synergetic results.



Dr. Makoto Nagao (President of the National Institute of Information and Communications Technology, an incorporated administrative agency)

NICT has also set up research centers around Japan to carry out cooperative research with universities and regional organizations. For example, studies on technologies for high-sensitivity instruments to measure electromagnetic waves are underway at the Sendai Research Center to devise countermeasures against leakage of electromagnetic radiation from electronic devices. The center is operated with the cooperation of scientists mainly from Tohoku University. Research and development efforts on resolving the various problems posed by the Internet and Internet use are also underway at the Kyushu Research Center.

The projects undertaken by each of the research centers are unique, reflecting the distinctive characteristics of the cooperating regional universities. So you can see that NICT is pursuing a variety of research themes, creating a bridge from basic to applied research by bringing together people from different fields and providing them with the facilities or funds for these R&D projects.

Suematsu: Looking at NICT's organizational outline, it seems that there are quite a number of people working at NICT in addition to its core staff.

Nagao: Due to limitations on the size of our staff, we can't carry out all of our projects alone. I believe it's important to have the cooperation of experts in various fields if we're going to move info-communication technology forward in Japan. We specifically hire post-doctoral fellows to keep our perspective fresh. NICT is also creating a research environment based around young scientists from foreign countries, paying for the costs of their travel and stays in Japan. We hope that by amassing these forces in a comprehensive manner, NICT will come to be recognized both in name and function as a world-class COE in the ICT field.



where the content is understandable.

Nagao: These advances have been made possible by progress in computer technology. We can now perform linguistic analysis on a massive scale by parallel operation of multiple computers, which results in performance equivalent to that of a supercomputer—something that had previously been unthinkable. We can analyze as many as 500 million Japanese sentences in just one or two days.

Suematsu: Computer technology and network technology have a reciprocal relationship. Progress in computer technology will no doubt lead to a variety of new demands on the network. I think that given

Overcoming the Language Barrier

Suematsu: Is any of NICT's research specifically focused on the next generation?

Nagao: Yes, it is. For example, at the Kobe Advanced ICT Research Center, basic research on nano-biotechnology, quantum information and telecommunications, and quantum encryption technologies are planned for ten- to fifteen-year spans.

Suematsu: Quantum information and communications is an important field, not only for application to quantum computing and encrypted communications, but also in the generation of new knowledge, new science, and new technology. I know that you are a leader in the field of linguistics and machine translation. Can you tell me about some new developments in this field?

Nagao: Overcoming the language barrier is one of the crucial keys in the realization of universal communication. However, the required research is very basic and not feasible for private businesses in terms of cost. So we hope to create a practical machine translation system as soon as possible and to return our results to society at large. First, we'll start with Japanese-English and Japanese-Chinese translations, and then we'll expand to include Thai and other Asian languages.

Suematsu: I've noted the significant progress of machine translation technologies over the past few years. Documents on the Internet, although not perfect, can be translated at a level

the almost limitless possibilities in the integration of computers and networks, we have to select a number of priority areas and concentrate our efforts on them.

Another phenomenon that has caught my attention is the so-called "prominence of display." The results of a recent survey by the Ministry of Internal Affairs and Communications has shown that adults spend 37 minutes a day accessing the Internet, and 31 minutes reading the newspaper. I think we can safely conclude that we are now in a display-dominated age. Super-high-definition TV systems that can faithfully reproduce objects in the natural world will immerse not only adults but also children in realistic electronic images. With these developments, the high-definition images these displays will offer will have a positive effect on children's growth, both psychologically and physically. R&D of 3-D imaging is an extension of these realistic displays; these and similar technologies will require efficient, large-volume signal transmission, an area for which the R&D conducted at NICT will become more and more important.

Nagao: In FY 2006, NICT established the Universal Media Research Center and launched a number of research projects to help realize an ultra-realistic environment using a variety of sensory information—sight, sound, touch, and smell. Studies are underway at the Center to produce technologies for displays with even higher definition, as well as 3-D imaging technologies. Many technical problems remain to be overcome. However, our current strategy aims to establish a firm prospective in five years and to produce a commercial model for marketing in ten.

Suematsu: High-definition and 3-D displays consist of essential technology not only for domestic use but also for corporate



activities. For example, in factory manufacturing processes, optimum designs based on work efficiency and the motions of the workers is essential, and 3-D displays can be of great use in arriving at such designs. What's more, 3-D displays will also be extremely useful during disasters and other crises.

The Importance of Collaboration Between Societal Services and Society

Suematsu: I have always felt that the Japan Standard Time maintained and supplied by NICT is a great contribution to society, ever since its days as the Radio Research Laboratories. Now that radio clocks have become a common household item, the importance of the transmission of a standard time-and-frequency wave has increased. I also believe that the provision of the standard time set by the government throughout the network society is an important duty, one in high demand in modern society. The responsibility for standard-wave transmission requires not only precision in terms of time but also high reliability and stable operation; undoubtedly this responsibility is an extremely challenging one. I think that the JST service provided by NICT is a prime example of a societal service that a country has to provide, and that this service is being excellently executed.

Nagao: Thank you. NICT is not only providing Japan Standard Time, it's also continually working to improve the precision of the service. The current system maintains a temporal precision of 10-15 seconds, and is competing technically with standard time organizations around the world. We're going to keep striving for precision to an even higher order, to arrive at a time standard system for the new era.

Suematsu: We should note that the more research becomes advanced, the more basic research becomes critical, and in this context also to consider the increased importance of



communication and discussions between researchers in various fields. I believe this is particularly true in the fields of linguistics and translation. Research shouldn't be conducted in a closed environment. The cooperation of many people is essential. Particularly now that the network has developed into a full-fledged societal infrastructure, the network itself will have a significant effect

on the direction of society in the future, even as society demands greater innovation in the network. As I've said before, we have to have cooperative efforts between all members of society, including ordinary users and legal specialists.



Importance of Research That Will Surprise 10 Years From Now

Suematsu: When I look back on progress throughout the world and particularly on achievements in communications, I can't help but realize the enormous significance of the R&D at public research institutes. We can easily say that these R&D efforts—initially undertaken in response to the demands of the time and governmental needs—form the bedrock of convenience in society today. On the other hand, I have on occasion debated with American researchers on the importance of setting research themes based on the ideas of researchers uninhibited by the goals of a specific organization. I believe that the identification of research themes with a broad outlook—and in some cases, the cultivation of these themes—is an important role of national research institutes. One of NICT's key missions should be to undertake promising themes that have nevertheless been abandoned by private businesses and universities.

Nagao: I certainly recognize the need to place emphasis on such areas. National research institutes tend to be mission-oriented, and are often under demands to pursue research that will produce results in two to three years.

Although this sort of research is very important, I also feel that NICT should pursue themes that could produce surprising results ten years into the future.

Suematsu: Well, I wish the best for NICT well into the future.

Nagao: Thank you very much for your time today. I'm very grateful for all of your valuable insights.



Successful Launch of ETS-VIII (*Kiku-8*)

Noriyuki Kurihara, Director of the Public Relations Office, Strategic Planning Department

At 15:32 JST on Dec. 18, 2006, the ETS-VIII satellite *Kiku-8* was launched from the Tanegashima Space Center of the Japan Aerospace Exploration Agency. This satellite was jointly developed by three organizations—the National Institute of Information and Communications Technology (NICT), the Japan Aerospace Exploration Agency (JAXA), and Nippon Telegraph and Telephone Corporation (NTT)—as a geostationary satellite designed to conduct a variety of engineering tests. It has been some time since NICT last placed its own experimental instruments aboard a satellite, and Dr. Matsushima, Vice President of NICT, was at the center to watch the launch together with the NICT staff members in charge of the experiment. When the countdown reached zero and the engines were ignited for liftoff, the surrounding area was instantly engulfed in the roar of the rocket and the dazzling red flames, and in no time at all, the rocket had disappeared beyond the blue sky.

Since then, the deployment of the solar battery paddles, the firing of the apogee motor for injection into the geostationary orbit, and the deployment of two large deployable antenna reflectors have taken place, and on Dec. 27, 2006 satellite operation shifted from the so-called “critical phase” to the “initial functional verification phase,” approximately 3.5 months after launch.

Validation experiments using the ETS-VIII are planned to commence in mid-April, 2007. NICT’s validation experiments with the satellite will consist mainly of the two shown in the table. The results will be presented on our website, which will be updated to reflect the progress of the experiments. Keep an eye out for the results of our ETS-VIII experiments!

H-IIA launch vehicle No. 11 carrying the ETS-VIII for launch from Tanegashima Space Center



Validation Experiments Using ETS-VIII

(1) Mobile-Body Satellite Communication Experiment

Two large antennas aboard the satellite, with a total surface area larger than two tennis courts, will be used in a mobile-body communication experiment, which is aimed at establishing technologies for a satellite communication system allowing for communication with anyone using a palm-sized cellular phone—regardless of whether the user is on the ground, at sea, or in flight, and even while the user is in motion.

(2) High-precision time comparison experiment

Using the cesium atomic clock aboard the satellite, a satellite-ground high-precision time comparison experiment will be performed to establish basic technologies in satellite positioning.

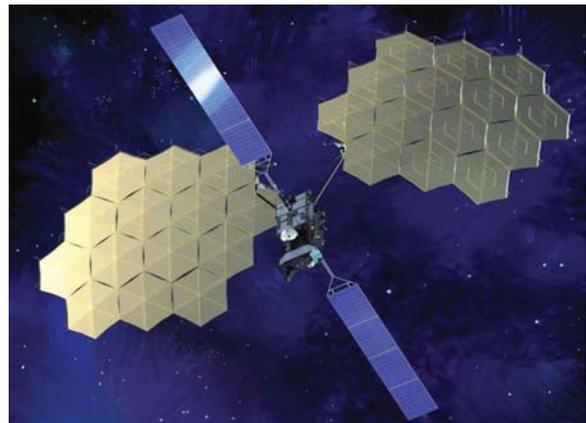


Image of the ETS-VIII (*Kiku-8*) in geostationary orbit above the equator at E146° longitude



A logo designed jointly by the three organizations depicted on the upper part of the H-IIA launch vehicle No. 11

Launch of the ETS-VIII (*Kiku-8*)

Date: Dec. 18, 2006

Place: Tanegashima Space Center of the Japan Aerospace Exploration Agency (Kagoshima Prefecture)

(Photo provided by JAXA)

Report on Fire Drill at NICT

Akira Toda, Assistant Chief of the Facility Team, Contract and Property Office, Financial Affairs Department

At NICT, numerous facilities and instruments are essential to our regular duties and research in various fields. In particular, the facilities for determining and maintaining Japan Standard Time must be protected from natural disasters and accidents. Thus, the response to these and other emergency situations will be critical.

Although NICT is taking all possible measures to prevent fire, it is important to train staff routinely on the actions to be taken in the event a fire does occur, to minimize the risk to human safety and to the facilities themselves.

With these concerns in mind, the FY2006 Fire Drill was conducted at NICT Headquarters (Koganei City, Tokyo) on Dec. 7, 2006.

First, the Koganei Fire Department gave a presentation on the importance of fire prevention and control, followed by an explanation from the Financial Affairs Department on the new NICT Fire Prevention Plan. In the afternoon, a fire drill was conducted in accordance with this plan, including alerting the fire department, initial extinguishment, and an evacuation drill, mainly for the

members of the NICT fire-defense headquarters and those in charge of fire prevention in each section. The results of the drill confirmed that the specified procedures could be executed quickly according to the plan.

We also enjoyed the complete cooperation of the Koganei Fire Department, which performed a fire extinguishment and rescue demonstration for us, consisting of a water discharge drill using fire trucks and the fire hydrants within the facilities of NICT and a rescue drill from the roof using an aerial ladder truck. I believe that the experience was an extremely productive one for all those who participated.

Since NICT is a public institution with an important role in society and a responsibility to many people, we plan to repeat drills such as these in the future and to step up our efforts in fire prevention.

Finally, I would like to thank the staff of the Koganei Fire Department for their cooperation in this year's drill.



Rescue drill from roof using an aerial ladder truck



Initial extinguishment drill



Elevated rescue drill

NICT Fire Drill
Date: Dec. 7, 2006
Place: NICT Headquarters (Koganei City, Tokyo)

Two symposia as part of Information Security Day

Safe and Secure Society and Info-Communication Technologies Disaster and Crisis Management ICT Symposium

Date and Time: Thursday, Feb. 1, 2007, 10:00 a.m.–4:10 p.m.

Venue: Halls 203 & 204 in the Annex Hall of Pacifico Yokohama

* Held on the same day: The 11th Earthquake Technology Expo / Natural Disaster Recovery Technology Expo, Yokohama (Exhibition Hall B)

Host: National Institute of Information and Communications Technology

Sponsor: Ministry of Internal Affairs and Communications

Summary: Recent years have seen growing demand for a safe and secure society, with particularly increased interest in contingency planning for earthquakes, meteorological disasters, tsunamis, and similar events, with vocal public demand for effective countermeasures. The present symposium will introduce an assessment of these demands in terms of info-communication technologies (ICT) and the current state of affairs. The future activities of NICT in this area will also be explained. Furthermore, we hope to make this an occasion to improve our future strategies by soliciting the opinions of experts and the public.

For details and registration:

http://www.prime-intl.co.jp/nict_sympto/

For inquiries:

Disaster and Crisis Management ICT Symposium Office

Tel: +81-3-5467-5539 Fax: +81-3-5467-5538

Participation is free of charge.

* Free admission tickets will be sent to pre-registered participants.

NICT Info-Communications Security Symposium Toward a Tractable Network — Safe and Secure Society and Info-Communication Technologies —

Date and time: Wednesday, Feb. 7, 2007 10:00 a.m.–5:45 p.m.

Venue: The Sapphire Room, Aoyama Diamond Hall (B1)

Host: National Institute of Information and Communications Technology

Co-Host: Telecom-ISAC Japan, Nippon Information Communications Association

Information Security (ISEC) of the Institute of Electronics, Information and Communication Engineers

Information and Communication System Security (ICSS) of the Institute of Electronics, Information and Communication Engineers

Sponsor: Ministry of Internal Affairs and Communications (planned)

National Information Security Center (planned)

Summary: The present symposium will be held to introduce the latest trends in R&D of info-communication security technologies at NICT and to promote R&D directed at the realization of a tractable network that will support a safe and secure society. Experts from this field will be invited to the symposium to give lectures and hold panel discussions.

For details and registration:

<http://www.ilcc.com/tractable-network/>

For inquiries:

Tractable Network Symposium Office

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E-mail: tractable-network@ilcc.com

Participation is free of charge.

* Free admission tickets will be sent to pre-registered participants.