NICT NEWS
独立行政法人
情報通信研究機構
National Institute of Information and Communications Technology
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10
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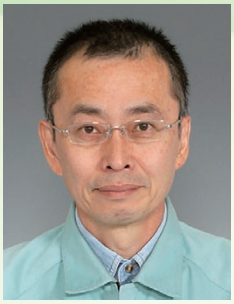
Cover image: Infrared two-dimensional lock-in amplifier system

Non-destructive Testing for Micro-cracks in Buildings and Other Structures

—Highly sensitive measurement technology using an infrared two-dimensional lock-in amplifier system—



Takashi MAENO

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

Joined Communications Research Laboratory, the Ministry of Posts and Telecommunications (currently NICT) in 1989 after completing graduate school. Engaged in research in areas including optical-electromagnetic measurement and dielectric properties. Professor at the Graduate School of Tokyo City University. Doctor of Engineering.

Introduction

The Japan archipelago lies on four large plates in an area prone to large earthquakes. In this geological situation, it is occasionally subject to major earthquake damage, so technology to ascertain the earthquake damage to structures such as buildings, bridges and roadways quickly and over wide areas is needed. Much of this damage can be detected visually, but micro-cracks that do not appear on the surface cannot be found easily in this way, even though they could develop into serious damage in the future. Typically, these types of defects are found with hammer testing. When the surface of a concrete wall is struck with a small hammer, for example, if the concrete is good it makes a high, crisp sound, but if there are cracks or delaminations near the surface, the sound is hollow and less clear. This is a very sensitive and reliable testing method when done by a skilled technologist, but it is labor-intensive and cannot be used if there is no direct access to the site. NICT is conducting research on various types of measurement methods using a broad range of electromagnetic (EM) frequencies from radio to visible light. Non-contact measurements can be done using EM radiation, so we developed a system that uses it to evaluate the types of defects described above.

Infrared non-destructive testing method

Figure 1 shows a non-destructive testing method for detecting voids using infrared images. Heat is transferred to the interior of the material when the surface of the sample is warmed using a lamp or other device. If there are cracks or delaminations, the heat is not diffused smoothly. As a result, locations where there are voids become warmer than surrounding areas, so if an infrared image of the area is captured, the size and shape of areas with voids can be seen in the temperature distribution. However, in contrast to a visible image, the edges in thermal images tend to be blurred, and do

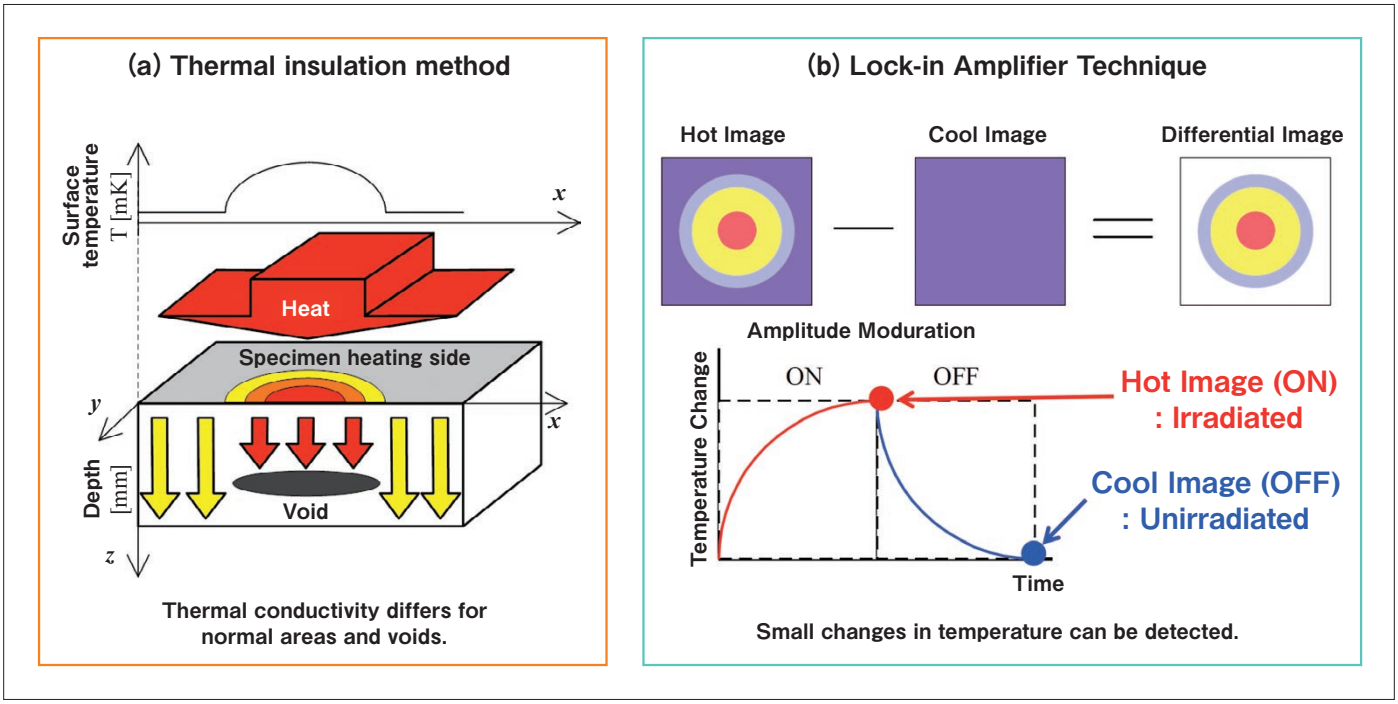


Figure 1 Non-destructive testing method for detecting voids using infrared images

Figure 2 Infrared two-dimensional lock-in amplifier system

not allow detection of fine cracks. We are conducting research into applying a technique uses a lock-in amplifier, which averages the results of many repeated measurements, to detect small changes in temperature. Our infrared two-dimensional lock-in amplifier system, integrating an infrared camera, is shown in Figure 2. Images are taken with the infrared camera as a heating lamp is turned on and off. This is repeated many times and the differences between the images during heating and cooling are computed and averaged by computer. This process enables micro-cracks that cannot be detected with simple thermal images to be detected.

Non-destructive detection of micro-cracks

Figure 3 shows an example of detecting micro-cracks appearing in a wall of a building. As is typical, its concrete surface is covered with paint. Both the interior and exterior of concrete walls in buildings are typically covered with wall paper or synthetic resin, so small cracks of 1 mm or less often cannot be detected from the surface. Even if cracks are small, they can penetrate to the rebar, so they require attention. On the left in Figure 3, cracks are almost invisible, but after averaging 20 times with the lock-in amplifier, they are clearly visible. Continuing for 100 repetitions reveals other, even smaller cracks.

Adaptation for disaster sites

We were able to detect defects well in the limited context of the laboratory. However it is necessary at present to be within one or two meters of the test site, although the method is non-destructive and non-contact. To perform tests at a disaster site, in places such as on a building high above the ground, it must be possible to make observations from as far away as possible. We will continue to improve this system to enable testing from farther away, such as by integrating an infrared telescope into the system.

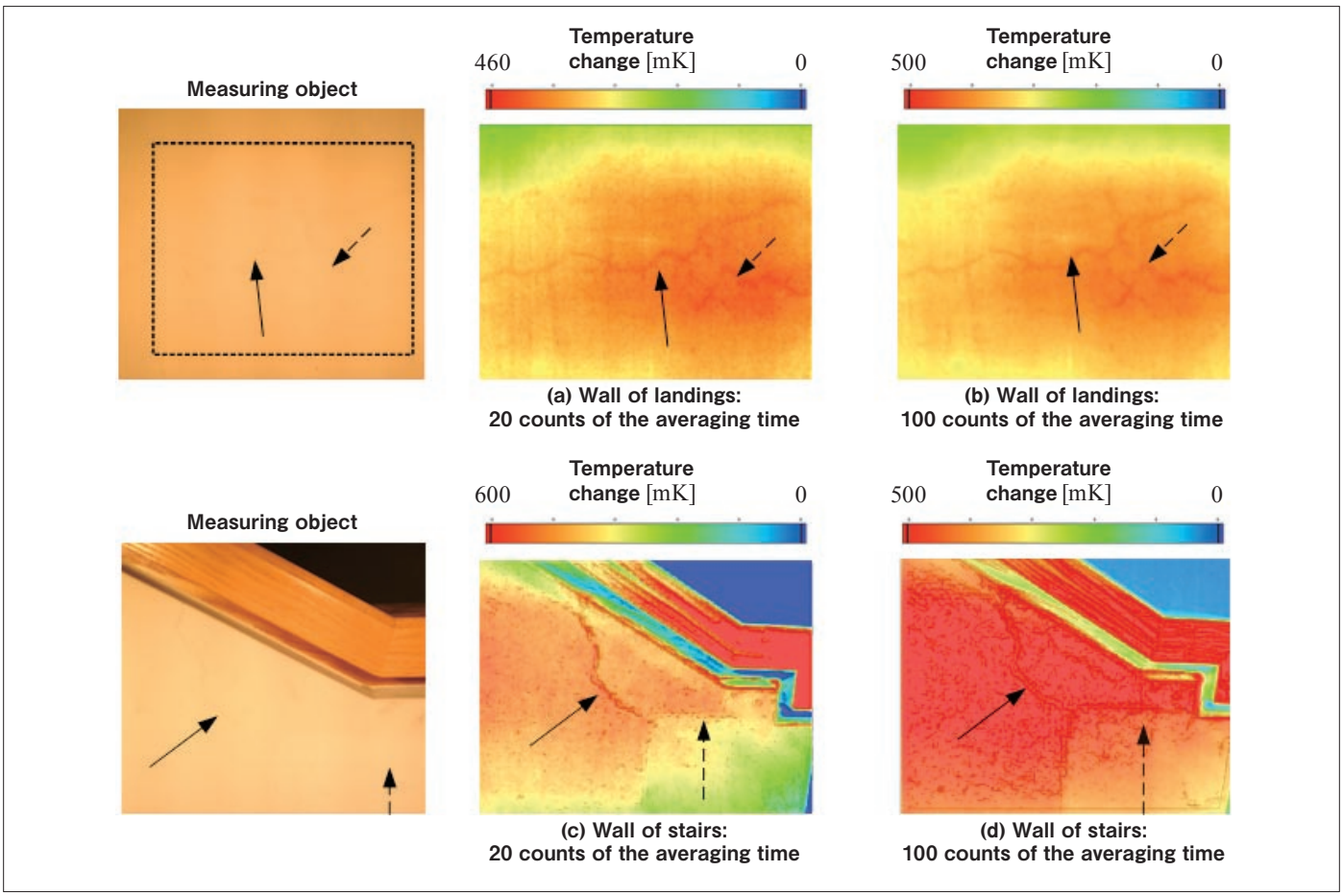


Figure 3 Detection of narrow cracks by two-dimensional lock-in amplifier system

PRINCESS: A Secure File Storage System

—With flexible data sharing based on confidentiality levels—

Lihua WANG

Senior Researcher, Security Fundamentals Laboratory, Network Security Research Institute

Worked as a Researcher at University of Tsukuba after completing her doctorate, and then joined NICT in November, 2006. Engaged in design and evaluation of cryptography and authentication protocols. Ph.D. (Engineering).

Atsushi WASEDA

Researcher, Security Fundamentals Laboratory, Network Security Research Institute

Joined NICT in 2007 after completing his doctorate. Engaged in research related to quantum cryptography and security protocols. Ph.D. (Information Science).

Shiho MORIAI

Director of Security Fundamentals Laboratory, Network Security Research Institute

Graduated from university in 1993. Joined NICT in 2012 after working at Nippon Telegraph and Telephone Corporation (NTT) and Sony Corporation. Engaged in research on design and security evaluation of cryptographic technology as well as international standardization. Ph.D. (Engineering).

Background

Cloud-based storage services have been increasingly common recently, but currently most of them simply store uploaded data as-is, without encryption, and there is a danger that archived data could leak due to a cyber attack or operational error by the storage company. It is also desirable to be able to set sharing policies (confidentiality levels) according to which members will share the data. Archive data encryption is an effective measure for resolving these issues. However, with conventional public-key cryptosystems (e.g. RSA encryption), files encrypted with user A's public key can only be decrypted with user A's private key, so to share an encrypted file with multiple members, the encryption process must be carried out as many times as there are sharing members. On the other hand, with symmetric-key cryptosystems (e.g. AES), all sharing members use the same key for encryption and encryption can be done all at once, resolving the issues with public-key encryption. However, a different key must be used each time to preserve safety, so key sharing and management is still an issue.

To resolve these types of issues, NICT developed the "Proxy Re-encryption with INd-Cca secure* Encrypted file Storage System" (PRINCESS). PRINCESS uses an ID-based encryption called "ID-Based Proxy cryptosystem with revocability and hierarchical confidentialities", which implements the two functions of proxy decryption and proxy re-encryption (IBPdr) and is proprietary NICT technology. It is an encrypted file sharing system that considers users' privacy in handling their confidential information.

Technologies used in PRINCESS

ID-based encryption

ID-based encryption is a type of public-key encryption that features use of a unique ID (e.g. the user's email address) as the public key. This makes it a very convenient encryption method for users. With conventional public-key encryption systems, users can issue their own private keys, but with ID-based encryption systems, keys corresponding to the users' IDs are issued by a trusted Private Key Generator (PKG) such as their organizations' information-management departments.

Proxy decryption and proxy re-encryption

Proxy decryption is an encryption method with a feature that enables a pre-designated party (a proxy) to decrypt ciphertext that conventionally only the legitimate receiver could decrypt. In this case, the legitimate receiver passes the proxy a proxy decryption key, rather than his/her own private key, and the proxy can use it to decrypt the ciphertext (Figure 1). On the other hand, with proxy re-encryption, receiver A passes a re-encryption key to a proxy server, which enables it to convert data encrypted for user A to data encrypted for user B, without decrypting the data first. User B can then use his/her own private key to decrypt the converted ciphertext (Figure 2). A feature of this re-encryption key is that it cannot be used to decrypt either the ciphertext for user A or the converted ciphertext for user B. We have proposed the IBPdr

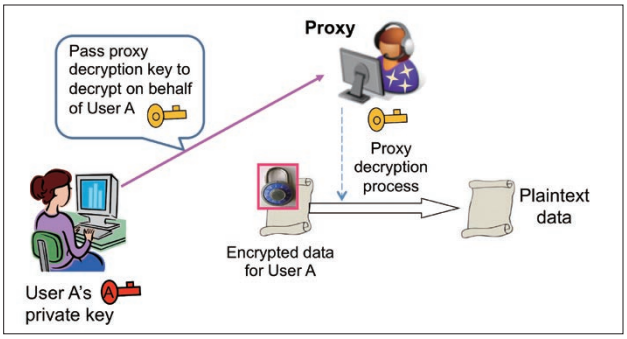


Figure 1 Proxy decryption

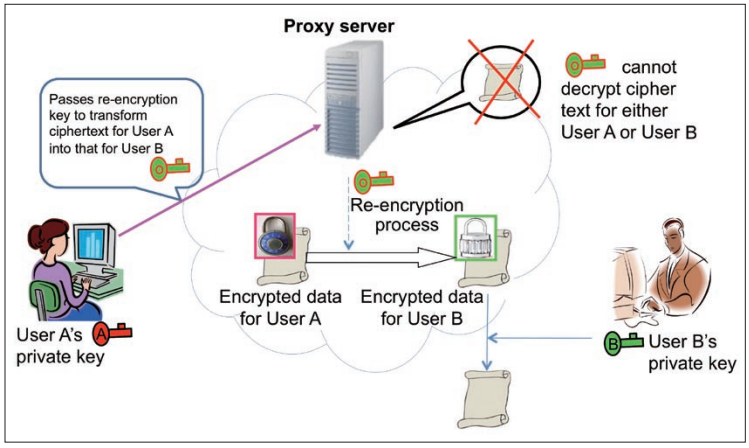


Figure 2 Proxy re-encryption

system, as a NICT-proprietary technology that is able to convert ciphertext created using a proxy decryption scheme to ciphertext for a different user through use of proxy re-encryption.

PRINCESS Functions

We implemented PRINCESS utilizing the features of the ID-based proxy cryptosystem described above (Figure 3). PRINCESS has three levels of confidentiality—high, medium and low—each using different encryption protocols. (1) ID-based encryption is used for sharing encrypted files with a single specified member (having a confidentiality level of "high"); (2) Proxy re-encryption is used for sharing encrypted files with members of the same organization (having a confidentiality level of "medium"); and (3) Proxy decryption is used for sharing encrypted files with users including those who do not belong to the same PKG (having a confidentiality level of "low"), by passing proxy decryption keys to such users. Through the features of IBPdr, ciphertexts with a lower confidentiality level can be converted to ciphertexts with a higher confidentiality level (e.g., from "low" to "medium", from "low" or "medium" to "high"), but the opposite conversion cannot be done.

PRINCESS is an efficient system that encrypts data using the AES symmetric-key cryptosystem, encrypts the AES key, K, using the IBPdr system, and then stores them both on a server. To share a ciphertext having confidentiality level of "low" with a user not belonging to the same PKG, the storage server sends the ciphertext as-is, the user computes K using a temporary proxy decryption key received earlier, and then uses K to decrypt the AES-encrypted data file. To share a file encrypted for user A and having a confidentiality level of "low" or "medium" with user B, a member of the same organization, a re-encryption key from user A to user B is sent to the server. The server then uses it to convert the ciphertext of K created for user A to a ciphertext for user B. In doing so, B can decrypt K using his/her own private key. Then the AES-encrypted data file can be decrypted. We have implemented PRINCESS in a storage server and tablet devices for controlling it (Figure 4).

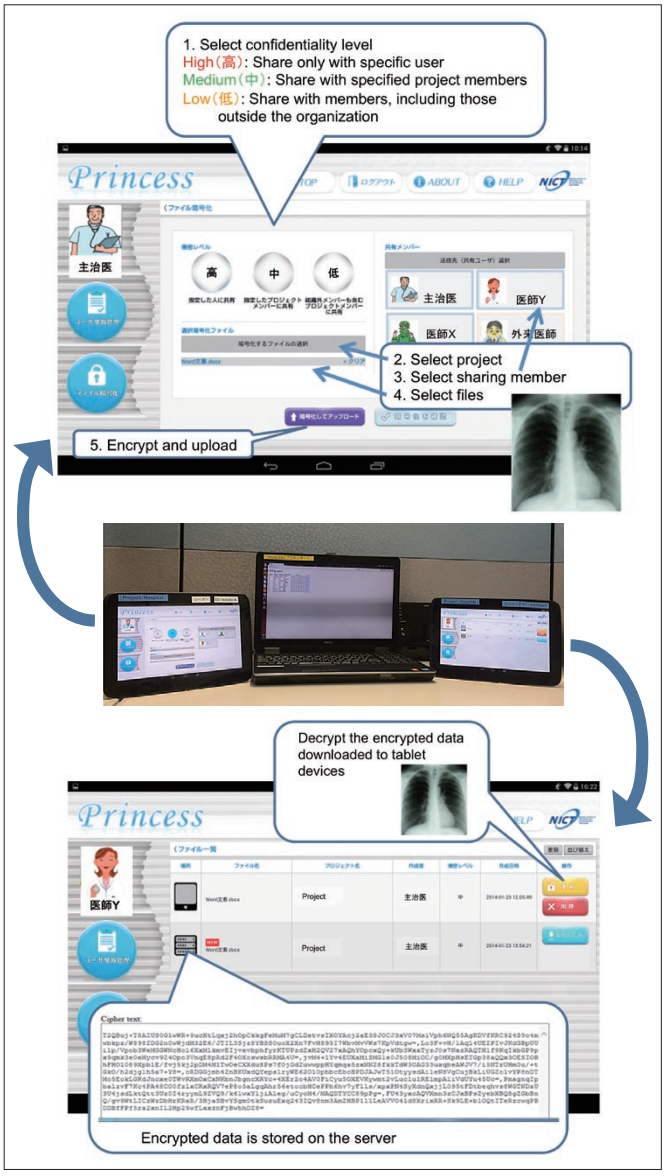


Figure 4 Storage server and tablet devices implementing PRINCESS

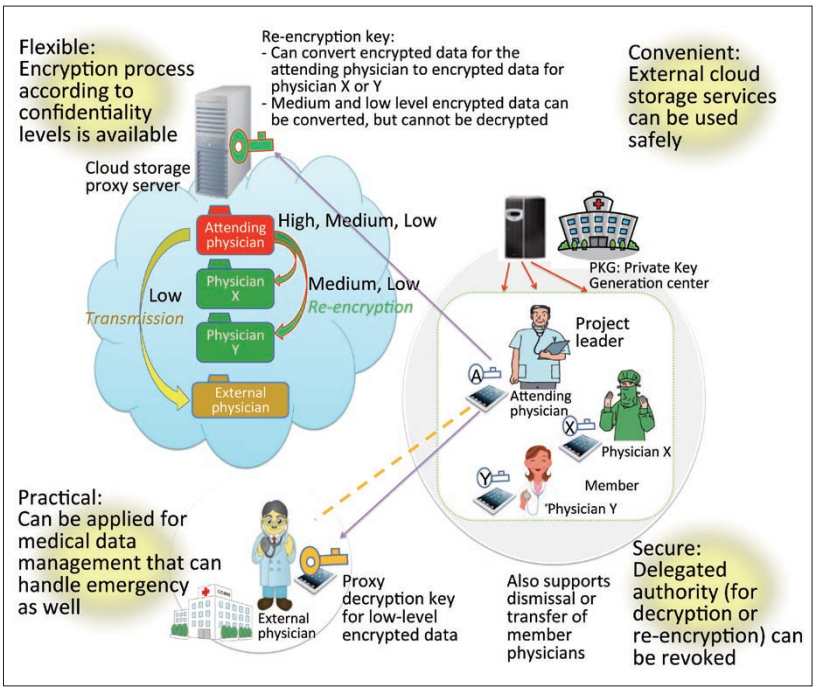


Figure 3 Overview of PRINCESS (application example of handling medical information in a cloud service)

Example applications and future prospects

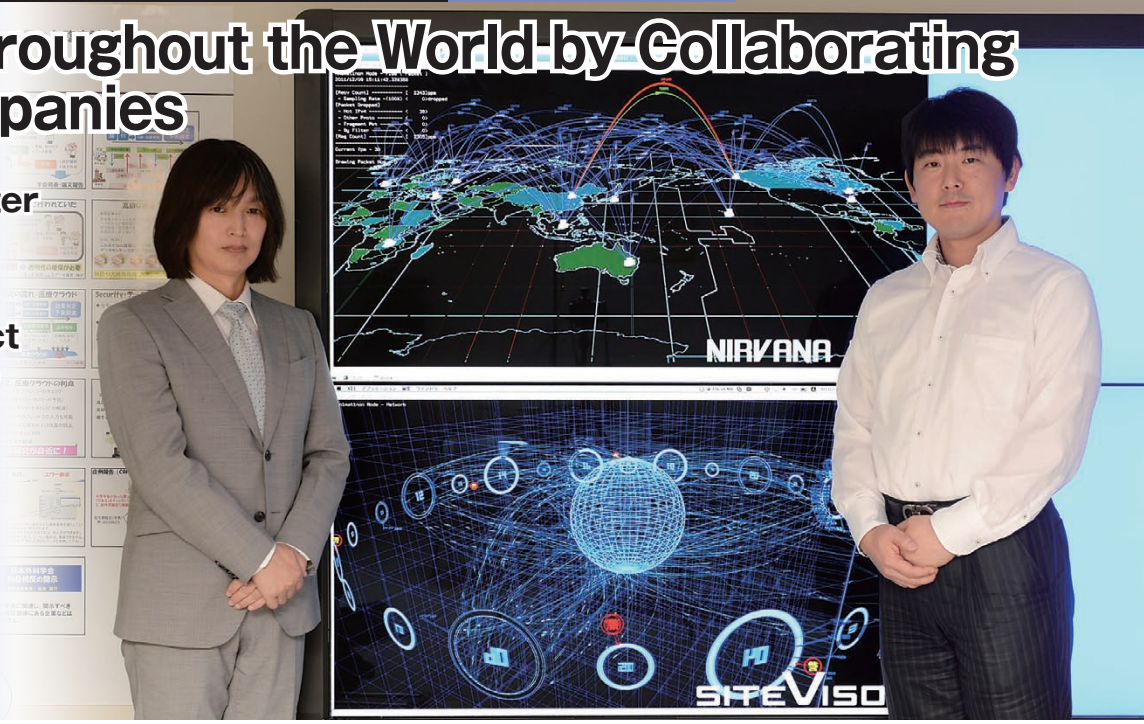
PRINCESS has many possible applications as an ordinary encrypted file storage and sharing system, such as for sharing medical data or automobile information, or for use with Social Big Data. Such data is likely to include private information, so using cloud storage services that have inadequate data protection measures can lead to concerns regarding security. PRINCESS not only resolves such issues of privacy, it is also useful from the perspective of Business Continuity Planning (BCP).

In the future, we intend work to put PRINCESS, the general encrypted file sharing storage system, to practical use in various fields.

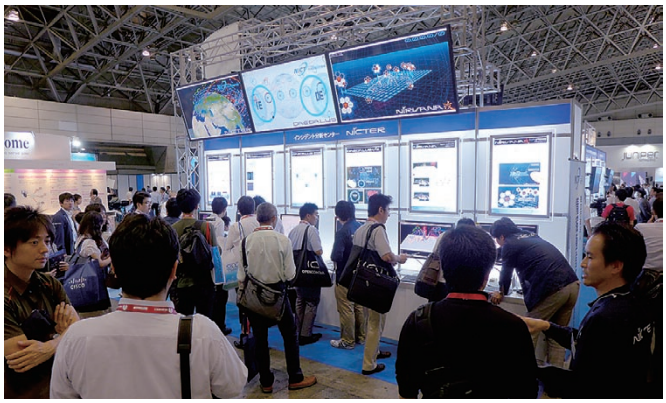
* IND-CCA secure: Defined as the strongest security level of encryption systems, satisfying indistinguishability (IND) even a chosen-ciphertext attack (CCA) is used. More specifically, consider a game in which the attacker must determine that ciphertext C was encrypted by which text, D1 or D2. In such a case, if the attacker cannot determine whether C is the ciphertext of D1 or D2 (IND), even if he/she can select a ciphertext other than C and obtain the plaintext data of the selected ciphertexts (CCA), IND-CCA security has been achieved.

Distributed throughout the World by Collaborating with Two Companies

Use of NIRVANA (NIcter Real-network Visual ANAlyzer) and DAEDALUS (Direct Alert Environment for Darknet And Livenet Unified Security)



Nippon RAD Inc. (hereinafter Nippon RAD) and clwit Inc. (hereinafter clwit) are both commercializing NICT-developed systems, which they have received through technology transfers, called "NIRVANA" and "DAEDALUS" respectively. The companies entered into a partnership with each other in April of this year. They are combining their forces to develop global business using domestically developed systems. Osamu TAKIZAWA, Manager of the Intellectual Property Promotion Office, is in charge of the Network Security Laboratory and one of his roles is to make connections to implement NICT-developed technologies in society. TAKIZAWA recently spoke with Mr. Michimasa SUZAWA, President of Nippon RAD, and Mr. Yasuhiro KUNIMINE, CEO of clwit.



NICT booth at Interop Tokyo 2014

NIRVANA Rapps: Displaying network traffic using 3D animation

TAKIZAWA: To begin, could you describe NIRVANA Rapps, which Nippon RAD is developing?

SUZAWA: NIRVANA Rapps is a product that Nippon RAD developed using the NIRVANA technology received through technology transfer. It displays network traffic in real time using 3D animation. It can extract and collect source and destination information from traffic and provide a visualization of this data in real time.

Our sales activity is mainly targeted to users that have high-volume traffic or operate large-scale networks, such as communications providers, data centers, manufacturers' laboratories and government agencies.

TAKIZAWA: What sorts of reactions have you had from organizations using the product?

SUZAWA: Traffic flow is shown using an animation that can be understood intuitively, so when trouble occurs, the location of the trouble can be addressed immediately. Users have said that they can address problems more quickly, because this can reduce the work involved in checking the logs of the applicable routers.

Mr. Michimasa SUZAWA, President, Nippon RAD Inc.

Nippon RAD Inc.
Established in 1971 and listed on JASDAQ. Mainly engaged in corporate software development contracting, but also developing hardware for hospitals, government, police and fire departments. Also conducting sales of products, mainly from overseas, and operating data centers. Currently approximately 300 employees.

SiteVisor: Detecting unauthorized access within an enterprise and sending alert notifications

TAKIZAWA: Could you describe the SiteVisor product that clwit is developing?

KUNIMINE: SiteVisor is a cyber-attack alert service that we are commercializing based on the DAEDALUS technology received from NICT through the technology transfer. It monitors all access from unused IP addresses belonging to an enterprise, detects any unauthorized access, and sends alerts to an administrator in the organization. It does this because any access to an unused IP address is likely to be due to some sort of trouble.

I cannot mention any enterprise names when talking about the

nature of the service, but most users are major corporations in areas such as data communication, financial or insurance services, but also include government agencies and others.

Creating new products prompted by trade shows

TAKIZAWA: Could you tell me how you came in contact with NICT technology?
SUZAWA: It began several years ago, when one of our staffs saw the NIRVANA exhibit at Interop Tokyo, and talked about how he wanted to create a product with it within our company.
KUNIMINE: We established the company in 2000, developed a safety confirmation system with the Internet, and NICT was the first to purchase it. We later participated in network security research and developed part of nicter in the course of that work. That was the beginning of work toward developing the DAEDALUS product.

Issues with permission for testing and delivery time

TAKIZAWA: Could you describe some of the difficulties you had in developing these businesses?
SUZAWA: We have to connect to the trunks of operating networks, so obtaining permission to test is an extremely difficult process. There were also many requests for additional alerts and other functions once we got started.

On the technical side, high-speed hardware is used to process the large volume of high-speed traffic. This involves dependencies on individual pieces of hardware, and can result in issues with compatibility.
KUNIMINE: When introducing SiteVisor, the configuration in the network must be changed to allow monitoring of communications that were previously discarded. Testing must be done while the system is actually running and can take a long time, because administrators in large enterprises have often changed since the network was installed and none of the staff have a full understanding of the overall network. Currently, it takes from six months to a year to deliver SiteVisor, but we are discussing ways to reduce this time.

Future developments for the two partnered companies

TAKIZAWA: In April, Nippon RAD and clwit entered into a partnership agreement. What sorts of synergistic effects do you expect from this collaboration, and could you talk about future developments?
SUZAWA: The current collaboration resulted when a NIRVANA Rapps customer requested an alert function. NIRVANA Rapps and SiteVisor are not competing products. NIRVANA Rapps customers may also purchase SiteVisor, and we believe that the opposite will also occur. We may also be able to help in terms of man-power in some areas.

clwit, Inc.
Established in 2000. Engaged in research and development for network security, as well as providing hosting services. The company involves seven people, including officers and employees.
The company name derives from the initials of the phrase "Communicable Life With Internet Technology."

Mr. Yasuhiro KUNIMINE, CEO, clwit Inc.

KUNIMINE: clwit has only seven employees, so this limits the scope of what we can do. We expect to collaborate on both technical and business aspects of the partnership. clwit also has sales agents in the U.S.A, the U.K., and Australia, so we are also promoting marketing efforts overseas. On that matter, many of our overseas associates are saying that visualization of packets in-use is more important than unused packets, so we would like to propose NIRVANA Rapps for that purpose.

Future business development and hopes for NICT

TAKIZAWA: Your two companies have their distinctive characteristics, both in substance and in scale, and are cooperating in business development. Having two of NICT's R&D results joined together and developed in this way is a very interesting development. Can you tell us a little more about future developments in your two companies?
SUZAWA: The name "Nippon RAD" comes from "R And D", so we have a culture of pursuing technical, cutting-edge topics. I expect we will continue to follow this direction.
KUNIMINE: We have always wanted to work in the information security business, but unfortunately, most of the information security products sold in Japan are from overseas, and there are few Japanese-made products. SiteVisor, on the other hand, is purely a Japanese product. One of our goals is to expand SiteVisor around the world. We also want to expand in the information security services department, which includes work with SiteVisor.
TAKIZAWA: Could you tell us of any hopes you have of NICT in the future?
SUZAWA: Most network technologies originate overseas. As a flagship facility in Japan, we would like to see leading-edge technical development that we can expand around the world.
KUNIMINE: We develop our business on the basis of technologies developed at NICT. NICT advances development of leading-edge technologies that hold promise for the future based on the feedback from our businesses. Then we take those technologies as a basis for expanding around the world. It would be wonderful to build more of a cooperative relationship together with NICT.

Interviewer
Osamu TAKIZAWA
Manager, Intellectual Property Promotion Office, Outcome Promotion Department

The next issue will include an article featuring the interview with Anritsu Corporation, regarding the Wi-SUN technology transfer.

Report on 2014 Children's Day for Visiting Kasumigaseki

NICT exhibited at the "Children's Day for Visiting Kasumigaseki," held at the Ministry of Internal Affairs and Communications (MIC) on August 6 and 7. The event is a collaboration among various government organizations in the Kasumigaseki area, which explain their work and give tours of their facilities, giving children experiences during their summer vacations that will help them understand society more broadly, and increasing understanding of the policies they are undertaking.

This year, over 23,000 people visited throughout Kasumigaseki, and 1,275 people visited the venue at MIC where NICT had its exhibit.

The exhibit featured various smartphone applications developed by NICT, including "VoiceTra4U", a multilingual speech-to-speech translator application, "KoeTra" that supports communication between the hearing impaired and people with normal hearing, and "Kyo no Osusume" and "AssisTra" which provide Kyoto tourist information in multiple languages. These technologies are accessible to all—women and men, young and old—so they attracted attention from children as well as parents, guardians, and grandparents.

These exhibits helped the visitors have interests in NICT.

NICT booth


Drawing using KoeTra features


Using the speech translation applications

Report on the Youngsters' Science Festival in Koganei, Tokyo

The Youngsters' Science Festival in Koganei, Tokyo, was held on August 31 at the Tokyo Gakugei University Koganei Campus, which is next to NICT headquarters. NICT exhibited again this year as part of its regional cooperation efforts.

The event is held every year to prevent younger people from turning away from science by giving young people opportunities to experience how interesting and fun the natural sciences can be, to nurture youth having a rich sensitivity and intelligence based on comprehensive knowledge of arts and sciences, and to creating new culture in the region by cultivating regional vitality.

This year, NICT presented exhibits on the following topics, based on the theme of "Highlights from National Institute of Information and Communications Technology!"

(1) Japan Standard Time and atomic clocks
(2) Optical communication and modulation
(3) Speech translation (VoiceTra4U, KoeTra, and AssisTra)
(4) Interesting experiments with light

Comments such as, "I knew NICT was nearby, but I didn't know what kind of research they were doing," "I'm very interested in NICT after seeing these exhibits," and "I want to see the NICT exhibit hall again!" were heard from visitors.

NICT exhibit

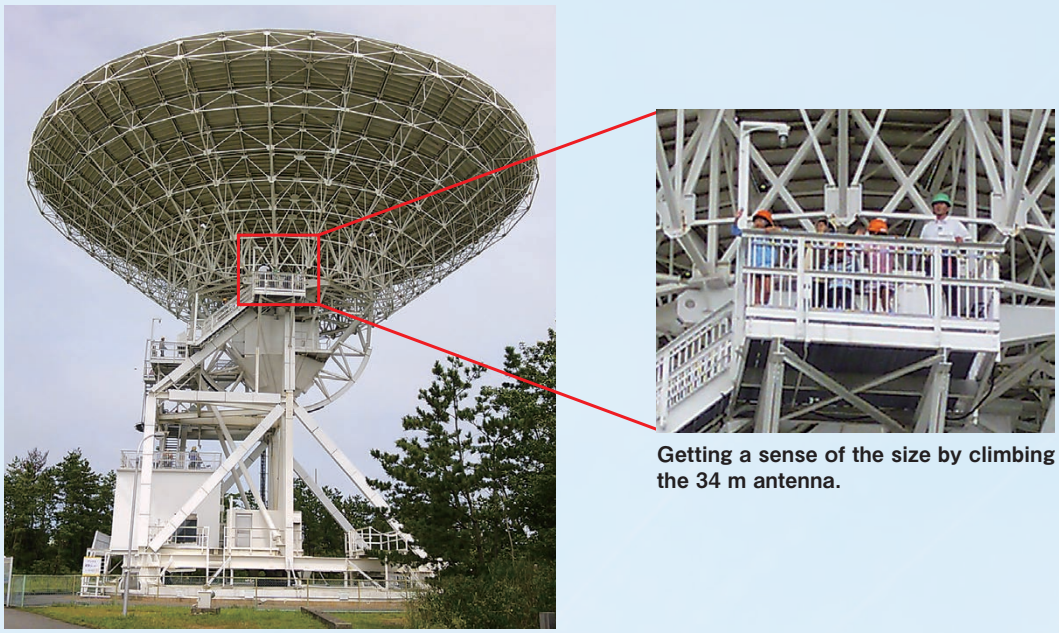
Japan Standard Time and atomic clocks exhibit

Optical communication and modulation exhibit

Interesting experiments with light exhibit

Report on Kashima Space Technology Center Open House and 50th Anniversary Lectures

On August 30, 2014, NICT held an open house at the Kashima Space Technology Center in Kashima City, Ibaraki Prefecture. This year, on the theme of "Getting Familiar with Space!", we gave explanations of topics, in an easy-to-understand manner, including research on use of satellite communications in disaster areas using the Wideband InterNetworking engineering test and Demonstration Satellite "KIZUNA" (WINDS), research on orbital motion of satellites and celestial bodies using an optical telescope, VLBI research using a parabolic antenna with a diameter of 34 m, and a tsunami observation system using the Engineering Test Satellite VIII (ETS-VIII).



Getting a sense of the size by climbing the 34 m antenna.

The next day, on August 31, the Kashima Space Technology Center 50th Anniversary Lectures were held at Kashima Kinro Bunka Kaikan in Kashima City. These lectures commemorated 50 years since the Radio Research Laboratories, Kashima Branch, was opened on May 1, 1964, and were held to express gratitude to all those in the Kashima region and others related to the Center that have provided support and direction since then. It was attended by 237 people, mainly from Kashima City and the surrounding areas.

The lectures included a greeting from the organizers by Dr. Fumihiko TOMITA, Vice President of NICT, and a greeting by the distinguished guest, Mr. Koichi NISHIKIORI, Mayor of Kashima City. These were followed by special lectures from a former researcher of the Kashima Space Technology Center, Prof. Kosuke HEKI from Department of Earth Sciences, School of Sciences, Hokkaido University, and Dr. Makoto YOSHIKAWA, a HAYABUSA-2 Project Preparation Team Leader at JAXA. The speakers gave simple explanations of difficult topics such as space geodesy, results from HAYABUSA and the design of HAYABUSA-2. The contents were very interesting and timely, and were followed by a very lively question and answer session.

Event scene

Prof. HEKI's lecture

Dr. YOSHIKAWA's lecture (relayed from the JAXA Sagamihara Campus)

Awards

Recipient ● Takashi MATSUDA/ Researcher, Dependable Wireless Laboratory, Wireless Network Research Institute

◎Award Date: May 30, 2014

◎Name of Award: Young Researcher's Award

◎Details:
For "Evaluation of intra-body sensing via sheet medium communication"

◎Awarding Organization:
Ambient intelligence and Sensor Networks, IEICE

◎Comment from the Recipient:

With recent decreases in size and power consumption of sensors, biological sensing has become a focus for improving sports technology and promoting health. In this research, we have implemented gathering data from and supplying power to biological sensors without cables, using a flexible sheet medium that is able transmit electromagnetic signals, and we have applied it to wearable sensing systems that can be used in everyday life. Upon receiving this award, I would like to express thanks to all who provided their cooperation.

From the left: Tomoaki OHTSUKI (Society specialist committee chair), Takashi MATSUDA

Recipients ● Ved Prasad KAFLE/ Senior Researcher, Network Architecture Laboratory, Photonic Network Research Institute
Yusuke FUKUSHIMA/ Researcher, Network Architecture Laboratory, Photonic Network Research Institute
Hiroaki HARAI/ Director of Network Architecture Laboratory, Photonic Network Research Institute

◎Award Date: June 5, 2014

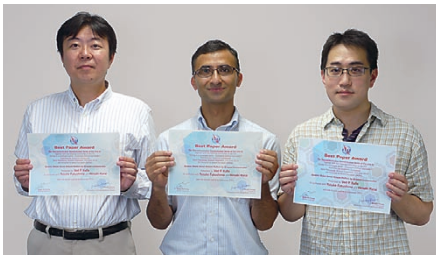
◎Name of Award: Best Paper Award

◎Details:
For the paper titled "Dynamic Mobile Sensor Network Platform for ID- based Communication"

◎Awarding Organization:
ITU Kaleidoscope Academic Conference 2014

◎Comment from the Recipients:

We have been promoting development of an ID/locator split-based new generation network, called HIMALIS, which is superior to the current Internet in supporting mobility, security, and heterogeneous network protocols. This award recognizes our research on HIMALIS and its usage in development of a dynamic mobile sensor platform where we can configure and control mobile sensors remotely irrespective of their location and can make them send sensor data to remote sink servers securely in rates as demanded by sensor applications. We are honored to get this award from ITU, where we are also standardizing some of this research outcome.



From the left: Hiroaki HARAI, Ved Prasad KAFLE, Yusuke FUKUSHIMA

Recipients ● Masao UTIYAMA/ Senior Researcher, Multilingual Translation Laboratory, Universal Communication Research Institute
Eiichiro SUMITA/ Associate Director General of Universal Communication Research Institute

◎Award Date: June 17, 2014

◎Name of Award: AAMT Nagao Award

◎Details:
In recognition of outstanding achievements in research, development and implementation of statistical translation technology using independent word-order transformations and word selection, as well as implementation of high-performance machine translation system services through technology transfer to several enterprises

◎Awarding Organization:
Asia-Pacific Association for Machine Translation (AAMT)

◎Comment from the Recipients:

This award is in recognition of research on new technologies needed to correctly translate long texts such as patents and manuals, as well as implementation of high-performance machine translation systems based on these technologies. Receiving it recognizes NICT's activities emphasizing both R&D and practical development of the results. I would like to express thanks to all who collaborated with me in this work.

From the left: Eiichiro SUMITA, Masao UTIYAMA

Recipient ● Fumihiko TOMITA/ Vice President

◎Award Date: June 23, 2014

◎Name of Award: The Information and Communication Technology Award, The TTC Chairman's Award

◎Details:
Achievement in the global promotion of the smarter communication society and establishment of the international partnership project, "oneM2M", to develop standards as a basis of the global business

◎Awarding Organization:
The Telecommunication Technology Committee, Japan

◎Comment from the Recipient:

This award is for activities since I was transferred to TTC in 2008. International standardization is definitely not a goal in itself, but a tool for strengthening global business. From this point of view, I represent many people in various business enterprises working together. In the coming society of smarter communications, ICT innovation spanning many kinds of business will be important, so we will continue to promote collaboration with associations related to automotive, health, disaster-prevention and other social issues, through NICT's Social Big Data ICT Promotion Project.

NICT Open House 2014

Lectures | Technology Exhibits | Lab Tours

November 27 and 28, 2014 (Thu.-Fri.) 9:30–17:00 (till 16:30 on 28 (Fri.))

NICT Open House 2014 will introduce NICT's latest R&D results through lectures, demonstrations, and panel exhibits.

Opening Ceremony November 27 (Thu.) 10:00

■Special Lecture

Toshio YANAGIDA

Director General of Center for Information and Neural Networks

"Future Society Arising from the Fluctuating Systems of the Human Brain and Musculature"

Lectures November 27 (Thu.) PM, 28 (Fri.) AM and PM

- Social ICT: Opening New Horizons of ICT through Users' Perspective
- Outlook for Cryptosystems used with Big Data
  —Security and privacy protection using Big Data in automobiles—
- Implementation of Multilingual Speech Translation Systems in Society for the Olympics
  —Global communication project—
- New Generation Networks Accelerating Network Service Innovation
- Information and Communications Technologies Inspired by Biological Mechanisms
- Space Weather Forecasting for Safe Operation of Aircraft
- 1000-times Acceleration of Optical Networks
- Neural Mechanisms That Run the Body: Lessons from Neymar
- Breaking the Barriers of Space Communications for Society's Future

※Please see NICT Web site for dates, times and lecture summaries.

Technology Exhibits November 27 and 28 (Thu.-Fri.)

The latest research results will be exhibited with many demonstrations and panel displays.

Laboratory Tours November 27 and 28 (Thu.-Fri.)

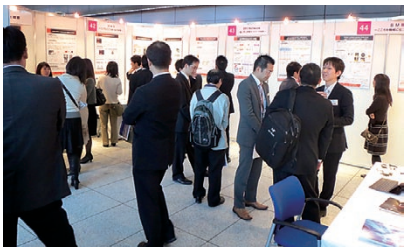
Prior application is required

Introducing the latest research activities through laboratory tours.

- Course A: Telescopes enabling optical communications with satellites
- Course B: Terahertz transceiver system: Research utilizing untapped radio frequencies
- Course C: Research facilities for radio-wave safety evaluation (Nov. 27 only)
- Course D: Advanced optical clocks for the next generation
- Course E: 3D video display with electronic holography
- Course F: Optical Packet & Circuit Integrated Network
- Course G: Advanced optical semiconductor device production environment (clean room)
- Course H: Visualizing science Big Data

※Please see NICT Web site for course details and application procedures.

NICT Open House 2013



We are looking forward to seeing you here!

Location: National Institute of Information and Communications Technology, 4-2-1 Nukui-Kitamachi, Koganei, Tokyo 184-8795
Please see http://www.nict.go.jp/en for access and other details.

Inquiries: NICT Open House 2014 Office, Public Relations Department, National Institute of Information and Communications Technology
Tel: +81-42-327-5322 E-mail: open-house@ml.nict.go.jp

Okinawa Electromagnetic Technology Center Open House

Experience with radio waves and light. Facility tour including the newly introduced weather radar.

Date: **November 22** (Sat.), 2014 10:00-16:30 (No admittance after 16:00)

Location: Okinawa Electromagnetic Technology Center
4484, Onna, Onnason, Kunigami-gun, Okinawa 904-0411
http://okinawa.nict.go.jp/EN/

Inquiries: +81-98-982-3705

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