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New Year Messages

From the Minister of MIC, Secretary-General of ITU, and President of ITU-AJ

Special Feature

IPTV Standardization and Global Testbed Trials by Japan

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About the ITU-AJ

The ITU Association of Japan (ITU-AJ) was founded on September 1, 1971, to coordinate Japanese activities in the telecommunication and broadcasting sectors with international activities. Today, the principle activities of the ITU-AJ are to cooperate in various activities of international organizations such as the ITU and to disseminate information about them. The Association also aims to help developing countries by supporting technical assistance, as well as by taking part in general international cooperation, mainly through the Asia-Pacific Telecommunity (APT), so as to contribute to the advance of the telecommunications and broadcasting throughout the world.

New Year's Greeting

Yoshitaka Shindo
Minister of Internal Affairs and Communications

Happy New Year!

At the beginning of a new year, our cabinet office is working hard to lift Japan into a new stage of social and economic prosperity. To reinvigorate the development of our nation, we must improve our international competitiveness in the global environment and cultivate opportunities in new frontiers as they arise.

The application of ICT to new innovation can make a large contribution to achieving this goal, and in June last year, the Ministry of Internal Affairs and Communications (MIC) published its ICT strategy and policy for growth, which sets out our vision for growth based on the use of ICT.

The aim of this strategy is to develop Japan's economy and contribute to the international community by promoting the use of ICT, which creates new value-added industries through the use of geospatial information, big data and the like, and resolves social issues such as the growing demand for medicine, caregiving and healthcare, and the need for regional stimulation measures, disaster prevention and sustainable resources.

Looking overseas, top Japanese officials have been strenuously promoting ICT — especially the Japanese terrestrial digital television system (ISDB-T) — in developing countries. As a result, the Japanese system was adopted as a national standard by Botswana in February, followed by Guatemala in May, and Honduras in September. In November the Philippines reaffirmed their commitment to the Japanese system, which is now used by a total of sixteen countries worldwide.

Likewise, we hope to make steady progress in increasing the adoption of Japan's terrestrial digital television standard, and we will contribute to the world by expanding the cooperative relationships we have built in terrestrial digital television into the entire ICT field in order to resolve diverse social issues in a wide range of areas.

In September, with the aim of strengthening our international ties and dealings with other ASEAN countries in the field of information security (one of the cornerstones of socioeconomic activity), the ASEAN-Japan Ministerial Policy Meeting on Cybersecurity Cooperation was held in Tokyo. This event allowed us to further strengthen our international liaisons in order to construct a safe and secure environment in which to conduct business and use ICT.

Meanwhile, Japan is also contributing to the international development of ICT through its activities in international and regional organizations, where the ITU plays a very important role.

As part of its efforts to connect people in the world through the use of ICT, the ITU has held "Connect" summits in various parts of the world. We discussed the ICT vision for the Asia-Pacific region in the year 2020 at the Connect Asia-Pacific Summit held in Thailand back in November.

The ITU Telecom World 2013 event was also held concurrently with the Connect summit, and included presentations and forums relating to the latest technologies, services and policy trends in the ICT field. With a focus on international cooperation in the Asia-Pacific region, Japan set up and exhibited a Japan Pavilion with the cooperation of many Japanese businesses and organizations.

This year will be of greater importance to the ITU, as the highest decision-making body, the ITU's quadrennial plenipotentiary conference (PP-14) is to be held in South Korea in October. This conference will decide the direction of the ITU for the next four years, so it is important that we pay close attention to this event.

Japan is one of the ITU's biggest contributor nations, and the MIC will continue to be proactive in its support for the ITU and its participation in ITU conferences.

With the aim of allowing people throughout the Asia-Pacific region to gain equal benefits from ICT, a regional organization called the Asia-Pacific Telecommunity (APT) is working in the field of telecommunications to cultivate expertise, participate in standardization and so on. Japan is a contributor to the APT, and continues to support it by providing human expertise and financial assistance.

The importance of MIC's role as an overseer of ICT is continuing to grow. By reliably implementing a range of different measures, we will continue to work as a single body in order to empower and enrich the lives of Japanese citizens. Your continued support and cooperation for another year is deeply appreciated.

I'd like to conclude by wishing you all a happy and healthy New Year. I hope 2014 brings you everything you wish for.

New Year Message from ITU Secretary-General

Dr. Hamadoun Touré
Secretary-General
International Telecommunication Union

It is always a great pleasure to have the opportunity to communicate with our Japanese community through ITU Journal.

ITU has a particularly close relationship with the ITU Association of Japan (ITU-AJ), an organization which, for over four decades, has made an invaluable contribution to ITU's extensive work, particularly in technical standardization and radiocommunications. The tireless efforts of membership associations such as the ITU-AJ make ITU even more effective in its role of helping to bring the benefits of modern communication technologies to people everywhere.

The year 2013 has been perhaps the busiest yet on the ITU calendar. We have seen major events in all world regions, from the very successful Connect Asia Pacific and ITU Telecom World events held just a month ago in Thailand, to the Transform Africa event in Kigali (in which ITU proudly partnered), to the Global Symposium for Regulators in Poland, and of course a host of events at our Geneva headquarters, including the WSIS Forum, World Telecommunication and Information Society Day, and the 2013 World Telecommunication Policy Forum (WTPF).

This important event was held just a few months after the complex and, at times, strained negotiations in Dubai over the new International Telecommunication Regulations. So it was very encouraging indeed to see delegations put their differences aside and come together in the spirit of true constructive discussion, under the very capable chairmanship of Minister Ivo Ivanovski of Macedonia. The event welcomed over 900 delegates from 126 Member States, including over 40 Ministers, Deputy Ministers and Ambassadors.

True to our commitment to accessibility, all sessions were captioned, allowing the entire forum to be as open and inclusive as possible. And true to our 'green ITU' policy, despite considering 900 pages of documents, the event was managed in an almost entirely paperless manner.

The output of the WTPF was an improved understanding of international Internet-related public policy matters, and the six Opinions agreed by the forum will serve as a solid framework to support further discussions on the shape of the ICT sector as it continues to evolve.

The Broadband Commission for Digital Development also continued its highly successful advocacy work throughout the year, punctuated by two annual meetings. In March, Commissioners were generously hosted by Co-Chair Carlos Slim Helú in Mexico City. This meeting also saw the first face-to-face meeting of the Commission's new Working Group on Gender – the most popular working group ever established by the Commission, with broad representation across the UN family, the private sector, government and civil society.

In the following month, ITU hosted a Girls in ICT Day event at its Geneva headquarters, while at the same time I joined European Commission Vice President Neelie Kroes and others in Brussels at a special session of the European Parliament to highlight this issue, where we were delighted to hear a talk from Facebook's Sheryl Sandberg on the highly rewarding career opportunities open to talented young women in the ICT industry.

World Telecommunication and Information Society Day this year focused on the theme of driver safety, highlighting the catalytic role ICTs can play in improving road safety and traffic management. ITU was proud to award three distinguished laureates for their outstanding work in promoting increased use of technology to improve the driving experience: Ueli Maurer, President of the Swiss Confederation; Volkmar Denner, Chairman of the Board of Management of Robert Bosch GmbH; and Jean Todt, President of the International Automobile Federation (FIA).

Another highlight of the year was the chance for ITU join President Laura Chinchilla of Costa Rica at the BYND2015 Global Youth Summit, an exciting and energizing event that welcomed some 600 young people from around the world to San José, Costa Rica, for three days of discussion, debate and activities around key issues of relevance to today's youth, from Child Online Protection to climate change to unemployment. The event attracted a huge number of partners, including UNICEF, the Kofi Annan Foundation, One Young World, Microsoft, América Móvil/Claro, Cisco Systems, Telecentre.org, Ooredoo, The Walt Disney Company, the government of Azerbaijan, PricewaterhouseCoopers, ICTQatar and Intel. President Chinchilla proudly presented the Manifesto developed by the youth at this summit to the UN General Assembly meeting a few weeks later.

Around the same time, the eighth meeting of the Broadband Commission in New York released the Commission's annual State of Broadband report – the only comprehensive global snapshot of the state of broadband development worldwide. This meeting also saw the launch of the report of the Working Group on Gender, presided over by screen actor Geena Davis, whose advocacy around the issue a year earlier had been the catalyst for the establishment of the group, which was most ably led by UNDP Administrator Helen Clark.

October saw the launch of ITU's own flagship analytical report, Measuring the Information Society, which was simultaneously launched in six locations globally, receiving unprecedented media coverage worldwide. The report revealed that 40% of the world is now online, with an additional 250 million people joining the online community in 2012 alone. ITU remains the primary statistics-gathering agency for ICT data, and I am very proud that our statistics are widely recognized as the world's most reliable and impartial global data on the state of the industry, and are used extensively by leading intergovernmental agencies, financial institutions and private sector analysts.

November was of course the month for the ITU Telecom World and the Connect Asia Pacific events, and we closed the year with a bigger and better version of our annual statistics meeting, which is renamed the World Telecommunication Indicators Symposium (WTIS), and features not just data experts but high-level thought leaders from industry, government, the global analyst community, and of course our sister UN agencies. The meeting, generously hosted by the government of Mexico, welcomed around 400 delegates and an impressive number of prominent figures from the global ICT community.

And so, with the year now at an end, ITU is already busy preparing for what will undoubtedly be the highlight of 2014, the ITU Plenipotentiary Conference, which will take place in Busan, Republic of Korea, from October 20 to November 7.

This promises to be the biggest Plenipot yet, with our Korean hosts planning a great many exciting side events and activities. I look forward to seeing a large contingent of delegates from the ITU-AJ at that conference, which Korea is pitching as 'the Olympics of ICT'!

In closing, may I also take this opportunity to wish all those at the ITU-AJ and their families a peaceful and prosperous 2014, and I look forward to engaging with many of you not just at PP-14, but at the many other exciting annual ITU events scheduled throughout the coming year.

Welcoming the New Year

Michiaki Ogasawara
President
The ITU Association of Japan

Happy New Year! I hope 2014 has got off to a good start for all of you.

Happily, it looks like Japan is showing signs of a gradual recovery. In September last year, the announcement that Tokyo would be hosting the 2020 Summer Olympics and Paralympics gave a boost to the economy, so the country's outlook is looking bright for some distance into the future.

In Japan last year, various initiatives were taken based on a new growth strategy in order to reinvigorate the country. These initiatives recognized the central role that ICT plays in Japan's development strategy, and included not only stimulating the domestic economy, but also promoting international development efforts such as stimulating the spread of the latest ICT throughout the world. I think it can be said that these efforts have borne fruit.

Taking a broad view of the ICT sector in recent years, various measures have been developed around keywords such as Big Data, geospatial information, 4K/8K television, cutting-edge communications infrastructure, and standardization.

In addition, while the country is still recovering from the Great East Japan Earthquake, it experienced widespread flooding, landslides and other problems caused by typhoons and other adverse conditions last year. Attention has thus been drawn to the importance of providing an ICT infrastructure that can cope robustly with natural disasters.

Furthermore, it seems to me that the importance of international standardization efforts is being recognized once again in Japan's promotion of overseas expansion in fields such as ICT, terrestrial digital television and broadcast content.

Under these circumstances, and with the guidance of the Ministry of Internal Affairs and Communications and supporting members, the ITU Association of Japan has joined in with the activities of the ITU (International Telecommunication Union) and with the organization and running of conferences and other events held by ICT-related international organizations. We have also put effort into activities such as holding study meetings and providing diverse information relating to the latest ICT.

For example, at the ITU-R WP5D meeting held in Sapporo in July last year, the study of additional frequency bands for IMT (International Mobile Telecommunications) was performed collectively by 185 participants from 36 countries, and was a great success. At the 2013 ITU Telecom World conference held in Thailand in November, the Japanese pavilion became the focus of interest from people of all nationalities. The ITU Association of Japan also cooperated with these events.

We also held about 30 events by the ITU and various study meetings related to the latest ICT technology, and welcomed over two thousand individual specialists from this field.

The ITU Association of Japan has also been actively building a website as a means of supplying people with up-to-date information, and publishing the ITU Journal and New Breeze magazines. In particular, the English-language journal New Breeze is enjoyed in over 190 countries worldwide by people involved in the telecommunications industry.

Thus our involvement in a diverse range of conferences, meetings and other events is not just good news for the ITU Association of Japan, but also something that should be actively encouraged in the future.

Early this year, we will be preparing to welcome ICT trainees from many countries as part of the JICA training course. From the end of June, we will be hosting the ITU's Japan conference on multimedia (to be held in Sapporo like last year), and the ITU-T SG16 study group. The ITU Association of Japan is looking forward to participating in these events.

To welcome the New Year, we will promote the improvement of Japan's presence by establishing links between the world's peoples and nations as the ITU and APT, while refreshing our links with the Ministry of Internal Affairs and Communications and supporting members.

Thank you for your continued support and encouragement over the coming year.

IPTV Standardization and Global Testbed Trials by Japan

Hideki Yamamoto
Broadband Media Department
Carrier Systems Division,
Telecom Systems Business Division
Oki Electric Industry Co., Ltd.

1. IPTV deployment in Japan

The delivery of video to personal computers via the Internet started in around 1998. This service (called Internet streaming) entailed transmitting streams of video images with bandwidths ranging from a few kbit/s to several hundred kbit/s, and at resolutions smaller than the desktop size of PC monitors. Internet streaming was an innovative service in that it provided real-time video images, but it was quite unlike other types of video service such as TV broadcasts that are enjoyed for recreational purposes.

Around 2003, the growing popularity of broadband services and developments in video compression and IP network technologies led to the arrival of IPTV services offering TV-quality video. In a broad sense, IPTV is another type of Internet streaming, but in a more narrow sense it refers to a service for distributing video via a closed IP network to ordinary television sets connected to set-top boxes (STBs) via broadband access networks. We will use this narrow definition of IPTV in the remainder of this paper.

When the Act Concerning Broadcast on Telecommunications Service came into force in Japan in January 2002, it became possible for broadcasters to make use of telecommunication lines. Telecommunication service operators offering services based on this act were registered as Priority Broadcasters, and the services they provided were considered official broadcasting services, which meant they were obliged to meet certain quality criteria in much the same way as conventional broadcasters. The packets carrying video data were therefore distributed via dedicated networks that were managed by telecommunication service operators (called Managed IP networks).

Since then, forums have been set up for the preparation of industrial standards for IPTV. The IPTV Forum Japan — comprised of domestic telecommunication service operators, broadcasters and consumer electronics manufacturers — was established to promote the utilization of IPTV services and increase their popularity by providing broadcasting and providing communication services based on standardized technical specifications that allow IPTV functions to be incorporated into consumer receiver equipment.

By September 2013, commercial services were already being provided to over 2.6 million subscribers in Japan, and this number was increasing by hundreds of thousands per year. At first, these were basic IPTV services such as linear TV and VOD (Video On Demand). Linear TV is a system that uses the IP network to deliver TV programs that are traditionally broadcast using radio waves, while VOD allows the viewer to control the playback of video through the IP network in a way similar to watching a recorded program at home. Recently, a greater range of new services have become available, including services that allow viewers to restart a program during the middle of the broadcast, and services for viewing programs on tablets/smartphones, interacting with Twitter, buying e-books and music, and playing games.

2. ITU IPTV standardization overview [1, 2]

2.1 IPTV standardization overview

Because IPTV services are delivered over IP networks managed by communication carriers, many of these services have different technical specifications due to the differing requirements of individual communication carriers. Efforts are now being made worldwide to standardize the details relating to IPTV in order to popularize IPTV services. With standardized services, users will ideally be able to receive a variety of services without having to switch between different terminals for individual carriers. In the United States, IPTV related specifications are being considered by the Alliance for Telecommunications Industry Solutions (ATIS), while in Europe, similar work is being done by the Digital Video Broadcasting (DVB) Project, and by TISPAN (Telecoms and Internet-converged Services and Protocols for Advanced Networks) — a part of the European Telecommunications Standards Institute (ETSI).

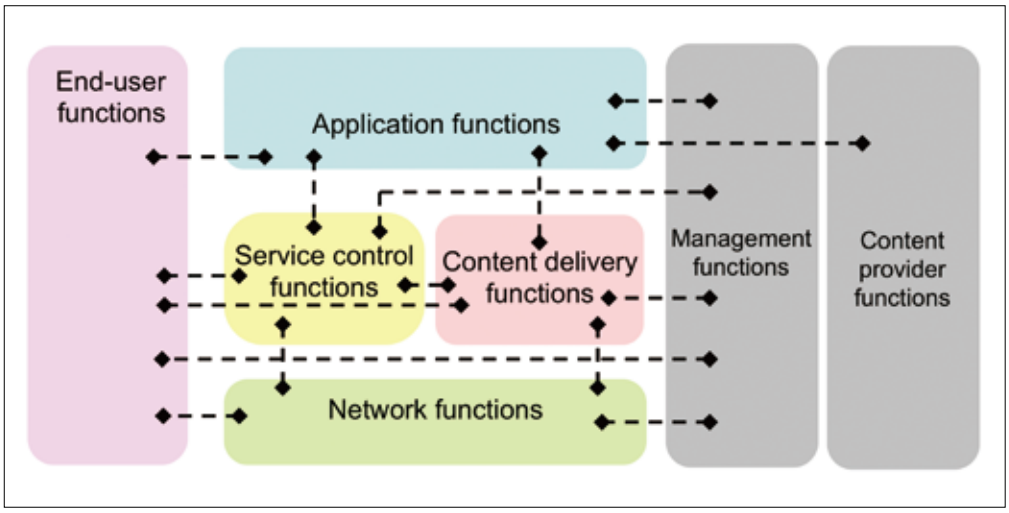
There is also a forum working on the preparation of industrial standards for IPTV. The Open IPTV Forum consists of companies in the United States, Europe and Asia, and aims to prepare an industrial standard encompassing all aspects of IPTV by summarizing the standards prepared by various other standardization organizations and forums.

2.2 Standardization trends of IPTV at ITU-T

Against this background of disparate standardization efforts being conducted in various regions by a diverse range of organizations, ITU-T established the Focus Group IPTV (FG IPTV) in April 2006 to promote and start coordinating the establishment of an international IPTV standard. The seven meetings conducted by FG IPTV were attended by a total of 1,300 participants and resulted in 20 documents — the sheer number of which was due to the fact that participation was not limited to ITU members but was open to any individual or organization from any member country of the ITU. In December 2007, this led to the formation of the IPTV Global Standard Initiative (IPTV-GSI), and the preparation of recommendations was started in January 2008 based on the resulting documents and discussions by the Study Group (SG) at ITU on the relevant topics.

General descriptions of the major recommendations, which are classified into categories of "Architecture and Services", "Middleware, Applications, Content Platforms" and "End Systems", are provided below.

Figure 1: IPTV architecture overview



2.3 Architecture and services

The requirements for realizing IPTV services, including their design, installation and operation, are described in Y.1901 (Y.IPTV-Req). This document forms the basis for IPTV recommendations from the ITU-T, and other recommendations can be considered to have stipulations on technical specifications that satisfy the conditions provided in this document. Individual requirements are classified into levels of "required", "recommended" and "can optionally".

The recommendation on the architecture for IPTV services, Y.1910 (Y.IPTV-Arch) calls for an IPTV architecture with a high degree of abstractness as shown in Figure 1. The end user function group is intended to provide functions to serve users, like a home network function and the IPTV terminal functions of set-top boxes. The application function group provides application functions for use with IPTV services. These include program guides for selecting or purchasing content, and guides for video on demand (VOD) content. Protection functions for services and content are also provided. The service control function group releases networks and service resources according to requests from terminals, in order to provide the services of IPTV in an appropriate manner. The content distribution function group is a group of functions that actually distribute content to the terminals of users and includes the distribution of VOD by unicasting and distributing IP broadcasts through multicasting. Included among these are functions for selecting the most suitable server for a user, depending on the user's physical location and the server load conditions, whenever distribution functions are provided by multiple servers. The network function group provides managed IP networks. These functions also dispense IP addresses and secure the bandwidth necessary for video distributions. The management function group monitors the status and sets the aforementioned end user functions, application functions, service control functions, content distribution functions and network functions. The content provider function consists of functions that provide content and metadata.

In anticipation of evolution of NGN (New Generation Network), Y.1910 (Y.IPTV-Arch) stipulates three architecture types:

(a) IPTV over non-NGN networks
(b) IPTV over NGN networks (non-IMS based)
(c) IPTV over NGN networks (IMS-based)

Unlike existing Internet technologies, quality and security can be assured with NGN networks. IMS (IP Multimedia Subsystem) and is a framework that implements service controls based on the Session Initiation Protocol (SIP), which are necessary for providing IP telephone and IP video phone services. It is expected that IMS will be used as a function for providing multimedia services over NGN networks.

When IPTV is classified into the above three architectures, the service management function group is expected to use existing specifications like RTSP and HTTP for (a), and protocols that are based on (a) (to be stipulated in the future) for (b). On the other hand, it is expected that the SIP control protocol of IMS will be used for (c).

Various services provided by IPTV are described in Y.Sup5, which is not a Recommendation but a supplementary document. The services described in this document are therefore not limited to the services currently provided by various carriers, but include service scenarios for new services that can be expected in the future. Aside from the technical requirements, this document is considered to be important from the perspective of considering and realizing services in the future.

2.4 Middleware, application and content platforms

Metadata necessary to realize services, such as electronic program guides for IPTV services, is stipulated by H.750. Although this document does not specify the extent of XML tags used to describe specific metadata, it does mention the elements of metadata necessary to realize various services. This document includes the metadata of specific elements stipulated thus far by the TV-Anytime Forum.

IPTV not only streams video, but is also capable of offering services that converge with data broadcasting or utilize the bi-directionality of IP services. An outline of the framework for multimedia features necessary to realize such services is defined in H.760 (H.IPTV-MAFR.0). H.761 is based on the Ginga middleware component, which is used for digital broadcasting in Brazil. H.762 is a recommendation for an environment called LIME (Lightweight Interactive Multimedia Environment) based on the Broadcast Markup Language (BML) used for digital broadcasting in Japan.

2.5 End systems

Terminals used to receive IPTV services are described by

documents of the H.720 series. A general description is provided in H.720, and subsequent documents in the series (H.721, etc.) deal with the preparation of recommendations for various terminals. Of these, H.721 (Basic terminal) is based on the specifications of IPTV Forum Japan, a standardization organization for IPTV in Japan. This recommendation includes the specification of IPTV terminals that accommodate conformity to existing digital broadcast receivers in Japan. This makes it possible to receive services not only with a set top box, but also with the IPTV terminal function built into television receivers. Television sets with features based on these specifications are now actually available on the market in Japan.

2.6 Standardizing the measurement of audiences

2.6.1 The importance of IPTV viewer information

It is important for broadcasters to be able to collect information about who is viewing their programs. Audience surveys of traditional broadcasted programs required the use of special information-collecting equipment in the homes of carefully selected sample audiences. IPTV makes this equipment unnecessary because the terminals are already connected to the network. Information can be gathered by implementing collection and transmission functions in the IPTV terminals. The IPTV audience information discussed here consists of program-independent information about the actual audience (user information) and what the audience has been watching (viewing history). IPTV audience measurement has the following characteristics.

(1) Collect large volumes of user information

With sufficient equipment, an information collector can collect information from all IPTV users. The terminals can also be classified according to user attributes, allowing information to be collected from users belonging to a particular audience segment.

Determining how many users view which content is critical to service providers for selecting future contents. If advertisements are streamed along with the content, the advertising rates can be changed according to the number of users. Information about each audience segment is also important for targeted advertisements.

(2) Collect detailed information on IPTV terminal operations

In addition to information regarding which programs were viewed, it is also possible to collect information on VOD programs that were fast-forwarded or stopped mid-way. If the user terminal is closely linked with a TV, then volume changes or zoom-ups during certain parts of the program can also be detected. This sort of information is useful for helping content (program) producers to create content that can be viewed without extra operations from the user.

(3) Collect IPTV information for other services

When an error occurs in a communication channel, the time and information of users at that time can be used to ascertain how many users switched channel/content and measure other ways in which the error affected the service. Furthermore, the user's selections can be used to make recommendations to other users who have made similar choices.

The first type of information is vital for network operators while the second would be useful for IPTV service providers.

2.6.2 Scope of audience measurement standardization

To tap the potentials of user information for application in an IPTV system, the following functions are required.

- Measure user information
- Collect and process this information for use by stakeholders

The first function is referred to as the Audience Measurement Function and latter as the Aggregation Function. The relationships between IPTV users, the two information collection functions and stakeholders are shown in Figure 2. Due to the variety of possible applications, it is currently considered to be too difficult to develop a standardized Aggregation Function for all applications. Therefore, the scope of IPTV audience measurement standardization is currently limited to the interface between the Audience Measurement Function and Aggregation Function

2.6.3 IPTV architecture including audience measurement

IPTV architecture has already been standardized by the ITU-T in Recommendation ITU-T Y.1910. The collection of user information requires an Audience Measurement Function (AMF) and an Aggregation Function. An IPTV user's selection of programs and channels can be measured at various locations in addition to the IPTV terminal (STB or STB-equipped TV). Possible locations of the AMF are shown as XX-AMF (where XX corresponds to TD, etc.), and are connected to the Aggregation Function with a dotted line in the IPTV architecture (Figure

Figure 2: The flow of IPTV viewer information

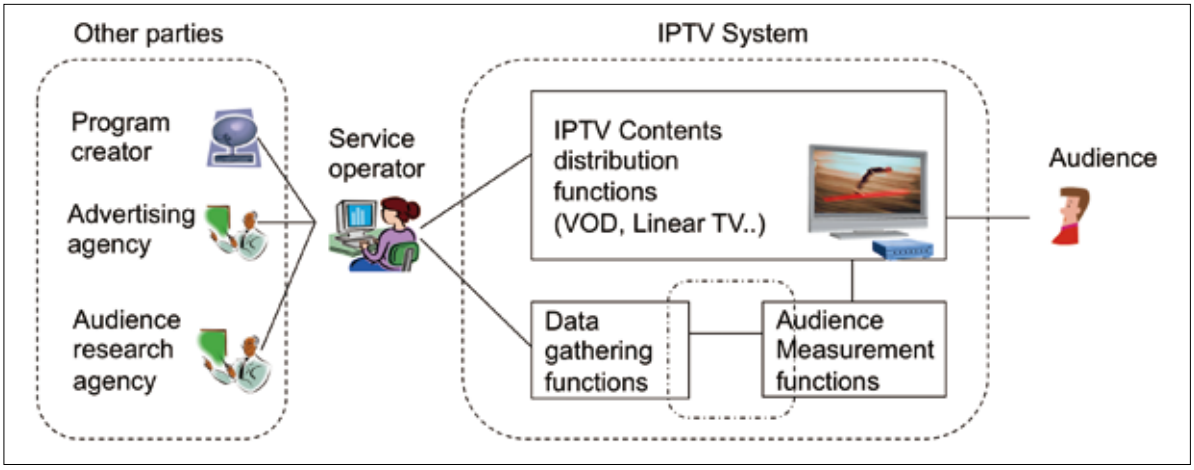
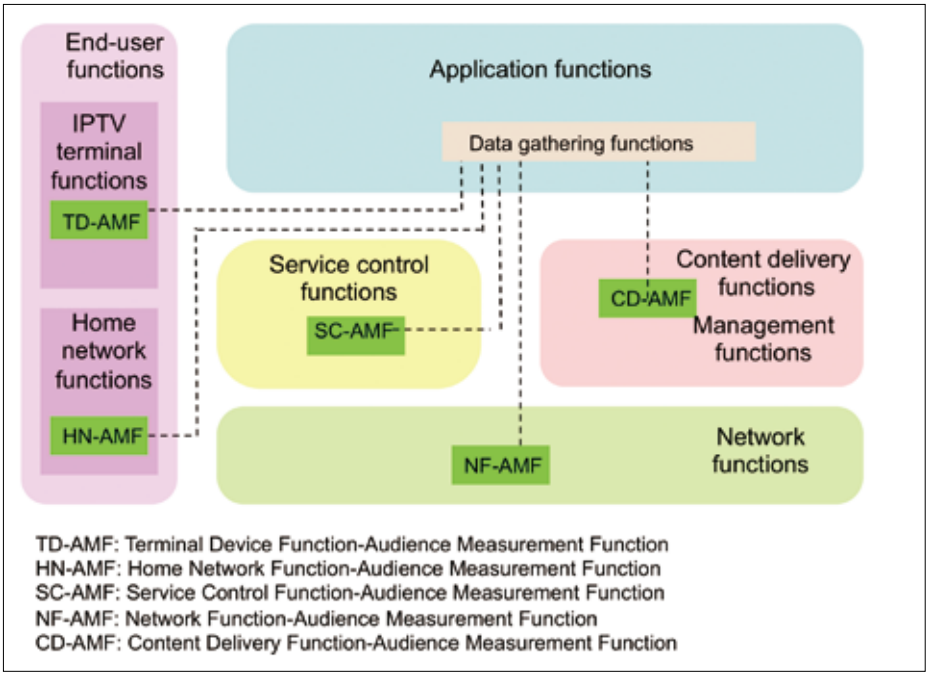


Figure 3: IPTV architecture including audience measurement functions



3). AMFs placed in locations other than the IPTV terminal are described below.

Channel selections of linear TV that are streamed using multicast technology can be measured at the home gateway or router as part of the multicast protocol. That is, the AMF can be integrated into the Home Gateway or Network Functions.

When viewing VOD, the viewer's content selection is sent from the IPTV terminal to the VOD server, which is part of the Content Delivery Functions, and then VOD server delivers the selected content. Therefore, VOD audience measurement can be implemented as part of the Content Delivery Functions. Similarly, measurements of various application services selected from the IPTV terminal can be placed with the Service Control Functions.

2.6.4 Obtaining permission for audience measurements

To perform IPTV audience measurements, giving the user the choice of simply permitting or not permitting the wholesale collection of their channel/VOD viewing history would not be an adequate way of obtaining user consent. For example, users might wish to impose time restriction so that measurements are only taken during periods when children are primarily making channel selections, and are forbidden at other hours. Based on such considerations, work is now under way to standardize the specifications for indication of audience measurement permission.

2.6.5 User information privacy levels and provided services

IPTV user information is personal information that can be used for variety of services as described above, and naturally it must be handled in accordance with the privacy laws of each country. The IPTV audience measurement standard divides user information into privacy levels and indicates the services provided at each level. This ensures that service providers who need to access user information to actually implement a service will not handle sensitive information more than is necessary.

The privacy levels are shown in Table 1. Level 1 grants access to a user's viewing history but does not allow use of identifiable

Table 1: AM permission levels, their impact on the AM system, privacy infringement potential and services supportable

	Level 1	Level 2	Level 3
Permitted measured data	End-user behavior and device info, distinguishable end user, no end-user information	End-user behavior and device info, distinguishable end user, and anonymous end-user information	End-user behavior and device info, distinguishable end user, anonymous end-user information, and identifiable subscriber or end-user information
Example data	Channel 5 was watched by anonymous end user #12683304 on mobile device model	Channel 5 was watched by anonymous end user #12683304, interested in gardening, on mobile device model "X"	Channel 5 was watched on mobile device model "X" being used by subscriber or end user "John Smith" who is interested in gardening.
End-user permission	Required	Required	Required
Privacy infringement potential	Measured data alone may not influence privacy profile. Measured data plus additional data may influence privacy profile	Measured data alone may not influence privacy profile. Measured data plus additional data may influence privacy profile	Measured data alone may influence privacy profile
Services supportable	Targeted advertisement and content recommendation. Content rating and Engagement reporting.	Better targeted advertisement and content recommendation. Content rating and engagement reporting.	IPTV end-user engagement driven personalized communications. Even better targeted advertisement and content recommendation. Content rating and engagement reporting.

user information. Only anonymous information is available at this level, although audience ratings can be collected to measure content popularity. At level 2, access is granted to user attributes such as age, gender, family structure and geographical region. Along with user's viewing history, this information can be used to determine the primary audience of a particular program. If most of a program's viewers are women, the advertisements delivered with the program can be geared toward women, thus enabling segmented advertising. User identifiable information like names and email addresses are accessible at level 3. Information available at this level can be used with the user's viewing history to provide direct adverting.

There are two important points here. First, level 3 access is not always necessary. Even at level 1, the use of IPTV user information enables collection of accurate large-scale information compared with what can be achieved from audience ratings of traditional TV. Second, information available at level 1 is still personal information, and user consent is required according to each country's privacy laws before information is collected.

2.6.6 User information collection messages and transmission timing

Audience measurement messages consist of configuration messages that indicate what information will be measured, and reporting messages that are used to send the measured results to the Aggregation Functions. The configuration messages include the following information: (a) which service to measure, (b) when to measure, (c) what to measure, (d) when to report, (e) how to report, and (f) how to handle exceptions.

Reporting messages are created according to the configuration messages and sent to the Aggregation Functions. When collecting information from the Audience Measurement Functions, simultaneous transmissions of messages will congest the network or place heavy loads on the Aggregation Functions. Therefore, the transmission timing needs to be different for each terminal.

3. Japan's involvement in the ITU's activities to promote the IPTV standard [3]

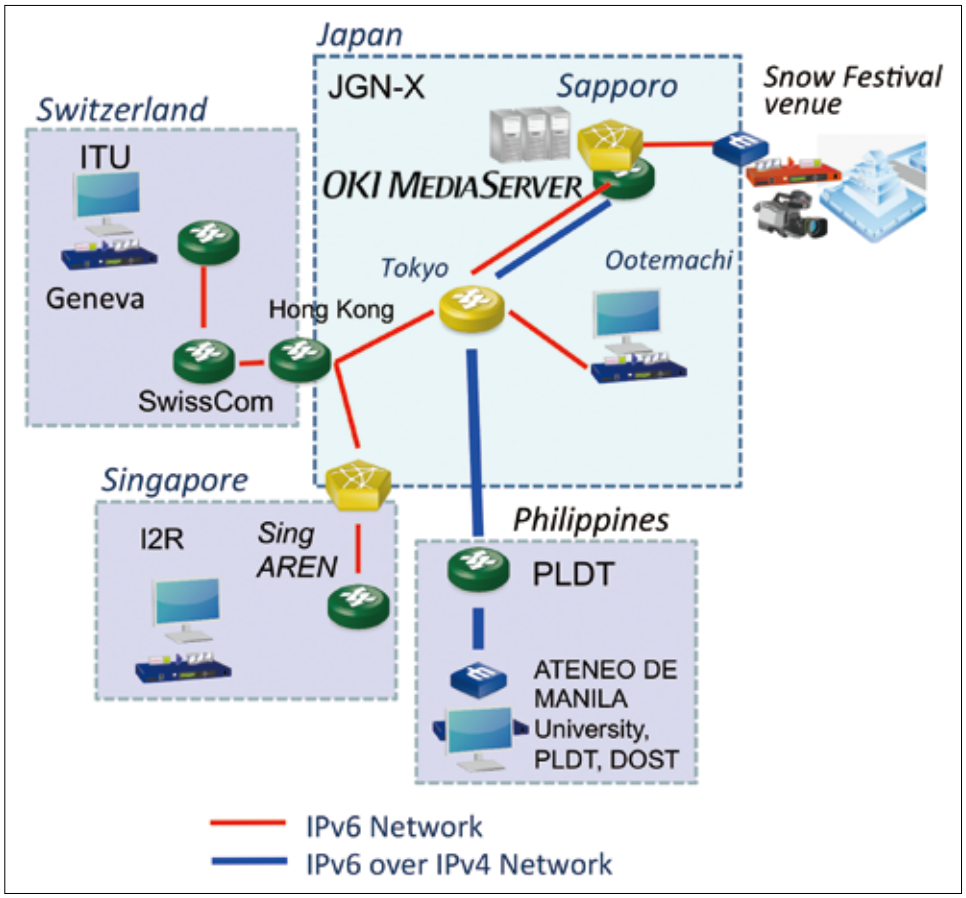
3.1 ITU's promotion activities

ITU-T has been promoting ITU's IPTV standards in workshops and exhibitions held in several countries that have expressed an interest in introducing IPTV. However, these events only last a few days, and there is not enough time for them to try their own applications.

Therefore, in October 2012, OKI and HTB have launched the ITU IPTV IPv6 Global testbed (I3GT) project in a cloud environment that connects with JGN-X provided by National Information Institute of Information and Communication Technology (NICT). LIME standard contents developed by HTB were used in I3GT.

The purpose of I3GT is to provide a test environment for service providers, research institutes, and universities in several countries planning to adopt the IPTV Standard, and to promote the spread of ITU-T IPTV standards. They can utilize the testbed to understand the standards, and establish an environment for service verification by service providers. The following sections present an outline of the tested, the experiments performed on it, and the future direction of this technology.

Figure 4: I3GT at the Sapporo Snow Festival



3.2 Overview of the ITU IPTV standard testbed system I3GT

To advance the adoption of the above ITU IPTV standards, OKI and HTB launched I3GT in October 2012. Using an IPv6 network, I3GT is intended to provide a worldwide testing environment for the ITU IPTV standards. The testbed can be used to (1) verify that a network has sufficient bandwidth and quality (delay, loss) for IPTV video distribution; (2) test the interactive functionality of applications with video/still image/text of LIME compliant contents; and (3) try out the interface during terminal development, thereby enabling a better understanding of the standard's value.

The testbed is built on a server located in NICT's JGN-X. OKI MediaServer, considered an ITU standards compliant reference, is

utilized as the IPTV platform.

The conceptual architecture of I3GT is shown in Figure 4. The tester at the left side of the figure interconnects the network (to which his terminal is connected) to JGN-X where the I3GT is located. Here, the interconnected tester's network and JGN-X act as the managed network (pseudo managed IP network) for IPTV.

The IPTV service description provider and IPTV service provider in Figure 1 are functions provided on the distribution server side of the network by the OKI MediaServer. Based on H.770, the IPTV service description provider maintains a database (DB) for the IPTV services available over the network and provides service-related information to the terminal. An IPTV service provider is one of the service providers registered in the IPTV service description provider DB, and provides actual VOD, linear TV and other video service based on H.721, or delivers LIME content based on H.762.

To the right of the IPTV service provider is the operations network used to add/delete content, authenticate service manage testers and manage software for the distribution server.

Besides testing the terminal, the tester can make use of area *A* (surrounded by dotted lines in the figure) to perform actual tests on distribution server performance and functions. To implement IPTV service provider functions such as VOD and linear TV in area *A*, the tester registers *A* with the IPTV service description provider DB. Then the tester can receive the services in *A* on his terminal following the steps below.

a) Connect to the IPTV service description provider when starting up the IPTV terminal.
b) The terminal will display *A* among the entries in the IPTV service description provider DB and IPTV service provider connected with JGN-X.
c) When the tester selects *A*, the terminal will connect with service provider *A* and begin receiving the service.

The mechanism by which an IPTV terminal connects to a newly added service as described above is called service discovery.

Rather than implement new IPTV service provider functions described previously, *A* can simply be connected as a server placed at different geographic location. From the IPTV terminal's point of view, it is simply connecting to a different server without notice while selecting content.

Table 2 shows the ITU IPTV standards that can be currently evaluated with the testbed. Since the IPTV service is still under development, active discussions are continuing in ITU IPTV-GSI toward the establishment of new standards. Therefore, the standards listed in the table below are liable to change.

Table 2: ITU Standards Evaluated with Testbed

ITU-T Rec. No.	Contents
H.762	Lightweight Interactive Multimedia Environment for IPTV
H.721	Basic terminal specification for VOD, Linear TV and information services.
H.770	Service discovery for IPTV terminals
H.701	Error compensation such as packet losses in network
H.264	Video compression standards for standard and high definition television.
H.750	Metadata for IPTV services.

Figure 5: Linking with a subtitling service on the Internet

3.3 Overview of I3GT experimental trials

(1) Trial at WTSA-12, November 2012

The first I3GT experimental trial and exhibition was conducted on November 20 and 21, 2012 at the ITU World Telecommunication Standardization General Assembly (WTSA-12) in Dubai, UAE. The system architecture for the trial is shown in Figure 5. Dubai's communication carrier, du, constructed a temporary 15Mbps IPv6 network to the trial site using IPv6 over IPv4. To demonstrate the system, a high-definition video created by HTB was delivered as VOD from Sapporo Japan. Additionally, video from a camera installed at the entrance to the United Nations in Geneva was also transmitted to demonstrate live video delivery. Over 1,000 people from 101 of the 190 United Nations member countries associated with communication service providers or communication related regulatory agencies were in attendance. In ITU Secretary-General's opening speech, I3GT was cited as an example of ITU's interconnection experiment, prompting many attendees to visit the exhibit during the meeting.

Although temporary, the experimental trial proved that a system compliant with ITU IPTV standards — which were originally created for video delivery in a closed network — can be built over intercontinental networks for viewing high-definition videos. This shows that I3GT can fulfill its goal as a worldwide testbed for ITU IPTV standards

(2) Video delivery trials at the Sapporo Snow Festival in February 2013

The second I3GT trial was carried out between February 5 and 7, 2013 at the Sapporo Snow Festival. Figure 4 shows the system architecture used for the trial. While the first trial tested delivery to a temporary trial site, this second trial tested delivery from the trial site to terminals set up at the Singapore National Information and Communication Institute, at Ateneo de Manila University in the Philippines, and at the ITU headquarters.

Currently, the transition to IPv6 is taking place globally. However, there are still many countries where actual construction is not progressing. For those countries, IPv6 packets are

encapsulated with IPv4 at the server-side and delivered to their destination via IPv4. At the receiving end, the encapsulated IPv6 packets are extracted and sent to the STB. This feature was demonstrated at the trial with content delivered to Ateneo de Manila University in the Philippines. The trial used live content and high-definition VOD created by HTB especially for the snow festival as well as VOD content provided by ITU.

A large-scale OpenFlow testbed known as RISE built over JGN-X by NICT was used to connect between the trial site and Singapore. In addition to the video content mentioned above, 4K video created with an encoder from MEDIAEDGE Co., Ltd. was also used. New IPTV applications that interact with SNSs (Social Network Systems) and subtitle services on the Internet were also tested during the trial.

The former service simultaneously displays high quality IPTV video and associated SNS information on the viewer's terminal, allowing video content to be enjoyed via an SNS. This demonstration used technology developed by NTT Communications Corporation that allows IPTV to interact with an SNS.

In the latter, LIME's Internet communication function was used to synchronize IPTV video content with an Internet subtitling service provided by ASTEM Inc. in order to deliver subtitles in the language and font size selected on the viewer's terminal.

Compared with methods where video is multiplexed with other information such as subtitles and broadcast as a single stream, as in digital broadcasting, it is possible to adapt flexibly to viewers requiring different subtitle languages, screen layouts and the like, thereby making services more accessible. An image of the screen display is shown in Figure 5.

In this trial, we were able to confirm that the two abovementioned functions worked as originally intended. This means that it is possible to perform trials of new IPTV applications linked with Internet services in I3GT, and in the future, this should be very important for confirming services that the countries participating in the trial actually want to introduce.

3.4 Activities in Asia-Pacific region

The APT/ITU Conformance and Interoperability (C&I) event was held in Bangkok, Thailand over a four-day period from September 9 to 12, 2013. Hosted by the Asia-Pacific Telecommunity (APT) and the International Telecommunication Union (ITU), the C&I event serves as a venue for showcasing products and technologies in order to evaluate their interoperability and compliance with international standards. At this event, OKI exhibited the OKI MediaServer — an IPTV video distribution system designed to achieve compatibility with international ITU IPTV standards, which is currently attracting attention in emerging countries. OKI also exhibited its GE-PON optical access system, which is ideally suited to building FTTH for high-quality video distribution. In the conformance testing event, Asian vendors participated in the event and tested their products based on ITU-T IPTV conformance document.

3.5 Activities in Africa region

For the purpose of industrialization, the Government of Rwanda (GoR) considers that it is important to diversify into different media platforms in order to provide better services and increase the penetration of TV. GoR recognizes the changing trends of video consumption and the immense potential of interactive multimedia, applications and services, particularly IPTV and is willing to connect to I3CT. As a first step towards the deployment of IPTV, a workshop ("Engagement of Rwandan Academia in ITU Activities") was held in Rwanda on 25 October 2013. This workshop introduced I3GT's activities and off-line showcasing. GoR is now preparing to connect with I3GT, which seems to be recognized as one of the key drivers of ICT deployment.

4. Conclusions

The ITU's IPTV standards are open and global, and are used in Japan's commercial IPTV services. The service menus and subscribers are increasing year by year.

Emerging countries are working feverishly to build broadband networks and to deploy applications that run over such networks to close the ICT gap with respect to advanced nations. Installing network equipment that complies with international standards and ensures the interoperability of products from multiple vendors will make it possible to continue procuring equipment with the required functionality from a wide range of vendors. This, in turn, is expected to enhance expandability and help reduce the cost of operating and expanding systems for many years into the future. Emerging countries are currently eyeing broadband-supporting products that meet international standards as they plan and build their telecommunications facilities.

In order to satisfy the expectations from emerging countries, the ITU IPTV IPv6 Global testbed (I3GT) has been launched by the ITU and several vendors including OKI. Several experimental trials have been done on the testbed.

Based on our experimental findings, OKI plans to expand the scope of the IPTV testbed to countries/regions that (1) have not deployed IPv6, (2) have deployed IPV6 and are planning 4K and higher image quality, or (3) are planning to improve accessibility or provide value-added video services such as e-health and e-learning.

OKI will enhance the features of the OKI MediaServer to meet market needs, push for standardization of features such as H.265 and 4K, work to promote the standards and advance the deployment of an appealing video distribution platform.

References
1 Hideki Yamamoto, Standardization Trends of Internet Protocol Television (IPTV) and Activities Undertaken by OKI, OKI Technical Review, No.215 (2009)
2 Hideki Yamamoto, Standardization Trend for IPTV audience measurement, OKI Technical Review, No.218 (2011)
3 Hideki Yamamoto, Kazuhiro Watanabe and Toshihiro Moriya, ITU IPTV Standards Testbed System based on OKI MediaServer, OKI Technical Review, No.221 (2013)

Notes:
JGN-X
A testbed environment operated by NICT since April 2011 for the implementation and deployment of new generation network technologies.
OpenFlow
One of the technologies behind SDN (Software Defined Network), a network that uses software to perform configurations instead of hardware such as routers and L2 switches. Standardization is carried out by Open Networking Foundation (ONF).
RISE (Research Infrastructure for large-Scale network Experiments)
A large-scale OpenFlow testbed developed on top of JGN-X. It is one of JGN-X's new generation network planes, virtually deployed over a wide area on an existing L2 virtual network.

International Strategy on Cybersecurity Cooperation

—*j-initiative for Cybersecurity*—

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1. Preface

Recently, the risks surrounding cyberspace have become much more serious. Specifically, so-called "targeted cyber attacks" designed to steal confidential information relating to national security and core technologies have been increasing. Cyber attacks targeting critical infrastructures, which could severely damage social activities, have been coming to light.

Furthermore, the spread of ICT with advanced functions, has led to cyber attacks targeting social infrastructures as well as individuals and organizations. In addition, risks are now rapidly spreading beyond borders and are becoming increasingly global.

Thus, cyber attacks on a global scale are now "common risks" faced by all nations. International cooperation is essential in order to take measures against these "common attacks," which render worldwide damages. In response to these changing environments, the Japanese government launched the "International Strategy on Cybersecurity Cooperation,*" which was endorsed by the Information Security Policy Council (ISPC) chaired by the Chief Cabinet Secretary, in October 2013.

This article presents an overview of the "International Strategy on Cybersecurity Cooperation – j-initiative for Cybersecurity".

2. Outline of the strategy

2.1 Objectives

As cyber threats emerge as an urgent global challenge facing the international community as a whole, it is essential to acknowledge different values, build mutual trust and work hand-in-hand to counteract the challenges in order for countries in the world to coexist in cyberspace and make the most of its benefits. Japan is strongly committed to actively strengthening cooperation and mutual assistance internationally.

It is said that Japan boasts the world's highest level of telecommunications infrastructure. Due to the increased use and application of information and communication technology, Japan has already faced a variety of cyber threats. Accordingly, the Strategy states that Japan is dedicated to utilize this extensive experience and knowledge in promoting international cooperation.

This Strategy summarizes Japan's basic policy and its priority areas for international cooperation and mutual assistance in the field of cybersecurity, so that it can be presented as a package to

Table 1: Basic Principles and Policies

Basic Principles

Summarizes the importance of international cooperation with regard to 4 basic principles described in the Cybersecurity Strategy

1. Ensuring free flow of information

Countries around the world can enjoy freedom of expression and vibrant economic activities, innovation, economic growth and solutions for social issues

2. Responding to increasingly serious risks

A new mechanism based on enhanced international cooperation is needed in addition to the existing measures and initiatives against increasingly serious, widespread and globalized risks.

3. Enhancing risk-based approach

The international community urgently needs a mechanism to implement a risk-based approach, whereby risks are quickly and appropriately identified as they evolve, and are responded to dynamically in accordance with their characteristics.

4. Acting in partnership based on social responsibilities

All stakeholders in the global cyberspace need to cooperate and assist each other while fulfilling the responsibilities corresponding to their respective roles in society.

Basic Policies

Summarizes 3 directions of Japan's contribution for strengthening international cooperation

1. Incremental fostering of common global understanding

- Vitality of cyberspace has been enhanced by the diversity of entities which make use of it, and the co-existence of countries with different cultures and values.
- A common understanding needs to be fostered incrementally, wherever feasible, while appreciating the diverse values
- All platforms will be utilized including bilateral, multilateral and regional frameworks as well as the U.N. meetings.

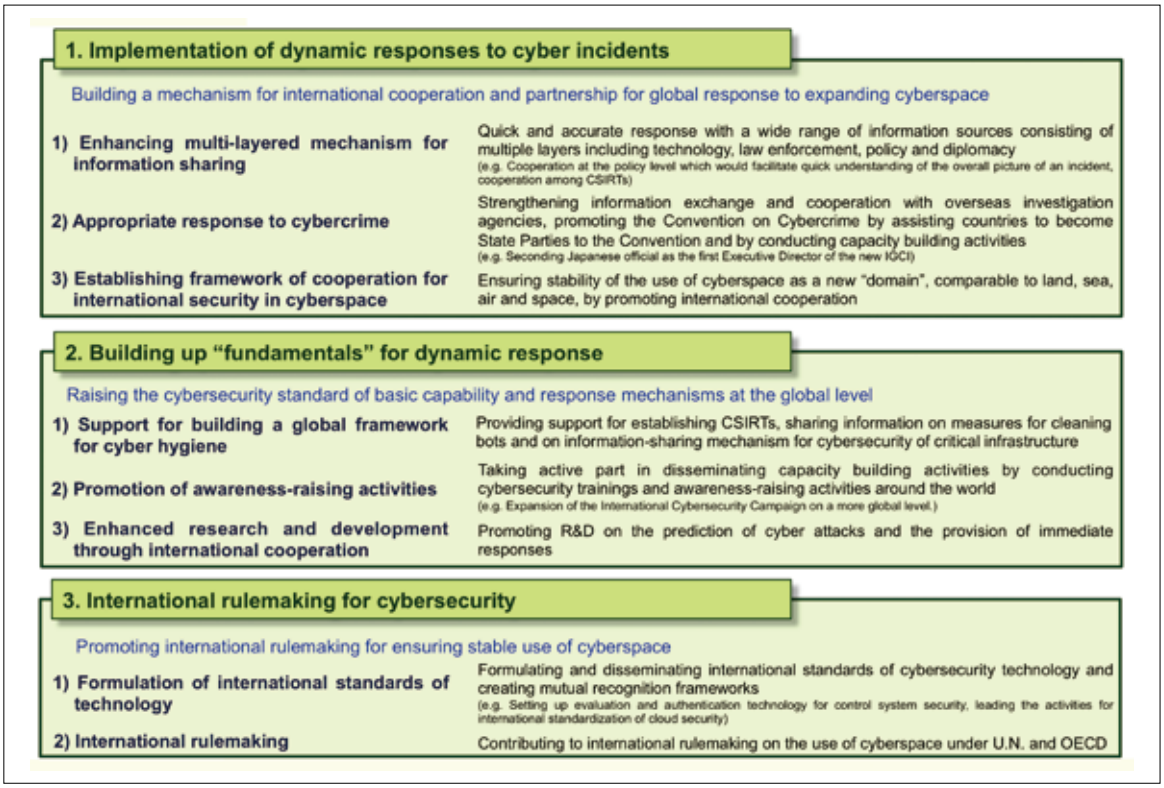
2. Japan's contribution to the global community

- Japan has faced and addressed serious cybersecurity issues ahead of other countries.
- Building on extensive experience and knowledge, Japan will actively contribute to capacity-building activities at the global level.

3. Expansion of the technological frontier at the global level

- Japan has accumulated extensive knowledge on technical responses to cyber threats, including development of cybersecurity technology and subsequent steps for its practical application
- Japan will extend its technological frontier at the global level and diffuse the benefits of advanced yet inexpensive technology based on its knowledge

Table 2: Priority Areas



the stakeholders both in Japan and overseas. Japan will promote initiatives for international cooperation and mutual assistance in cybersecurity based on this Strategy under the common understanding shared among all domestic stakeholders including those from industry, academia and the government. Japan will actively contribute to the formation of a safe and reliable cyberspace in which the free flow of information is ensured by building relationships of cooperation with countries around the world.

2.2 Basic principles

Basic Principles summarizes the importance of international cooperation with regards to four basic principles described in Japan's Cybersecurity Strategy issued in June 2013, which are: "Ensuring free flow of information", "Responding to increasingly serious risks", "Enhancing risk-based approach", and "Acting in partnership based on social responsibilities." In particular, it describes that it is imperative to maintain and develop a safe and reliable cyberspace in which the free flow of information is ensured in order to ensure freedom of expression and vibrant economic activities in cyberspace, to facilitate innovation, economic growth and solutions for social issues, and to provide positive benefits which countries around the world can enjoy.

2.3 Basic policies

International cooperation involves various entities such as government, private companies, and research institutes. In order to make these efforts effective in a consistent manner, based on the basic principles described above, the International Strategy summarizes the three directions of Japan's contribution to strengthening international cooperation: "Incremental fostering of common global understanding", "Japan's contribution to the global community", and "Expansion of the technological frontier at the global level."

Issues pertaining to cybersecurity vary widely across a broad spectrum, from socio-economic to national security, and from the easily resolved to the more difficult. There is also an infinite variety of entities that can take part and degrees to which a common understanding can be fostered. Therefore, a common understanding needs to be fostered incrementally, wherever feasible, while appreciating the diverse values. Accordingly, the Strategy lists "Incremental fostering of common global understanding" as the first basic policy.

Japan has developed the world's top-level telecommunications infrastructure, which has led to increased use and application of cyberspace by various entities of all generations. Consequently, Japan has faced serious cybersecurity issues ahead of other countries. At the same time, relevant entities in both public and private sectors have worked in partnership to implement a wide variety of measures to address these issues and have achieved successes. Building on these extensive experience and knowledge, Japan will contribute to the global efforts to address these challenges more efficiently and effectively. This "Japan's contribution to the global community" is the second basic policy listed in the Strategy.

On the subject of technology, the Strategy specifies the vital importance of continuously developing, using and applying technology and lists "Expansion of the technological frontier at the global level" as the third basic policy in order to utilize extensive knowledge and experiences on technical responses to cyber threats which Japan has accumulated and to respond appropriately to sophisticated cyber attacks. (Table 1)

Table 3: Regional Initiatives

1. Asia Pacific

- **Close cooperation with the Asia Pacific region is crucial due to geographical proximity and close economic ties**
- **Continuing to strengthen the relationship with the ASEAN through:**
  - ✓ Policy dialogues such as ASEAN-Japan Ministerial Meeting on Cybersecurity Cooperation, ASEAN-Japan Information Security Policy Meeting, and ASEAN-Japan Ministerial Meeting on Transnational Crime
  - ✓ Promoting initiatives such as capacity-building for human resources development
  - ✓ Promoting joint projects such as JASPER and TSUBAME
- **Promoting Japan-India Cyber Dialogue**

2. U.S. and Europe

- **Deepening partnership with the U.S. centered on Japan-U.S. Security Arrangements**
  - ✓ Promoting such policy dialogues as the Japan-U.S. Cyber Dialogue and the Japan-U.S. Policy Cooperation Dialogue on the Internet Economy
  - ✓ Promoting cooperation in the area of cyber incident response
- **Strengthening cooperation with European countries**
  - ✓ Conducting policy dialogues such as the Japan-UK Cyber Dialogue and the Japan-EU Internet Security Forum
  - ✓ Conclusion of the Convention on Cybercrime

3. Other regions

- **Extending cooperation to countries in regions such as South America and Africa where the use of cyberspace has rapidly progressed.**
  - ✓ e.g. Support for establishing CSIRTs
  - ✓ In regions such as South America and Africa, the use and application of cyberspace has also rapidly progressed. As a consequence, a number of cybersecurity issues have surfaced including an increase in malware infections and other cyber threats. Japan has extended cooperation to countries in these regions, such as through provision of support for the establishment of CSIRTs. Going forward, Japan will further expand these efforts.

4. Multilateral frameworks

- **Actively contributing to international rulemaking of cybersecurity:**
  - ✓ Rulemaking at various forums such as the U.N., G8, OECD, and APEC.
  - ✓ Global initiatives with respect to critical infrastructure protection and rapid incident response undertaken at the Meridian, IWWN, and FIRST (e.g. Hosting the Meridian in 2014)

2.4 Priority areas

In promoting international cooperation efforts, it is important to prioritize targeted areas for effectively counteracting various cybersecurity issues and making maximum use of limited resources. The International Strategy specifies three "Priority Areas": "Implementation of dynamic responses to cyber incidents" which aims to build a mechanism for international cooperation and partnership for global response to expanding cyberspace, "Building up 'fundamentals' for dynamic responses" which is aimed at raising the cybersecurity standard of basic capability and response mechanisms at the global level, and "International rulemaking for cybersecurity" which is aimed at promoting international rulemaking to ensure the stable use of cyberspace. (Table 2)

2.5 Regional initiatives

In promoting international cooperation, issues which can develop common understanding and areas in cooperation differ between countries and regions. The International Strategy summarizes the necessary measures in countries and regions that have close relationships with Japan, and the direction of Japan's contribution to multilateral frameworks. (Table 3)

3. Summary

The "International Strategy on Cybersecurity Cooperation" is the first strategy devoted to international cooperation on cybersecurity, and clarifies Japan's position in this area. Japan will actively present this Strategy at such venues as bilateral, multilateral and regional frameworks aimed at accelerating the efforts toward international cooperation on responding to cyber threats rapidly and appropriately.

While the Internet's information and communications infrastructure continues to develop and its use and application evolves, it is inevitable that cybersecurity issues will become more serious. By responding rapidly and appropriately to these challenges through close cooperation among related entities, it is expected that steps towards ensuring secure use of cyberspace will progress steadily.

* http://www.nisc.go.jp/active/kihon/pdf/InternationalStrategyonCybersecurityCooperation_e.pdf

Cover Art

Fuji sanjurokkei Toto Sukiya-gashi
(Riverbank at Sukiya in Edo, from the series 36 Views of Mt. Fuji.)

Utagawa Hiroshige (1797-1858)

Woodblock print:
Courtesy of Sakai Kokodo Gallery

Start of Transmission from Tokyo Skytree

—*Part 1: History of the Relocation Project*—

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Efforts to switch over to digital broadcasting began to gather momentum from around 1997, when NHK (Japan Broadcasting Corporation) and five commercial broadcasters based in Tokyo entered into discussions regarding a suitable transmission site.

Although the idea of attaching transmitters to the Tokyo Tower was investigated, its operator (Nippon Television City Corporation) was initially of the opinion that the tower had neither enough space for the attachment of digital broadcast antennas, nor enough strength to support their weight.

There was also insufficient space to house the transmitter equipment, so if the Tokyo Tower were to be used for broadcasting, a new building would have to have been built nearby to house the transmitter equipment.

Besides, there are many more high-rise buildings in central Tokyo today compared with when the Tokyo Tower was built, so the interference of radio waves from the Tokyo Tower has increased significantly. The construction of tall buildings is likely to continue into the future.

Therefore, in 1998, a transmission-related project was set up by NHK and five commercial broadcasters, who began discussing the idea of building a new broadcasting tower.

1. Initial studies of the new tower

At this stage, the investigations initially focused on three candidate sites — the Tokyo Tower, Saitama Tower and Tama Tower. Plans had been made to use UHF signals for digital broadcasting, but these were said to have a shorter propagation distance than VHF signals. It was also necessary to consider the cliff effect (cut-off characteristic) that is inherent to digital broadcasting. It was therefore concluded that a taller tower was needed to allow signals to propagate further, and that the tower should be roughly 500 m tall. We investigated the total cost of each approach, including not only the master station but

also the number of relay stations required, and summarized these results in an interim report.

As a result, we found that a tower at least 500 m tall could also reduce the number of relay stations required. (However, since there was not enough time for relocation to take place before the end of analog transmissions, it was ultimately not possible to reduce the number of relay stations.)

After that, a new tower study project and a current tower project were set up in conjunction with a further six companies based in Tokyo. These projects published two reports in June 1999.

Due to the time taken to conduct these studies, it was by this stage starting to seem unlikely that a new tower could be constructed in time for the start of digital broadcasting.

Therefore, to make the September 1999 plan more realistic, scenarios were prepared for the introduction of terrestrial digital broadcasting.

2. Proposal of a stepped transition to transmissions from a new tower

This proposed scenario corresponds to the case where high-power broadcasting is performed from another transmission point after broadcasting at low power from the existing tower.

Before starting digital broadcasting, it was necessary to change the frequencies used for analog broadcasting.

Since full-power transmissions were to start after changing the analog frequencies in regions with large numbers of residential households, such as the service areas of the Tama and Utsunomiya relay stations, it was decided that low-power transmissions would be made from the Tokyo Tower during the initial stage of digital broadcasting. Therefore, a plan was drawn up whereby the existing Tokyo Tower would initially be used only for low-power transmissions for a few years, and then a single-frequency network (SFN) would be configured using high-power transmissions from a new transmitter tower, together with low-power transmissions from the Tokyo Tower, before completing the transition to the new transmitter tower.

An issue to be resolved in this case was the degree to which SFN interference would result in households being unable to receive a signal. It was found that the number of affected households was very large, so a stepped transition would be difficult to achieve in an SFN configuration. This meant that a single overnight switchover was the only viable option.

Thereafter, from 2000, Nippon Television City Corporation proposed the construction of a new tower situated 130 m away from the existing Tokyo Tower. This proposal was also considered by the transmission-related project.

Although technically sound, this proposal was severely hampered because the vicinity of the existing tower is designated as an existing non-compliant structure according to Japanese aviation law, which would mean having to obtain a special dispensation from the Ministry of Transport to build a new tower in this location.

3. Expanding the One-Seg area, and increasing the field strength

There were some broadcasting companies that questioned the need for this, and in 2002 a private research establishment was commissioned to examine the feasibility of a new tower. The

report on this study was submitted in 2003.

This resulted in a significant expansion of the area in which One-Seg can be viewed, and also increased the field strength. This makes it possible to ensure that critical infrastructure remains available in the event of a natural disaster, and from a business perspective it also had advantages such as support for advertising in the mobile communication era.

Initially, it was decided that digital transmissions would start at the Tokyo Tower, and would then be transferred to the new tower. The structure of the Tokyo Tower was partially reinforced, and a new transmitter room was installed below the tower's observation deck. A multi-faceted antenna for digital transmissions was installed in the lower part of the gain tower for the existing analog antenna.

From December 2003, terrestrial digital television was first started in Japan's major cities — Tokyo, Osaka and Nagoya. In Tokyo, the signals were initially transmitted at low power from the Tokyo Tower

4. Establishment of a new Tokyo Tower expert committee in 2004

Considering the growing rivalry between potential locations for the new tower, the six companies established an expert committee on candidate sites for the new tower. The members of this committee were chosen from among university professors and other specialists in fields such as urban landscaping, seismology, city planning, electromagnetic wave propagation, civil engineering and tourism.

Four candidate sites were shortlisted from a total of fifteen candidates, and finally in March 2005 the findings of this study were released. Sumida ward was recommended because it is close to the city center and would allow viewers in most places to continue receiving signals without having to adjust the direction of their antennas.

Based on this report, the six companies finally announced at the end of March that Sumida ward had been chosen as the prime contender.

This was followed by a series of discussions with the site's owner (the Tobu railway company) regarding the building specifications and other matters, and the formal decision to go ahead with construction was made in March 2006. The Tobu railway company held a groundbreaking ceremony in 2008, and it was decided that the new tower would be called the Tokyo Skytree.

After resolving many issues relating to the tower's design and construction (bearing in mind the prevalence of earthquakes in Tokyo), the construction was completed in May 2011. The Tokyo Skytree is 634 m tall, making it the highest free-standing broadcasting tower in the world and a center of tourism in Tokyo.

5. Advance investigation of reception hindrances caused by relocating the transmitter station to the Tokyo Skytree

NHK and the five commercial broadcasting companies formed an investigative working group, and convened 83 times on a once-per-week basis. The working group conducted wide-ranging field studies as described below. The procedure for the simulation of reception difficulties was more or less the same as the procedure used by the joint council for the promotion of terrestrial digital broadcasting (an organization formed by the Ministry of Internal Affairs and Communication) when studying the change of analog frequencies and the start of terrestrial digital television broadcasting (master stations and relay stations). Studies were conducted on the following topics:

- Interference countermeasures in the Kanto region: Interference between relay stations constituting the single frequency network (SFN)
- Interference countermeasures for neighboring prefectures: Interference of broadcasting in neighboring prefectures using the same channels as Tokyo (e.g., Fukushima master station, Kofu master station, Mishima relay station)
- Reception measures for the local vicinity of the tower: Reception difficulties arising from the fact that the electric field strength from the Tokyo Skytree is greatly reduced compared with the Tokyo Tower
- Countermeasures for reception difficulties caused by buildings: Countermeasures to new incidences of signal blocking by buildings
- Booster interference countermeasures: Countermeasures for excessive input to the boosters used in ordinary receiver equipment
- Countermeasures to interference in channel 28 (the Open University of Japan): Countermeasures for reception difficulties arising due to the lack of an adequate adjacent channel protection ratio for channel 27 (used by the Skytree) and channel 28 (which continues to broadcast from the Tokyo Tower)
- Reception countermeasures for communal reception facilities in outlying areas and for communal reception facilities with interference countermeasures: Countermeasures for reduced/increased electric field strength or interference occurring due to changes in the reception environment at the point of reception
- Interference countermeasures for reception at relay stations: Countermeasures for reduced/increased electric field strength or interference occurring due to changes in the reception environment at the point of reception
- Reception surveys and countermeasures for relay stations receiving signals from the tower, methods for the utilization of test signals

6. Basic concepts of simulation

The area being studied was subdivided by a fine grid drawn onto a map, and at a representative point in each grid cell, a table (called an electric field list) was produced from data including the electric field strengths of the Tokyo Skytree signal, the Tokyo Tower signal, and other signals that use the same frequency and arrive from relay stations necessary for studies and the like. This data was then subjected to probabilistic analysis according to statistical methods by using the macro function of a spreadsheet application. As a result of this analysis, decisions were made such as whether or not it was possible to set up a SFN and whether or not there would be interference between different programs. The possibility of successful reception in each area was also calculated and used to derive a figure for the number of affected households, which was plotted on the map in order to visualize the data.

Furthermore, to predict the occurrence of booster interference, the performance of a commercial booster was modeled, and was used to quantitatively evaluate the reception interference resulting from the intermodulation components of the harmonics such as the third and fifth harmonics generated by non-linear input/output characteristics.

Based on the number of affected households, the scale of countermeasures was calculated by considering a menu of countermeasures suited to each form of interference.

Start of Transmission from Tokyo Skytree

—Part 2: Transmission Equipment—

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1. Introduction

The transmission equipment at Tokyo Skytree constitutes the largest transmission facility in Japan. The equipment is designed to be more reliable, easier to maintain and operate, and more energy efficient. This part introduces NHK's transmission equipment for television and FM radio.

2. Television transmission equipment

2.1 Overview

The specifications of the television transmission equipment are listed in Table 1, and an overall system diagram is shown in Fig. 1. TV program signals are transmitted from the NHK Broadcasting Center in Shibuya via three routes, comprising two optical lines and a radio link. We use a dual transmitter system (active plus standby) in which the standby transmitter is automatically switched when a fault has occurred in the active transmitter. Each of these transmitters consists of two 5 kW transmitters generating 10 kW of power, resulting in a highly reliable system. If one of the 5 kW transmitters in the active transmitter fails, the other keeps on broadcasting while the live transmitter is switched over to the standby transmitter.

2.2 Ease of maintenance and operation

The television transmission equipment is shown in Photo 1. To prevent operational errors, the transmitter racks for NHK General TV and NHK Educational TV are colored differently.

Photo 1: Television transmission equipment

The transport stream (TS) switch at the stage before the OFDM modulator input can switch signals seamlessly, and the active/standby transmitter output switch system is capable of switching without any output fluctuations because it uses an uninterruptible antenna switching apparatus.

This makes it possible to perform maintenance on either of the transmitters even in the middle of live broadcasting by switching between the active and standby transmitters.

2.3 Power saving

The power amplifiers (PAs) of digital transmitters generally have poor efficiency (output power/electricity consumption) and higher electricity consumption. However, Skytree's transmitters achieve greater efficiency through the use of a Doherty circuit configuration with gallium nitride (GaN) circuit elements in the PA amplifier devices. Moreover, the circuit that compensates for the intermodulation distortion that occurs when amplifying OFDM signals outperforms a conventional circuit, leading to greater PA efficiency. The combination of these factors has enabled us to improve the PA efficiency to at least 30% (compared with 18% for a conventional PA), resulting in substantially lower electricity consumption.

3. FM transmission equipment

The specifications of the FM transmission equipment are listed in Table 2, and an overall system diagram is shown in Fig. 2. With a configuration similar to that of the television transmission equipment, the device inputs are obtained via three routes, comprising two optical

Figure 1: Overall system diagram of television transmission equipment

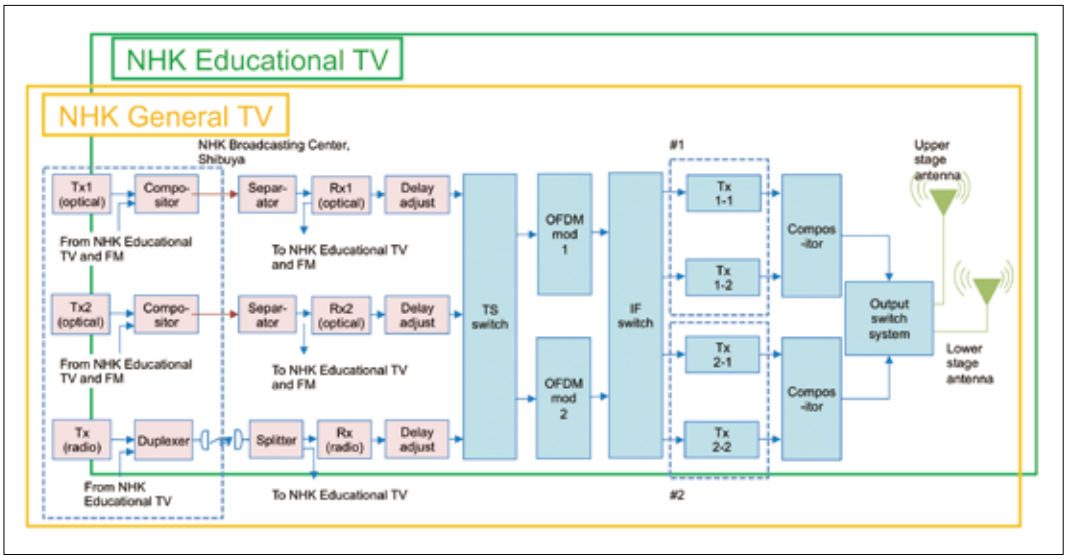


Table 1: Specifications of television transmission equipment

Item	Summary
Transmitting channels	NHK General TV: 27 channels NHK Educational TV: 26 channels
Nominal output	10 kW
Transmitter type	Dual system (non-disruptive changeover)
Cooling system	Transmitter PA: Water-cooled Other parts: Fan-cooled

Table 2: Specifications of FM transmission equipment

Item	Summary
Transmission frequency	82.5 MHz
Nominal output	7 kW
Transmitter type	Dual system (non-disruptive changeover)
Cooling system	Fan-cooled (indoor circulation)

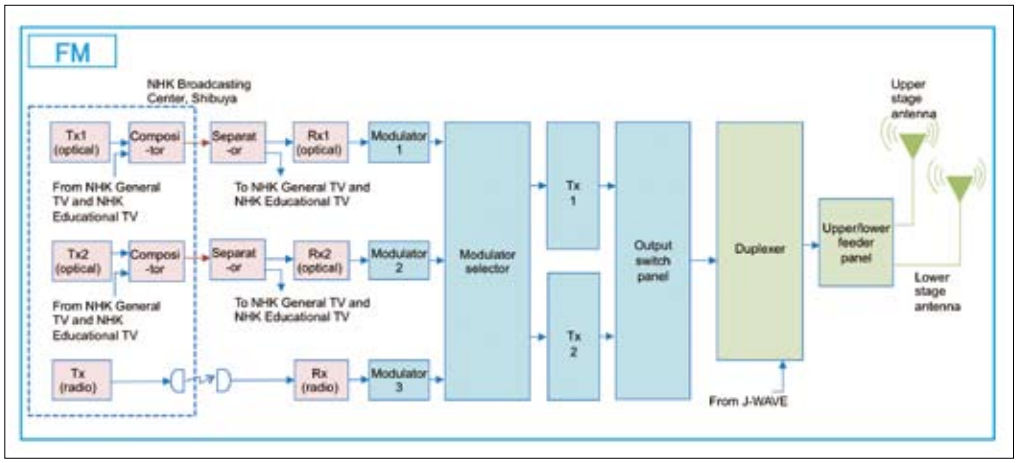
Table 3: Specifications of television transmission antenna

Item	Summary
Antenna type	4L stacked loop antenna with shared space for 20 panels in 4 stages
Directivity	Horizontally directionless, electrical tilt 2°
Main feeder	CX-120D, approx. 250 m × 2

Table 4: Specifications of FM transmission antenna

Item	Summary
Antenna type	2L stacked loop antenna with 9 panels in 4 stages (shared with J-WAVE)
Directivity	Horizontally directional (suppressed except in westerly direction)
Main feeder	CX-120D, approx. 200 m × 2

Figure 2: Overall system diagram of FM transmission equipment



lines and a radio link. The audio program signals (AES/EBU format) are input to an FM modulator, which outputs FM-modulated stereo signals at the broadcast frequency. The modulated output signals of the three systems are selected using switches and output to two transmitters. We use a dual transmitter system (active plus standby) in which the standby transmitter is automatically switched when a fault occurs in the active transmitter. An uninterruptible antenna switching apparatus has been introduced to enable switching between the active and standby transmitters without any fluctuations in the output.

4. Antenna equipment

4.1 TV transmission antenna

The specifications of the television transmission antenna are listed in Table 3, and an exterior view of the antenna is shown in Photo 2.

The TV transmission antenna is attached to the gain tower, a hexagonal column about 140 m tall and 6 m wide at the upper part of Skytree. To reduce as much as possible the height difference between the transmitting antennas so as to avoid differences in the coverage areas of seven different channels (including private broadcasters' channels), a space-sharing system is used whereby the antenna elements of two channels (in our case, NHK General TV and NHK Educational TV) are arranged alternately. For these two channels, there are a total of 160 antenna elements. With such a large number of elements, we monitor not only the voltage standing wave ratio (VSWR) and DC resistance (DCR), which are normally used for monitoring the antenna characteristics, but also the radiated power of each antenna by attaching sensors to each individual antenna element.

Photo 2: TV transmission antenna

4.2 FM transmission antenna

The specifications of the FM transmission antenna are listed in Table 4, and an exterior view of the antenna is shown in Photo 3.

The FM transmission antenna is a dual wave antenna that is used for J-WAVE (a private broadcaster) and NHK transmissions. Since FM is used for regional broadcasting, the main beam is electrically confined in the horizontal direction to suppress the spillover to other prefectures and to improve the reception environment in regions lying to the west.

5. Conclusion

We have introduced NHK's transmission equipments in Tokyo Skytree. By actively incorporating new technologies to produce equipment that is highly reliable and efficient, we will work to maintain and manage this facility so as to provide viewers and listeners with a stable service for many years to come.

Photo 3: FM transmission antenna

Start of Transmission from Tokyo Skytree

—*Part 3: Relocation Measures*—

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1. Relocation measures

At 9 am on 31 May 2013, the master station used for terrestrial digital TV broadcasting in Tokyo by NHK and five private broadcasting companies (with a reach of some 15 million households) was relocated from the Tokyo Tower to the Tokyo Skytree. This relocation took place during normal broadcasting without changing channels, and proceeded smoothly and without major incident due to the prior application of diverse studies, safeguard measures and common knowledge to ensure that signals could be received from both stations.

2. Deployment of countermeasures

To ensure the relocation went smoothly, six companies in the Kanto region set up the Tokyo Skytree Transition Center (T-SAPO) in July 2011. This center liaised with call centers, general market researchers and industries to promote various studies and countermeasures.

3. Advance simulation

Although the network for transmissions from the Tokyo Tower is currently complete, differences in electric field values arose due to differences in the transmitter specifications and differences in lag times due to the effect of the relocation on the positional relationships of relay stations.

These relocation effects were estimated in a simulation. First, the study area was divided into a mesh of approximately 1 km square blocks, and a radio propagation simulator was used to calculate the field strength of all transmitting stations. A single frequency network (SFN) was then used to study the effects of all the stations in each area, and the effects of transmissions in the same channels by other stations outside the broadcast region. The effects of boosters installed on receiver equipment were also studied in a simulator. Furthermore, in the vicinity of the transmitter where there is a strong electric field, we simulated the effects of adding or removing obstacles for all buildings in the area, using data on the shape and height of buildings.

4. Optimization of transmission delay time

To minimize SFN failures caused by exceeding the guard interval around the time of the relocation, an optimal delay time was determined for each relay station, and advance modifications were made at 65 of these (approximately one third of the total number of relay stations). This made it possible to greatly reduce the number of households affected by interference in the Kanto region.

5. Launch of experimental test station

An effective way of studying the effects of relocation is to perform measurements in which test waves are actually transmitted. However, considering the effects on broadcast radio waves in the same area and in other regions, we were somewhat constrained by having to confine these emissions to periods when other broadcasts are off the air. We therefore launched an experimental test station for the purpose of estimating the behavior of OFDM waves emitted from the Tokyo Skytree as low-power single carrier waves (CW) in the intervals between transmitted signals (OFDM waves). This enabled us to figure out if there would be any effects by using estimated values calculated from the CW measurement values, even during ordinary broadcast time slots.

6. Preliminary survey measures

In places that were expected to be affected by the relocation, we first surveyed the reception patterns so as to exclude areas using other means of reception such as CATV, and we adjusted the measurement points accordingly. In the survey, we measured the desired station, broadcast waves from the Tokyo Tower, and a CW signal from the Tokyo Skytree. In cases where it was not possible to estimate the propagation effects with a CW signal alone due to multipath effects, measurements were performed by emitting OFDM test waveforms at nighttime during inactive periods in order to determine in advance the measures required.

A measurement survey was performed for each facility where it was found that the electric field increased or decreased significantly according to the simulation results for each building. Furthermore, in areas where there were inferred to be new concentrations of facilities in the shadow of other buildings, a C/N continuous measurement system incorporating a car-mounted TV tuner and GPS device was used to confirm the changes in reception status from both towers, and measurements were performed individually if necessary. Based on the results of these measurements, advance measures were implemented where necessary.

7. Measures implemented based on monitor surveys and reception confirmation tests

Monitor tests were performed centered around large-scale apartment blocks where the relocation was expected to have a large effect. These tests involved checking nighttime test broadcasts and implementing advance measures at facilities that were judged to be inadequate. Next, we performed reception confirmation tests to elicit statements from households experiencing poor reception when switching over to the Tokyo Skytree during broadcasting. These started in early morning time slots, and were gradually shifted towards time slots with higher viewing figures. The tests were performed 128 times before the cutover, and a series of measures was implemented at facilities where reports had been made.

A call center was opened at about the same time as the initial test wave transmissions. This call center was staffed by up to 260 operators at peak times around the time of the migration.

Knowledge of the reception confirmation tests became widespread due to publicity in broadcast programs, websites, newspapers, train advertising and the like, with the result that a questionnaire conducted at the end of March found that approximately 75% of respondents had viewed these tests.

8. Post cut-over support

On 31st May, the relocation went ahead as planned. At its peak, the work to implement countermeasures was being carried out by 1,000 crews, and was completed without any major disruption.

We are currently conducting long-term radio wave measurements at 16 locations in Tokyo and the surrounding regions, and are implementing anti-fading measures.

New-Born JAXA

Naoki Okumura
President
Japan Aerospace Exploration Agency

On October 1, 2013, the Japan Aerospace Exploration Agency (JAXA) celebrated its tenth anniversary.

Over the last decade, JAXA has launched a series of rockets, participated in manned activities on the International Space Station (ISS) and has made steady progress in space science research. It has also achieved successes with the maiden flight of the Epsilon Launch Vehicle and the pioneering *Hayabusa* mission. These activities have gained international recognition, and we believe that they have helped to elevate Japan's international standing and R&D capabilities while drawing attention from all over the world.

JAXA experienced a series of mishaps soon after its inauguration, and has since made efforts to acquire a technological infrastructure and improve reliability in order to successfully accomplish its projects and business missions. As a result, 21 out of 22 H-IIA Launch Vehicles have launched successfully, resulting in a world-beating success rate of 95%. Also, all four of the H-IIB Launch Vehicles used to launch the *Kounotori* H-II Transfer Vehicle (HTV) have launched successfully, providing the world with a valuable means of transportation to deliver supplies to the ISS. Last year we also successfully launched the Epsilon Launch Vehicle, which is capable of being controlled by two PCs equipped with self-checking functions.

On the subject of satellites, we aim to establish a means of sharing information during natural disasters as a response measure to large-scale disasters such as the Great East Japan Earthquake of three years ago, and we are involved in a joint trial with the Japan Association of Medical Practitioners involving the use of the high-speed Internet relay satellite WINDS (Wideband Internetworking Engineering Test and Demonstration Satellite). In 2007, we launched ALOS (Advanced Land Observing Satellite), which provided useful services such as emergency observations after the 2007 West Sumatra earthquake, monitoring illegal logging in the Amazon rainforest, and providing data for resource surveys and maps. This satellite ceased operating in 2011, but its successor ALOS-2 is being prepared for launch this year and is expected to make further international contributions in various fields including agriculture. In the Global Precipitation Measurement (GPM) project (a chiefly US-Japan initiative scheduled for launch this year), a dual-frequency precipitation radar will be used to measure precipitation with unprecedented accuracy, and is expected to improve the accuracy of weather forecasts and provide useful information for the study of extreme weather and the management of water resources. In the field of science, we are working on the development of technology to probe the origins of life by studying the characteristics of primordial asteroids rich in organic compounds and hydrated minerals. This will be carried on the *Hayabusa* 2 probe — the successor to our *Hayabusa* probe, which accomplished the first ever sample return from an asteroid.

Alongside this steady accumulation of successes, the environment surrounding JAXA has been changing. In addition to the United States, Europe and the like, emerging nations are developing their own space programs, and in Japan new systems are being put in place, including revisions to the JAXA Law. According to the basic space policy as revised in January last year, JAXA is expected to expand the use of space and operate autonomously. In this regard, in addition to pushing at the frontiers of space science and the like, it also plays the key role of a central technology agency that assists the entire government in the use of technology for space development, including support for security measures and disaster prevention.

Based on these circumstances, we have decided to reconsider our mission and continue moving forwards as a reborn JAXA with renewed determination. In line with this, we have decided to adopt the guiding principle of exploiting space and aerospace to provide a safe, rich society, and we have adopted the corporate slogan *"Explore to Realize"*. The new-born JAXA aims to contribute to humankind by developing its technical demonstration and technical platform capabilities, and by promoting links with society and other industries. We will also usher in a new era through the creation of value by using technology to address the dynamically changing needs of society.

Launch of the Epsilon Launch Vehicle ©JAXA

APT/ITU Conformance and Interoperability Event

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1. Introduction

From September 9 through September 12, 2013, a Conformance and Interoperability (C&I) event was held jointly by the APT[1] and ITU. The purpose of this event was to promote activities to deepen the understanding of C&I throughout countries in the Asia-Pacific region, and to improve the capabilities of each APT member nation and resolve their problems. This event featured C&I-themed workshops, NGN/IPTV interoperability testing, and showcases giving demonstrations of NGN, IPTV and optical access technology. This article provides a broad description of the APT/ITU C&I event.

2. Cooperation of ITU with national/regional SDOs

In response to strong demands from developing countries, the ITU-T adopted resolution 76[2] at WTSA08 (October 2008, Johannesburg, South Africa), and has been working to resolve interoperability issues as a key priority. In each of the ITU-T's study groups, recommendations relating to conformance and interoperability have been developed, and interoperability events relating to IPTV and home networks have been held by SG16 and SG15 respectively. In July 2012, the results of a survey by the external organization KPMG were reported at a TSAG meeting (2–4 July 2012 in Geneva), and the ITU was recommended to implement four action items (1. Assessing product conformity with ITU-T recommendations, 2. Holding interoperability events, 3. Cultivating human resources for capacity building, and 4. Establishing test centers in developing countries) and a business plan. As the lead SG for test specification and C&I testing, ITU-T SG11 is working to set up an action plan to address C&I issues. At WTSA12 (November 2012, Dubai, UAE), SG11 was assigned as the parent SG of Joint Coordination Activity on Conformance and Interoperability Testing (JCA-CIT), which coordinates C&I initiatives associated with multiple study groups of the ITU-T. This was done to strengthen SG11's efforts. Although the ITU-T's activities relating to C&I are supported by developing countries and need to be performed reliably, the business plan required on the part of developed countries is unclear, and it is also thought that there is too much overlap with the activities of other SDOs, resulting in a conflicting composition. This conflict exists against a complex background in which developing countries that plan to construct and introduce network technologies such as NGN and IPTV are calling for interoperability to be reliably assured, while on the other hand the developed countries that have already brought various types of equipment onto the market are keen to mitigate any impact on their existing network products.

In Japan, TTC[3] have completed the specifications JT-Q3401 and JT-Q3402 based on the ITU-T NGN UNI/NNI specifications ITU-T Q.3401/Q.3402 by adding technical details for interconnections, and HATS[4] have performed terminal-to-terminal interconnection tests based on this UNI specification. In June 2009, TTC established the IoP-AG (Interoperability Advisory Group), which is continuing to study NGN interoperability submit contributions to SG11. At ITU-T SG11, this activity has so far resulted in the completion of ITU-T recommendations Q.3909 (test framework), Q.3948 (VoIP test specification) and Q.3949 (TV phone test specification), based on TTC specifications. At the SG11 meeting in May 2012, based on the test specification recommendations developed by SG11, it was proposed that the ITU-T should provide backing for an NGN interoperability testing event. With the support of relevant departments of bodies including the CIAJ, TTC and Ministry of Internal Affairs and Communications, this culminated in the HATS Interoperability event supported by the ITU, which took place on December 11–12, 2012. On July 13, 2012, a workshop styled as an open seminar was held on the theme of interoperability activities at HATS and ITU-T, at which there was a lively discussion of the outcome of this event and its future prospects. At this workshop, a video letter was sent from ITU-T director Malcolm Johnson to introduce his expectations regarding HATS. Other HATS interoperability events backed by ITU-T took place the following year, with an HDTV interoperability testing event held on July 9, 2013, and the second NGN interoperability workshop held on 24 September.

3. APT/ITU conformance and interoperability event

At the APT/ITU conformance and interoperability event, discussions were started based on Japanese contributions proposed at the 36th APT Management Committee (November 2012, Bangkok). At the 21st ASTAP general assembly (March 2013), a Japanese contribution was submitted and discussed proposing that the conformance and interoperability event be held in September 2013. At this meeting, it was agreed that an APT/ITU C&I event coordination committee would be set up to make preparations and study the contents of the event. I was appointed chairman of the coordinating committee. Since April 2013, we have recruited committee members from each of the APT member countries, and by September we had held six telephone conferences to investigate the specific details of the testing, showcasing and workshops, announce the event, and invite participation from individuals and companies. This event was announced on the APT and ITU websites, and participants were invited from the APT and ITU member countries. We are also providing technical support, including delegating personnel from the ITU.

This event was held jointly with the ITU, and included interoperability testing and showcasing events. It was therefore

Fig. 1: The NGN Showcase event

Fig. 2: Visitors taking part in one of the workshops

targeted at people from developing countries in the region with the purpose of contributing directly to the resolution of issues in developing countries. By taking advantage of the opportunities presented by the event held in Japan since 2012 by HATS with the backing of the ITU, I think the scope of these activities has expanded to a more global level since the 2014 event will be hosted by the APT and ASTAP (Asia-Pacific Telecommunity Standardization Program).

The APT/ITU C&I event was held at the Centara Grand Hotel in Bangkok, and its configuration and schedule were as follows:

1) Workshop (Afternoon on 9th and 10th September)
2) Interoperability testing (9th AM September)
   1) NGN (VoIP, Video conference)
   2) IPTV (including IPTV-MAFR (Multimedia Application Framework))
3) Showcasing (from 9th PM to 12th September)
   1) NGN (VoIP, Video conference)
   2) IPTV (including IPTV-MAFR (Multimedia Application Framework))
   3) Optical access

The 22nd ASTAP general assembly was held on September 9–14, so from September 9 through September 12, our event ran back-to-back with the ASTAP general assembly.

For Testing & Showcasing, there were seven exhibitor companies, and 120 visitors came to listen and observe at the workshops and showcase events. For NGN Testing & Showcasing, there were five exhibitors: NTT, OKI, NEIX, NEC and Teluu PJSIP. For IPTV Testing & Showcasing, there were two exhibitors: OKI and Mitsubishi. And for the Optical access showcasing, there were three exhibitors: OKI, Mitsubishi and Fujitsu. At the workshops, there were country reports from three countries (China, Vietnam and Mongolia), and eight showcase introductions to technologies including NGN, IPTV and optical access. Panel discussions were held at the end of the workshops to gather suggestions to the ASTAP relating to C&I. Based on these suggestions, we plan to discuss specific implementation method at the next ASTAP general assembly.

In a questionnaire survey performed after the event, responses were received from 45 APT member countries, of which 39 supported holding another similar event. Overall, the feedback was very positive, and we have started discussions with a view to holding the second C&I event simultaneously with the ASTAP conference in September 2014. On the other hand, among this year's Testing & Showcasing exhibitors, there was one company from the UK, but the other six were all Japanese businesses. During the preparatory period, invitations were extended to APT member countries centered on the host nation Thailand, but unfortunately they did not participate as exhibitors. Since this was the first such event, perhaps there were a lot of companies who wanted to see how things turned out before getting involved. At the second event in September 2014, I hope we can continue our activities to facilitate the participation of operators and vendors from countries all over Asia.

4. Conclusion

Spurred on by the experience of the first APT/ITU C&I event, we have started discussions aimed at forging closer links between the business world and the activities of the APT to contribute directly to the construction of the network infrastructure in APT member countries. Japan proposed holding a C&I event due to the considerable amount of interest in C&I in all countries, and the expectation of active participation from the ICT industries. Although the APT had no prior experience of holding C&I events and was obliged to rely on technical support from the ITU, there were many issues to address such as the configuration of the event, the negotiations with the APT secretariat on the participation fees, and the recruitment of exhibitors. However, at the sixth coordination committee meeting, more support was obtained from the APT members and ITU-T SG16 chairman Yushi Naito, and this helped us to hold the C&I event successfully. The testing and showcasing was mainly performed by TTC/HATS members, while I acted as a coordinator and hopefully made an impression of Japan's leadership. The event was rated very highly in a questionnaire survey conducted afterward, and there are growing expectations of another similar event next year. I intend to continue acting as a coordinator with the aim of holding a second event in September 2014. I would like to thank everyone who helped make the first event a success, and I hope you will be able to offer your continued support for the second event.

1 APT: Asia Pacific Telecommunity
2 Resolution 76 "Studies related to conformance and interoperability testing, assistance to developing countries, and a possible future ITU mark programme"
3 TTC: Telecommunication Technology Committee
4 HATS: Harmonization of Advanced Telecommunication Systems

JICA Group Training Course 2013

—*Construction and Design of ICT Infrastructure to Bridge the Digital Divide in Rural Areas*—

International Cooperation Department
The ITU Association of Japan

For about 6 weeks from July 25 to September 6, 2013, the ITU Association of Japan (ITU-AJ) held a group training course on behalf of the Japan International Cooperation Agency (JICA). This training course was aimed at cultivating expertise in the creation of infrastructure development plans to rectify the digital divide in rural areas of the trainees' countries and included theoretical and practical training in the establishment of effective and efficient rural communication network facilities and data transmission methods.

In previous business years, the ITU-AJ has held other training courses on behalf of the JICA: Rural telecom engineering (phase I) (1990–99), Rural telecommunication planning (phase II) (2000–04), Information infrastructure maintenance for rural community (phase III), Networking of rural community information infrastructure course (phase IV) (2005–2009), and Capacity building for developing a communication and information environment in rural community (phase V) (2010–2012). During the 23-year span of these five training courses, we have admitted a total of 243 trainees (including individual trainees).

Starting in the current business year, our latest training course follows on from these previous courses with the first year of phase VI (a three-year course). This year we welcomed nine trainees from seven different countries — Bangladesh, Ethiopia, Myanmar, Peru, Samoa, Thailand and Tuvalu.

In the course lectures, the trainees first learned about the state of telecommunications in Japan (Outline of telecommunications in Japan), and were then given a general introduction to the theory of ICT development in rural areas (ICT development strategy: Global challenges for rural communities, Consideration to provide universal service, Development of rural telecommunications, and Fundamentals of rural telecommunication networks). The course also covered the key technology subjects necessary for network design, including Fundamentals of optical networks, Outline of cellular networks (W-CDMA, LTE), Terrestrial digital broadcasting for distributing information in rural areas, and Sensor Networks. As an example of the implementation of a

Appearance of the Chizu town observation element.

Pattern of lectures

Trainees and field trip destinations

communication network in a rural area, we included an item on ICT Technology and frameworks needed for the introduction of ICT in villages called Actively Promote Use of ICT Utilization in Rural Area. These subjects also included lectures on the state of recovery of mobile communication services following the Great East Japan Earthquake.

As an item on the analysis of designed networks, there were lectures on the items that need to be covered in feasibility studies (Study items and process of Feasibility St), and on the outline of project cycle management techniques.

As a practice exercise, the trainees performed network planning drills. This item involved a case study of six rural model areas based on the technical knowledge acquired so far in this training course. For each of these areas, the trainees designed and planned an optimal rural communication network. The results were announced each day, and were studied and discussed by each subject's instructor. This training course brought together the techniques acquired throughout the course, and was well received by the trainees who were able to devise and apply plans back in their own countries using the techniques and knowledge acquired in this system design exercise.

As an actual case study of the construction and operation of a network for a rural region, we examined the town of Chizu in Tottori prefecture. In this town, a system called IRU (indefeasible right of user) was introduced in order to close the information gap of rural areas. The IRU system is a form of state-funded privatization whereby the local government builds a network, which is then operated by communications providers.

The trainees also visited the Panasonic Electronics factory at Nishikinohama to observe a solar power system, which is attracting attention as a power source that can be used in rural regions. Furthermore, to inspect state-of-the-art telecommunications, the trainees visited the NTT Kansai R&D open room. Each visit was well received by the trainees, who not only experienced the nature of work first-hand, but also gained first-hand experience of the latest telecommunications technology.

At the final stage of the training course, the trainees proposed infrastructure development plans aimed at bridging the digital divide in actual rural regions of their own countries. They submitted these proposals to JICA as interim reports, and also delivered presentations. The interim reports made full use of not only network planning but also project management techniques (PDM: Program Development Matrix), and the network designs included considerations of financial aspects (including profitability), human resources, procurement, environmental effects, maintenance/operation, and future design plans. These were finally summarized as an interim report. When the trainees gave their presentations on the final day, there were active question-and-answer sessions. After the trainees had returned home, this interim report was shared with their companies, where the contents of the reports were brushed up to form (within two months) a final report which was submitted to the JICA.

During the period of this training course, we lent PCs to the trainees in the hope that they would as a rule produce electronic text files on CD-ROM.

This training course received a number of good ratings from trainees, but from next year the ITU-AJ plans to clarify any issues that arise during the course by evaluating the content and text of lectures delivered by trainees at the end of the course, and listening to their appraisals, opinions and requests regarding site visits and field trips. By analyzing and investigating these evaluation results, we will shed light on the course's practical problems.

Summary of ITS World Congress Tokyo 2013, and Efforts by the Ministry of Internal Affairs and Communications of Japan towards the Advancement of ITS

Land Mobile Communications Division
Radio Department
Telecommunications Bureau
Ministry of Internal Affairs and Communications of Japan

The ITS World Congress was held in Tokyo, Japan from Monday 14th through Friday 18th October 2013. This was an international conference on intelligent transport systems (ITS), which are systems to reduce traffic accidents and alleviate traffic jams using ICT.

At this year's event (the 20th ITS World Congress), many cutting edge technologies on the theme of "Open ITS to the Next" were introduced by way of conference sessions, exhibitions and demonstrations such as test drives. The event was enthusiastically attended by over 20,000 visitors from 65 different countries.

This article presents a summary of ITS World Congress Tokyo 2013, and introduces the efforts of the Ministry of Internal Affairs and Communications of Japan towards the advancement of ITS.

1. Opening ceremony

The ITS World Conference started off with the Tokyo International Forum on Monday, 14th October. Although the conference hall could accommodate 5,000 visitors, it was filled by many ITS stakeholders from Japan and overseas.

The opening address was delivered by Hiroyuki Watanabe, the chairman of ITS Japan. Mr. Watanabe expressed his enthusiasm for opening new doors in the automotive industry through the use of autonomous vehicles and Big Data. Opening statements by representatives from the three key regions of Asia, the United States and Europe were then delivered, followed by a video message from H.E. Mr. Shinzo Abe, Prime Minister of Japan, and a public acknowledgement of people who had worked hard to promote the spread of ITS.

2. Exhibitions, demonstrations, etc.

From Tuesday October 15 (the second day of the congress), the Tokyo Big Sight became the venue for conference sessions, exhibitions of the latest equipment, and demonstrations including test drives in actual vehicles.

At the conference sessions, participants from various fields of industry, government and academia introduced their latest work based on broad themes such as roads, traffic, telecommunications and industry.

In the exhibition hall, booths were set up by a total of 238 organizations including businesses and research organizations from all over the world, of which 114 were from Japan. These were used to introduce the latest initiatives through a combination of display panels, video displays, equipment demonstrations and simulators. At the booth run by the Ministry of Internal Affairs and Communications of Japan, we introduced the ITS that has been put to practical use in Japan, and the telecommunications technology used in these systems by linking together related businesses and the like under the three themes of (1) Guard Your Life, (2) Easy Travel, and (3) Improved Communication Technology. Many people were particularly interested in our diorama illustrating the telecommunications technology that

Fig. 1: Welcome address by ITS Japan chairman Hiroyuki Watanabe

Fig. 2: Video message from H.E. Mr. Shinzo Abe, Prime Minister of Japan

Fig. 3: Inside the exhibition hall

supports ITS in an easy-to-understand way, and our simple demonstration of 79-GHz high-resolution radar equipment.

Outside the exhibition hall, there were demonstrations of future ITS technologies — some that are ready for practical applications, and others that are aimed at being used further into the future. In particular, there were many organizations demonstrating the latest technology on the theme of autonomous vehicles and advanced driver support.

For example, in a course set within the grounds of the exhibition hall to simulate city roads and car parks, Honda demonstrated a vehicle that can drive autonomously by using communication between pedestrians and vehicles in addition to recognizing the road environment from radars and cameras mounted on the vehicle, and automatically parks in an available parking space while avoiding obstacles based on information from cameras situated in the car park.

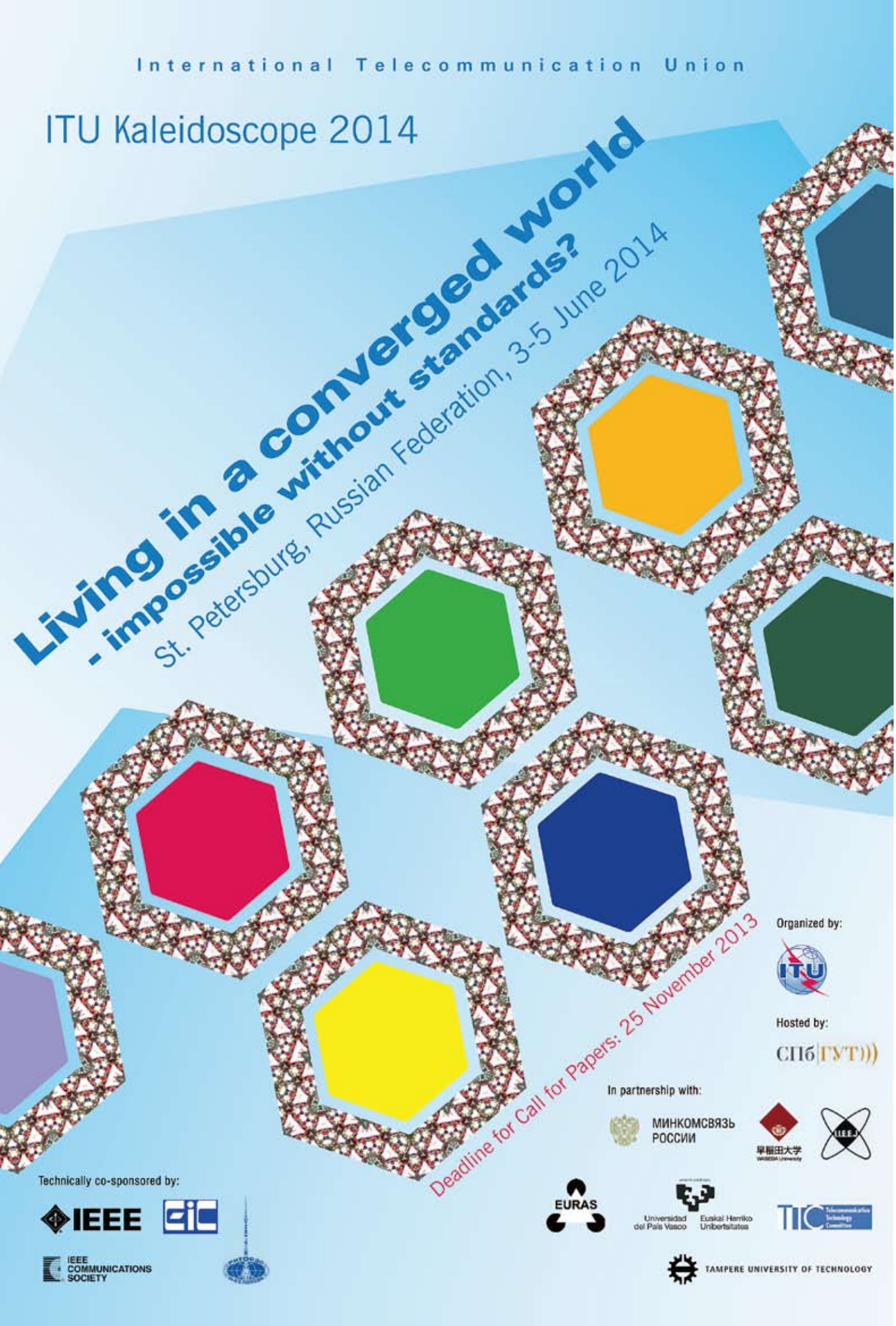
Under the theme of advanced driving support technology for highways, Toyota demonstrated a vehicle that automatically operates the accelerator and steering so as to follow the car in front in a metropolitan expressway. This system uses cooperative adaptive cruise control (CACC), which is an enhancement of an existing technique called adaptive cruise control (ACC) where tools such as radars and cameras are used to keep a constant distance from the car in front. CACC can follow a vehicle more responsively because in addition to ACC, it also has the ability to instantaneously share acceleration and deceleration information by vehicle-to-vehicle communication. This autonomous vehicle demonstration used 700-MHz band radio waves which had been allocated by the Ministry of Internal Affairs and Communications for ITS.

In the ASV (Advanced Safety Vehicle) promotion study group, which studies how to promote the development, practical use and popularization of ASV, demonstrations were performed in the nearby urban region, using a combination of vehicle-to-vehicle communication and vehicle-to-infrastructure communication to prevent collisions at crossroads and collisions when turning right. This system also uses radio waves in the 700 MHz band. Since radio waves in this band are able to travel around obstacles and can communicate even in non-line-of-sight situations like the driver's blind spots, applications that take advantage of this characteristic were also introduced.

Fig. 4: The Ministry of Internal Affairs and Communications booth

Fig. 5: Diorama describing the ITS used in Japan

Fig. 6: Demonstration of 79-GHz high-resolution radar



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