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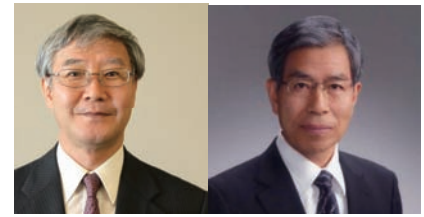
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## Early days of fusion splice developments

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### 1. Introduction

We have enjoyed broadband services through optical fiber cables in these days. Many technologies have been intensively developed for realizing optical transmission systems using optical fibers. One of the important technologies to construct optical systems is fiber connection technology. Low connection loss makes use of low-loss fibers and fusion splice using discharge has been provided low splice loss and low reflection. In this letter, we will review early research and development of fusion splice.

### 2. Beginning of research

The research and development of the optical fiber joining technologies in Japan started in 1973, when NTT Basic Research Laboratories introduced full-scale research on splicing and connector technologies. At that time, it was completely unknown whether transmission systems using optical fibers could be put into practical use. In order to achieve its practical use, NTT Basic Research Laboratories conducted basic research on technologies necessary for the optical fiber transmission such as optical fibers, semiconductor lasers, optical detectors, high speed modulation and demodulation technologies, systemization technologies, and optical fiber joining technologies. Among them, the research on the joining technologies had big issues of how to establish axis alignment of an optical fiber and then how to fix it although they are currently taken for granted technologies. Especially a transmission system which used a single mode optical fiber was one of the most difficult research themes because axis alignment must be established to an accuracy of 1 micron or less in an adverse environment such as a manhole. In addition, the joining technologies were recognized as critical to the success whether the system could be realized or not.

In 1975, Hatakeyama and Tsuchiya experimentally showed the possibility of practical use of fusion splice technologies using electrical discharge for the first time in the world [1]. The splicing loss of a multimode optical fiber was 0.2 dB or less, which was particularly low-loss at that time. In addition, the impact was extremely significant for its shortening of splicing time and reliability of the splicing part. Although this research was positioned as the basic research, the research and development were accelerated in each research institution after that because of its potential for practical use. The fusion splicing machine at the early

stage is shown in Fig1. It aimed for multimode optical fiber splicing as the first step. Previously discharge had been considered to be unstable. However, it was revealed that 4KV AC with around 20mA current led to glow discharge, and it heated the fiber splicing part extremely stably. In advancing experiments of discharge heating, it was found that each optical fiber separated in opposite direction unless pressure is put in the axis direction.

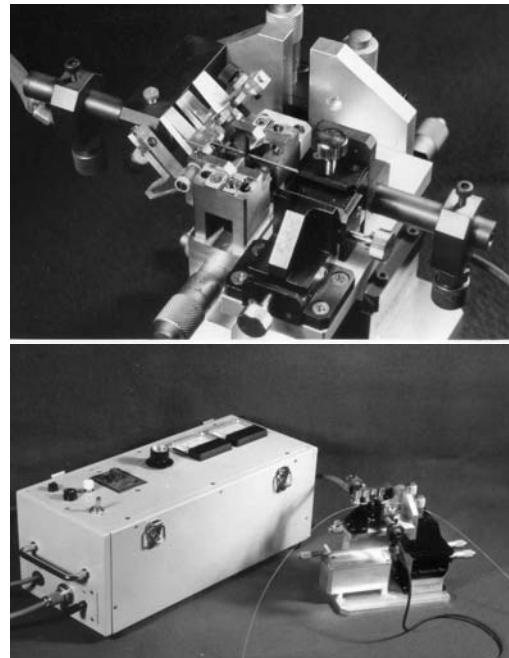


Fig. 1 Fusion splicing machine for the basic research at the early stage

This is because the surface tension of the optical fiber made the heated part spherical, which caused separation of the both sides. This finding of the surface tension led to the practical use of the single mode optical fiber joining later. The scenery of the joining experiment at that time is shown in Fig.2.

Because of the possibility of the practical use of multimode optical fiber joining, the multimode optical fiber fusion splicing technologies were transferred from the Basic Research Laboratories to Ibaraki Laboratories and three collaborative research manufactures in the summer of 1976 in order to meet the schedule of a system trial test in a laboratory in Yokosuka Research Laboratories as the preliminary step toward the large-scale field trial of optical fiber transmission starting in 1978(FR1). The technical materials at that time are

shown in Fig.3. Since then, fusion splicing technologies have become the mainstream of the optical fiber splicing in the world.

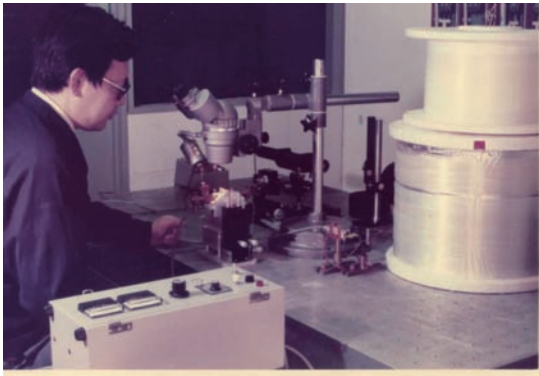


Fig. 2 Scenery of the joining experiment in Basic Research Labs. in 1975

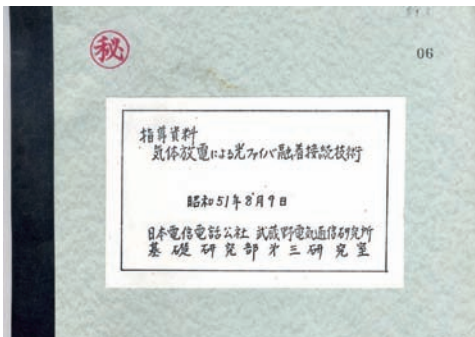


Fig. 3 Technical material for technical transfer in 1976

After that, Tsuchiya, et al, shifted their focus to single mode optical fiber joining, and advanced their research. At some point, it was found that splicing loss decreased after discharge heating even if the single mode optical fiber axis was misaligned. This was because self axis alignment occurred by surface tension when quartz fiber fused. Tsuchiya, et al, was surprised that it was possible to splice with loss of 0.2dB or less without mechanical alignment in a single mode optical fiber.

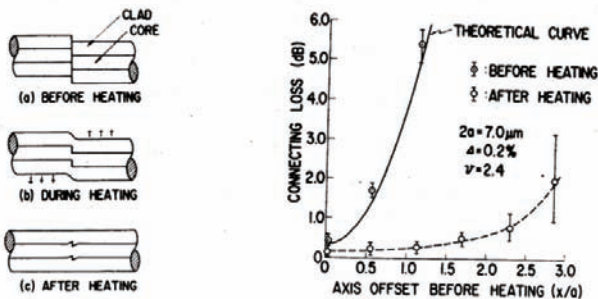


Fig. 4 Self axis alignment phenomenon of single mode optical fiber splicing

Then they presented the experimental results in the post deadline paper of Topical Meeting on Optical Fiber Transmission-II in 1977, and this received a great

response. Fig.4 shows self axis alignment phenomenon of single mode optical fiber splicing. This publication achieved one of the breakthroughs for the practical use of the single mode optical fiber transmission system [2][3]. After that, research on the single mode optical fiber transmission system in the world was accelerated, and began to make considerable steps as the practical system development.

Needless to say, the core and the clad of the optical fiber should be concentric because surface tension acts on the outer periphery of the optical fiber. In the technologies such as the mass-fusion splice technologies which are currently put into practical use, single mode fiber splicing is established without a high degree of accuracy axis alignment, and this is due to the surface tension.

As illustrated above, the research results of technologies in NTT Basic Research Laboratories made a great impact on the practical use of the optical fiber transmission system, and they were taken over to development for practical use. The basic joining results have developed into splicing technologies which are currently used throughout the world.

### 3. Pre-fusion method and the first field trial FR1

Multimode optical fibers are easy to splice and the coupling efficiency of optical source is high. Therefore, multimode optical fibers were considered to use for early commercial optical transmission systems. Before constructing commercial systems, field trials conducted by NTT laboratories were planned. Portable and user friendly fusion splicing machine, which can be used in a manhole or a tunnel by workers not researchers, was required to construct commercial optical systems. Based on the fundamental investigation described in section 2, pre-fusion method was proposed by Hirai and Uchida [4]. In a manhole or a tunnel, it is sometimes difficult to obtain a good quality of fiber end face. When end faces of fibers are not smooth, fusion splices result in large splice losses. To obtain low-loss splice, fiber ends to be spliced are smoothly arranged by pre-fusion before fused together. Using this method, portable fusion splicing machines were jointly-developed in 1977 with NTT and three manufacturers. One of the machines is shown in Fig.5.



Fig. 5 Fusion splicing machine used for FR1 (This machine is about 20kg in weight)

Developed portable fusion splicing machines were used and tested in the first large-scale field trial, named FR1. The trial was conducted from March 1978 to September 1978 in Tokyo. The route is about 20km from Kuramae through Kasumigaseki to Karagasaki in Tokyo. Graded-index multimode fibers with 50 μm core were used. Both fusion splice and mechanical splice were tested in this trial [5]. Numbers of fusion splices and mechanical splices were 1108 and 858, respectively. Both splice methods successfully resulted in low splice loss (average splice loss is about 0.14 dB). Picture of actual construction scenery of fusion splicing in a tunnel is shown in Fig. 6. A photo shows half of a face of one of the authors (Kashima).



Fig. 6 Construction of optical cable route (FR1 1978)

**4. High frequency discharge with high voltage trigger (HHT)**

Research for realizing optical subscriber systems, that is, fiber to the home (FTTH), starts in 1979. Field trial of FTTH was conducted near Yokosuka in 1980 (from May to September). Many technologies suitable for optical subscriber systems started to realize the field trial. Experiments of FR1 taught one of the authors (Kashima) to correspond to several situations in a field. Available power supply at a manhole and a tunnel is not always stable which reflects discharges in unstable discharge conditions. Very heavy fusion splicing machines used in FR1 have trouble moving from one place to another. Workability will be severely required in subscriber systems. Based on these experiences and considerations, one of the authors (Kashima) wanted to realize a handheld fusion splicing machine powered by a small battery. In these days, DC (direct current) discharge or AC (alternating current) 50Hz discharge was used. Schematic property of AC discharge is shown in Fig. 7. To realize low power consumption, initial discharge is made by a high voltage trigger and then continuous discharge is held by a voltage of  $V_s$ .

Further low power consumption is realized when  $V_s \approx V_g$ . During the research of discharge, Kashima found out that this condition is realized by using high frequency discharge. The invented method is named as HHT (High frequency discharge with high voltage trigger) [6].

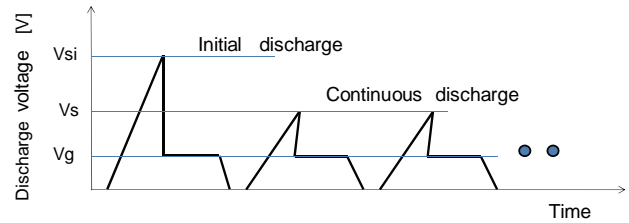


Fig. 7 Property of AC discharge (Polarity is ignored)

Picture of discharge circuits of HHT method used for experiments is shown in Fig. 8. After fundamental experiments, experimental circuits were integrated into an IC, which was used for developed fusion splicing machines. With HHT method, a very compact portable fusion splicing machine (only 2.5 Kg including a power battery) was developed in 1979. Voltage of a battery is 12V. In Fig. 9, two types of fusion splicing machines are compared. Newly developed machines using HHT method were used to construct FTTH field trial in 1980. This method becomes one of the fundamental technologies for fusion splice for single-mode and multimode fibers.

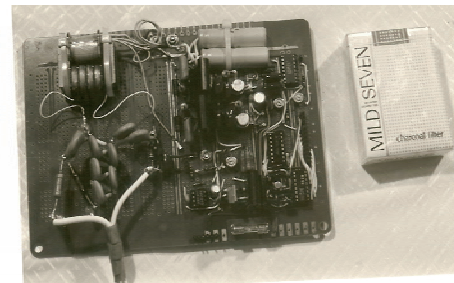


Fig. 8 Discharge circuit for experiments (1979)

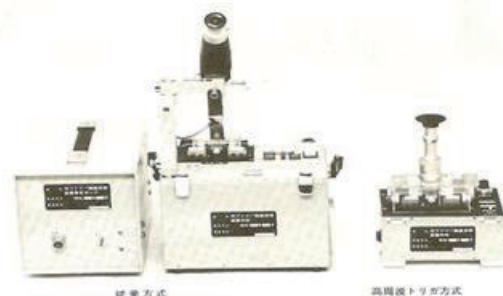


Fig. 9 Comparison of two types of fusion splicing machines (Left: traditional machine, Right: the developed HHT machine in 1980 and 2.5 Kg in weight)



## 5. Mass-fusion splice

There are two major splice technologies, fusion splice and mechanical splice. Mechanical splice using silicon V-groove can splice 12 fibers simultaneously in early 1980s. Many people wanted to splice multiple fibers by one discharge, that is, mass-fusion splice. The first mass-fusion splice by discharge was realized by Tachikura in 1981 [7]. This is realized by using two pairs of electrodes (four electrodes) to make uniform discharge area. Four electrodes is due to AC 50Hz discharge and the adoption of four electrodes is not attractive from a workability viewpoint. Experiments of the HHT method revealed that wider uniform discharge area is realized by high frequency discharge when compared to traditional 50Hz discharge [8]. With the adoption of the HHT method, we can realize mass-fusion splice using a pair of electrodes (two electrodes) in 1983 [9]. A picture of the first mass-fusion splice using two electrodes is shown in Fig. 10. Temperature at five fibers was measured and the condition of uniform heating was found out. With this technique, mass-fusion splice machines for five-fiber ribbons using multimode fibers were developed and they were used and tested in the field trial of FTTH at Mitaka near Tokyo in 1981. After the development of mass-fusion splice technique, single-mode fibers are used not only in trunk systems but also in access systems. The developed mass-fusion splicing machine is successfully applied to splice single-mode multiple-fibers.

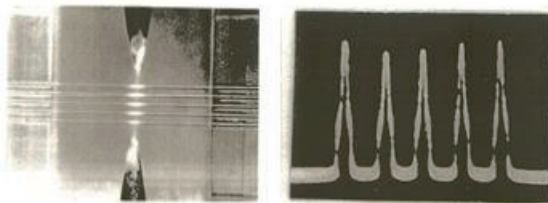


Fig. 10 First mass-fusion-splice using two electrodes in 1983 (Left: discharge, Right: Measured temperature at fibers)

## 6. Conclusions

We report early developments of fusion splice in this letter. These early technologies have served to construct optical fiber transmission systems and have been used to construct today's optical transmission systems. Since these early developments, many important technologies have been developed by many researchers and engineers. A modern fusion splice machine can estimate splice losses and today's mass-fusion splicing machine can splice 16-fiber simultaneously. One of the sophisticated machines is shown in Fig.11. This machine can splice not only ordinary fibers but also polarization-maintaining fibers. It can also splice large diameter fibers (up to 500 $\mu$ m in diameter). Today, there are many families of fusion splicing machines to correspond to several situations and user's demand. Fusion splice technology served to

construct existing optical transmission systems and it will serve to construct future systems world widely.



Fig. 11 Resent fusion splicing machine

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# Evolution of Modulation Technology Trend for High-Capacity Optical Transport Network

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## 1. Abstract

Data traffic has continually increased to the point that it is now the dominant traffic flow in optical transport networks; key sources are IP-based video streaming, huge data transport between data centers, and the rapid adoption of modern cellular phones (such as LTE) for data access.

Since the coming of the Internet in the latter half of the 1990s, data communications began its ascent on the network and has been forcing dramatic increases in transmission capacity. Optical communications R&D based on single mode fiber has brought forth a number of amazing system technologies, and current commercial systems offer high-capacity transmission in excess of 1 Tbit/s over a single optical fiber. This represents a 10,000-fold increase from the bit rates of 1980 as shown in Fig.1.

In this letter, I would like to describe the innovative trends in optical fiber transmission, especially modulation technologies, that I have experienced since I joined the field of R&D on high-capacity transmission in 1988.

## 2. Coherent Detection to IM-DD

I commenced R&D activities in 1988, about ten years after the installation of the first single-mode optical fiber route running the length of Japan; it was the first gigabit-class system and featured a bit rate of 1.6 Gbit/s over a single optical fiber. R&D of the next-generation 10-Gbit/s transmission system then commenced at NTT Laboratories and I was assigned to that project. Up to that time, optical communications developments had mainly been targeting the highly reliable and economical transmission of voice calls. This was an intensity-modulated direct-detection (IM-DD) system that achieved high-capacity communications by high-speed on/off modulation of optical intensity using one wavelength (color). The capacity of 10 Gbit/s was equal to about 130,000 telephone lines or the information requirements of one Japanese rural prefecture at that time, and this capacity was expected to be sufficient to meet future demands.

The intensity of an optical signal traveling through a transmission fiber is significantly attenuated after 100 km by as much as 99 % of the original level due to optical-fiber loss. Thus, to maintain signal quality while achieving long-distance transmission, it was initially necessary to use optical regenerative repeaters, which convert light to electrical signals, every 100 km

as part of the repeater system process, (there were no practical optical amplifiers at that time, and satisfying the optical loss budget was a paramount concern). However, to achieve an IM-DD system with even higher speeds that remained practical, determining how to significantly lower the noise in the optical repeater chain became a major technical issue. Given the limits of IM-DD, interest turned to coherent detection; the phase and frequency of the optical signal are modulated and demodulated with the goal being high receiver sensitivity.

The development of the erbium-doped fiber amplifier (EDFA) in 1989, however, proved to be an epoch-making event. EDFAs can effectively amplify light in the wavelength band where optical-fiber transmission loss is minimum (in the neighborhood of 1.55  $\mu\text{m}$ ) [1]. EDFAs enable IM-DD systems with very high-sensitivity. Furthermore, they made it possible to use an external Mach Zehnder Modulator (MZM) for optical transmission for the first time, since an EDFA can simply compensate the loss of the modulator without degrading the signal to noise ratio (SNR). The introduction of practical MZMs was a very important step in making it possible to modulate not only the intensity but also the phase of the optical signal.

Nowadays, EDFAs allow up to 100 channels (wavelengths) of information to be transmitted across a single optical fiber compared with only one wavelength in prior optical communications systems. In short, EDFAs yield wavelength-division multiplexing systems that can amplify multiple waves as a group, enabling high-capacity transmission with very good efficiency.

I was very impressed that these innovative technologies have not only altered research trends but also profoundly revolutionized the organizational structures of research laboratories around the world and the approach to system development

## 3. IM-DD to Digital Coherent Detection

The available optical signal bandwidth of EDFA has been enlarged to 4 THz in the 1.55  $\mu\text{m}$  band (C-band) and the 1.58  $\mu\text{m}$  band (L-band)[2], and the typical grid spacing of the optical carrier is now 50GHz. Therefore, the spectral efficiency (SE) is limited to 0.2 bit/s/Hz for either the C or L band based on a 10 Gbit/s binary signal.

In 2000, the next generation system was expected to offer 40Gbit/s channels and much higher SE based on 50GH-grid WDM systems [3]. However, several big challenges remained before we could establish practical

long-haul terrestrial systems; data rate of 40Gbit/s over more than 500km. The SNR had to be enhanced by 6dB, proportional to the bit rate increase, and the transmission impairments by chromatic dispersion (CD) and polarization mode dispersion (PMD) of installed optical fiber had to be mitigated.

The PMD-induced impairment was particularly difficult due to its time-variant nature. This is similar to the fading effect in mobile radio transmission systems. To solve this problem, a radical change from IM-DD system to Return-to-Zero (RZ) differential phase shift keying– DD system was started to be considered [4]. To establish a good balance between PMD tolerance and SNR enhancement, the RZ differential quadrature phase shift keying format with direct detection (RZ-DQPSK-DD) was introduced as a practical 40Gbps WDM system [5]

This radical change in modulation technologies represents a further significant advance. Coherent detection has recovered its position as a prime candidate due to advances in massive digital signal processing (DSP) techniques, the so-called digital coherent detection system [6]. Among several modulation formats, the polarization division-multiplexed (PDM)-QSPK format offers the highest OSNR tolerance and high spectral efficiency of over 2 bit/s/Hz. The introduction of this DSP approach to coherent detection systems enables stable carrier recovery that eliminates the undesirable optical phase locked loop delay inherent in conventional coherent detection receivers. The DSP approach also offers powerful dispersion compensation of PMD and CD, which simplifies the dispersion map design and optical amplifier configuration. Its stable high-speed carrier recovery also enables us to use conventional distributed feedback laser diodes (DFB-LDs) instead of external cavity lasers with narrow linewidth. Digital coherent detection systems suggest that 10 Tbps-class long haul terrestrial systems are possible in the near-term.

One of the most important technical barriers to the realization of these digital coherent transmission systems was eliminated with the development of real-time LSIs consisting of analog to digital converters (ADCs) and DSPs. In the case of a 100Gbit/s single-carrier digital coherent system using PDM-QPSK format, the DSP signal processing throughput must be more than 1.3 Tbps (we assume 28 GSymbol/s per lane, 4 lanes, 6 bit quantization and 2 samples per symbol). For the cost-effective realization of such a huge throughput DSP, one-chip integration of all functions described above is essential.

Several efforts are under way for the realization of real time DSP-LSIs for 100-Gbps digital coherent systems. A proof-of-concept demonstration confirmed 100Gbit/s-class real-time DSP operation in 8Tbit/s capacity field experiment [7].

#### 4. Summary

We reviewed the trends in R&D activities on optical modulation technologies for high-capacity terrestrial

optical transport networks over the last 20 years. The continuous evolution of system capacity in today's core network has been and will be supported by well-timed changes in modulation technologies to satisfy the system requirements. Great progress in this area is expected to continue, and I expect more participation by young researchers.

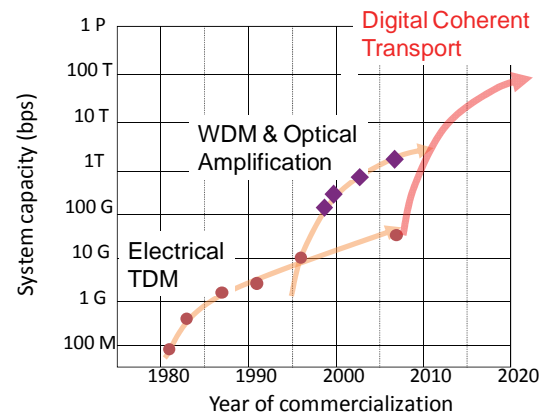


Fig. 1 System Capacity Evolution

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# Visiting Japan after a long time thanks to the IEEE ICC 2011

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## 1. Introduction

I happily accepted the editor's invitation to express my impression from my third visit to Japan. This time my visit was due to my participation to the IEEE International Communications Conference (ICC), held in Kyoto, June 5-9, 2011 [1]. Twenty years have passed since my first visit in 1991, when I was accepted as an Associate Researcher (Post-Doc) in NTT Telecom Networks Labs at Musashino-Shi, Tokyo (Headquarters). My second visit was in 1996, when I had won a travel grant to participate to the IEEE NOMS conference in Kyoto. Given that my one-year stay in Japan (1991-1992) influenced my whole life and career, I have a strong motivation to send this message to be read by friends all over the world. I mainly mean by old colleagues from NTT, who now are Professors in distinguished Japanese Universities (Konosuke Kawashima, Kenichi Mase, Shigeo Shioda, Akiya Inoue, Masaki Aida, Hisao Yamamoto and others), or hold key positions in NTT (Hiroshi Saito, Hideaki Yoshino, Hirofumi Yokoi, Hiroshi Yamada, Hisao Uose, Arata Koike to mention some). I owe many thanks to the IEICE-CS GLOBAL NEWSLETTER.

## 2. IEEE ICC 2011

As I am not authorized to provide an official report on ICC 2011, I would like to just say a few words about it. First of all, this time I managed to face successfully the jetlag (because of my long flight), by staying up all day, walking in the streets, and returning completely exhausted to my hotel at the evening. The next day I had to attend a *tutorial* on **Passive Optical Networks** [2]. Fortunately, I won a lot from it, mainly because Prof. Nirwan Ansari's presentation included open research issues. Needless to say that the ICC confirmed its high scientific standards, at least for the **Communications QoS, Reliability and Modeling Symposium** that I attended [3]. There were some *automated audio presentations* (because of the absence of the authors). This, however, was a rather bad idea, because it was completely out of the conference concept; nothing was offered to the audience, given that they could not ask questions to authors.

Despite the serious concerns about the *earthquake* and *radiation*, the number of participants was high, as usually in ICC; it is reasonable, that most of them were coming from Asia. Let me express a very personal opinion: I believe that the serious concern was mostly about traveling cost than radiation, given that radiation

measures were available through Internet, showing safe levels in Kyoto [4]. Every author knew this information through "personal" e-mail. By the way, I have travelled twice to Asia because of ICC: in Beijing 2008 and in Kyoto 2011. Surprisingly, in both cases big earthquakes had occurred *prior to the event*; was it just a coincidence or needs some metaphysical interpretation?

What was really excellent was the organization part of ICC 2011. For every problem that might arise during the event, there was an authorized person found through the Registration desk. The most important however was the venue: **Kyoto's International Conference Center (ICC!!!)** is really appropriate for such events, and is located in a green and quiet area, easily accessible by subway (new, no subway station in 1996). As usually, in front of the Registration desk there was a table with leaflets for future conferences; the related "traffic" however was very low. It seems that, in the era of Internet, advertisement through leaflets is not popular.

As far as the social part is concerned, I mainly enjoyed the **welcome party**, where traditional Japanese dishes were offered, like tempura soba and sushi, under the sound of shamisen (instrument) [5]. As I am a fan of Japanese cuisine, I didn't like so much the banquet, because it was based on international cuisine; traditional Japanese dishes are prepared to be offered immediately and not to wait to be served to too many sitting people at the banquet. I enjoyed however the **dance of Geishas** (Fig. 1, the youngers, 2<sup>nd</sup> and 4<sup>th</sup> from left-hand-side, are called Maiko) and the **karate performance** offered by the **Women National Team** (world's best for 2010!). Fig. 2 comes from the banquet.



Fig. 1 Geishas Dance



Fig. 2 Dr. K. Mase, Dr. M. Logothetis, Dr. H. Saito, Dr. H. Yoshino

### 3. Images from Kyoto and Nara

One of the many temples of Kyoto, which belongs to the world's cultural heritage, is the Kinkaku-ji (Golden Pavilion), shown in the middle of Fig. 3 [6]. Left and right to it, you can see trees with white leaves; on the left natural and marvelous, and on the right artificial and religious made of small papers with written wishes to God. I found these trees near the Heian-jingu (shrine), which also belongs to Unesco World Heritage [7].

On the other hand, in Nara, one of the dominant temples is the Buddhist Toudai-ji (Great Eastern Temple), shown in the middle of Fig. 4 [8]. Deer are everywhere in the parks. Interesting is the Japanese jinrikisha i.e. rickshaw [9]. What is remarkable is the continuous presence of high-school students in the traditional Japanese sites.



Fig. 3 Photos from Kyoto



Fig. 4 Photos from Nara

### 4. Remarks

Despite the fact that I feel I know "Japan", Japan continues to surprise me positively (fortunately!). Some new surprises are expressed below as remarks:

- *The Quality of Service offered by the Japanese restaurants is kept constant irrespectively of the demand!*

Although this first remark comes from the ICC, I think that it is not related to the specific event, but it is rather general. In the rush hour of lunch time, although long waiting queues were formed in the restaurants, the offered service was as good as if you were the unique customer. The waiter was asking the number of persons of your company in order to offer an appropriate table. If you were alone, you could get a separate table, without losing your line. Besides, when it was estimated that the restaurant runs out of dishes, the waiter informed the customers in the queue on how many customers could be still served.

- *Plural Transportation system*

Being for third time at Kyoto, I found the opportunity to visit the nearby city of Nara, first capital of Japan. For this trip I had many transportation choices: 3 trains (JR, Subway and Kintetsu Line), as well as buses. I avoided buses, because in some buses of Kyoto, I found a strange ticket system; the fares depend on your destination but are not fixed [10]. At the entrance you approximately know the cost of your

ticket, while the exact cost is known only when you reach your destination; it appears on a screen (counter) near the bus driver, like in taxi.

The wide use of bicycles by Japanese of all ages is remarkable. For a foreigner, the cost of renting a bicycle and moving around Kyoto is equivalent to that of the public transportation cost. This is due to the parking cost. Almost everywhere there are well organized parking, especially for bicycles!

- *Peaceful Pets*

Japanese are very polite and peaceful. I can understand that babies and children are also polite and peaceful. I cannot understand how dogs are so quiet! At the begging I thought that this is a feature of a specific race, but finally I realized that this is a feature of all dogs owned and trained by Japanese.

### 5. Warm Hospitality

Dr Konosuke Kawashima, now Professor at Tokyo University of Agriculture & Technology and formerly head of NTT's Traffic Design Laboratory in which I was a member, made my last evening in Kyoto very memorable, by offering to me dinner in a traditional small Japanese restaurant. It opened only for us. To enter, you have to leave your shoes at the entrance. Then you sit down (squatting if you wish) and the owners prepared among other foods (misosiru, tofu, etc [11]), delicious sashimi (raw fish in soya sauce and wasabi) and thin noodles (length of 10 cm) made from fish!!!

A Japanese lady, friend of the Professor's family, visited us at the restaurant and offered to us traditional Japanese hand-fans for decoration. Omiyage (gift-giving, souvenir) is a long and deep (sine qua non) tradition in Japan. Fig. 5 shows photos from the small restaurant. I greatly appreciate the warm hospitality of Prof. Kawashima.



Fig. 5 Together with Prof. Dr. Konosuke Kawashima

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# Experiencing Culture and Knowledge Diversity in Japan

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## Abstract

In this article, I will share my experience of being a student in Japanese university for about ten years. The story on what is happening during that time will also be elaborated. The story will be divided into three parts, namely pre-entry, during the study, and post-study at Japan. Based on experiences obtained, the opinions and comments on doing research in Japanese university will also be discussed.

## 1. Introduction

First, I would like to express my gratitude to IEICE Communications Society Global Newsletter for offering me an opportunity to share my personal experience studying at Japan for ten years. My name is Nordin Bin Ramli, currently works as staff researcher at MIMOS Berhad, the research institute under the Ministry of Science, Technology and Innovation (MOSTI), Malaysia.

I came to Japan in January 1995, two weeks before Great Hanshin earthquake. The purpose during that time was to seat for university entrance exam. Luckily, I was accepted to enter Faculty of Science and Technology, Keio University, and graduated successfully in March 1999. After that, I went back to serve a company, namely as Telekom Malaysia as an engineer. After three years in Telekom Malaysia, I have decided to pursue my master study again at Japan. I came back to Japan in April 2002 to enroll as the research assistance at Department of Electronic Engineering, The University of Electro-Communications, Japan. I was successfully obtained Master in Electronic Engineering, and Doctor of Philosophy (PhD), both at Department of Electronic Engineering, in March 2005 and March 2008, respectively.

## 2. Preparation to further study in Japan

The intention to pursue study at Japan came when I have been awarded the scholarship to study at United Kingdom. At that point, I felt that what is the different to others if I were decided to pursue my study at United Kingdom. After thinking awhile, I took a decision to choose the Japanese university as for my degree study which I believe that, by choosing Japan, it is not just about the qualification that I will obtain later, however it is about the language that I need to master in order to

be success in Japan. In addition, the experiences that I will go through during the study will be benefitted my very much. I think that I won't get it if I were decided to pursue my study at other countries.

Interestingly, the adventures began when I entered the Japanese Matriculation Center, at Kuala Lumpur, to study Japanese Language and another subjects related to Japanese university admission. The study was very tough as I am not having any background on Japanese or background on Chinese characters. However, I realized that during that time, it was very fun and enjoyed, as we, the students needed to master the language and other related subjects within two years. If we compare with Japanese students, who are their mother tongue, they had been studied Japanese from primary school. However, we needed to make it within two years of preparation. During that time, learning Japanese was the most priority task as we believed that it will be the tool for our success while in the university. The most difficult part was mastering the Japanese Kanji, as I was not educated with the Chinese background. Nevertheless, we were tried our best to master the language in short duration.

## 3. Living and Studying at Japan

In this part, the story will be divided into two parts, undergraduate study and graduate study, respectively.

### 3.1 Undergraduate Study

I entered the Japanese university at degree level in 1995. During the early period staying in Japan, it was the most challenging part of our life as the student, as we realized that the Japanese language used by most of the professors and Japanese students were not the "written Japanese" that what we had been studied for last two years of preparation at our home country. It made our life terrible in understanding the subjects lectured by professors. The way they spoke Japanese also vary in several dialects, such as *kansai-ben* and so on. Furthermore, their Kanji writing in blackboard in the lecture room was not easy to be imagined by us, as such environment was quite new to us. It was a hard time to us in understanding the subject since we were not so familiar with their dialects, and it became worst whenever they used the Kanji which was unknown to us. What I did to overcome this hurdle was seeking helps from Japanese friend. Although, they were firstly hard to accept me when approached, as I am a foreign



student, but by continuously trying, finally they accepted me.

After struggling for about six months, my Japanese became better and improved. Another approach that I took in order to improve my language proficiency was learning Japanese through watching television, especially news and knowledge based variety program. Through news hour, I got to know what is happening inside and outside Japan during those days. Moreover, I got to witness important news happening throughout inside and outside Japan. For example, I had witnessed the bankruptcy of oldest Japanese Bank, namely Hokkaido Takushoku Bank, and the story behind a Japanese new religious movement.

After few years in Japan, my Japanese proficiency improved and was able to complete my degree study successfully in March 1999. Upon completion, I decided to return home to work as network engineer at one of local telecommunication company.

### 3.2 Graduate Studies

After three years in work, I have decided to return to Japan for pursuing master degree. The reason behind that was I felt that to be more successful in the future, I need to experience the research work at Japan, as I always admired with their good way of supervision. At this time, I joined Prof. Yoshio Karasawa Laboratory at The University of Electro-Communications, Japan. At this time, I haven't felt any problem in culture or Japanese way of teaching, as I had experienced it before. I was grateful that the experiences during the first degree allowed me to adapt with research activity very fast. Luckily, I finished my master study within schedule and had been offered to continue with Ph.D program at the same laboratory. Through the great supervision and guidance from Prof. Karasawa, I was able to finish my PhD study within three years. During my six years in this laboratory, I have published many journal and conference papers.

### 4. Post Study at Japan

After graduated from PhD study, I decided to come back to my home country to serve at the previous employee. Currently, I am at MIMOS Berhad. In MIMOS, my responsibility is to conduct research project related to cognitive radio and mesh networking, WiMAX (Worldwide Interoperability for Microwave Access), and IMT-Advanced. In MIMOS, I have contributed to the concept creation of new ideas by providing innovative ideas thus, contributing to the company's intellectual property right (IPR) portfolio, which will be incorporated in the final product realization. Furthermore, I have developed few new algorithms and verify the technical concept by means of link and/or system level simulations.

At the mean time also, I am quite active in voluntary works with IEEE Malaysia Communication Society and Vehicular Technology Joint Chapter.

### 5. Remarkable research experience in Japan

Throughout my studies in Japan, I was so lucky to be supervised by two great supervisors, namely Prof. Iwao Sasase from Keio University, and Prof Yoshio Karasawa from The University of Electro-Communications. Although, they have different way of supervision, both of them are so passionate in doing high level research and believe in individual talent. These two great professors inspire me a lot as they influence me in conducting high end research and human capital development through research.



Fig. 1 Meeting with Prof. Sasase during ICC2011, Kyoto, Japan.

What I found from Prof Sasase was the way he supervised student. As shown in Fig. 1, he managed his students and at the mean time provided a training ground to those senior students with responsibility to look after their junior research. For example, for those fresh bachelor fourth year students, since they are new in research, they will be supervised by master students, and similarly for those master students, their research will be supervised by PhD students. Similarly, PhD student will be supervised minimally by professor, as they are quite independent in doing their research. He also encouraged his students to publish in the international conferences and journals. This 'triangle concept' of supervision is very critical to this laboratory, and by doing so, it was allowing him to be active at outside of university, locally and internationally, partly for laboratory branding and networking in order to make the laboratory known to the public. By successfully doing so, the chances of getting research grants and funds from the government and also from private sectors become higher. This grants and funds will be used to run the laboratory later. He also encouraged his students to 'squeeze their mind' for breakthrough research and came out with novel ideas in research [1]. He always said to us, "you have to work hard to come out the new novel idea, and the laboratory will reward those students to present their research output at any good conference at any place within the globe". This way of thought will motivate students to work harder to produce more significant



research output. The eco-system that had been used by this great professor worked nicely under his leadership, and I believe this is quite similar to another organization in Japan.

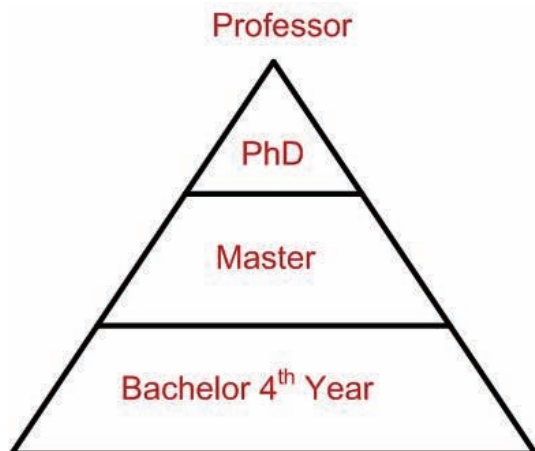


Fig. 2 Common hierarchical approach of most Japanese university research laboratory.

Next, I was also fortunate of pursuing my graduate studies under the supervision of Prof. Yoshio Karasawa of The University of Electro-Communications, Japan. Coming from industry background, he brought the different way of supervision. As he believed in each individual talent, he encouraged us to define our own research theme for our study. In order to be successful in doing research, he also believed that it is important to respect what the student want to research. He will try to magnify and sharpen the scope of research to be more valuable and novel. Furthermore, he always encourage us to challenge new things and continuously doing it, as he believed in the word of “Serendipity = Serendip + Ability” [2]. Serendipity is happening whenever someone finds something that they weren't expecting to find, especially for breakthrough research. Thus, he encouraged us to continuously focus on the daily research and appreciate any findings. Some findings might not bring any value at that time, but at other time, those findings will answer many problems which that student asked earlier.



Fig. 3 Meeting with Prof. Karasawa before leaving Japan for good in March 2008.



Fig. 4 Graduation day with family, in March 2008.

I felt very lucky as I have spent six years under his supervision, and generally, I am very pleased with his supervision. As being the foreign student, he was like our father, who had been taking care very much on our personal matters and welfare. His concerns were just not limited to research, however covers other matters including student’s financial and family matters.

In this article, I would like to express my appreciation to these two great supervisors. I was so lucky to be their students and they had admired me very much as they influenced my life. Without both of them, I would have been lost. Thank you for guiding me, inspiring me and making what I am today.

## 6. Conclusion

In this article, the experiences staying in Japan for ten years have been highlighted. The experiences had been divided into three parts, namely pre-entry, during the study, and post-study at Japan. The story on research supervision by two great professors also has been included. Based on the experiences obtained, the opinions and comments on doing research in Japanese university also discussed.

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# Living in Japan - Priceless Experience and Great Research Opportunity

Jinho Kim

Research Laboratories, NTT DOCOMO, INC.



## 1. Introduction

First of all, I would like to thank the IEICE-CS (Institute of Electronic, Information and Communication Engineers - Communication Society) for giving me a good opportunity to share my ideas and experiences for living in Japan as a foreign researcher. From this article, I'd like to share my priceless experience in Japan and briefly introduce great research opportunity in NTT DOCOMO, which is Japan's premier mobile communications company and a major provider of services based on advanced mobile technologies. I also would like to give some tips about how to research that is based on my personal experience in the company.

I received the Ph.D. degree in computer engineering from Kyung Hee University, Korea, in August 2010. I have been working at the company as a postdoctoral research fellow in Wireless Networking Research Group, Research Laboratories, since November 2010.

## 2. Priceless Experience

In the past couple of years, I personally had many chances to visit Japan for attending conferences, technical meetings, workshops, and travels as well. So, I could interact with Japan more naturally, such as Japanese people, cultures, foods, technologies, language, and so forth. These great experiences could be highly motivated me to start working in Japan.

Living in a foreign country for the first time made me keep the feeling of expectation. Furthermore, I was really excited to have greater opportunities by working abroad, such as meeting more people, gaining more experience, learning a new language, and so on. But on the other hand, I also had to think more deeply about how I can adapt well to the strange, unfamiliar, and new surroundings as quickly as possible at the initial period for starting life in Japan. This is because there are obviously significant differences between the temporary visit and staying away from my home country for a long time. Therefore, all necessary in detail should be well prepared before moving to Japan.

In my opinion, however, it is better to focus on arriving at Japan since there are so many things to do. For example, it is necessary to apply for a foreign resident registration, create a bank account, requesting essential services such as gas, water, and electricity, purchase daily necessities, appliances, or furniture, adapting to new surrounding environments such as building, hospital, shopping, or transportation,

arranging the stuff, and setting up the office environments as well. All these things should be given the higher priority for a quick settlement than research works in the office at the initial period.

As for me, my colleagues helped both office work and daily life environments with kindness supports to complete my settlement so that everything had been a very smooth transition without any difficulty. Due to the language barrier, it was obvious that it took quite a long time to complete all the above things if I had to do them all myself. I appreciate all my colleagues who were taking precious time out from their busy schedules for helping me. In addition, the company provided a modern company housing with advanced structures. Especially, on arriving at Japan, I was impressed that the company offered the hotel to stay for a while until the certain settlement and arrangement of my stuffs. With all these great supports, I could start and concentrate my research work as soon as possible with the minimum of additional overheads at the beginning.



Fig. 1 Many events with colleagues

During working time at the Research Laboratories as a foreign researcher, my colleagues came to me first with open-mind, had a lunch together almost every day, understood my differences, and gave me good advices in detail. After the work, they also took good care of me. For example, my group members threw a welcome party and birthday party for me. Also, I could enjoy participating in many events such as the end-of-the-year party, and special bowling rally, as shown in Fig. 1. Lucky for me, everyone that I met is very nice, warm, and friendly people.



An unforgettable experience in Japan was the massive earthquake and tsunami that struck the eastern coast of Japan on March 2011. At that time, I was working, as usual, at the office. The earthquake shook the building, and the electricity supply was cut off at the same time. Fortunately, the earthquake didn't do much damage both my company housing and the office buildings since these are so constructed as to withstand a violent oscillation in an earthquake. Nevertheless, all members of the Research Laboratories including me were much surprised, and they even said that we had never felt before this kind of terrible earthquake and tsunami. Nuclear power plant problems caused shortages of electricity so that a planned outage was enforced to prevent a grand-scale blackout. I roughed it for several weeks with a bit of problems with electricity, water, gas, and transportation. Furthermore, significant aftershocks sometimes were felt and are still continuing to hit.

These unexpected and sudden changes made me confused, and my nerves were on edge since I had to pay careful attention to everything. This caused that I couldn't sleep well at night and was broken the rhythm of my life. I finally couldn't work hard, and it was difficult to concentrate my research for a few weeks. Unlike me, however, Japanese people were responding to the disaster in a calm manner. I was much impressed with their mind, and they inspired me that I can decide to turn over a new leaf and work harder. Additionally, I have once again reminded that we should not forget to appreciate the value and sublimity of nature. I also have realized the importance of electricity so that I have taken to make energy conservation a part of my daily routine.

### 3. Great Research Opportunity

NTT DOCOMO R&D Center, as shown in Fig. 2, is located in the grounds of the YRP (Yokosuka Research Park), where many of the wireless and mobile communications related companies have set up their research and development centers and joint testing facilities. The R&D Center has been active in the research and development for the creation of evolutionary mobile communications. The Research Laboratories, one of the divisions of the R&D Center, research relating to the hardware, software, and formats involved in network systems, wireless systems and mobile multimedia.

In the R&D Center buildings, seismic isolation structure is adopted in order to minimize damages from major earthquakes. Seismic isolation devices, consisted with a rubber/iron-laminated body, support the entire building. In the event of large earthquakes, the building absorbs the strike by sliding across the devices. With this structure, there was no damage of buildings from the huge earthquake on March 2011.

The outside view from the indoor office through the window is pleasing to my eye with the open spaces and green trees. I can also get a splendid bird's-eye view of the Bay of Tokyo from the desk. While it has a

peaceful atmosphere, I can see Chiba-ken across the sea. It helps refreshing my brain and pleasing the eye when a problem is not solved.



Fig. 2 NTT DOCOMO R&D Center in YRP

I am actually a first postdoctoral research fellow in the Research Group. My current position is a senior research engineer that work style is a sort of manager. However, this is not an actual managerial position. That is, I don't have a subordinate. Therefore, I can focus on my research work without considering daily overtime managements. My main research works include creation of IPR (Intellectual Property Rights), publication of journal papers or technical reports, conference presentations, and contribution to standardization.

A brief introduction to my current primary research topic is as follows. The mobile data traffic has been extremely increasing in recent years due to the rapid penetration of Internet-enabled mobile devices (e.g., smart phone, tablet PC, laptop, netbook, etc). Mobile communication operators, including NTT DOCOMO, are now faced with significant challenges to solve the mobile data explosion problem. On the other hand, a variety of wireless network systems (e.g., W-CDMA, LTE, WiFi, WiMAX, etc) is continuously evolving, and the radio access coverage is deployed with overlapping each other. Also, most of mobile devices are currently equipped with multiple radio interfaces that typically 3G and WiFi. The mobile data traffic can be offloaded from the cellular network to the complementary networks by the simultaneously use of different wireless access technologies. The traffic offloading is one of the key solutions for the mobile data explosion problem in the heterogeneous network environments. I mainly focus on how to perfectly support the selected IP flow mobility of the future core network in the heterogeneous network environments for providing seamless mobile data traffic offloading and enhancement of mobile user experience.

In order to achieve my research work, I have opportunities of face-to-face meeting for exchange of technical opinions or asking for advices and comments with various experts in their fields, such as group

leader, senior researchers, engineers, standard specialists in 3GPP or IEEE 802, etc. Furthermore, the wide variety academic activities are encouraged to obtain the feedback on my research results by presentation in international conferences, and to identify or access the new research topic by participation to technical or tutorial sessions. Finally, standardization activities are also promoted to International Standard Organizations such as IETF (Internet Engineering Task Force), 3GPP (3rd Generation Partnership Project), IEEE (Institute of Electrical and Electronics Engineers) 802, etc.

In particular, I'm interested in contributions to the IETF standard, and I have actively started to participate the IETF meeting that is an open international standard plenary, which has the biggest influence on Internet-related protocols. More than 1,500 network researchers, experts, designers, operators, and vendors participate the IETF meeting to discuss the evolution of the Internet architecture, including mobility management core technologies. The IETF mobility management solutions are taken into consideration by the 3GPP all-IP core network for mobile data offloading and enhancement of user experiences. Also, the integration of non-3GPP accesses within the 3GPP core network is performed at the IP level and is based on the IETF IP mobility protocols.

By participating in the IETF meeting, it is possible to identify the current with trends in the IP mobility management-related core technologies, such as network-based IP mobility, seamless movement of selected flow mobility, the use of multiple radio interfaces of mobile devices, and simultaneously access of different wireless technologies in the heterogeneous network environments. In addition, I can make more personal connections by face-to-face discussions with relevant experts.

#### **4. Research Tips based on My Experience**

I would like to give you my personal opinions about "How to identify the research topic in NTT DOCOMO as a postdoctoral research fellow", based on my experience. If the settlement is more or less over at the initial period, the identification of research topic should be started promptly. Through much of the discussion with group members, it is necessary to try to fully understand research goals in the group at present. You will have to decide for yourself which can be a mutually interested research topic with considering in the same context as the research goal. I would like to recommend you had better to identify your research item that can be accomplished as much as possible in a short time. This is because you haven't much time as a postdoctoral research fellow. Therefore, I don't recommend you to start your research item with little or no knowledge. At the beginning of time, much focus will be also required to create a systematic research plan with the right direction in order not to waste time.

When the research plan is identified, you need to set realistic final goals. After that, you also need to clearly

define problem statements and current issues in detail on your research topic, and aim to achieve them one step at a time. When you do your research, you should have the answers about the following questions; why the research is needed, where the research could be applied practically, and how the research could be beneficial to the company. Most importantly, you don't need to try to have an obsession with perfection. I would definitely recommend that you try to get good feedback or comments from others, and revise your faults as process your research.

#### **5. Closing Remark**

Living in Japan and working in Research Laboratories, NTT DOCOMO as a foreign researcher have been giving me both the priceless experience and the great research opportunity. With the world-class research environments in the Research Laboratories, I will try to successfully complete my work through the variety research activities, including creation of new proposals, making IPRs and contribution to standards as much as possible. I hope this article helps people who are planning to work as a postdoctoral research fellow in the Research Laboratories.

Finally, I am sure that Japanese people will overcome the misfortune and recover soon from the ruins of the earthquake. Offering my heartfelt sympathy again, I pray that no more disaster will occur in Japan.

#### **Acknowledgement**

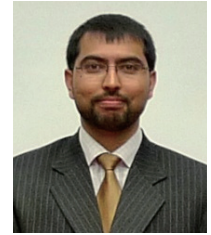
Through this article, I would express warmest thanks to all of my colleagues for their numerous helps in every academic and administrative aspect.



# My Research and Life Experience in Japan

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## 1. Introduction

I was thinking from last few months to write about my research and overall life experience in Japan. Luckily, I found this platform of IEICE Communications society's global newsletter, where I can write to express my observations. I would like to introduce myself briefly here. I came to Japan in September 2009 and joined Sato Lab as a doctoral student at Graduate School of Global Information and Telecommunication Studies, Waseda University, under the MEXT future leader program scholarship. Before coming to Japan, I had spent two years (2007 to 2009) in South Korea, where I received my MS. in Electronics and Computer Engineering from Hanyang University, Seoul. I received my BS. degree in Computer Systems Engineering from NWFP University of Engineering & Technology, Peshawar, Pakistan, in 2006.

## 2. Why I chose Japan for My Doctoral Degree

During my M.S. studies in Hanyang University, I had an opportunity to attend research seminar/symposiums arranged by my supervisor, Prof. Yong Jin Park, where mostly invited guests were Japanese professors. Prof. Park had completed his education from High School to PhD degree, all from Waseda University before moving back to Korea. Over the years, Prof. Park developed strong professional and research linkages with various distinguished professors of Japan. Currently, he is among very few overseas fellows of IEICE. Therefore, during such seminars, it was a good chance for me to discuss contemporary research issues with distinguished Japanese professors in my area of research. In addition, the strong research exchange programs between Hanyang and Waseda Universities enabled me to proceed for doctorate degree in Japan from Waseda University.

## 3. Education and Research Life in Japan

I chose Prof. Takuro Sato Laboratory (Sato Lab) Waseda University, as a research lab to continue my doctoral research. I met with Prof. Sato and some of his PhD students back in Seoul in a research exchange program. I was very well acquainted about the research activities, which were going on in Sato Lab. After joining Sato Lab, I continued my research in the area of wireless sensor networks, which was the same area of research in my MS. degree.

## 4. General Impression about Japanese Way of Life

After spending almost two years in Japan, I had a good chance to observe Japanese culture and society

very closely. In general, I found Japanese people very polite, respective and highly reserved. In my perception, Japanese don't show affection in public places. It is very rare to see emotional show off in public spots. However, Tokyo night life is an exception to that. Tokyo nightlife is altogether different from usual life in Japan, where it has a very different code of conduct with totally opposite to the reserved nature of Japanese society. The entertainment offered by Japanese popular culture, such as Karaoke, Pachinko parlors, Comics, and Maid cafes are other form of enjoyments, which once can find all around Tokyo.

Japanese usually give respect to everyone and their treatment with foreigner is usually very good, however, it is interesting combination of respect, admiration, and to some extent suspicion also. You will find that most locals are very willing to help if one asks for help. However, sometimes it is very difficult to get help if you don't know Japanese language. The language barrier and the nervousness from dealing with a foreigner cause the locals to laugh nervously with embarrassment, but they somehow manage it out and will help you to lead you toward the right direction.

## 5. Cultural and Seasonal Events in Japan

There are various activities that are associated with the Japanese society, starting with the cherry blossom viewing (Hanami) in spring, fireworks (Hanabi) in early summer, hiking in the mountains like Mount Fuji



Fig. 1 Hiking with friends around Mt. Bandai in Fukushima Prefecture in autumn 2010

in late summer, and the skiing in the winter season. Contrary to other countries, events like mountain hiking, skiing, and similar adventure sports are done mainly by fresh blood, however, in Japan these events are part of their culture, which are attended by people from all walk of life. For example, if you go to a ski

resort in Nagano Prefecture, you will find people of all ages, skiing all around the field. Same craziness can be seen in the people snaking their way up to Mount Fuji. Over there, you will often find young ladies in high heels, young men in business suits, and senior citizen with traditional dress. In short, you will find people from all walks of life, participating in these activities.



Fig. 2 Skiing with TIEC friends in Nagano Prefecture

## 6. Residence in Tokyo

Being one of the most expensive cities in the world, it is always difficult to find a reasonable student residence in Tokyo. I got the prestige to get accommodation in one of the best residence for graduate students in Japan, i.e. Tokyo International Exchange Center (TIEC), in Odaiba, Tokyo. TIEC, which is run by the Japan Student Services Organization (JASSO), provides quality residences and opportunities for intellectual exchange for exceptional graduate students and researchers from Japan and abroad. TIEC a culture exchange center, promote various international and cultural activities among researchers and graduate students from all around the world. It strives to play a part in the creation of a global network of intellectuals, researchers, and scientists, to give birth to new ideas and innovation in technology



Fig. 3 Get together after BBQ-party in TIEC

that exceeds for generations. In TIEC, I got this opportunity to come across and make friendship with people from all around the world. There is no doubt the time that I spent in TIEC is best in my life.

## 7. Japan Strong Industry and Academic Linkages

Being world 3<sup>rd</sup> biggest economic power behind America, and China, I found that Japan has strongest industry/academia linkages. Japanese companies, mostly multinational, not only give funded projects to different universities research labs, but also offer jobs to student much earlier than completion of their degrees. Usually the recruitment process starts at least one year before joining a particular company, which is a bit lengthy compared to other parts of the world. However, it is almost sure that almost every Japanese University graduate get vacancy in some company after his/her graduation. There is a great advantage for a foreigner to developed Japanese language skills if he/she wants to enter in a Japanese company.

## 8. My Association with IEICE

I came to know about IEICE during my stay in South Korea. Most of PhD students in our Lab in Hanyang University, had preferences to publish their research works in IEICE Transactions. Over there, it was indeed considered to be a prestige to publish a paper in IEICE. In addition, I also attended various workshops/seminars that were sponsored by IEICE Seoul section. I became a student member of IEICE after starting my PhD in Waseda University. Until now, I issued two paper in IEICE transactions on communications. I am planning to attend upcoming IEICE society conference to be held in Sapporo, in September this year.

## 9. Future Plans

After completion of my PhD degree, I am planning to return back to my home country to join academic society. Irrespective of current critical situations in my country, I have already decided to return back and serve my motherland to the best of my abilities. In near future, I am thinking about establishing IEICE Islamabad section in Pakistan. I would like to be a focal person and overseas member of IEICE to establish a strong research linkage between the already established academic and industrial societies of Japan and the rapidly increasing academic society of Pakistan. In this way, we can get mutual benefits, taking advantages from the technology of Japan and emerging brain power of Pakistani engineering youth.

## 10. Conclusions

During my two years stay in Japan, I not only conducted very useful research and completed all my PhD research requirements in a record time, but at the same time explored various part of Japan. Besides, it is the high-tech and world most advanced country, it is still a place where people follow their old tradition and celebrate all their seasonal and culture events with full commitment. It is a country worth visiting, where one can observe the state of the art technology in cities like Tokyo and Osaka, the speed of Shinkansen, the beauty of Mount Fuji, the cold winter of Hokkaido, misery the sight of destructions of World War II atomic bombing in Hiroshima and Nagasaki, and the occasional shaking through earthquakes. This is Japan, some people may say wired but I must say very unique.

# Technical Committee on Software Radio 6<sup>th</sup>-year

Seishi Hanaoka, Suguru Kameda, Kanshiro Kashiki, Osamu Takyu  
Technical Committee on Software Radio

## 1. Introduction

Technical Committee on Software Radio (TCSR) has promoted research on software radio, cognitive radio, and their related technologies since 1999. It was 6th year of TCSR since it was restructured to a permanent committee of IEICE in 2005. The steering committee members of TCSR in 2010 are shown below:

- Chair:** Kazuhiro Uehara (NTT)  
**Vice Chair:** Yukitoshi Sanada (Keio Univ.),  
 Kei Sakaguchi (Tokyo Inst. of Tech.)  
**Secretary:** Takeo Fujii (Univ. of Electro-Commun.)  
 Seishi Hanaoka (Hitachi)  
**Assistant:** Suguru Kameda (Tohoku Univ.)  
 Osamu Takyu (Shinshu Univ.)  
 Kentaro Ishizu (NICT)

TCSR organized five technical conferences, and a special section on the Transactions in fiscal year of 2010. This article summarizes the latest activities of TCSR.

## 2. The 1st technical conference in May 2010 (Cognitive/Software radio and Joint Wireless Innovation Forum and IEICE TCSR-workshop)

- ✓ Date : May 20-21, 2010
- ✓ Place : Keio University.
- ✓ The number of presentations: 18 (1 invited presentations, 2 presentations as International Workshop)
- ✓ The number of participants: 66

### General Session

On the first day, there were 7 presentations, such as fractional sampling technologies. In the session, PHYBIT presented 3 presentations, such as their prototype basestation, radio equipment and protocol stacks based on software defined radio.

On the second day, there were 8 presentations, such as technologies to construct radio environment database and studies of radio equipment architecture.

### Invited Talk

In the conference, we have a invited talks from Prof. Haruyama, celebration of his reception of IEICE fellow.

Prof. Haruyama presented a history to promote software defined radio and details of SOPRANO, that is the SDR prototype at that time. Moreover, he

presented research activities on light (visible rays) communication.

### International Workshop

L. Pucker and H.Fujii, which are very active in the research field of the cognitive radio and software defined radio, were invited to talk on the following topics.

- L. Pucker (The Wireless Innovation Forum (SDR Forum Version 2.0) "The Future of Wireless Communications: Software Defined Radio, Cognitive Radio and Beyond".
- H. Fujii (NTT Docomo, Inc.) "Studies on Spectrum Sharing between IMT-Advanced and Fixed Satellite service - Overview of a Technical Examination Service -".

## 3. The 2nd technical conference in July 2010 (Technical Exhibition)

- ✓ Date : July 29- 30, 2010
- ✓ Technical and Products Exhibitions
- ✓ Venue : ATR (Advanced Telecommunications Research Institute International)
- ✓ Number of papers : 24 (Invited Talk: 1, Panel Discussion: 4, Technical Exhibition : 7)
- ✓ Number of Technical Exhibitions : 7
- ✓ Number of Products Exhibitions : 5
- ✓ Number of participants : 134

### Invited Talk and Panel Discussion

In the conference, we have two invite talks on the following topics about SR:

• M. Taromaru (Fukuoka Univ.), "On Transceiver Architecture and Tunable Filter Technologies towards Software Defied Radio -- Trends, Problems, and Prospect --" (on the first day)

• S. Kubota (Shibaura Inst. of Tech.), "Software Defined Radio and Cognitive Radio Technologies for Wireless Access Systems" (on the second day)

We also held the panel discussion of GNU radio on the first day. The chair of panel was H. Murata (Kyoto Univ.). Three panelists, S. Ishihara (Shizuoka Univ.), M.-S. Kim (Tokyo Inst. of Tech.), and M. Yamamoto (Kyoto Univ.), presented their research activities and discussed the issues of GNU radio.

### Technical Exhibition and Products Exhibition

The TCSR has held the technical exhibition and products exhibition every year in July. In this year, the



following seven exhibitions were held on the second day:

- Field Experimental Equipment for Cooperative Spectrum Sensing (Kyoto Univ.)
- Design and Implementation of Emergency Radio Information System (Tokyo Inst. of Tech.)
- Physical Layer for Open Mesh Network (WiViCom)
- Testbed Development of Heterogeneous Radio System and its Evaluation (KDDI Labs.)
- Proposal of Flexible Wireless System to Receive Multiband Multi Signals Simultaneously (NTT)
- Si CMOS RF Frontend for Dependable Wireless System (Tohoku Univ.)
- Development of Multi-mode SDR Terminal with Energy Efficient Radio Access Network Selection Algorithm (KDDI Labs.)

In the products exhibition, the five groups exhibited there products. The exhibition halls swarmed with large researchers.



Fig. 1 Technical exhibition and products exhibition in the 2nd technical conference in July 2010.

### 3. The 3rd technical conference in October 2010 (Workshop on Wireless Distributed Networks cosponsored with AN, RCS and USN)

- ✓ Date : Oct. 27-29, 2010
- ✓ Topics : Wireless Distributed Networks (WDN), Invited presentation
- ✓ Venue : Osaka University
- ✓ Number of papers : 29 (Invited papers: 6, Special session: 7, Regular papers: 16 )
- ✓ Number of participants : 300

#### General Session

There were eight presentations in the general session on the first day. Their technical fields are as follows.

- RF devices
- TV White-space Wireless Communication System
- Cognitive Wireless Router
- Distributed Control and Data Channel Coordination Algorithms for V2V DSA

- Experimental Measurement of Transmission Quality and Analysis of Quality Improvement
  - IEEE 1900.4 signaling method on IMS system
- On the third day, there were eight presentations in the general session. Technical fields are as follows.
- Spectrum Sensing
  - Channel Selection
  - Spectrum Management
  - PHY/MAC Cross-layer Multi-system Simulator of DSA system in ISM band
  - Achievable Capacity of Cognitive Radio Systems

#### Invited Talks and Joint Session

We had one special invited presentation and five invited presentations. Prof. Komaki of Osaka University addressed the invited special talk entitled “Software definable radio networks and Radio agents”. In his talk, it was impressive that the RR (Radio Renaissance) is more important than the RR (Radio Regulation).

Technical field of invited presentations are as follows:

- Dr. Harada (NICT, Smart Utility Network)
- Dr. Matsui (Hitachi, Ad Hoc Networks)
- Prof. Hayashi (University of Tokyo, Science and Technology in Japan)
- Prof. Yomo (Kansai Univ., Physical-Layer Network Coding)
- Dr. Nakamura (Kyocera, LTE/LTE-Advanced Heterogeneous Network)

In the Joint session concerning the Wireless Distributed Networks (WDN), seven papers are presented. Their technical fields are as follows.

- Secure Wireless Communication
- Road to Vehicle and Inter-Vehicle Communications for Avoiding Interference
- Reliable Routing Schemes for 950MHz Band
- Cognitive Virtualization Platform for Wired and Wireless Networks
- Bi-directional Relaying Transmission using Network Coding for Multi-hop Wireless Networks
- Rate Allocation in Distributed Antenna System
- Low Power Communication to observe Nature



Fig. 2 Attendee in Wireless Distributed Networks session



#### 4. The 4th technical conference in January 2011

- ✓ Date: Jan. 27- 28, 2011
- ✓ Venue: Kyushu Institute of Technology
- ✓ Number of papers: 19 (Special Talk:1, Invited Talk: 1, Panel Discussions: 4, Regular Presentations: 13)
- ✓ Number of participants: 98
- ✓ Focused topics: Cognitive Networks Cognitive Radio Network, Cross Layer

##### General Sessions

A number of research outcomes were presented, mainly on cognitive radio and cognitive networks. Even if solo committee is in this time, about 100 persons came to it, so we can see the topics of this committee are very interesting for a lot of researchers.

##### Special Talk: Standard Movement of IEEE 802.19

Dr. Tuncer Baykas of NICT in Japan talked about the standard movement of IEEE 802.19, where IEEE 802.19 is one of standards for TV white space. His talks pay attention to the technique for physical layer and MAC layer. In addition, he introduces P802.19.1, which is the project of IEEE 802.19. The developed network manager system is one of the most interesting topics in talk. The purpose of it is co-existing between TV channel user and secondary communication user. In the developed manager, entire network tries to support individual mobile communication.

##### Panel Discussion: Capability of Cross Layer Technology for Cognitive Radio

Panelists: Prof. Ryoichi Shinkuma (Kyoto Univ.), Dr. Kazuto Yano (ATR), Prof. Kazuya Tsukamoto (Kyushu Institute of technology), and Dr. Masayuki Ariyoshi (NEC)

First, each panelist had presentation for introducing their latest hot topic. Prof. Shinkuma talked about the inter-control between application layer and lower layer. He translates Cognitive as "Recognition" and then how the adaptive controller of lower layer works for satisfying the requirement of application layer. Dr. Yano talked about MAC layer's technology for the required traffic. He showed the field experiment of co-existing systems between Bluetooth and Wireless LAN in ISM-band. Prof. Tsukamoto talked about the cognitive radio oriented to network layer. He shows the construction of vehicle to vehicle routing cooperated with lower layer. Finally, Dr. Ariyoshi talked about the activity of QoS, which is the project of FP 7 in Europe. He emphasizes on the necessity of cognitive radio from ensuring QoS.

In panel discussion, Prof. Takeo Fujii became the facilitator of panel discussion and then discussion was started. There were a lot of opinions from not only

panelists but also audiences. Panel discussion was so heat up that the scheduled time was over.

##### Invited Talk: International Standard Activity for Gigabit multiuser MIMO in wireless LAN

Prof. H. Ochi of Kyushu Institute of Technology was invited for talking about the latest progress of researches about Multi-user MIMO technology. Prof. Ochi is one of the pioneers for the activity of IEEE 802.11ac Standard. He showed the interested episode for the activity of IEEE 802.11ac standard and suggested that the necessity for the activity of world standard is "Guts".



Fig. 3 Panel Discussion

#### 5. The 5th technical conference in March 2010 (Workshop on Mobile Communications cosponsored with TCs on MoMuC, RCS)

- ✓ Date : March 2-4, 2011 (The conference of SR were held from 2 to 3 March.)
- ✓ Topics : Workshop on Mobile Communications
- ✓ Venue : Yokosuka Research Park
- ✓ Number of papers : 20 (Organized Sessions of SR:5, Organized Session of three committee collaborations: 7, Regular Presentation:8)
- ✓ Number of participants : 238

##### General Session

Every year, in the collaboration among MoMuC, RCS, and SR, Mobile Communication Workshop is held in Yokosuka Research Park (YRP) of Yokosuka Kanagawa. On second day, the organized session of 3 committee collaborations was held and the theme of it is heterogeneous network. Since a lot of participants attended this session, we can see that heterogeneous network is surely attracting much attention.

##### Organized Session of SR

The concept of SR's organized session is the reviewing of research activity in SR by inviting the persons who have aggressively shown many interested results in SR conference for one year. There are 5

invited talks in this session.

First invited presenter is Prof. Hidekazu Murata from Kyoto Univ.. He talked about the implementation of cognitive radio based on USRP. He showed not only the latest interested results but also the feeling of reality and difficulty to deal with USRP. The latter information is significantly useful for the researcher who tries to start the treatment of USRP. Second invited presenter is Dr. Doohwan Lee from NTT. He talked about the fundamental principle of compressing sensing and application. Even if the theory of compressing sensing should be complicated, he gave us the understandable explanation of it by showing some examples. Third invited presenter is Dr. Hiroki Harada from NTT DoCoMo. His topic of talking is the fundamental theory of cyclo-stationary detection and application example. He showed the interesting application of cyclo-stationary detection for heterogeneous network. Forth invited presenter is Prof. Osamu Takyu from TUS. He talked about the MAC layer technique for cognitive radio. He shows the possibility of high frequency spectrum usage efficiency by the data base of spectrum usage and suitable MAC controller. Finally, fifth invited presenter is Prof. Mikio Hasegawa from TUS. He talked about the wireless network system of complex system theory, such as neural network. He suggests that in complex system theory, the distribution of system is maintained but the equivalent high efficiency of performance to centralized system can be achieved.

### **Organized Session of three committee collaboration: Heterogeneous Network ~Technical Component to Service Application**

The three collaborated committees introduce the organized session whose topic is heterogeneous network (HetNet). HetNet is one of the most attracted topics so not only research and development but also international standard of it are popular. In this session, we invited 7 presenters and Prof. Takeo Ohgane, who is the chair of RCS, as the organizer of panel discussion. Since the session room is filled to capacity, a lot of people are surely interested in HetNet.

Firstly, Prof. Ohgane explained the purpose of this session in detail. After that, each invited presenter had the presentation for showing the latest result of HetNet. Dr. Toshinori Suzuki from KDDI talked about the merging among multiple wireless systems, Dr. Kazuhiro Uehara from NTT about the introduction of Flexible wireless communication, Dr. Akira Yamada from NTT DoCoMo about the activity of wireless LAN standard for the cooperation among multi-kinds of wireless systems. Dr. Yoshikazu Kakura about the activity of the international standard for HetNet in 3GPP, Prof. Kei Sakaguchi about the modeling of HetNet and the optimization of wireless resource usage efficiency, Dr. Masugi Inoue, about NerveNet, Dr. Hosei Matsuoka about accumulated broadcasting system for multimedia broadcasting and compensating

technique of broadcasting.

After presentation, when Prof. Ohgane becomes facilitator and all the presenters become panelists, the panel discussion was started. There are a lot of comments from not only panelists but also audiences. So, it is quite aggressive discussion.

There are interested comments as follows. The one of the most important role for HetNet is offloading from cellular system. Panelists give us the opinions about quality guarantee, selection rule for connected system, hardware realization. While the standard of each wireless system are being constructed, the structure for global optimization should be taken into account.

In the comments from the audiences, since HetNet has significant impact to cellular system and internet, the outstanding proposal of HetNet from Japan is necessary. For it, the frequency spectrum allocation for wireless LAN should be reconsidered. In addition, we have to suggest the legal task such as fairness of using resources to administrator of country. In addition, it should be necessary to consider the collaboration to wired network system.



Fig. 4 Panel Discussion of three collaborated committees

## **6. Conclusion**

Technical committee on software radio (TCSR) held five conferences in 2010. TCSR makes a strong effort to international collaboration with the research organization of software defined radio and cognitive radio fields all over the world. In this year, we had one joint workshop with international organizations, WIF. We have one Technical Exhibition event in July. In addition, we had joint technical conferences in October and March. In FY 2011 we will plan five conferences as follows:

- Apr. 2011: Shinji-ko Spring
- July 2011: YRP (Technical exhibition).
- Oct. 2011: Osaka Univ. (Joint Workshop)
- Jan. 2011: Kyushu
- March 2011: YRP (Joint Workshop)

TCSR welcomes contributions from newcomers. We are looking forward to meeting you at conferences.

# Annual Report of Technical Committee on Network Systems

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## 1. Introduction

This report covers the annual activities of the IEICE Technical Committee on Network Systems (NS). It describes activities at the monthly technical meetings, recent research topics of the committee, and the research awards for 2010.

## 2. Technical meetings

The schedule from April 2011 to March 2012 will consist of ten technical meetings and one workshop (Table 1). Several of these meetings will be held in collaboration with other group committees, e.g. Optical Communication Systems (OCS), Photonic Network (PN), Radio Communication Systems (RCS), Communication Systems (CS) and Information Networks (IN), Information Communication Management (ICM), Communication Quality (CQ), Network Virtualization (NV), and Network Software (NWS).

Recently, presented papers have mainly focused on technologies that support traffic control/measurement, wireless and mobile networks, P2P, content delivery networks, and ad-hoc network issues. At each technical meeting, we host lectures by invited speakers who are experts in their fields. In this fiscal year, we have held

invited lectures on QoS and QoE for user-centric services, cloud networks, technology trends in submarine optical cable, wide area ubiquitous networks, overlay network service platforms, packet transport techniques, ergodic Markov chains and networks, grid computing, and wired/wireless network virtualization. The number of papers presented at our meetings in recent years is shown in Fig. 1. In general, this number is increasing, and that from the telecommunications industry is also increasing.

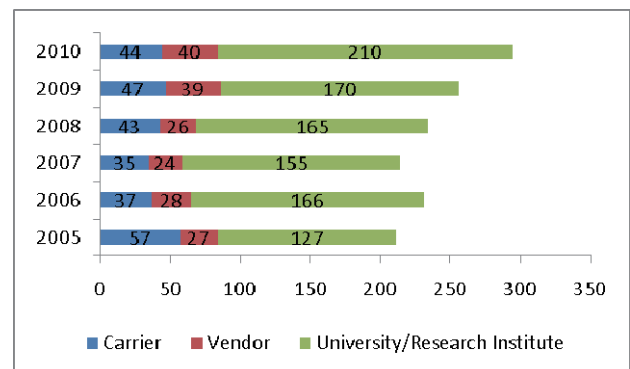


Fig. 1 Number of presented papers.

Since June 2003, we have fostered the work of young researchers who have presented papers at technical

Table 1. Technical meeting schedule for fiscal 2011

Date	Location	Theme	Co-location with
April 21-22	Fukui University (Fukui)	Traffic Modeling, Network Evaluation, Performance, resource control, Traffic Engineering, Network reliability, resiliency	
May 19-20	Sophia University (Tokyo)	Advanced Protocol and Network Control (Application level routing, QoS and Path Control, P2P, P4P, SIP), Network System Architecture (Interface, Hardware, Software)	
June 23-24	Wakayama University (Wakayama)	Core metro system, Photonic Network System, Optical network management and control and monitoring, Optical network design, traffic engineering, signaling, OTN, high-speed interface, Optical control (Switching and routing), OXC, OADM, WDM, optical signal process, optical switch element	OCS, PN
July 21-22	Asahikawa citizen cultural hall (Hokkaido)	Fixed/Wireless seamless network, Hand Over, Distributed MIMO, Mobile Ad-hoc Network	RCS
September 1-2	Tohoku University (Miyagi)	Post IP Networking, Network Model, Internet Traffic, TCP/IP, Multimedia Communication, Network Management, Resource Management, Private Network, NW Security, etc	CS, IN
October 13-14	Nagoya Institute of Technology (Nagoya)	Network architecture (overlay, P2P, ubiquitous NW, scale free network, active network, NGN, new generation network), next generation packet transport (high speed Ethernet, IP over WDM, multi-service packet technology, MPLS), Grid network	
November 10-11	Hiroaki University (Aomori)	Quality of service, Quality of Network, Traffic Measurement, general areas	ICM, CQ, NV
December 15-16	Yamaguchi University (Yamaguchi)	Mobile Ad-hoc Network, Ubiquitous Network, Wireless Communication, security, Multi-Access Network, User network interface, home network,	RCS
January 26-27	Ryukyu University (Okinawa)	Network Software, Network Application, SOA/SDP, NGN, IMS, API, distributed control, dynamic routing, Grid, reliability of network and network system, evaluation of network and network system	NWS
March 8-9	Phoenix Seagaia resort (Miyazaki)	General,	IN



meetings by inviting them to give a follow-up talk some months later. We call these the “incentive lectures.” We invited 11 young researchers to give such lectures in the past year, and we will continue this activity.

### 3. Research Awards 2010

The Technical Committee selected recipients of the Network System Research Award from among 229 papers that had been presented at monthly technical meetings from January to December 2010. The award is given to the authors of the three or four best papers of each year. The 2010 recipients attended the award ceremony at the NS/IN Workshop (Fig. 2) held in Okinawa in March 2011. The abstracts of the four papers that won awards in 2010 are shown below.

**Takahiro Miyamoto, Jin Tanaka, Hideki Otsuki, Tomohiro Kudoh, Ryousei Takano, Michiaki Hayashi, Itsuro Morita, and Shinji Shimojo: “Demonstration of dynamic network path provisioning over multi network layers” [1]**

A bandwidth-guaranteed network is required for applications which involve distributed computer processing and transferring a large amount of data over a large scale network. Network resource management systems have been studied to provision bandwidth-guaranteed network paths according to requests of the distributed computing applications. To coordinate end-to-end bandwidth resources of large scale networks consisting of heterogeneous network domains, different network resource management systems need to be assigned to each domain. In such a condition, to provision network paths over multi-domain networks, the applications need to request network resources for each network resource management system via different network service interfaces. Therefore, in order to provision network paths over multiple domains, we have demonstrated dynamic network path provisioning over a layer 1 network of JGN2plus and a layer 2 network of JGN2plus and Internet2, using a universal network service interface proxy which enables interoperability among different network resource management systems.

**Yohei Okamoto, Yosuke Tanigawa, and Hideki Tode: “High-quality P2P video streaming system considering constitution information and delivery status” [2]**

Recently, video streaming services using P2P (Peer-to-Peer) have attracted attention as a way to solve problems in load concentration on servers and in large distribution latency. However, many P2P streaming systems, e.g., CoolStreaming, take a complicated approach to strictly control playback timing. This leads to less churn resiliency and less adaptability to fluctuation of network traffic.

Therefore, we have focused on a simple and robust approach to realize “pseudo” streaming with high

quality, which is based on BitTorrent. In the existing methods with the simple approach, peers download pieces closer to playback timing to decrease the playback discontinuity. However, these methods do not consider the constitution of the video structure in a sophisticated manner. P2P streaming systems must consider several important metrics for high-quality and fair distribution. Moreover, in these methods, the process to buffer pieces is not described clearly. To provide a streaming service stably in P2P, an appropriate buffering process should be clearly defined.

Therefore, in this paper, we propose a new P2P video streaming system based on the cooperation of three important metrics: video structure, playback timing, and piece dispersion over the network. In this system, users vary three piece selections to suit the delivery status. Specifically, users preferentially download pieces which affect the video quality, which are closer to playback timing, and which improve the delivery efficiency over all users. In addition, to decrease playback discontinuity, peers receive pieces closer to the playback timing by limiting the range of piece selection. The range is also decided autonomously and asynchronously based on the video structure, which differs from the existing methods. Also, we define a buffering process of received pieces, which is essential for streaming in P2P. This buffering process decreases playback discontinuity and enables peers to upload pieces that have already been played back. Moreover, we verify the effectiveness of the proposed method by extensive computer simulation.

**Yudai Honma, Masaki Aida, and Hideyuki Shimonishi: “Hierarchical approach for new routing protocol with respect to control time-scale” [3]**

In recent years, information systems have become such important social infrastructures that very high reliability is essential. Meanwhile, information systems have become much faster, larger, and more complicated. This means that comprehending and controlling the systems are very difficult. The present control architectures of information systems have a hierarchical structure of functional-scale. However, this hierarchical structure has no logical necessity with the exception of implementing benefits. We have considered that it is more favorable to introduce a hierarchical structure of “control time-scale” for sustainable systems.

In this study, we present a new routing methodology which focuses on the hierarchical structure of control time-scale. The key concept of this study is to incorporate multiple routing protocols simultaneously, OSPF routing (shortest-path) and MLB-routing (multi-path). By considering the differences in their control time-scale, we construct a new routing scheme which can adapt to sudden changes in circumstances. That is, we design the architecture which basically allocates packets to the shortest path route, and collaterally allocates packets to a detour route when congestion

occurs. We believe this methodology will be a persuasive example for hierarchical approaches based on control time-scale. Furthermore, using simulations, we have also shown that this methodology achieves more efficient use of the network, as well as significant improvements in end-to-end delays.

**Tsukasa Okamoto, Kou Miyake, Kyoko Yamori, and Yoshiaki Tanaka: “Pricing method of resource reservation services for corporate users” [4]**

Resource reservation services have been emerging recently in IP networks in addition to usual best effort services. Those services generally have an advantage in service quality of real-time telecommunication in IP networks. Because they are also expected to be promising telecommunication services for corporate business use, it is a relevant issue to clarify service pricing to improve corporate users’ satisfaction and to assure service provider’s revenue.

This paper shows a desirable pricing strategy of resource reservation services for business uses according to variations in users’ requirements. This paper assumes the function of corporate users’ utility as the willingness to pay for their bandwidth. The function of individual corporate user’s utility has the lower limit of the bandwidth with positive user’s utility, which characterizes a particular business use with the particular minimum bandwidth condition. This paper also considers the function of multiple users with different minimum bandwidth conditions. Moreover, it models the choice probability of resource reservation services depending on service price by using a logit model, which is a disaggregate demand model.

Based on this assumption and the model, this paper evaluates the relation among service price, users’ utility, and provider’s revenue by numerical calculation, and it especially focuses on variations in users’ utility in the case when the minimum bandwidth condition varies severely on the whole.

The comparison among some numerical calculations under the different minimum bandwidth condition shows that the desirable service price decreases as the minimum bandwidth increases, from the viewpoint of the balance between users’ utility and provider’s revenue. This paper shows a rational pricing strategy in which the services are provided initially at a high price, and the price goes down as users’ requirements for bandwidth increase.

#### 4. Future Plans

The Technical Committee will organize open symposia at the IEICE Conferences, one of which will be on “Network optimization, self control and power saving technologies for supporting network infrastructure” at the IEICE Society Conference in September 2011.

(For more information, please see our home page.

URL: <http://www.ieice.org/cs/ns/index.html>)



Fig. 2 Research award recipients with chair Dr. Kimura.

#### 5. References

- [1] T. Miyamoto, J. Tanaka, H. Otsuki, T. Kudou, R. Takano, M. Hayashi, I. Morita, and S. Shimojo, “Demonstration of Dynamic Network Path Provisioning over Multi Network Layers” *IEICE Tech. Rep.*, NS2009-225, March 2010.
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# Report on Korea-Japan Workshop on Beyond 100G

Yoshinari Awaji

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## 1. General information

This workshop was held on June 1~3 in Jeju Grand hotel, Jeju island, Korea. The scope was focused on R&D activity beyond 100G transmission.



Fig. 1 Conference venue  
Jeju Grand hotel

Actually, Japanese study group "EXAT (Extremely advanced transmission)" has reported new paradigm of optical fiber communications infrastructure aiming thousand times capacity increase and suggested desirable investment target of R&D in this area. Several members of EXAT group served as committee and contributed numbers of paper to this workshop.



Fig. 2 Opening remark from Prof. Y. C. Chung  
(KAIST)

The organizing committees were Prof. Y. C. Chung (KAIST), Prof. K. Kim (ETRI), Prof. S. B. Lee (KIST), Dr. M. Suzuki (KDDI R&D Labs), Dr. T. Morioka (NTT), and Prof. H. S. Chung (ETRI). Four single

sessions were organized from two keynote speeches, and 31 papers, Opening plenary session, Innovations in Optical Fiber Technologies (I)(II), Innovations in Transmission Technologies (I)(II).

Number of total attendee exceeded 70, from Japan and Korea.



Fig. 3 Plenary session with 70 attendees

Prof. U. C. Paek was also scheduled as a keynote speaker. Unfortunately, he suddenly passed away just before the workshop. I'd like to offer my deepest condolences.

## 2. Sessions at a glance

The first session after plenary, Optical Fiber Technologies (I), is almost dedicated to history of optical fiber and bend insensitive fiber. Another major topic of this session was recent progress of multi-core fiber and related fabrication technologies. Multi-core fiber development has been accelerated in north America and Japan, and national R&D project of multi-core fiber in Japan was introduced. The second session, Optical Fiber Technologies (II) included micro-structured fiber, fiber laser, UWB generation, Fourier optics applications and related technologies for multi-core fiber. The two sessions for transmission covered advanced modulation format, FEC, digital coherent technologies, PMD/PDL emulator, Tx/Rx, Ethernet, optical comb and framing technology for optical transport network, and so on.

In total, 18 Japanese and 15 Korean speakers presented papers.

It seemed difficult to merge all of interests and direction of research immediately, however, such kind of workshop was surely effective to exchange information toward sophisticated optical transmission technology beyond 100G, and more.



# Report on International Conference on Communications 2011

Koichi Asatani  
ICC2011 Organizing Committee



## 1. Introduction

The International Conference on Communications 2011 (ICC 2011) was held on 5-9 June, 2011. With the theme of "Source of Innovation: Back to the Origin," the conference was expected to provide opportunities to rethink traditions and conventions, which could lead to epoch-making innovations. This conference was sponsored by the IEICE Communications Society, the IEEE Communications Society and the Science Council of Japan, in cooperation with Kyoto Prefecture and Kyoto City. This article describes the major topics of the conference.

## 2. Opening Plenary

ICC2011 officially commenced with the Opening Plenary on 6 June. With the introduction by Executive Chair, Prof. Koichi Asatani, General Chair, Mr. Noritaka Uji gave the welcome address, in which he expressed his sympathy to those who were affected by the Great East Japan Earthquake as well as thanks to those who had supported Japan's recovery effort and to the participants who came to this conference. Looking back the history since 1987, when the first mobile phone service started in Japan, he mentioned that the contribution of this community played an essential role in advancement of information and communication technologies (ICT). However, he also emphasized that the disaster made us realize a number of challenges, and the further contribution of this community will help achieve a sustainable society.



General Chair, Mr. Noritaka Uji

President of IEEE Communications Society, Prof. Byeong Gi Lee and TPC Chair and President of IEICE Communications Society, Mr. Kazuo Hagimoto also expressed, in their remarks, their sympathy as well as their thoughts on future directions on R&D. It was an impressive occasion when all of the participants joined a moment of silence requested by Prof. Byeong Gi Lee.

## 3. Technical Program

Under the leadership of Executive Chair, Prof. Koichi Asatani, TCP Chair, Mr. Kazuo Hagimoto, TPC Vice-Chairs, Prof. Hiromi Ueda and Abbas Jamalipour, the interesting and stimulating technical program was organized.

### 3.1 Keynote Addresses

Three executive leaders from industry and academia were selected as the ICC 2011 keynote speakers.

Mr. Ryuji Yamada, President and CEO of NTT DOCOMO addressed the company's action for new growth. Firstly, Mr. Yamada detailed the company's response to the Great East Japan Earthquake, highlighting that the restoration of pre-disaster level was achieved by the end of April by placing large-zone base stations, satellite and high-performance antennas. Based on the trend of proliferation of smartphones and new LTE services, He also introduced the concept of collaboration between device and network as an enabler of new services. The demonstration of "Translator Phone" was impressive and convincing.



Mr. Ryuji Yamada

Prof. Maurizio Decina, Politecnico di Milano addressed his vision of Future Networks and Service by introducing the latest developments of enabling technologies for Internet of Things. He envisioned that a flatter and much more densely interconnected internet is needed for Internet with Things.



Prof. Maurizio Decina

Dr. Toshitaka Tsuda, Fujitsu Laboratories, spoke about ICT paradigm shift and communications technology trends. Showcasing the innovative enabling technologies, He proposed a new paradigm called Human-Centric Intelligent Society, which will create a new value chain for more dependable, intelligent ICT society.



Dr. Toshitaka Tsuda

### 3.2 Commemorative Ceremony

A special program was organized in the morning of 7 June. This ceremony was chaired by Executive Chair, where he introduced distinguished guests including Vice Governor of Kyoto Prefecture, Shuichi Yamauchi and Vice-Mayor of Kyoto City, Fumihiko Yuki, President of the Science Council of Japan, Ichiro Kanazawa. It was our greatest honor and privileges to have the presence of His Imperial Highness Prince Akishino on the occasion of this commemorative ceremony. Reflecting the progress of recovery effort from the Great East Japan Earthquake, His Imperial Highness Prince Akishino offered special appreciation to the audiences for participation to this conference, and extended his heartfelt sympathy to all that were affected, while emphasized the essential role of this conference for advanced information and communication society.

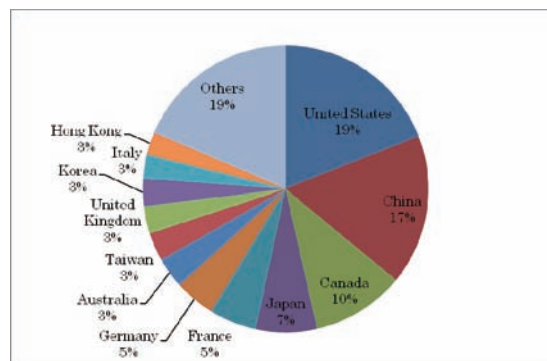


His Imperial Highness Prince Akishino

### 3.3 Technical Symposia

ICC 2011 Technical Program Committee received 2838 technical submissions from 64 countries and regions, and selected 1092 papers for presentation. The overall acceptance ratio was 38.5%. For this selection, each paper was carefully peer-reviewed by at least three reviewers, all of whom worked closely with the

47 symposium co-chairs and 2254 TPC members in 11 symposia and three tracks. The accepted papers were presented in 198 sessions: 180 lecture-style sessions (900 papers) and 18 poster-style sessions (192 papers)



Accepted papers by Countries and Regions

### 3.4 Tutorials

Tutorial Co-Chairs, Prof. Iwao Sasase and Hussein Mouftah organized the ICC2011 tutorial program. The best 16 tutorials were selected out of 59 proposals. The latest topics by high profile lecturers attracted many attendees. Topics include Evolution to 4G Wireless, Cooperative Wireless Communications, Next Generation Internet, Visible Light Communications, Vehicular Networking, and so forth. Since ICC2011 offer one free tutorial to the attendee with full, limited and student registrations, more than 900 attendees in total were registered.

### 3.5 Workshops

Workshop Co-Chairs, Prof. Masayuki Murata and Dr. Heinrich Stüttgen oversaw the ICC2011 workshops. The 9 full-day or half-day workshops were organized for ICC2011. 81 papers were selected for presentation out of 171 paper submissions. The topics include Heterogeneous Networks, Smart Grid Communications, Future Network, Green Communications, and so forth. Those workshops were organized by small groups of researchers who were interested in brand new topics. Extensive discussion was continued even after the scheduled program completed.

### 3.6 Business Forum

Business Forum Co-Chairs, Dr. Tetsuya Yokotani and Dr. Chi-Ming Chen organized the industry forum to create a venue for facilitating collaborations between attendees from academia and industry. The program consisted of two parts: Executive sessions and General Sessions. In executive sessions, the high profile leaders were invited to present their visions and strategies for corporate business or emerging research topics. General Sessions were organized as panels of the emerging topics, such as Smart Grid, Next Generation Access Networks, Wireless Sensor Networks, Green ICT, Optical Device and so forth. Each session had attendance of roughly 30-100 people, and interesting discussion was made among attendees.



### 3.7 ICC Kyoto Exhibitions

ICC Kyoto Exhibition was co-located with ICC 2011 at the Event hall of ICC Kyoto on 6-8 June, 2011. In this Exhibition, 10 exhibitors and two publishers were registered. 9 world's leading companies and a national research institute working in all areas of telecommunications and networking exhibited their latest products, services, and applications in each 54 sqm booth. Many demonstrations on next generation optical network technologies, LTE technologies, augmented reality technologies, Green ICT, and home ICT attracted many researchers and engineers participating in ICC 2011. The Origami corner, the lounge with the free Internet PC station and the free drink station, the lucky drawing, and the student travel grant award ceremony organized by ICC 2011 were also organized, and attendees spent an enjoyable time. The total number of participants for three days was 2600.



ICC Kyoto Exhibition

### 4. Kyoto Social Events

Kyoto City reigned as the capital of Japan for 1200 years, and is known as the culture heart of Japan. The history of Kyoto City has left a legacy of tradition and elegance and was considered as the best place for this conference.

The venue, Kyoto International Conference Center (ICC Kyoto) is the first national conference facility in Japan, when it opened in 1966. With its unique design, participants enjoyed Japanese traditional architecture as well as modern decoration and furnishings.

Under the leadership of Local Arrangement Chair and Vice-Chair, Prof. Susumu Yoshida and Prof. Masahiro Morikura the excellent and conformable conference atmosphere were created.

On the first day of 5th June, attendees were welcomed by the performance of Koto, a Japanese traditional instrument, played by ladies dressed in Japanese Kimono. With traditional Japanese cuisine such as sushi, etc., served at a small wooden booth, attendees met and talked with their friends from all over the world until late in the evening.



At the welcome reception

Attendees who participated in the conference banquet at Grand Prince Hotel Kyoto on 7th June enjoyed the traditional dance of Kyoto, and the performance of KARATE, which were played by the National team of Japan. Introduced by the Executive Chair, the performance was so impressive and breathtaking and the stage was soon filled with huge applause. The number of attendees is 430.



At the banquet.

During the banquet, Executive Chair handed over the “Comsoc globe” to Mr. Lee Roy F. Gaspard, Jr., General Chair of Globecom2011, where he made a presentation to introduce Houston, the conference venue of Globecom 2011.



From ICC2011 to Globecom 2011

The Science Laboratories for elementary and junior high school children were co-located with ICC2011. Prof. Toshimi Okada, Toyama Prefectural University, and Prof. Naoki Shinohara, Kyoto University, were



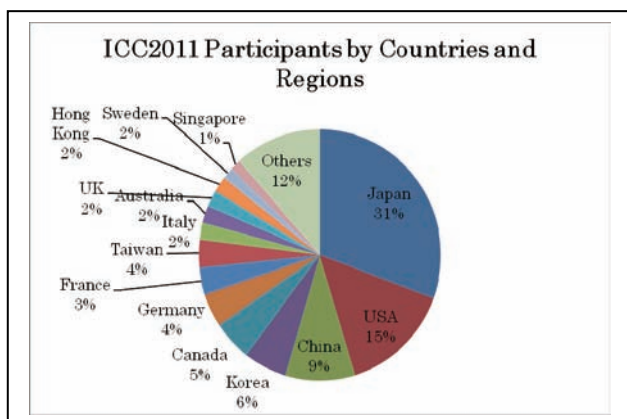
invited to give hands-on lectures to 89 students and their parents gathered in ICC Kyoto. Prof. Okada introduced crystal radio receivers as battery-less information terminals. The students, with their parents, created their own receivers by using plastic bottles, and enjoyed listening to their radio sounds. Prof. Shinohara prepared a wireless power transfer workshop, where the students created their own antennas to receive radio wave power by looking how bright their LED light. The students experiences how received power depends on the shape of antennas. This event was organized by IEICE and Science Council of Japan in incorporation with Kyoto City Board of Education.



Creating crystal radio receivers

### 5. Participation to the conference

Despite concerns and worries arose from the Grate East Japan Earthquake and subsequent nuclear power plant problem, more than 1800 researchers and engineers from all over the world participated into the conference, and actively discussed latest developments on Information and Communication Technologies.



### 6. Final Remarks

This conference would not have been possible without the dedicated effort of many volunteers and supports.

Acknowledgement should given to the symposium co-chairs, TPC members and the reviewers who worked so hard to complete the peer review process and authors who submitted their works to ICC2011. In addition, gratitude should be given to the IEEE Comsoc, the IEICE-CS and the Science Council of Japan, Kyoto City, Kyoto Prefecture and the members of ICC2011 Advisory board for the continued support to hold this conference while facing a difficult situation after the incident of the disaster. Special appreciation should be expressed to all of the participants who came to the conference.

Behind the conference program, many volunteers contributed for organizing the conference. Under the leadership of the Conference Operations Chair Toshitaka Tsuda, the members of organizing committee execute essential functions such as Local arrangement, Publication, Registration, Finance, Patronage and Publicity. Their contributions should also be recognized. The members of the organizing committee are listed in the appendix.

### 7. References

[1] ICC2011 Web Site: <http://www.ieee-icc.org/2011/>

### Appendix: ICC 2011 Organizing Committee

- General Chair: Noritaka Uji
- Executive Chair: Koichi Asatani
- TPC Chair: Kazuo Hagimoto
- TPC Vice-Chairs: Hiromi Ueda, Abbas Jamalipour
- Tutorial Co-Chairs: Iwao Sasase, Hussein Mouftah
- Workshop Co-Chairs: Masayuki Murata, Heinrich Stüttgen
- Business Forum Co-Chairs: Tetsuya Yokotani, Ci-Ming Chen
- Publication Chair: Naohisa Komatsu
- Conference Operations Chair: Toshitaka Tsuda
- Local Arrangement Chair: Susumu Yoshida
- Local Arrangement Vice-Chair: Masahiro Morikura
- Finance Chair: Shigeyuki Akiba
- Finance Vice-Chairs/Treasurer: Takashi Shimizu, Bruce Worthman
- Registration Chair: Tomohiko Taniguchi
- Patronage Chair: Hitoshi Aida
- Publicity Chair: Atsushi Murase
- Student Travel Grant Chair: Tomohiro Ishihara
- Expo Chair: Hiromichi Shinohara
- GIMS Advisor: Robert S. Fish
- GITC Advisor: Stefano Bregni
- Project Managers: June Leach-Barnaby, Gayle Weisman
- Secretaries: Masatsugu Ichino, Daisuke Umehara, Hiroyuki Kasai, Osamu Kamatani, Shoichiro Seno, Satoshi Denno, Hirotaka Nakamura, Hisaya Hadama, Takatoshi Minami, Hidekazu Murata, Koji Yamamoto
- Photograph: Tetsuo Tsujioka, Tomohiro Ishihara

# Report on the 6th International ICST Conference on Cognitive Radio Oriented Wireless Networks and Communications (CrownCom 2011)

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## 1. Introduction

The 6th International ICST Conference on Cognitive Radio Oriented Wireless Networks and Communications 2011 (CrownCom 2011) was held at Osaka University Nakanoshima Center, Osaka, Japan, June 1st - 3rd. There were 140 participants.

The conference was organized by general co-chairs, Dr. Kazuhiro Uehara (NTT, Japan) and Prof. Maria-Gabriella Di Benedetto (Univ. of Rome, Italy), organizing chair, Prof. Yukitoshi Sanada (Keio Univ., Japan), the technical program co-chairs, Dr. Hiroshi Harada (NICT, Japan), Prof. Marcos Katz (Univ. Oulu, Finland), Dr. Ying-Chang Liang (I2R A-STAR, Singapore), Prof. Seiichi Sampei (Osaka Univ., Japan), Prof. Kei Sakaguchi (Tokyo Tech., Japan) and their organizing committee.

Continuing the tradition from previous years, the CrownCom has focused on cognitive radio aspects of wireless communications and provided opportunities for researchers in both academia and industry to present the latest technologies and exchange ideas in the area of cognitive radio.

The conference was mainly supported by the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering (ICST). Technical co-sponsorship was provided by Center for Research and Telecommunication Experimentation for Networked Communities (CREATE-NET), Osaka University, IEEE Microwave Theory and Techniques Society (MTT-S), Institute of Electronics, Information and Communication Engineers (IEICE), IEICE Communications Society (IEICE CS), IEICE CS Technical Committee on Software Radio (IEICE CS TCSR) and Wireless Innovation Forum.

## 2. Program

In this year, there were large paper submissions of 163 regular session papers, 26 special session papers, and 9 demonstration papers. After peer, independent, and rigorous reviews, 93 high quality papers were accepted, which include 76 regular session papers, 10 special session papers, and 7 demonstration papers.

The papers cover a broad range of important and timely issues, e.g. (cooperative) spectrum sensing, spectrum management, spectrum map, spectrum sharing, dynamic spectrum access, flexible PHY/MAC, MAC for cognitive radio, heterogeneous networks, cognitive relay networks, beamforming for interference management, modeling and capacity, opportunistic spectrum access, and hardware prototyping especially for spectrum sensing. These papers were grouped into 16 regular sessions and 2 special sessions.

Furthermore, we had four valuable keynote speeches, and 1 panel session for discussion about standardization of cognitive radio. We also had the demonstration and exhibition sessions on the 1st day.

## 3. Keynote speech

In CrownCom2011, there were four great keynote speeches every day at Keizo Saji Memorial Hall in the conference venue (Fig. 1). All speeches were very comprehensive and timely, so that they make the conference very attractive.

On the 1st day, Dr. Hiroshi Harada (NICT, Japan) gave us a talk entitled “Amphibia Networks -A Dependable Wireless and Wired Integrated Social Network Infrastructure.” The speech started from the definition of cognitive radio, and then moved to cognitive wireless cloud, that is cognitive radio with cross-network optimization. The speech also showed prototype hardware and feasibility studies in real environments. It was reported that the developed heterogeneous type cognitive radio has supported the internet access in the evacuation area due to Tohoku earthquake. Finally, Dr. Harada gave future perspective of cognitive wireless network services to give dependable wireless and wired integrated social network called “Amphibia Network.”

On the 2nd day, world-widely known Prof. Vahid Tarokh (Harvard Univ., USA) gave us a talk about “Information Theoretic Fundamentals, Regulatory Issues, Physical Limitations and the Future of Opportunistic Transmission.” The talk started from a need of cognitive radio, and then showed fundamental limits of cognitive radio network in information theoretic aspects. The theoretical analysis indicated that

cognitive radios may have some promise under idealized assumptions. Prof. Tarokh also mentioned regulatory issues, economics, and business models. As one of conclusions, Prof. Tarokh argued about conservative regulations that may not allow for a fully cognitive radio to be realized.

On the 3rd day, there were two keynote speeches from governmental side. Firstly, Mr. Yasuo Tawara (MIC, Japan) gave us a talk entitled “Outlook and Issue of Radio Use -Strategy for Creating New Radio Industry-.” His talk started by pointing out the problem of increasing data traffic due to development of radio spectrum use in Japan. Then Mr. Tawara introduced several core technologies to support growth of spectrum usage, and one of them is “white space.” He gave us promotion strategy of Japanese government for achievement of white space usage. Finally, he reported about the effect of earthquake statistically, and gave us future requirement of network infrastructure that should be robust against the disaster.

Finally, Dr. Yasuhiko Ito (KDDI R&D Labs, Japan), he is also a member of Radio Regulation Board in ITU, gave us a talk about “To be or not to be Cognitive.” The talk started from a role of radio regulation board especially about coordination of frequency sharing. He pointed out the status of present regulations, and suggested that cognitive radio may provide another possibility. Through our experience of the tsunami due to Tohoku earthquake, he explained about importance of coordinated use of different infrastructure and different operators that may be realized by cognitive radio. Dr. Ito concluded his talk by giving several requirements for realization of cognitive radio.



Dr. Hiroshi Harada



Prof. Vahid Tarokh



Mr. Yasuo Tawara



Dr. Yasuhiko Ito

Fig. 1 Keynote speakers

#### 4. Plenary Panel Session

The session entitled “Regulation and Standardization Landscape of Cognitive Radio,” organized by Dr. Abdur Rahim Biswas (CREATE-NET, Italy), Dr. Markus Dominik Mueck (Intel Mobile Communications, Germany) and Prof. Jun-ichi Takada (Tokyo Institute of Technology, Japan), was held on the 3rd day. Four panelists were invited from US, Europe, Asia and ITU-R to discuss about the regulatory and standardization trends and future directions of cognitive radio in regional and global levels.

Dr. Hitoshi Yoshino (Softbank Mobile Corporation, Japan; ITU-R WG 5A5 Chair), summarized the current TV white space regulations in US, Canada and UK by stating two regulatory scenarios, i.e. “no harmful interference basis” and “non interference basis.” The former scenario (Canada) requires the coordination with primary users, and the secondary system should be licensed for the operation. The latter scenario (US and UK) does not require the coordination so that the secondary system can be easily deployed.

Prof. Vahid Tarokh (Harvard University, USA), stated that spectrum sharing is nothing new in US by citing ISM, UWB and MVDDS (Multichannel Video and Data Distribution Service; 12.2-12.7 GHz). He also mentioned about FCC’s regulation of cognitive transmission at 3650-3700 MHz as well as TVWS. TVWS devices require geo-location capability as well as access to the database of protected areas. He finally concerned the emerging new killer services which are the key to the success of cognitive radio.

Dr. Michael Fitch (British Telecom, UK), positioned TVWS as a first opportunity to examine new regulatory model for spectrum allocation. He quantitatively estimated the WS resource by counting the population weighted availability of TVWS in UK, and found that more than 200 MHz is available 20% of population. Two use cases for fixed services, i.e. not-spot (premises that have less than 2Mbit/s fixed broadband) and machine to machine. Field test results for not-spot coverage were also presented.

Dr. Stanislav Filin (NICT, Japan), reviewed the standardization landscape of CRS in three categories, i.e. general aspects, heterogeneous type and spectrum sharing type. Activities of working groups such as ITU-R WP1B/WP5A, IEEE DySPAN (P1900), IEEE 802.11af/15/19/21/22, ETSI TC RRS WG1/3, and ECMA TC48 TG1 were mentioned. He also reported current discussions and trials of WS in CEPT and Asian countries such as Japan, Korea and Singapore.

Open discussion was quite active focusing on three particular points: 1) Necessity of spectrum sharing: Advantages of TVWS over existing bands are wide coverage and wide bandwidth in rural area, but not in dense area. 2) Application vs regulation: In contrast to heterogeneous type CRS, spectrum sharing type CRS is not yet recognized as a stable technology. Rural wireless broadband seems most promising application. Although the market size is small, it can be a good opportunity to make CRS more confident. However,



strict regulation such as in Japan may be the obstacle to introduce a new service. 3) Coexistence among different secondary systems: First come first served basis, etiquette, or spectrum trading are possible solutions. Discussions are ongoing in IEEE 802.19.1 and EU FP7 COGU project.



Fig. 2 Panel Session (Dr. Yoshino, Prof. Tarokh, Dr. Fitch and Dr. Filin from left to right)

## 5. Special Sessions

Two special sessions related to cognitive radio systems had been opened on the 2nd day and 3rd day. The first session was “Standardization Activities of Cognitive Radio” organized by Dr. Hitoshi Yoshino, (Softbank Mobile Corporation, Japan). The other one was “Strategical National and Regional R&D Projects Regarding Efficient Spectrum Management for Future Wireless Network” organized by Dr. Kanshiro Kashiki (KDDI R&D Labs., Japan) (Fig. 2).

### 5.1 Standardization Activities of Cognitive Radio

As a back ground of increased demands for wireless communications, e.g. cellular, wireless LAN and broadband wireless access, cognitive radio systems have recently attracted our attentions as one of the promising technologies to satisfy the demands while improving spectrum efficiency. Different forums and organizations are currently working on the standardization of cognitive radio. Four invited talks in this special session introduced and discussed the ongoing four standardization activities studied on ITU-R, CEPT, DYSPAN, and national standardization within China for each. Through the invited talks, most of audience might recognize commonality and difference, as well as future directions of the activities.

### 5.2 Strategical National and Regional R&D Projects Regarding Efficient Spectrum Management for Future Wireless Network

In order to ensure the spectrum wireless resources for vital mobile communications, advanced technical research and development (R&D) has been conducted to launch cognitive radio services. These days, a lot of strategic national and regional R&D projects have been organized. In this special session, 10 talks were presented. Common keywords among the talks were cooperative heterogeneous network, cooperative multi-point, spectrum sharing, and public safety. Each presentation not only introduced its main concept, but

also opened up new vistas of the spectrum management, in terms of the application services.



Fig. 3 Special session

## 6. Demonstration and Exhibition Sessions

In the 1<sup>st</sup> day of conference, the demonstration and exhibition sessions of cognitive radio and software defined radio were held. These sessions were opened for full day.

### 6.1 Demonstration

From Dec. 2010 to Jan. 2011, we called for demonstration by international opened call. As a result, we got nine extended abstracts of demonstrations. After carefully reviewing them, we selected eight demonstrations for showing to demonstration session. Unfortunately, one demonstration was withdrawn due to location moving from original location to new one because of significant earthquake. So there were eight noticeable and interested demonstrations in conference.

In demonstration session, the session room kept open for discussing anytime. Therefore, the participants could have discussion with the presenter of demonstration without pressed for time (Fig. 4).

The demonstration list is as follows.

1. Flexible Wireless System: United Wireless Platform for a Wide Variety of Wireless Systems (NTT Japan)
2. Experimental Investigation of IEEE802.11n Reception with Fractional Sampling (Keio University Japan)
3. Realization of TDD Two-way Multi-hop Relay Network with MIMO Network Coding (Tokyo Institute of Technology Japan and Nihon Dengyo Kosaku Co. Ltd. Japan)
4. A Demonstration of Adaptive Spectrum Sensing and Interference Suppressed Opportunistic Secondary Transmission (WINLAB Rutgers University USA and NEC Corporation Japan)
5. Cognitive Radio Systems for Heterogeneous and Spectrum Sharing Type Wireless Network Managements (NICT Japan)
6. Emergency Radio Information System for Post-disaster Communication (Tokyo Institute of Technology Japan)
7. Measurement method and result for Frequency Spectrum Sharing in Cognitive Radio (Shinshu-University Japan, Tokyo University of Science Japan,

and The University of Electro-Communications Japan)

As we show the list of demonstration, there were three demonstrations from academic, two ones from the cooperation between academic and industrial, and two ones from industrial. So this session was really good balances. In the topics of demonstration, four demonstrations were the prototype trial manufacture and performance evaluations, one was the evaluation results and method for wireless propagation, and two were the implementation of element techniques.

### 6.2 Exhibition

We got five industrial Exhibitions for cognitive radio and software defined radio. Exhibitions were along with demonstrations. So, not only the participants for products of exhibition but also the presenters of demonstration paid attention to the explanation of exhibition. The list of Exhibitions is as follows. In this session, each exhibiter has the individual theme.

- a. 「Xprobe」 FPGA Analysis Software (Plum System, Inc. Japan)
- b. Data Acquisition & Playback System (iDAQS Co., Ltd Japan)
- c. System Level Simulator SystemVue (Agilent Technologies Japan)
- d. Detect everything in rapidly changing signals! Latest measurement solutions for Cognitive radio development from R&S (ROHDE & SCHWARZ Japan K.K. Japan)
- e. LabVIEW-base Software Defined Radio Development Platform with NI FlexRIO FPGA and RF Instrument modules (National Instruments Japan)

In the difference from technical session, the demonstration and exhibition session was great meaningful because the participant could feel the state of cognitive radio and software defined radio for practical realization.



Fig. 4 Demonstration and exhibition sessions

### 7. Paper awards

The CrownCom award ceremony was held in the banquet on the 2nd day. The CrownCom technical program committee presented the following three awards and award winners.

- Best Paper Award
  - Title: Receiver-side Opportunism in Cognitive Networks
  - Authors: Natasha Devroye (University of Illinois at Chicago), Petar Popovski (Aalborg University)
- IEICE Software Radio Paper Award
  - Title: Development of a TV White Space Cognitive Radio Prototype and its Spectrum Sensing Performance
  - Authors: Mohammad Azizur Rahman (NICT), Chunyi Song (NICT), Hiroshi Harada (NICT)
- Student Paper Award (Fig. 5)
  - Title: Design and Performance Trade-offs in Parallelized RF SDR Architecture
  - Authors: Sami Kiminki (Aalto University), Ville Saari (Aalto University), Aarno Pärssinen (Nokia Research Center), Vesa Hirvisalo (Aalto University), Antti Immonen (Nokia Research Center), Jussi Ryyänen (Aalto University), Tommi Zetterman (Nokia Research Center)



Fig. 5 Student paper award

### 8. Conclusion

We had started to organize the committee two years ago, and at the beginning of March, we've almost completed the detailed plan to hold the conference in Keio University, Yokohama. However, the greatest earthquake and tsunami of the millennium struck the northeast Japan on March 11, and then we had carefully considered the risks, and finally decided to change the conference location from Yokohama to Osaka. Under the difficult circumstances, it was very delighted to realize the holding the conference and presenting exciting programs. Finally, we would like to give a special thanks to all participants, all committee members, secretaries, and staffs for their hard work, and to all the technical and financial sponsors, and would like to express our deepest sympathies and condolences to the people affected by the disaster and to the families of the victims. The next conference will be held in Stockholm, Sweden on June 18-20, 2012.



# Report on 3<sup>rd</sup> Sarajevo Technology Forum on Communication Technologies and Services (STF 2011)

Haris Gacanin  
Alcatel-Lucent Bell, Antwerp, Belgium



## 1. Introduction

The 3rd Sarajevo Technology Forum 2011 on communication technologies and services (STF 2011) was held on 19th and 20th May, 2011 at Hotel Europe in Sarajevo a beautiful capital of Bosnia and Herzegovina. The city is famous for its historical cities and traditional religious diversity, with adherents of Islam, Orthodoxy, Catholicism and Judaism coexisting there for centuries. Due to its long and rich history of religious diversity and coexistence Sarajevo is often called the "Jerusalem of Europe".

The forum is organized by IPSA Institute, Sarajevo, with aims to re-establish research and development (R&D) activities in Bosnia and Herzegovina, to make stronger R&D relationships in the region.

Together with IPSA Institute the event was supported by the core members in charge toward the establishment of The Institute of Electronics, Information and Communication Engineers (IEICE) Europe Section and to further establish and promote the activities of IEICE in Europe. With this in mind the forum has been technically sponsored by both IEICE and Communications Society of IEICE (IEICE-CS).

## 2. STF 2011 Program

The forum has been opened by H.E. Futao Motai, Ambassador of Japan in Bosnia and Herzegovina (Fig. 1). H.E. Futao Motai pointed out the importance of this



Fig. 2 Invited speech by Prof. Fumiyuki Adachi

event for regional development as well for the education of students. Then, the opening ceremony contributed Prof. Alija Behmen, Mayor of Sarajevo, Prof. Faruk Caklovica, Rector of University of Sarajevo, and Prof. Branislava Perunicic-Drazenovic, Vice-president of Academy of Science and Art in Bosnia and Herzegovina.

The forum presentations started with the opening speeches by the general committee chairs, Prof. Fumiyuki Adachi, IEICE (Tohoku University), and Prof. Asrar Ul-Haq Sheikh, King Fahd University of Petroleum & Minerals, Dhahran, Saudi Arabia. The



Fig. 1 Opening speech by H. E. Futao Motai, Ambassador of Japan in Bosnia and Herzegovina



Fig. 3 Participants at STF2011



first presentation by Prof. Adachi (see Fig. 2) entitled “Broadband Wireless Challenges,” addressed the state-of-the-art technologies of the fourth generation (4G) as well as beyond (4G). The second presentation by Prof. Sheikh entitled “Wideband Wireless Channel Measurement and Characterization,” addressed some practical problems and solutions to channel characterization for broadband communications.

Those were followed by other presentations on 19th and 20th May (see Fig. 3). During the forum we had 13 presentations associated with related discussions, questions and answers over two forum days, with about 60 participants each day, all contributed to success of the forum.

There were five sessions organized as follows:

- Broadband Communications
- Home networking and applications
- Communication theory
- Cognitive radio
- Sensor networks

This year, IPISA Institute, Sarajevo, Bosnia and Herzegovina, signed the Research Agreement with Wireless Signal Processing Laboratory, Tohoku University, Sendai, Japan (see Fig. 4). The agreement will help to improve the relationships between both



Fig. 4 Research cooperation agreement

countries and further establish promotion of IEICE activities in Europe.

Closing remarks were held at the end of the second day by Dr. Haris Gacanin, having remarks of great success of the conference and notes on the next event in 2012. The number of forum participants in 2011 grown rapidly in comparison with STF 2010 and it is expected to grow more in coming years.

### 3. IEICE Europe Section pre-activity meeting

Toward the establishment of the IEICE Europe Section, the pre-activity meeting was held on May 18th 2011 in conjunction with the STF 2011.

In the meeting we discussed about following points:

- Organizational structure of IEICE European Section;
- Efficient information distribution and exchange among IEICE European Section members (webpages, mailing lists, social networks, etc.);
- Promotion of IEICE activities in Europe (IEICE conferences, IEICE transactions, etc.);
- Support and assistance mechanisms available to the IEICE Europe Section from the IEICE headquarters.

### 4. Future Event

The next forum will be held on 24-25 May, 2012 in Sarajevo, Bosnia and Herzegovina. The detailed information on STF 2012 will be distributed to IEICE members and provided on the web page, once defined. The best selected papers will be recommended for publication in the Special Issue of IEICE Trans. on Communications in 2013 (TBD).

Your paper submissions as well as participations in IEICE Europe Section activities will be much welcomed. Please join the forum and enjoy together with us in beautiful city of Sarajevo!

# Report on the Fifth International Symposium on Medical Information and Communication Technology (ISMICT2011)

Takahiro Aoyagi  
Tokyo Institute of Technology



## 1. Introduction

The Fifth International Symposium on Medical Information and Communication Technology (ISMICT 2011) was held in Grand Hôtel Suisse Majestic, Montreux, Switzerland on March 27 through 30 in cooperate with IEICE Communications Society.

The focus of ISMICT 2011 is on “Medical Body Area Networks, Technology and Services for Personalized Medicine”. The event is sponsored by a number of universities and organizations. This report provides a brief overview on the event with background knowledge.

## 2. Background

Increase of aging population and demand for high quality of medical and healthcare services motivate the research and development activities on the related technologies. In 2006, IEICE Communications Society approved a time-limited Technical Committee on Medical Information and Communication Technology (TC-MICT)[1], which can be regarded as an important effort from academy to promoting MICT.

The first event, ISMICT 2006, was held in Yokohama, Japan on December 1-2, 2006 with members from TC-MICT as main local organizers. ISMICT 2007 was held in Oulu, Finland on December 12-13 with Oulu University as the local host. The third event was held in Montreal, Canada on February 24-26, 2009 with local host of McGill University Health center. The fourth event, ISMICT 2010, was held in Taipei, Taiwan on March 22-25 with local hosts including National Chiao Tung University and China Medical University. ISMICT 2011 is the fifth event in this series. The local hosts include the Swiss Center for Electronics and Microtechnology (CSEM) and École Polytechnique Fédérale de Lausanne (EPFL).

## 3. Main topics in ISMICT 2011

The organizers successfully invited many famous figures to deliver keynote speech from different aspects. These keynote speeches well addressed main topics related to ISMICT. Titles of 6 keynote speeches delivered at ISMICT 2011 are as follows.

- Medical Informatics and BAN for Future Personalized Medicine
- Server based computing as an infrastructure of hospital- wide EPR and the regional healthcare information system
- Communication strategies for brain interfacing

- Clinical Information Systems: the thin line between success and failure
- The e-toile experience: from the eHealth vision to a political necessity
- The Swiss eHealth Strategy – a model for international cooperation?

Body area network (BAN) was a main focus on the symposium. A panel discussion was held to discuss “Body Area Network for Medical Treatment and Healthcare --- Technologies and Challenges”. Technical program committee co-chair, Dr. Huan-Bang Li coordinated and chaired the panel. The main topic from the chair and individual themes from panelists are as follows.

- Body Area Network for Medical Treatment and Healthcare– Technologies and Challenges
- UWB Technology for Medical Applications
- Challenges of Interference Mitigation in Medical Body Area Networks
- Body Area Network: Introduction of Research on a New Generation Tele-health System in NICT
- Visualizing RF Propagation in Body Area Networks Using a 3D Immersive Platform

The organizers also successfully invited two famous researchers to deliver invited speeches. Prof. Dr. Christian Enz talked about “Ultralow-power MEMS-based Radio for WBAN”, and Prof. Dr. Ryuji Kohno talked about “Dependable Wireless for Medicine and Other Reliable Systems” as can be seen in Figure 1.



Fig. 1 Prof. Dr. Kohno as an invited speaker.

Besides the above topics, two separated tracks were organized for presentations of technical papers. Main categories of the technical presentations are as follows.

- MAC and Security
- Medical BAN and eHealth Applications
- Modeling, Miniaturization, EMI and Physical Parameters
- Antenna, Propagation and Ranging
- Wireless BAN Technology
- Telemonitoring, Wireless Healthcare and Homecare
- Medical Imaging and Patient Diagnostic System
- Medical and Diagnostic Systems, Rehabilitation and eHealth

One can find more detail about the technical program from the WEB of the symposium [2].



Fig. 2 Montreux and Lake Geneva shoreline

#### 4. Statistics

As summarized by the organizers, there were 105 registered participants in ISMICT 2011. The participants hold a broad geographical distribution including Swiss, Japan, U.S.A, Canada etc. Total 18 keynote and invited speakers and panelists were presented. Moreover, 40 technical papers were accepted and presented at the symposium.

#### 5. Connecting to the Next

ISMICT 2011 was held in Grand Hôtel Suisse Majestic, which is next to the Montreux station of Swiss Federal Railway. The hotel is also next to the famous Lake Geneva. Some of the participants may have taken the chance to experience the romantic lakeside walk along the “flower path” from Montreux far from the noise and bother of road traffic (Figure 2). During the symposium, the steering committee members held a meeting to evaluate the next host for the symposium. Several proposals were submitted to bid for ISMICT 2012. A decision will be made and announced soon.

#### 6. Acknowledgement

The author thanks Dr. Huan-Bang Li and Prof. Dr. Chika Sugimoto for providing photos and symposium statistical data.

#### 7. Reference

- [1] <http://www.ieice.org/~mict/>
- [2] <http://www.ismict2011.org/>



# Report on 21st International Conference on Optical Fiber Sensors

Nobuaki Takahashi, OFS21 International Steering Committee  
Dept. of Communications Engineering, National Defense Academy



## 1. Introduction

The twenty-first International Conference on Optical Fiber Sensors (OFS21) was held at the Fairmont Château Laurier Hotel in Ottawa, Canada on 15 through 19 May 2011.

The general chair of the conference was Prof. Wojtek J. Bock, Université du Québec en Outaouais, Canada, who also served as the chair of the technical program committee. Appointed as the co-chairs of the committee were Profs. Jacques Albert of Carleton University and Xiaoyi Bao of University of Ottawa, Ottawa, Canada. The venue, Fairmont Château Laurier, which was constructed between 1909 and 1912 in tandem with Ottawa's downtown Union Station (now the Government Conference Center), is a historic



Fig. 1 Venue: Fairmont Château Laurier Hotel

landmark hotel in Ottawa, Ontario, Canada (see Fig. 1).

On operating the conference, the OFS does not have any particular sponsor like most of other academic conferences but is essentially managed and run by a temporarily organized local committee as well as International Steering Committee of the OFS while some of the works associated with the conference are often supported by a learned society, which was SPIE in the case of OFS21. The technical co-sponsorships were also given by many organizations over the world including the Communications and Electronics Societies of the Institute of Electronics, Information and Communication Engineers, Japan Society of Applied Physics, Optical Society of Japan (JSAP),

Institute of Instrument and Control Engineers, and Institute of Electrical Engineers of Japan.

The scope of the conference includes not only various aspects of optical fiber sensors from theoretical and experimental analysis of the fundamentals to practical applications but also peripheral technologies supporting the optical fiber sensor systems.

## 2. Statistics of paper submission

The number of the papers presented was 375 [1]. 67 of them were the oral presentations including 9 papers in the workshop, 9 invited papers and 5 papers in the

Table 1 Paper submission from each country

China	95	UK	26
Japan	38	Ireland	7
Singapore	8	Spain	18
Australia	12	France	4
Korea	16	Italy	15
Israel	3	Germany	13
India	1	Portugal	7
Iran	2	Denmark	3
Mexico	3	Cyprus	2
Columbia	1	Bulgaria	1
Brazil	17	Switzerland	3
US	23	Greece	2
Canada	31	Netherlands	2
		Poland	8
		Belgium	2

post-deadline paper session. The rest of them, 308 were poster presentations. The number of oral presentations was kept rather low because the OFS conference has the tradition to run only a single session for oral presentations. Table 1 shows the paper submission from each country, from which it is seen that almost half of the papers were from Asian countries. As is common in many other conferences, furthermore, the country that contributed most to the conference was China. 26 percent of the papers were indeed from China, which was almost comparable to the percentage from the whole European countries. Not only this tendency is considered to continue but also more papers will be contributed from China in near future. The Japan was rated second with the contribution of 10 percent. Although the activities were somewhat limited from America, especially from the United States, the

number of the papers from Brazil, 17 drew attention. The number of participants was 400 from 28 countries.

### 3. Workshop

The first day afternoon of the conference was dedicated to the Workshop, which consisted of two sessions. All of the presentations were invited and the details are as follows:

#### Session 1: A Look Back at Optical Fiber Sensors

1. “Research on fibre optic sensors at the University of Kent its subsequent exploitation” by D. A. Jackson, Univ. of Kent.
2. “Optical fiber sensor research and industry in Germany: review and outlook” by R. Willsch, IPHT.
3. “The origin, history and future of fiber-optic interferometric acoustic sensors for US Navy applications” by J. H. Cole, US Naval Res. Lab.

#### Session 2: Current Fiber Sensor Applications and Technologies.

1. “Pressure measurement with fiber-optic sensors: commercial technology and applications” by E. Pinet, FISO Technologies.
2. “Distributed Sensing with OFDR and its application to structural health monitoring” by H. Murayama, Univ. of Tokyo.
3. “Fiber sensor applications in structural sensing and railway monitoring” by H.-Y. Tam, City Univ. of Hong Kong.
4. “Distributed sensors based on Rayleigh scattering” by B. Soller, Luna Technologies
5. “Smart structures and applications” by M. Voet, Fibre Optic Sensors and Sensing Systems
6. “Structural shapes sensing and damage assessment of navy vessels” by C. Baldwin, Aither Engineering.

### 4. Plenary Talk

The plenary talk was an invited paper given by E. Udd, Columbia Gorge Research (US): The title was “Sensing high speed phenomena using fiber gratings and the Sagnac interferometer.”

### 5. Regular sessions

The regular sessions consisted of 360 papers including 52 oral presentations, of which the following 8 presentations were the invited papers:

1. “Brillouin scattering accompanied by acoustic grating in an optical fiber and applications in fiber distributed sensing” by K. Hotate, Univ. of Tokyo.
2. “Optical fibre microwire sensors” by G. Brambilla, Univ. of Southampton.
3. “Optical fiber coupled microresonator for single nanoparticle detection and measurement” by L. Yang, Washington Univ. in St. Louis.
4. “Long-range coherent optical frequency domain reflectometry and its applications” by F. Ito, NTT Access Network Service System Labs.
5. “Photonic crystal fibers from non silica glasses for fiber optic sources in the NIR and IR ranges” by F. Smektala, Univ. de Bourgogne.
6. “Photonic liquid crystal fibers: an innovative sensing technology” by T. Wolinski, Warsaw Univ. of Technology.

7. “Sensing with gratings, nanolayers & complex beams, in optical fibers” by S. Ramachandran, Boston Univ.
8. “Fiber-based cavity ring down spectroscopy” by H. P. Loock, Queen’s Univ.

Figure 2 shows the statistics of the presented papers categorized according to the object to be measured [2]. As seen from the figure, the number of papers on the measurement of mechanical parameters was largest and

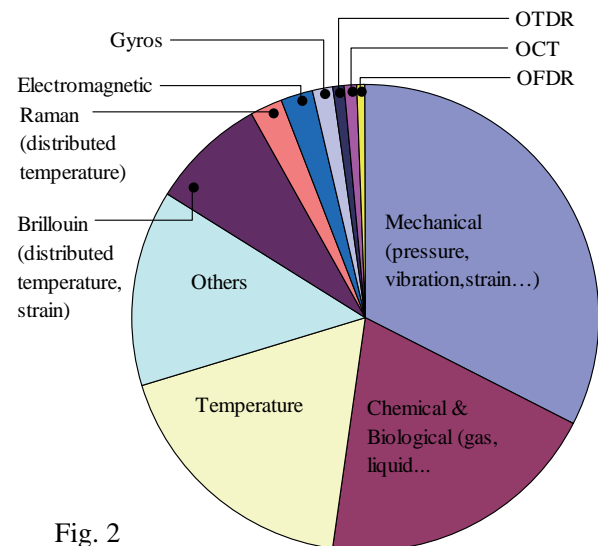


Fig. 2

those on temperature as well as chemical and biological parameters followed, which was in the same tendency as in the last several OFS conferences.

### 6. Post-deadline papers

During the period of the conference, the Technical Program Committee meeting was held to select the papers from the submission for the post-deadline paper session. Although 7 papers were selected, 5 papers were presented in the session. Because four papers were from two groups (two from each) and the time was limited for the session, two papers were not presented.

### 7. Exhibition

The exhibition accompanying OFS21 was held on 17 and 18 May at the Ottawa Convention Center in conjunction with the Photonics North Product Showcase and International Meeting on Information Photonics (IP2011).

### 8. Next OFS

The next OFS (OFS22) will be held in Beijing, China on October 14–19, 2012.

### 9. References

- [1] Eds. W. J. Bock, et. al., Proc. of SPIE vol. 7753, 21<sup>st</sup> International Conference on Optical Fiber Sensors, 15-19 May 2011, Ottawa, Canada.
- [2] Y. Tanaka, “Report on the 21<sup>st</sup> International Conference on Optical Fiber Sensors,” Proc. of 47<sup>th</sup> Meeting on Lightwave Sensing Technol. (JSAP), Tokyo, vol. 47, pp. 85-90, 14-15 June 2011.

## IEICE-CS Conferences Calendar

Date	Conference Name	Location	Note
06 May – 09 May 2012	The 2012 IEEE 75th Vehicular Technology Conference (VTC2012-Spring)	Yokohama, Japan	Submission deadline: Sept. 30 2011
05 Mar. - 06 Mar. 2012	World Telecommunications Congress 2012 (WTC2012)	Miyazaki, Japan	Submission deadline: closed
01 Feb. - 03 Feb. 2012	The 26th International Conference on Information Networking (ICOIN2011)	Bangkok, Thailand	Submission deadline: closed
28 Nov. - 01 Dec. 2011	29th AIAA International Communications Satellite Systems Conference (AIAA ICSSC-2011)	Nara, Japan	Submission deadline: closed
25 Oct. - 28 Oct. 2011	2011 International Symposium on Antennas and Propagation (ISAP2011)	Jeju, Korea	To be held <b>soon</b>
04 Oct. – 07 Oct. 2011	15th International Conference on Convergence in Services, Media and Networks (ICIN2011)	Berlin, Germany	To be held <b>soon</b>
02 Oct. - 05 Oct. 2011	The 17th Asia-Pacific Conference on Communication (APCC2011)	Kota Kinabalu, Malaysia	To be held <b>soon</b>
11 Sept. - 14 Sept. 2011	Forth International Workshop on Wireless Distributed Networks (WDN2011)	Toronto, Canada	To be held <b>soon</b>
08 Aug. - 10 Aug. 2011	AsiaFI2011 Summer School & Future Internet Architecture Workshop (AsiaFI2011)	Daejeon, Korea	Done
08 Aug. - 10 Aug. 2011	IEEE International Workshop on Electromagnetics: Applications and Student Innovation Competition (IEEE iWEM2011)	Taipei, Taiwan	Done
02 Aug. - 04 Aug. 2011	The 2011 International Conference on Advanced Technologies for Communications (ATC2011)	Da Nang City, Vietnam	Done
31 Jul. – 05 Aug. 2011	International Geoscience and Remote Sensing Symposium 2011 (IGARSS2011)	Sendai, Japan	Done
04 Jul. - 08 Jul. 2011	16th Opto-Electronics and Communications Conference (OECC2011)	Kaohsiung, Taiwan	Done
04 Jul. 2011	16th Opto-Electronics and Communications Conference (OECC2011-WSII)	Kaohsiung, Taiwan	Done
29 June. - 01 Jul. 2011	The 10th International Symposium on Autonomous Decentralized Systems (ISADS2011)	Kobe, Japan	Done
05 June - 09 June 2011	4th International Workshop on the Network of the Future (FutureNet IV)	Kyoto, Japan	Done
05 Jun.- 09 Jun. 2011	International Conference on Communications 2011 (ICC2011)	Kyoto, Japan	<b>Reported on this issue</b>
01 Jun. - 03 Jun. 2011	Korea-Japan Workshop on Beyond 100G (KJWS-B100G)	Jeju, Korea	<b>Reported on this issue</b>
31 May. - 03 Jun. 2011	Cognitive Radio Oriented Wireless Networks and Communications (CrownCom2011)	Yokohama, Japan	<b>Reported on this issue</b>
19 May. - 20 May. 2011	The 3rd Sarajevo Technology Forum 2011 (STF2011)	Sarajevo, Bosnia and Herzegovina	<b>Reported on this issue</b>
15 May. - 19 May. 2011	21st International Conference on Optical Fiber Sensors (OFS-21)	Ottawa, Canada	<b>Reported on this issue</b>
27 Mar - 30 Mar. 2011	The 5th International Symposium on Medical Information and Communication Technology (ISMICT 2011)	Montreux, Switzerland	<b>Reported on this issue</b>

\*: Please confirm with [the following IEICE-CS web site](http://www.ieice.org/cs/conf/calendar.html) for the latest information.

<http://www.ieice.org/cs/conf/calendar.html>





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<b>B</b> (Communications)	EB (English) B (Japanese)	Fundamental Theories for Communications, Devices/Circuits for Communications, Transmission Systems and Transmission Equipment for Communications, Optical Fiber for Communications, Fiber-Optic Transmission for Communications, Switching for Communications, Switching for Mobile Communications, Network, Network Management/Operation, Internet, Wireless Communication Technologies, Terrestrial Radio Communications, Satellite Communications, Optical Wireless Communications, Antennas and Propagation, Electromagnetic Compatibility (EMC), Sensing, Navigation, Guidance and Control Systems, Energy in Electronics Communications, Terminals for Communications, Multimedia Systems for Communications, Broadcast Systems, Integrated Systems for Communications, Space Utilization Systems for Communications
<b>C</b> (Electronics)	EC (English) C (Japanese)	Electromagnetic Theory, Lasers, Quantum Electronics, Optoelectronics, Microwaves, Millimeter-Waves, Ultrasonic Electronics, Electronic Circuits, Electronic Materials, Organic Molecular Electronics, Electronic Components, Electromechanical Devices and Components, Semiconductor Materials and Devices, Integrated Electronics, Electron Tubes, Vacuum and Beam Technology, Electronic Displays, Superconducting Electronics, Storage Technology, Electronic Instrumentation and Control
<b>D</b> (Information and Systems)	ED (English) D (Japanese)	Computation and Computational Models, Automata and Formal Language Theory, Algorithm Theory, Complexity Theory, Computer Components, VLSI Systems, Computer Systems, Fundamentals of Software and Theory of Programs, System Programs, Software Engineering, Database, Contents Technology and Web Information Systems, Data Mining, Networks, Dependable Computing, Application Information Security, Distributed Cooperation and Agents, Artificial Intelligence and Cognitive Science, Human-computer Interaction, Office Information Systems, e-Business Modeling, Educational Technology, Rehabilitation Engineering and Assistive Technology, Pattern Recognition, Speech and Hearing, Image Processing and Video Processing, Image Recognition, Computer Vision, Computer Graphics, Multimedia Pattern Processing, Natural Language Processing, Biocybernetics, Neurocomputing, Biological Engineering, Music Information Processing, Kansei Information Processing, Affective Information Processing
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To foster the cooperation between the Sister Society and the IEICE Communications Society (IEICE-CS), the Sister Society agreement enables members of each institution to become members of both societies by granting special annual fees.

A 10% - 20% discount\* of the annual fees will be granted to the sister society members to become the IEICE-CS overseas members. The discounted fees will be applied for the individual members when the new membership is starting or the current membership is renewing. The details of this discount can be found in the following IEICE-CS Web page:

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\* The discount does not apply to the optional items and services i.e. “Additional Society”, “Additional Transactions of paper version” and “Rapid Mailing Service”.

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URL <http://www.ieice.org/eng/member/OM-appli.html> E-mail [member@ieice.org](mailto:member@ieice.org) FAX +81-3-3433-6659

◆ **Please type or print in English. The deadline for submitting application form is the 1<sup>st</sup> day of every month.**

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First name Middle name Last name  Female

Prof.  Dr.  Mr.  Ms. Place of birth: \_\_\_\_\_ Date of birth: \_\_\_\_\_  
Day Month Year

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Name of Company/School/College Department/Section

\_\_\_\_\_  
Street City State/Province

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Postal code Country

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The highest academic degree:  Ph.D.  Masters  Bachelors  Others: \_\_\_\_\_

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Card number:

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Year Month

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I recommend this applicant for IEICE membership.

(Director of Planning and Member Activities, IEICE-CS)

\_\_\_\_\_  
Endorser's name Membership number Endorser's signature Date

## From Editor's Desk

### ● **IEICE Society Conference in Sapporo**

The IEICE Communications Society (CS) Conference will be held at Hokkaido University in Sapporo City on September 13 (TUE) to 16 (FRI). On the first day of the conference, we will have the forth CS Welcome Party with some food and drink sponsored by the IEICE CS. It's free. In the party, we will have poster sessions from companies and research institutes. Young talented researchers from main companies will have nice short speeches in communications area, and you can exchange ideas and views in an informal manner under friendly atmosphere. We hope that many IEICE-CS members, especially student members, will really have a very nice time in the party. Please attend the next conference in Sapporo to enjoy the party!

IEICE Global News Letter Editorial Staff

#### Editorial Staff of this issue

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**IEEE**



**VTC2012-Spring**

**YOKOHAMA**

*Connecting the Mobile World*

**IEEE 75<sup>th</sup> Vehicular Technology Conference  
6 – 9 May 2012 Yokohama, Japan  
Submissions by 30 September 2011**



In May 2012, IEEE VTC Spring will be held in Yokohama, Japan. VTC is the premier semi-annual flagship conference of the IEEE Vehicular Technology Society (VTS) that gathers researchers, industry professionals and academics dedicated to innovation across the broad field of wireless technologies. You are invited to submit papers in any areas of wireless communications, networks and applications. Potential topics are solicited in, but not limited to the following categories:

- Ad hoc, Mesh and Sensor Networks
- Antenna and Propagation
- Cognitive Radio and Spectrum Sensing
- Cooperative Communications, Distributed MIMOs and Relaying
- Green Networks
- Multiple Antenna Systems and Space-Time-Frequency Processing
- Positioning, Mobile Applications and Services
- Transmission Technologies
- Transportation
- Vehicular Electronics and Telematics
- Wireless Access
- Wireless Networks

**General Co-Chairs:**

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**30 September 2011**

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# IEEE, IET 8<sup>th</sup> International Symposium on COMMUNICATION SYSTEMS, NETWORKS AND DIGITAL SIGNAL PROCESSING (CSNDSP 2012)

18-20 July 2012, Poznan University of Technology, Poznań, Poland

Hosted by: Chair of Communication and Computer Networks, Poznan University of Technology, Poland

[www.csndsp.com](http://www.csndsp.com) Call for Papers [www.csndsp2012.pl](http://www.csndsp2012.pl)

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## Call for Papers

CSNDSP has now been recognised as a forum for the exchange of ideas among engineers, scientists and young researchers from all over the world on advances in communication systems, communications networks, digital signal processing and other related areas and to provide a focus for future research and developments. The organising committee invites you to submit original high quality papers addressing research topics of interest for presentation at the 8<sup>th</sup> symposium which will be held in the beautiful city of Poznań in Poland in July 2012.

Papers are solicited from, but not limited to the following topics:

### Communications Systems & Theory

Adaptive modelling  
Antennae  
Chip design for communications  
Coding theory & techniques  
Communications for disaster management  
Demodulation  
Fading channels  
Filtering techniques  
Microwave Communications  
Modulation  
Multiplexing  
New techniques in RF-design & modelling  
Noise reduction  
Radio communications  
Satellite & Space communications  
Speech technology  
Synchronization  
Transmission diversity  
**Communications Protocols**  
Communication standards  
Internet communications  
Internet protocols  
IP over ATM  
Routing protocols  
Transport control protocols  
**Networks & Network Management**  
Bandwidth management  
Buffering  
Channel allocation

Congestion & admission controls  
Digital integrated services  
Intelligent networks  
Modelling and simulation techniques  
Network capacity analysis  
Network management & operation  
Network planning & deployment  
Packet scheduling  
QoS, Reliability & performance modelling  
Queueing theory  
Regulatory issues  
Routing issues & Multicasting  
Security & privacy  
Signalling  
Switching systems & networks  
Teletraffic models & traffic engineering Traffic control  
Wavelength assignment  
**DSP**  
Adaptive signal processing  
Digital & Multirate signal processing  
DSP algorithms & applications  
DSP implementation  
Multidimensional signal processing  
Optical signal processing  
Signal processing for storage  
VLSI for communications & DSP  
**Photonics**  
Free space optics  
High-speed devices for photonics

Optical buffering  
Optical fibre communications  
Optical MEMS for lightwave networks  
Optical routing  
Optical signal processing  
Optical switching  
Photonic networks  
Radio over fibre  
RF/Optical wireless communications  
**Wireless Networks & Devices**  
3G/4G network evolution  
Ad-hoc & Sensor networks  
Disconnected & weakly connected operation  
Interworking wireless & wireline networks  
Location-based Services & Positioning  
MEMO & FORM systems  
Mobile agents  
Mobile computing for e-commerce  
Mobility management  
Multimedia & broadband services  
Multimedia QoS support & middleware  
Performance of end-to-end protocols  
Proxies & middleware  
Roaming  
System-level energy management  
Transport layer issues  
Wireless broadband mobile access  
Wireless LAN/WAN  
Wireless/mobile networked applications

## Submission Dates:

- Full Paper due: 6<sup>th</sup> February 2012
- Notification of acceptance by: 9<sup>th</sup> April 2012
- Camera ready paper due: 7<sup>th</sup> May 2012

Contributions by MPhil/PhD research students are particularly encouraged.  
Papers may be presented in the following forms: ♦ Oral presentation ♦ Poster

**Registration Fees: 350.00 Euro for 1 person (2 papers),  
650.00/880.00 Euro for Group Delegates of 2 persons (4 papers) / 3 persons (6 papers),  
respectively.**

Includes: A copy of the Symposium Proceedings, Lunches and Symposium Dinner on 19<sup>th</sup> July.  
CSNDSP will offer a number of travel grants or registration fee waivers.

Poznań, the capital of Wielkopolska region, is the birthplace of the state of Poland. Being located at the intersection of important routes joining East and West Europe, Poznań has been the trade centre of Poland for 80 years. In the general opinion, Poznań is an example of thrift and its dwellers constitute a model for diligence. Since 1551 this all has been witnessed by two Poznań Goats which fight under the clock at the tower of the Town Hall at noon every day. There is a positive atmosphere felt for cultural activity and various forms of social life. Everyone can choose something for themselves from the rich offer of cinemas, theaters, museums, galleries and clubs, restaurants and pubs. In Poznań, there are international theater festivals such as Malta, Masks, Off Cinema or the International Young Audience Film Festival "Ale Kino".

The name "alternative theater heart" has permanently clung to the capital of Wielkopolska region. The city is also named "the music capital of Poland" in tourist guidebooks because of boys and men's choirs that are active here. The Henryk



Wieniawski International Violin Competition held here every 5 years.

Poznań is an important academic centre. There are 8 state universities and academies here. At these universities and academies, there are almost 150 thousand students. Poznań belongs to the leading centres of scientific research in Poland. Scientific research is carried out here not only by universities but also by the branches of Polish Academy of Sciences and numerous scientific research and development units. The research potential of this environment and the quality of scientific research work are recognized as one of the best in Poland and appreciated worldwide. It is shown by annual congresses and scientific conferences held in Poznań.

**Poznan University of Technology (PUT)** grew out of the State School of Mechanical Engineering which was established in 1919. Currently, it is one of the leading technical universities in Poland which has become one of the most recognized landmarks of the region and even the whole country. Poznan University of Technology offers education at 9 faculties, which altogether provide 23 fields of study. There are almost 20 thousand students studying at the Bachelor and Master levels, PhD, and postgraduate studies. Over 1200 academic teachers, including 240 professors and almost 900 administrative personnel and technical service staff, take care of their students' education.

It is the mission of Poznan University of Technology to educate highly qualified personnel in engineering in its broad sense, in a close relationship with scientific research, the development of technologies and innovations, in the cooperation with industry and community. The realization of such a mission allows for materialization of a vision of Poznan University of Technology as a leading national technical university, aspiring to be a partner of European universities with respect to the quality of education and the level of scientific research.

## CSNDSP 2012 General Information

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# A New On-line Journal

## IEICE Communications Express (ComEX)

I am pleased to announce that a new on-line journal, IEICE Communications Express (ComEX) will be launched in **June 2012**. ComEX is an all-electronic journal published by Communications Society of the Institute of Electronics, Information and Communication Engineers (IEICE).

ComEX covers the entire field of communications such as fundamental theory, optical communications, network, wireless communications, and multimedia systems.

The features of ComEX are:

- ✧ Papers are DOI (digital object identifier) attached and accessible through the Internet from all over the world.
- ✧ Papers with multimedia files such as movie files can be published.
- ✧ Papers are rapidly published. (up to 1,500 words, within almost one month after submission)
- ✧ Archives are available in the ComEX web pages.

For further information on ComEX, please visit the journal web site at

<http://www.comex.ieice.org/> .

All members of IEICE are invited to submit original papers on any aspect of communications, which have not been published elsewhere and are not currently under consideration for another journal or conference.

Materials contained in the first several years will be freely available for anyone to read, download, or print from the journal web site.

With best regards,

Prof. Nobuyoshi KIKUMA

Editor-in-Chief, IEICE Communications Express

# Discontinuance of Letter Category IEICE Transactions on Communications

We would like to announce the discontinuance of the letter category from IEICE Transactions on Communications. **May 31, 2012** is the last date upon which we will accept letter submissions. The new variant of IEICE Transactions on Communications will be published as a collection of full technical papers.

Letters should be promptly handled and so will be released in the newly published on-line journal, IEICE Communications Express (ComEX), starting from June 1, 2012. For further information on ComEX, please visit the journal web site at <http://www.comex.ieice.org/>.

Please be aware that letters on "Written discussions to submit opinions to articles published in the Transaction" will continue to be accepted by IEICE Transactions on Communications even after May 31, 2012.

With best regards,

Editorial Committee of IEICE Transactions on Communications