

***IEICE Communications Society* GLOBAL NEWSLETTER Vol. 29**

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Technical Committee on Software Radio 4th-year

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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 third year of TCSR since it was restructured to a permanent committee of IEICE in 2005. The steering committee members of TCSR in 2008 are shown below:

Chair: Jun-ichi Takada (Tokyo Inst. of Tech.)

Vice Chair: Kazuhiro Uehara (NTT),
Yukitoshi Sanada (Keio Univ.)

Secretary: Kei Sakaguchi (Tokyo Inst. of Tech.)
Takeo Fujii (Univ. of Electro-Commun.)

Assistant: Kenta Umebayashi (Tokyo Univ. of Agriculture and Tech.)
Tsuguhide Aoki (Toshiba Corp.)

TCSR organized five technical conferences, and a special section on the Transactions in fiscal year of 2008. This article summarizes the latest activities of TCSR.

2. The 1st technical conference in May 2008 (Standardization and panel discussion)

- ✓ Date: May 29~30, 2008
- ✓ Venue: Education & Culture Hall, Yokohama National University
- ✓ Papers: 18 (Invited papers: 3, Panel: 4, Regular papers: 11)
- ✓ Participants :108

Overview

The first TCSR meeting in 2008 took place again at Yokohama National University (YNU), Yokohama since the anniversary meeting for the establishment of regular technical committee was held on May 2005.

In the first day, there were 5 general presentations and 2 invited speeches about the standardization of mesh network (IEEE 802.11s) and network coding, respectively. Prof. Ryuji Kohno (YNU) who is a past chairman was awarded for his TCSR activity (Special Activity Award) and also invited to special memorial lecture. In the second day, 6 papers were presented in general session. In addition, active discussion, trend review about cognitive radio network, MAC/PHY technologies and cooperative network which attract growing interest, were made in the panel session.

• INVITED LECTURES

In this meeting, there were 2 invited lectures. Prof. Masahiro Morikura (Kyoto Univ.) gave a lecture on network coding which is now regarded as a promising cross layer technology. And then, Dr. Kazuyuki Sakoda (Sony Corporation) presented the overview of the standardization activity of IEEE 802.11s mesh network with relaying through the wireless link between base stations. He explained the practical issue of IEEE802.11s as well as the overview and fruitful discussion was also made.

Special Lectures

Prof. Ryuji Kohno (YNU) who won the Special Activity Award gave a special memorial lecture on his research life, activity and future vision entitled “Application of the advanced information and communication technologies to the medical and transportation systems - Request for the software defined radio and cognitive radio –.”

Panel Session

In panel session, the cognitive radio network connecting multiple heterogeneous was discussed from lower layer to upper layer including optimization of network resource. At first, Dr. Hiroshi Harada gave introductory talk about the trend of IEEE1900, ITU-R and cognitive network cloud. Second, Dr. Kazunori Takeuchi presented MAC sub-layer architecture of cognitive radio system for the mesh network. And then interesting talk about physical layer for cognitive mesh networks using MIMO was presented by Prof. Kei Sakaguchi. Prof. Hideki Ochiai gave an overview of cooperative communication techniques in a cognitive radio channel.

2nd TCSR Award Winners

In welcome reception, the second TCSR award winners were announced and awarded as follows.

- Technical Special Award: Seiichi Sampei (Osaka Univ.)
- Best Paper Award: Kentaro Nishimori (NTT)
- Young Investigator Award: Kimtho Po (Tokyo Tech.)

• GENERAL SESSION

In general session, 11 papers were presented. The topics were mainly as.

- Interference mitigation scheme
- Cooperative sensing
- Cyclic detection
- Narrow-Band signal detection using auto-correlation
- Fractional Sampling-MIMO-OFDM
- Coexistence between broadcasting and WRAN

3. The 2nd technical conference in July 2008 (Technical Exhibition and Joint workshop with SDR Forum and IEEE SCC41)

- ✓ Date : July 31- August 1, 2008
- ✓ Topics : Technical Exhibition and Joint workshop with SDR Forum and SCC41
- ✓ Venue : NICT, Koganei
- ✓ Number of papers : 19 (Regular papers: 9, Technical exhibition : 6, Invited papers in the workshop : 4)
- ✓ Number of Exhibitions : 11
- ✓ Number of participants : 215

Introduction

The second SR technical conference was held at the National Institute of Information and Communications Technology (NICT) in Koganei Tokyo, from July 31 to August 1. On the first day, there were general sessions of nine papers and presentations of six technical exhibitions. In the morning on the second day, there were technical exhibitions, which were constantly held in the SR technical conference. Before the technical exhibition, the interview of the presenters was performed for the introduction of individual exhibitions. In the afternoon on the second day, we had the joint workshop with the SDR Forum and the SCC41.

A welcome party was held in the evening on the second day. The foreign members of the SDR Forum and the SCC41 attended the party, which was excellent and enjoyable.

General Sessions

There were nine presentations. Several presentations on the important technologies of cognitive radio were introduced, which include the primary signal detection scheme, the evaluation of throughput simulation, the performance evaluation of environment-adaptive OFDM, and the implementation and evaluation of the cognitive radio network. We attended some valuable presentations regarding the software defined radio and related technologies, which include the effective SDR software porting for hardware platforms, the efficient memory access system for array processor, and the broadband receiver based on ALU array LSI.

Furthermore, there were useful presentations such as the radio propagation experiment in the VHF band, and the fairness evaluation method and utilization function for user-centric radio resource usage.

This conference was characterized by the presentation of a wide range of studies from the system investigation to the software and hardware considerations.

Subsequently, there were six presentations regarding the technical exhibitions, which were held on the second day. Active discussions were conducted before the exhibitions were demonstrated.

Technical Exhibition

There were 11 exhibitions, and Figure 1 shows a photograph of a presentation at the technical exhibition. Before the exhibition, a short introduction to exhibited articles was given in interview style. There were not only presentations, but also many discussions among the presenters and the audience.

Exhibitions include the cognitive prototype system with high-accuracy interference detection and interference avoidance functions, the experimental investigation of WLAN system with fractional sampling, the FPGA implementation of Gaussian multicarrier transceiver, the spectrum sharing technique using channel occupancy rate, the cognitive MIMO mesh relay node, the standardization of smart antenna system for SDR network spectrum sensing based on feature detection, the reconfigurable RF front-end (multi-band power amplifier and band-tunable isolator), the spectrum sensing evaluation system, and the cognitive wireless network (cognitive wireless clouds). The members of the SDR Forum and the SCC41 joined the exhibitions and held active discussions full of international flavor.

Joint workshop with SDR Forum and SCC41

The technical committee on software radio (TCSR) organized the Joint Workshop with the SDR (Software Defined Radio) Forum and the IEEE SCC41 (Standards Coordinating Committee 41). Under the theme of the Dynamic Spectrum Access (DSA), R & D scenarios to commercialize DSA were presented by the NICT (Dr. Harada), the current activity status of the SDR forum by the SDR Forum (Mr. Pucker), and the standardization status of SCC41 and its working group P1900.3 by the chairperson of SCC41 (Ms. Guenin) and the chairperson of P1900.3 (Mr. Sicker). The meeting of the SCC41 was held in Tokyo until July 31, which was the day before the joint workshop.

Since the SDR Forum and the SCC41 have a close relationship with the TCSR in terms of the software radio and cognitive radio, there were many active questions and discussions such as the cooperative relationship with other standardization organizations (refer to Figs. 2-4).

Others

A welcome party was held after finishing the two-day technical conference. The number of attendees was about forty, which included members of the SDR Forum and the SCC41 from overseas (refer to Fig. 5). This enabled us to forge international relationships with the foreign authorities of the organizations concerned, which will be useful for the sharing and exchange of information.



Fig. 1 Presentation at the technical exhibition



Fig. 2 Joint workshop with SDR Forum and SCC41



Fig. 3 Presentation by SDR Forum (Mr. Pucker)



Fig. 4 Presentation by SCC41 (Ms. Guenin)



Fig. 5 Welcome party with the participation of the members of the SDR Forum and SCC41 (from left to right) Dr. Harada (NICT), Ms. Guenin (SCC41), Mr. Pucker (SDR Forum), Mr. Sicker (P1900.3)

4. The 3rd technical conference in October 2008 (Workshop on Wireless Distributed Networks)

- ✓ Date : Oct. 22-24, 2008
- ✓ Topics : Wireless Distributed Networks
- ✓ Venue : Okinawa industry support center
- ✓ Number of papers : 100 (Invited papers: 4, Panel: 9, Regular papers: 87)
- ✓ Number of participants : 290 (1st day 123, 2nd day 84, 3rd day 83)

The 3rd technical conference on October of TCSR was held in Okinawa with jointly organizing among TCAN (Ad-hoc Network), TCRCS (Radio Communication System), TCUSN (Ubiquitous Sensor Network) and TCSR as a topic of “Wireless Distributed Networks.” This conference is the first workshop on wireless distributed networks on this field by jointly organizing four TC. The participants are aggressively discussed over the wireless distributed networks beyond the framework of each TC.

Special Session on Wireless Distributed Networks

This conference is jointly organized by four technical committees for a topic of “Wireless Distributed Networks.” The middle day of this conference is called “Special Section on Wireless Distributed Networks” in which the papers related subject topics of wireless distributed networks are programmed together beyond the framework of each technical committee. In this section, totally 18 papers are submitted. The morning session is organized by single session including invited papers and the afternoon session is separated into two parallel sessions as the higher layer session and lower layer session. The presented papers include the topic of ad-hoc network, multi-hop network, multi-hop relay, cognitive network, sensor network, network coding, cooperative MIMO and so on. The presenters and participants had deeply discussion and sometimes the assigned time for presentation was exceeded. We can understand rapidly increasing the attention in this field.

Invited Papers

In this conference, one invited speaker is selected from each of organized technical committee. Then totally four invited speakers present the latest hot topic related to wireless distributed networks. TCSR invites Prof. Mikio Hasegawa from Tokyo University of Science. His presentation title is “Cognitive Wireless Networks and Autonomous Optimization Algorithms.” He summarized the distributed optimization algorithms based on neural networks with easy understanding. TCAN invites Prof. Yasushi Fuwa from Shinsyu University. His presentation title is “Regional Protection System using a Wireless Ad-Hoc Network.” He presented a wireless network contributing to a regional safety system. TCRCS invites Prof. Hidekazu Murata from Kyoto University. His presentation title is

“Transmission Techniques for Distributed Cooperative Communication in Wireless Networks.” He presented the latest research topics about cooperative distributed wireless communication networks in which plural distributed terminals are cooperated together for improving the communication performance. Finally, TCUSN invites Prof. Shiro Tamaki from the University of Ryukyu. His presentation title is “Remote Sensing and Control System based on ICT, and the Practical Use Plan to the Agriculture.” He presented information and communication technologies based on Okinawa community.

Panel Discussion in Evening Session

At the night of the second day of conference, the evening session with panel session titled “Research Approach for Wireless Distributed Networks of Each Technical Committee.” Prof. Takaya Yamazato organized this panel. Each Technical Committee selects one presenter for discussion. TCAN selects Prof. Shiro Sakata from Chiba University, TCRCS selects Prof. Takeo Ohgane from Hokkaido University, TCUSN selects Dr. Masayoshi Ohhashi from ATR, and TC SR selects Prof. Jun-ichi Takada from Tokyo Institute of Technology. Presentation from each panelist and discussions with all participants are held. There are lots of questions and comments from the floor and friendly discussion was held.

Panel Discussion “Heterogeneous Networks”

On the last day of the conference, TCSR planned a panel titled “Heterogeneous Networks” organized by Prof. Seiichi Sampei from Osaka University. We select five panelists, Prof. Kei Sakaguchi from Tokyo Institute of Technology, Dr. Takashi Shono from Intel, Mr. Takayuki Yoshimura from Softbank, Dr. Onur Altintas from Toyota ITC, and Dr. Hiroshi Harada from NICT. Academic and practical discussion was held about heterogeneous networks which utilizes integrated multiple wireless systems. Application to femto cell and ITS are also discussed.

Regular Session

In this conference, 87 papers are presented including 18 papers in special session from four technical committee. In particular, many papers related to cognitive radio was presented in the session of TCSR.

5. The 4th technical conference in January 2009

- ✓ Date: January 22-23, 2009
- ✓ Venue: Kyodai Kaikan (Kyoto University Hall)
- ✓ Number of Papers: 19 (Invited papers: 6, Regular papers: 13)
- ✓ Number of participants: 92 (1st day: 48, 2nd day: 44)

- ✓ Focused topic: Cognitive radio

The 4th SR technical conference was held with the focused topic of cognitive radio. Active discussions were continued in particular in the invited sessions, and the closing time was far behind the schedule.

Joint workshop with E3 was initially planned, but has been postponed due to the scheduling.

Invited Presentations on the 1st day

There were 3 invited presentations on the 1st day. The first speaker was Mr. Shinji Ide of MIC. He reported the MIC policy toward the realization of future generation mobile communication systems. It covered the frequency allocation strategy for advanced mobile and wireless systems, introduction of 3.9G/4G/BWA systems, and R&D of future mobile systems. He mentioned that the cognitive radio technology has been investigated under the framework of R&D for advanced usage of frequency spectrum, and discussed in Radio Wave Policy Panel. Dr. Hitoshi Yoshino of NTT DoCoMo provided the current status of ITU-R studies on cognitive radio systems. He has extensively reviewed the whole figure about the discussion of cognitive radio in ITU-R, European initiatives for the new spectrum allocation of cognitive pilot channel, resolutions of WRC-07 and questions toward WRC-11, discussion on the regulatory issues in WP1B, study on software defined radio and cognitive radio systems by WP5A (ex. WP8A). Prof. Satoshi Denno of Kyoto University presented the challenge for multimode receivers with a single RF chain. He described the dual-frequency conversion heterodyne receiver with a single RF chain, and the challenges in the image suppression and hardware implementation.

Technical Session on the 1st Day

Prior to the invited session, a special session on the dynamic spectrum access (DSA) was held. Four presentations covered the partial spectrum transmission with low PAPR, load-balancing in DSA network, spectrum sharing with joint power control and spectrum aggregation, control of contention window size considering channel occupancy.

Invited Presentations on the 2nd Day

There were 3 invited presentations on the 2nd day. The first one was given by Prof. Murata in Kyoto Univ. His talk was about the research on a spectrum sharing scheme that takes the social significance of the communications into account. His scheme controls the transmission power according to the priority-utility function and the required signal-to-interference-and-noise (SINR) ratio. Prof. Morikura gave the second talk about the spectrum sharing issues regarding 5GHz band wireless access systems. His talk reviewed the spectrum-sharing issues which were discussed for the 5GHz bands and suggested some solutions for future

spectrum-sharing issues. The final invited speaker in this session was Dr. Miura in ATR. He talked about a multi-hop communication scheme for inter-vehicle communications. His scheme was based on a spread ALOHA access scheme to achieve high reliability and low latency in the real traffic environment.

Technical Session on the 2nd Day

Two technical sessions were held on the 2nd Day. Technical reports such as signal processing in an OFDM receiver, signal constellation recognition for a cognitive radio receiver, or location estimation of access points for a cognitive radio system were presented in the morning session. The special session about “sensing” was organized in the afternoon and four technical reports were presented.

6. The 5th technical conference in March 2009 (Workshop on Mobile Communications cosponsored with TCs on AN, MoMuC, RCS)

- ✓ Date : March 4-6, 2009
- ✓ Topics : Workshop on Mobile Communications
- ✓ Venue : Yokosuka Research Park
- ✓ Number of papers : 119 (TCSR 21: Organized papers: 6, Regular papers: 15)
- ✓ Number of participants : 355 (1st day 130, 2nd day 140, 3rd day 85)

The SR technical conference on March was held at YRP (Yokosuka Research Park) from March 4th to 8th cosponsored with TCs on AN, MoMuC and RCS as workshop on mobile communications. Every year, a lot of papers are submitted to this workshop. In this year, 119 papers were presented throughout the three day workshop. The number of the presentations from TCSR was 21 including 6 organized papers. The organized papers are invited based presentations of the field of recent research topics discussed in TCSR. High quality 15 regular papers are also presented and discussed in this conference.

Regular Sessions

The regular papers submitted to TCSR were presented on the first day (13 papers) and the second day (2 papers). The papers including the hardware field were presented from Keio University and Tokyo Institute of Technology. Keio University presented the paper of fractional sampling. Tokyo Institute of Technology presented two papers of the IQ imbalance compensation method and GNU radio which is attracted researchers' attention as one of the testbed of cognitive radio in these days.

Many papers related to the cognitive radio were presented in the workshop. NICT presents the architecture of spectrum sensing considered for

international standard IEEE P1900.6. ATR presents the three papers related to a national project funded by Ministry of Internal Affairs and Communications. In this presentation, the research of the multiple wireless systems shares the ISM band is reported. Ibaraki University presented the paper of dynamic spectrum access with applying the overlapped FFT. Tokyo Institute Technology presented a spectrum sensing method and Tokyo University of Science presented a power control method for spectrum sharing by estimating the modulation of the primary system, and Tokyo Institute of Technology presented a study of spectrum sensing. The University of Ryuky presented the paper of remote control system for island area by using a fixed wireless access (FWA).

Organized Regular Session

The organized regular session is a special session organized by TCSR for introducing the recent research topics discussed in TCSR during the fiscal 2008. The first organized regular session was held on last year so that this year session is a second organized session. We invited six presenters for giving us recent research results of this year. The name and topic of presenter presented in this year is shown below,

- ✓ Standardization status of IEEE P1900.6: Dr. Masayuki Ariyoshi (NEC)
- ✓ White space type cognitive radio: Ms. Tazuko Tomioka (Toshiba)
- ✓ Wireless sensor networks: Dr. Shusaku Shimada (Yokogawa)
- ✓ Multi-band RF circuit: Dr. Shoichi Narahashi (NTT Docomo)
- ✓ Distributed Cooperative Wireless Networks: Prof. Kei Sakaguchi (Tokyo Institute of Technology)
- ✓ Cognitive MAC protocol: Prof. Takeo Fujii (The University of Electro-Communications)

A large number of audiences attends this session and it is very good chance to introduce the recent research topics discussed in TCSR.

7. Special Section of IEICE Transactions on Communications (Japanese Edition) in November 2008

The Special Section on Cognitive Radio for Ubiquitous Network Society (Japanese Edition) has been published on November 2008 issue of IEICE Transactions on Communications. 12 papers and 1 letter have been submitted. After fair and square review, 4 invited papers related to elemental technologies for cognitive radio, cognitive radio from regulatory design and economic view points, multi-band multi-mode transceivers and cognitive radio technical standard in U.S.A., 4 papers and 1 letter were accepted for publication. These papers cover topical subjects such as cognitive network, spectrum sharing, spectrum sensing, distributed optimization, and

enabling technologies.

8. Conclusion

Technical committee on software radio (TCSR) held five conferences in fiscal year 2008. 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, SDR and IEEE SCC41. We have aggressive discussion in the joint workshop. TCSR is also interested in a technical exhibition of SDR equipments for exchanging the related information of hardware. We have one Technical Exhibition in July. In addition, we had a joint technical conference with TCAN, TCRCS, and TCUSN and the topic in the joint conference is “wireless distributed networks.” in October. In FY 2009 we will plan five conferences as follows:

-May 2009: Niigata Univ. (Joint workshop with SDR Forum)

-July 2009: Tokyo Inst. Of Tech. (Technical exhibition).

-Oct. 2009: Tohoku Univ. (Joint Workshop on Wireless Distributed Networks cosponsored with TCs on AN, USN)

-Jan. 2010: Univ. of Electro-Commun. (Joint workshop with E3)

-March 2010: Yokosuka Research Park (Workshop on Mobile Communications cosponsored with TCs on AN, MoMuC, RCS).

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 2008.

2. Technical meetings

The schedule from April 2009 to March 2010 consists of eight technical meetings and one workshop (Table 1). Several of these meetings are co-located with Optical Communication Systems (OCS), Photonic Network (PN), Radio Communication Systems (RCS), Communication Systems (CS) and Information Networks (IN), Information Communication Management (ICM), and Communication Quality (CQ) committees. In addition, the May technical meeting was co-sponsored by the International Teletraffic Congress (ITC) Japan Committee chaired by Dr. Hiroshi Saito of NTT.

Recently, presented papers have mainly focused on technologies that support the next generation network (NGN), new generation networks, ad-hoc and P2P networking, traffic control/measurement, quality of service (QoS), and security issues. At each technical meeting, we host lectures by invited speakers who are experts in their fields. During this fiscal year, we have

had invited lectures on network performance evaluation and simulation, service oriented architecture, power line communication, P2P, advanced Ethernet, new generation networks, and other topics. The number of papers presented at our meetings in recent years is shown in Fig. 1. In general, the number of papers is increasing, but that from the telecommunications industry is almost same.

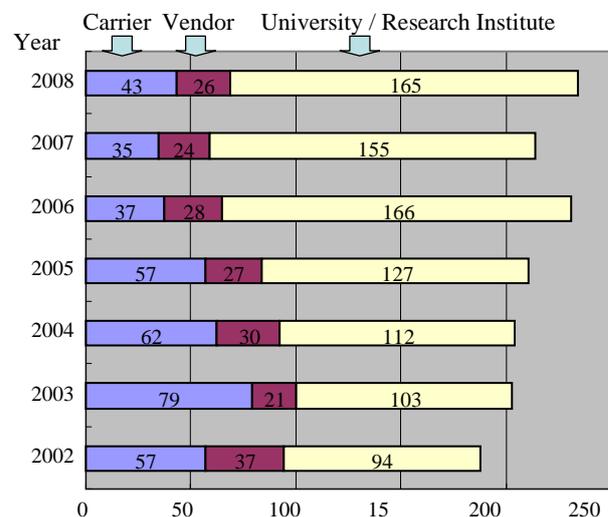


Fig. 1: Number of papers.

Table 1. Technical meeting schedule for fiscal 2009

Date	Location	Theme	Co-location with
Apr 16-17	Shibaura Institute of Technology (Tokyo)	Traffic Modeling, Network Evaluation, Performance Control, Traffic Engineering	ITC Japan Committee
May 21-22	Hiroshima City University (Hiroshima)	Advanced Protocol and Network Control (Application level routing, QoS and Path Control, P2P, P4P, SIP), Network System Architecture (Interface, Hardware, Software)	
June 25-26	Nagasaki Museum of History and Culture	Photonic Network System, Optical Control, Optical Switching, WDM, Multi-layer, Next Generation Transport	OCS, PN
July 16-17	Hokkaido University (Hokkaido)	Fixed/Wireless Network, Hand Over, Distributed MIMO, Mobile Ad-hoc Network	RCS
August 3-4	Asuka Institute of Kansai University (Nara)	Simulation Summer School	
September 10-11	Tohoku University (Miyagi)	Post IP Networking, Network Model, Internet Traffic, TCP/IP, Multimedia Communication, Network Management, Resource Management, Private Network, NW Security, etc	IN, CS
October 15-16	Prefectural University of Kumamoto (Kumamoto)	Network Architecture (Overlay, P2P, Ubiquitous Network, Active Network, NGN, New Generation Network), Grid	
November 12-13	Kanazawa Institute of Technology (Ishikawa)	Network Management, NGN Architecture, NGN Operation, Traffic Modeling, QoS Measurement, Overlay Networks, NGN Service Quality, general areas	CQ, ICM
December 10-11	Ehime University (Ehime)	Mobile Ad-hoc Network, Ubiquitous Network, Wireless Communication, security, Multi-Access Network	
January 28-29	Kyushu University (Fukuoka)	Network Software, Network Application, SOA/SDP, NGN, IMS, API, Grid	
March 4-5	Miyazaki Phoenix Seagaia Resort (Miyazaki)	General, NS+IN workshop (March 3-4)	IN

Since June 2003, we have fostered the work of young researchers who have presented papers at technical meetings by inviting them to give a follow-up talk some months later. We call these the “incentive lectures.” We invited 13 young researchers to give such lectures in the past year, and we will continue this activity.

3. Research Awards 2008

The Technical Committee selected recipients of the Network System Research Award from among more than 210 papers that were presented at monthly technical meetings from January to December 2008. The award is given to the authors of the three or four best papers of each year. The 2008 recipients attended the award ceremony at the NS/IN Workshop (Fig. 2) held in Okinawa in March 2009. The abstracts of the four papers that won awards in 2008 are shown below.

Kazumasa Matsuda, Hidehisa Nakayama, Masaru Dobashi, and Nei Kato: “A study of definition of traffic pattern on traitor tracing technology” [1]

Traitor tracing technology is one type of digital rights management (DRM) technology, which enables content distributors to observe and control content reception at the user-end. Since general tracing methods are required to run on user nodes, user tracking might be interrupted by user’s actions. On the other hand, if traitor tracing executes on routers, user tracking can be independent from individual users. However, this may cause the tracing function to run at all routers, hence the load at routers may drastically increase.

To resolve this problem, we have proposed a traitor tracing method for streaming content that makes use of traffic patterns extracted from only traffic volume information obtained from routers. Because variable bit rate (VBR) streaming traffic varies according to the always changing rate of the streamed video, each streaming content has its unique traffic pattern. The proposed method observes the traffic patterns from both server-side and user-side routers, and uses the similarity of those traffic patterns to track users. Because our method obtains traffic volume information from IP packet headers, it does not have to analyze the corresponding payloads. Therefore, the proposed method can alleviate the load of tracing at the concerned routers.

Our previous experimental results demonstrated that this method can track illegal users with high accuracy in a low jitter network environment. However, as the packet delay and jitter increase, the tracking accuracy decreases. In this paper, we propose a new robust method, which is more resilient to increasing packet delay and jitter. The proposed method is based on the sizes of the received packets instead of fixed time-slots. As a consequence, the tracing accuracy remains unaffected even in high-delay and high-jitter network environments compared with conventional methods.

Hideyuki Shimonishi, Yusuke Shinohara, Takashi Yoshikawa, and Atsushi Iwata: “Fast and scalable per-flow bandwidth control using bloom filter” [2]

Diversified requirements for network services and applications have increased the demand for per-flow QoS management. Current router technologies, however, have difficulties for 1) high-speed per-flow QoS management due to per-flow state maintenance and 2) flexible QoS management due to hardware implementation.

We propose a scalable and programmable QoS control scheme. The proposed scheme consists of control server programs, which monitor traffic conditions using packet sampling and calculate the per-flow packet discarding rate, and a hardware packet discarder for routers, which discards packets according to the calculated discarding rate sent from the control server. By installing appropriate programs into the server, a variety of active queue management schemes, DoS mitigation schemes, per-flow weighted fair queuing (WFQ) schedulers, and so on, are realized within the proposed mechanism. In addition to simplifying the router mechanisms, its flow table also needs to be minimized to handle 1 million flows at 10 Gbps; otherwise memory cost and power consumption become serious issues. Thus, the proposed mechanism compresses the flow table using a time series of bloom filters.

Our simulation results show that the proposed scheme achieves per-flow fairness that is comparable to deficit round robin (DRR) packet schedulers. Also, we found that the processing cost at the control server and the router are small enough for very high-speed links.

Hiroki Yahata, Takayuki Konishi, Kagenari Yamamoto, and Miki Yamamoto: “Directional antenna preferable routing protocol in multi-hop wireless networks” [3]

In multi-hop wireless networks, IEEE 802.11 DCF is generally used for MAC layer protocol, and the broadcast nature of request to send (RTS) and clear to send (CTS) frames brings inefficiency of usage of wireless communication channels. Directional antenna is one of the most promising ways for improving spatial usage of wireless channels. In multi-hop wireless networks, heterogeneous network configuration is general, which means each host is equipped with different network facilities. For antennas, it is also the case that not all hosts are equipped with directional antennas. In this situation, there co-exist directional antenna hosts and omni-directional antenna hosts in a multi-hop wireless network. We propose a new routing method in this co-existence scenario, which preferentially chooses directional antenna hosts as relay nodes. When all hosts simply choose directional antenna hosts as relay nodes, this deterministic relay node selection leads to a concentration of generated traffic to the directional antenna hosts and performance degradation. For small deployment of directional antennas, the concentration of traffic to a small number

of directional antenna hosts should be prevented. For large deployment, a large portion of traffic can be directed to directional antenna hosts because there should be plenty of directional antenna hosts and traffic can be distributed to these hosts. From these observations, we propose probabilistic preferable selection of directional antenna hosts. Our proposed routing method is based on ad hoc on-demand distance vector (AODV) protocol and a host equipped with omni-directional antenna broadcast received route request (RREQ) with probability which is adaptively determined by the deployment of directional antennas. This dynamic adjustment of flooding probability leads to a moderate concentration of generated traffic to directional antenna hosts. Simulation results show that our proposed routing protocol improves throughput performance from two viewpoints. One is reduction of control frames by probabilistic flooding at omni-directional hosts in the case of small deployment ratio of directional antennas, and the other is efficient spatial usage by directional antennas in the case of large deployment ratio of directional antennas. Therefore, our proposed routing protocol greatly improves throughput performance for a wide range of directional antenna deployment ratios.

Noriaki Kamiyama, Tatsuya Mori, Ryoichi Kawahara, and Haruhisa Hasegawa: “Performance evaluation of ISP-operated CDN” [4]

Recently, the number of users downloading video content on the Internet has dramatically increased, and it is highly anticipated that downloading large rich content, such as movie files, will become a popular use of the Internet in the near future. The transmission bandwidth consumed by delivering rich content is enormous, so it is urgent for ISPs to design an efficient delivery system minimizing the amount of network resources consumed. To efficiently deliver web content, a content delivery network (CDN) has been widely used. CDN providers collocate a large number of servers within multiple ISPs without being informed of detailed network information, i.e., network topologies, from ISPs. Minimizing the amount of network resources consumed is difficult because a CDN provider selects a server for each request based on only rough estimates of response time. Therefore, an ordinary CDN is not suited for delivering rich content. P2P-based delivery systems are becoming popular as scalable delivery systems. However, by using a P2P-based system, we still cannot obtain the ideal delivery pattern that is optimal for ISPs because the server locations depend on users behaving egotistically. To provide users with rich content economically and efficiently, an ISP should optimally provide servers with large storage capacities at a limited number of locations within its network. Therefore, we investigated the content deployment method, the content delivery process, and the server allocation method that are desirable for this ISP-operated CDN (I-CDN). We evaluated the I-CDN using 31 topologies of



Fig. 2: Research award recipients with chair Prof. Yamamoto.

commercial ISP backbone networks. Providing the I-CDN over ladder-type networks is effective in reducing the average hop length of delivery flows and the amount of traffic consumed. Although the total link cost is reduced in ladder networks, the average hop length of flows tends to increase. Reducing the hop length is important when delivering rich content in ladder networks. By applying the I-CDN on ladder networks, we can effectively use the link resources while suppressing the total cache server cost.

4. Future Plans

The Technical Committee will organize an open Symposia at the IEICE Conferences, one of which will be on “Issues and solutions on the technology for All IP Network-based next generation network” at the IEICE Society Conference in September 2009.

(For more information, please see our home page.

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

References

- [1] K. Matsuda, H. Nakayama, M. Dobashi, and N. Kato, “A study of definition of traffic pattern on traitor tracing technology,” *IEICE Tech. Rep.*, NS2007-135, March 2008.
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International Activity of Technical Committee on Antennas and Propagation

Jiro Hirokawa, Secretary to Tech. Committee on A.P.
Tokyo Institute of Technology



1. Introduction

The technical committee on antenna and propagation has been very active in international cooperation and academic exchange. This letter reports the recent international activities such as an overseas meeting in Macau in March 2009, a meeting joining Korean AP members in Otaru in July 2009, and ISAP 2009 (International Symposium on Antennas and Propagation) in Bangkok in October.

2. Oversea meeting in Macau in March

We had a technical meeting in Univ. of Macao from March 9 to 10. This overseas AP technical meeting was the fourth one following after the meeting held in Taiwan in March 2007. The number of the participants was 50 (33 from Japan, 6 from Hong Kong and 11 from Macau). We had 29 presentations including the invited talks by Prof. Chan of City Univ. of Hong Kong and Prof. Sawaya (President of the communications society) of Tohoku Univ. We could have fruitful exchange between Macau and Japan AP members. Especially the Macau AP members have great interest in the IEICE activities.

In the next year, we are planning to have an overseas technical meeting in Nanjing, China in May.

3. Meeting joining Korean AP members in July

We had a meeting joining Korean AP members in Otaru City Hall from July 8 to 10. We had the Korea-Japan AP joint session on July 9. Prof. Choi of Hanyang Univ. gave us the special talk on the design of an indoor repeater antenna with high isolation for WCDMA systems. Other Korean participants are Prof. Yoon of Yonsei Univ., Prof. Min of Korea Maritime Univ., Prof. Choo of Hongik Univ. and Prof. Kim of Gwangju Inst. of Science and Technology. They also had presentations to demonstrate their research activities in Korea.

We keep good and strong relations not only by welcoming Korean AP members to attend our meeting but also by sending Japanese AP members to the Autumn Microwave and Radio Conference in Korea every year. This year, Prof. Ito of Chiba Univ., Chair of AP Committee will lead a team to attend this conference on September 25.

4. ISAP 2009 in Bangkok in October

ISAP 2009 will be held in the imperial Queen's park hotel from October 20 to 23. The number of the submission is about 370. ISAP is held every year in one of Asian and Oceania countries. This year, many countries are contributing in the paper review. About 50 Japanese AP, EMT (electromagnetic theory) members are served as reviewers. The IEICE Transactions on Communications will publish "a special section on advanced technologies in antennas and propagation in conjunction with main topics of ISAP 2009" in October 2010. The editorial committee consists of AP members both from Thai and Japan. The deadline is on January 4, 2010. The detail can be found at the ISAP2009 web page (<http://www.isap09.org>). We are expecting many papers will be submitted to the special section.



Fig.1 Oversea meeting in Macau in March



Fig.2 Meeting joining Korean AP members in July

Report on the Ninth International Symposium on Autonomous Decentralized Systems (ISADS 2009)

Yoshiaki Kakuda
Hiroshima City University



1. Introduction

The Ninth International Symposium on Autonomous Decentralized Systems (ISADS 2009) was held in Athens, Greece on March 23 to 25, 2009. ISADS 2009 is sponsored by IEEE Computer Society, Information Processing Society of Japan (IPS), The Society of Instrument and Control Engineers of Japan (SICE) and The Institute of Electronics, Information and Communication Engineers, Japan (EIC).

2. Objective of ISADS 2009

Opportunities and challenges for realizing highly complex, efficient and dependable business and control systems have been steadily increasing, driven by the continuous growth in the power, sophistication, intelligence, adaptiveness, and openness of technologies applied in computing, communication, and control systems. Dynamically changing social and economic situations demand the next-generation of systems to be based on adaptive and reusable technologies and applications. Autonomous Decentralized Systems (ADS) concepts and technologies are well researched in the past sixteen years to address these challenges. The past eight successful symposia on ADS were held in 1993 (Japan), 1995 (USA), 1997 (Germany), 1999 (Japan), 2001 (USA), 2003 (Italy), 2005 (China) and 2007 (USA). While ISADS 2009 will primarily focus on advancements and innovations in ADS concept, technologies, and applications related to networked embedded systems, other topics, listed below, are also encouraged. The ISADS 2009 Technical Program Committee invites papers, workshop proposals and panel proposals on the topics of the Symposium that will foster interactions among researchers and practitioners in computer, communication, management and control as applied to networked embedded systems and other related fields from academia, industry and government.

3. ISADS 2009 Organization

ISADS 2009 organizers are as follows.

General Chair:

Stavros Koubias, University of Patras, Greece

Program Co-Chairs:

Dimitrios Serpanos, University of Patras and ISI, Greece

Yoshiaki Kakuda, Hiroshima City University, Japan

I-Ling Yen, University of Texas-Dallas, USA

The Program Committee consists of 45 members from Asia, Europe and Americas.

4. ISADS 2009 Program: Plenary Sessions

The plenary sessions in ISADS 2009 are as follows.

- Opening of ISADS chaired by Prof. S. Koubias, University of Patras, Greece

The General Chair and Program Co-Chairs introduced the outline and program of ISADS2009 (See Figure 1).

- Kanai Award Ceremony – Plenary Talk chaired by Prof. K. Mori, Tokyo Institute of Technology, Japan

The title of the talk is “P2P, DSM and Other Products of the Complexity Factory” by Prof. W. Zwaenepoel (EPFL) (See Figure 2).

- Plenary Talk II chaired by Prof. S. Koubias, University of Patras, Greece

The title of the talk is “Advances in Chinese High-speed Railway” by Mr. He and Prof. Chen Chunyang, China.

- Plenary Talk III chaired by Prof. D. Serpanos, ISI and University of Patras, Greece

The title of the talk is “Security in Networked Embedded Systems – The Troubles of Practice” by Dr. T. Sauter, Austrian Academy of Sciences, Austria

- Plenary Talk IV chaired by Prof. Y. Kakuda, Hiroshima City University

The title of the talk is “Challenges for Driving the Ubiquitous...” by Dr. R. Imura, Hitachi Ltd., Japan (See Figure 3).

- Panel II chaired by Prof. K. Mori, Tokyo Institute of Technology, Japan

The title of the panel is “Future Trends in Autonomous Decentralized Systems.”

The panelists of the panel are as follows: Prof. Radu Popescu-Zeletin, FOKUS-Fraunhofer, Germany, Dr. Takashi Hotta, Hitachi, Japan, and Prof. Yongdong Tan, South West Jiaotong University, China.

5. ISADS 2009 Program: Sessions and Workshops

The regular and special sessions and workshops have been executed by three parallel sessions in each day. The following three workshops are included in ISADS 2009.

- The Third International Workshop on Ad Hoc, Sensor and P2P Networks (AHSP 2009)
- The First International Workshop on Autonomous Embedded Systems and Networking (AESN 2009)
- The First International Workshop on Wireless & Mobile Networks (WiMoN 2009)

The titles of regular and special sessions in ISADS 2009 are as follows. The number in the parentheses is the number of papers in the session. The session with * denotes a special session.

- March 23
 - Quality (3)
 - Embedded Systems Security (4)
 - Network Protocols (5)
 - Distributed Systems (4)
 - Practical Development and Field Experiments* (4)
 - Network and Service Security (3)
 - WiMoN 2009 Session 1 (4)
 - Advancing Railway System Technologies Expanding the World* (3)
 - Agent Systems (4)
 - WiMoN 2009 Session 2 (3)
- March 24
 - Sensor Networks (4)
 - AESN 2009 Session I (4)
 - AHSP 2009 Invited Papers (3)
 - Panel I: Protection of Critical Infrastructure and Its Design Implications on Mesh Network Based Systems
 - AHSP 2009 Session II (3)
 - AESN 2009 Session II (2)
 - Ad-hoc Networks and Systems (5)
 - AHSP 2009 Session III (4)
 - AESN 2009 Session III (2)
- March 25
 - Wireless Sensor Networks (4)
 - Network Services I (3)
 - Distributed Computing (3)
 - Protocols for Sensor Networks (4)
 - Reliable Network Services and Systems (3)
 - Network Services II (3)

The details of ISADS2009 can be found at <http://www.ece.upatras.gr/isads2009>.

6. Personal Comments on ISADS 2009

ISADS can be characterized by emphasis on application of theoretical concepts and methodologies to practical systems and networks. Therefore, not only researchers from academia but also engineers from industries are encouraged to be presented in ISADS. In ISADS 2009, two special sessions on field experiments and railway systems were executed, in which some engineers from industries were invited to present their papers.

7. Summary

This report concisely explains ISADS2009. Thanks to committee members, speakers, participants and volunteers, ISADS 2009 was successfully held. We are grateful to the ISADS Steering Committee Chair Prof. Kinji Mori, Tokyo Institute of Technology for his constant advice and support to ISADS 2009. The Tenth Anniversary ISADS2011 will be held on March, 2011, in Japan. The Call for Papers for ISADS 2011 will appear soon.

8. Reference

- [1] Proceedings of the Ninth International Symposium on Autonomous Decentralized Systems (ISADS 2009), IEEE Computer Society, March 2009.



Figure 1 Opening



Figure 2 Kanai Award Winner Prof. W. Zwaenepoel



Figure 3 Keynote Speaker Dr. R. Imura

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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
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D (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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From Editor's Desk

● IEICE Society Conference in Niigata

The IEICE Communications Society Conference is coming soon. The next conference is held at Niigata University in Niigata City from September 15th to 18th. On the first day of the conference, the event called “CS’s Welcome Party” is to be held by the IEICE Communications Society. The party (this is 2nd time) is like a casual social gathering and we plan to offer opportunities to enjoy short speeches and poster explanations by active young researchers in telecommunications area, and also to exchange ideas and views in an informal manner under friendly atmosphere. Some food and drink will be served for free in the party. We hope that many members of the Communications Society, especially student members and young members, join the party and have a good time. Please attend the conference in Niigata and enjoy CS’s Welcome Party!

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