APNOMS2014

The 16th Asia-Pacific Network Operations and Management Symposium

September 17-19, 2014
National Chiao Tung University, Taiwan

Final Program

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KNOM KICS 1996

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National Chiao Tung University

科技部
Ministry of Science and Technology

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Welcome to APNOMS 2014

The 16th Asia-Pacific Network Operations and Management Symposium

17 - 19 September 2014 | Taiwan

Sponsored by: IEICE ICM, KICS KNOM, NCTU
Technically Co-Sponsored by: IEEE Communications Society
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APNOMS (Asia Pacific Network Operations and Management Symposium) has been a premier conference on network operations and management in the Asia Pacific region. APNOMS 2014 is sponsored by IEICE Technical Committee on Information Communication Management (ICM) and the KICS Committee on Korean Network Operations and Management (KNOM), and technically co-sponsored by IEEE Communications Society. APNOMS meets every year, typically during September and boasts a rich history of successes. It includes a full three-day program of keynotes, tutorials, technical sessions, innovation sessions, panel discussions, poster sessions, and exhibits that focus on managing networks that span the computing and telecommunications areas.

APNOMS 2014 is the 16th in the series, following the successful APNOMS'97 (Seoul), APNOMS'98 (Sendai), APNOMS'99 (Kyongju), APNOMS 2000 (Nara), APNOMS 2001 (Sydney), APNOMS 2002 (Jeju), APNOMS 2003 (Fukuoka), APNOMS 2005 (Okinawa), APNOMS 2006 (Busan), APNOMS 2007 (Sapporo), APNOMS 2008 (Beijing), APNOMS 2009 (Jeju), APNOMS 2011 (Taipei), APNOMS 2012 (Seoul), and APNOMS 2013 (Hiroshima).

We cordially welcome you to join this year's event in Hsinchu, Taiwan. Hsinchu is the center of Taiwan's IT industry. It is the home city of National Chiao Tung University, one of the most prestigious universities in Taiwan. Many government research agencies, such as Industrial Technology Research Institute and several labs, are also located in Hsinchu. We hope you will have a joyful trip here in Hsinchu and enjoy this year's excellent program.

Finally, we would like to express our sincere thanks to the authors, reviewers, committee members, volunteers, and participants, whose great efforts have made the success of APNOMS 2014.

General Chair: Yu-Chee Tseng (NCTU, Taiwan)
Shingo Ata (Osaka City Univ., Japan)
Vice Co-Chairs: Heychyi Young (CHT, Taiwan)
Wang-Cheol Song (Jeju Nat'l Univ.,Korea)

Welcome Message from TPC Co-Chairs

This 16th APNOMS will continue to facilitate research discussion in a wide variety of network management subjects. Based on experience from previous APNOMS events, the conference attracts papers both in traditional management research as well as in recent advances in the area. This year, we received 140 papers, of which 41 papers were accepted for Technical Sessions after a thorough review process. The acceptance rate is 29.29%. We focus on the Software Defined Network (SDN) technology and have set the symposium theme "Integrated Management of Software Defined Infrastructure." However, this does not mean that we exclude other topics. APNOMS is happy to create sessions discussing practical research in network management, trials, case studies, and simulations. We look forward to seeing you in Hsinchu!

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Jyh-Cheng Chen, National Chiao Tung University, Taiwan
Takuya Asaka, Tokyo Metropolitan University, Japan
Youngseok Lee, Chungnam Nat'l University, Korea

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Program at a Glance

Wednesday, 17 September 2014			
	International Conference Hall	Conference Room 4	Corridor
08:00 ~			Registration
09:00 ~ 10:30	**Tutorial 1** Offering SDN services with Evolved IP/MPLS Network Speaker: Mr. Lim Wong Chair: Dr. Yu-Huang Chu	**Tutorial 2** Proactive Network Operation through Network Data Analytics Speaker: Dr. Keisuke Ishibashi Chair: Dr. Hongtaek Ju	
10:30 ~ 10:45	Coffee Break		Exhibition Preparation
10:45 ~ 12:15	**Tutorial 3** Software Defined Networking: Why, When, Where, and How Speaker: Dr. Rung-Hung Gau, Chair: Dr. Kiyohito Yoshihara	**Tutorial 4** Software-Defined Networking from Concept to Reality Speaker: Dr. Eun Kyoung PAIK Chair: Dr. Yu-Huang Chu	
12:15 ~ 13:15	Lunch		
13:15 ~ 13:55	**Welcome Address** by General Chairs **Keynote Speech 1:** Dr. Joe Betser		
13:55 ~ 14:25	Poster Session 1 & Coffee Break		Exhibition Demos
14:25 ~ 16:05	Technical Session 1	Technical Session 2	
16:05 ~ 16:35	Poster Session 1 & Coffee Break		
16:35 ~ 18:15	Technical Session 3	Innovation Session 1	
18:30 ~ 20:30			Welcome Reception

Program at a Glance

Thursday, 18 September 2014			
	International Conference Hall	Conference Room 4	Corridor
08:00 ~			Registration
09:00 ~ 10:00	**Keynote Speech 2:** Dr. Takashi Ooi, **Keynote Speech 3:** Dr. Chie-Teuk Ahn		
10:00 ~ 10:30	Poster Session 2 & Coffee Break		Exhibition Demos
10:30 ~ 12:10	Technical Session 4	Technical Session 5	
12:10 ~ 13:10	Lunch		
13:10 ~ 14:50	Technical Session 6	Special Session1	
14:50 ~ 15:20	Poster Session 2 & Coffee Break		
15:20 ~ 17:20	Distinguished Expert Panel		
18:30 ~ 20:30	Symposium Banquet @ Sheraton Hsinchu Hotel		

Friday,19 September 2014			
	International Conference Hall	Conference Room 4	Corridor
08:00 ~			Registration
09:00 ~ 10:00	**Keynote Speeches 4:** Dr. Yi-Bing Lin **Keynote Speeches 5:** Dr. Nen-Fu Huang		
10:00 ~ 10:30	Poster Session 3 & Coffee Break		Exhibition Demos
10:30 ~ 12:10	Technical Session 7	Special Session 2	
12:10 ~ 13:10	Lunch		
13:10 ~ 14:50	Technical Session 8	Technical Session 9	
14:50 ~ 15:20	Poster Session 3 & Coffee Break		
15:20 ~ 17:00	Technical Session 10	Innovation Session 2	
17:20 ~ 17:35	Best Paper Awards, Student Traveling Award and Closing Remarks		

Keynotes

Keynote 1: Wed., Sept. 17, 2014, 13:20-13:55, International Conference Hall

Big Data on Clouds - The Soft Stuff is the Hard Stuff

Chair: Shingo Ata (Osaka City Univ., Japan)

Dr. Joe Betser, Senior Project Leader, Aerospace Corporation

Joe Betser is a Senior Project Leader for Strategic Planning, Knowledge Management, and Business Development with the Aerospace Corporation. Joe Coordinates strategic and developmental planning support to the Chief Scientist of the USAF Space and Missile Systems Center, in order to enhance our collaboration projects, and successfully transition science and technology results into Space capabilities. Dr Betser joined Aerospace in 1991, established the network management laboratory, and served as a DARPA principal investigator in the fields of networking, cyber, fractionated space architectures, and manned on-orbit servicing (NASA/DARPA). He received multiple commendations including the GPS Program Recognition Award, and awards for serving as a Program Chair and General Co-Chair of the Ground System Architectures Workshop (GSAW). Dr. Betser served as the Vendor Program Chair of the IFIP/IEEE IM 1993 in San Francisco, recruiting 39 company sponsors and leading five networked technology centers demonstrating SNMPv2, OSI, RMON, OMNI-Point, & Applications. Joe was commended repeatedly for spearheading university outreach activities, and also received international citations from the IEEE and IFIP for leading global activities. Joe serves on multiple boards, and chairs the Engineering Visitors Committee at Harvey Mudd College. He has a B.S. in aerospace engineering, M.S. and Ph.D. degrees in computer science, and an executive MBA from the University of California, Los Angeles.

Keynote 2: Thurs., Sept. 18, 2014, 09:00-09:30, International Conference Hall

Transformation of Enterprise Network for Changing Business Environment -New era by Network Functions Virtualization (NFV)

Chair: Shingo Ata (Osaka City Univ., Japan)

Dr. Takashi Ooi, Vice President of Enterprise Network Services, Network Services Division NTT Communications Corporation

Takashi Ooi is the Vice President of Enterprise Network Services, Network Services Division at NTT Communications (NTT Com), a position to which he was appointed in August 2011. In this role, he is responsible for NTT Com's enterprise network service development and planning worldwide. In addition, Mr. Ooi serves as Head of the Global Network Integration Task Force within NTT Com's Corporate Planning division. Beginning in July, Mr. Ooi will assume the role of Senior Vice President and Head of the Network Services Division at NTT Com. He will also be appointed to the NTT Com Board of Directors. Mr. Ooi has contributed to success and innovation at NTT for nearly 30 years, having built his career entirely within the parent company and its subsidiaries. Over the course of three decades, Mr. Ooi has gleaned direct insight and experience in the many facets and functions of the global organization's operations. He has led the installations of multi-national companies' network, developments in network services and international relations with business partners including regional/local carriers. Earlier this year, he oversaw the post-merger integration process of NTT Com's complete acquisition of Virtela Technology Services, a leading cloud-based network services company, which successfully resulted in an enhanced portfolio of services for both companies' customers. He is also a longtime board member of the Philippine Long Distance Telephone Company (PLDT), the Philippines' leading and largest telecommunications provider, and served as the organization's Board Director from 2007 to 2011.

Mr. Ooi's previous roles include Vice President, Global Solution Department, NTT Com; Vice President, Network Integration and Solutions, NTT Com; Vice President, Product Management, NTT Com; Director of NTT America and Technical Advisor to Teligent, Inc, a U.S. Wireless Local Loop (WLL) start-up company; and Manager, Network Systems Development, NTT. While working in NTT's Human Resources Department, Mr. Ooi earned his Master of Business Administration degree from Boston University. He was then appointed to Manager of the International Affairs Department, where he oversaw NTT's international relations and business development with U.S. carriers. Mr. Ooi received a Master of Science degree in Physics from the University of Tokyo in Japan.

Keynote 3: Thurs., Sept. 18, 2014, 09:30-10:00, International Conference Hall

5G & Giga Networking Vision in Korea

Chair: Wang-Cheol Song (Jeju Nat'l Univ., Korea)

Mr. Kyung-Hyu Lee,

Principal Researcher of Communications and Internet Research Laboratory, ETRI, Korea

Mr. Kyung-Hyu Lee is currently a Principal Researcher in Communications and Internet Research Laboratory of ETRI (Electronics and Telecommunications Research Institute) and president of KOSVIA (Korean Open Service Industrial Association). He has worked in ETRI since 1982. In ETRI he has been involved in developing technologies related to the subscriber Line/Networking Operation System, Intelligent Control System for Exchange, Service Control System for Intelligent Network, Management system for the Optical Network and 10G Transport Network, Open Service Networking, Director for Research & Operation of the network service engineering Center in BcN(Broadband Convergence Network). Due to the achievements in the High-Speed Networking Infra technology development he received the National Award from the Korean Government in 2006, and The distinguished policy (Smart-working Infra, Big-Data & Mobile Infra, etc) award of Korea's ICT for 2010-2011. He received B.S. and M.S./PHD-Researcher Course in computer science from Sungsil Univ/KAIST, Korea. He was a president of the KICS/KNOM Committee, a senior member of the IEEE Communication/Computer Society and the Founder & Steering Committee of the APNOMS.

Keynote 4: Fri., Sept. 19, 2014, 09:00-09:30, International Conference Hall

Accelerating Broadband Wireless Services and Industrial Development

Chair: Heychyi Young (CHT, Taiwan)

Dr. Yi-Bing Lin, Deputy Minister, MOST

Education
B.S. in Electrical Engineering, National Cheng-Kung University, Taiwan, R.O.C. June 1983.
Ph.D. in Computer Science University of Washington, Seattle, WA. August 1990.
Thesis title: Understanding the Limits of Optimistic and Conservative Parallel Simulation (Thesis Advisor: Edward D. Lazowska).
Experience
2014/03-present: Deputy Minister, MOST
2014/01-2014/03: Deputy Minister, NSC
2011-2013: Vice President, NCTU
2010-present: lifetime Chair Professor,NCTU
2007-present: Dean, College of Computer Science, National Chiao Tung University (NCTU)
2004-2007: Dean, Office of Research and Development, NCTU
2004-present: Chair Professor, NCTU
2003-present: Adjunct Chair Professor, Providence University
2000-present: Adjunct Research Fellow, Academia Sinica.
1997-1999: Chairman, Department of Computer Science and Information Engineering (CSIE), NCTU
1995-present: Professor, CSIE, NCTU
1996: Deputy Director, Microelectronics and Information Systems Research Center, NCTU
1990-1995: Research Scientist, Bell Communications Research (Telcordia) Awards
Merit NSC Research Fellow Award, 2011
National Chair Award, Ministry of Education (國家講座), 2011
TWAS Prize in Engineering Sciences, 2011
IBM Faculty Award, 2010
IBM Shared University Research Award, 2009
The 2008 Award for Outstanding contributions in Science and Technology, Executive Yuen, ROC. (行政院 2008 年傑出科技貢獻獎)
CT Ho Honored Award, 2007 (侯金堆傑出榮譽獎)
HP Technology for Teaching Higher Education Grant Award, 2007
YZ Hsu Technology Cathedra Award, 2007 (有庠科技講座).
ISI Highly Cited Scholar (top 1% in Computer Science; Author Publication Number: A0096-206-L; see http://hcr3.isiknowledge.com).
Academic Publication Award of The Sun Yat-Sen Cultural Foundation, 2006 (中山學術文化基金會學術著作獎).
Academic Award of the Ministry of Education, 2006 (教育部學術獎).
Best Impact Award, IEEE Taipei Section, 2006 (IEEE 最佳影響力獎).
Quanta's Outstanding Invention Award, 2005. W.Y. Pan Distinguished Research Award, 2005 (潘文淵研究傑出獎).
Teco Award, 2005 (第十二屆東元獎).
Honory Medal of Information, IICM, 2005 (中華民國資訊學會資訊榮譽獎章).
Sitronix Endowed Chair Professorship, 2005-present (矽創科技講座教授).
NSC Distinguished Researcher, 2005 (國科會特約研究員獎).
K.T. Lee Breakthrough Award, IICM, 2004 (李國鼎穿石獎).

Fellow, American Association for the Advancement of Science (AAAS), 2004. Citation: Honored for distinguished contributions to the design and modeling of mobile telecommunications networks and for leadership in personal communications services education.
Recognition of Excellence, Ministry of Economic Affairs, ROC. 2004. Citation: In recognition of his significant achievement in setting directions for the wireless communication industry of Taiwan.
Fellow, IET (IEE), 2004.
Fellow, IEEE, 2003 through the IEEE Communications Society. Citation: For contributions to the design and modeling of mobile telecommunications networks and leadership in personal communications services education.
Fellow, ACM, 2003. Citation: For contributions to mobile networks.
Distinguished Research Award, National Science Council, ROC, 1997-1999, 1999-2001, 2002-2004 (國科會傑出研究獎).
Distinguished Teaching Award, NCTU, 2002(交通大學傑出教學獎).
Patent Usage Award, ITRI/CCL, 2001.
Outstanding Youth Electrical Engineering Award, CIEE, 1998.
Abstract:
After licensed by Executive Yuan in October 2013, Communication Common Carriers had started 4G services in May 2014. To speed up the LTE service development, 27 proposals from different government authorities have been considered. This program is expected to be the catalyst to accelerate the first wave of 4G services launching with the goal of hitting 10 million 4G users within 3 years. In this talk, we describe the solutions include speeding-up of the infrastructure of mobile broadband network, innovation of service of mobile broadband network, protection of consumer rights, development of mobile broadband techniques and cultivation of mobile broadband talents.

Keynote 5: Fri., Sept. 19, 2014, 09:30-10:00, International Conference Hall
Flows/Applications classification and QoS management for SDN networks
Chair: Heychyi Young (CHT, Taiwan)

Dr. Nen-Fu Huang, National Tsing Hua University, Taiwan

Nen-Fu (Fred) Huang received the Ph.D. degree in computer science from National Tsing Hua University (NTHU), Taiwan, in 1986. From 1997-2000, he was the Chairman of Department of Computer Science, NTHU and since 2008, he is a Distinguished Professor of NTHU. His current research interests include Cloud/p2p-based interactive video streaming technologies, VoIP, network security, high-speed switch/router, SDN networks, IPv6 enable sensor networks, and MOOCs (Massive Open Online Courses) platform.
He received the Outstanding Teaching Award from the NTHU in 1993, 1998, and 2008, the Outstanding University/Industrial Collaboration Award from Ministry of Education, Taiwan in 1998, and Outstanding IT people Award from ITmonth, ROC in 2002. He received the Technology Transfer Award from National Science Council (NSC) of Taiwan in 2004. He received the Technology Creative Award from Computer and Communication Research Center (CCRC), NTHU in 2005, and the Outstanding University/Idustrial Collaboration Award from the NTHU in 2010. He is the founder of Broadweb Corp., and from 2002 to 2006, he served as the CEO/Chairman of Broadweb. The Broadweb Corp. was acquired by TrendMicro in 2013. He is also the founder of NetXtream Corp. (www.netxtream.com), a company developing MOOCs/SPOCs platform and offering MOOCs service (http://www.sharecourse.net). Dr. Huang has published more than 200 journal and conference papers, including more than 50 papers in IEEE INFOCOM/ICC/GLOBECOM flag-ship conferences. He is a senior member of the IEEE.

Distinguished Experts Panel

DEP Session: Thurs., Sept. 18, 2014, 15:20 - 17:20, International Conference Hall

Integrated Management of Software-Defined Infrastructure

Panel Chair — **Fuchun Joseph Lin (National Chiao Tung University, Taiwan)**

Fuchun Joseph Lin is Professor of Department of Computer Science and Associate Chief Director of Microelectronics and Information Systems Research Center at National Chiao Tung University (NCTU). Before joining NCTU in August 2012, he was Chief Scientist in Applied Research of Telcordia Technologies in U.S.A. focusing on IoT/M2M Communications and Next Generation Network Technologies including IMS/EPC, SDN and NGSON. He was with Telcordia Technologies for 20 years and AT&T Bell Labs for 4 years. He received his PhD in Computer and Information Science from the Ohio State University and MS and BS in Computer Science from National Chiao Tung University. He published more than 50 journal and conference papers and acquired and filed more than 10 patents. He was also active in SDOs such as IEEE, 3GPP and ATIS and contributed to the formation of NGSON, ISB and NGN architecture and specifications.

Panelist — **Dr. Yu-Huang Chu (CHT, Taiwan)**

Dr. Yu-Huang Chu is a project manager in the broadband network department of Telecommunication Laboratories, Chunghwa Telecom Co., Ltd. He is responsible for SDN and IP application services networking and planning teams. He has been involved in planning and constructing commercial multimedia on demand service networks and cloud computing data center.

He specializes in researching and implementing IP and Triple-Play services. As key accomplishment, he has successfully deployed Cloud computing Data Center, broadband IP/MPLS network, NGN network, IPTV network. His current major work is planning smart and secure network. He's interest topics include SDN, Openflow, LISP, and Content Centric Network.

Panelist — **Dr. Shin Miyakawa (NTT, Japan)**

Dr. Shin Miyakawa is a director of Technology Development which is an R&D arm of NTT Communications corporation which runs not just only the biggest FTTH service in Japan but also one of the biggest Internet backbone which covers Asia Pacific, North America, Europe and other areas on the earth as an Tier-1 provider for many international Solution business, private/public cloud service and so on. Now He leads several teams working on Networking (Internet, SDN, NFV...), Network Security (anti-malware, anti-DDoS...), and Cloud (public/private cloud) in that organization and also works as a director of Corporate Planning Division of NTT Communications.

He joined to NTT (Nippon Telegraph and Telephone) in 1995 as a researcher right after he received his doctoral degree on Computer Science from Tokyo Institute of Technology. Since then, he has been working on the research, development and standardization of Internet Protocol technologies at the Labs in Tokyo and SiliconValley, California. An active participant of IETF and an author of several RFC documents such as RFC 3769 - Requirements for IPv6 Prefix Delegation, RFC6888 - Common Requirements for Carrier-Grade NATs (CGNs) and so on. He is also Sr. Visiting Researcher at Keio University, Guest Professor of Japan Advanced Institute of Science and Technology, a member of the Japanese governmental committee on the strategy of information security policy.

Panelist	Dr. Young-Tak Kim (Yeungnam University, Korea)
	Prof. Young-Tak Kim received Ph.D. degree from KAIST in February 1990. He joined Korea Telecom (KT) in 1990, where he had researched and developed the ATM MAN Switching System (ATM-MSS) and related network operations and management technologies for broadband networking. Currently he is a professor of the Department of Information and Communication Engineering, College of Engineering in Yeungnam Univ., South Korea. In 2001 and 2008, he had been working as a visiting scholar at NIST (National Institute of Standards and Technology), USA, where he joined in the design and implementation of NIST GMPLS simulator (GLASS) and Next Generation Routing Architecture (NGRA) project. His research interests include QoS-guaranteed traffic engineering in future Internet, Cloud Computing, QoS-aware Network Operating System, OpenFlow, QoS-aware seamless secure mobility, Internet of Thing (IoT), and related network operations and managements. He is a member of IEEE Communication Society, KICS, KISS, KIPS, and Korea Multimedia Society. He had been the Technical Program Chair of IEEE ComSoc CNOM in the period of 2007-2008, TPC Co-chair of IM2009 and the general chair of APNOMS2009.

Panelist	Dr. Cho-Yu Jason Chiang (Applied Communication Sciences, USA)
	Dr. Cho-Yu Jason Chiang is Director and Chief Scientist at Applied Communication Sciences, formerly Telcordia Applied Research in Basking Ridge, New Jersey, USA. Dr. Chiang has been PI or co-PI on several U.S. government agency-funded research and development programs. He has published over 50 papers in refereed conference proceedings and journals. He has served on the program committees of a number of conferences and was a co-chair for the IEEE NOMS 2010 Workshop programs and a co-chair for the IEEE MILCOM 2013 Track 4, “System Perspectives”. Dr. Chiang received B.S. in Computer Science and Information Engineering from the National Taiwan University and Ph.D. in Computer Science from the Ohio State University. Over the years Dr. Chiang’s research interests span across a number of areas, including communication network protocols, network management and operations, mobile ad hoc networks, adaptive communication middleware, policy-based management, cognitive networks, dynamic spectrum access, cyber security, trust in computers and mobile devices, large-scale wireless network testing and testbed, software-defined networking, host and network function virtualization, machine learning, healthcare data analytics, big data, multi-player online gaming, as well as cloud-based system infrastructure and security.

Special Sessions

Session 1: Thurs., Sept. 18, 2014, 13:10-14:50, Conference Room 4

Topic: Management of Disaster Response Networks

Chair: Dr. Ling-Jyh Chen (Academia Sinica, Taiwan)

Communications Infrastructure Recovery for Disaster Responses

Dr. Wei-Ho Chung (Academia Sinica, Taiwan)

• Abstract: Unpredictable natural or manmade disasters often cause the outages of communications. The fast recovery of communications infrastructure is crucial in providing decision makers, responders, victims and general public the vital data and information for the timely responses. In traditional systems, a communication component failure may take up to hours or even days for recovery, which severely jeopardizes the requirement of timely command and control operations. In this session, we will give an overview of the modern communications recovery mechanisms, including network layer and physical layer techniques. The design considerations for the infrastructure recovery will be briefly introduced and the relevancy to the disaster management will be discussed.

• Bio: Wei-Ho Chung received the B.Sc. and M.Sc. degrees in Electrical Engineering from the National Taiwan University, Taipei, Taiwan, in 2000 and 2002, respectively, and the Ph.D. degree in Electrical Engineering from the University of California, Los Angeles, in 2009. From 2002 to 2005, he was a system engineer at ChungHwa Telecommunications Company, where he worked on data networks. In 2008, he worked on CDMA systems at Qualcomm, Inc., San Diego, CA. His research interests include communications, signal processing, and networks. Dr. Chung received the Taiwan Merit Scholarship from 2005 to 2009 and the Best Paper Award in IEEE WCNC 2012, and has published over 30 refereed journal articles and over 40 refereed conference papers. Since January 2010, Dr. Chung has been a tenure-track assistant research fellow, and promoted to the rank of associate research fellow in January 2014. He leads the Wireless Communications Lab in the Research Center for Information Technology Innovation, Academia Sinica, Taiwan.

Disaster Resilient Communication and Applications

Prof. Yao-Hua Ho (National Taiwan Normal University, Taiwan)

• Abstract: In the last few years, we have witness many disasters which destroyed communication networks to the outside world. Wireless mesh network (WMN) is one of the best choices for establishing a network during disaster recovery. In most disaster area, the reliability of WMNs decreased rapidly due any unpredictable environment changes. The disruption of services are often introducing delay and dropping of important and live saving messages. Thus, it is desirable to have a disaster resilient network that can temporarily withstand one or multiple of failed mesh nodes. In this talk, we discuss Disaster Resilient Network (DRN) for tunnels and bridges that allows mesh clients to contribute and retain the connectivity of the network.

• Bio: YAO HUA HO (yho@csie.ntnu.edu.tw) received his B.S., M.S., and Ph.D. degrees in computer science from the University of Central Florida in 2001, 2002, and 2009, respectively. He joined the in the Department of Computer Science and Information Engineering at National Taiwan Normal University as an Assistant Professor in 2012. He has published widely, including several papers recognized as best/top papers at various international conferences. His research interests include social networks and computing, mobile, and wireless networks (WLAN/WSN/MANET/VNET), network protocols, mobile applications (iPhone/Android/platform), location-aware service, and network measurements.

NerveNet: Resilient Network and Application Service Platform for Safe and Secure Regional Society

Dr. Yasunori Owada (NICT, Japan)

• Abstract: In the Great East Japan Earthquake, weakness in the existing network have been revealed. In such emergency situation as disconnection from the core network, the local communication services should be continue among the available network infrastructures and terminals. In addition, it is required to deploy temporary network and application service as soon as possible until the recovery of damaged network system. We have been developing NerveNet as a platform that contains such features. In this presentation, the NerveNet architecture, platform and applications are introduced.

• Bio: Yasunori Owada received the B.E., M.E. and Ph.D. of engineering from Niigata University in 2002, 2004 and 2007, respectively. He is currently a Senior Researcher at NICT. He is involved in designing distributed wireless access network architecture, information/contents centric network, in-network processing architecture at Resilient ICT Research Center. Dr. Owada was involved in a research and development on practical application of mobile ad hoc networks for disaster communication at Research Institute for Natural Hazard and Disaster Recovery, Niigata University, Japan as Assistant Professor from 2007 to 2008. He was then involved in development of a wireless network simulator at Space-Time Engineering Japan, Inc., serving as President from 2008 to 2010. He is a member of IPSJ, IEICE and IEEE.

Integrated Control and Management of Disaster Emergency Response Networks

Prof. Young-Tak Kim (Youngnam University, Korea)

• Abstract: The most important role of public safety communication network in disaster emergency response activity is providing the well-organized audio visual information of the disaster site for fast and efficient rescue activities. Especially when the public safety communication infra cannot provide proper broadband communications in the building basements, mountain valley area and offshore sea, ad hoc networking should be connected to the backhaul public safety communication network. In this presentation, we review the overall public safety communication network and ad hoc networking at disaster emergency rescue operations, and the integrated control and managements for realtime multimedia communications for fast and efficient rescue activities.

• Bio: Prof. Young-Tak Kim received Ph.D. degree from KAIST in February 1990. He joined Korea Telecom (KT) in 1990, where he had researched and developed the ATM MAN Switching System (ATM-MSS) and related network operations and management technologies for broadband networking. Currently he is a professor of the Department of Information and Communication Engineering, College of Engineering in Yeungnam Univ., Korea. In 2001 and 2008, he had been working as a visiting scholar at NIST (National Institute of Standards and Technology), USA, where he joined in the design and implementation of NIST GMPLS simulator (GLASS) and Next Generation Routing Architecture (NGRA) project. His research interests include QoS-guaranteed traffic engineering in future Internet, Cloud Computing, QoS-aware Network Operating System, OpenFlow, QoS-aware seamless secure mobility, and related network operations and managements. He is a member of IEEE Communication Society, KICS, KISS, KIPS, and Korea Multimedia Society. He had been the Technical Program Chair of IEEE ComSoc CNOM in the period of 2007-2008, TPC Co-chair of IM2009 and the general chair of APNOMS2009.

Special Sessions

Session 2: Fri., Sept. 19, 2014, 10:30-12:10, Conference Room 4

Topic: Practical Approach for Virtualized/Software-Defined Networks Management

Chair: Dr. Kazuhiko Kinoshita (Osaka University, Japan)

Large-Scale SDN Testbed over TWAREN and SDN-Based Resource Management

Prof. Li-Der Chou (National Central University, Taiwan)

• Abstract: Software Defined Network (SDN) enables researchers to design novel network protocols by separating control plane and data plane and hence brings revolutionary impact to current network industry. In 2009, National Center for High-performance Computing (NCHC) started to construct a large-scale SDN Testbed over TWAREN (TaiWan Advanced Research and Education Network) backbone involving domestic and international research organizations. In order to monitor flows across different administrative domains, NCHC implemented a multi-domain automatic network topology discovery mechanism to observe network status and troubleshoot flow status. The large-scale SDN Testbed composes of seven universities and companies in Taiwan, and connects to iCAIR in US, SURFnet in the Netherlands, and JGN-X in Japan. In addition, the speaker will present his research on SDN-based cloud resource management, including load balancing, virtual network management, cloud resource control, and DoS attack mitigation.

• Bio: Li-Der Chou received the M.S. degree and Ph.D. degree in electronic engineering from National Taiwan University of Science and Technology, Taipei, Taiwan, in 1991 and 1995, respectively. He is currently the Deputy Director General with the National Center for High-Performance Computing, Taiwan, and a Distinguished Professor with the Department of Computer Science and Information Engineering, National Central University, Taoyuan, Taiwan. Dr. Chou is also the Secretary-General of the Computer Society of the Republic of China. He is the author or co-author of more than 200 journal and conference papers in the area of computer networks. He is the holder of 5 U.S. and 15 Taiwan invention patents. Dr. Chou served as the Principal Investigator of an interdisciplinary project in the application of information and communication technologies to families with children with developmental disabilities and individuals with cognitive impairments. His research interests include vehicular networks, network management, broadband wireless networks, and Internet services. Dr. Chou has been invited to join many technical program committees of international conferences. He has received two Best Paper Awards and three Excellent Paper Awards from international conferences. He has won two Gold Medal Awards and four Silver Medal Awards in many international invention shows held in Geneva, Moscow, London, and Taipei.

Evolution of SDN services in NTT Communications and management issues to be resolved for future services

Dr. Dai Kashiwa (NTT Communications, Japan)

• Abstract: Telecom operators put their hopes on virtualized / Software-Defined networks (SDN) technologies from the point of view of reducing CAPEX (CAPital EXpeses) and OPEX (OPerating EXpenses) and shortening period of services evelopment. First, I explain about the evolution of SDN services in NTT Communications. We have expanded SDN technologies into DC(Data Center)s and VPNs, and will expand into WANs. Second, I mention some management issues to be resolved for future virtualized/ SDN services and our activities on them, which include management framework and DevOps tools for virtualized / SDN services.

• Bio: Dai Kashiwa received his Bachelor's and Master's degrees from Keio University, Japan in 1995 and 1997, respectively. In 1997, he joined NTT and had been involved in research including network management system, network security and Active Networks. Since 2004, he had worked for NTT Communications, where he developed network services including video broadcasting and dynamic VPN. From 2002 he joined Keio University again and received the Ph.D. degree in 2004. In 2013, he had started developing SDN services.

ODENOS: A modularized SDN controller platform for multi-layer/heterogeneous networks

Dr. Masayoshi Kobayashi (NEC, Japan)

• Abstract: The advent of SDN has removed the constraints brought about by rigid control protocols, thereby enabling a flexible description of control software as an SDN controller, which meets the needs of network operators. Further simplification in creating SDN controllers will become an issue in the need to create more SDN controllers quickly. This paper proposes a network abstraction model that makes it possible to simplify the description for the virtualization of network resources and the implementation of complex path control algorithms while absorbing differences in control protocols between network devices. It is also shown that an SDN controller can be created quickly and simply using the SDN controller platform prototype that was designed based on the proposed model.

• Bio: Masayoshi Kobayashi received his Bachelor's and Master's engineering degrees from Kyoto University, Japan in 1995 and 1997, respectively. In 1997, he joined NEC and had been involved in research including high-speed routers, contents-delivery network, congestion control, network measurements and OpenFlow/SDN. From 2007 to 2012, he was with Prof. Nick McKeown's group at Stanford as a visiting researcher from NEC, where he was one of the first to be involved in the OpenFlow project. He led OpenFlow network deployments in Stanford and eight universities attending GENI project and contributed to define OpenFlow specification and to mature early-stage OpenFlow switches and open-source controllers. From 2012 to 2014, he was with Open Networking Laboratory, where he was developing a distributed SDN controller, called ONOS (Open Network Operating System). He moved back to NEC Japan in May 2014 and since then he has been leading OpenFlow/SDN research team.

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Management Framework Using SDN for Open Source Based Mobile R&D Networks and Considerations for NFV of Cellular Networks

Prof. Choong Seon Hong (kyung Hee University, Korea)

• Abstract: In this presentation, we introduce the open source based mobile networks and its management framework in Korea Research Networks. The mobile networks include WiFi, Cellular and Femto networks. The all service functions for mobile networks are deployed on the cloud service platform. As practical services, we implemented VoIP and MVNO services. Also we share you our experiences in the process for the construction of experimental networks. In addition, we introduce the considerations and orchestration architecture for NFV in order to manage LTE network resources.

• Bio: Choong Seon Hong received his B.S. and M.S. degrees in electronic engineering from Kyung Hee University, Seoul, Korea, in 1983, 1985, respectively. In 1988 he joined KT, where he worked on Broadband Networks as a member of the technical staff. From September 1993, he joined Keio University, Japan. He received the Ph.D. degree at Keio University in March 1997. He had worked for the Telecommunications Network Lab., KT as a senior member of technical staff and as a director of the networking research team until August 1999. Since September 1999, he has worked as a professor of the department of computer engineering, Kyung Hee University. He has served as a General Chair, TPC Chair/Member, or an Organizing Committee Member for International conferences such as NOMS, IM, APNOMS, E2EMON, CCNC, ADSN, ICPP, DIM, WISA, BcN, TINA, SAINT, ICOIN, ICC and so on. Also, he is now an associate editor of IEEE Transactions on Network and Service Management, International Journal of Network Management, Journal of Communications and Networks, and an Associate Technical Editor of IEEE Communications Magazine. And he is a Senior Member of IEEE, and a Member of ACM, IEICE, IPSJ, KIISE, KICS, KIPS and OSIA. His research interests include Future Internet, Ad hoc Networks, Network Management, and Network Security.

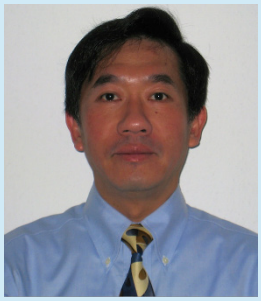
Tutorials

Tutorial 1: Wed. Sept. 17, 2014, 9:00~10:30, International Conference Hall

Chair: Dr. Yu-Huang Chu

Offering SDN services with Evolved IP/MPLS Network

Mr. Lim Wong (Cisco Systems, Inc. Hong Kong)



SDN introduces a shift in how networks are designed, operationalized and monetized, and will make them far more agile and responsive to service requirements. NFV services provide the real-time network resource management needed to support on-demand services. With SDN and NFV working in concert, revenue generating services can be placed anywhere within the network, and invoked as needed according the needs of specific applications. This represents a clear opportunity for service providers to better monetize their networks, as service providers can exploit their abilities to guarantee SLAs for premium services, and continue providing volume-based services as well. This session will present the fundamental building blocks of SDN/NFV that one should consider for the implementations. We will explore how some of these concepts can be applied to traditional IP/MPLS network for revenue generating services.

Tutorial 2: Wed. Sept. 17, 2014, 9:00~10:30, Conference Room 4

Chair: Dr. Hongtaek Ju

Proactive Network Operation through Network Data Analytics

Dr. Keisuke Ishibashi (NTT Network Technology Laboratories, Japan)

Recently, network anomalies such as cyber-attacks, network failures, and traffic spikes have become common occurrences and have impacted service performance. To minimize such impact, proactive approach in network operation is required. In this regard, bigdata generated from networks, such as syslog, access log, traffic data, performance metrics are expected to be sources of intelligence to enable the proactive network operations. In this talk, we show some use case of network data analysis for proactive network operations.

Tutorial 3: Wed. Sept. 17, 2014, 10:45~12:15, International Conference Hall

Chair: Dr. Kiyohito Yoshihara

Software Defined Networking: Why, When, Where, and How

Dr. Rung-Hung Gau, (National Chiao Tung University, Taiwan)

The first wave of cloud computing was to centralize and virtualize servers into the clouds, with a phenomenal result. The emerging second wave, named Software Defined Networking (SDN), is to centralize and virtualize networking, especially its control, into the clouds. SDN deployment started from data centers and now expands to the model of “networking as a service” (NaaS) offered by the operators to enterprise and residential subscribers. By centralizing the control-plane software of routers and switches to the controller, and its applications, and controlling the data-plane of these devices remotely, SDN reduces the capital expenditure (CAPEX) and operational expenditure (OPEX) because the devices become simpler and hence cheaper and number of administrators could be reduced. SDN also enables fast service orchestration because the data plane is highly programmable from the remote control plane at controllers and applications. However, as we detach control plane from where data plane resides, new protocols shall be introduced between control plane and data plane, as the southbound API between controllers and devices and the northbound API between controllers and applications. As we further extend the control plane from controllers to applications such as Service Chaining (SC) and data plane from devices to Network Function Virtualization (NFV), newer mechanisms and APIs need to be added to these APIs. We argue why, when, and where SDN would prevail, and then illustrate how to make it happen. We shall introduce the key technology components, including OpenFlow, SC, NFV, and Network Service Header (NSH) and then review the issues on standardization, development, deployment, and research.

Tutorial 4: Wed. Sept. 17, 2014, 10:45~12:15, Conference Room 4

Chair: Dr. Yu-Huang Chu

Software-Defined Networking from Concept to Reality

Dr. Eun Kyoung PAIK,(KT, Korea)

Emerging Internet applications and services demand for dynamic networking environment. Software-Defined Networking (SDN) provides flexible and agile networking infrastructure to meet those novel requirements. This talk illustrates the concept and realization of SDN from the perspective of open networking/software/hardware. Firstly, this talk introduces the motivation, basic concept, and core technologies of SDN. Secondly, it addresses the latest state of standardization with commercialization issues. Finally, it illustrates use cases over classified fields, then concludes with the vision of SDN.

Technical Sessions

Technical Session 1: Wed, Sept. 17, 14:25~16:05, International Conference Hall

Software Defined Networks I (SDN-I)

Chair: Yi Ren (National Chiao Tung University, Taiwan)

No	Title and Authors
TS1-1	IPv6 Operations and Deployment Scenarios over SDN. Chia-Wei Tseng, Sheue-Ji Chen (Chunghwa Telecom labs., Taiwan), Yao-Tsung Yang (Chungwa-Telecom/National Central University, Taiwan), Li-Der Chou (National Central University, Taiwan), Ce-Kuen Shieh, Sheng-Wei Huang (National Cheng Kung University, Taiwan)
TS1-2	Network-Wide Visibility in OF@TEIN SDN Testbed using sFlow. Shafqat Rehman (Air University, Pakistan), Wang-Cheol Song (Jeju National University, Korea),Mingoo Kang (Hanshin University, Korea)
TS1-3	Efficient Model Checking of OpenFlow Networks Using SDPOR-DS. Yutaka Yakuwa, Nobuyuki Tomizawa, Toshio Tonouchi (NEC, Japan)
TS1-4	Software Defined Networking-based Traffic Engineering for Data Center Networks. Yoonseon Han, Sin-seok Seo, Jian Li, Jonghwan Hyun, Jae-Hyoung Yoo, James Hong (POSTECH, Korea)

Technical Session 2: Wed, Sept. 17, 14:25~16:05, Conference Room 4

Integrated Management

Chair: Ruei-Hau Hsu (National Chiao Tung University, Taiwan)

No	Title and Authors
TS2-1	Opportunistic Resource Sharing in Mobile Cloud Computing: the Single-copy Case. Wei Liu, Ryoichi Shinkuma, Tatsuro Takahashi (Kyoto University, Japan)
TS2-2	vConductor: An NFV Management Solution for Realizing End-to-End Virtual Network Services. Wenyu Shen, Masahiro Yoshida, Taichi Kawabata, Kenji Minato, Wataru Imajuku (Nippon Telegraph and Telephone Corporation, Japan)
TS2-3	Autonomous Retransmission Control with Neighbour Terminals for Ad Hoc Networks. Taku Yamazaki, Yoshiaki Tanaka (Waseda University, Japan), Ryo Yamamoto (The University of Electro-Communications, Japan), Takumi Miyoshi (Shibaura Institute of Technology, Japan)
TS2-4	A Mobility Clustering-based Roadside Units Deployment for VANET. Chengyuan Wang, Xin Li, Fan Li, Huimei Lu (Beijing Institute of Technology, China)

Technical Session 3: Wed, Sept.17, 16:35~18:15, International Conference Hall

Wireless and Mobile Networks I

Chair: Jyh-Cheng Chen (National Chiao Tung University, Taiwan)

No	Title and Authors
TS3-1	PowerGuide: Accurate Wi-Fi Power Estimator for Smartphones. Jian Li, James Hong (POSTECH, Korea), Jin Xiao (IBM T. J. Watson Research Center, USA), Heni Azzouz (Higher School of Communication of Tunis, Tunisia), Raouf Boutaba (University of Waterloo, Canada)
TS3-2	Application Dependency Tracing for Message Oriented Middleware. Li-Juin Wu, Hong-Wei Li, Yu-Jui Cheng, Yu-Sung Wu (National Chiao Tung University, Taiwan), Houcheng Lin (Industrial Technology Research Institute, Taiwan)
TS3-3	Self-Optimized Cloud RAN Based Smart Zone. Chih Hsuan Tang (Chunghwa Telecom labs., Taiwan), Yen Keui Chen, Li Chun Wang (National Chiao Tung University, Taiwan)
TS3-4	Priority control using multi-buffer for DTN. Shota Tajima (Kyoto University, Japan), Takuya Asaka (Tokyo Metropolitan University, Japan), Tatsuro Takahashi (Kyoto University, Japan)

Technical Session 4: Thur, Sept.18, 10:30~12:10, International Conference Hall

Wireless and Mobile Networks II

Chair: Yen-Wen Chen (National Central University, Taiwan)

No	Title and Authors
TS4-1	A Reliable Multi-hop Safety Message Broadcast in Vehicular Ad hoc Networks. Duc Dang, VanDung Nguyen, Chuan Pham, Thant Zin Oo,Choong Seon Hong (Kyung Hee University, Korea)
TS4-2	MORSA: A Multi-objective Resource Scheduling Algorithm for NFV Infrastructure. Masahiro Yoshida, Wenyu Shen, Taichi Kawabata, Kenji Minato, Wataru Imajuku (Nippon Telegraph and Telephone Corporation, Japan)
TS4-3	Multi-layer fault diagnosis method in the Network Virtualization Environment. Congxian Yan, Ying Wang, Xuesong Qiu, Wenjing Li, Lu Guan (Beijing University of Posts and Telecommunications, China)
TS4-4	In-Network Guide Performance in Wireless Multi-Hop Cache Networks. Kento Ikkaku, Yukio Sakaguchi, Miki Yamamoto (Kansai University, Japan)

Technical Session 5: Thur, Sept.18, 10:30~12:10, Conference Room 4

Simulation and Experimental Approaches

Chair: Takuya Asaka (Tokyo Metropolitan University, Japan)

No	Title and Authors
TS5-1	QoE-driven Bandwidth Allocation Method Based on User Characteristics. Huong Pham, Hiep Hoang, Takumi Miyoshi (Shibaura Institute of Technology, Japan), Tatsuya Yamazaki (Niigata University, Japan)
TS5-2	Packet Out-of-order and Retransmission in Statistics-based Traffic Analysis. Su-Kang Lee, HyunMin An, Myung-Sup Kim (Korea University, Korea)
TS5-3	Implementation of A Distributed Web Community Crawler. Seonyoung Park, Youngseok Lee (Chungnam National University, Korea)
TS5-4	A Comparison of 4G Telecommunications Tariff Plans in Asia Countries. Huai-Sheng Huang, Tzu-Chung Su, Jo-Ching Wu, Wan-Du Tsai, Yu-Chee Tseng, Fuchun Lin (National Chiao Tung University, Taiwan), Bo Ting Lin, Wan-Hsun Hu (Chunghwa Telecom labs., Taiwan)

Technical Session 6: Thur, Sept.18, 13:10~14:50, International Conference Hall

Contents-Oriented/Data-Centric Networks

Chair: Takumi Miyoshi (Shibaura Institute of Technology, Japan)

No	Title and Authors
TS6-1	Supporting Groupware Communication with Topology-enhanced Content-based Network. Yi Qin, Xianping Tao, Jian Lu (State Key Laboratory for Novel Software Technology at Nanjing University, China)
TS6-2	CHT Cloud Orchestration: an Integrated Cloud System of Virtualization Platform. Chien-Ming Tu (National Taiwan University - Taiwan),Shih-Han Ku, Ju-Chi Tseng, Hsiang-Ting Kao, Fang-Sun Lu (Chunghwa Telecom labs., Taiwan), Fei-Pei Lai (National Taiwan University, Taiwan)
TS6-3	Design of handover self-optimization using big data analytics. Chien-Lung Lee, Wen-Shu Su, Kai-An Tang, Wei-I Chao (Chunghwa Telecom labs., Taiwan)
TS6-4	Distributed Object Storage toward Storage and Usage of Packet Data in a High-speed Network. Masahisa Tamura (Fujitsu Laboratories Ltd., Japan)
TS6-5	SRP: A Routing Protocol for Data Center Networks. Pengcheng Zeng , Yao Shen, Minyi Guo (Shanghai Jiaotong University, China),Zijun Qiu, Zhun Qiu (Tencent Technology (Shenzhen) Company Limited, China)

Technical Session 7: Fri, Sept.19, 10:30~12:10, International Conference Hall

SDN-II and Security

Chair: Keisuke Ishibashi (NTT, Japan)

No	Title and Authors
TS7-1	An On-line Anomaly Detection Method Based on LMS algorithm. Ziyu Wang, Jiahai Yang, Fuliang Li (Tsinghua University, China)
TS7-2	Mobile Network configuration for Large-scale Multimedia Delivery on a Single WLAN. Huigwang Je, Dongwoo Kwon, Hyeonwoo Kim, Hongtaek Ju (Keimyung University, Korea)
TS7-3	OpenFlow Switch Actions are not Enough for Me! What about You?.Hamid Farhadi, Akihiro Nakao (The University of Tokyo, Japan), Ping Du (NiCT, Japan)
TS7-4	A Context-Aware Content Delivery Framework for QoS in Mobile Cloud. Rim Haw, Md Golam Rabiul Alam, Choong Seon Hong (Kyung Hee University, Korea)

Technical Session 8: Fri, Sept.19, 13:10~14:50, International Conference Hall

QoS

Chair: Woojin Seok (KISTI, Korea)

No	Title and Authors
TS8-1	A Novel Traffic Information Estimation Method Based on Mobile Network Signaling. Ling-Chih Kao (Chunghwa Telecom labs., Taiwan), Zsehong Tsai (National Taiwan University, Taiwan)
TS8-2	Path Capacity Estimation by Passive Measurement for the Constant Monitoring of every Network Path. Naoyoshi Ohkawa, Yuji Nomura (Fujitsu Labs, Japan)
TS8-3	Building a CDR analytics platform for real-time services. Chia-Chun Shih, Chi-Chang Huang, Bo Ting Lin, Chao Wen Huang, Wan-Hsun Hu, Chien-Wei Cheng (Chunghwa Telecom labs., Taiwan)
TS8-4	Performance Analysis and Validation of High QoS Route Navigation for Mobile Users. Kenji Kanai, Jiro Katto (Waseda University, Japan), Tutomu Murase (NEC - Japan)

Technical Session 9: Fri, Sept.19, 13:10~14:50, Conference Room 4

Internet and Software Engineering

Chair: Seung-joon Seok (Kyungnam University, Korea)

No	Title and Authors
TS9-1	A Framework of Code Reuse in Open Source Software. Yuan-Hsin Tung, Chih-Ju Chuang, Hwai-Ling Shan (Chunghwa Telecom labs., Taiwan)
TS9-2	Mobile Ticket Dispenser System with Waiting Time Prediction. Yun-Wei Lin (Academia Sinica, Taiwan), Yi-Bing Lin (National Chiao-Tung University, Taiwan)
TS9-3	A Best Practice of Java-Based Applications Migration with Variety of Software Solutions. Yung-Shih Wang, Chih-Chin Yang (Chunghwa Telecom labs., Taiwan)
TS9-4	Utilizing Group Prediction by Users' Interests to Improve the Performance of Web Proxy Servers. Tsozen Yeh, Liangtzu Chang (Fu Jen Catholic University, Taiwan)

Technical Session 10: Fri, Sept.19, 15:20~17:00, International Conference Hall

Wireless and mobile Networks III

Chair: Wonyong Yoon (Dong-A University, Korea)

No	Title and Authors
TS10-1	A Novel 3D Beamforming Scheme for LTE-Advanced System. Cheng Yu-Shin (Chunghwa Telecom labs., Taiwan)
TS10-2	Performance Study of Downlink Scheduling for Video Streaming in LTE Network. Meng-Hsien Lin (Chunghwa Telecom labs., Taiwan), Yen-Wen Chen (National Central University, Taiwan)
TS10-3	A VoLTE Traffic Classification Method in LTE Network. Jonghwan Hyun, Jian Li, Jae-Hyoung Yoo, James Hong (POSTECH, Korea) ChaeTae Im (Korea Internet & Security Agency, Korea)
TS10-4	Evaluation of Information-Centric Networking for Mobile and Distributed Environment Using Wide-Area Test Bed. Daisuke Matsubara, Satoru Okamoto, Naoaki Yamanaka, Tatsuro Takahashi (Kyoto University, Japan)

Poster Sessions

Poster session 1:

Wed, Sept.17, 13:55~14:25 & 16: 05~16:35, International Conference Hall

Chair: Phone Lin (NTU, Taiwan)

No	Title
S1-1	Network Dimensioning Methodology in Packet-Optical Transport Network. Jieun Lee, Byoungkwon Shim (KT, Korea)
S1-2	A vehicle speed estimation method based on using voice call signals. Chi-Hua Chen, Ta-Sheng Kuan, Kuen-Rong Lo (Chunghwa Telecom labs., Taiwan)
S1-3	Evolution of Network Configurations: High-level Analysis of an Operational IP Backbone Network. Fuliang Li, Jiahai Yang, Jianping Wu (Tsinghua University, China), Huijing Zhang (Beijing University of Posts and Telecommunications, China),Suogang Li (CERNET National Network Center, China)
S1-4	Hawkeye: Finding Spamming Accounts. Chia-Heng Li, Fu-Hau Hsu (National Central University,Taiwan), Shih-Jen Chen (Instutute for Informtion Industry, Taipei, Taiwan), Chuan-Sheng Wang (Chunghwa Telecom labs., Taiwan),Yao-Hsin Chen (Information and Communication Research Laboratories, Industrial Technology Research Institute, Taiwan), Yan-Ling Hwang (Chung Shan Medical University, Taichung, Taiwan)
S1-5	A Flexible Architecture of Real-Time Audio Transmission to Heterogeneous Devices for Surveillance System. Yu-Tung Cheng, Heng-An Lin, Yun-Jaw Yeh (Chunghwa Telecom labs., Taiwan)
S1-6	Sales Process Management of Project-based Telecom Services. Ruey-Sheng Horng, Kuo-Dong Huang, Chien-Cheng Shen,Ya-Ting Hsu, Min-Che Hsu, Ming-Liang Fan (Chunghwa Telecom labs., Taiwan)
S1-7	BP Neural Network-Based Web Service Selection Algorithm in the Smart Distribution. Grid.LanLan Rui, Yinglin Xiong, Ke Xiao, Xuesong Qiu (Beijing University of Posts and Telecommunications, China)
S1-8	Quality Management and Network Faults Diagnosis for IPTV Service. Yan-Yih Wang, Kuan-Wei Wu, Chih-Meng Huang, Chih-Chia Chan (Chunghwa Telecom labs., Taiwan)
S1-9	Quality of service test mechanism and management of broadband access network. Wen-Che Yang, Jhih-Dao Jhan, Dong-Yie Chen, Kuo-Hsiang Lai, Rong-Ruey Lee (Chunghwa Telecom labs., Taiwan)
S1-10	The design and performance of the hybrid access network for FTTH bottleneck areas. Chen Kuo-Tsai, Yang Shun-Kai, Huang Lung-Chin, Kuo-Hsiang Lai, Rong-Ruey Lee (Chunghwa Telecom labs., Taiwan)
S1-11	The Mathematic Model for Site Selection of Central Office Consolidation. Kuo Sheng Lo, Fangyu Ling (Chunghwa Telecom labs., Taiwan)
S1-12	Dynamic Internet Pricing and Bandwidth Guarantees with Nash Equilibrium.Rohit Tripathi, Gautam Barua (Indian Institute of Technology Guwahati, India)
S1-13	A flexible public cloud based testing service for heterogeneous testing targets. Sheng-Jen Hsieh, Guo-Heng Luo, Shyan-Ming Yuan (National Chiao Tung University, Taiwan),Hsiao-Wei Chen (Chunghwa Telecom labs., Taiwan)
S1-14	Adaptive Decision Making for Improving Trust Establishment in VANET. Yu-Chih We i(Chunghwa Telecom labs., Taiwan)
S1-15	A High-Speed Method for Evaluating One-to-all Reliability. Junpei Aramata, Masahiro Hayashi (Tokyo City University, Japan)
S1-16	Auto-Scaling Method in Hybrid Cloud for Scientific Applications. Younsun Ahn, Jieun Choi, Sol Jeong, Yoonhee Kim (Sookmyung Women's University , Korea)
S1-17	Collaboration of IMS and SDN to Enable New ICT Service Creation. Chung-Shih Tang, Chin-Ywu Twu, Jen-Hong Ju, Ying-Dian Tsou (Chunghwa Telecom labs., Taiwan)
S1-18	Mediating Between OpenFlow and Legacy Transport Networks For Bandwidth On-Demand Services. Chuan Yin, Tsan-Chang Kuo, Tai-Yuan Li, Min-Chia Chang, Been-Huang Liao (Chunghwa Telecom labs., Taiwan)
S1-19	A Random Switching Traffic Scheduling Algorithm for Data Collection in Wireless Mesh Network. Sujie Shao, Shaoyong Guo, Xuesong Qiu, Meng Luoming (Beijing University of Posts and Telecommunications, China), , Cheng Zhong (State Grid Hebei Electric Power Company of China, China),
S1-20	Reliability-Oriented Clustering Algorithm for Service Search in Ubiquitous Stub Environments. Feng Jiang, LanLan Rui, Shaoyong Guo, Xuesong Qiu (Beijing University of Posts and Telecommunications, China),Wei Li (Jianxi jingdezhen power supply company of State Grid, China)
S1-21	Location-Aware Services based on Wi-Fi Network. Hsu-Sheng Chang, Yun-Hui Wen, Hsiao-Wen Kao, Gwo-Hwa Ju (Chunghwa Telecom labs., Taiwan)
S1-22	An Intelligent Image-based Customer Analysis Service. Ting Wei Lee, Yen-Lin Chiu, Yu Shan Wu, Heng Sung Liu (Chunghwa Telecom labs., Taiwan)
S1-23	Software-Defined QoE Measurement Architecture. Yu-Huang Chu, WeiTing Lin, Ching-Tzu Hsieh, Kai-Mao Cheng, Yao-Chun Wang, Ya-Lun Yang (Chunghwa Telecom labs., Taiwan)

Poster session 2:

Thurs., Sept.18, 10:00~10:30 & 14:50~15:20, International Conference Hall

Chair: Noriaki Kamiyama (NTT Network Technology Labs, Japan)

No	Title
S2-1	Model for Cost Evaluation of OSS Data Integration. Naoki Take, Manabu Nishio (NTT, Japan)
S2-2	User Experience Optimization for Personal Services. Ming-Huei Chen, Shih-Ming Lin, Gong-You Chen, Chun-Chi Chen, Hung-Chi Chan (Chunghwa Telecom labs., Taiwan)
S2-3	Linux kernel-based Feature Selection for Android Malware Detection. Hwan-Hee Kim, Mi-Jung Choi (Kangwon National University, Korea)
S2-4	Synergy-aware Selection Mechanism for High Quality and Sustainability of Ubiquitous Services. Xiyue Mao, LanLan Rui, Shaoyong Guo, Xuesong Qiu (Beijing University of Posts and Telecommunications, China)
S2-5	Multiple Features For Image Retrieval In Distributed Datacenter. Di Yang (Beijing University of Posts and Telecommunications, China)
S2-6	Time and Frequency Transfer System for Synchronization Applications. Jia-Lun Wang, Huang-Tien Lin, Chia-Shu Liao (Chunghwa Telecom labs., Taiwan)
S2-7	The Strategy of Probe Station Selection of Active Probing in WSNs. Hang Zhou, Yang Yang, Xuesong Qiu (Beijing University of Posts and Telecommunications, China),Zhipeng Gao (State Key Laboratory of Networking and Switching Technology, China)
S2-8	Energy Efficient Virtual Network Embedding for Path Splitting. Xiaohua Chen, Chunzhi Li (East China Normal University, China)
S2-9	Price Competition in a Duopoly IaaS Cloud Market. Xianwei Li, Cheng Zhang, Kyoko Yamori, Yoshiaki Tanaka, Bo Gu (Waseda University - Japan)
S2-10	A energy-saving mechanism of mobile-terminal based on LTE - A uplink CoMP. Bin Wen, Wenjing Li, Lei Feng, Peng Yu, and Yang Yang (Bejing University of Posts and Communications)
S2-11	A Load Balance Algorithm Based on Nodes Performance in Hadoop Cluster. Zhipeng Gao (State Key Laboratory of Networking and Switching Technology, China),Dangpeng Liu, Yang Yang (Beijing University of Posts and Telecommunications, China),Yuwen Hao (General Hospital of Chinese Peoples Armed Police Forces, Beijing, China)
S2-12	Routing Algorithm of Smart Grid Data Collection based on Data Balance Measurement Model. Jia XiaoChun, Xingyu Chen, Sujie Shao, Qi Feng (Beijing University of Posts and Telecommunications, China)
S2-13	Opportunistic Resource Allocation via Stochastic Network Optimization in Cognitive Radio Networks. Tai Ho, Tuan Le, Ahsan Kazmi, Choong Seon Hong (Kyung Hee University, Korea)
S2-14	e-VeMAC: An Enhanced Vehicular MAC Protocol to Mitigate the Exposed Terminal Problem. VanDung Nguyen, Duc Dang, Sungman Jang, Choong Seon Hong (Kyung Hee University, Korea)
S2-15	SQUARE: FF on CUBIC TCP over Links with Differenct RTT. Tomoki Kozu (Kogakuin University, Japan)
S2-16	Sensor Failure Detection and Recovery Mechanism Based on Support Vector and Genetic Algorithm. Zhu Jiehui, Yang Yang, Xuesong Qiu (Beijing University of Posts and Telecommunications, China), Zhipeng Gao (State Key Laboratory of Networking and Switching Technology, China)
S2-17	An Efficient Provisioning Mechanism for In-Service Migration in Access Network. Ya-Shian Wang, Ya-Ping Huang, Chin-Ping Chuang (Chunghwa Telecom labs., Taiwan)
S2-18	Assessing the Quality of Experience of HTTP Video Streaming Considering the Effects of Pause Position. Ruiyi Wang, Yang Geng, Yifan Ding, Yang Yang, Wenjing Li (Beijing University of Posts and Telecommunication, China)
S2-19	Most Distinguished Port Based UDP Traffic Classification. Qianli Zhang, Yunlong Ma, Jilong Wang, Xing Li (Tsinghua University, China)
S2-20	A Scalable Flow Rule Translation Implementation For Software Defined Security. Hao Tu, Weiming Li, Dong Li, Junqing Yu (Huazhong University of Science and Technology, China)
S2-21	SDN-based architecture for end-to-end path provisioning in the mixed circuit and packet network environment. Seongbok Baik, Chan-Kyou Hwang, Young-Woo Lee (KT, Korea)
S2-22	A Pipe-Assisted Mobility Management in Named Data Networking Networks. Chen Yuh-Shyan, De-Yi Huang (National Taipei University, Taiwan), Cih-Shun Hsu (Shih Hsin University, Taiwan),

Poster session 3:

Fri, Sept.19, 10:00~10:30 & 14:50~15:20, International Conference Hall

Chair: Seung-Joon Seok (Kyungnam Univ., Korea)

No	Title
S3-1	Managing Syslog. Hiroshi Tsunoda (Tohoku Institute of Technology, Japan), Glenn Mansfield KEENI (Cyber Solutions Inc., Japan)
S3-2	An Implementation Model and Solutions for Stepwise Introduction of SDN. Hiroki Nakayama, Tsunemasa Hayashi (BOSCO Technologies Inc., Japan), Tashuo Mori, Satoshi Ueno, Yoshihide Watanabe (NTT Communications Corporation, Japan)
S3-3	Big Data Processing Framework of Road Traffic Collision Using Distributed CEP. In Jung Lee (Hoseo University, Korea)
S3-4	A Dynamic Taint Tracking Based Method to Detect Sensitive Information Leaking. Weiming Li, Yilin Yan, Hao Tu, Jia Xu (Huazhong University of Science and Technology, China)
S3-5	Aggregation management design for user-defined network infrastructure. Ardiansyah Ardi, Sungmin Hwang, Fiqri Muthohar, Kyehyun Bang, Deokjai Choi (Chonnam National University, Korea), Wangcheol Song (Jeju National University, Algeria), Seungjoon Seok (kyungnam University, Korea), Seunghae Kim (KISTI, Korea)
S3-6	Applying NetInf for the M2M Service Platform.T. Kaida and O. Mizuno (Kogakuin University, Japan)
S3-7	Application Traffic Classification in Hadoop Distributed Computing Environment. Kyu-Seok Shim, Su-Kang Lee, Myung-Sup Kim (Korea University, Korea)
S3-8	DCP: An Efficient and Distributed Data Center Cache Protocol with Fat-Tree Topology. Zhihui Jiang, Zhiming Ding, Xiaofeng Gao, Guihai Chen (Shanghai Jiao Tong University, China)
S3-9	Analysis of ICMP Policy for Edge Firewalls Using Active Probing. Hyeonwoo Kim, Dongwoo Kwon, Hongtaek Ju (Keimyung University, Korea)
S3-10	A Performance Comparison of In-Memory Virtual Desktop Environment. Dai Tran, Dung Nguyen, Huh Eui-Nam, Choong Seon Hong (Kyung Hee University, Korea)
S3-11	Building a Product Feature Mining and Evaluation System on E-commercial Comments. Ke Xu, Ma Xuedong, BoQin Hu, Shuman Liu, Pengfei Sun (Beijing University of Posts and Telecommunications, China)
S3-12	Active Packet Dropping for Improving Performance Fairness among Modern TCPs. Yuria Akiyama (Kogakuin University, Japan)
S3-13	A Traffic Load Balancing Method for Component-based Service Platform with Heterogeneous Wireless Access Networks. Hiroki Matsuyama, Yuya Inoue, Yusuke Hirota, Kazuhiko Kinoshita, Hideki Tode, Takashi Watanabe (Osaka University , Japan)
S3-14	A QoS Supporting Ad Hoc Network Protocol Combing Admission Based TDMA and 802.11 DCF. Jing Lin, Celimuge Wu, Satoshi Ohzahata, Toshihiko Kato (University of Electro-Communications, Japan)
S3-15	Consistent Hashing Based Cooperative Caching and Forwarding in Content Centric Network. Kyi Thar, Saeed Ullah, Choong Seon Hong (Kyung Hee University, Korea)
S3-16	Optimal Resource Allocation for Multimedia Application in Single and Multiple Cloud Computing Service Providers. Cuong T. Do, Nguyen H. Tran, Dai Tran, Kyi Thar, Choong Seon Hong (Kyung Hee University, Korea), Duy Do (University of Transport and Communications, Vietnam)
S3-17	Network operational Method by using Software-Defined Networking for Improvement of Communication Quality at Disasters. Koichi Ogawa, Noriaki Yoshiura (Saitama University, Japan)
S3-18	Multi-Objective Optimization-based Traffic Engineering for Data Center Networks. Taeyoel Jeong, Sin-seok Seo, Jae Yoon Chung, Bernard Niyonteze, Jae-Hyoung Yoo, James Hong (POSTECH, Korea)
S3-19	On the Resilience of Software Defined Routing Platform. Pengcheng Zeng, Yao Shen, (Shanghai Jiaotong University, China), Kien Nguyen, Shigeki Yamada (National Institute of Informatics, Japan)
S3-20	QoE-oriented Resource Management Strategy by considering user preference for Video Content. Yifan Ding, Yang Geng, Ruiyi Wang, Yang Yang , Wenjing Li (Beijing University of Posts and Telecommunication, China)
S3-21	Challenges From Voice-over-LTE to Video-over-LTE. Yingrong Sung, Yu-Hsin Yang (National Chiao Tung University, Taiwan)
S3-22	Extending Dijkstra's Shortest Path Algorithm for Software Defined Networking. Jehn-Ruey Jiang, Hsin-Wen Huang, Ji-Hau Liao, Szu-Yuan Chen (National Central University, Taiwan)

Innovation Sessions

Innovation Session 1: Wed. Sept. 17, 2014, 16:35~18:15, Conference Room 4

Architectures, Methods & Technologies

Chair: Dr. Teh-Sheng Huang, (CHT, Taiwan)

No	Title
I1-1	Abstracting Internal API with an Extension Module in SDN controller, Tse-Han Wang, Chien-Hao Chen (Chunghwa Telecom, Taiwan)
I1-2	Abstract Modeling of SDN Architecture Enabling Comprehensive Performance Evaluation in SDN Architecture, Tatsuya Sato, Yasuhiro Sato, Shingo Ata, Ikuo Oka (Osaka City University, Japan)
I1-3	An Experimental of a Lightweight SID Based Model for BSS, Tsung-Tso Pan, Po-Kuang Chen, Chern-Bin Ju (Chunghwa Telecom, Taiwan)
I1-4	A Heuristic Resource Load-Balancing Algorithm for Cloud Computing Environments, Tzu-Chi Guo, Hsi-Lu Chao, Yi-Ming Chang (National Chiao Tung University, Taiwan)

Innovation Session 2: Fri. Sept. 19, 2014, 15:20~17:00, Conference Room 4

Network and Service Management

Chair: Dr. Hongtaek Ju, Keimyung University, Korea

No	Title
I2-1	Identification of User Behavior based on Time Variation of Traffic Statistics, Yusuke Iemura, Shingo Ata, Ikuo Oka (Osaka City University, Japan)
I2-2	Implementation and Evaluation of Server-assist Method for Machine-to-machine Gateway Configuration, Masaharu Hattori, Kiyohito Yoshihara (KDDI Laboratories, Japan)
I2-3	Prototype of peer-to-peer clustering system based on network distance, Kazunori Ueda, Shingo Yamamoto (Kochi University of Technology, Japan)
I2-4	Reducing Average Travel Time through Individualized Route Guidance in Urban Traffic Network, Zilu Liang, Yasushi Wakahara (The University of Tokyo, Japan)

Exhibitions

E1. Chunghwa Telecom: An integrated monitoring system for multiple technology network

The new generation communication service providers are facing operating issues: Networks are large and complicated including fixed-line/wireless network, global network. Convergence services are deployed with various technologies and multi-vender equipments. The complexity of management is very high. With the dedicated management systems for all fields, we may monitor all of above information but silo. CSPs urge a comprehensive, integrated way to see the whole picture of network operation. Chunghwa Telecom's Argus system provides a single platform to integrate Operation Support Systems at all levels within the company. By utilizing Chunghwa Telecom's enterprise information exchange platform (an EAI platform that complies with NGOSS standards), it gathers information of network to provide a comprehensive monitoring tool that can master the whole operational status of the entire communication service.

Features：

1. Centralization & Integration: Centralized Monitoring Chunghwa Telecom multi-domain network, including fixed networks (access/aggregation/core networks), wireless networks (WiFi), data centers and international networks (submarine cables, satellites) all around Taiwan in just a single platform.
2. Service Impact analysis: With smart analysis of the relation between the devices faults and multiple type of services, like VoIP, Internet Service, IPTV, Leased Lines. The System notifies operation personnel and customers automatically.
3. Business Intelligence: With visualized and user-configurable tools, we provide real-time analysis of network status and KPIs about key resources usage.

E2. Chunghwa Telecom: Smart Broadband Network

By the technologies of SDN (Software-Defined Networking) and NFV (Network Functions Virtualization), the vision of Smart Broadband Network can be put into realization. The network will be no longer a dump pipe by only transferring bytes, but rather the network components along with its applications can be programmable and automatically provisioned to meet the business needs.

Chunghwa Telecom Laboratories (CHT-TL), as a leading telecom carrier in Taiwan, has conducted SDN and NFV related research and application development for years. Several innovative solutions have been developed and built for the Smart Broadband Network. SDN and NFV indeed play quite important roles in constructing the Smart Broadband Network.

A Smart Broadband Network should include the following features:

(1) Real-time Traffic Monitoring
(2) Dynamic Traffic Engineering
(3) Network Security
(4) Application Control
(5) Network Functions Virtualization

In APNOMS 2014, the concept of the Smart Broadband Network will be illustrated by CHT-TL.

E3. KT: KT Transport SDN Controller: NaaS Enabler

The leading network R&D organization at KT, Infra Laboratory has successfully contributed commercializing new technologies such as ADSL, FTTH, and so forth for years. Given that the world is moving forward to service-driven economy, the laboratory has focused on developing software-centric technologies. The outcome of many years' effort, the Transport SDN Controller which is displayed here today is capable of managing a telco's emerging network infrastructure which is typically composed of PTN, OTN, POTN, etc. The controller is unprecedented in terms of providing end-to-end connectivity provisioning in minutes. KT has rigorously enhanced and verified features of the controller and the company is ready to start applying it over its commercial service network from the next year.

Here are representative key components and underlying technologies.

- Service Enabler : Open & programmable northbound APIs (RESTful)
- Controller : ML-PCE, resource recovery, real-time E2E provisioning
- Network Abstraction: Multi-vendor, domain and technology adaptation (RESTful, CORBA, SNMP, etc.)
- Software Architecture: Flexible framework with seamless integration

Utilizing the controller's central control and resource management features, telcos are expected to use it as a NaaS Enabler for their future business and customers will be benefited from many advanced features of it such as real-time E2E provisioning, on-demand bandwidth control, dynamic pricing schemes which were not supported in traditional networks.

E4. Fujitsu Limited: High-capacity Storage and High-speed Search System for 40 Gbps Packet Transmission

Fujitsu has developed a technology that can capture communication data flowing through a high-speed 40 Gbps packet transmission without the need for dedicated hardware and search data while storing it for a long period of time.

This technology achieves high capturing and storage performance by arranging read data into a suitable size for each processing and restricting copying while not causing a lock-up to occur. In addition, it achieves high-speed searches by storing data while classifying it in real-time.

It makes possible to catch, inexpensively and with certainty, network bottlenecks or even external cyber-attacks through communications breaches that sampling of partial data or short-term observations might miss. This will work to improve network quality, stabilize datacenter operations, and enhance security.

Patrons

Platinum Patrons

Chunghwa Telecom

Chunghwa Telecom is Taiwan's leading telecom service provider. It provides fixed line, mobile and Internet and data services to residential and business customers in Taiwan. Chunghwa Telecom is the first company to roll out 4G services in 2014. Chunghwa Telecom continues to enhance its capabilities to tap demand for non-traditional telecom services for incremental business opportunities. These would include fast-growing businesses such as cloud computing and ICT in the overseas markets. Chunghwa Telecom strive to bring its customers a refreshing viewing experience on a platform seamlessly integrated across mobile internet, broadband and MOD, allowing Chunghwa to remain at the forefront of the ongoing trend of digital convergence. Chunghwa Telecom continues to maintain a high standard in corporate social responsibility through strong contributions to society and environment, while it strives to improve its operational efficiency utilizing technology as well as management process optimization. Chunghwa Telecom is dedicated to maximizing values to its shareholders, customers and employees.

Gold Patrons

Nokia Solutions and Networks

Nokia invests in technologies important in a world where billions of devices are connected. We are focused on three businesses: network infrastructure software, hardware and services, which we offer through Networks; location intelligence, which we provide through HERE; and advanced technology development and licensing, which we pursue through Technologies. Each of these businesses is a leader in its respective field.

Through Networks, Nokia is the world's specialist in mobile broadband. From the first ever call on GSM, to the first call on LTE, we operate at the forefront of each generation of mobile technology. Our global experts invent the new capabilities our customers need in their networks. We provide the world's most efficient mobile networks, the intelligence to maximize the value of those networks, and the services to make it all work seamlessly.
www.nsn.com / www.company.nokia.com

Silver Patrons

National Center for High-performance Computing

The National Center for High-performance Computing (NCHC), founded in 1991, is Taiwan's only national-level supercomputing center. It possesses a large computing and networking platform facilities for use by domestic academia and the general public. The NCHC plays a leading role in Taiwan's cloud technology services by integrating high performance computing (HPC), storage, and networking to provide cloud services in storage, big data analysis, and scientific and engineering simulation.The goal of the NCHC is to become an internationally renowned HPC center that promotes scientific discovery and technological innovation. Since its inception, the NCHC has been dedicated to strengthening Taiwan's HPC and networking infrastructure. In order to effectively support Taiwan's technology research, the NCHC constructed technology R&D platforms to support domestic and foreign R&D teams in developing HPC and big data applications, which cover engineering and science, environmental and disaster prevention, biomedicine, and digital cultural content creation. The NCHC hopes to achieve the goal of becoming an HPC center of international caliber and a base for HPC applications and R&D collaborations within the Pacific Rim region.

Silver Patrons

kt

kt, leading the development of the information and communications industries of Korea since its foundation in 1981.

▪ **Quadrupling the number of fixed lines in 12 years.**

Expanding 4.5 million fixed lines to 20 million in just 12 years, kt introduced universal telephone service to every citizen of Korea, leading the development and advancement of communications services. More recently, kt established an advanced broadband network for the first time in Asia, and launched Korea's first communication satellite 'Mugunghwa (Sharon's Rose)', contributing to making Korea one of the most advanced countries in information and communications.

▪ **More than just fixed lines, into the wireless internet business.**

As becoming a government-funded corporation in 1997, kt changed its business portfolio by focusing more on wireless and internet services instead of fixed lines. Taking over Hansol M.com and merging with its subsidiary KTF, kt expanded its business scope and included mobile communication as its main service. kt became a privately owned company in 2002 and began concentrating on building broadband network. As a result, the company set several new records including the increase of ADSL subscribers to 6 million in just 3 years and played a leading role in the age of digital networking.

▪ **A growing corporation, prepared for the age of convergence**

kt will continue to make efforts to play a leading role in the global market and become a trustworthy company by fulfilling corporate responsibility and ensuring quality service and technology in the age of convergence where voice and data, fixed and mobile, and communications and broadcasting services are converged.

▪ **Global kt**

Meanwhile, kt also became a global corporation by tapping into overseas markets. In particular, kt's mobile subsidiary NTC enlisted more than one million subscribers in 2007 in Primorsky Krai, Russia and was selected as the best corporate in social contribution in the Russian province. In 2009, kt merged with KTF to keep pace with the global trends of fixed/mobile convergence and entered the new era of convergence, following those of CDMA and ADSL.

Ericsson Taiwan

Ericsson is the driving force behind the Networked Society – a world leader in communications technology and services. Our long-term relationships with every major telecom operator in the world allow people, businesses and societies to fulfill their potential and create a more sustainable future.

Our services, software and infrastructure – especially in mobility, broadband and the cloud – are enabling the telecom industry and other sectors to do better business, increase efficiency, improve the user experience and capture new opportunities.

With more than 110,000 professionals and customers in 180 countries, we combine global scale with technology and services leadership. We support networks that connect more than 2.5 billion subscribers. Forty percent of the world's mobile traffic is carried over Ericsson networks. And our investments in research and development ensure that our solutions – and our customers – stay in front.

Founded in 1876, Ericsson has its headquarters in Stockholm, Sweden. Net sales in 2013 were SEK 227.4 billion (USD 34.9 billion). Ericsson is listed on NASDAQ OMX stock exchange in Stockholm and the NASDAQ in New York.

Silver Patrons

CITI, Academia Sinica

The Research Center for Information Technology Innovation(CITI) at Academia Sinica was founded in February 2007, with the purpose to integrate the research and development activities in information technologies among various organizations in Academia Sinica, and also to further leverage IT-related multi-disciplinary research.

Currently, CITI has three thematic centers, namely, Grid & Scientific Computing Center, Taiwan Information Security Center, Intelligent & Ubiquitous Computing Center. The mission of CITI is to promote the innovation and application of information technologies, with emphases on exploring the enabling technology for essential infrastructure and also on integrating inter-disciplinary technologies so as to provide the key ingredients that are invaluable for the upcoming knowledge-based and service-based societies.

IIS, Academia Sinica

The Institute of Information Science (IIS) was formally established in September 1982 after a five-year preparation period, and is one of the eleven institutes and research centers within the Division of Mathematical and Physical Sciences. IIS presently has 39 full-time research fellows, 29 postdoctoral research fellows and over 300 full-time information technology specialists and part-time research assistants supporting research and development of information science and engineering. All members of IIS prescribe to the motto, "Every job is a self-portrait of those who did it; autograph your work with quality," emphasizing excellence and synergistic teamwork effort.

The mission of IIS is to conduct quality fundamental research in information science, develop cutting edge technologies applicable to advanced information systems, and improve our national competitiveness in information technology, and international visibility. Being a member of the highest research institution in Taiwan, IIS is obligated to assuming the leadership role in the area of information science and engineering, and aims to establish itself as one of the first-class research institutions in the world.

Bronze Patrons

FUJITSU LIMITED

Fujitsu is the leading Japanese information and communication technology (ICT) company offering a full range of technology products, solutions and services. Approximately 162,000 Fujitsu people support customers in more than 100 countries.

We use our experience and the power of ICT to shape the future of society with our customers. Fujitsu Limited (TSE: 6702) reported consolidated revenues of 4.8 trillion yen (US$46 billion) for the fiscal year ended March 31,2014.
For more information, please see http://www.fujitsu.com.

Industrial Technology Research Institute

工業技術研究院是國際級的應用科技研發機構，擁有近 6 千位科技研發尖兵，以科技研發，帶動產業發展，創造經濟價值，增進社會福祉為任務。成立於 1973 年，培育超過 140 位 CEO、累積超過 2 萬件專利，並新創及育成 244 家公司，包括台積電、聯電、台灣光罩、晶元光電、盟立自動化、旺能、鈺邦等上市櫃公司。
為因應產業環境趨勢，工研院除持續深化技術前瞻性與跨領域技術整合外，更提供全方位的研發合作與商業顧問服務，包括新技術與新產品委託開發、小型試量產、製程改善、檢校量測，以及技術移轉、智權加值服務等，並設置開放實驗室及育成中心，積極推動及育成新創公司，加速產業技術開發及孕育新興高科技產業。
面對不斷改變的世界，工研院以「創新、誠信、分享」的核心價值，持續深耕前瞻性、關鍵性的技術，為了人類更美好的未來而努力，關懷日漸老化的人口，預見未來環境的趨勢，回應對智慧化的需求；並聚焦於綠能環境、健康照護、智慧生活等跨領域整合，以創新科技的研發，謀求人類社會福祉，為產業社會帶來更美好的未來。

Symposium Registration

Registration Fees:

Attendee/Type	Author (by July. 24, 2014)	Early-Bird (by Aug. 17, 2014)	Advance (by Sep. 10, 2014)	Regular/Onsite (after Sep. 10, 2014)
Full	12,000 TWD	12,000 TWD	14,000 TWD	16,000 TWD
Student	Not Available	1,500 TWD	1,500 TWD	1,500 TWD
Extra Banquet Ticket	2,000 TWD	2,000 TWD	2,000 TWD	Not Available

- Full registration fee includes proceedings, admissions to tutorial sessions, technical sessions, banquet, three lunches and coffee breaks.
- Student registration fee includes the same as full registration except the banquet is not included.
- Exhibitor registration fee includes lunches and banquet, but does not include admission to the tutorials and technical sessions.
- For **each of all accepted papers, at least one author including students must register by the Early-Bird due date at the Full rate** in order to guarantee their papers to be published in the symposium proceedings and IEEE Xplore.
- Presenters must provide the paper number and title of their paper.
- Registration fees will **be charged in Taiwan Dollars (TWD) only** according to local financial regulations.

Welcome Reception

- **Location:** Microelectronics and Information Systems Research Center, National Chiao Tung University
- **Time:** 18:30 – 20:30, Wednesday, September 17, 2014

All attendees are invited to join this cocktail party surrounded by casual music, delicious cuisine and cold beer.

Microelectronics and Information Systems Research Center

Lunch

Lunch

Lunches will be provided to all attendees during the symposium. When you check in at the registration desk, be sure to receive lunch tickets for 3 days. We may provide lunches in lunch box or light meal buffet style. Final arrangement for everyday lunch will be announced in a note in your registration bag, or you can confirm with our staffs at the registration desk.

Symposium Banquet

6:30 – 8:30 p.m., Thursday, September 18, 2014

- Banquet Hall #1 and #2 on the 3rd floor of Sheraton Hsinchu Hotel

Invited speakers, exhibitors, and all attendees with full registration are welcome to the symposium banquet. Extra banquet tickets for accompanying people or student attendees can be purchased at registration desk for TWD 1,400. Just relax and enjoy the excellent entertainment program, delicious cuisine and fine wine.

Banquet Hall, Sheraton Hsinchu Hotel

Transportation

GENERAL INFORMATION

APNOMS 2014 will be held in Hsinchu, Taiwan. You can reach Taiwan by booking a flight that is bound for Taiwan Taoyuan International Airport, which is approximately 60-kilometer in distance to Hsinchu. You may also look for flights that are bound for Taipei Songshan Airport, which is approximately 80-kilometer in distance to Hsinchu. Taipei Songshan Airport is a regional airport. Taipei Songshan Airport has direct flights from/to Haneda airport (Japan) and Jeju airport (South Korea)

AIRPORT INFORMATION

Taiwan Taoyuan International Airport :

Address	No. 9, Hangzhan S. Rd., Dayuan Township, Taoyuan, Taiwan 33758, R.O.C.
Service Counter	+886-3-398-2144 (Terminal 1 Service Counter) +886-3-398-3274 (Terminal 2 Service Counter)
Website	http://www.taoyuan-airport.com/english/index.jsp

Taipei Songshan Airport :

Address	No. 340-9, Dunhua N. Rd., Songshan District, Taipei City 10548, Taiwan (R.O.C.)
Service Counter	+886-2-8770-3430 (Terminal 1 Service Counter) +886-2-8770-3460 (Terminal 2 Service Counter)
Website	http://www.tsa.gov.tw/

Transportation

GENERAL INFORMATION FOR AIRPORT TRANSPORTATION (Airport → Hsinchu)

- **By Taxi**

Local Taxi	
Taxis are available outside the arrival halls of Taoyuan International Airport	
Fare	The charge is conventionally based on the meter plus a 50% surcharge. On average, a trip from Taoyuan International Airport to Hsinchu by taxi costs about NT$1,300.
Service Hours	24 hours a day.
Driving Distance	About 50 minutes.

- **By Taiwan High Speed Rail**

To get to Hsinchu by High Speed Train, please refer to the following steps

Step 1

U-Bus Shuttle Bus to Taoyuan THSR station	
U-Bus counter is in Arrival Greeting Hall. You can take the bus in terminal 1 and terminal 2.	
Fare	NT$30
Driving Distance	About 25 minutes.
For more information on bus service, please visit this website	

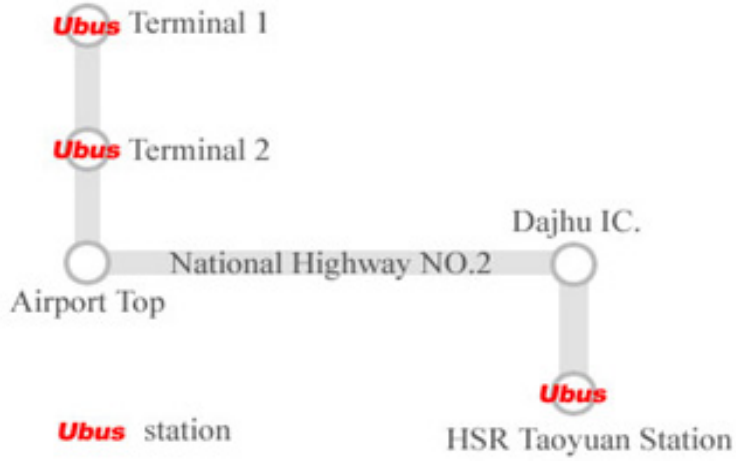
Transportation

GENERAL INFORMATION FOR AIRPORT TRANSPORTATION (Airport → Hsinchu)

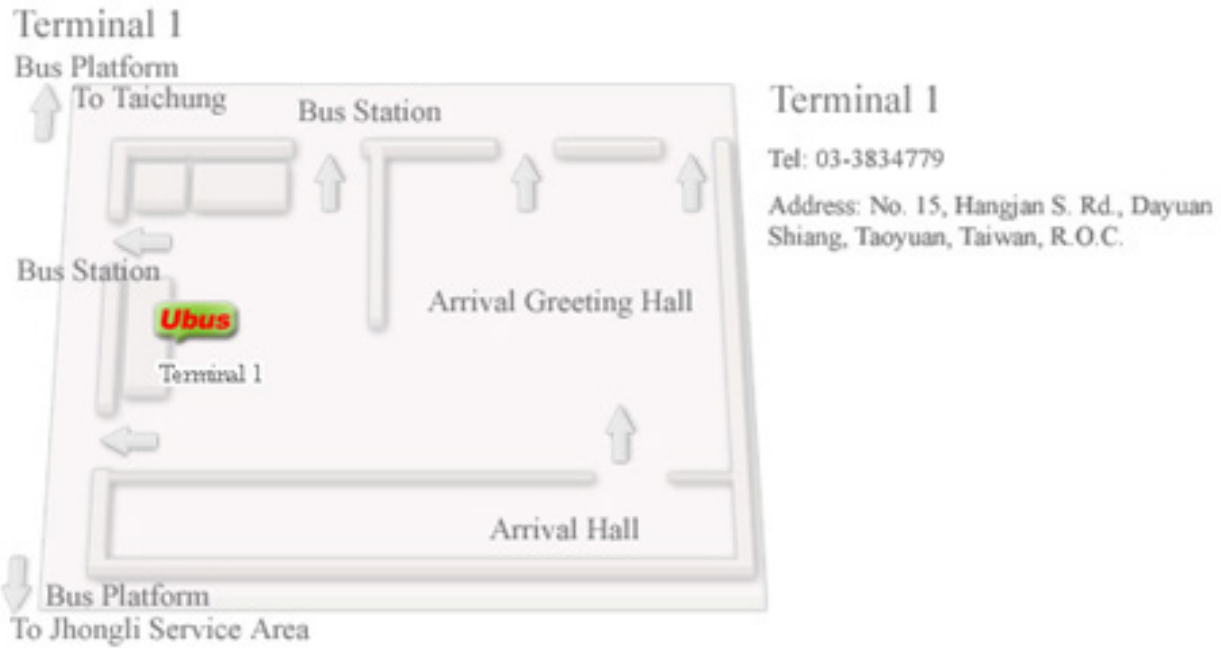
Taiwan High Speed Rail Shuttle Bus

UBUS counter is in Arrival Greeting Hall. You can take the bus in terminal 1 and terminal 2.

THSR Taoyuan Station to Taoyuan Airport Routes



Terminal 1



Terminal 2

Terminal 2

Tel: 03-3833552

Address: No. 9, Hangjan S. Rd., Dayuan Shiang, Taoyuan, Taiwan, R.O.C.

Transportation

Step 2

Taiwan High Speed Rail (Taoyuan THSR Station ⇨ Hsinchu THSR Station)	
Fare	NT$140
For more information on Taiwan High Speed Rail service, please visit this website.	

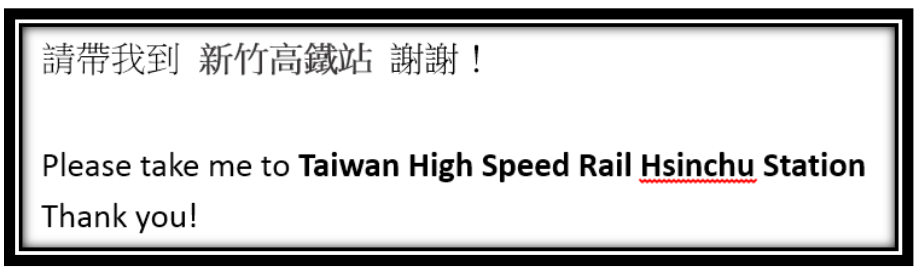
Step 3

Taxi (Hsinchu THSR Station to NCTU)
Please download and print the Taxi Instruction Cards. You could use these cards to show your destinations to taxi drivers

TAXI INSTRUCTION CARDS

Most taxi drivers in Taiwan do not speak English. Please download and print the Chinese-English instruction cards below so you may use them when needed.

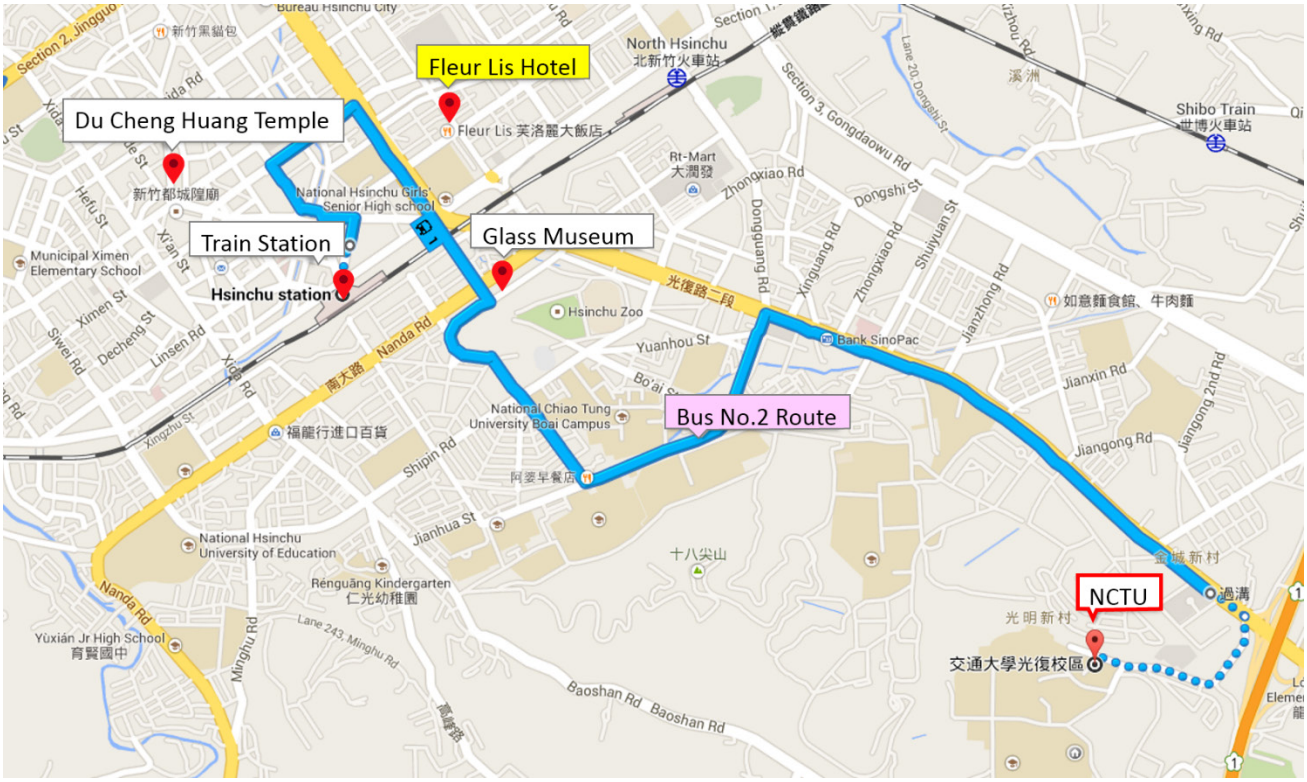
(If you need the Taxi Instruction Cards, please click the figure below to download.)



Transportation in Hsinchu

INTRODUCTION:

Hsinchu is the center of Taiwan's information industry. It is the home of National Chiao Tung University and National Tsing Hua University. It is also the home of many government research agencies such as Industrial Technology Research Institute, National Health Research Institutes, and National Synchronous Radiation Research Center. Many of the leading technology companies in Taiwan such as TSMC and MediaTek are also headquartered in Hsinchu. Due to its unique geographic location, Hsinchu is famous for strong winds through all seasons. As one of the oldest city in northern Taiwan, many ancient architectural structures and artifacts remain intact in the city streets. The downtown area is pedestrian friendly. You may take city bus No.2 or a cab to the downtown to experience the winds and enjoy the local cuisines of Hsinchu.



TRAVELING between NCTU and Hsinchu downtown:

- **Bus**

Hsinchu city bus	
City bus No. 2 runs between NCTU to Hsinch train station (downtown).	
Fare (per trip)	NT$15
Driving Distance	About 20 minutes
For more information on bus service, please visit this website	

Venue Information

Introduction

The NCTU Microelectronics and Information Systems Research Center building was established in 1984 to explore and perform long-range collaborative research in microelectronics and information systems to promote the cooperation between academic institutions and industries. APNOMS 2014 will be held on the first floor of the MIRC building. On the first floor, there is the international conference center that may house 232 people. There are three meeting rooms that can house 100 people (Room 101), 50 people (Room 104), and 150 people (Room 106), respectively.

Microelectronics and
Information Research Center

International Conference Hall

Hallway on the First Floor

Venue Information

Traffic Information

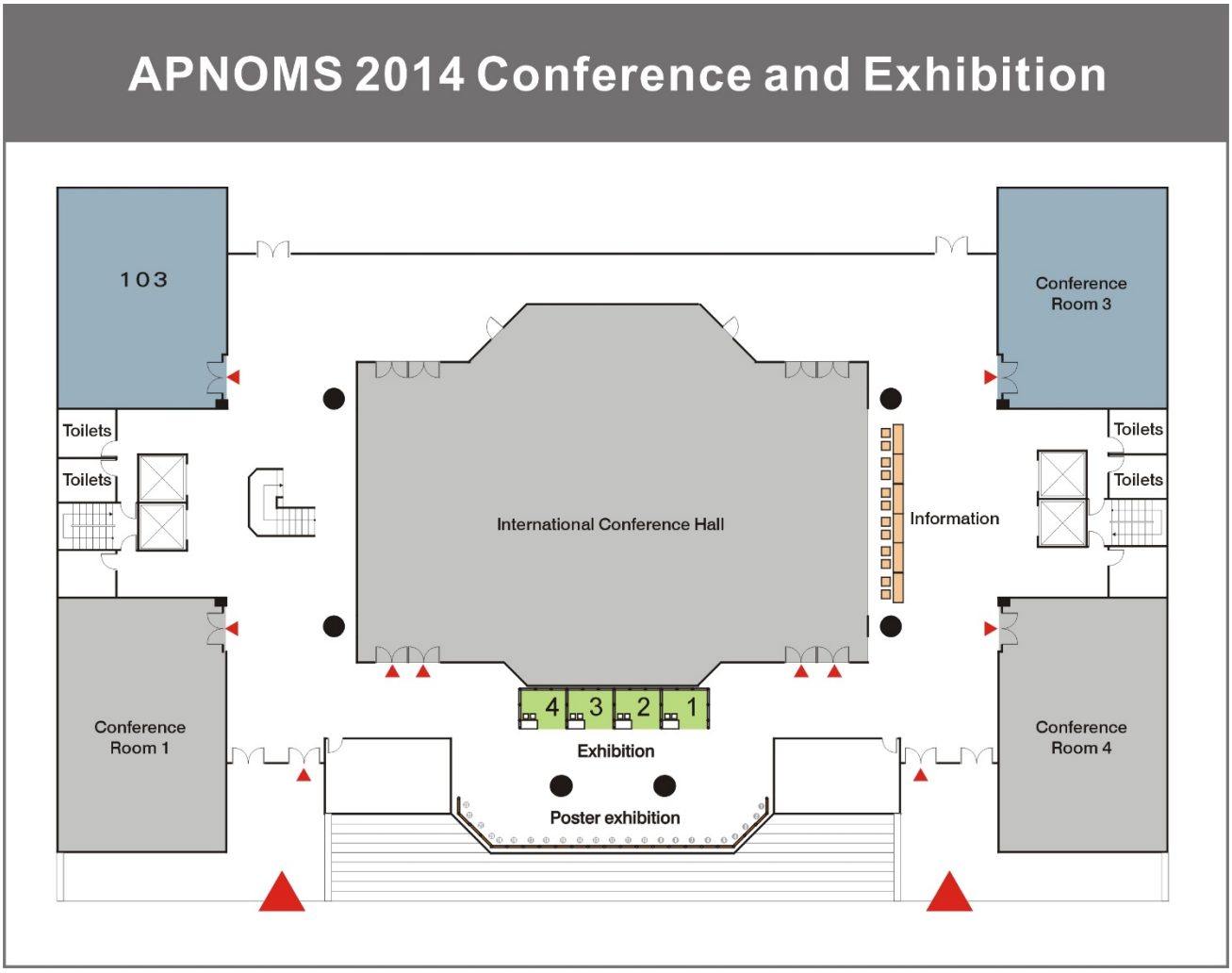
You may reach the conference venue (MIRC) by taxi or bus. The picture below displays the campus of NCTU where MIRC is located.

A Google street view of MIRC is available on Google Map on APNOMS 2014 website. The coordinates of MIRC building, Bus stop (for city bus No.2) and Hsinchu train station below for your convenience.

- The venue, MIRC : (24.786683, 121.001743)
- Bus stop "NCTU" : (24.788251, 120.999331)
- Hsinchu train station : (24.801639, 120.971694)

Venue Information

Floor Plan

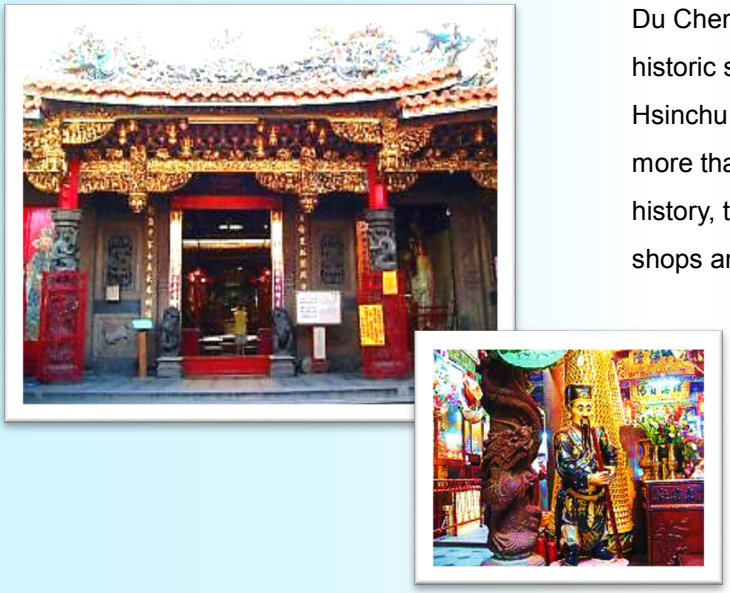


Tour Information

Hsinchu Science Park

Hsinchu Science Park (HSP) was established in 1980. The Hsinchu Science Park is surrounded by the Industrial Technology Research Institute, National Tsing Hua University and National Chiao Tung University. The science park is currently the home of more than 500 high-tech companies focused on semiconductor, optic-electronic, information technology, and telecommunication. Hsinchu

Hsinchu Du Cheng Huang Temple



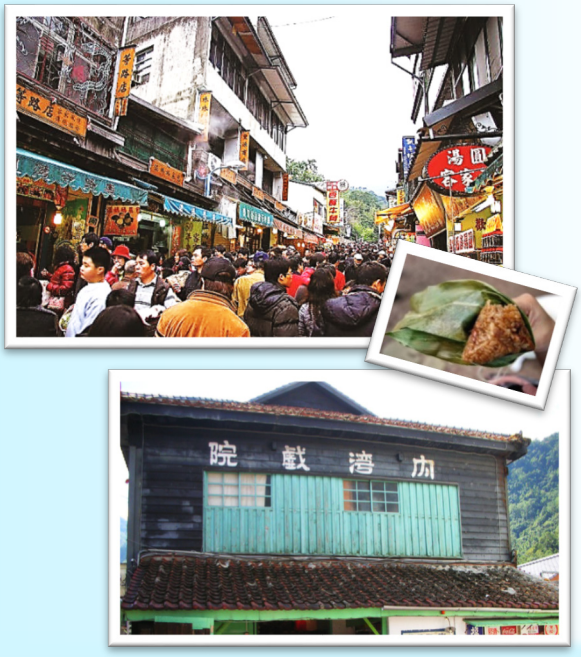
Du Cheng Huang Temple, which is a Grade II historic site in Taiwan, is located near the center of Hsinchu City. The structure was built over a span of more than two hundred sixty years.Due to its long history, the Temple is surrounded by traditional food shops and restaurants.

Tour Information

Glass Museum

Glass Museum located in the Northwest direction of Hsinchu Park was built in 1936. It was reconstructed from the Autonomous Club House, and opened officially on December 18, 1999. Glass Museum, a non-profit permanent institution with industry upgrading. The establishment of Glass Museum successfully combines culture and sightseeing resources to promote Hsinchu glass industry. It's not only bridging the connection with international glass art, but shaping Hsinchu city as the city of glass art.

Neiwan old street



Neiwan Old Street smelt wonderfully nostalgic, and has tremendous and long history in the industrial economy and culture. In Neiwan, there are many scenery spots such as Neiwan suspension bridge, Neiwan old street; Neiwan train station is also a well-known spot which many tourists like to stay. Neiwan street is the major road in Jianshih areas where forestry were flourishing. Those traditional houses on it have a unique historical significance. When you come to the Neiwan street, please take the opportunity to taste the delicious wild ginger flower rice dumpling, Hakka Lei Cha, Hakka mochi and other specialties. It will be an unforgettable experience.

Mission

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