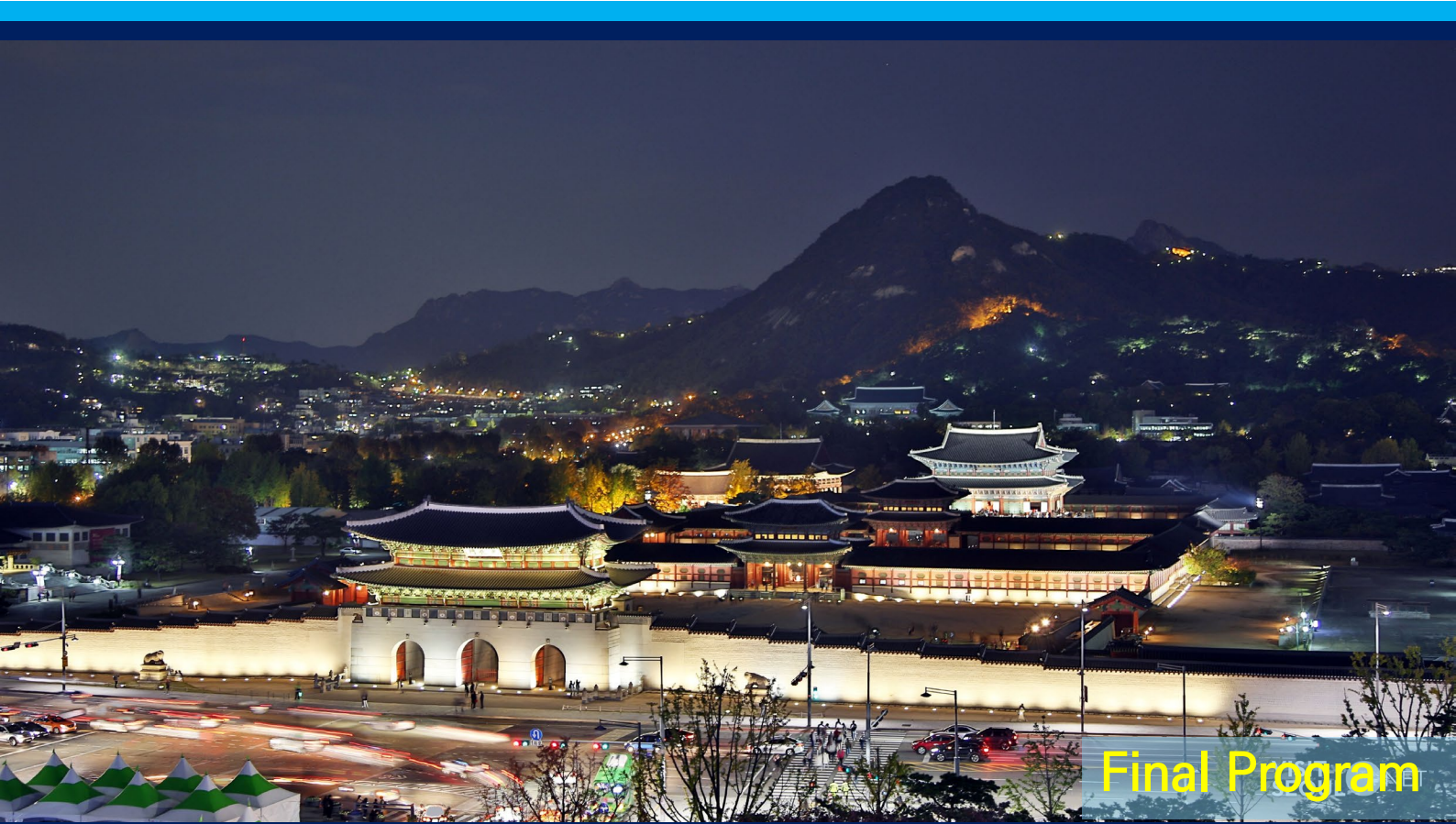




IEEE/IFIP Network Operations and Management Symposium

May 6–10, 2024 | The-K Hotel, Seoul, South Korea



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Program-at-a-Glance

Date Time	5/6 (Mon.)						5/7 (Tue.)				5/8 (Wed.)			5/9 (Thu.)			5/10 (Fri.)					
Room	Bipa	Sogeum	Cosmos	Daegu	Haegeum B	Haegeum A	Gayageum A	Gayageum B	Daegu	Gayageum A	Gayageum B	Daegu	Gayageum A	Gayageum B	Daegu	Bipa	Acacia	Cosmos	Daegu	Haegeum B	Haegeum A	
8:00-9:00	Registration						Registration				Registration			Registration			Registration					
9:00-10:30	AnNet	MFI5.0		MC1	TU1	TU2	TS1	TS2	ES1	TS7	TS8	ES2	PA4	TS11	DS3	IPSN	A-T-Q	GAIN	MC5	TU5	TU6	
10:30-11:00	Coffee Break						Coffee Break / Poster 1				Coffee Break / Poster 3			Coffee Break / Poster 5			Coffee Break					
11:00-12:30	AnNet	MFI5.0		MC2	TU1	TU2	Opening Ceremony Keynotes 1 & 2			Keynotes 3 & 4			Keynotes 5 & 6			IPSN	A-T-Q	GAIN	MC6	TU5	TU6	
12:30-14:00	Lunch Time						Lunch Time / Demo 1				Lunch Time / Demo 2			Lunch Time / Demo 3			Lunch Time					
14:00-15:30	AnNet	MFI5.0	man-IoT	MC3	TU3	TU4	PA1	TS3	TS4	PA2	TS9	TS10	PA5	TS12	TS13	IPSN	A-T-Q		MC7	TU7	TU8	
15:30-16:00	Coffee Break						Coffee Break / Poster 2				Coffee Break / Poster 4			Coffee Break / Poster 6			Coffee Break					
16:00-17:30	AnNet	MFI5.0	man-IoT	MC4	TU3	TU4	TS5	TS6	DS1	PA3	DS2		Distinguished Experts Panel, Best Paper Awards & Closing Ceremony			IPSN	A-T-Q		MC8	TU7	TU8	
	Welcome Reception at Uccello (18:00-20:00)												Conference Banquet at Geomungo B&C (19:00-21:00)									

- ES: Experience Session
- WS: Workshop
- AnNet: Workshop on Analytics for Network and Service Management
- MFI5.0: Workshop on Management for Industry
- man-IoT: Workshop on Internet of Things Management
- IPSN: Workshop on Intelligence Provisioning for Network and Service Management in Softwarized Networks
- A-T-Q: ANMS-TNT-QoDaNeT (Workshop on Autonomous Network Management Systems-Technologies for Network Twins-Quality of Data in Network Telemetry)
- MC: Mini-Conference
- DS: Doctoral Symposium
- TU: Tutorial Poster
- KN: Keynote Demo
- PA: Panel
- DEP: Distinguished Experts Panel
- TS: Technical Session

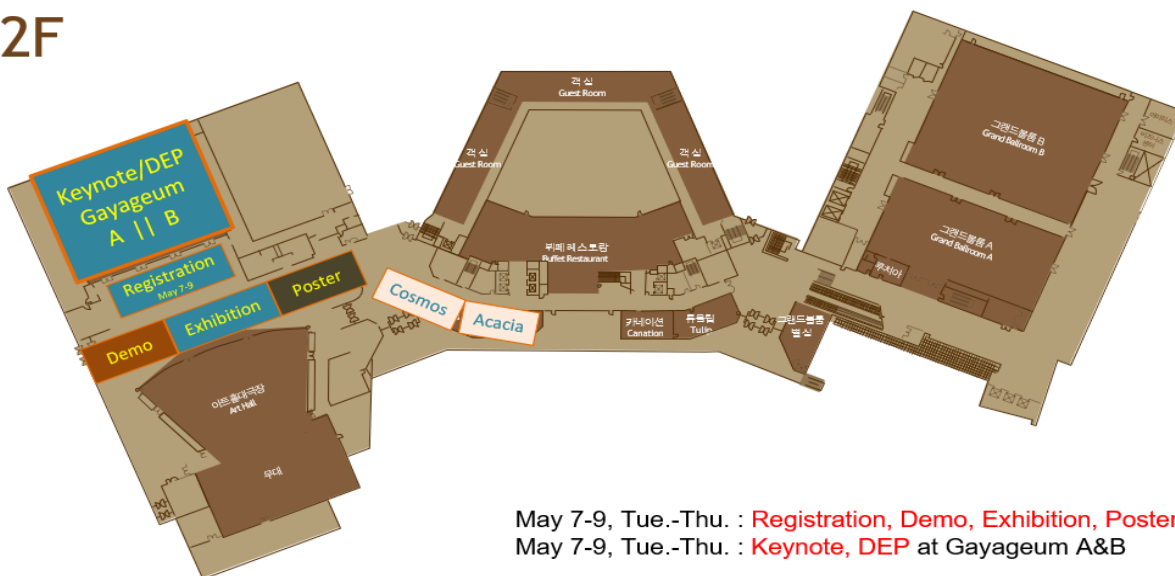
Floor Plan

1F



May 6, Mon. 18:00: **Welcome Reception** at Uccello
 May 6-10, Mon.-Fri. 12:30: **Lunch** at Four Seasons

2F



May 7-9, Tue.-Thu. : **Registration, Demo, Exhibition, Poster**
 May 7-9, Tue.-Thu. : **Keynote, DEP** at Gayageum A&B

3F



May 5, Sun. 16:00: **OC meeting** at Daegeum
 May 6/10, Mon./Fri. : **Registration**
 May 8, Wed. 19:00: **Banquet** at Geomungo B&C

Welcome Message by General Chair



Welcome to the 2024 IEEE/IFIP Network Operations and Management Symposium (NOMS 2024)!

We are delighted to welcome you to NOMS 2024, which takes place from **May 6 to 10, 2024**, in the vibrant city of **Seoul, Korea**. It's a momentous occasion as NOMS returns to Korea after **20 years**, following the successful NOMS 2004.

NOMS 2024 promises an exhilarating program featuring:

- **Keynotes:** Insights from industry visionaries and thought leaders.
- **Panels:** Engaging discussions on pressing topics.
- **Technical Sessions:** Deep dives into cutting-edge research.
- **Demo Sessions:** Hands-on exploration of innovative solutions.
- **Doctoral Symposium:** Showcasing doctoral research.
- **Mini-Conference Sessions:** Focused discussions.
- **Poster Sessions:** Interactive displays of novel ideas.
- **Tutorials:** Learning opportunities for all levels.
- **Workshops:** Presenting and discussing with early results on hot topics.
- **Experience Sessions**
- **Vendor Exhibitions**

Our theme for NOMS 2024 is **"Towards intelligent, reliable, and sustainable network and service management."** As technology evolves, we witness the rapid deployment of **5G** networks worldwide and the emergence of **6G** networks on the horizon. Backbone networks, optical networks, and their convergence play pivotal roles in supporting mobile/wireless networks, the Internet of Things (IoT), metaverse applications, smart cities, autonomous vehicles, healthcare, and network twins. Exciting advancements like generative AI and large language models (LLMs) are reshaping the landscape of network operations and management.

We extend a warm invitation to researchers, developers, vendors, service providers, and policy makers. Let's collaborate, learn, and shape the future of our field. Together, we'll make NOMS 2024 an unforgettable experience!

Thank you for being part of our community. See you in Seoul!

Warm regards,
James Won-Ki Hong
General Chair, NOMS2024



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Keynotes
May 7, 2024 (Tuesday)
Keynote Address 1
11:00 – 11:45, Room: Gayageum-Hall
Title : Network Innovation and the Future of Digital Transformation

Speaker JINBAE HONG, PRESIDENT
INSTITUTE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY PLANNING & EVALUATION


Abstract Networks play a pivotal role as enablers of digital innovation, seamlessly integrating services, contents, and devices. From a global perspective, networks serve as the foundation and starting point for achieving digital co-prosperous society and civil rights. However, as infrastructure technologies, networks face challenges on their path to innovation. They require nationwide infrastructure development, significant amount of time, and exceptionally high levels of reliability. Additionally, network innovation must be intertwined with service innovation to foster widespread adoption. Korea has successfully overcome these hurdles through a harmonious combination of 'proactive R&D & pilot projects', 'pro-competitive telecommunications policies including facility-based competition', and 'demand generation for convergent services'. In the era of digital transformation, the role of networks is to expand further. Future networks are expected to converge with AI, Software, Cloud Service and Security, etc., serving as accelerators of digital transformation. Korea remains committed to securing network innovation technologies across diverse fields including 6G and O-RAN to realize a sustainable future vision. Our aspiration is to drive collaborative research for network technology innovation and to share the benefits of the network with the world.

Bio  **Dr. Jinbae Hong** has been the president of the Institute of Information and Communications Technology Planning and Evaluation (IITP) since February 2024. In this role, he strives to secure Korea's digital core strategic technologies, such as networks, cybersecurity, AI semiconductor, quantum, etc., to innovate the R&D system for them, to cultivate top-notch talents, such as master's and doctoral level researchers and digital convergence experts, to boost the global ICT R&D capacity for international joint research, and to spread the R&D outcomes. Before this position, he was responsible for Korea's next-generation network policy, communication industry policy, information security industry policy, etc. as the director general of the Office of Network Policy, the director of the Cyber Security and Network Policy Bureau, and the Telecommunication Policy Bureau at the Ministry of Science and ICT of the Korean government from 1996. He received his bachelor's degree from Korea University in Seoul, Korea in 1995 and moved to the London School of Economics (LSE) for his master's degree in 2005 and earned the Ph.D. in technology management from the University of Manchester in the UK in 2008. He is particularly interested in the fields of next-generation networks, artificial intelligence, cybersecurity-related ICT policy, technology development, human resource development, and infrastructure establishment.

Keynote Address 2
11:45 – 12:30, Room: Gayageum-Hall
Title : AI-Driven Evolution of Cloud-Native Networks

Speaker JONGSIK LEE, HEAD
NETWORK R&D LAB, KT (KOREA TELECOM)

Abstract As AI and cloud technologies continue to reshape the telecommunications landscape globally, there's a burgeoning interest in migrating from traditional, hardware-centric network infrastructures to innovative systems and methodologies. KT is actively leveraging AI and cloud solutions to enhance network efficiency and elevate service quality. This keynote will delve into diverse use cases showcasing the optimization of network equipment and the enhancement of quality through AI-driven methodologies. Additionally, we will unveil a transition framework aimed at migrating network functions to cloud-based software, fostering enhanced flexibility and agility in service delivery. Practical insights and case studies elucidating the seamless integration of cutting-edge technologies into existing network architectures will also be shared. Join us as we unveil KT's forward-looking vision for the future of networking.

Bio  **Jongsik Lee** is currently responsible for leading Network R&D Lab, one of Network Group. He joined KT in 1998 and has worked on various wireless areas including 3G, Mobile WiMAX, and LTE-related R&D project. Since 2014, he has been leading LTE Evolution and 5G-related R&D projects. His latest contributions include developing, deploying and improving key 5G technologies leading up to and beyond KT's commercial launch in 2019 and AI Operations 2.0 for network stability and survivability. He received the B.S. & M.S. degrees in Electrical Engineering from the Seoul National University in 1996 and in 1998, respectively. His main research areas were RF and microwave engineering.


May 8, 2024 (Wednesday)
Keynote Address 3
11:00 – 11:45, Room: Gayageum-Hall
Title : Revisiting Networking, Distributed Computing and Systems due to Huge Scientific Workflows with Implications for Monitoring and Management
Speaker DEEP MEDHI, PROGRAM DIRECTOR
NATIONAL SCIENCE FOUNDATION (NSF)

Abstract Huge-scale scientific workflows arise in various scientific disciplines such as telescope-generated data (e.g., blackhole imaging), DNA sequencing, processing of Whole Slide Imaging for Digital Pathology, and so on. Handling them brings up new issues in networking, distributed computing, and systems, with the need to further understand network and systems management issues. The talk will focus on a few problem domains from scientific workflows, issues faced, and potential new opportunities

Bio  **Deep Medhi** is a Program Director in the Computer & Network Systems (CNS) Division at the National Science Foundation (NSF), USA. He retired with the Curators' Distinguished Professor Emeritus status in 2022 from University of Missouri-Kansas City (UMKC), USA, which he joined in 1989. He was a rotating program director at NSF from August 2018 to August 2022 and took the permanent position at NSF in September 2022. He received B.Sc. in Mathematics from Cotton College, Gauhati University, India, M.Sc. in Mathematics from St. Stephen's College, University of Delhi, India, and his M.S. and Ph.D. in Computer Sciences from the University of Wisconsin-Madison, USA. Prior to joining UMKC in 1989, he was a member of the technical staff at AT&T Bell Laboratories from 1987 to 1989. While at AT&T Bell Labs, he co-developed Facility Diverse Routing - a feature that was deployed in AT&T's nationwide dynamic routing network. He is co-author of the books, "Routing, Flow, and Capacity Design in Communication and Computer Networks" (2004) and "Network Routing: Algorithms, Protocols, and Architectures" (1st edition, 2007; 2nd Edition 2017), both published by Morgan Kaufman/Elsevier. He is a Fellow of the Institute of Electrical and Electronics Engineers (IEEE)


Keynote Address 4
11:45 – 12:30, Room: Gayageum-Hall
Title : Security of Open Radio Access Networks
Speaker HANNA BOGUCKA, PROFESSOR
POZNAŃ UNIVERSITY OF TECHNOLOGY (PUT)

Abstract The architecture of the 5G network and the prospective 6G network, will be almost entirely virtualized and based on software functionalities. These virtualization trends reach out all the way from the core to the Radio Access Network (RAN) functionalities. The open specification of the radio interface (Open RAN) allows for more competition in providing radio technologies with the required cost-efficiency, transparency, and security. A key element of Open RAN architecture is the Radio Intelligent Controller (RIC) managing execution of near real-time (near-RT) applications (xApps) and non-real-time (non-RT) ones (rApps). Artificial Intelligence (AI) and Machine Learning (ML) algorithms are planned to reside in near-RT RIC and non-RT RIC creating huge opportunities for automation of RAN operation. However, these additional functions, open interfaces, modified architecture, containerization and virtualization, SW and HW decoupling, and the open source code principle pose challenges regarding communication security, algorithms cybersecurity, and privacy of collected data. On the other hand, open architecture with embedded AI allows for running the specialized programming applications, which can continuously monitor and analyze security threats and protect RAN from malicious and illegal access to network segments. These opportunities and challenges will be discussed in the keynote.

Bio  **Prof. dr hab. inż. Hanna Bogucka** is a full professor and the Director of the Institute of Radiocommunications at Poznan University of Technology. Moreover, prof. Bogucka is the co-founder, Board Member and the Head of Cooperation of RIMEDO Labs, a spin-off from PUT. Prof. Bogucka is involved in research in the area of radio access networks (RANs): open RAN, RAN security, cognitive radio, and green communication. She has been involved in multiple European 5th – 7th Framework Programme and Horizon 2020 projects, European COST actions, National Science Centre projects, and industry cooperation. She is the author of over 200 research papers, 3 handbooks in the area of radio communications and digital signal processing (in Polish), and 3 scientific monographs on flexible and cognitive radio. Prof. Bogucka has been appointed IEEE Communications Society Director of the EAME Region (Europe, Africa, Middle East) and elected IEEE Radio Communications Committee Chair for the term of 2015-2016. Currently, she is the IEEE ComSoc Fog/Edge Industry Community Regional Chair in Europe, elected Member at Large of the IEEE ComSoc Board of Governors representing EMEA region (2023-2025), and a member of the Polish Academy of Sciences.


May 9, 2024 (Thursday)
Keynote Address 5
11:00 – 11:45, Room: Gayageum-Hall
Title : 6G: Future Telecom for the AI Era
Speaker CHARLIE ZHANG, SVP
SAMSUNG ELECTRONICS

Abstract With the recent history and experience on 5G as the guide, we will share our perspective and shed some light on the initial 6G vision of bringing the next hyper-connected experience to every corner of life. We intend to provide a holistic view from an industry perspective that includes megatrends driving technology evolution towards 6G, new services envisioned and enabled, as well as technical requirements to realize these new services. We believe it is important that we take into consideration the lessons learned from 5G deployments, evolving market dynamics as well as emerging technology trends, in order to prepare well for the upcoming 6G. While 6G are still in its early days, a few emerging technology directions are taking shape and gaining momentum in academia and industry alike, including the support of new spectrum bands such as Upper Mid Bands, Energy-efficient Sustainable future networks, AI as a native part of the network design, ubiquitous coverage for future devices, etc.

Bio  **Charlie Zhang** is an SVP at Samsung Research America, where he leads research, prototyping, and standardization for 5G/6G and other wireless systems. He is also a Corporate VP and head of the global 6G team at Samsung Research. He is currently serving as the ATIS North America Next-G Alliance Full Member Group Vice Chair. He was the Board Chair of the FiRa Consortium from May 2019 to May 2023, and the Vice Chairman of the 3GPP RAN1 working group from 2009 to 2013, where he led development of LTE and LTE-Advanced technologies. He received his Ph.D. degree from the University of Wisconsin, Madison. Dr. Zhang is a Fellow of IEEE.

Keynote Address 6
11:45 – 12:30, Room: Gayageum-Hall
Title : What-If Networking
Speaker LAURENT CIAVAGLIA, HEAD
NETWORK MANAGEMENT DATA AND INTELLIGENCE, NOKIA

Abstract A visionary exploration of the future of networking, charting the course towards 6G networks. By integrating network digital twins, AI advancements, and sustainable practices, we illuminate the path towards intelligent, reliable, and sustainable network and service management, shaping the landscape of tomorrow's digital infrastructures.

Bio  **Laurent Ciavaglia** is leading the network management, intelligence and data research and standards team at Nokia, and contributes to network automation technologies in various standards working groups and research communities. Prior, Laurent has worked with Rakuten Mobile and Rakuten Symphony as Head of Autonomous Networks Innovation Europe. He has extensive experience in inventing future network automation technologies with focus on intent-driven, zero-touch and artificial intelligence techniques. Laurent is an experienced standards contributor as editor and co-author of multiple specifications in the IETF, IRTF and ETSI in the fields of zero-touch networking, intent-based networking, autonomic networking, closed-loop automation, telemetry, and integration of machine learning and machine reasoning functionalities in networking environments. Laurent serves as co-chair of the IRTF Network Management Research Group (NRMG) and participates in standardization activities related to network and service automation in IETF, O-RAN, ETSI, ITU-T and TMF. Laurent is also a proud member of the IEEE network operations and management community (CNOM).

Distinguished Expert Panel Session

Ma 9, 2024 (Thursday)

DEP Securing Critical Infrastructure: Navigating IoT Challenges and Ensuring Systematic Visibility
16:00 – 17:30, Room: Gayageum A

Moderators: Prof. Pal Varga (BME, Hungary), Dr. Taesang Choi (ETRI, Korea)

Abstract

As the landscape of network and service management continues to evolve, the Distinguished Expert Panel (DEP) at NOMS 2024 seeks to explore the transformative impact of these changes. Our discussion is motivated by the convergence of cutting-edge concepts such as cloudification and softwarization; the new advancements in mobile networks beyond 5G and towards 6G; and the integration of AI/ML algorithms into management frameworks. Over the past decade, the infusion of cloudification and softwarization has revolutionized management solutions. However, the adoption of AI/ML remains at the forefront of ongoing research, promising to further enhance the efficiency and efficacy of network operations.

The theme of NOMS 2024 is "Towards intelligent, reliable, and sustainable network and service management." Join us for this DEP, and be part of the conversation as we navigate the challenges and opportunities presented by softwarization, cloudification, 5G and 6G networks, and AI/ML-driven processes - envisioning a world where network and service management not only reliable but also sustainable, paving the way for transformative applications and a connected future.

Panelists



Prof. Hanna Bogucka (PUT, Poland) is a full professor and the Director of the Institute of Radiocommunications at Poznan University of Technology. Moreover, prof. Bogucka is the co-founder, Board Member and the Head of Cooperation of RIMEDO Labs, a spin-off from PUT. Prof. Bogucka is involved in research in the area of radio access networks (RANs): open RAN, RAN security, cognitive radio, and green communication. She has been involved in multiple European 5th – 7th Framework Programme and Horizon 2020 projects, European COST actions, National Science Centre projects, and industry cooperation. She is the author of over 200 research papers, 3 handbooks in the area of radio communications and digital signal processing (in Polish), and 3 scientific monographs on flexible and cognitive radio. Prof. Bogucka has been appointed IEEE Communications Society Director of the EAME Region (Europe, Africa, Middle East) and elected IEEE Radio Communications Committee Chair for the term of 2015-2016. Currently, she is the IEEE ComSoc Fog/Edge Industry Community Regional Chair in Europe, elected Member at Large of the IEEE ComSoc Board of Governors representing EMEA region (2023-2025), and a member of the Polish Academy of Sciences.



Dr. Laurent Ciavaglia (Nokia, France) is leading the network management, intelligence and data research and standards team at Nokia, and contributes to network automation technologies in various standards working groups and research communities. Prior, Laurent has worked with Rakuten Mobile and Rakuten Symphony as Head of Autonomous Networks Innovation Europe. He has extensive experience in inventing future network automation technologies with focus on intent-driven, zero-touch and artificial intelligence techniques. Laurent is an experienced standards contributor as editor and co-author of multiple specifications in the IETF, IRTF and ETSI in the fields of zero-touch networking, intent-based networking, autonomic networking, closed-loop automation, telemetry, and integration of machine learning and machine reasoning functionalities in networking environments. Laurent serves as co-chair of the IRTF Network Management Research Group (NRMG) and participates in standardization activities related to network and service automation in IETF, O-RAN, ETSI, ITU-T and TMF. Laurent is also a proud member of the IEEE network operations and management community (CNOM).



Ericsson is one of the leading providers of Information and Communication Technology (ICT) to service providers around 180 countries. **Dr. Hyungoo Lee (Ericsson-LG, Korea)** is responsible for driving the 4G and 5G features development on L3 layers. He is supporting research on new technology including machine learning and AI applied on 5G/6G within telecom. His position also covers securing the long term and strategic goals to contribute to Ericsson's thought leadership. He received Master's degree in radio communication from Inha University, Korea.



Prof. Lisandro Zambenedetti Granville (UFRGS, Brazil) is Full Professor of Computer Science at the Institute of Informatics of the Federal University of Rio Grande do Sul (UFRGS), Brazil. He hold Ph.D. (2001) and M.Sc. (1998) degrees in Computer Science, both received from UFRGS. From September 2007 to August 2008, he was a visiting researcher at the University of Twente, The Netherlands, with the Design and Analysis of Communication Systems group. He is a member of the Computer Networks Group, where he has been working on network and service management. As a Full Professor, he is also involved with supervision and education activities on undergraduate and graduate courses in both Computer Science and Computer Engineering.

Panel Sessions

May 7, 2024 (Tuesday)

Panel 1 **Securing Critical Infrastructure: Navigating IoT Challenges and Ensuring Systematic Visibility**

14:00 – 15:30, **Room: Gayageum A**

Moderator: [Dr. Arash Shaghghi, UNSW Sydney and Cyber Security Cooperative Research Centre, Australia](#)

Abstract Major cybersecurity attacks have recently targeted critical infrastructure, significantly affecting service providers and their customers. Investigations have revealed that associated risks could have been better managed if appropriate measures had been taken to ensure the visibility of the critical infrastructure. Systematic visibility and automated guarantees of critical infrastructure are now emerging research topics in academia and industry to manage cybersecurity risks. In this panel, we bring leading researchers and industry experts to discuss the most important challenges related to the security of critical infrastructure with a specific focus on the case of the Internet of Things (IoT).

Panelists Prof. Burkhard Stiller (University of Zurich, Switzerland)
Prof. Robin Doss (Deakin University, Australia)
Prof. Sangdon Park (POSTECH, South Korea)
Dr. Nadeem Ahmed (Cyber Security Cooperative Research Centre and UNSW Sydney, Australia)
Dr. Jerome Meyer (Nokia)

May 8, 2024 (Wednesday)

Panel 2 **Advances and Impacts of SmartNICs in Modern Datacenters**

14:00 – 15:30, **Room: Gayageum A**

Moderator: [Prof. Sue Moon, KAIST, Korea](#)

Abstract The end of Dennard Scaling and Moore's Law opened up the era of multicores and accelerators. In this era of Artificial General Intelligence, applications after applications are crunching more numbers than ever before and clamoring for more computing cycles in CPUs, GPUs, APUs, etc. SmartNICs are a form of an accelerator for network processing. Along with other XPU they are evolving fast, accommodating FPGA and ASIC technologies. In this panel, we review recent advances and research challenges in SmartNICs and discuss their implications and impacts of adoption in datacenters.

Panelists Jeehoon Kang (KAIST)
Gwangsun Kim (POSTECH)
Gyuyeong Kim (Sungshin University)
Eunyoung Jeong (Alpaca Networks)

Panel 3 **Global Insights: Exploring International Research Funding Opportunities**

16:00 – 17:30, **Room: Gayageum A**

Moderator: [Prof. Baek-Young Choi, University of Missouri - Kansas City, USA](#)

Abstract By bringing together distinguished representatives from diverse funding agencies, this panel aims to shed light on the international funding opportunities available for research across disciplines, from fundamental sciences to applied research in technology. Topics will include navigating the landscape of the global research funding environment, strategies for building international partnerships and research initiatives, and understanding the criteria for successful applications. Attendees will leave with a deeper understanding of how to leverage international research grant opportunities, and successfully navigate partnerships and collaborative projects to advance their research goals and contribute to the global body of knowledge.

Panelists Dr. Deep Medhi (US National Science Foundation, NSF)
Dr. Mamadou H. Diallo (US Office of Naval Research Global, ONRG)
Dr. Juhee Ki (Global Cooperation, Institute of Information & Communications Technology Planning & Evaluation, IITP)

May 9, 2024 (Thursday)**Panel 4 Digital Network Twins for Network Management****09:00 – 10:30, Room: Gayageum A****Moderator:** Laurent Ciavaglia, Nokia, France

Abstract Advancements in the field of digital twin technologies have revolutionized various industries, and now, it's time for networks to reap the benefits. The panel on Technologies for Network Twins aims to bring together researchers, experts, and practitioners from academia and industry to share their latest insights and discoveries in the field of network digital twins. This panel will serve as a vibrant platform for fostering collaboration, exchanging ideas, and developing innovative solutions to address the challenges and opportunities presented by the rapidly evolving world of interconnected systems.

Panelists Nicolas Dupuis (Nokia)
Paul Harvey (University of Glasgow)
Marc-Oliver Pahl (IMT Atlantique)
Filippo Poltronieri (University of Ferrara)

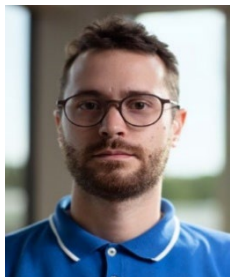
Panel 5 Generative AI for Network Management**14:00 – 15:30, Room: Gayageum A****Moderator:** Alberto Leon-Garcia, University of Toronto, Canada

Abstract Network management has always been inherently data-centric, especially within the expansive and public communication networks that generate substantial error logs and continuously monitor service quality. Current networks are not only complex in their physical interconnections but also in their virtual constructs, such as SDN slices, network function virtualization, OpenRAN, cloud-native operations, MEC, just to name a few factors that increase complexity. The high costs associated with network management are often attributed to the limited automation within these systems. The strategic application of data-driven AI, and specifically Generative AI, holds the potential to navigate through these challenges, heralding a new era of efficiency and innovation in network management. The promise of Generative AI extends beyond mere novelty; it is rooted in the robust principles of generative statistical models capable of discerning and leveraging intricate statistical correlations within voluminous datasets. This technology set, which recently has been extended with Large Language Models (LLMs), has already made waves by providing insights that have captivated networking experts. We are now experiencing novel ideas in exploiting Generative AI capabilities in network and service management. NOMS 2024 co-locates with GAIN, the First Workshop on Generative AI in Network Management. As it is poised to be a cutting-edge forum for exploring the transformative potential of Generative AI in the realm of network and service management, this panel previews the discussions for the GAIN Workshop. This panel aims to address the pressing challenges faced by modern networks, such as the need for greater automation to reduce costs and improve efficiency - or how to balance sustainability and AI/ML in network management. The panel discussion will be an opportunity for thought leaders to share their visions, debate the merits and challenges of Generative AI, and chart a course for its integration into the fabric of network management. It promises to be an enlightening experience for all attendees, offering a glimpse into the future of networks powered by the next generation of AI technology.

Panelists Kristina Dzevaroska (University of Toronto)
Pal Varga (Budapest University of Technology and Economics)
Kurt Tutschku (Blekinge Institute of Technology)
Seowoo Jang (Samsung Electronics)

Tutorials
May 6, 2024 (Monday)
Tutorial 1
09:00 – 12:30 Room: Haegeum B
Title : Optimization solutions for Digital Twins Reinforcement Learning and Computational Intelligence approaches
Speaker Filippo Poltronieri, Department of Engineering, University of Ferrara, Italy

Abstract Digital Twins, virtual replicas of physical systems, hold promise in network and service management research. In this area of research, Digital Twins gained a lot of attention as they represent a useful approach for studying the behavior of complex systems such as large telecommunication networks or large IT systems relying on multiple and interconnected microservices. Specifically, Digital Twins methodologies can effectively enable what-if scenario analysis, thus allowing network and service providers to evaluate the impact of multiple system configurations in a shorter time without altering the physical system. However, to run accurate what-if analysis there is the need to implement complex and computationally expensive simulations, whose optimization requires solving dynamic and expensive optimization problems - that traditional optimization solutions, such as Integer Linear Programming (ILP), are not always well suited for. To enable and foster research in this area, this tutorial aims to provide a comprehensive overview of state of the art optimization methodologies and tools for digital twins. More specifically, this tutorial explores the adoption of computational intelligence (CI) and reinforcement learning (RL) methods, including Genetic Algorithms, Particle Swarm Optimization, Multi-swarm Particle Optimization, Grey-wolf Optimization, State–Action–Reward–State–Action, Deep Q-Network, and Proximal Policy Optimization, to optimize Digital Twins for network and service management problems.

Bio


Filippo Poltronieri received a Ph.D. degree from the University of Ferrara, Italy, in 2021. He joined the interdepartmental Distributed System Research Group <https://ds.unife.it>, led by Prof. Cesare Stefanelli in 2017. He is currently an Assistant Professor (RTD-A) at the Department of Engineering of the University of Ferrara, where he teaches the “Computer Networks Laboratory” course.

Filippo Poltronieri's research interests include Distributed Systems, Cloud Continuum, Digital Twins, and tactical networks. He conducts his research activity with national and international scientists from several institutions as demonstrated by the publications in international journals and conference proceedings. As part of his research career, he has been visiting the Florida Institute for Human & Machine Cognition (IHMC) in Pensacola, FL (USA) in 2016-2017 and 2018.

Tutorial 2
09:00 – 12:30 Room: Haegeum A
Title : Securing the Future of Web Transport: A Deep Dive into QUIC Protocol Security and Performance
Speakers Y A Joarder, Carol Fung, Concordia University, Canada

Abstract This tutorial offers an introduction to the QUIC protocol, focusing on its security and performance aspects. The tutorial aims to provide a comprehensive understanding of QUIC's innovative features, including its integration with TLS, loss detection, congestion control, and the evolution to HTTP/3. Participants will learn about QUIC's architecture, security mechanisms, performance optimization strategies, and practical applications. The tutorial will overview the recent research progress on QUIC security and highlight the significance of QUIC in modern web transport, emphasizing its role in enhancing both security and performance.

Bio


Y A Joarder is a Ph.D. student in Information and Systems Engineering at Concordia University, Montreal, Canada, specializing in cybersecurity and protocol security. With a rich academic background, including a Master's and Bachelor's in Information & Communication Engineering from Islamic University, Bangladesh, Mr. Joarder brings over 4.5 years of research and 3.8 years of teaching experience in Computer Science and Engineering in Bangladesh and Canada respectively. At Concordia's Next Generation Network Security (NGNSec) Lab, he focuses on QUIC protocol security research, complemented by his role as a Graduate Teaching Assistant, where he teaches a variety of courses, including Network Security Architecture and Management. His expertise spans a broad spectrum of programming, cyber-security tools, and scientific computing, making him a prolific contributor to international conferences and journals, especially in areas related to QUIC protocol security. Mr. Joarder is recognized for his analytical prowess, educational contributions, and a deep commitment to advancing the field of network security.



Professor Dr. Carol Fung, currently the Gina Cody research chair at Concordia University, Canada, is an esteemed figure in network and security management with a Ph.D. in Computer Science from the University of Waterloo, Canada. Her academic journey includes influential roles as Associate and Assistant Professor at Virginia Commonwealth University, USA. Dr. Fung's research, marked by a focus on network management and security in IoT, cloud networks, and software-defined networks, particularly emphasizes trust management, anomaly detection, and machine learning. She is a recipient of numerous accolades, such as the IEEE/IFIP IM 2015 Young Professional Award and the Alumni Gold Medal from the University of Waterloo. A mentor to many doctoral, masters, and undergraduate students, Dr. Fung has also authored the book "Intrusion Detection Networks: A Key to Distributed Security" and numerous scholarly articles. Her patents and innovative research, especially in application permission recommendation and control, highlight her expertise. As an educator, Dr. Fung's contributions to cybersecurity and

Tutorial 3

14:00 – 17:30 Room: Haegeum B

Title : **Feature Extraction leveraging Programmable Data Planes for Network Protection based on Reinforcement Learning**

Speakers Sergio Armando Gutiérrez, Universidade de Antioquia, Columbia
 Juan Felipe Botero, Universidade de Antioquia, Columbia
 Adrian Lara, University of Costa Rica

Abstract Programmable Data Planes have created an expanded landscape for the complete realization of the Software Defined Networking paradigm. Programmability enables further customization of the logic of packet processing within forwarding devices. Thanks to the capabilities of Programmable Forwarding Devices (PFD), it is possible to implement personalized functions that make it possible to introduce additional intelligence for packet processing at the data plane while preserving the benefits of centralized logical view of the network state at the control plane.

As an option to deal with the dynamic conditions exhibited in modern communication infrastructures, specially in the context of network protection, Reinforcement Learning (RL) has arisen as an important approach. RL can improve network policies through the interaction with the runtime environment of the infrastructure in order to find the optimal policy for a given use case. When an environment changes, RL can gradually discover new optimal strategies, by performing adjustments based on trial and error and environmental feedback. In this tutorial, we explore how to take advantage of the functionalities of PFDs for one of the crucial operations of RL which is Feature Extraction. Given the visibility that PFDs have of the traffic while considering their computational limitations, it is possible to use these devices, located at the data plane, to extract features which can be passed up as input to complex RL algorithms controlling different operational aspects of the network.

Bio



Sergio Armando Gutiérrez (presenter) is a Postdoctoral research fellow at Universidad de Antioquia. He received the B.Eng. degree in Computer Science from Universidad de San Buenaventura, Medellín, Colombia, in 2008, the M.Eng in Computer Science degree from Universidad Nacional de Colombia in 2011 and the Ph.D in Computer Science degree from Universidad Nacional de Colombia in 2018. His current research interests include Software Defined Networks, Programmable Data Planes, Network Security and the application of Artificial Intelligence Techniques to solve different Computer Network problems.



Juan Felipe Botero (co-author) is an associate professor at Universidad de Antioquia, Medellín, Colombia. He received the B.S. degree in computer science from the University of Antioquia, Medellín, Colombia, in 2006, and the M.Sc. and Ph.D. degrees in telematics engineering from the Network Engineering Department, Technical University of Catalonia, Barcelona, Spain, in 2008 and 2013, respectively. Since 2013, he has been Professor with the Telecommunications Engineering Department, University of Antioquia, where he is currently with the Applied Telecommunications Research Group. His current research interests include the Internet of the future, in particular network programmability, network virtualization, mathematical programming, routing, energy efficiency and network flows, SDN, and NFV.



Adrian Lara (co-author) is an associate professor at the Computer Science department of the University of Costa Rica. He received his Ph. D. degree in Computer Science from the University of Nebraska in 2015. He teaches systems courses such as operating systems, communication networks and his research areas include network security, software-defined networking, IoT and machine learning. His Google Scholar profile is available at <https://scholar.google.com/citations?user=sRrfw8EAAA&hl=en>.

Tutorial 4
14:00 – 17:30 Room: Haegeum A
Title : Greening the Network: Advancing Sustainability of Networks –Challenges, and Solution Approaches
Speaker

Alex Clemm, Sympotech, USA
 Cedric Westphal, Futurewei Technologies, USA
 Toerless Eckert, Futurewei Technologies, USA

Abstract

Reducing humankind's carbon footprint and greenhouse gas emissions to slow climate change is one of humanity's Grand Challenges. Communication networks play an important role in addressing that challenge. On one hand, they enable applications that reduce the need for physical travel and that enable solutions that optimize efficiency of resource and energy usage, from teleworking to remote operations, from smarter agriculture to more energy-efficient factory floors. On the other hand, networks themselves (in addition to applications that run over them) have a significant environmental footprint rivaling that of entire countries. It is thus becoming important to make networks themselves "greener" and devise solutions that allow networks to be operated in ways that make them more sustainable while continuing to meet increasing traffic demands and service requirements.

Many of today's network sustainability improvements relate to general advances in energy efficiency of computing hardware as well as in transmission technology (antennas, lasers). While this is where the biggest opportunities for networking infrastructure may lie, it is important to extend questions of greenness to other layers in the networking stack - to data and control plane, to routing and traffic forwarding, to the ways in which networks are organized and deployed. For example, can data planes be designed in ways that make them inherently more energy-efficient? What protocol advances could enable greener networking solutions? How can networks be optimized not just for QoS or utilization but for carbon? What novel tools are needed to operate networks more sustainably? How can peak demand be flattened to minimize waste due to overprovisioning? How can we even properly account for energy usage and other sustainability parameters to be optimized? In which ways can network programmability, faster control loops, and AI- or intent-based networking help?

The tutorial aims to provide a broad overview and convey a general understanding of the subject area, including of the factors which contribute to the environmental impact of networking, of technical challenges, pitfalls, and constraints in the development of solutions, and of selected solution approaches. The tutorial will also provide an overview of current standardization activities in that subject area (with an emphasis of activities that are currently taking place in the IETF and the Internet Architecture Board's associated E-Impact Program). In addition, the tutorial will point out opportunities for further research and further engagement on the topic.

Bio


Alex Clemm has been involved in networking software and management technology throughout his career, providing technical leadership from original conception to customer delivery for countless projects and product development efforts. His most recent activities are in the areas of sustainable networking, future networking services, network analytics, intent-based networking, service assurance, and telemetry. Alex has for many years been regularly serving on the committees of NOMS/IM, NetSoft, and CNSM (including on several occasions as general co-chair or TPC co-chair). He is the recipient of the 2020 Salah Aidarous Award given by IEEE CNOM and IFIP TC6.6 to "an individual who has provided unremitting service and dedication to the IT and Telecommunications Network Operations and Management community". From 2008-2017, he was also moonlighting as an Adjunct Professor on the Faculty for Computer Engineering at Santa Clara University where he taught courses on Network Management. Alex has an extensive publication record including 70+ papers, 70+ patents, and 15 RFCs. He holds an M.S. degree from Stanford University and a Ph.D. from the University of Munich, Germany, both in Computer Science.



Cedric Westphal is a Principal Research Architect with Futurewei working on future network architectures, both for wired and wireless networks. His current focus is on next generation Internet. He was an adjunct assistant, then associate professor with the University of California, Santa Cruz from 2009 to 2019. Prior to Futurewei, he was with DOCOMO Innovations from 2007 to 2011 in the Networking Architecture Group focusing on next generation network architectures. He was at Nokia Research Center (now Nokia Bell Labs) from 2000 to 2006. He has received a MSEE in 1995 from Ecole Centrale Paris, and a MS (1995) and PhD (2000) in EE from the University of California, Los Angeles. From 1997 to 2000, he was a visiting researcher at Stanford University. Cedric Westphal has authored and coauthored over 150 journal and conference papers, including several best paper awards at conferences such as IEEE ICC'11, ICNC'18, IEEE MuSIC'16 and others. He has been awarded over thirty patents. He has received the IEEE Communication Society IINTC 2018 Technical Achievement Award to "recognize a lifelong set of outstanding technical contributions in the area of information infrastructure and networking." He is an associate editor for IEEE Transactions on Multimedia and for the ITU Journal on Future and Evolving Technology (J-FET), and was an area editor for the ACM/IEEE Transactions on Networking, an assistant editor for (Elsevier) Computer Networks journal, and a guest editor for Ad Hoc Networks journal and ACM/IEEE JSAC. He has served as a reviewer for the NSF, GENI, the EU FP7, INRIA, and other funding agencies; he has chaired the technical program committee of several conferences, including IEEE ICC (NGN symposium), IEEE NFV-SDN or IEEE IPCCC, and he was the general chair for IEEE INFOCOM 2016. He is a senior member of the IEEE.



Toerless Eckert is a Distinguished Engineer at Futurewei, California, USA where he works on innovations in architecture and standardization of the Internet and its protocols. His experiences includes planning, building and operating networks with new technologies, educating and supporting customers around the globe, researching, developing, standardizing and building network products, protocol and services and developing advanced, network integrated multimedia applications. Toerless is subject matter expert for routing, multicast, MPLS, QoS and secure network automation. He was a part of Cisco Systems IOS operating system development team where he worked on IP/IPv6/MP LS multicast and from the early 2000ths, IP/IPv6 multicast standardization in DOCIS 3.0 and integration of multicast with a variety of networked applications. He led the architectures for the Medianet and Autonomous Networking advanced development projects.

Currently, Toerless is co chair of the IETF ANIMA working group, which is defining an IPv6 centric and fully autonomous and secure network communications infrastructure. He holds more than 45 patents, issued and pending and is co-author of 13 IETF RFCs and various IETF drafts. Beside IETF and CableLabs, he has also worked for standardization in ETSI and ITU-T and has published research papers and research book chapters. Toerless holds a Dipl. Inf. from Friedrich Alexander Universität Erlangen Nürnberg, Germany.

May 10, 2024 (Friday)

Tutorial 5

09:00 – 12:30 Room: Haegeum B

Title : **Reputation Systems in 5G/6G Networks**

Speaker Bruno Sousa, University of Coimbra, Portugal

Abstract Reputation System are important approaches to build trust through reputation. These systems have been extensively used in marketplaces, social media platforms and Peer-to-Peer networks, as an approach measuring the entities' trustworthiness and reliability. Nowadays, reputation systems rely on decentralized networks like blockchains to manage reputation information. With a decentralized model, the information of trust is distributed and can leverage on the benefits of blockchain technology (integrity, immutability, and authenticity). Blockchain as a distributed ledger does not rely on a secure/trusted third-party (centralized authority) to guarantee trust, and rather uses cryptographic mechanisms to prevent tampering of the stored data.

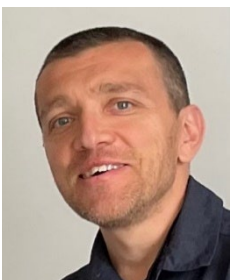
The notion of reputation is highly correlated with the context. In a marketplace the feedback from users is normally expressed in a five-star rate, whereby combining the opinion from different users, the reputation of a service is determined. Other reputation models consider two types of events: 1) positive, contributing positively to the reputation, 2) or negative which impact negatively the reputation. Authorization processes in 5G/6G can rely on the trust information managed by reputation systems to authorize the network access as per the reputation score (trust information) and policies configured by the 5G/6G network operator. A device not holding a high reputation score is not authorized to access the network, while a device with a medium reputation score can be allowed but with certain limits (i.e., reduced bandwidth).

This tutorial aims to provide insights on how the decentralized reputation systems can build trust, how the trust information can be used in the authorization processes of 5G/6G networks, and how the reputation system can be employed as enablers in the Chain-of-Trust (CoT) paradigm.

The objectives of the tutorial are:

1. Provide insights regarding reputation systems with policies in 5G/6G networks.
2. Present a comprehensive description of reputation models to determine reputation scores.
3. Present a comprehensive description regarding privacy concerns in reputation systems.
4. Hands-on on Hyperledger Fabric permissioned blockchain to store reputation information.

Bio



Bruno Sousa is an Assistant Professor in the Department of Informatics Engineering of the University of Coimbra, Portugal, since December 2018, from where he got a PhD in Informatics Engineering on the subject of Multimoming for IP-based networks, in December 2014. He is a senior researcher in the Centre for Informatics and Systems of UC (CISUC), where he has initiated his activities in 2006. He is the author of several book chapters, several publications in journals and international conferences. He has participated in the TPC of several conferences. He has participated in several European and national research projects, and is currently involved in H2020 ARCADIAN-IoT, NEXUS and MH-SDVANET projects. He was the principal research of the ELEGANT project. He is also a member of the editorial team of journals like Wiley Transactions on Emerging Telecommunications Technologies – Wiley ETT, and Frontiers in Communication and Networks. He is also a member of the coordination teams of the master's in security informatics (MSI) in the University of

Coimbra. His research interests include resilience mechanisms in networks and applications/services, intrusion detection and prevention in 5G networks and for Internet of Things (IoT), and federated authentication services.

Tutorial 6
09:00 – 12:30 Room: Haegeum A
Title : Content Steering for Adaptive Video Streaming over the Edge-Cloud Continuum: A Hands-on Experience
Speaker Roberto Rodrigues Filho, Federal University of Santa Catarina, Brazil

Abstract Video streaming is among the most used Internet applications nowadays, with many big techs competing for a share in a billion-dollar market size. The demands of these video streaming products require the careful utilization of computing resources strategically placed close to the end users to deliver high-quality experience services. New technologies such as 6G and edge-cloud continuum infrastructures have been investigated to supply these increasing computing resource demands. These technologies are envisioned to be combined to provide fast and reliable data transfer for extremely high volumes of data. The edge-cloud continuum, particularly, also enables service placement mobility from the cloud data centers placed on the core of the network all the way to the edge devices closer to the end-users. However, network management to support seamless service mobility and timely and precise computing resource allocation to maintain high-quality service experiences is extremely complex. As a way forward, in this scenario, the concept known as zero-touch network, where there is no need for human interaction to (re)configure networked systems and the network itself, has gained popularity. In the video streaming application domain, the combination of Content Steering architecture, part of the Dynamic Adaptive Streaming over HTTP (DASH) protocol, and container orchestrator technologies would allow strategies for autonomous video streaming services placement throughout the continuum with minimal human involvement and maximum computing resources exploitation. In this context, this tutorial offers a hands-on experience with the state-of-the-art technology that supports content steering for adaptive video streaming on the edge-cloud continuum. We present the latest technology, architectures, and tools that enable the creation and autonomous management of adaptive video streaming applications on the continuum, leveraging the hierarchy of computing resources to provide high-quality experiences to end-users. Our tutorial provides both a theoretical and practical experience for the participants who will have access to a small edge-cloud virtual testbed to explore strategies for steering requests to video content to services placed throughout the computing continuum. We will also lay down current challenges and future opportunities for research in this area.

Bio


Roberto Rodrigues-Filho serves as an Assistant Professor in the Department of Computing at the Federal University of Santa Catarina, where he teaches Computer Networking and Distributed Systems courses for Computer Engineering undergraduates. In addition to his teaching responsibilities, he is actively involved in research focused on Self-adaptive and Emergent Distributed Systems. His academic background includes a Ph.D. in Computer Science from Lancaster University, UK, completed in 2018, and a master's and bachelor's degree in Computer Science from the Federal University of Goiás, Brazil, obtained in 2013. His postdoctoral endeavors have been extensive and diverse, encompassing roles such as a researcher at the University of Campinas, focusing on a project in partnership with Ericsson Research investigating service placement and resource allocation on computing continuum infrastructures, a Postdoctoral Fellowship at the Federal University of Goiás working on 'Autonomic Composition of Software Systems for Smart Cities', and a Postdoctoral Research Associate position at Lancaster University, UK, where he delved into 'The Emergent Self-Aware Data Centre: Autonomous Software Landscaping at Scale'. In addition to these roles, he was a visiting researcher at IRISA/INRIA, University of Rennes 1, France, in the summer of 2019, and participated in the prestigious Schloss Dagstuhl seminar series in Germany in 2018, where he extensively discussed the topic 'Software Engineering for Intelligent and Autonomous Systems'. Dr. Rodrigues-Filho's primary research interests are rooted in Autonomic Computing, with a special emphasis on Emergent Distributed and Self-organising Systems.

Tutorial 7
14:00 – 17:30 Room: Haegeum B
Title : Multi-5G/6G Autonomous Networks (ANs) Federation : Challenges, Solutions, and PoC
Speaker Taesang Choi, ETRI, Korea

Abstract Future Networks in 5G/6G will continue to expand in scale, complexity and interconnectivity, and will be highly shaped by distributed systems that serve various use cases that go beyond current use cases like mMTC and URLLC. This will be coupled with an increasing demand for autonomy in self-provisioning and self-management, network interoperability, and service federation on a very dynamic flexible way. Requirements on systems-of-systems architectures will become more relevant as multiple autonomous/semi-autonomous systems/networks (AN) adaptively seek to operate and interact with their peers. Federated Distributed Open Platforms (DOPs) as peers for cross-industry sectors end-to-end (E2E) services innovation and delivery agility can meet such requirements. The DOPs should be formed by way of federations of ICT network facilities and assets that are owned by various sectors (including public sector ICT infrastructures, enterprise/private ICT infrastructures, government owned infrastructures, research institutes, and other stakeholders). The use of federation and associated mechanisms is a promising technology for interconnecting systems, innovation and service delivery by the federating AN systems; and allowing asset sharing and extending traditional eco-systems and value-chains with further resources and stakeholders. In this tutorial, we first examine various challenges for such multi-ANs federation. We then explain existing and developing solutions ranging from standards, open source tools, and R&D solutions. Finally, we introduce our R&D proof of concept solution, AgileAFP: ML-enabled Agile Private/Public 5G/B5G Service and Network Autonomic Federation Platform with a real-world private and public ITS (Intelligent Transport System) federation use case.

Bio



Taesang Choi is a Principal Engineering Staff in ETRI, having joined the institute in 1996 after research and development careers on network and service management of telecommunications during his Ph.D studies at the University of Missouri at Kansas City. He has successfully managed a number of projects in the area of networking, especially in Internet traffic engineering, measurement and analysis, QoS, SDN, and NFV, autonomic management. He has successfully managed related projects such as OPEN-TAM subproject in ONOS consortium, a Korean government supported project, “Smart Networking Core Technology Development” which addresses SDN/T-SDN/NFV control and management for carrier-grade networks. Currently he is a project coordinator of “Agility” project.

He has had substantial experience as an educator, workshop facilitator and public speaker. He has spoken at various regional and international conferences and workshops (NOMS, APNOMS, IM, etc.) as a technical session speaker and tutorial speaker. He has worked as an active organizing committee member and reviewer in a number of conferences, workshops and symposiums. He has also been actively contributed to various standardization organizations and open source communities such as ONF, ETSI NFV-ISG, ITU-T, IETF and ONOS in the area of SDN/NFV management, 5G network management, Internet traffic engineering, Internet traffic measurement and analysis, and Future Internet Management since 1993. His current research interests are autonomic network management and control, and Quantum information technology management and control.

Tutorial 8

14:00 – 17:30 Room: Haegeum A

Title : **Integrity attestation of distributed infrastructures (cloud, SDN, NFV)**

Speaker Antonio Lioy, Politecnico di Torino, Italy

Abstract Remote attestation is a hot topic today in cloud computing and networking, as demonstrated by the different standardization groups active in this area (TCG, ETSI-NFV, IETF-RATS). Attestation is the ability to provide undeniable and unforgeable evidence about the hardware and software identity and integrity state of a network component. This evidence can be evaluated by an external verifier to attest the state of the node as good or compromised. In the latter case, appropriate remediation actions can be taken.

The tutorial will introduce the basic concepts of attestation (root-of-trust, measurements), the protocols involved, and the architectural design of an integrity attestation system, as a support for security and operations management. The goal is to let the participants understand the foundations of this important technology, its deployment strategy, and identify the open-source and commercial solutions available for practical application.

Bio



Antonio Lioy holds a MSc in Electronic Engineering and a PhD in Computer Engineering. He is Full Professor of Cybersecurity at the Politecnico di Torino, Italy, where he leads the TORSEC research group. He has 30+ years of teaching experience at undergraduate, graduate, and PhD level, as well as for cybersecurity training in the industry. Since 1996, he has taken part to more than 20 European research projects in the cybersecurity area and published more than 100 research papers. His research interests are in the fields of electronic identity, network security, trusted computing, and policy-based design and monitoring of modern IT infrastructures (IoT, cloud, SDN, NFV).

Prof. Lioy is frequently a consultant, evaluator, and reviewer for the European and Italian institutions.

Technical Sessions
May 7, 2024 (Tuesday)
Technical Session 1 : Security I
09:00 – 10:30 Room: Gayageum A Chair : Gabi Dreo Rodosek (University of Federal Armed Forces, Germany)
TS1-1 Shells Bells: Cyber-Physical Anomaly Detection in Data Centers

Lars Wüstrich, Sebastian Gallenmüller, Stephan Matthias Günther, Georg Carle (Technical University of Munich, Germany); Marc-Oliver Pahl (IMT Atlantique, Germany)

TS1-2 Voyager: MTD-Based Aggregation Protocol for Mitigating Poisoning Attacks on DFL

Chao Feng, Alberto Huertas Celdran, Michael Vuong, Gerome Bovet, Burkhard Stiller (University of Zürich UZH, Switzerland)

TS1-3 TrafficSiam: More Realistic Few-shot Website Fingerprinting Attack with Contrastive Learning

Shangdong wang, Zhiliang Wang, Chenglong Li, Dongqi Han, Jiahai Yang, Hui Zhang (Tsinghua University, People's Republic of China)

TS1-4 Anomaly Detection in Security Logs using Sequence Modeling

Simon Gökstorp, Jakob Nyberg, Yeongwoo Kim, Pontus Johnson (KTH Royal Institute of Technology, Sweden); György Dán (KTH, Sweden)

Technical Session 2 : Vehicular Networks
09:00 – 10:30 Room: Gayageum B Chair : Sanjay Madria (Missouri University of Science and Technology, USA)
TS2-1 Enhanced C-V2X Mode-3 with Smart Handover and Wide-area Propagation of Emergency

WarningsMoin Ali, Hyundong Hwang, Young-Tak Kim (Yeungnam University, South Korea)

TS2-2 Quantifying the Impact of Frame Preemption on Combined TSN Shapers

Rubi Debnath(TUM, Germany) ; Philipp Hortig ; Luxi Zhao ; Sebastian Steinhorst(Technical University of Munich, Germany)

TS2-3 Over-The-Air updates for Software Defined Vehicle services with IPFS

José Oliveira, Pedro Almeida, Pedro Rito, Duarte Raposo (Instituto de Telecomunicações, Portugal); Susana Sargento (Universidade de Aveiro, Portugal)

TS2-4 An Artificial Intelligence Framework for Dynamic Selection and Resource Allocation for EVs in Vehicular Networks

Monishanker Halder, Apurba Adhikary, Seong-Bae Park, Choong Seon Hong (Kyung Hee University, South Korea)

Technical Session 3 : Security II
14:00 – 15:30 Room: Gayageum B Chair : Paulo Simoes, University of Coimbra, Portugal
TS3-1 Windower: Feature Extraction for Real-Time DDoS Detection Using Machine Learning

Patrik Goldschmidt (Brno University of Technology, FIT, Czech Republic) ; Jan Kučera (CESNET a.l.e., Czech Republic)

TS3-2 Identification of Device Dependencies Using Link Prediction

Lukáš Sadlek, Martin Husak, Pavel Celeda (Masaryk University, Czech Republic)

TS3-3 Multi-agent Reinforcement Learning-based Network Intrusion Detection System

Amine Tellache (Oodrive & University of La Rochelle, France); Amdjed Mokhtari (Oodrive, France); Abdelaziz Amara Korba, Yacine Ghamri-Doudane (University of La Rochelle, France)

TS3-4 Automatic and optimized firewall reconfiguration

Francesco Pizzato, Daniele Bringhenti, Riccardo Sisto, Fulvio Valenza (Politecnico di Torino, Italy)

Technical Session 4 : SDN/NFV I
14:00 – 15:30 Room: Daegeum
Chair : Sergio Armando Gutiérrez (Universidad de Antioquia, Colombia)
TS4-1 TimeGAN as a Simulator for Reinforcement Learning Training in Programmable Data Planes

Thiago Caproni Tavares, Leandro C. de Almeida, Washington Rodrigo Dias da Silva, Marco Chiesa (KTH Royal Institute of Technology, Sweden); Fábio Luciano Verdi (UFSCAR, Brazil)

TS4-2 Drift-Aware Policy Selection for Slice Admission Control

Jesutofunmi Ajayi, Antonio Di Maio, Torsten Braun(University of Bern, Switzerland)

TS4-3 Towards Safe Load Balancing based on Control Barrier Functions and Deep Reinforcement Learning

Lam Dinh (HUAWEIPRC, France); Quang Pham Tran Anh (Huawei Technologies Co., Ltd, France); Jérémie Leguay (Huawei, France Research Center, France)

TS4-4 SPINNER: Enabling In-network Flow Clustering Entirely in a Programmable Data Plane

Luigi Cannarozzo (University of Bordeaux / Bordeaux INP, France); Thiago Bortoluzzi Morais, Arthur Francisco Lorenzon (UNIPAMPA, Brazil); Paulo Silas Severo de Souza (Pontifical Catholic University of Rio Grande do Sul, Brazil); Leonardo Reinehr Gobatto, Ivan Peter Lamb, Pedro Arthur P. R. Duarte, José Rodrigo Furlanetto Azambuja, Arthur Francisco Lorenzon (UFRGS, Brazil); Fábio Diniz Rossi (IFFar, Brazil); Weverton Cordeiro (UFRGS, Brazil); (Federal University of Rio Grande do Sul, Brazil); (IFFarroupilha, Brazil); Marcelo Caggiani Luizelli (UFRGS, Brazil)

Technical Session 5 : Monitoring and Measurements
16:00 – 17:30 Room: Gayageum A
Chair : Helmut Reiser (Leibniz Supercomputing Center, Germany)
TS5-1 Exploring the Benefit of Path Plausibility Algorithms in BGP

Nils Rodday(University of Armed Forces Neubiberg, Germany) ; Gabi Dreo Rodosek(University of Federal Armed Forces, Munich, Germany) ; Aiko Pras(University of Twente, Netherlands) ; Roland van Rijswijk-Deij(University of Twente, Netherlands)

TS5-2 End-to-End Detection of Middlebox Interference

Vahab Pournaghshband(University of San Francisco, United States of America) ; Peter Reiher(UCLA, United States of America)

TS5-3 Log-TF-IDF for Anomaly Detection in Network Switches

Sukhyun Nam, Jae-Hyoung Yoo ; James W. Hong(POSTECH, South Korea)

TS5-4 An Efficient FEC Scheme with SLA Consideration for Low Latency Transmissions

Chao Xu(THU, People's Republic of China) ; Jessie Hui Wang ; Rui Li(Tsinghua University, People's Republic of China) ; Zongpeng Li ; Hao Wu ; Jilong Wang

Technical Session 6 : Traffic Management
16:00 – 17:30 Room: Gayageum B
Chair : Weverton Cordeiro (UFRGS, Brazil)
TS6-1 Encrypted Traffic Classification at Line Rate in Programmable Switches with Machine Learning

Aristide Tanyi-Jong Akem, Marco Fiore (IMDEA Networks Institute, Spain); Guillaume Fraysse (Orange, France)

TS6-2 Traffic Centralization and Digital Sovereignty: An Analysis Under the Lens of DNS Servers

Demétrio Francisco Freitas Boeira ; Eder John Scheid, Muriel Figueredo Franco, Luciano Zembruzki, Lisandro Zambenedetti Granville (UFRGS, Brazil)

TS6-3 PIPO-TG: Parameterizable High-Performance Traffic Generation

Filipo Gabert Costa, Francisco Vogt, Fabricio Eduardo Rodriguez Cesen, Ariel Góes de Castro(UNIPAMPA, Brazil) ; Marcelo Caggiani Luizelli(Federal University of Pampa, Brazil) ; Christian Esteve Rothenberg(UNICAMP, Brazil)

TS6-4 SpinTrap: Catching Speeding QUIC Flows

Ike Kunze, Constantin Sander, Lars Tissen, Benedikt Bode, Klaus Wehrle (RWTH Aachen University, Germany)

May 8, 2024 (Wednesday)
Technical Session 7 : IP Network
09:00 – 10:30 Room: Gayageum A
Chair : Burkhard Stiller (University of Zurich, Switzerland)
TS7-1 Virtual Multi-Topology Routing for QoS Constraints

Nicolas Huin (IMT Atlantique, France); Sebastien Martin (Huawei Technologies, France, SASU, France); Jérémie Leguay (Huawei, France Research Center, France)

TS7-2 Katoptron: Efficient state mirroring for middlebox resilience

Lyn Hill, Charalampos Rotsos, Chris Edwards, David Hutchison(Lancaster University, United Kingdom)

TS7-3 Enhancing Network Data Plane Analysis with Native Graph Database

Amar Abane, Abdella Battou, Mheni Merzouki ((NIST Maryland, USA)

TS7-4 OLIVIS: An OSINT-Based Lightweight Method for Identifying Video Services in Backbone ISPs

Yuki Tamura(Keio University, Japan) ; Fumio Teraoka ; Takao Kondo (Hokkaido University, Japan)

Technical Session 8 : AI I
09:00 – 10:30 Room: Gayageum B
Chair : Edmundo Madeira (UNICAMP, Brazil)
TS8-1 Generalizable One-Way Delay Prediction Models for Heterogeneous UEs in 5G Networks

Akhila Rao (RISE SICS, Sweden); Hassam Riaz (Ericsson, Sweden); Aleksandr Zavodovski (University of Oulu, Finland); Rami Mochaourab (RISE SICS, Sweden); Viktor Berggren, Andreas Johnsson (Ericsson Research, Sweden)

TS8-2 Online Policy Adaptation for Networked Systems using Rollout

Forough Shahab Samani, Kim Hammar, Rolf Stadler (KTH The Royal Institute of Technology, Sweden)

TS8-3 Optimizing Video Conferencing QoS: A DRL-based Bitrate Allocation Framework

Kyungchan Ko, Sangwoo Ryu, Tu Van Nguyen, James W. Hong (POSTECH, South Korea)

TS8-4 Distributed Intelligence for Dynamic Task Migration in the 6G User Plane using Deep Reinforcement Learning

Sayantini Majumdar (MRC, Germany); Susanna Schwarzmann (European Research Center, Huawei Technologies Duesseldorf GmbH, Germany); Riccardo Trivisonno (Huawei ERC, Germany); Georg Carle (Technical University of Munich, Germany)

Technical Session 9 : Performance Management
14:00 – 15:30 Room: Gayageum B
Chair : Stephan Guenther (Technical University of Munich, Germany)
TS9-1 Energy-Aware VNF-FG Placement with Transformer-based Deep Reinforcement Learning

Rania Sahraoui, Omar Houidi(Institut Telecom, Telecom SudParis, France); Fetia Bannour(ENSIE, France)

TS9-2 Unlocking Security to the Board: An Evaluation of SmartNIC-driven TLS Acceleration with kTLS

Felipe A. S. Novais, Fábio Luciano Verdi(UFSCAR, Brazil)

TS9-3 ZEST: Attention-based Zero-Shot Learning for Unseen IoT Device Classification

Binghui Wu(National University of Singapore, Singapore) ; Philipp Gysel ; Dinil Mon Divakaran ; Mohan Gurusamy

TS9-4 FTA-detector: Troubleshooting Gray Link Failures Based on Fault Tree Analysis

Yan Zou(Beijing University of Posts and Telecommunications, People's Republic of China) ; Tian Pan(BUPT, People's Republic of China) ; Qiang Fu(RMIT University, Australia) ; Chenhao Jia, qingqiang yi a(Beijing University of Posts and Telecommunications, People's Republic of China) Ying Wan ; Jiao Zhang, Tao Huang(Beijing University of Posts and Telecommunications, People's Republic of China)

Technical Session 10 : AI II
14:00 – 15:30 Room: Daegeum
Chair : Filippo Poltronieri (University of Ferrara, Italy)
TS10-1 Learn to Compress (LtC): Efficient Learning-based Streaming Video Analytics

Quazi Mishkatul Alam, Nael Abu-Ghazaleh (University of California, Riverside, United States of America); Israat Haque (Dalhousie University, Canada)

- TS10-2 Joint User Pairing and Beamforming Design of Multi-STAR-RISs-Aided NOMA in the Indoor Environment via Multi-Agent Reinforcement Learning**
 Yu Min Park (Kyung Hee University, South Korea); Yan Kyaw Tun (Aalborg University, Denmark); Choong Seon Hong (Kyung Hee University, South Korea)
- TS10-3 Graph Neural Networks for IoT Data Aggregation Scheduling**
 Van-Vi Vo, Syed Muhammad Raza, Duc-Tai Le (Sungkyunkwan University, South Korea); Moonseong Kim (STU, South Korea); Hyunseung Choo (Sungkyunkwan University, South Korea)
- TS10-4 Towards Effective Reinforcement Learning in Video Conferencing using Network Status Data and Model Analysis**
 Sangwoo Ryu, Kyungchan Ko, James W. Hong (POSTECH, South Korea); Tu Van Nguyen (Pohang University of Science and Technology, Vietnam)

May 9, 2024 (Thursday)

Technical Session 11 : SDN/NFV II

09:00 – 10:30 Room: Gayageum B

Chair : Nour El Houda YELLAS (Cnam, France)

- TS11-1 Delay-aware Service Function Chain Provisioning with VNF Instance Sharing**
 Snigdha Snigdha (IITH, India); Venkatarami Reddy Chintapalli (National Institute of Technology Calicut, India); Antony Franklin (IITH, India)
- TS11-2 Joint SDN Synchronization and Controller Placement in Wireless Networks using Deep Reinforcement Learning**
 Akrit Mudvari (YALE, United States of America); Leandros Tassioulas (Yale University, Algeria)
- TS11-3 An Enhancement Framework for RDMA Congestion Control in Multi-tenant Datacenters**
 TIANSHI WANG, Yiran Zhang(Beijing University of Posts and Telecommunications, People's Republic of China) Ao Zhou ; Shangguang Wang
- TS11-4 Correctness of Flow Migration for Service Function Chains**
 Ranjan Patowary(CITK, India) ; Gautam Barua ; Radhika Sukapuram(Indian Institute of Information Technology Guwahati, India)

Technical Session 12 : Cloud Management

14:00 – 15:30 Room: Gayageum B

Chair : Bruno Sousa (University of Coimbra, Portugal)

- TS12-1 Towards Intent-based Configuration for Network Function Virtualization using In-context Learning in Large Language Models**
 Tu Van Nguyen, Jae-Hyoung Yoo, James W. Hong (POSTECH, South Korea)
- TS12-2 Efficient Microservice Deployment in Kubernetes Multi-Clusters through Reinforcement Learning**
 Jose Santos (Ghent University, Belgium); Mattia Zaccarini (Unife, Italy); Filippo Poltronieri, Mauro Tortonesi, Cesare Stefanelli (University of Ferrara, Italy); Nicola Di Cicco (Politecnico di Milano, Italy); Filip De Turck (Ghent University - IMEC, Belgium)
- TS12-3 Accelerating Containerized Machine Learning Workloads**
 Ali Tariq (University of Colorado at Boulder, USA); Lianjie Cao, Faraz Ahmed (Hewlett Packard Labs, USA); Eric Rozner (University of Colorado at Boulder, USA); Puneet Sharma (Hewlett Packard Labs, USA)

Technical Session 13 : NFV/Edge Network

14:00 – 15:30 Room: Daegum

Chair : Jorge Crichigno Benitez (University of South Carolina, USA)

- TS13-1 Network Slice Robustness with Function Sets**
 Nour El-Houda Yellas (Cnam, France); Jeongku Choi (Cnam, South Korea); Prosper Chemouil, Stefano Secci (Cnam, France); Deep Medhi (National Science Foundation, USA)
- TS13-2 StateOS: Enabling Versatile Network Function Virtualization in Edge Clouds**
 Tung V. Doan (TU Dresden, Germany); Frank H.P. Fitzek (Technical University of Dresden, Germany); Giang T. Nguyen (TU Dresden, Germany);
- TS13-3 EdgeURB: Edge-driven Unified Resource Broker for Real-time Video Analytics**
 Xiaojie Zhang, Amitangshu Pal, Saptarshi Debroy (City University of New York, United States of America)

Mini-Conference Sessions
May 6, 2024 (Monday)
MC 1 : 5G/6G
09:00 – 10:30 Room: Daegeum
Chair : Alberto Leon-Garcia (University of Toronto)

- MC1-1 Pilot Optimization and Channel Estimation Scheme for Semantic Communication: A Framework for Edge Intelligence**
 Kitae Kim, Choong Seon Hong (KyungHee University, South Korea); Yan Kyaw Tun (Aalborg University, Denmark); Md. Shirajum Munir (Old Dominion University, United States of America); Walid Saad (Virginia Tech)
- MC1-2 Transfer Learning Empowered Power Allocation in Holographic MIMO-enabled Wireless Network**
 Apurba Adhikary, Avi Deb Raha and Yu Qiao, Seok Won Kang, Choong Seon Hong (Kyung Hee University, South Korea)
- MC1-3 Towards Ultra-Reliable 6G: Semantics Empowered Robust Beamforming for Millimeter-Wave Networks**
 Avi Deb Raha, Apurba Adhikary, Mrityunjoy Gain, Yu Min Park, Choong Seon Hong (Kyung Hee University, South Korea)
- MC1-4 Open RAN Embracing Continual Learning: Towards NextG Adaptive Traffic Analysis**
 Mrityunjoy Gain, Avi Deb Raha, Apurba Adhikary, Kitae Kim, Choong Seon Hong (Kyung Hee University, South Korea)

MC 2 : 5G/6G
11:00 – 12:30 Room: Daegeum
Chair : Seung-Joon Seok (Kyungnam Univ., Korea)

- MC2-1 SMOOTHIE: Efficient and Flexible Load-Balancing in Data Center**
 Loic Champagne, Benoit Donnet (University of Liege, Belgium)
- MC2-2 Congestion-Free Rerouting of Network Flows: Hardness and an FPT Algorithm**
 Esra Ceylan (ISTA, Austria, TU Berlin, Germany); Krishnendu Chatterjee (ISTA, Austria); Stefan Schmid (TU Berlin, Germany); Jakub Svoboda (ISTA, Austria)
- MC2-3 Integrity Management in Softwarized Networks**
 Enrico Bravi, Antonio Lioy, Diana Gratiela Berbecaru (Politecnico di Torino, Italy)
- MC2-4 GTT-NTP: A Graph Convolutional Networks-Based Network Traffic Prediction model**
 Li Longfei, Kyungbaek Kim (Chonnam National University, South Korea)

MC 3 : Federated Learning
14:00 – 15:30 Room: Daegeum
Chair : Yoonhee Kim (Sookmyung Women's University, Korea)

- MC3-1 Towards Robust Federated Learning via Logits Calibration on Non-IID Data**
 Yu Qiao, Apurba Adhikary, Chaoning Zhang; Choong Seon Hong (Kyung Hee University, South Korea)
- MC3-2 Non-Cooperative Edge Server Selection Game for Federated Learning in IoT**
 Kinda Khawam (Universite de Versailles Saint-Quentin-en-Yvelines, ROCS, LISN, Universite Paris Saclay, France); Hussein Taleb (Ecole Supérieure d'Ingénieurs de Beyrouth, Lebanon), Samer Lahoud (Dalhousie University, Canada), Hassan Fawaz (SAMOVAR, Télécom SudParis, Institut Polytechnique de Paris, France), Dominique Quadri, Steven Martin (ROCS, LISN, Universite Paris Saclay, France)
- MC3-3 Data Distribution-Aware Model Aggregation for non-IID Data in a Federated Learning Framework**
 Deepali Kushwaha, Ananya Mehrotra, Rajesh M. Hegde (Indian Institute of Technology, Kanpur, India)
- MC3-4 Quantal Response Analysis of Simultaneous Multi-Target Attacker-Defender Security Games**
 Md Reya Shad Azim, Mustafa Abdallah (Indiana University Purdue University Indianapolis, United States of America)

MC 4 : Blockchain

16:00 – 17:30 Room: Daegeum

Chair : Guillaume Fraysse (Orange, France)

- MC4-1 A 9-dimensional Analysis of GossipSub over the XRP Ledger Consensus Protocol**
 Flaviene Scheidt de Cristo, Jean-Philippe Eisenbarth(SNT-UL, Brazil); Jorge Augusto Meira, Radu State (University of Luxembourg, Luxembourg)
- MC4-2 Optimal Resource Utilization in Hyperledger Fabric: A Comprehensive SPN-Based Performance Evaluation Paradigm**
 Carlos Melo, Glauber Gonçalves, Francisco A. Silva, Leonel Feitosa, Iure Fe´, Andre Soares (Federal University of Piau´ı (UFPI), Brazil), Eunmi Choi (Kookmin University, South Korea), Tuan Anh Nguyen (Konkuk University, South Korea), Dugki Min (Konkuk University, South Korea)
- MC4-3 To Squelch or not to Squelch: Enabling Improved Message Dissemination on the XRP Ledger**
 Lucian Andrei Trestioreanu, Flaviene Scheidt de Cristo and Wazen M. Shbair, Radu State(University of Luxembourg, Luxembourg); J´erˆome Fran¸cois (SnT, University of Luxembourg, France); Damien Magoni(University of Bordeaux, France)
- MC4-4 Thimblorig: A Game-Theoretic, Adaptive, Risk-limiting Security System for Cloud Systems**
 Gautam Kumar, Brent Lagesse (University of Washington Bothell, United States of America)
- MC4-5 Gamu Blue: A Practical Tool for Game Theory Security Equilibria**
 Ameer Taweel (Koc University, Turkey); Burcu Yildiz (EPFL, Switzerland); Alptekin Kpc (Koc University, Turkey)

May 10, 2024 (Friday)
MC 5 : IoT & Security

09:00– 10:30 Room: Daegeum

Chair : Charalampos Rotsos (Lancaster University, UK)

- MC5-1 Unconsidered Installations: Discovering IoT Deployments in the IPv6 Internet**
 Markus Dahlmanns, Felix Heidenreich, Johannes Lohmller, Jan Pennekamp, Klaus Wehrle (RWTH Aachen University, Germany); Martin Henze (RWTH Aachen University, Germany, Fraunhofer FKIE, Germany)
- MC5-2 SHIFT: a Security and Home Integration Framework for IoT**
 Katharina Mueller (University of Zurich, Switzerland); Elliott Wallace and Daria Schumm and Burkhard Stiller(University of Zrich UZH, Switzerland); Bruno Rodrigues (Communication Systems Group CSG@IfI, University of Zurich, Switzerland)
- MC5-3 BatchIT: Intelligent and Efficient Batching For IoT Workloads at the Edge**
 Guoxi Wang, Ryan Hildebrant, Andrew Chio (University of California, Irvine, United States of America); Nalini Venkatasubramanian, Sharad Mehrotra (UCI, United States of America)
- MC5-4 IT Intrusion Detection Using Statistical Learning and Testbed Measurements**
 Xiaoxuan Wang (KTH, Sweden); Rolf Stadler (KTH The Royal Institute of Technology, Sweden)

MC 6 : Communication Protocol

11:00 – 12:30 Room: Daegeum

Chair : Ved P. Kafle

(National Institute of Information and Communications Technology, Japan)

- MC6-1 SWPTMAC: Sleep Wake-up Power Transfer MAC Protocol**
 Luan Borges dos Santos (Univerddade de Brasılia, Brazil); Geraldo Rocha (UESB, Brazil); Lucas Bondan (RNP, Brazil); Marcos F. Caetano, Aleteia de Araujo, Marcelo Antonio Marotta (UnB, Brazil)
- MC6-2 From WHOIS to RDAP: Are IP Lookup Services Getting any Better?**
 Lorenzo Corneo (Ericsson Research, Sweden); Mario Di Francesco (Aalto University, Finland)
- MC6-3 RECAP 5GC: Resilience and CAP aware 5G Core for Consistent and High Availability Service**
 Siddhesh Sovitkar, Shwetha Vittal, Antony Franklin A (Indian Institute of Technology Hyderabad, India)
- MC6-4 MANET-Rank: A Framework for Defence Protocols against Packet Dropping Attacks in MANETs**
 Charles Hutchins, Leonardo Aniello, Enrico Gerding, Basel Halak ((University of Southampton, UK)

MC 7 : AI

14:00 – 15:30 Room: Daegeum

Chair : Jin-Hee Cho (Virginia Tech, USA)

MC7-1 Reinforcement Learning (RL) Based Admission Control in Advance Bandwidth Reservation

Tananun Orawiwattanukul (KDDI Research Inc., Japan); Takuya Miyasaka

MC7-2 Configuring the IEEE 802.1Q Time-Aware Shaper with Deep Reinforcement Learning

Adrien Roberty, Quentin Besnard, Siwar Ben Hadj Said (CEA, France), Frédéric Ridouard, Henri Bauer (ISAE-ENSMA, France), Annie Geniet (UNIVPOITIERS, France)

MC7-3 Distributed and Adaptive Workload Prediction for In-Network Computing

Takaya Miyazawa, Ved Kafle, Hitoshi Asaeda (National Institute of Information and Communications Technology, Japan)

MC7-4 TrafficEd: Deployment and Management System of Edge AI Cameras

Guan-Wen Chen, Yi-Hsiu Lin and Tsi-Ui Ik(NYCU, Taiwan)

MC 8 : Performance Management

16:00 – 17:30 Room: Daegeum

Chair : Prosper Chemouil (Cnam, France)

MC8-1 Application-aware Resource Sharing using Software and Hardware Partitioning on Modern GPUs

Theodora Adufu (Sookmyung Women's University, South Korea); Jiwon Ha (Seoul National University, South Korea); Yoonhee Kim (Sookmyung Women's University, South Korea)

MC8-2 POLUS: Detecting and Characterising Latency Under Load In Multi-Bottleneck Wireless Internet Service Provider Networks

Duncan E. Cameron, Murugaraj Odiathevar, Alvin C. Valera, and Winston K.G. Seah (Victoria University of Wellington, New Zealand)

MC8-3 iMIA: Interdependent Mission Impact Assessment Using Subjective Bayesian Networks

Han Jun Yoon, Ashrith Reddy Thukkaraju (Virginia Tech, USA); Shou Matsumoto, Jair Feldens Ferrari (George Mason University, USA); Donghwan Lee, Myung Kil Ahn (Agency for Defense Development, South Korea); Paulo Costa (George Mason University, USA); Jin-Hee Cho (Virginia Tech, USA);

MC8-4 Residence Time Aware Client Selection in Federated Learning in Vehicular Network

Selman Sezgin, Kahina Mokrani, Sylvain Allio, Nour El Houda Yellas (Orange Labs., France)



아리스타 네트워크는 클라우드 네트워킹을 제공하는 업계 일등 벤더로서 대규모 데이터센터, 캠퍼스 및 라우팅에 필요한 솔루션을 제공하고 있습니다.



Highlights

- #1 in 100/200/400GE networking
- 21% CAGR ■ Global 9000+ customers
5 Year CAGR
- 92% Customer Satisfaction
TechValidate Net Promoter Score Recognition
- Forrester Wave Leader
Open Programmable Switches for Business Wide SDN
- Gartner Leader
2020 Magic Quadrant for Datacenter and Cloud Networking

New Standard in Software Driven Networking



Poster Sessions
May 7, 2024 (Tuesday)
PS 1 : Network Technologies
10:30 – 11:00 Room: Hallway
Chair : Kisang Ok (KT, South Korea)

- PS1-1 Curve-encoding-based Target Generation with Transfer Learning Optimization for IPv6 Address Scanning**
Yuzhe Wu, Rui jin, Songjie Wei (Nanjing University of Science and Technology, People's Republic of China)
- PS1-2 Is It Time to Upgrade from CRC-32?**
Mohit Balany, Craig Partridge (Colorado State University (CSU), United States of America)
- PS1-3 Dynamic Wavelength Switching for Open All-Photonics Networks**
Li-Hsuan Chu, Yen-Lin Tung, Yong-Zen Huang, Jhih-Heng Yan, Kuang-Heng Shen (Chunghwa Telecom Labs, Taiwan)
- PS1-4 Adaptive In-Network Queue Management using Derivatives of Sojourn Time and Buffer Size**
Saad Saleh, Sunny Shu (UG, Netherlands); Boris Koldehofe
- PS1-5 Detecting Heavy Hitters in Network-Wide Programmable Multi-Pipe Devices**
Thiago Henrique Silva Rodrigues, Fábio Luciano Verdi (UFSCAR, Brazil)
- PS1-6 Deep Tailored Dynamic Registration in B5G/6G with Lightweight Recurrent Model**
Bokkeun Kim, Gyeongsik Kim, Jin Kim (Samsung Electronics, South Korea); Syed Muhammad Raza, Hyunseung Choo (Sungkyunkwan University, South Korea)
- PS1-7 RDA: Residence Delay Aggregation for Time-Sensitive Networking**
Chengbo Zhou (TU Darmstadt, Germany); Christoph Gärtner (Technical University of Darmstadt, Germany); Amr Rizk (University of Duisburg-Essen, Germany); Boris Koldehofe, Björn Scheuermann (Humboldt University of Berlin, Germany); Ralf Kundel (Technische Universität Darmstadt, Germany)
- PS1-8 Eliminating Bottlenecks in MANETs**
Klement Hagenhoff (Research Assistant of the University of Federal Armed Forces Neubiberg, Germany); Gabi Dreo Rodosek (University of Federal Armed Forces, Munich, Germany)

PS 2 : Security and Risk Management
15:30 – 16:00 Room: Hallway
Chair : Utae Kim (KT, South Korea)

- PS2-1 VT-SOS: A Cost-effective URL Warning utilizing VirusTotal as a Second Opinion Service**
Kyohei Takao, Chika Hiraishi, Rui Tanabe (Yokohama National University, Japan); Kazuki Takada (SecureBrain Corporation, Japan); Akira Fujita, Daisuke Inoue (NICT, Japan); Carlos Ganan, Michel van Eeten (Delft University of Technology, Netherlands); Katsunari Yoshioka, Tsutomu Matsumoto (Yokohama National University, Japan)
- PS2-2 Investigate and Improve the Certificate Revocation in Web PKI**
Chengyuan Zhang, Changqing An (Tsinghua University, People's Republic of China); Tao Yu, Zhiyan Zheng, Jilong Wang (Tsinghua University)
- PS2-3 Data-Centric Federated Learning for Anomaly Detection in Smart Grids and other Industrial Control Systems**
Dylan **Perdigão**, Tiago Cruz, Paulo Simoes, Pedro Henriques Abreu (University of Coimbra, Portugal)
- PS2-4 A Secure Framework in Vertical and Horizontal Federated Learning Utilizing Homomorphic Encryption**
Li-Yin Bai, Pei-Hsuan Tsai (NCKU, Taiwan)
- PS2-5 Improving Resilience Of Future Mobile Network Generations Implementing Zero Trust Paradigm**
Kamyar Abedi (KIT, Germany); Giang Nguyen (TU Dresden, Germany); Thorsten Strufe (KIT, Germany)
- PS2-6 Formal Verification for Blockchain-based Insurance Claims Processing**
Roshan Neupane (University of Missouri at Columbia, United States of America); Ernest Bonnah, Bishnu Bhusal (University of Missouri at Columbia, Nepal); Kiran Neupane, Khaza Anuarul Hoque, Prasad Calyam (Columbia, United States of America)
- PS2-7 A Blockchain-based Approach for Continuous Auditing in IT Change Management**
Carlos Fraga (UFRGS, Brazil); Antônio Jorge Gomes Abelém (UFPA, Brazil); Vinicius Cunha M Borges (Federal University of Goias, Brazil); Billy Anderson Pinheiro (Amazônia Blockchain Solutions, Brazil); Weverton Luis da Costa Cordeiro (UFRGS, Brazil)
- PS2-8 A Game-theoretic Approach for DDoS Attack Mitigation in IIoT Deterministic Networking**
Thierry M. Ndimis Toko, Martine Bellaiche (Ecole Polytechnique de Montreal, Canada); Talal Halabi (Université Laval, Canada)

May 8, 2024 (Wednesday)
PS 3 : Networking and Virtualization
10:30 – 11:00 Room: Hallway
Chair : Kyungbaek Kim (Chonnam National University, Korea)

- PS3-1 iCPN: Scalable Control Plane for the Network Service Automation System**
Pedro Martinez-Julia, Ved Kafle, Hitoshi Asaeda (NICT, Japan)
- PS3-2 On-demand network bandwidth reservation method exploiting machine learning intuitive judgment**
Kouichi Genda (Nihon University, Japan)
- PS3-3 Routing optimization based on DRL and Generative Adversarial Networks for SDN environments**
Juan Chafra Altamirano (LAAS-CNRS, Ecuador); Mariem Guitouni (LAAS-CNRS, Tunisia); Hassan Hassan (CNRS, France); Khalil Drira (LAAS, France)
- PS3-4 Securing P4-SDN Data Plane against Flow Table Modification Attack**
Avinash Reddy Buchammagari (IIITNR, India); Kshira Sagar Sahoo, Monowar Bhuyan (Umeå University, Sweden)
- PS3-5 Multi-Tenant Programmable Switch Virtualization Architecture**
Ivan Peter Lamb (UFRGS, Brazil); Theo Facen (University of Bordeaux, Brazil); Pedro Duarte, José Rodrigo Azambuja, Weverton Cordeiro (UFRGS, Brazil)
- PS3-6 ERAFL: Efficient Resource Allocation for Federated Learning Training in Smart Homes**
tina rezaei, Suzan Bayhan, Andrea Continella, Roland van Rijswijk-Deij (University of Twente, Netherlands)
- PS3-7 AI-based Network Function Virtualization Orchestration**
Hee-Gon Kim, Jae-Hyoung Yoo, James W. Hong (POSTECH, South Korea)
- PS3-8 SFC Consolidation: Energy-aware SFC Management using Deep Reinforcement Learning**
euidong jeong, Jae-Hyoung Yoo, James W. Hong (POSTECH, South Korea)

PS 4 : Artificial Intelligence and Machine Learning
15:30 – 16:00 Room: Hallway
Chair : Sejin Park (Keimyung University, Korea)

- PS4-1 Unmasking the Phishermen: Phishing Domain Detection with Machine Learning and Multi-Source Intelligence**
Radek Hranický, Adam Horák, Jan Polišenský, Kamil Jerabek, Ondrej Rysavy (Faculty of Information Technology, Brno University of Technology, Czech Republic)
- PS4-2 ML-based 5G Core Network Load Forecasting With Metrics From Performance Management**
Tse-Ming Chen (NYCU, Taiwan); Chien Chen, Jyh-Cheng Chen (NCTU, Taiwan)
- PS4-3 Similarity-Based Selective Federated Learning for Distributed Device-Specific Anomaly Detection**
Christian Lübben (Technical University of Munich, Germany); Marc-Oliver Pahl (IMT Atlantique, Germany)
- PS4-4 Wireless Link Quality Estimation Using LSTM Model**
Yuki Kanto, Kohei Watabe (Nagaoka University of Technology, Japan)
- PS4-5 ANOVA Simultaneous Component Analysis for the Efficient Exploration of Massive Network Traffic**
José Camacho (Universidad de Granada, Spain)
- PS4-6 Energy-Efficient Trajectory and Age of Information Optimization for Urban Air Mobility**
Hyeonsu Kim, Yu Min Park, Pyae Sone Aung (Kyung Hee University, South Korea); Md. Shirajum Munir (Old Dominion University, United States of America); Choong Seon Hong (Kyung Hee University, South Korea)
- PS4-7 Lightweight Multi-Input Shape CNN-based Application Traffic Classification**
Ui-Jun Baek, Min-Seong Lee, Jee-Tae Park, Jeong-Woo Choi, Chang-Yui Shin, Ju-Sung Kim, Yoon-Seong Jang, Myung-Sup Kim (Korea University, South Korea)
- PS4-8 Deep UAV Path Planning with Assured Connectivity in Dense Urban Setting**
Jiyong OH, Syed Muhammad Raza, Lusungu J. Mwasinga (Sungkyunkwan University, South Korea); Moonseong Kim (STU, South Korea); Hyunseung Choo (Sungkyunkwan University, South Korea)

May 9, 2024 (Thursday)
PS 5 : Internet of Things and Application
10:30 – 11:00 Room: Hallway
Chair : Youngjoon Won (Hanyang Univ., Korea)

- PS5-1 Adaptive Transmit Power Control for 3GPP C-V2X Networks by Considering Traffic Conditions**
Shao-Wei Kao, Kai-Yi Yang, Meng-Shiuan Pan (NTUT, Taiwan)
- PS5-2 Framework for the development of a Network Digital Twin**
Angela Burgaleta, Ignacio Dominguez (Telefonica I+D, Spain); Amit Karamchandani (Universidad Politécnica de Madrid, Spain); Diego R. Lopez, Antonio Pastor (Telefonica I+D, Spain)
- PS5-3 Trusted Digital Twin Network for Intelligent Vehicles**
Asad Malik, Ayan Roy, Sanjay Madria (Missouri University of Science and Technology, United States of America)
- PS5-4 ChatGPT-enabled Network Automation using API-based Prompts**
Olasupo Okunaiya (Birmingham City University, United Kingdom, United Kingdom); Ron Austin, Shao Ying Zhu (BCU, United Kingdom)
- PS5-5 Analysis of Diffusion Process of ICN Based on Economic Factors**
Shuntaro Hashimoto, Makoto Misumi (Fukuoka University, Japan); Noriaki Kamiyama (Ritsumeikan University, Japan)
- PS5-6 Towards a Mobility-cum-Battery Aware Dynamic UAV Deployment for Uninterrupted Connectivity**
Kolicchala Rajashekar, Subhajit Sidhanta, Souradyuti Paul (IITBHILAI, India)
- PS5-7 Realizing Open and Decentralized Marketplace for Exchanging Data of Expected IoT Behaviors**
Song Guo, Minzhao Lyu, Hassan Habibi Gharakheili (University of New South Wales, Australia)
- PS5-8 Achieving Best-path Selection at Line Rate through the SRv6 Live-Live Behavior**
Marco Polverini (Sapienza, University of Rome, Italy); Antonio Cianfrani (University of Rome Sapienza, Italy); Tommaso Caiazzi (Roma Tre University, Italy); Mariano Scazzariello (KTH Royal Institute of Technology, Italy); Ahmed Abdelsalam, Clarence Filsfils, Pablo Camarillo (Cisco Systems, Belgium)

PS 6 : Cloud Computing and Data Analytic
15:30 – 16:00 Room: Hallway
Chair : Mi-Jung Choi (Kangwon National University, Korea)

- PS6-1 An Innovative Bridge Layer Access Control Method to Improve SSD Utilization**
Feng Jiang, Yongyang Cheng, Tao Zhang (China Telecom Cloud Computing Corporation, People's Republic of China)
- PS6-2 A Novel Service Node Selection Approach Towards Resource-intensive Cloud Computing Environment**
Yongyang Cheng, Feng Jiang (China Telecom Cloud Computing Corporation, People's Republic of China)
- PS6-3 Upsampling Aggregated Network Traffic Data with Denoising Diffusion Probabilistic Models**
Nicolas DUPUIS, Axel Van Damme, Philippe Dierickx, Olivier Delaby (Bell Labs Nokia, Belgium)
- PS6-4 CLAIM: A cloud-based framework for Internet-scale measurements**
Rafi Kurnia Putra, Lorenzo Corneo (Ericsson Research, Sweden); Walter Wong, Mario Di Francesco (Aalto University, Finland)
- PS6-5 Latency-aware Scheduling in the Cloud-Edge Continuum**
Cristopher Chiaro, Doriana Monaco, Alessio Sacco, Claudio E. Casetti, Guido Marchetto (Politecnico di Torino, Italy)
- PS6-6 Coupled Design and Analysis of Experiments in Network Management**
Rafael Adan-López, David Fernández-Martínez, Rafael Rodríguez-Gómez, José Camacho (Universidad de Granada, Spain)
- PS6-7 Transport Assistants to Enhance TCP Performance: Analysis of the Packet Delivery Delay**
Jaime Galán-Jiménez (University of Extremadura, Spain); Mohamed Faten Zhani (University of Sousse, Tunisia); Luis Jesús Martín León, John Kaippallimalil (Futurewei Technologies, Inc, United States of America)
- PS6-8 Oz: Towards an Extensible Intent Handler Architecture with Semantic Reasoning**
Paul Alcock, Charalampos Rotsos, Nicholas Race (Lancaster University, United Kingdom)

Experience Sessions
May 7, 2024 (Tuesday)
ES 1 : Network Monitoring and Orchestration
09:00 – 10:30 Room: Daegeum
Chair : Joon-Myung Kang (Google, USA)

- ES1-1 Fusing Heterogeneous Data for Network Asset Classification - A Two-layer Approach**
Ondrej Sedlacek, Vaclav Bartos (CESNET, Czech Republic)
- ES1-2 Practical Evaluation of Dynamic Service Function Chaining (SFC) for Softwarized Mobile Services in a SDN-based Cloud Network**
Hanif Kukkalli, Thomas Bauschert (Technische Universität Chemnitz, Germany); Mehrdad Hajizadeh (Student, Germany)
- ES1-3 Avoiding "Hot Potato" Problems in Internet Service Providers**
Khanh Huu The Dam (UCLouvain, Belgium); Gorby Nicolas Kabasele Ndonga, Axel Legay, Ramin Sadre (Université Catholique de Louvain, Belgium)
- ES1-4 TCI: A system for distributed network monitoring, troubleshooting and dataset creation.**
Dominik Soukup, Jaroslav Pesek (Czech Technical University in Prague, Czech Republic); Lukáš Hejzman, David Beneš, Tomas Cejka (CESNET, a.l.e., Czech Republic)

May 8, 2024 (Wednesday)
ES 2 : Security and Performance of Future Networks
09:00 – 10:30 Room: Daegeum
Chair : Joon-Myung Kang (Google, USA)

- ES2-1 Enhancing 5G Core security with eBPF/XDP**
Luis Loureiro, Vasco Pereira, Tiago Cruz, Paulo Simoes (University of Coimbra, Portugal)
- ES2-2 Lightweight security for IoT systems leveraging Moving Target Defense and Intrusion Detection**
Van-Tien NGUYEN (INSA Toulouse, France); Renzo Navas, Guillaume Doyen (IMT Atlantique / IRISA, France)
- ES2-3 RPL at Scale: Experiences from a Performance Evaluation on up to 700 IEEE 802.15.4 Devices**
Mateusz Banaszek, Markus Schuß, Carlo Alberto Boano, Konrad Iwanicki (University of Warsaw, Poland)
- ES2-4 Evaluating 5G SA Testbeds: Unveiling Performance Disparities in RAN Scenarios**
Mohamed Rouili, Niloy Saha, Morteza Golkarifard, Mohammad Zangoeei, Raouf Boutaba, Aladdin Saleh (University of Waterloo, Canada); Ertan Onur (Middle East Technical University, Turkey)

Demo Sessions
May 7, 2024 (Tuesday)
DEMO 1
12:30 – 14:00 Room: Hallway
Chair : Do-Young Lee (ETRI, Korea)
Demo1-1 Digital Twin Network for dynamic management of a Bluetooth Mesh Network

Jorg Wieme (Ghent University, Belgium); Mathias Baert (Ghent University - IMEC, Belgium); Jeroen Hoebeke (Ghent University, Belgium)

Demo1-2 Preparing for the 6G Era: Introducing the Internet of Edges

Khaldoun Al Agha (Green communications, France); Pauline Loygue, Guy Pujolle (Sorbonne University, France)

Demo1-3 Orchestrating Multi-Tenant Code Updates Across Multiple Programmable Switches

Timo Geier, Sebastian Rieger (Fulda University of Applied Sciences, Germany)

Demo1-4 Using A Digital Twin for Verification of Automatic Fulfillment Procedures in Telecom Services

Chia-Lun Huang, Jyh-Yuan Chen, Yi-Chih Huang (Chunghwa Telecom, Taiwan)

Demo1-5 Hierarchical Software-Defined Control for coordinated RAN and PON-based Transport Scaling

Alessandro Pacini, Andrea Sgambelluri (Scuola Superiore Sant'Anna, Italy); Carlo Centofanti, Andrea Marotta (University of L'Aquila, Italy); Emilio Paolini (Scuola Superiore Sant'Anna, Italy); Alessio Giorgetti (University of Pisa, Italy); Luca Valcarengi (Scuola Superiore Sant'Anna, Italy)

May 8, 2024 (Wednesday)
DEMO 2
12:30 – 14:00 Room: Hallway
Chair : Hongtaek Ju (Keimyung University, Korea)
Demo2-1 Detect Silent Failures with Network Sentinel

Chang Chih Wei (Chunghwa Telecom Co., Ltd, Taiwan); Pei Jung (Chunghwa Telecom Laboratories, Taiwan); Chien-Che Hung, Yuan-Chih Chang (Chunghwa Telecom Co., Ltd, Taiwan)

Demo2-2 An AI/ML Proactive Network Service Relocation Approach for Multi-Admin Domain Scenarios

Jorge Baranda, Akram Galal, Luca Vettori (Centre Tecnologic de Telecomunicacions de Catalunya, CTTC, Spain); Asterios Mpatziakas (Centre for Research and Technology, Greece); Andrea Gentili (VTT Technical Research Centre of Finland, Finland); Anastasios Sinanis (Centre for Research and Technology, Greece); Anastasia Yastrebova-Castillo (VTT Technical Research Centre of Finland, Finland), Guillermo Gómez (ATOS/EVIDEN Research & Innovation); Sozos Karageorgiou (eBOS); Anastasios Drosou (Centre for Research and Technology, Greece); Johan Scholliers (VTT Technical Research Centre of Finland, Finland); Miquel Payaró, Josep Mangues-Bafalluy (Centre Tecnologic de Telecomunicacions de Catalunya, CTTC, Spain)

Demo2-3 Demonstrating the Energy Consumption of Radio Access Networks in Container Clouds

Italy); Jose Santos (Ghent University, Belgium); Andrea Marotta (University of L'Aquila, Italy); Koteswararao Kondepu (IIT-DHARWAD, India)

Demo2-4 Demo: Towards Reliable Cloud-native 5G and Beyond Networks using In-network Computing

Mahdi Attawna, Osel Lhamo (TU Dresden, Germany), Tung Doan (TUD, Germany); Frank Fitzek (Technical University of Dresden, Germany); Giang Nguyen (TU Dresden, Germany)

Demo2-5 An Adaptable AI Assistant for Network Management

Amar Abane, Abdella Battou, Mheni Merzouki (NIST, USA)

May 9, 2024 (Thursday)

DEMO 3

12:30 – 14:00 Room: Hallway

Chair : Eiji Takahashi (NEC, Japan)

Demo3-1 Demo: Towards Rapid Prototyping Network-Slicing Solutions in Software-Defined Networks

Fritz Windisch, Kamyar Abedi (KIT, Germany); Giang Nguyen (TU Dresden, Germany); Thorsten Strufe (KIT, Germany)

Demo3-2 ProNA: A Virtual Lab Framework to Teach Network Automation and SDN in Undergraduate Courses

Sebastian Rieger (Fulda University of Applied Sciences, Germany); Martin Stiemerling (Hochschule Darmstadt, Germany)

Demo3-3 SDN-based Mitigation of Synchronization Attacks on Distributed and Cooperative Controls in Microgrid

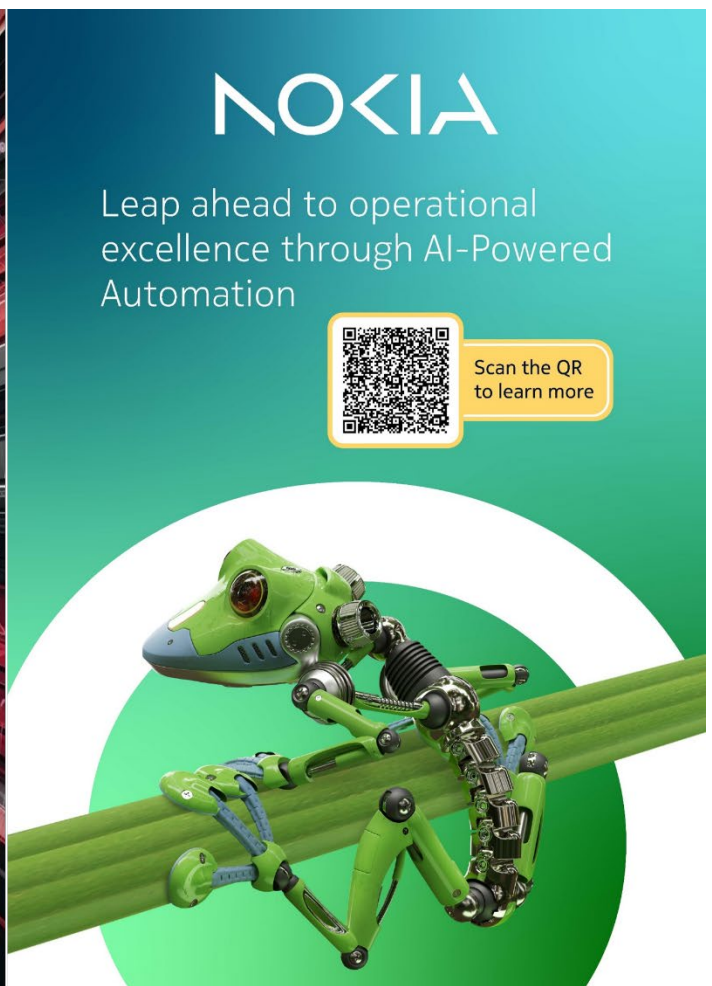
Aurélie KPOZE (IMSP-UAC, Benin); Abdelkader Lahmadi (University of Lorraine, France); Isabelle Chrisment (TELECOM Nancy - Université de Lorraine, France); Jules DEGILA(IMSP-UAC, Benin)

Demo3-4 Dynamic QoS for High Quality SD-WAN Overlays

Quang Pham Tran Anh (Huawei Technologies, France); Jérémie Leguay (Huawei, France Research Center, France); Feng Zeng (Huawei Technologies, France); Jianqiang Hou (Huawei Technologies Co. Ltd., Switzerland); boyuan yu (Huawei Technologies Co. Ltd., Switzerland); Davide Restivo(Swisscom)

Demo3-5 The True Cost of Network Security Automation: Demo Playbook for Posture Assessment

Daniel Tovarnak, Michal Cech, Vojtech Dohnal, Martin Hamernik, Matus Racek, Dusan Tichy (Masaryk University, Czech Republic)



Doctoral Symposium
May 7, 2024 (Tuesday)
DS 1 : Networks
16:00 – 17:30 Room: Daegum
Chair : Mauro Tortonesi (University of Ferrara, Italy)

- DS1-1 Modeling the Coexistence Performance between Wi-Fi 7 and legacy Wi-Fi**
Suhwan Jung, Seokwoo Choi, Hyoil Kim, Youngkeun Yoon, Ho-Kyung Son (UNIST, South Korea)
- DS1-2 Distributed Intelligence for Automated 6G Network Management Using Reinforcement Learning**
Sayantini Majumdar (MRC, Germany); Susanna Schwarzmann (European Research Center, Huawei Technologies Duesseldorf GmbH, Germany); Riccardo Trivisonno (Huawei ERC, Germany); Georg Carle (Technical University of Munich, Germany)
- DS1-3 Towards Data-Driven Management of Mobile Networks through User Plane Inference**
Aristide Tanyi-Jong Akem, Marco Fiore (IMDEA Networks, Spain)
- DS1-4 DRL meets GNN for improving QoS in tactical MANET**
Johannes Loevenich (Thales Communications & Security, Germany), Roberto Rigolin F Lopes (Thales, Germany)

May 8, 2024 (Wednesday)
DS 2 : Softwarization
16:00 – 17:30 Room: Gayageum B
Chair : Mauro Tortonesi (University of Ferrara, Italy)

- DS2-1 Improving Multi-Tenant I/O-Acceleration for Containerized Network Function Environments**
Timo Geier (Fulda University of Applied Sciences, Germany)
- DS2-2 The Evolution of Kubernetes Management: Introducing the KubeTwin Framework**
Mattia Zaccarini, Filippo Poltronieri, Mauro Tortonesi (University of Ferrara, Italy)
- DS2-3 Latency-Aware Cache Mechanism for Resolver Service of Domain Name Systems**
Ibirisol Fontes Ferreira (Department of Communications and Computer engineering, Graduate of Informatics, Kyoto University, Brazil); Eiji Oki (Kyoto University, Japan)
- DS2-4 Enabling Big Data and Machine Learning Applications in High-Stakes Environments**
Simon Dahdal, Mauro Tortonesi (University of Ferrara, Italy)

May 9, 2024 (Thursday)
DS 3 : Security
09:00 – 10:30 Room: Daegum
Chair : Mauro Tortonesi (University of Ferrara, Italy)

- DS3-1 Protocol Security in the Industrial Internet of Things**
Markus Dahlmans, Klaus Wehrle (Communication and Distributed Systems, RWTH Aachen University, Germany)
- DS3-2 Security Automation in next-generation Networks and Cloud environments**
Francesco Pizzato, Daniele Bringhenti, Riccardo Sisto, Fulvio Valenza (Politecnico di Torino, Italy)
- DS3-3 Using Contextual Reinforcement Learning to Design FANET Defence Protocols to Combat Grey Hole Attacks**
Charles Hutchins (University of Southampton, UK, United Kingdom)
- DS3-4 Evolving the Industrial Internet of Things: The Advent of Secure Collaborations**
Jan Pennekamp (RWTH Aachen University, Germany)

Workshop: AnNet 2024

May 6, 2024 (Monday) 09:00 – 17:30,

Room : Bipa

Time	Subject
09:00 – 10:00	<p>Keynote AI and Data Analytics for Network Service Design and Resource Control Ved Kafle (National Institute of Information and Communications Technology, Japan)</p>
10:30 – 11:00	<p>Short Paper Session 1: Network Operation and Analysis</p> <p>Improvement of Segment Length Selection Method for DASH Considering Shared Bottleneck Links Sumiko Miyata (Shibaura Institute of Technology)</p> <p>Optimal quadratic control of queues by dynamic service rates Rubén Milocco (Universidad Nacional del Comahue), Paul Mühlethaler, Selma Boumerdassi, Eric Renault (ESIEE Paris)</p> <p>Loss-Aware Adaptive Load Balancing Scheme for IoT-Enabled WBANs with QoS-Factor Amit Samanta (University of Utah), Thanh Phung Truong, Nhu Ngoc Dao (Sejong University), Sungrae Cho</p> <p>Practical Anomaly Detection in Internet Services: An ISP centric approach Alex Huang Feng (INSA Lyon – CITI), Pierre Francois (INSA Lyon – CITI), Kensuke Fukuda (National Insutitute of Informatics), Wanting wanting.du@swisscom.com (Swisscom), Thomas Graf (Swisscom), Paolo Lucente, Stéphane Frénot (INSA Lyon – CITI)</p> <p>Packet Continuity DDoS Attack Detection for Open Fronthaul in ORAN System Jung-Erh Chang, YI-CHEN CHIU (National Taiwan University of Science and Technology), Yi-Wei Ma, Zhi-Xiang Li, Chenglong Shao(Kyushu Institute of Technology)</p> <p>A Preliminary Study on the Aggregation of FIBs ICN Routers using Routing Strategy Ryo Nakamura (Fukuoka University), Noriaki Kamiyama (Ritsumeikan University)</p> <p>Analysis on a Performance and Fairness Tradeoff in Entanglement Routing for Quantum Networks Shu Ichinoseki (Osaka University), Yuki Koizumi (Osaka University), Junji Takemasa (Osaka University), Toru Hasegawa (Osaka University)</p>
11:00 – 12:30	<p>Session 1: Security Chair : Raouf Abozariba (Birmingham City University)</p> <p>IP Geolocation with Adversarial Probe Mitigation Andikan Otung (Fujitsu Laboratories of Europe), Kenji Hikichi (Fujitsu Limited), Yasuki Fujii (Fujitsu Limited), Motoyoshi Sekiya (Fujitsu Limited)</p> <p>Investigating Impact of DDoS Attack and CPA Targeting CDN Caches Jiaqi Liu (Ritsumeikan University), Noriaki Kamiyama (Ritsumeikan University)</p> <p>Optimum Worker Sampling in Crowdsensing with Multiple Areas Chihiro Matsuura, Noriaki Kamiyama (Ritsumeikan University)</p> <p>Comparing Two-stage Clustering Methods for Traffic Pattern Analysis in IoT Mizuki Asano (Shibaura Institute of Technology), Takumi Miyoshi (Shibaura Institute of Technology), Taku Yamazaki (Shibaura Institute of Technology)</p>
12:30 – 14:00	<p>Lunch time</p>
14:00 – 15:30	<p>Session 2: Network Operation and Analysis Chair : Yuki Koizumi (Osaka University)</p> <p>Discovery of Cloud Incidents through Streaming Consolidation of Events across Timeline and Topology Hierarchy Ashot Harutyunyan (YSU), Naira Grigoryan (VMWare), Artur Grigoryan, Vahan Tadevosyan, Nelson Baloian (Universidad de Chile), Arnak Poghosyan (IMRA), Tigran Bunarjyan (Technische Universität München)</p> <p>Radio Environment Maps through Spatial Interpolation: A Web-based Approach Md Abrar Jahin Almazi Bipon (Birmingham City University), Md Shantanu Islam (Birmingham City University), A. Taufiq Asyhari(Monash University), Adel Aneiba, Raouf Abozariba (Birmingham City University, United Kingdom)</p> <p>Reconfiguration with Virtual Gate Control List for Deterministic Transmission in Time-Sensitive Networks Mengjie Guo (Beijing University of Posts and Telecommunications), Guochu Shou (Beijing University of Posts and Telecommunications), Yaqiong Liu (Beijing University of Posts and Telecommunications), Yihong Hu (University of Posts and Telecommunications)</p> <p>Microservices in Edge and Cloud Computing for Safety in Intelligent Transportation Systems João Oliveira (Universidade de Aveiro), Pedro Teixeira (Universidade de Aveiro), Pedro Rito (Instituto de Telecomunicações), Miguel Luis (Instituto de Telecomunicações), Susana Sargento (Universidade de Aveiro), Bruno Parreira (NOSTech)</p>

15:30 – 16:00	Short Paper Session 2: AI
	Machine learning-based estimation of the number of competing flows at a bottleneck link Zeyou Xia (Tohoku University), Go Hasegawa (Tohoku University)
	A ML-Based Model for Evaluating the Power Consumption of Network Devices Chi-Sheng Hsu (Network Management Laboratory, Chunghwa Telecom Laboratories Co., Ltd.), Yi-Cheng Chu, Ya-Ping Huang(CHT), Huang Lung-Chin (Chunghwa Telecom Telecommunication Laboratories), Teng Che-Chun (Chunghwa Telecom Labs), Chin-Ping Chuang (CHT)
	One-Class Learning on Temporal Graphs for Attack Detection in Cyber-Physical Systems Robin Buchta (HSH), Tobias Fritz (Universität der Bundeswehr München), Carsten Kleiner (HSHANNOVER), Felix Heine (HSH), Gabi Dreo Rodosek (University of Federal Armed Forces, Munich)
	AI-Driven Traffic-Aware Dynamic TDD Configuration in B5G Networks Sanguk Jeong, dahyun mok (Sungkyunkwan University), Gyurin Byun (Sungkyunkwan University), Hyunseung Choo
	Federated Learning-Driven Edge AI for Enhanced Mobile Traffic Prediction Hyunsung Kim (Sungkyunkwan University), Yeji Choi, Jeongjun Park (Sungkyunkwan University), Lusungu J. Mwasinga(Sungkyunkwan University), Hyunseung Choo
	Completion of Traffic Matrix by Tensor Nuclear Norm Minus Frobenius Norm Minimization and Time Slicing Takamichi Miyata (Chiba Institute of Technology)
16:00 – 17:30	Session 3: AI Chair : Taufiq Asyhari (Monash University)
	Comparing transfer learning and rollout for policy adaptation in a changing network environment Forough Shahab Samani (KTH Royal Institute of Technology), Hannes Larsson (Ericsson Research), Simon Damberg (Ericsson Research), Andreas Johnsson (Ericsson Research), Rolf Stadler (KTH The Royal Institute of Technology)
	Real-Time Application Identification Method for Mobile Networks Using Machine Learning Tatsuhiko Ou (The University of Tokyo), Akihiro Nakao (The University of Tokyo)
	Towards a Transformer-Based Pre-trained Model for IoT Traffic Classification Bruna Bazaluk (USP), Mosab Hamdan (KFUPM), Mustafa Ghaleb (King Fahd University of Petroleum and Minerals), Mohammed Gismalla (KFUPM), Flávio Soares Corrêa da Silva (USP), Daniel Macêdo Batista (University of São Paulo)
	Identifying IoT Devices: A Machine Learning Analysis Using Traffic Flow Metadata Jeffrey Adjei (Dalhousie University), Nur Zincir-Heywood (Dalhousie University), Biswajit Nandy (Carleton University), Nabil Seddigh (Solana Networks)

Workshop: MFI5.0 2024

May 6, 2024 (Monday) 09:00 – 17:30,

Room : Sogeum

Time	Subject
09:00 – 09:15	Welcome and Introduction
09:15 – 10:00	Keynote Gerald Reiner (WU, Vienna University of Economics and Business)
10:00 – 10:30	Full Paper: AIMS5.0 AI Toolbox: Enabling Efficient Knowledge Sharing for Industrial AI Gergely Hollósi (Budapesti Muszaki Egyetem, Hungary), Daniel Ficzer (Budapest University of Technology and Economics, Hungary), Attila Franko (AITIA International Inc., Hungary), Máté Bancsics, Ruba Almahasneh (Budapest University of Technology and Economics, Hungary), Csaba Lukovszki, Pal Varga (Budapest University of Technology and Economics, Hungary)
10:30 – 11:00	Coffee Break
11:00 – 11:30	Full Paper: Harvesting Innovation: Analysis of Decentralized MAPE-K Loops in Cyber-Physical Production Systems Michael Boch (RSA FG, Austria), Christian Hirsch (RSA FG, Austria), Yukari Susaki (RSA FG, Austria), Stefan Gindl (Research Studios Austria Forschungsgese, Austria), Markus Tauber (Research Studios Austria Forschungsgese, Austria)
11:30 – 11:45	Short Paper: A Self-assessment Tool to Encourage the Uptake of Artificial Intelligence in Digital Workspaces Belal Abu Naim (Research Studios Austria Forschungsgese, Austria), Yasin Ghafourian (RSA, Austria), Markus Tauber (Research Studios Austria Forschungsgese, Austria), Fabian Lindner (HSZG, Germany), Christoph Schmittner (Austrian Institute of Technology, Austria), Erwin Schoitsch (AIT Austrian Institute of Technology, Austria), Germar Schneider, Olga Kattan, Gerald Reiner, Anna Ryabokon, Francesca Flamigni, Konstantina Karathanasopoulou, George Dimitrakopoulos
11:45 – 12:00	Short Paper: MLOps in CPS - a use-case for image recognition in changing industrial settings Pal Varga (Budapest University of Technology and Economics, Hungary), Adam Kovari, Marton Gergely Herkules, Csaba Hegedus (Budapest University of Technology and Economics, Hungary)
12:00 – 12:15	Short Paper: Extended Reality Based Education and Training for Human-Centric Industry 5.0 Skill Enhancement Thomas Moser (St. Pölten University of Applied Sciences, Austria), Josef Wolfartsberger, Sabrina Romina Sorko (FHJ, Austria), Belal Abu Naim (Research Studios Austria Forschungsgese, Austria)
12:15 – 12:30	Closing Session 1
12:30 – 14:00	Lunch time
14:00 – 14:15	Start Session 2
14:15 – 14:45	Full Paper: Co-pilots for Arrowhead-based Cyber-Physical System of Systems Engineering Csaba Hegedus (Budapest University of Technology and Economics, Hungary), Pal Varga (Budapest University of Technology and Economics, Hungary)
14:45 – 15:15	Full Paper: A Generic Framework for Resource-Limited Microcontrollers Deployment in I-IoT Systems Belal Abu Naim (Research Studios Austria Forschungsgese, Austria), Yasin Ghafourian (RSA, Austria), Anna Ryabokon, Francesca Flamigni, Ralph Baldrian
15:15 – 15:30	Closing Session 2
15:30 - 16:00	Coffee Break
16:00 – 17:00	Pannel
17:00 – 17:30	Closing

Workshop: Manage-IoT 2024

May 6, 2024 (Monday) 14:00 – 17:30,

Room : Cosmos

Time	Subject
14:00 – 14:05	Opening (Chair : Marc-Oliver Pahl)
14:05 – 14:10	1 min madness per paper Each author presents in 1 min why one should stay and listen to the paper presentation.
14:10 – 15:10	Keynote Unveiling the Next Frontier: IoT Management in the Compute Continuum Mauro Tortonese (Ph.D., Associate Professor, Dept. of Mathematics and Computer Science, University of Ferrara, Ferrara, Italy)
15:10 – 15:30	Paper Session 1 Chair : Marc-Oliver Pahl (IMT Atlantique, Rennes, France) A Machine Learning Operations Platform for Streamlined Model Serving in Industry 5.0 Lorenzo Colombi (University of Ferrara, Italy), Alessandro Gilli (University of Ferrara, Italy), Simon Dahdal (University of Ferrara, Italy), Ion Boleac (University of Ferrara, Italy), Mauro Tortonese (University of Ferrara, Italy), Cesare Stefanelli (University of Ferrara, Italy), Massimiliano Vignoli
15:30 – 16:00	Coffee Break
16:00 – 17:30	Paper Session 2 Chair : Filippo Poltronieri, (University of Ferrara) Design and Implementation of CWMP-Enabled Multipath Management Mechanism in Home Networks Wei-Zhi Huang (Telecommunication Laboratories, Chunghwa Telecom Co., Ltd., Taiwan, Province of China), Yu-En Chang, Yu-Hsiang Lin (Chunghwa Telecom Laboratories, Taiwan, Province of China), Hsin-Chieh Huang Distributed Automated Testing Framework for Bluetooth Mesh Applications Jorg Wieme (Ghent University, Belgium), Mathias Baert (Ghent University – IMEC, Belgium), Jeroen Hoebeke (Ghent University, Belgium) Time Sensitive Industrial Applications in Kubernetes Dávid Balla (Budapest University of Technology and Economics, Hungary), István Moldován (Budapest University of Technology and Economics, Hungary), Miklós Máté (Budapest University of Technology and Economics, Hungary), Markosz Maliosz (Budapest University of Technology and Economics, Hungary), Janos Harmatos (Ericsson Hungary, Hungary) eMTD: Energy-Aware Moving Target Defense for Sustainable Solar Sensor-based Smart Farms Dian Chen (Virginia Polytechnic Institute and State University, United States of America), Ing-Ray Chen (Virginia Tech, United States of America), Dong Sam Ha, Jin-Hee Cho
17:30	Closing
18:00	Welcome Reception

Workshop: IPSN 2024

May 10, 2024 (Friday) 09:00 – 17:30,

Room : Bipa

Time	Subject
09:00 – 09:15	ISPN Presentation Jaime Galán-Jiménez and Marco Polverini
09:15 – 10:30	Keynote 1: AI/ML for Networking in the Era of Programmable Data Planes: Are We There Yet? Luciano Paschoal Gaspary(Federal University of Rio Grande do Sul, Brazil)
10:30 – 11:00	Coffee Break
11:00 – 12:30	perfSONAR: Enhancing Data Collection through Adaptive Sampling Ali Mazloum (University of South Carolina, USA), Ali AlSabeH (University of South Carolina, USA), Elie Kfoury (University of South Carolina, USA), Jorge Crichigno (University of South Carolina, USA)
	Proposal and Investigation of a Distributed Learning Strategy for training of Neural Networks in Earth Observation Application Scenarios Francesco Valente (University of Rome "Sapienza", Italy), Francesco Giacinto Lavacca (University of Rome "Sapienza", Italy), Tiziana Fiori (University of Rome "Sapienza", Italy), Vincenzo Eramo (University of Rome "Sapienza", Italy)
	Adaptive Configuration with Deep Reinforcement Learning in Software-Defined Time-Sensitive Networking Mengjie Guo (Beijing University of Posts and Telecommunications, People's Republic of China), Guochu Shou (Beijing University of Posts and Telecommunications, People's Republic of China), Yaqiong Liu (Beijing University of Posts and Telecommunications, People's Republic of China), Yihong Hu (Beijing University of Posts and Telecommunications, People's Republic of China)
12:30 - 14:00	Lunch time
14:00 – 15:30	Keynote 2: Towards Efficient Network and Service Management across the Cloud Continuum José Santos (Ghent University - imec, IDLab, Belgium)
	Inferring Visibility of Internet Traffic Matrices Using eXplainable AI Cristian Zilli (Politecnico di Torino, Italy), Alessio Sacco (Politecnico di Torino, Italy), Doriana Monaco (Politecnico di Torino, Italy), Okwudilichukwu Okafor (Saint Louis University, USA), Flavio Esposito (Saint Louis University, USA), Guido Marchetto (Politecnico di Torino, Italy)
15:30 – 16:00	Coffee Break
16:00 – 17:00	Improving the Traffic Engineering of SDN networks by using Local Multi-Agent Deep Reinforcement Learning José Gómez-delaHiz (University of Extremadura, Spain), Jaime Galán-Jiménez (University of Extremadura, Spain)
	Multi-armed Bandits for Self-distributing Stateful Services across Networking Infrastructures Frederico Meletti Rappa (Instituto de Computação da Universidade Estadual de Campinas, Brazil), Roberto Rodrigues-Filho (UFSC, Brazil), Alison R. Panisson (PUCRS, Brazil), Leandro Marcolino (Lancaster University, United Kingdom), Luiz Fernando Bittencourt (UNICAMP, Brazil)
17:00 – 17:25	Panel Jorge Crichigno (University of South Carolina, USA), José Santos (Ghent University - imec, IDLab, Belgium), Francesco Giacinto Lavacca (University of Rome "Sapienza", Italy)
17:25 – 17:30	Best Paper Award and Closing Jaime Galán-Jiménez and Marco Polverini

Workshop: ANMS-TNT-QoDaNeT 2024

May 10, 2024 (Friday) 09:00 – 17:30,

Room : Acacia

Time	Subject
09:00 – 10:00	Welcome to ANMS + QoDaNet + TNT
09:15 – 10:30	<p>Technical Session 1 - ANMS</p> <p>Enabling 6G Campus Networks Intelligent Control with Digital Twin: A case study Zied Ennaceur, Mounir Bensalem, Cao Vien Phung, André Costa Drummond, Admela Jukan</p> <p>A Design and Development of Operator for Logical Kubernetes Cluster over Distributed Clouds Thanh-Nguyen Nguyen, Jangwon Lee, Younghan Kim</p> <p>Policy Compression for Low-Power Intelligent Scaling in Software-Based Network Architectures Thomas Avé, Paola Soto-Arenas, Miguel Camelo, Tom De Schepper, Kevin Mets</p>
10:30 – 11:00	Coffee Break
11:00 – 12:30	<p>Technical Session 2 - TNT</p> <p>Towards Autonomous Networks—Applying Digital Twin to 5G Xhaul Telecom Equipment Configuration Dynamic Management Chueh Pai Lee, Zheng Lei, Min Tzu Liao</p> <p>Towards a Partial Computation offloading in In-networking Computing-Assisted MEC: A Digital Twin Approach Ibrahim Aliyu, Awwal Arigi, Seungmin Ho, Tai-Won Um, Jinsul Kim</p> <p>Design of an AI-driven Network Digital Twin for advanced 5G-6G network management Amit Karamchandani, Mario Sanz, Angela Burgaleta, Luis de la Cal, Alberto Mozo, Jose Ignacio Moreno, Antonio Pastor, Diego Lopez</p> <p>DigSiNet: Using Multiple Digital Twins to Provide Rhythmic Network Consistency Sebastian Rieger, Leon-Niklas Lux, Jannik Schmitt, Martin Stiemerling</p>
12:30 – 14:00	Lunch Time
14:00 – 14:45	<p>Technical Session3 - QoDaNet</p> <p>Peaking Beyond the Best Route: An Extensive Dataset for Looking Glasses. Pascal Hennen, Poornima Mani, Anja Feldmann</p> <p>Analysis of Statistical Distribution Changes of Input Features in Network Traffic Classification Domain Lukas Jancicka, Dominik Soukup, Josef Koumar, Tomas Cejka</p>
14:45 – 15:30	Demo 1 DigSiNet: Using Multiple Digital Twins to Provide Rhythmic Network Consistency
15:30 - 16:00	Coffee Break
16:00 – 16:45	Panel Trends in Autonomous Networks Management, Network Digital Twins and Data
16:45 – 17:15	Q&A/ Discussion
17:15 – 17:30	Best Paper Award and Closing Remarks

Workshop: GAIN 2024

May 10, 2024 (Friday) 09:00 – 12:30,

Room : Cosmos

Time	Subject
09:00 – 09:05	Welcome
09:05 – 10:35	<p>Intent Assurance using LLMs guided by Intent Drift K. Dzeperoska, A. Tizghadam , A. Leon-Garcia, University of Toronto, Canada</p> <p>Utilising Generative AI for Test Data Generation - use-cases for IoT and 5G Core Signalling T. Tothfalusi, AITIA International Inc., Hungary, Z. Csiszar, P. Varga, Budapest University of Technology and Economics, Hungary</p> <p>GAN Enhanced Vertical Federated Learning System for WHAR with non-IID Data C. Lee , S. Cho, H. Park, J. Park, S. Lee, Yonsei University, South Korea</p>
10:35 – 11:00	Coffee Break
12:00 – 12:30	<p>S-Witch: Switch Configuration Assistant with LLM and Prompt Engineering E.Jeong , H. Kim, S. Nam, Pohang University of Science and Technology, South Korea), J. Yoo, J. W. Hong , POSTECH, South Korea</p> <p>Impact of Graph-to-Sequence Conversion Methods on the Accuracy of Graph Generation for Network Simulations K. Yasuda , S. Tsugawa, K. Watabe, Nagaoka University of Technology, Japan</p>
12:00 – 12:25	Community Panel
12:25 – 12:30	Wrap-up and Farewell

Exhibitions

KT, GSMA-compliant Open Gateway



KT (Korea Telecom) has been leading the development of the information and communications industry of Korea since its foundation in 1981.

KT is developing global federation with Docomo and China Mobile for QoD API. Previously, it was difficult to achieve the economy by developing services such as VOD separately due to different standards for each global carrier, but GSMA has standardized the Common NW API capable of Global Roaming to make it a Hyper-Scale Network Application Market.

KT's API services support all APIs of GSMA Open Gateway and support Federation and Aggregation between carriers.

The GSMA Open Gateway API developed by KT supports Federation and Aggregation between carriers and DevOps, which allows developers to develop APIs to commercialize.

Chunghwa Telecom, 4G/5G Network Quality Heat Map



Chunghwa Telecom (CHT) has developed a 4G/5G network quality heat map, integrated into the Customer Experience Management System (CEM). This technology can analyze the customer experience situation at different locations and times to maintain and optimize for a high-performing 4G/5G network.

The CEM transforms 10 billion pieces of communication data from all users every week into geographical grids, which are then visualized using different colors to represent the strength and quality of 4G/5G signals.

From the heat map, network managers can obtain analytical information on different indicators, frequency bands, customer groups, and scopes, allowing them to decide on the best construction locations to enhance the customer experience, and also help CHT maintain a leading position in the annual mobile network evaluation in the country.

Arista Networks, 800GE AI Networking



Arista provides the best solution for GPU and Storage interconnects driving AI/ML workloads using IP/Ethernet switches. Exponential growth in AI applications requires standardized transports to build power efficient interconnects and overcome administrative, scale-out complexities of existing approaches. Building an IP/Ethernet architecture with high-performance 400GE/800GE Arista switches maximizes the performance of the application while at the same time optimizing network operations.

As the Ultra Ethernet Consortium (UEC) completes their extensions to improve Ethernet for AI workloads, Arista is building forwards compatible products to support UEC standards as they firm up in 2025. Arista Etherlink™ is standards based Ethernet with UEC compatible features. These include dynamic load balancing, congestion control and reliable packet delivery to all NICs supporting ROCE. Arista Etherlink will be supported across a broad range of 400G and 800G systems based on EOS.

Nokia, Leap ahead to operational excellence through AI-powered Automation



Master the unexpected with scalable, secure, and adaptive networks. Nokia's operations and management portfolio is engineered to empower networks the capabilities of automation, analytics, and virtualization for efficient management and control of both traditional and cloud-based IP networks.

Nokia's Network Services Platform (NSP) seamlessly integrates automation to optimize operations, from provisioning to dynamic management. Additionally, our AI-powered IP networks portfolio enhances provisioning, assurance, security, and sustainability, ensuring robust protection against evolving threats.

Our platform is built on a foundation of security, safeguarding networks against threats from access control to threat detection. Users can experience streamlined integration and automation, improving network operations and enhancing the user experience. Advanced analytics enable data-driven decisions, with real-time monitoring and predictive analytics facilitating proactive maintenance to minimize downtime.

Nokia leads the way in creating networks that sense, think, and act, facilitating effortless scaling, uninterrupted service, and sustainable growth to meet the demands of the digital age.

INSoft Co., Ltd. , E-UM 5G Monitoring, NMS



Established in 2002, I_N SOFT is a top-tier IT expert company in South Korea that has been continuously pursuing businesses relating to system integration for platforms and cloud technology-related businesses for over 20 years.

I_N SOFT can professionally execute diverse projects in various aspects of Cloud technology such as the transition and migration to cloud systems, cloud infrastructure modernization with MSA-based solutions, cloud monitoring solution development, and Cloud PC (VDI) solution creation.

As a leading company in the cloud industry, its core Cloud solutions include Cloud Mesh (CMP), Open Manager (Monitoring), Cloud PC (VDI), and iCNP (CNP) with certificates possessed across various fields.

As a major cloud specialist company qualified with top-notch technology and personnel in domestic market, it provides the best services driven by optimal organization and personnel to customers through leveraging its experience in Cloud Native construction, networks and servers operation for solution services and cloud monitoring business.



中華電信 Chungwa Telecom

The only Telecommunications Company in Taiwan listed on the U.S. Stock Market (20th Anniversary)

Expansion of Overseas Operations to Asia, America and Europe (Coming soon)

Vietnam Viettel-CHT Joint Company, Japanese Subsidiary (15th Anniversary)

International Submarine Cables and Network Nodes (PoP) are spread all over the world, roaming in 200+ countries/regions

International Business Revenue: Tens of Billions

The complete layout of High, Medium and Low Orbit Satellite Constellation Network



Optimal Spectrum

4G/5G (sub-6GHz) Maximum Bandwidth (290MHz)

5G Maximum Continuous Bandwidth (90MHz)

The Highest Market Share

No. 1 in 5G Subscribers (more than 3.11 million)

No. 1 in Mobile Subscribers (including IoT, more than 13.13 million)

Mobile revenue accounts for 40%+ of the market

The Latest Technology

The first new C-RAN architecture in Taiwan (Save Energy Consumption, Reduce Carbon Emissions)

5G 2CA (3.5GHz+2.1GHz)

Establish Open RAN laboratories and fields

The Best Quality

No.1 in 4G/5G Network Speed, with dual certification by international authoritative authorities

The largest number of base stations, the largest capacity, and the widest coverage

Won the Speedtest championship for six consecutive years (2018-2023)

