IEEE Conference on Standards for Communications and Networking (IEEE CSCN 2026)

London, United Kingdom
7 - 9 September 2026

Workshop on AI Agent-Based Cyber-Physical Networking in Next-Generation Networks

Workshop co-Chairs:

Chair/Lead: **Dr. Lina Bariah**, Khalifa University – lina.bariah@ku.ac.ae

Co-Chair: **Dr. Onur Ayan**, Huawei Technologies Duesseldorf GmbH – onur.ayan@huawei.com

Brief description

Cyber-Physical Systems (CPS) represent the tight integration of computation, networking, and physical processes, where embedded systems monitor and control physical variables through feedback loops. In the emerging 6G era, cyber-physical applications, such as connected robotics, smart factories, autonomous ground and aerial vehicles become increasingly complex, requiring tight interaction between application and underlying network. Conventional mobile communication networks, centered on minimizing bit-error rate (BER) and network-induced delays are increasingly inadequate when it comes to maximizing performance in networked cyber-physical applications. Therefore, we are witnessing a transition toward semantic communications, where the significance and "meaning" of data for the performed physical task play a central role during the transmission of data.

Simultaneously, generative AI is emerging as a transformative force. The use of generative AI in CPS does not only improve the decision-making within the application layer, it also makes the network a more intelligent, autonomous, and flexible system. In particular, the adoption of large language models and agentic AI in next generation mobile networks, enables a shift toward intent-based service generation and customization for industrial verticals and therewith facilitates application- and flow-specific service provisioning in CPS. Moreover, the emergence of new protocols tailored for collaboration between multiple AI-capable components and devices such as the agent-2-agent (A2A) protocol and model context protocol (MCP) paves the way for tight collaboration between intelligent cyber-physical applications and intelligent cellular networks, rendering the end-to-end system a highly intelligent, autonomous, and flexible one. This workshop aims to bring together researchers from wireless communications, control systems, robotics and machine learning to explore the intersections of semantic-aware networking and AI/ML-based engineering of next generation cyber-physical networking.

Topics of Interest includes (but not limited to):

- Semantics- and task-oriented communications in cyber-physical networking,
- Age of Information (AoI) and Value of Information (VoI) for networked control,
- Time-sensitive networking in industrial wireless networks,
- Communication, and control co-design in next generation networking,
- Interoperability and protocols in multi-agent systems,
- Intent-based service provisioning for vertical applications in 6G networks,
- Collaborative robotics and swarm intelligence in wireless environments,

- Use of AI-ML-based algorithms in cyber-physical applications,
- Use of generative AI in next generation mobile communication systems,
- Autonomous Agentic AI Workflows for Network Security and Resilience,
- AI-ML-based signal processing in wireless communications,
- Beyond-connectivity services for vertical industries.

Technical Program Committee (TPC)

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Support

This Workshop is supported by the European Union's Horizon Europe MSCA-DN programme through the SCION Project under Grant Agreement No. 101072375 and the UK Research and Innovation (UKRI) under the UK government's Horizon Europe funding guarantee [grant numbers EP/X027201/1 and EP/X027244/1.

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Short bio of the co-Chairs

Dr. Lina Bariah

Dr. Lina Bariah received the Ph.D. degree in communications engineering from Khalifa University, Abu Dhabi, UAE, in 2018. She was a Visiting Researcher with the Department of Systems and Computer Engineering, Carleton University, Ottawa, ON, Canada, in 2019, and an affiliate research fellow, James Watt School of Engineering, University of Glasgow, UK. She was a Senior Researcher at the technology Innovation institute, and a Lead AI Scientist at Open Innovation AI. She is currently an Adjunct Professor and a Scientist at Khalifa University, and an Adjunct Research Professor, Western University, Canada.

Dr. Bariah serves as the Industry Chair for GenAINet ETI. Dr. Bariah is a senior member of the IEEE, IEEE Communications Society, IEEE Vehicular Technology Society, and IEEE Women in Engineering. She is the founder and lead of Women in Machine Learning and Data Science (WiMLDS)-Abu Dhabi Chapter. She was recently listed among the 100 Brilliant and Inspiring Women in 6G", by Women in 6G organization. She has authored/co-authored 80+ research papers/book chapters in highly ranked journals and flagship conferences. She is currently an Editor at IEEE Transactions on Wireless Communications.

Her research area includes Generative AI for Telecom, Large Language Models, and AI for communications.

Dr. Onur Ayan

Dr. Onur Ayan is a senior research engineer at Huawei's Heisenberg Research Center in Munich, Germany. Prior to his current role, he completed his doctoral degree at Technical University of Munich, where he has also received his Bachelor's and Master's degrees in Electrical Engineering and Information Technology. During this period, he was a visiting researcher at the department of Electrical and Computer Engineering at University of Maryland, College Park, MD, USA.

Dr. Ayan has been serving as a rapporteur within European Telecommunications Standards Institute (ETSI) Industry Specification Group (ISG) Experiential Networked Intelligence (ENI) and leading multiple work items that focus on AI agent-based mobile communication systems, protocols and frameworks for multi-agent systems, and agent-to-agent interface- and protocol specification.

His research interests include agent-based architecture for next generation mobile networks, applications of generative AI in telecommunications, networked cyber-physical systems, and semantics- and task-oriented communications for networked control systems.