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Special Session
End-to-end slicing and data-driven automation of next generation cellular networks with mobile edge clouds (SEMANTIC)

Organizing Project	SEMANTIC (https://www.semantic2020.eu/)
Structure	5 h, 1 Keynote speaker, 16 talks (x 15 minutes)
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Background and Motivation

Beyond 5G mobile data networks will be flexible and adaptive ICT ecosystems, capable of allocating resources and creating services on-the-fly to support various vertical stakeholders and guarantee their diverse performance requirements. Research and innovation actions targeting to the development of Beyond 5G enabling technologies have set ambitious societal, business and performance objectives, using measurable Key Performance Indicators (KPIs) that should be met under specific use cases spanning the manufacturing, automotive, media, energy, e-health, public safety and smart city industries. However, given the diverse set of services to which leading 5G industries target at supporting (e.g. vehicle-to-everything (V2X), extended reality, critical medical applications), the current version of the 5G NR can only be considered as an early step towards meeting the ambitious objectives set for the IMT-2020 radio interface by the International Telecommunication Union - Radiocommunication (ITU-R) and 5GPPP. Resourceful support of the thriving range of new and diverse services under the 5G ecosystem dictates abstraction and cloudification of the heterogeneous network and information technology (IT) resources and functions (i.e., radio, computation, storage) via the means of virtualization and softwarization, as well as their dynamic placement and chaining at the network edge, depending on the performance target. Dynamic pooling of edge network resources using mobile edge computing (MEC) in particular, combined with the potential for migrating core network functions to the edge using network function virtualization (NFV), is key enabler for reduced service creation times, massive edge network connectivity, multi-access and multi-service support in 5G. Although a handful of technical reports, (e.g. by 3GPP SA1 SMARTER, or by ETSI MEC) and relevant projects exist in the area (e.g. 5G-PICTURE), smooth integration of MEC capabilities in the 5G network is still in its early development phase4 and considerable effort should be put to guarantee high service availability, uninterrupted data delivery and flexible resource utilization over joint MEC/5G Radio Access Network (RAN) infrastructures.

Adding to the need for converged MEC / RAN, another key challenge for 5G is to create, on demand and in a programmable fashion, logical and isolated pipes by chaining together the necessary resources and virtual

network functions (VNFs) into network slices for the dynamic provisioning of diverse services. Network slicing is the backbone of 5G, however, given the rich set of capabilities offered by 5G NR and other key 5G technologies, the potential of network slicing cannot be fully harnessed without the appropriate algorithmic innovations and data-driven network automation that will permit e2e modeling, dynamic placement, chaining and optimization of the various 5G service components. This special session will encompass top-notch research papers towards the development and experimental evaluation of a gamut of techniques, methodological frameworks and tools that will fully leverage the exciting new capabilities offered by the 5G NR (including multi-GHz communications) and will set the foundations for the integration of the disruptive new technologies of MEC, e2e network slicing and Integrated Access Backhaul (IAB), data-driven control and automation, into the baseline operation of Beyond 5G networks.

Topics of Interest

This special session aims at bringing together scientists and practitioners to discuss the opportunities, challenges and design of beyond 5G NR techniques, MEC/RAN integration, network slicing in joint MEC/RAN infrastructures and data-driven network automation, with focus on, but not limited to:

- *Future-proof 5G NR and Beyond transmission techniques*
- *Multi-GHz spectrum utilization mechanisms*
- *Mechanisms and protocols for smooth coexistence of 5G NR with other mmWave systems*
- *Beam management techniques*
- *Adaptive duplexing techniques*
- *Massive / distributed Multiple Input Multiple Output (MIMO) techniques*
- *Signal Processing techniques, mathematical models and HW design for 5G NR operation in multi-GHz bands*
- *Architectural and functional frameworks for the integration of MEC services into beyond 5G networks*
- *Service Function Chaining and NFV mechanisms*
- *Model-based optimization and service provisioning in joint MEC/RAN clusters*
- *Methodological frameworks and tools for MEC service continuity and mobility*
- *Enriched MEC services for flexible resource utilization and massive edge connectivity*
- *Forward-thinking strategies for flexible modelling, creation and optimization of dynamic e2e slices over joint MEC/RAN infrastructures*
- *E2e modelling, optimization and orchestration enabling integrated access and backhaul (IAB) in beyond 5G networks*
- *Resource slicing and traffic steering for next generation cellular networks*
- *Data-driven network control and automation towards fast acceleration and joint optimization of critical network tasks*
- *Experimental assessment/network automation platforms and mechanisms*
- *Data-driven inter-slice control and service function chaining*
- *Algorithmic innovations for programmability and automation for beyond 5G NR*
- *Automated network service placement and functional chaining in MEC/RAN*
- *inter-slice management and network-wide resource orchestration*
- *Experimental platforms and testbeds for beyond 5G network service provisioning*