Editorial for the Special Issue “Next Generation Softwarised Wireless Networks” published in IEEE VEHICULAR TECHNOLOGY MAGAZINE | DECEMBER 2018.
DOI: 10.1109/MVT.2018.2871019

Next Generation Softwarised Wireless Networks

Fifth Generation (5G) systems are being designed not only to face the unprecedented growth of mobile data traffic forecasted for the coming years, but also to support other multiple and diverse use cases associated with new market segments and vertical industries (e.g., connected cars, smart cities, e-health, smart factories). Hence, 5G systems are envisioned to become flexible and versatile network infrastructures that can be leveraged through a wide range of service delivery models (e.g., neutral network hosting, network as a service, private networks) and that operators can customize for different applications and customer needs using network slicing.

In this context, the necessary improvements in terms of network management automation and higher flexibility in scaling/upgrading network resources and services are gradually being confronted via a progressive *softwarisation* of the wireless network, which is being transformed into a more IT centric architecture using technologies such as network functions virtualization (NFV) and software-defined networking (SDN). Together with the improved network automation and flexibility, NFV/SDN technologies are also expected to lower both network equipment costs and operational expenses. Indeed, the adoption of NFV/SDN architectural frameworks and technologies enables the creation of more intelligent networks that are open, programmable and application aware.

This special issue provides a number of interesting insights, results and research perspectives in the emerging area of next generation softwarized wireless networks. The issue has four articles with complementary views on the topic.

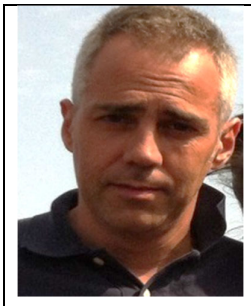
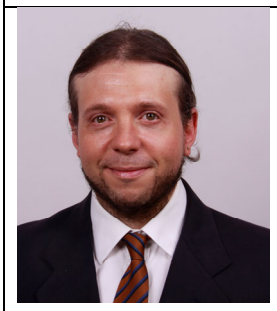
The first article, “*Enabling Network Applications for Multi-Service Programmability in a Disaggregated RAN*” by Chia-Yu Chang and Navid Nikaein, presents an architecture for the Radio Access Network (RAN) part of a 5G system that enables a flexible customization of slices on top of it. Relying on a two-level abstraction concept, the authors introduce a runtime architecture and Software Development Kit (SDK) for the development and chaining of RAN shared/dedicated control applications for multi-sliced RAN scenarios. A prototype implementation of the proposed approach demonstrates how slicing and programmability of the RAN can be achieved in two representative use-cases.

The second article, “*Spectrum Management Application for Virtualized Wireless Vehicular Networks*” by Adrian Kliks, Paweł Kryszkiewicz, Łukasz Kułacz, Karol Kowalik, Michał Kołodziejski, Heikki Kokkinen, Jaakko Ojaniemi and Arto Kivinen deals with the challenges of spectrum management in virtualized networks through the support of dynamic, yet policy-compliant allocation of spectrum. Through measurements in an experimental setup, the authors show that spectrum can be controlled in a fully automated and software-based manner for better spectrum utilization without causing harmful interference to systems that require full quality protection.

In the next article by Nhu-Ngoc Dao, Umar Sa’ad, Viet Cuong Vu, Quang Dieu Tran, Eun-Seok Ryu and Sungrae Cho, titled “*Enabling Softwarized Device-to-Infrastructure for Fifth-Generation Mobile Virtual Networks*”, an approach is proposed to provide alternative wireless access methods to Mobile Virtual Network Operators (MVNOs) so that they can minimize their dependency on the hosting mobile networks. The solution leverages softwarization technologies to provide selective multipath device-to-infrastructure (D2I) connections and different service configurations. The feasibility and performance of the proposed approach is validated through three experimental scenarios.

In the last article, "*HSVF: Hierarchical SDN-based Wireless Vehicular Fog Architecture; Case Study: Scheduling of Electric Vehicles Energy Demands*", Djabir Abdeldjalil Chekired, Mohammed Amine Togou and Lyes Khoukhi explore the applicability of SDN, cloud and fog computing technologies in vehicular networks for improved network management and QoS performance. An architecture is presented that consists of decentralized SDN controllers deployed over distributed fog cells and a centralized SDN controller implemented within a cloud data center. The authors evaluate the proposed architecture in a case study that addresses the scheduling of the energy demands requested by electric vehicles.

Guest Editors' Biographies

	**Ramon Ferrús** (ramon.ferrus@upc.edu) received the Ph.D. degree on Telecommunications Engineering in 2000 and currently serves as a tenured Associate Professor in the Department of Signal Theory and Communications at the Universitat Politècnica de Catalunya (UPC) in Barcelona, Spain. His research interests include system design, functional architectures, protocols, resource optimization and network and service management in wireless communications. He has participated in numerous national and European Commission funded research projects as well as in technology transfer projects for public and private companies. He is co-author of two books on mobile communications and over 130 papers in peer-reviewed journals and conference proceedings.
	**Vuk Marojevic** (vuk.marojevic@msstate.edu) graduated from the University of Hannover (M.S.), Germany, and UPC (Ph.D.), both in electrical engineering. He is Associate Professor in Electrical and Computer Engineering at Mississippi State University. Prior to joining Mississippi State University in 2018 he was with Wireless@Virginia Tech, where he built and managed Virginia Tech's LTE and cognitive radio testbeds. His research interests are in resource management, V2X, physical layer security, spectrum sharing, software radios, and wireless network virtualization with application to commercial cellular communications, mission-critical networks, and unmanned aircraft systems.
	**Leonardo Goratti** (Leonardo.Goratti@zii.aero) received his PhD degree from the University of Oulu (Finland) and his MSc from the University of Firenze (Italy). Currently, he is with Zodiac Inflight Innovations (Germany) as a Senior System Engineer. Before, he was with the Fondazione Bruno Kessler in Trento (Italy) and with the European Joint Research Center of Ispra (Italy). Dr. Goratti's research interests span across SDN and NFV for 5G mobile network technology, 4G and millimeter wave communications. Dr. Goratti is an expert in Medium Access Control theory, device-to-device and machine-type communications, as well as in spectrum management techniques. Dr. Goratti authored more than 70 research papers in IEEE journals and conferences.