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5G-enabled heterogeneous vehicular networks: Radio and network resources management

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The heterogeneous structure of the future fifth generation (5G) wireless communications systems with their heterogeneous service requirements revolutionize the research directions to meet the urgent standardization and commercialization of the 5G for 2020 and beyond. One of the significant research challenges in the 5G systems is the emergence of the tactile internet in which ultra-reliable and ultra-responsive real time haptic communications must be enabled by the 5G to deliver a real-time control and physical tactile experiences remotely. The Tactile Internet will provide a true paradigm shift from content-delivery to skill-set delivery networks, and thereby revolutionize almost every segment of the society. There are many technologies for enabling the 5G to meet one or more of the service requirements, but there is not a single technology that can span all the urgent service requirements for the ubiquitous and haptic network connectivity. To tackle this challenge, a flexible and scalable design of the network architecture must be implemented. Network Slicing (NS), which is implemented by Software-Defined Networking (SDN)/Network Functions Virtualization (NFV), enables flexible/abstracted architecture based on radio-aware SDN/NFV slicing in the networking domain and network-aware Radio Resource Management (RRM) in the wireless domain. One of the promising 5G-enabled wireless networking technologies is so called Heterogeneous Vehicular Networks (HetVNets), which enables an Intelligent Transport System (ITS) to meet the urgent heterogeneous vehicular services, both of tactile (e.g. autonomous driving and safety applications) and non-tactile (e.g. infotainment and non-safety applications) vehicular services. The main critical service requirements, for tactile vehicular applications, are the ultra-high reliability [i.e. the Bit Error Rate (BER)≤10-9] and ultra-low latency [i.e. the Round Trip delay Time (RTT≤10-3 s)] of the End-to-End (E2E) vehicular network connectivity. Many enabling technologies and techniques are recently proposed to tackle the main research challenges of the tactile internet and support its applications. In this speech, I will focus on one of the significant enabling technologies for the tactile applications of the future HetVNets, which is the virtualized Radio and Network Resources Management (vRNRM). In the vRNRM, the end-to-end radio and network resources (communication resources, computing resources, and storage resources) will be virtualized and efficiently sliced to meet the requirements of the heterogeneous vehicular applications, i.e. safety and non-safety wireless applications.

Biography

Najib Abdo Nasser Odhah received BSc, MSc, and PhD from Faculty of Electronic Engineering, Menoufia University, Egypt, in 2002, 2009 and 2013, respectively. From 2013 to 2015, he was an Assistant Professor in Electrical Communication department, Engineering Faculty at Ibb University, Yemen. He is currently working as Postdoc at Institute of High Performance (IHP) Microelectronics, Frankfurt (Oder), Germany. His research areas of interest include wireless communications, signal processing techniques for wireless communications, multiple antennas techniques for wireless communications, Multiple-Input Multiple-Output (MIMO) techniques (traditional, cooperative, and massive), power allocation algorithms for Orthogonal Frequency Division Multiplexing (OFDM) systems (traditional and cognitive), Radio Resource Management (RRM) for wireless communications, digital signal processing, digital communications, Interference Cancellation and Interference Coordination (ICIC) techniques, channel estimation and equalization, game theory based optimization techniques for future 5G wireless communication systems, Machine-to-Machine (M2M) communications, Device-to-Device (D2D) communications, and green wireless communications.

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