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Network optimization in 5G

Abstract: The next generation (called 5G) communication systems will most likely not be an incremental advance on contemporary communication systems. They are expected to be extremely dense and heterogeneous, which introduces many new challenges for network optimization and management. It is under discussion whether the 5G networks will further enhance peak data rates or focus will be on area-wise spectral and energy efficiency. In general, it is expected that 5G innovations will enhance new services and enrich our societies beyond what we experience today. However, the largest technology challenge would be to enable customer-centric technologies that takes into consideration customer's quality of experience.

The next-generation networks should target to enrich a customer experience by providing broadband multimedia content (a thousand-fold increase in network capacity) and the connectivity for mass (billions) of devices. Because of this it is expected that the 5G network requirements will require more advanced self-organization and self-optimization (Self-X) capabilities. This is mainly because the current concepts may not be flexible enough and sufficient to support such complex deployments and ultra-high performance requirements. This is even more challenging when we consider that services may (and most probably will) have different performance requirements (e.g. latency, bandwidth, etc.). Hence, in 5G networks, a customer (and service) management may be an integral part of the network optimization process.

The today's requirements from the mobile customer perspective are known. They expect to be "connected" all the time through different devices. They expect to have access to broadband services from indoor (home, office, shopping mall) or outdoors. Today, mobile data traffic growths tenfold mainly from either indoor users and it is clear that contemporary communication systems may not support this trend. Studies have shown that more than 50 percent of voice and 70 percent of all data traffic originates from indoor users. This sets a challenging requirement on the 5G technologies to provide both target data rates per area and seamless customer experience with respect to network, device and service. Future network's Self-X must be able to provide high quality of customer experience across the network by maintaining a seamless connectivity and the connection quality irrespective of location and/or interference from other sources. This is not the case today. In this presentation we give an overview of the technical and business requirements for customer-centric Self-X network. We point out the issues that may arise with respect to their optimization and management challenges. With this in mind we also describe the technical challenges and give some ideas of possible directions. Finally, unlike today, new technologies must be able to utilize service information and thus, optimize both the network and the service quality per customer.

Biography: Haris Gačanin received his Dipl.-Ing. degree in Electrical engineering from the Faculty of Electrical Engineering, University of Sarajevo in 2000. He received his M.E.E. and Ph.D.E.E. from Graduate School of Electrical Engineering, Tohoku University, Japan, in 2005 and 2008, respectively. Since April 2008 until May 2010 he has been working first as

Japan Society for Promotion of Science (JSPS) postdoctoral research fellow and then as an Assistant Professor at Graduate School of Engineering, Tohoku University. In June 2010 he joined Alcatel-Lucent Bell in Antwerp, Belgium.

His professional interest is to develop, lead and motivate the activities of real and virtual multinational research and development teams with strong emphasis on product/solution development through applied research projects. Advanced signal processing and algorithms with focus on mobile/wireless and wireline physical (L1) and media access (L2) layer technologies and network architectures. In particular, in-house broadband technology, L1/L2 management/diagnostics, wireless network coding, channel estimation and equalization, cognitive radio, MIMO, wireless sensor networks, dynamic resource allocation, iterative receivers, channel coding and hybrid ARQ, peak-to-average power reduction, cooperative relaying, communication theory, xDSL and gigabit PON identification. In these areas he has published 100 scientific publications (journals, conferences and patent applications).

He is senior member of The Institute of Electrical and Electronics Engineers (IEEE) and The Institute of Electronics, Information and Communication Engineering (IEICE). Currently, he is a chair of IEICE Europe Section. He was acting as a chair, review and technical program committee member of various technical journals and conferences. He is a recipient of the 2010 KDDI Foundation Research Grant Award, the 2008 Japan Society for Promotion of Science (JSPS) Postdoctoral Fellowships for Foreign Researchers, the 2005 Active Research Award in Radio Communications, 2005 Vehicular Technology Conference (VTC 2005-Fall) Student Paper Award from IEEE VTS Japan Chapter and the 2004 Institute of IEICE Society Young Researcher Award. He was awarded by Japanese Government (MEXT) Research Scholarship in 2002.