

White paper submission to Future Wireless Cities Workshop –
Nada Golmie
NIST

Future Wireless Cities are likely to witness massive capacity enhancements (upwards of 3 orders of magnitude), connectivity for billions of users and machines, and an increasingly diverse set of services and applications. However before this vision is realized, novel network architectures, communication systems and protocols are needed to support additional bandwidth and greater temporal, spectral, coding and spatial resource efficiency. To this end the following research avenues are promising to explore.

First, new radio access architectures are needed where logical and physical separation is provided between the control and data planes for optimal spectrum and energy efficiencies. Second, in order to meet the fast changing demands on network resources and operation and achieve greater resource efficiency, network and infrastructure may need to be shared on all levels. Thus cooperative spectrum sharing techniques can be deployed in non-homogeneous bands, while innovative cooperation and coordination schemes can be applied to network nodes, in a flexible heterogeneous network deployment, including wireless network coding systems applied to dense, cloud-like, massively-interacting networks of nodes. Third, smart antenna adaptability should be explored where an integrated approach is taken to effectively optimize performance by considering the interactions with the users and appropriately sensing the physical environment.

In its future generation wireless program, NIST's Communications Technology Laboratory, is currently considering three enabling technologies, namely, **millimeter-wave**, **massive MIMO technology**, and **ultra-dense networks**. NIST is tackling several areas that are important to wireless system designers and standards organizations, including, channel propagation measurements and models, network and communication protocol simulations and, optimized synchronization and management algorithms.

Short Bio for Nada Golmie

Nada Golmie is currently the chief of the wireless networks division in the Communications Technology Laboratory at NIST. She conducts research in device-to-device communications and ultra-dense network deployments and represents NIST in next generation wireless communications standard development organizations such as 3GPP and IEEE 802. She is the co-chair for the 5G mmWave Channel Model Alliance promoting the development of channel propagation measurement and modeling techniques. She participates in the Interagency NITRD/Wireless Spectrum Research and Development Committee and serves as the technical lead for the modeling and performance analysis of LTE in support of public safety communications. From 2009 to 2014 she was the lead for the Smart Grid Interoperability Panel, Priority Action Plan 2 on wireless communications and oversaw the development of a wide array of requirements for smart grid and cyberphysical system applications. Her research in media access control and protocols for wireless networks led to over 100 technical papers presented at professional conferences, journals, and contributed to international standard organizations and industry led consortia. She is the author of "Coexistence in Wireless Networks: Challenges and System-level Solutions in the Unlicensed Bands," published by Cambridge University Press (2006).