

Future Cities Workshop - White Paper

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Brief Background: Currently, I serve as one of the PIs for the NetHealth study, a study instrumenting five hundred smartphone users coupled with Fitbit Charge HR devices for study sociological / technical interplays of always-on networking. I also serve on the Executive Committee of the Wireless Institute at Notre Dame and am the faculty representative to the NDXG stadium effort exploring next-generation wireless services for the Campus Crossroads project, a \$400M renovation of the ND football stadium.

Research Directions / Comments

The interplay of how existing technologies of today (LTE, small cells, WiFi) and next generation technologies (mmWave) will play together is a fascinating subject, particularly with regards to high capacity / ultra-dense venues. In particular, the notion of moving away from fixed paths / traditional IP routing into on-demand / more fluid routing as afforded with such technologies is a key question to explore. The extent to which the devices and network should be fluid (ex. SDN), the wireless interfaces need to be fluid (ex. SDR), and where various assistive resources need to be located (at the edge, ex. Fog Computing) create tremendous opportunities for researchers in these networks.

For my part, I am interested in the interplay of content distribution and said next-generation networks as it relates to Quality of Experience, particularly as it relates to mmWave in ultra-dense venues. While mmWave affords incredible bursts of capacity, understanding the dynamics when / if mmWave arrives at the handset is incredibly interesting. Notably, line of sight (LoS) issues and propagation effects will necessitate active collaboration of mobile devices, the question is to the extent that such active collaboration will be a net capacity, energy, or QoE win remains to be seen.

Testbed Needs

From a testbed perspective, while I am perhaps slightly biased, there is a tremendous need to instrument high capacity venues to better understand the interplay of how WiFi, cellular, and mmWave might work together. Various efforts underway have made significant headway (ex. Levi's stadium, Falcons stadium, Texas A&M) but user experience at such venues still conveys that significant improvements are needed. Interesting, such venues are almost cities unto themselves on game day. Hence, the instrumentation of said venues could offer intriguing insight of use to the community.