

White Paper for Future Wireless Cities Workshop

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New research directions: Future smart cities are expected to be blanketed with multiple, heterogeneous wireless networks. We believe the deployment of these diverse types of wireless networks will give rise to new services that go beyond communications. Examples of new services include:

- *Localization as a service.* There has been considerable research in understanding how to utilize wireless infrastructure to perform localization tasks, as well as in designing new applications to take advantage of this feature. With multiple types of wireless infrastructure deployed in a Smart City, we envision this new service to provide different forms of localization for different applications.
- *Security as a service.* Physical layer security utilizes distortions to the radio signals to perform security tasks such as key establishment, pairing, and so on. Given the large number of computational devices in a Smart City, the conventional approach of using certificates is not scalable. We anticipate an expansion of physical layer security to take advantage of the wireless infrastructure in a Smart City to provide security services like re-keying, location verification, etc.
- *Sensing as a service.* The coverage of wireless infrastructure, such as access points throughout a City, makes this infrastructure hardware ideal for sensing tasks, e.g. detecting Bluetooth beacons to infer traffic. We predict that new applications will arise to take advantage of the passive sensing capabilities in a Smart City.

These applications will require discovering and addressing new challenges, as well as the re-thinking of establishing metrics. For example, the usual measures of quality-of-service in wireless networks such as throughput, jitter, and so on, are not immediately applicable to such services. We also envision an even closer convergence of the design of mobile/cloud systems and design of wireless algorithms and standards to realize these new services.

Test bed infrastructure requirements: An urgent requirement for our community, in our view, is the design and deployment of outdoor wireless test beds. Most existing wireless test beds are deployed indoor, e.g. placing access points in a controlled grid fashion. Consequently, results from indoor test beds may not translate accurately to real world uses. Outdoor test beds in different environments, e.g. urban, downtown, suburbs, etc. will be immensely useful in for Wireless Smart City research.

Biography: Jie Wu is the Associate Vice Provost for International Affairs at Temple University. He also serves as the Chair and Laura H. Carnell professor in the Department of Computer and Information Sciences. His current research interests include mobile computing and wireless networks, routing protocols, cloud and green computing, network trust and security, and social network applications. He was an IEEE Computer Society Distinguished Visitor, ACM Distinguished Speaker, and chair for the IEEE Technical Committee on Distributed Processing (TCDP). Dr. Wu is a CCF Distinguished Speaker and a Fellow of the IEEE. He is the recipient of the 2011 China Computer Federation (CCF) Overseas Outstanding Achievement Award.