

ORBIT 10 Years Later

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Abstract: In this talk we will cover 10 years of "Open Access Research Testbed for Next-Generation Wireless Networks" (ORBIT) - one of the first publicly accessible academic wireless testbeds that consists of an indoor radio grid emulator for controlled experimentation and an outdoor field trial network for end-user evaluations in real-world settings. We will start with the description of the testbed system architecture including an identification of key hardware and software components: the open-access radio node that runs experimenters code, the system-level controllers that handle management and control of the testbed, and the process of specifying and running experiments. We will also discuss the motivation and design of a number of ORBIT testbed extensions, introduced since initial testbed release in 2005 with the special emphasis on the current ORBIT testbed extensions supporting research and experimentation with cloud RAN and massive MIMO. The first part of the talk will conclude with a brief introduction of the ORBIT inspired wireless deployment that is part of Global Environment for Network Innovation (GENI), the National Science Foundation's effort to build a national at scale facility that will support research on future designs and architectures for future global communications networks. Second part of the talk will focus on MobilityFirst network architecture, which is a clean-slate project being conducted as part of the NSF Future Internet Architecture (FIA) program. The novel architecture is intended to directly address the challenges of wireless access and mobility at scale, while also providing new services needed for emerging mobile Internet application scenarios. A number of key wireless access network requirements including user/network mobility, varying wireless link quality and disconnection, multi-homing, ad hoc networking, flexible autonomous system boundaries and spectrum coordination are identified along with a brief discussion of the implications for protocol design. In addition to describing key concepts of protocol design, we will also summarize the MobilityFirst proof-of-concept protocol stack implementation on core routers as well as end-user devices and a real-time evaluation on the ORBIT testbed and the GENI meso-scale networking testbed. The talk concludes with a brief discussion of SND/SDR opportunities and challenges that these new FIA architectures introduce.

Bio: Ivan Seskar is Associate Director at WINLAB, Rutgers University responsible for experimental systems and prototyping projects. Mr. Seskar is currently PI for two NSF GENI projects - the “meso-scale” Open-Flow virtual network deployment at Rutgers University and the Open WiMAX/LTE base station project which resulted in campus deployments at several US universities as well as the PI of an ongoing NSF CRI project aimed at deployment of a wideband cognitive radio platform (“WiSER”). He is also co-PI for the NSF-supported ORBIT project at WINLAB and has led technology development and operations activities since the testbed was released as a community resource in 2005 and for which the team received 2008 NSF Alexander Schwarzkopf Prize for Technological Innovation. His technical interests include experimental protocol evaluation, radio technology, software defined and cognitive radios, vehicular networking and wireless systems in general. Ivan is a Senior Member of the IEEE, member of ACM and co-founder and CTO of Upside Wireless Inc.

About the lab: WINLAB (Wireless Information Network Laboratory), an industry-university cooperative research center focused on wireless technology, was founded at New Jersey’s [Rutgers University](#) in 1989. Its research mission is to advance the development of wireless networking technology by combining the resources of government, industry and academia. The center’s educational mission is to train the next generation of wireless technologists via graduate research programs that are especially relevant to industry.

WINLAB has enjoyed considerable success in achieving these goals. The center has completed over 20 years of research on wireless data networks, and has made a number of important technical contributions to mobile computing, high speed modem design, radio resource management, and network architectures and protocols. In fulfillment of its educational aims, to date WINLAB has also produced approximately 125 MS and PhD graduates specializing in wireless technology. These graduates are playing a key role within leading wireless technology and service companies as they work toward the center’s vision of deploying the Mobile Internet.

Since its inception, WINLAB has been supported by a broad cross section of leading wireless industry sponsors, including several major wireless equipment vendors, chip manufacturers and service providers based in the United States, Europe and Japan. The center has also received grants from the National Science Foundation (NSF), the Defense Advanced Research Projects Agency (DARPA) and the New Jersey Commission on Science and Technology (NJCST). Since 2003, WINLAB has been home to the "ORBIT" Next-Generation Wireless Testbed sponsored by NSF's Network Research Testbeds (NRT) program, thus serving as a hub for experimental wireless networking research for the community as a whole. In 2010, a WINLAB-led team was awarded a \$7.6M "Future Internet Architecture" (FIA) grant from NSF to design, prototype and validate a comprehensive mobility-centric future Internet architecture called "MobilityFirst". WINLAB faculty have also been awarded numerous research grants from NSF, DARPA, ARL (Army Research Laboratory), NRL (Naval Research Lab) and other agencies on topics ranging from energy efficient radio system and dynamic spectrum access to mobile content delivery and information security/privacy.