Addressing the Emerging Wireless Bandwidth Crisis and the Need for Power-Efficient Bandwidth: Prospects for mm-Wave Radio Technology

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Abstract

In recent years, demand for wireless bandwidth has been growing rapidly; this demand has been driven by worldwide growth in access to mobile devices, the increasing capabilities of newer mobile devices (e.g., the rapid emergence of "smart phones"), and by the increasing data size of media-rich applications (such as high-definition video). In fact, a recent study has predicted that by 2015, the demand for wireless bandwidth will increase to twenty-six times that of today. However, the ability of wireless networks to handle even contemporary traffic is becoming problematic, with network overloading becoming a growing and widening problem; if data traffic increases by even a fraction of projections, wireless networks (as presently constructed) will be completely unable to cope with demand; this problem afflicts both the situation at the mobile device, and the situation in backhaul. In addition, according to Shannon Information Theory, there is no limit to the ability to increase wireless bandwidth; however, this is only possible via a corresponding increase in the power consumption - something that is unacceptable in mobile electronic devices. New thinking and new directions are needed.

This presentation will review the current state of mm-wave radio technology as a vehicle for addressing this incipient bandwidth crisis. The main promise of mm-wave radio is that it offers a route to power-efficient bandwidth - that is, the ability to greatly increase the available data rates without increasing the power consumption. To deliver successful mm-wave radio technology for general use, a number of multifaceted challenges will need to be overcome; these range all the way from basic integrated circuit design up to network design and network management. A complete effort on all of these challenges is necessary for successful commercial deployment of high-bandwidth, low power mm-wave networks.

Short Biography of the Presenter

Dr. Daniel Foty has some two decades of engineering and management experience in the mainstream of the technology industry – specifically in integrated circuits and wireless communications. He is the President of his own consulting firm, Gilgamesh Associates, LLC, which works in very demanding areas of design and development – such as signal processing, wired/wireless communications, and ultra-low-power design. A serial entrepreneur, he is currently beginning to co-organize a new start-up company (Sarissa Radio, Inc., where he presently serves as Chief Technical Officer (CTO)) for the development of new technologies for ubiquitous ultra-high-speed, low-power, low-cost wireless interconnectivity.

Dr. Foty is also an Adjunct Professor of Electrical Engineering at the Georgia Institute of Technology ("Georgia Tech"), and has served as an external graduate thesis examiner/advisor with the Tallinn University of Technology (Estonia), the University of Pretoria (South Africa), and the Tshwane University of Technology (South Africa). He is the author of the best-selling book, MOSFET Modelling with SPICE: Principles and Practice, which was published in 1997 by Prentice-Hall and is now in its third printing; a Vietnamese language edition was published in early 2006. In addition, he has authored or co-authored some 100 journal articles and conference presentations, and is a frequent plenary/keynote speaker at major international conferences throughout the world.

Dr. Foty holds the B.S. degrees in Physics and Chemistry from Bates College, the M.S. degree in Electrical Engineering from the University of Illinois, and the Ph.D. degree in Materials Science from the University of Vermont.