

Research Challenges in 5G Cellular Systems

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ABSTRACT

In order to meet the ever-growing need for wireless data and services, 5G cellular systems are advocating fundamental advances in both utilizing the radio access spectrum efficiently and providing efficient data and service delivery through new system architectures. A wide spectrum of advanced communication techniques comprising, among others, carrier aggregation, advanced MIMO, cooperative communication, or self-organizing networks, are currently being investigated and standardized. However, historic data regarding capacity improvements in wireless networks show that the largest gains ever obtained come mainly from the use of smaller cells. These can provide more than three orders of magnitude increase in network capacity. For this reason, the paradigm of Heterogeneous Cellular Networks (HetNet), comprised of a macrocell network underlaid by one or several tiers of small cells, has become a key element in the envisioned future cellular system of every wireless carrier across the world. A tremendous activity on small cells has been conducted in recent years by standardization bodies including 3GPP, 3GPP2 and the WiMAX forum. Similarly, world-wide academic research and industry efforts, which include leading service providers and equipment manufacturers, have embraced small-cell technology as a key element for future wireless cellular systems. Although in order to fully exploit the potential of this technology, a number of technical challenges still need to be solved, a varied range of small cell solutions for cellular systems have already been adopted and deployed.

Biography of the Speaker

I. F. AKYILDIZ received his BS, MS, and PhD degrees in Computer Engineering from the University of Erlangen-Nuernberg, Germany, in 1978, 1981 and 1984, respectively. Currently, he is the Ken Byers Chair Professor with the School of Electrical and Computer Engineering, Georgia Institute of Technology, Director of the Broadband Wireless Networking Laboratory and Chair of the Telecommunications Group. He is an Honorary Professor with School of Electrical Engineering at the Universitat Politecnica de Catalunya, and Director of N3Cat (NaNoNetworking Center in Catalunya) in Barcelona, Spain, since June 2008. Dr. Akyildiz is a Consulting Chair Professor (HCI: Highly Cited Professor) with King Abdulaziz University, Jeddah, Saudi Arabia since October 2011. Dr. Akyildiz is also the Finnish Distinguished Professor with Tampere University of Technology, Tampere, Finland since January 2013.

He is the Editor-in-Chief of Computer Networks (Elsevier) Journal since 2000, the founding Editor-in-Chiefs of the Ad Hoc Networks Journal (2003), Physical Communication (PHYCOM) Journal (2008), and Nano Communication Networks (NANOCOMNET) Journal (2010) all published by Elsevier.

Dr. Akyildiz is an IEEE FELLOW (1996) and an ACM FELLOW (1997). He received the 1997 IEEE Leonard G. Abraham Prize award and the 2003 Best Tutorial Paper Award and the Best Paper Awards at IEEE ICC, June 2009 and IEEE Globecom 2010 conferences (all IEEE Communications Society).

He received the "Don Federico Santa Maria Medal" for his services to the Universidad of Federico Santa Maria in Chile in 1986. He served as a National Lecturer for ACM from 1989 until 1998 and received the ACM Outstanding Distinguished Lecturer Award for 1994. Dr. Akyildiz received the 2002 IEEE Harry M. Goode Memorial award (IEEE Computer Society) and the 2003 ACM SIGMOBILE Outstanding Contribution Award for his "pioneering contributions in the area of mobility and resource management for wireless communication networks".

Dr. Akyildiz received the 2004 Georgia Tech Faculty Research Author Award for his "outstanding record of publications of papers between 1999-2003". He also received the 2005 Distinguished Faculty Achievement Award from School of ECE, Georgia Tech, and the Georgia Tech Outstanding Doctoral Thesis Advisor Award for his 20+ years service and dedication to Georgia Tech and producing outstanding PhD students. He also received the 2009 ECE Distinguished Mentor Award by the Georgia Tech School of Electrical and Computer Engineering Faculty Honors Committee.

Dr. Akyildiz received the 2010 IEEE Communications Society Ad Hoc and Sensor Networks Technical Committee (AHSN TC) Technical Recognition Award with the citation: "For pioneering contributions to wireless sensor networks and wireless mesh networks", in December 2010. He received the 2011 IEEE Computer Society W. Wallace McDowell Award for pioneering contributions to wireless sensor network architectures and communication protocols and the 2011 TUBITAK (Turkish National Science Foundation) Exclusive Award for outstanding contributions to the advancement of scholarship/research at international level.

He is the author of two textbooks on "Wireless Sensor Networks" and on "Wireless Mesh Networks" published by John Wiley & Sons in 2010 and 2007, respectively. Due to Google scholar, his papers received over 69+K citations and his h-index is 87 as of March 2015.

His current research interests are in Next Generation Cellular Systems, Nanonetworks, Cognitive Radio Networks and Wireless Sensor Networks.

NOTE: This keynote is based on the paper:

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