Past, Present and Future of IEEE 802.11 Toward Wireless Gigabit Experience

Abstract: A long time has passed since IEEE released the first 802.11 standard in 1997 for satisfying users' needs to access the Internet wirelessly (mostly webpages and emails) through Wireless Local Area Networks (WLANs). During the next years, IEEE 802.11 Working Groups have carried out a prolific program of introducing new standards (e.g. the well-known 802.11a/b/g/n) as well as improvements and extensions driven by a complete alphabet of amendments that led recently to fully revised standard 802.11-2012 incorporating most contemporary application requirements. Currently, a new generation of standards and amendments is making its appearance (IEEE 802.11ac and 802.11ad are the latest additions) that is capable of achieving speeds of multiple gigabits per second, supporting a wide variety of new applications and delivering rich Quality of Experience (QoE) to users.

This tutorial aims to bridge the gap between the well-known and widely applied IEEE 802.11 variants with the recently developed amendments, focusing on three major technical aspects/areas of interest: (i) the Physical layer (PHY) (ii) the Medium Access Control (MAC) layer and (iii) the new usage models and applications that will be supported in the coming years. The tutorial will cover both the research and engineering challenges as well as identify challenges and open issues. Therefore, the intended audience of the tutorial includes young and experienced researchers looking for inspiration and a clear presentation of the evolution of WiFi standards and open challenges, as well as industry players and practitioners looking for a clear understanding of the current state- of-the-art in the technology behind WiFi.

Presenters:
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Periklis Chatzimisios serves as an Associate Professor at the Alexander TEI of Thessaloniki (Greece). Recently he has been a Visiting Academic/Researcher in University of Toronto (Canada) and Massachusetts Institute of Technology (USA). He currently participates in many European and National research projects. For more than 10 years he has researched IEEE 802.11 protocols and lately he has contributed to standards (i.e., IEEE 802.15.4). Dr. Chatzimisios is involved in several standardization activities serving as a Member of the Standards Development Board for the IEEE Communication Society (ComSoc) (2010-today) and lately as Secretary of the IEEE 1907.1 Standardization Working Group. He is also very active in IEEE activities such as serving as the Secretary of the IEEE Technical Committee on Cognitive Networks (TCCN), handling International Relations and Dissemination Activities for the VTS & AESS Joint IEEE Greece Chapter, serving as the Counselor for the IEEE Student Branch of the Alexander TEI of Thessaloniki. Dr. Chatzimisios has served as Organizing/TPC Committee member for more than 150 conferences and Founder/Organizer/Co-Chair for many Workshops which are co-allocated with major IEEE conferences. He also holds editorial board positions for several IEEE/non-IEEE journals and he is acting as co-Director for the E-letter of the IEEE Technical Committee on Multimedia Communications (MMTC). He is the author/editor of 5 books and more than 80 peer-reviewed papers and book chapters on the topics of performance evaluation and standardization activities of mobile/wireless communications (especially IEEE 802.11), Quality of Service/Quality of Experience and vehicular networking. His published research work has received more than 1000 citations by other researchers. He is regularly invited for talks, tutorials and seminars on topics related to his research interests. Dr. Chatzimisios received his Ph.D. from Bournemouth University (UK) (2005) and his B.Sc. from Alexander TEI of Thessaloniki, Greece (2000).

Athanassios Iossifides received his diploma in Electrical Engineering and Ph.D. in Electrical and Computer Engineering from Aristotle University of Thessaloniki, Greece, in 1994, and 2000, respectively. From 1999 to 2010 he was with COSMOTE Mobile Telecommunications S.A., first as a telecom engineer in radio network and transmission systems; in September of 2004 he was assigned the leadership of the Access and Transmission Network Team and in April of 2008 he was appointed Head of the Network Management Section of North Greece. He participated in 4 internal projects on network transmission optimization and he was a member of the 3G vendor evaluation group (2003) and 3.5G (HSDPA) evaluation and testing group (2006), on behalf of COSMOTE S.A. Moreover, he participated in several projects regarding technical and managerial procedures improvement and he organized (in conjunction with HR department) and lectured 7 technical seminars on WCDMA systems. Since 2010 he is with the department of Electronics Engineering of Alexander Technological Educational Institute of Thessaloniki (ATEITH) as an Assistant Professor on Wireless and Mobile Communication Systems. His main research interests lie in the areas of modulation, coding, diversity, MIMO, QoS, multiple access and radio resource management techniques. He has published 35 research papers in refereed journals and conferences and received the best paper award in IEEE ISCC'2011 conference. Throughout his professional career he has been invited for lectures and seminars on the topics mentioned above, and he has participated in various relevant research projects. He regularly serves as a TPC member for conferences, he is an Associate Editor for *Wiley Transactions on Emerging Telecommunications Technologies* (ETT) and a regular reviewer for several international research journals. Since 2012 he holds the position of Vice Chair of IEEE VTS and AESS Joint Greece Chapter.

Jesus Alonso-Zarate received his M. Sc. (with Honors) and Ph. D (Cum Laude) degrees in Telecommunication Engineering from the Universitat Politècnica de Catalunya (UPC, Spain) in March 2004 and February 2009, respectively. In 2005, he was awarded by the National Telecommunication Agency (COIT) of Spain with the Best Master Thesis Award in ICT and in 2011 he received the UPC Award for his PhD thesis. He is now with the CTTC (Barcelona, Spain) holding a Senior Research Associate position and is Head of the M2M Department. He has published more than 90 scientific papers in renowned international journals (*IEEE Wireless Communications Magazine*, *IEEE Transactions on Wireless Communications*, etc.) and international conferences (*IEEE ICC*, *IEEE GLOBECOM*, *IEEE PIMRC*, *IEEE VTC*, etc.) over the last years and has also participated in both European-funded and industrial research projects. He is member of the IEEE ComSoc

CSIM Technical Committee (Communication Systems Integration and Modeling) and works as reviewer and chair for numerous international conferences. He is part of the Editorial Board of the *IET Wireless Sensor Systems Journal* and the *Wiley Transactions on Emerging Telecommunication Technologies* (ETT). In 2011 he was awarded with the Best Paper Award of *IEEE International Conference on Communications (ICC)* with a technical contribution towards the energy-efficiency of wireless communications. In 2013, he has been awarded with the 2013 EURASIP Best Paper Award on Advances in Signal Processing for a journal paper published in a special issue on wireless cooperative communications. Since 2010, he has been giving a number of talks and tutorials on Machine-to-Machine (M2M) communications all around the globe in prestigious international events and conferences, such as *IEEE GLOBECOM*, *IEEE ICC*, *IEEE WCNC*, or *IEEE PIMRC*, co-speaking with Dr. Mischa Dohler (Chair Professor at Kings College London).