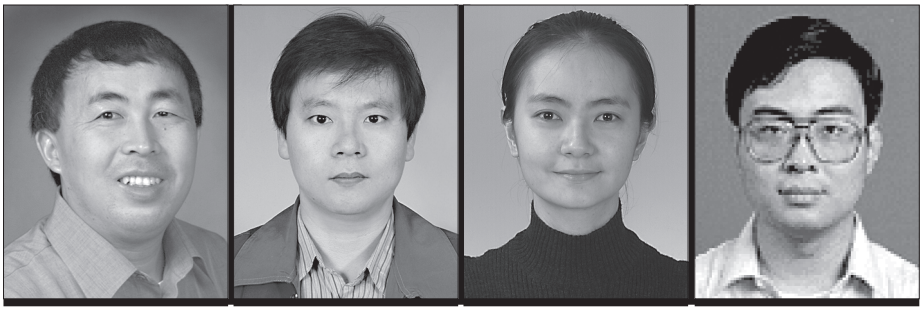
VOICE OVER WIRELESS LOCAL AREA NETWORK



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The market for wireless local area network (WLAN) has been experiencing tremendous growth in recent years, as evidenced by the fast increasing popularity of WLAN hotspots deployed in residence, enterprise, and public areas such as airports, campuses, conference venues, shopping malls, and exhibitions. Meanwhile, WLAN services are evolving from best effort data services to real-time applications with a certain level of quality of service (QoS) provisioning. In the near future, voice over IP (VoIP) is expected to be extended from the Internet to the wireless domain via WLAN. An 802.11-based phone system is generally less expensive to install and support than a wired system. A significant benefit of mixing telephone traffic with data on a WLAN is that it can support user mobility and make use of a common infrastructure.

However, unlike cellular networks where dedicated channels are assigned to voice traffic, the voice packets in WLAN are multiplexed with other data traffic. The distributed coordination ffunction (DCF) is the primary operation mode of WLAN, which introduces significant delay jitter. Investigation of voice packet delay/jitter performance over 802.11/DCF mode is a necessary and challenging problem. The 802.11e group is currently working on QoS support in WLAN, but the ratification of the standard has a long way to go. Until then, development of VoWLAN QoS proprietary schemes is essential to prioritize traffic on the network for QoS support for real-time traffic. In addition, it is necessary that voice over WLAN has handover capability across WLANs and/or hybrid WLAN-cellular networks. Improved WLAN security, WPA, and WPA2 introduce unacceptably high delays for VoWLAN during session switching, and 802.11r is going to address the issue. The next-generation wireless access technology (NGWA), such as WiMax and its mobility enhancements 802.16e and IEEE 802.20, is above the horizon. The new technology and standard migration and investment protection should also be considered.

This special issue is to disseminate the state-of-the-art R&D results on VoWLAN, facilitate the deployment of VoWLAN, and bring together researchers from both academia and industry in networking, wireless communications, and mobile computing, with the goal of fostering interaction among them. It is timely and valuable for those involved in the research of VoWLAN.

In the first article "Pricing VoWLAN services through a Micro-Economic Framework," Badia *et al.* investigate the issue of determining an appropriate pricing strategy for voice-over-WLAN provisioning. The voice services are framed in a tunable QoS scenario. Analysis is then performed with the awareness that in a WLAN system the tariff payment determines price-based access regulation. The authors also apply a micro-economic framework which considers the trade-off between perceived QoS and paid price in the users' request.

A contention-based medium access mechanism is a mandatory part of the IEEE 802.11 standard series. In the second article, "QoS Guarantee and Provisioning at the Contention-Based Wireless MAC Layer in IEEE 802.11e Wireless LANs," Xiao provides a survey of previous work on QoS provisioning with contention-based medium access control (MAC). Distributed admission control, data control mechanisms, bandwidth allocation, and handoff/roaming are discussed. Further research directions are also pointed out.

The next two articles focus on polling, which is an effective solution for supporting real-time traffic over WLANs with stringent delay requirements. In the article "Polling-Based Protocols for Packet Voice Transport over IEEE 802.11 Wireless Local Area Networks," Lam *et al.* present a survey of different polling-based protocols for supporting VoWLAN. Three key issues are discussed: managing a polling list, determining the polling sequence and reducing polling overhead. An isochronous control function (ICF) is also proposed. In the article "IEEE 802.11e Enhancements for Voice Service," Wang *et al.* propose mechanisms to enhance IEEE 802.11e with voice QoS provisioning capability. The delay requirement of real-time voice is guaranteed by controlled channel access, while bandwidth efficiency can be greatly improved by overhead suppression and statistical multiplexing. A call admission control scheme is also presented to admit voice stations into the system with QoS guarantee.

Admission control is essential to QoS provisioning of VoWLAN. In the article "Providing Statistical QoS Guarantee for Voice over IP in IEEE 802.11 Wireless LANs," Zhai *et al.* propose a call admission control scheme that runs over the MAC layer to support VoIP services. Voice traffic is regulated to efficiently coordinate medium contention among voice sources. Non-voice traffic is regulated by a rate control mechanism to control its impact on the performance of voice traffic. Statistical QoS guarantee for voice traffic is provided, and a stable high throughput is maintained for non-voice traffic at the same time. In the article "A Call Admission Control Framework for Voice over WLANs," Qian *et al.* present a call admission control framework called WLAN Voice Manager. The WLAN Voice Manager interacts with WLAN MAC layer protocols, soft switches (VoIP call agents), routers, and other network devices to perform end-to-end (ETE) QoS provisioning and control for VoIP calls originated from WLANs. By implementing the proposed WLAN Voice Manager in the WLAN access network, a two-level ETE VoIP QoS control mechanism can be achieved.

In the final article, "Quality-Aware VoWLAN Architecture and Its Quantitative Evaluations," Koga *et al.* propose a media optimization network architecture (MONA). An intercarrier handover mechanism based on a cross-layer approach using the number of layer 2 retransmissions is evaluated. Voice quality management in WLAN is also discussed.

In closing, the guest editors would like to thank all the authors who responded to the Call for Papers, regardless of whether their papers have been included in this issue or not due to space limitations. The editors would also like to acknowledge the contribution of many experts who participated in the review process, and provided helpful and valuable suggestions to the authors on improving the content and presentation of the articles. The advice and support of Dr. M. Zorzi, Editor-in-Chief of *IEEE Wireless Communications*, and the assistance of Sue Lange are greatly appreciated.

BIOGRAPHIES

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