

Special Issue on Next Generation Wireless Technologies

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The next generation wireless networks are expected to converge into a ubiquitous architecture, which includes high-speed cellular networks, wireless local area networks (WLANs), mobile ad hoc networks, peer-to-peer networks, wireless metropolitan area networks (WMANs), etc. The increasing demand of wireless multimedia services has motivated the development of broad wireless access in the heterogeneous wireless networks. Mobile subscribers can enjoy the high bit rate, low cost, ubiquitous coverage, and secure connection. For the next generation wireless networks, further extensive investigation, experimentation and development are necessary, such as capacity analysis/enhancement, quality-of-service (QoS) support, power saving, wireless routing, security, and mobility management. This special issue presents recent cutting edge research and state-of-the-art technology. The accepted eight papers are selected from the 2nd International Conference

on Broadband Networks (BroadNets'05, held in Boston, MA, Oct. 3–7, 2005), the 2nd International Conference on Quality of Service for Heterogeneous Wired/Wireless Networks (QShine'05, held in Orlando, FL, Aug. 22–24, 2005), and the 11th Mobile Computing Workshop (held in Taiwan, Mar. 31, 2005). These papers are timely and valuable for future analysis, implementation and experiments of heterogeneous broadband wireless networks.

In the first paper “Dynamic power saving mechanism for 3G UMTS system,” Yang investigates a power saving mechanism for Universal Mobile Telecommunications System (UMTS). Analytic and simulation models are proposed to study the two control parameters: discontinuous reception (DRX) cycle and the inactivity timer threshold. Optimal values of the two parameters in terms of maximum power saving are obtained. A dynamic algorithm is also proposed to enhance the performance of DRX.

In the second paper “Predictive dynamic channel allocation scheme for improving power saving and mobility in BWA networks,” Chen and Tan propose a signal-aware dynamic channel allocation (SDCA) to improve the channel utilization as well as to reduce the probability of out-of-service for IEEE 802.16 networks. The SDCA not only increases the capacity of the system but saves the overall power consumption of the system well. A location prediction scheme is presented to prevent the out-of-service effect on mobile subscriber stations due to user mobility.

In the third paper “Queue analysis and multiplexing of heavy-tailed traffic in wireless packet data networks,” Teymori and Zhuang investigate the queuing behavior of self-similar traffic flows for data applications in a packet-switching single-server wireless network. Close-form expressions are derived for the relation among the traffic parameters, the channel working state probability, the server capacity, and the queue distribution for an infinite

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buffer size or the packet loss probability for a finite buffer size. Queueing behavior is also studied for a multiple-input system with a finite buffer size.

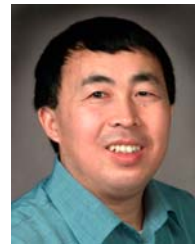
The fourth and fifth papers focus on cross-layer design approaches for wireless ad hoc networks. In the fourth paper “A cross-layer approach to channel assignment in wireless ad hoc networks,” Gong, Midkiff, and Mao propose a distributed channel assignment scheme to improve the capacity of wireless ad hoc networks. Through a joint design of channel assignment and routing protocols, the proposed scheme has the advantages of low communication, computation, and storage complexity. A multi-channel medium access control protocol is also presented, which is shown to substantially increase throughput and reduce delay. In the fifth paper “Joint design of routing and medium access control for hybrid mobile ad hoc networks,” Du and Wu present a new routing protocol, Hybrid Routing, which takes advantage of the powerful nodes in hybrid mobile ad hoc networks. The routing area is divided into multiple cells, and one powerful node is maintained in each cell if possible. Based on location information and cell structure, routing among the powerful nodes is efficient and simple. A hybrid medium access protocol is also proposed, which can improve the efficiency of medium access in hybrid mobile ad hoc networks.

In the sixth paper “A differentiated service model for enhanced distributed channel access (EDCA) of IEEE 802.11e WLANs,” Lee, Liao, and Chen propose a service mechanism called Differentiated Service-Enhanced Distributed Channel Access (DS-EDCA) for IEEE 802.11e WLANs. Delay and delay variation of the high priority traffic can be controlled, and at the same time, proportional bandwidth sharing among the best-effort traffic can be achieved. A hierarchical link sharing model is also presented.

The last two papers deal with network security. In the seventh paper “Privacy-enhanced, attack-resilient access control in pervasive computing environments with optional context authentication capability,” Ren and Lou propose a privacy enhanced anonymous authentication and access control scheme to secure the interactions between mobile users and services in pervasive computing environments with optional context authentication capability. The proposed scheme provides explicit mutual authentication between a mobile user and a service, and it also allows the mobile user to anonymously interact with the service. It is denial-of-service (DoS) resilient by requiring the user to prove its legitimacy when initializing a service session. In the last paper “On the impact of quality of protection in wireless local area networks with IP mobility,” Agarwal and Wang present a detailed experimental study to demonstrate the impacts of quality of protection on performance by integrating cross-layer security protocols in a wireless LAN testbed with IP mobility. It is demonstrated that the effects of security policies on QoS

parameters span a wide range. Suggestions are also given for the design of future security protocols for real-time services in wireless LANs.

In closing, the guest editors would like to acknowledge the contribution of many experts who participated in the review process and provided helpful suggestions to the authors on improving the content and presentation of the articles. The advice and support from Dr. Imrich Chlamtac, Editor-in-Chief, and Ms. Karen Decker are greatly appreciated.



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