CALL FOR PAPERS

CROSS-LAYER DESIGN OF

MULTIHOP WIRELESS NETWORKS

Background

Packaging of communications functionalities into independent protocol layers has been the traditional way of designing communications protocols, whereby each layer receives service from the underlying layer through abstracted service access points. This means of protocol design is now seen as a performance restriction in some situations. Hence, there is a current drive towards cross-layer protocol engineering and inter-layer communications/interactions in order to optimize system design across protocol layers to achieve better performance.

Multihop wireless networks (MWNs) including vehicular networks are infrastructureless networks of nodes that can function as both hosts and clients. Variants of MWNs include wireless sensor networks, wireless ad hoc networks, wireless home networks and wireless mesh networks. Such networks have many applications, including environmental monitoring for safety, security and climate change, formation of an outdoor community network, transporation, broadband access network to the Internet and an indoor home network. Interest in wireless multihop networks is enhanced by their relatively low deployment costs as they do not require an infrastructure and complicated network pre-planning, just to name a few. MWNs face several fundamental issues, including limited capacity, how to organize the network to achieve efficient and reliable communication, and cooperation among the distributed nodes.

The efficient performance of a multihop wireless network serving multiple users concurrently depends largely on its Media Access Control (MAC) layer. Hence, contributions in cross-layer MAC for MWNs are interesting. So far research contributions on opportunistic communication has been limited to single-hop, single-carrier and delay-tolerant terrestrial wireless networks. Hence, extension of opportunistic communications to multi-carrier multihop networks including multihop networks on moving platforms (vehicular networks) serving both real-time and non-real-time applications remains open.

Optimum tradeoff between competing design issues, such as throughput (spectral efficiency), fairness and traffic QoS requirements (e.g. delay constraints) are not fully answered yet. Another issue yet to be explored is the potential impacts of cross-layer design on device energy consumption. The scope,

depth and how nodes in distributed wireless networks learn about channel conditions of neighbors also needs further research inquiry. Many proposed schemes for wireless networks are user-centric. However, as popularity of wireless multimedia communications increase, many service users may have multiple different flows (applications) active simultaneously. Hence, the fact that a user's overall service is satisfactory does not guarantee that all its individual flows receive satisfactory service. This requires an appropriate attention on channel-sensitive flow-centric wireless protocols that attempt to meet the QoS demands of individual flows active on the same or different users concurrently.

Scope of Contributions

This special issue of the AJICT is devoted to the research (both analytical & simulation studies), testbeds, implementation and regulatory activities within the industry, regulatory bodies and academia on all topics related to cross-layer design of multihop wireless networks. Articles for this special issue are solicited through an open call-for-papers from experts and practitioners in the field. Topics of interest include, but not limited to:

- Pertinent issues in cross-layer design of multihop wireless networks
- ISO/OSI-friendly vs ISO/OSI-hostile cross-layer techniques for MWNs
- Framework for cross-layer design of multihop wireless networks
- Dependence of node/user population/density on capacity of multihop wireless networks
- Cross-layer multiple access protocols for multihop wireless networks
- Cross-layer routing protocols for multihop wireless networks
- Cross-layer techniques to enhance capacity and security in multihop wireless networks
- Cross-layer radio resource management in multihop wireless networks
- Impacts, future and business case of cross-layer design in multihop wireless networks
- The future of cross-layer design in multihop wireless networks
- Applications of multimedia communications in multihop wireless networks
- TCP enhancements in multihop wireless networks via cross-layer design
- Cross-layer schemes enhancing efficiency, reliability and cooperation among nodes
- Implications of multimode transceivers in cross-layer multihop wireless networks
- Interactions between physical, application, and link layers in multihop networks
- Comparison between user-centric, flow-centric and connection-centric protocol designs
- Impacts, challenges, pros and cons of cross-layer protocol design in MWNs
- Comparison between link/rate adaptation and opportunistic communications in MWNs
- Efficient techniques for exchanging inter-layer information in multihop networks
- Efficient techniques for enhancing multiuser diversity gains in cross-layer design
- Applications of cross-layer design in practical wireless networks (e.g. IEEE 802.11, WiMAX/IEEE 802.16).

Submission

Articles should be written in IEEE Transactions format, and should be original and not published or submitted for potential publication in another periodical. Articles should be well-written, be technically sound and where possible of tutorial nature. All submissions will be reviewed based on technical merit and relevance by peer experts in the specialty of the topic. Authors are encouraged to include mathematical and analytical basis of their contributions. Guidelines for prospective authors can be found on-line at http://epress.lib.uts.edu.au/journals/ajict. Prospective authors should submit their manuscripts as a pdf file online and also e-mail their manuscripts as attachment along with the title, the abstract, and the address for correspondence as a separate text attachment to the Guest Editor by the schedule below.

Schedule

- Online Manuscript Submission Deadline: **November 30, 2006**
- Notification of Review Outcome: **January 29, 2007**
- Proof-Read Manuscript Due: **February 12, 2007**
- Expected Publication Date: **March 12, 2007**

Guest Editor

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