

Stony Brook University The Graduate School

Doctoral Defense Announcement

Abstract

Efficient Medium Access Protocols for Wireless and RFID Networks

By

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Wireless multihop networks of various forms -- such as ad hoc, mesh or RFID networks - - are getting popular as a means of creating a pervasive wireless networking mechanism. The central concept in such networks is use of multihop relaying. Multihop wireless links give rise to new challenges in medium access control (MAC) protocols. The challenges include combating interference and fading, use of various transmit diversities such as directional antennas and multiple channels, and guaranteeing fairness. Our work responds to some of these challenges.

In our first work, we develop a cross-layer solution called *MAC-layer anycast* that combats link loss due to interference or fading by exploiting path diversity available from the routing layer. We develop an 802.11-like protocol to implement anycast. We show via both simulations and testbed experiments that it is superior to 802.11-like protocols. We also show that anycast is very useful when used in conjunction with directional antenna or multiple channels, as well as for improving reliability and efficiency of MAC-layer multicast.

In our second work, we develop protocols for provisioning max-min fair bandwidth for multihop flows. Here, we develop a two-part solution that combines queueing/scheduling and MAC protocol for guaranteeing max-min fairness for multihop flows.

In our third work, we focus on developing accurate physical interference modeling techniques for use in STDMA scheduling. To this end, we use the TelosB motes platform to model the relationship between the packet capture probability and SINR based on measurements. We show how this model can be used to develop a realistic interference model for a given testbed using only $O(n)$ measurements on the testbed. We provide validation results for the accuracy of this approach for predicting whether a set of links are schedulable concurrently.

Finally, we focus our attention to RFID networks where new forms of interference are possible due to presence of two different entities, RFID tags and readers. We demonstrate via a testbed how interferences can be resolved in a RFID networks via simple carrier-

sensing mechanism that can be implemented using commodity hardware.

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