Rendezvous: An Application Aware MAC for Wireless Networks

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The increasing reliance of users on wireless networks for Internet connectivity has posed two significant challenges for mobile networking research. The first challenge is to provide high quality of service for interactive real-time applications such as VoIP and video conferencing. The second challenge is to reduce the energy consumption of mobile devices and improve battery life. Past research has focused on separately addressing these seemingly conflicting goals in distributed medium access based wireless networks. Contrary to the traditional tiered networking approach, we show that an application aware approach to medium access and power saving has the potential to significantly improve the performance of real-time applications and conserve battery power on mobile devices.

We demonstrate a system implementation of Rendezvous MAC that uses information about application traffic characteristics to improve channel utilization and enable power savings by achieving quasi- TDM channel access behavior. Rendezvous leverages the knowledge of real-time application traffic characteristics such as periodicity and duration of data bursts. Rendezvous is comprised of three channel access modes that provide dynamic periodic scheduling by means of explicit reservations, without the need for a central controller or global time synchronization. Such an approach ex- tends beyond just giving priority to real-time traffic, such as in the IEEE 802.11e protocol. The intuition is that, by maintaining soft state about the predicted channel usage in the near future, the MAC protocol can make appropriate reservations for medium access in advance. Such scheduled channel access reduces contention and allows devices to sleep during periods of inactivity and save power.

We use the FreeMAC framework [2] to implement the three access mechanisms of the application aware Rendezvous MAC [1] as shown in Figure 1. The testbed is comprised of 4 laptops, each running kernel 2.6.24 on the Ubuntu Linux distribution. Each laptop is equipped with an AR5212 chipset-based LinkSys 802.11 a/b/g PCMCIA card. We setup a network on an unused 802.11a channel with four nodes arranged in a linear topology as shown in Figure 2. We use MAC address filters to ensure a linear topology even if the nodes are within communication range of each other. The network runs Rendezvous but also has the ability to switch to conventional 802.11 operation. We stream live video between the end nodes (across three hops) in the network and demonstrate the improved performance of the Rendezvous MAC over the 802.11 MAC.

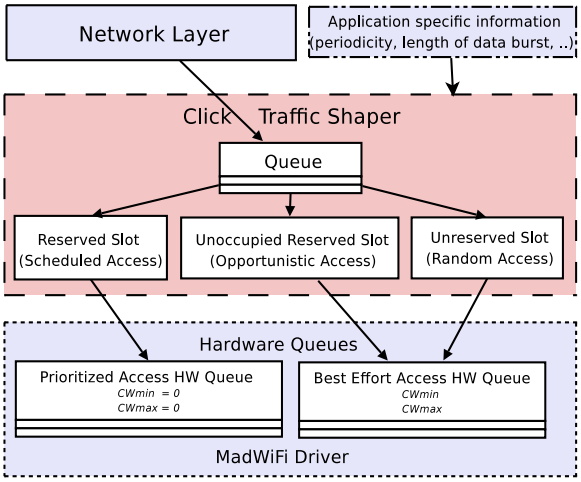

Figure 1: Rendezvous MAC Architecture

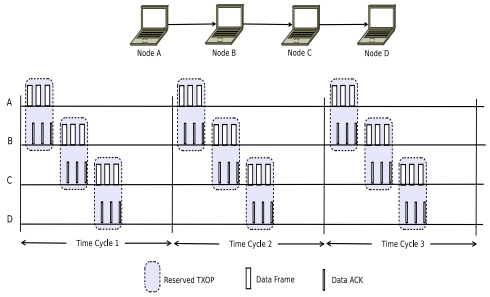

Figure 2: Testbed Setup

1. REFERENCES

[1] A. Sharma and E. M. Belding. A Case for Application Aware Channel Access in Wireless Networks. In *HotMobile'09*, Santa Cruz, CA, USA.

[2] A. Sharma and E. M. Belding. FreeMAC: Framework for Multi-Channel MAC Development on 802.11 Hardware. In *PRESTO'08*, Seattle, WA, USA.