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Joint ICWS and Systems/Networking Seminar



DiffQ: Differential Backlog Congestion Control for Wireless Multi-hop Networks

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Abstract: Congestion control in wireless multi-hop networks is challenging because of two reasons. First, broadcast is an inherent feature of wireless networks and motivates many creative protocols including opportunistic routing and network coding. These protocols enable the use of many diverse, yet dynamically changing routing paths. Congestion control for these protocols using traditional end-to-end protocols such as TCP may result in too conservative rate control. Second, the wireless medium is shared among neighboring nodes; thus bandwidth must be allocated fairly among neighboring flows that do not necessarily share the same link.

There have been no practical solutions for congestion control for these networks. Inspired by existing theoretical solutions of cross-layer optimization, we develop a protocol, called DiffQ, for congestion control in wireless multi-hop networks.

DiffQ can support congestion control for network flows that use either single-path or opportunistic multi-path routing. The protocol is currently implemented in Linux 2.6 series and tested in a network of 46 IEEE 802.11 wireless nodes. It is observed that DiffQ greatly improves the efficiency and fairness of existing transport protocols that use application-level multi-path routing and single-path routing.

Biography: Injong Rhee is Associate Professor of Computer Science at North Carolina State University. He works primarily on network protocols for the Internet. His major contributions in the field include the development of congestion control protocols, called BIC and CUBIC. Since 2004, these protocols have been the default TCP algorithms for Linux and are currently being used by more than 40% of Internet servers around the world and by several tens millions Linux users for daily Internet communication. He also has invented several multimedia streaming and multicast technologies licensed to companies for commercial applications. He started a company based on these technologies in 2000 where he developed and launched the world's first video streaming products and push-to-talk (PTT) VoIP products for cell phones. His recent research topics include mobile ad hoc networks, delay/disruption tolerant networks, and P2P systems. He received NSF Career Award in 1999, NCSU New Inventor's award in 2000.