Lydia Sidrak

A Comparison of Mechanisms for Improving TCP Performance over Wireless Links
Hari Balakrishnan, Venkata Padmanambhan,
Srinivasan Seshan, Randy Katz

TCP assumes packet losses are due to congestion, and reacts with congestion control and avoidance procedures. This is a problem for wireless networks in which many errors occur due to transmission issues, in which the same reaction would result in reduced throughput. This paper presents a survey of implementations improving TCP performance (defined as end-to-end throughput and wired/wireless goodput) over wireless links, all of which can be mostly categorized by the following:

End to end proposals
- These use selective ACKs to allow recovery from multiple packets loses without coarse timeout.
- Have the sender distinguish congestion from other forms of losses using Explicit Loss Notification.

Split connection proposals
- Hide wireless links from sender by stopping TCP connections at base station (second connection use techniques such as negative ACKs or SACK over wireless link)

Link-layer proposals
- Hide link related losses from TCP with local retransmits and forward error correction.

Findings:
- The TCP-AWARE link layer mechanism avoids redundant retransmits and yields 10-30% higher throughput than regular link layer implementations. This was the most successful solution.
- Split connections that shield end hosts from wireless losses may still result in stalls when the wireless connection times out. Even with SMART-based SACKs it doesn't perform as well as link-layer mechanisms.
- SMART-based SACKs perform particularly well with lossy links, especially when bursty.
- End-to-end proposals improve TCP performance and have the added benefit of not requiring any support on the intermediate nodes.

Questions:
- Is it an issue that the Poisson-distributed error model does not "empirically model" a wireless channel?
- How do the proposed mechanisms fare when there are mixed topologies (wired/wireless) with several wireless hosts that might actually exhibit congestion?
- How can packet losses that result from errors on a lossy link be detected?