COMPARISION & EVALUATION OF TCP PERFORMANCE OVER WIRELESS NETWORKS

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ABSTRACT

For the last few years the popularity of wireless communication and of internet is on rise. Applications like e-mail, web browsing, mobile computing etc over wireless is gaining importance. Some of these applications make use of reliable end to end transport level services provided by TCP. TCP, a reliable, connection oriented, byte stream transport level protocol developed primarily for traditional wired networks where the error rates are very low and congestion is the primary cause of packet loss. On the other hand the wireless networks are typically characterized by high bit error rate and offer less available bandwidth. Thus the performance of TCP degrades if applied to wireless networks without any modifications as it assumes all the losses are due to congestion. Several mechanisms have been proposed that modify TCP to be tailored to the wireless networks. This paper presents a comparison of some of the already proposed protocols to evaluate TCP performance over wireless medium.

1. Introduction

Wireless networks are an emerging technology of this decade and have become very popular in last few years. It뭘 becoming more obvious that wireless network will play an important role in future generation communication systems. TCP was primarily developed for wired networks and has been working well in wired networks. TCP is a reliable, connection-oriented, full-duplex, byte stream, transport-layer protocol. The packet losses in wired networks are mainly due to congestion, and thus TCP assumes that any loss is due to congestion and consequently invokes congestion control measures.
TCP reacts to packet losses by dropping its congestion window size before transmitting packets, initiating congestion control or avoidance mechanisms and backing off its retransmission timer. These measures result in a reduction in the load on intermediate links, thereby controlling the congestion in the network. But performance of TCP has been degraded if applied without ay modifications on wireless networks due to the distinct features of wireless environment.

2. Evaluation of TCP

In this section, we evaluate some of the protocols that have been adapted to improve the performance of TCP over wireless networks.

2.1 The Snoop protocol

Snoop protocol is classified as TCP Aware link-level protocol though it involves modification of the network layer IP software at the base station (BS) by adding a module called snoop. The main idea of the protocol is to maintain a cache of TCP packets at the BS sent from Fixed Host (FH) and sent to MH but haven뭘been acknowledged by the Mobile Host. When a packet loss is detected, it retransmits the lost packet to the MH if it has the packet cached. Thus, the base station hides the packet loss from the FH by not preventing unnecessary congestion control mechanism invocations.

2.2 Delayed Duplicate Acknowledgements

It is a TCP-unaware protocol that attempts to imitate the behavior of TCP-aware Snoop protocol. This method tries to reduce the interference between TCP retransmissions and the link level retransmissions. When the TCP receiver receives out-of-order packets, it sends the duplicate ACKs for first two out-of-order packets but if it gets more of them p then it deferes the ACKs for these packets for a time period of say t. If during this time period t, it gets the next in-sequence packet for a time period t, it gets the next in-sequence packet then it discards the duplicate ACKs. This method performs better in a scenario when the packet losses are due to wireless transmission errors and performs bad when the losses are due to congestion on the wired network. The overall performance depends on the relative frequency of the two types of losses. The base station does not need to look at the TCP header so this method may be especially useful if the transmission is encrypted.

2.3 Fast Retransmit

When the MH does handover, several data packets or ACKs might be missed between the handover. If the disconnection time were too long, timeout would be triggered by absence of an ACK arriving. Fast retransmit recommends that as soon as the mobile host terminates its handover, it returns back the last ACK 3 times to avoid waiting for a timeout after a handover. The main advantages of fast retransmit are it reduces the length of disconnections due to handover and it can be used to adapt