TCP in Ad Hoc Wireless Networks

This project is to use ns2 simulator to understand the performance of TCP in a wireless network, and test your ideas on improving the performance.

NS-2 is a discrete event simulator written in C++, with an OTcl interpreter shell as the user interface that allows the input model files (Tcl scripts) to be executed. Most network elements in NS-2 are developed as classes, in object-oriented fashion. The simulator supports a class hierarchy in C++, and a very similar class hierarchy in OTcl. The root of this class hierarchy is the TclObject in OTcl. Users create new simulator objects through the OTcl interpreter, and then these objects are mirrored by corresponding objects in the class hierarchy in C++. NS2 provides substantial support for simulation of TCP, routing algorithms, queueing algorithms, and multicast protocols over wired and wireless (local and satellite) networks, etc. It is freely distributed, and all source code is available.

In this project we examine the performance of TCP in an ad hoc wireless network.

1. Consider 30 nodes, uniformly randomly placed in a region of size 10 by 10 units. The nodes use wireless transmission to communicate with each other. Each node has an omni-directional antenna having unity gain. The nodes are static.

2. For link layer use 802.11 protocol.

3. Routing is done with dynamic source routing (DSR).

4. Use TCP Reno to handle fixed data rate traffic between 10 pairs of nodes, say, between source $i$ and destination $20 + i$ for $i = 0, 1, \cdots, 10$.

5. For each algorithm please run 50 times and take the average performance of the 50 instances.

6. The performance is analyzed by the throughput, i.e., the total number of packets that can be transmitted by the network.

You need to finish the following three tasks.

1. Implement and analyze the basic TCP protocol on the above mentioned network. (10pts)

2. Design, implement and analyze an idea to improve the performance and show the performance improvement. Changing parameters of the basic TCP protocol is allowed. (10pts)
3. In your report please put in the details of the assumptions you make in addition to the conditions given above. Please draw figures/use tables to elaborate the performance in your implementation and explain your findings. (10pts)

You must submit the relevant Tcl programs, other scripts, and a project report. Pack all the files in a zipped folder and submit it through blackboard digital dropbox.

Please use the blackboard discussion board to ask questions regarding ns2 and other tools. Students who help to answer questions on the forum will be given bonus marks.