Solution Assignment 2

Question 1

Tcl script file **net1.tcl** is attached.

Question 2

a. What is the relationship of Ethernet frame, with segment length and the supported bandwidth?
b. The round trip delay for a maximally configured Ethernet has been determined to be 51.2 µs. How much delay has been supposed to be caused by a repeater?
c. In a token ring network with bandwidth 20 Mbps, each station can send one 500 byte packet on its turn. If 6 Mbps is the maximum throughput that any single node can attain, calculate the TRT for this network.

Solution:

a. In Ethernet a transmitting station must continue to transmit data for at least one RTT time in order to detect a collision. RTT depends on segment length. Therefore, length of the segment is one factor that determines the minimum length of the Ethernet frame. Minimum length of the Ethernet frame also depends on the supported bandwidth. A higher bandwidth means that more data can be transmitted in one RTT time. Therefore, the supported bandwidth is also a factor that determines the minimum length of Ethernet frame.
b. A maximally configured Ethernet is 2500m long, and there may be up to four repeaters between any two hosts. Round trip distance would then be 5000m with each of the four repeaters coming across twice. If signal propagation speed in Ethernet is supposed to be $2 * 10^8$ m/s then it will take 25µs for a bit to travel 5000m distance. (51.2 – 25)µs = 26.2µs time will be taken by the four repeaters. Hence, each repeater is supposed to cause 6.55µs two way delay.
c. Token rotation time (TRT) is the time it takes for a token to circle back to a node. To have a 6 Mbps throughput a stations is required to send (6 M bits / 500 * 8 bits) = 1500 packets in one second. Hence, TRT for this network will be 1/1500 = 667µs.

Question 3

Read the paper entitled "On the Self-Similar Nature of Ethernet Traffic (Extended Version)" and answer the following questions.

a. Briefly describe the effects of self-similar nature of traffic as discussed in the paper.
b. What does the Hurst parameter measure?

Paper link: http://www2.ensc.sfu.ca/~ljilja/ENSC833/Assignments/papers/00282603.pdf

Solution:

a. The effects of self-similar nature of Ethernet traffic are discussed in the sections "Ethernet Traffic is Self-Similar" and "Engineering for Self-Similar Network Traffic" and summarized in the "Discussion" section.
b. Hurst parameter *H* measures the degree of self-similarity. The burstier the traffic, the higher *H*.

Question 4

Read the paper entitled "WTRP – Wireless Token Ring Protocol" and answer the following questions.

a. Briefly discuss the performance gain of WTRP over IEEE 802.11 as claimed by the authors.
b. How WTRP can be extended with other architectures?

Paper link: escholarship.ucop.edu/uc/item/21f8k3vh

Solution:

a. Read the section "Performance Analysis".
b. Read the "Conclusion" section.

Question 5

Read the paper entitled "Does the IEEE 802.11 MAC Protocol Work Well in Multihop Wireless Ad Hoc Networks?" and answer the following question.

a. Briefly discuss the two problems identified in IEEE 802.11-based multihop wireless ad hoc networks.

Paper link:
http://drw.politekniktelkom.ac.id/Bebas/Bachelor%20Degree/Jaringan%20Komputer%20Lanjut/jarkom%20pdf/Does%20the%20IEEE%20802.11%20MAC%20Protocol%20Work%20Well%20in%20Multihop%20Wireless%20Ad%20Hoc%20Networks.pdf

Solution:

a. The two problems are discussed in the sections "The TCP Instability Problem and Analysis" and "Serious Unfairness and Analysis" and summarized in the section "Discussion and Related Works".

Question 6

Read the paper entitled "A High-Throughput Path Metric for Multi-Hop Wireless Routing" and answer the following question.

a. How the paper justifies that the proposed ETX metric performs better than the minimum hop-count metric?

Paper link: http://pdos.csail.mit.edu/papers/grid:mobicom03/paper.pdf

Solution:

a. Read the section “Evaluation”.