CS158A Project 2: Final Draft

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MAC Protocol:

The subset of MAC protocol that is simulated is the IEEE 802.11 (Wireless LAN) which was released in 1997. Wireless LAN is a type of LAN that uses radio waves to communicate between nodes instead of using wires. Using different types of acknowledgements such as Request to Send and Clear to Send, Wireless LAN focuses on collision avoidance.

Network Parameters:

The network parameters include: The number of nodes is 10, the number of transmissions is 20, and the network length is 100 meters. The traffic type is synchronous video with a constant bit rate of 1.5 Mbps and asynchronous image files with varying file sizes. The data rate is 54 Mbps.

Simulation Settings:

Ask user for which mode and Number of nodes in the network.

Synchronous**:**

In this simulation the settings are set to: Max back off attempts is 16 and the back off value is 51.2 microseconds. Bit rate is 1536 kbps for video. The max frame size is 18768 bits with max payload 18496 bits.

Asynchronous**:**

In this simulation the settings are set to: Max back off attempts is 16 and the back off value is 51.2 microseconds. Bit rate is the *Poisson process* with an average rate of 100 packets per second for image files. The max frame size is 18768 bits with max payload 18496 bits.

Throughput Performance:

Delay and Jitter:

Discussion of simulation results:

For synchronous traffic, our simulator sends a constant stream to a node at the fastest rate possible while it still have delay in which the node can be Clear To Send. While it is not fully utilizing the pipe, the throughput is still limited by bandwidth and seem small compared to the bandwidth. For asynchronous traffic, the packets are sent in bursts, thus the throughput tend to lower with the limitation of the bandwidth. It no longer has a constant stream of sending packets since it uses the Poisson process to determine the rate at which packets arrive. As a result, the throughput in the asynchronous traffic tends to be significantly larger than the throughput in the synchronous traffic. Asynchronous traffic ranged from 7.2 mbps to 46.0 mbps while synchronous traffic ranged from 0.66 mbps to 2.5 mbps.

For synchronous traffic, delay tended to range from 0.16 ms to 0.64 ms, but there were occasional instances of outliers, such as in node 10 which had a delay of 2.12 ms. Synchronous traffic had consistent jitter ranging from 8.04 x 10-6 ms to 1.02 x 10-5 ms. Unlike synchronous traffic, asynchronous traffic’s delay and jitter were less consistent. Asynchronous traffic had delay ranging from 10.1 ms to 84.4 ms and jitter ranging from 1.9 ms to 71.3 ms. The significantly higher delay in asynchronous traffic is caused by the usage of the Poisson process to determine packet arrival. Since the time between packet arrival is randomly chosen using the Poisson process, it could lead to very little or large delay. This means that the variance of delay, jitter, could be wildly inconsistent as shown on the “Asynchronous Traffic – Jitter” graph. Since synchronous traffic has a constant stream of traffic, the packets arrive at a uniform rate which leads to a tendency of minimal variance in delay as demonstrated in the “Synchronous Traffic – Jitter” graph. Atypical results, such as the outlier in synchronous traffic delay, can most likely be explained by collision avoidance and back off being performed.

References

Input Traffic Load

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http://protocols.netlab.uky.edu/~calvert/classes/571/lectureslides/MAC-Intro.pdf

Message length

Textbook page 163. Problem 2-53.

Poisson message arrival process

www.netlab.tkk.fi/opetus/s38143/luennot/E\_poisson.pdf

Variance

http://davidmlane.com/hyperstat/A16252.html

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http://research.microsoft.com/en-us/projects/mesh/ccr06\_troubleshooting\_mesh.pdf

Threads

<http://download.oracle.com/javase/1.5.0/docs/api/java/lang/Thread.html>

Making jar files

<http://www.excelsior-usa.com/articles/java-to-exe.html>