UPLB NETWORK QUEUE SIMULATOR (UNQS): ANALYZING NETWORK PERFORMANCE FOR INTERNET BANDWIDTH MANAGEMENT

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ABSTRACT

Internet bandwidth is an expensive resource that is increasing in demand. To meet those demands, UNQS was developed to simulate real traffic data and to help identify the optimal bandwidth setting, which can then minimize cost. Traffic data was collected using ntopng and had a bandwidth of 3,448.96 Kbps, 554,392 flows and 432,616,056 packets over a span of 8 days. FIFO was used to process the data under different bandwidth constraints and with 60 seconds TTL. Results showed that increasing the bandwidth reduced the dropped flows until eventually, all flows are serviced. A recommended and optimal bandwidth of 37.5 Mbps is determined. Therefore, UNQS was used to find the optimal bandwidth setting for a network given existing traffic data.

STATEMENT OF PROBLEM

With the prevalence of internet usage, the rise of demand for fast and reliable online services is inevitable. A quick solution to the problem would be increasing bandwidth size, however, this method is costly and inefficient.

GOALS & OBJECTIVES

The general objective of the study is to efficiently simulate the UPLB network traffic by identifying the most optimal bandwidth setting, specifically, to:

1. Collect traffic data from the UPLB network;
2. Simulate the traffic data using various bandwidth constraints;
3. Observe the result of the simulation by noting the duration, throughput, and flow loss for each constraint; and
4. Determine the most optimal network setting.

METHODOLOGY

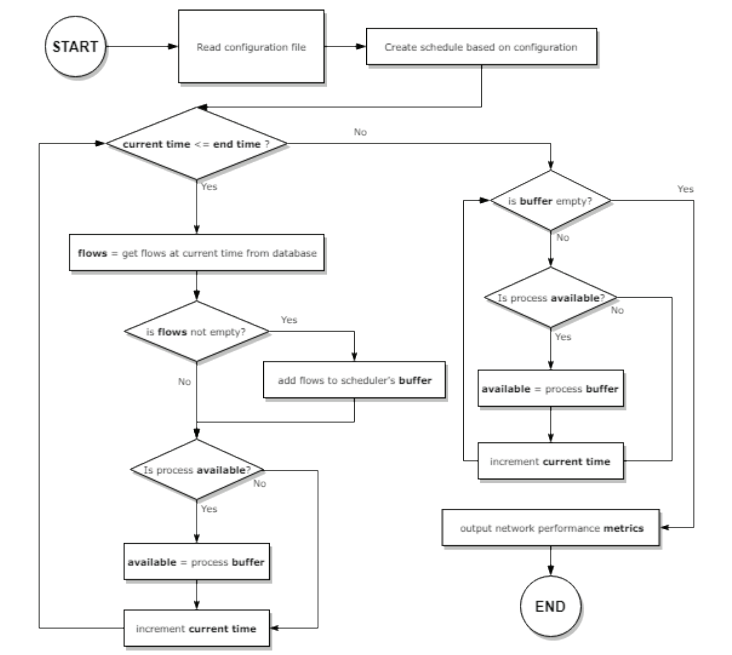

Figure 1. UNQS Main Program Logic.

After collecting traffic data, the simulation logic is summarized in Figure 1.

RESULTS & DISCUSSIONS

Simulation was run for the bandwidth settings 32.5 Mbps, 35.0 Mbps, 37.5 Mbps, 40 Mbps, and with timeout set as a constant of 60 seconds.

The table below summarizes the simulation results using the indicated network performance metrics. It is observed that increasing the bandwidth reduces dropped flows until all the flows are switched. Aside from the information concerning the flows, the simulation results showed that the througput and duration values across the four bandwidth constraints have significantly small difference and thus have similar performance

Table 1. Simulation results per bandwidth

	BANDWIDTH (Mbps)			
METRICS	32.5	35.0	37.5	40.0
flows_dropped_size (Gb)	72.59	18.87	0	0
flows_dropped_cnt	36	9	0	0
flows_switched_size (Gb)	866.46	920.18	939.05	939.05
flows_switched_cnt	554,356	554,383	554,392	554,392
duration (days)	8.22	8.22	8.22	8.22

CONCLUSIONS

Traffic data that was collected using ntopng was successfully processed using the FIFO scheduling algorithm as simulated by UNQS. The output performance metrics showed the effect of increasing the bandwidth in order to switch all the flows. When simulated, the actual traffic data had a throughput of 3.45 Mbps, which was used as a starting point to test other bandwidth settings. With intervals of 500 Kbps per bandwidth contstraint, the shift in the network performance metrics was observed between 35 Mbps and 37.5 Mbps. While there were dropped flows under bandwidth constraint 35 Mbps, there was none under a bandwidth of 37.5 Mbps. Therefore, with the existing traffic data, a bandwidth of 37.5 Mbps is recommended as the most optimal.

Future works may implement other scheduling algorithms like Priority Queueing and Weighted Fair Queueing, and collect and simulate data over peak and slack periods in order to find an optimal bandwidth setting and scheduling algorithm based on the network's actual behavior.

ABOUT THE AUTHOR

LEENSEY M. LAWAS is a BS Computer Science undergraduate student. She not only writes code, but also songs, poems, and stories.