Simulation and Exploration of RCP in the networks

EE384Y Final Proposal
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Motivation:

Congestion Control plays a very important rule in the current Internet to provide better performance to users. Generally the goals of a congestion control scheme are to limit flow rates to avoid "congestion" in the routers, to use the network resources efficiently to minimize flow durations, and to ensure "fairness" in resource allocation among flows.

Currently the prevailing congestion control algorithms are all feedback schemes based on TCP, which will force flows to last multiple RTTs thus adjust the service rate according to the feedback information. But in the future the bandwidth of Internet will grow higher and higher, while the flow sizes will remain relatively constant, which leads that an increasing number of flows could finish within a round-trip time. Hence, the feedback schemes will be unsuitable for such situation. Instead, the open loop control scheme based on the flow rate doesn't have such limitations. Such a scheme, called "Rate based Congestion control Protocol (RCP) ", is proposed by Rui Zhang and Nandita Dukkipati to find the optimal operation point, in which the flow rate served is determined at start by interaction between routers and the end-host, thus provide the best flow response time and fair allocation amongst flows without any feedback information during transmissions.

The performance of RCP over one single link has been studied and analyzed, but in the network systems, the specific flow may pass through several links which have different capacities and different traffic loads. In order to understand RCP well and improve it, this project is supposed to explore the performance of RCP (Flow response time and Queue size vs. Rate) under different testing situations, hence to propose improvements on the existing schemes in the networks.

Tasks:

In this project, the following work will be done:
Case design: Design different challenging cases with selected topology and traffic load, based on intuition and the analysis of previous results.
Simulation: Obtain results of the average response time and buffer occupancy through ns2 for the designed testing cases for RCP.
Analysis: Analyze the simulation results to find the optimal operation point under different cases, thus summarize the relationship among buffer size, average response time and assigned flow rate.
Improvement: This part is based on the result of the RCP performance under all designed cases, might be not necessary.

Schedule:

1. Getting into RCP and simulations, setting up environments, by week 3;
2. Several scenario cases designed and simulated intuitively, by week 5;
3. Basic analysis on the results and intermediate report, by week 6, May 14th;
4. More complicated cases designed and studied based on analysis, by week 8;
5. Conclusion, possible improvements proposed if necessary, week 8 to week 9;
6. Presentation and final report, by week 10, June 5th.