Project 3: Quality of Service with MPLS

Project objectives

Using MPLS to enhance network forwarding delay and encapsulate network packets can work with QoS protocols. MPLS is usually considered in WAN links, a network topology with two and more LANs must be connected via core routers that represent WAN cloud. You must apply QoS techniques using weighted round robin queue and MPLS protocols on selected critical core routers.

Project requirements

1) Implement MPLS on required routers to solve network switching and forwarding delay.
2) Apply different labeling schemes for each type of traffic.
3) Support MPLS using WRR queue method.

General Requirements for all projects

For all these projects, the following requirements must be achieved:

1) Use OMNeT++ simulator with INET framework to implement the required specification and simulate the network.
2) You must design a network with minimum 10 routers, one data source host and one destination host.
3) The network topology must have multible paths between source and destination.
4) The links between routers must have variety speed with bandwidth limitations. Traffic demands must be more than the link capability.
5) OSPF routing protocol must be configured and used on all routers.
6) Three different types of applications (video, audio, and data) must be used to generate traffic across the network.
7) All queues types must be bounded size fixed capacity.
8) You must measure following metrics: 1) end to end delay, 2) queueing delay, 3) packets dropped, 4) packets send and received.
9) You must show statistical output in clear diagrams that show the difference in network performance with and without QoS.
10) You must explain and justify the output from types of traffic and QoS solution.
11) Your work must enhance network performance by applying QoS techniques.
12) Your code and configuration on OMNet++ files ned, ini and xml must be well organized and documented.
13) A detailed technical report that explains the project implementation and results must be presented in addition to source code.
14) A readme file must be in your project explaining all technical details, how to run the project and its components.

Technical Report Format

You will write a technical report summarizing your work. The report must be technically well written and contain these parts:

1) Cover page: Student name and ID

2) Objectives: Objectives of the project and expected results must be stated clearly.

3) Introduction: It should be written clearly that explain the relevant theory used in the project and the techniques you used to achieve the project objectives.

4) Results: Provide and Explain the results in clear diagrams. Each diagram should be discussed and explained thoroughly, and the enhancements should be clearly explained.

5) Discussion: You must add a Discussion section for providing information about your observations and the resulted technical facts.

6) Conclusion: In this section, a detailed conclusion of activities and the technical facts that have been learned should be provided.

Demo and discussion

You will demonstrate your work to your TA. In the demo you must show that all the project components and requirements are included and implemented.

The demo includes run your code, discussion, and questions mainly focusing on the QoS method(s) you use to enhance the network performance. Your code must have two operation modes with and without QoS applied. You must demonstrate the real effect of your QoS method on the network traffic.