

Project1 (100 points)

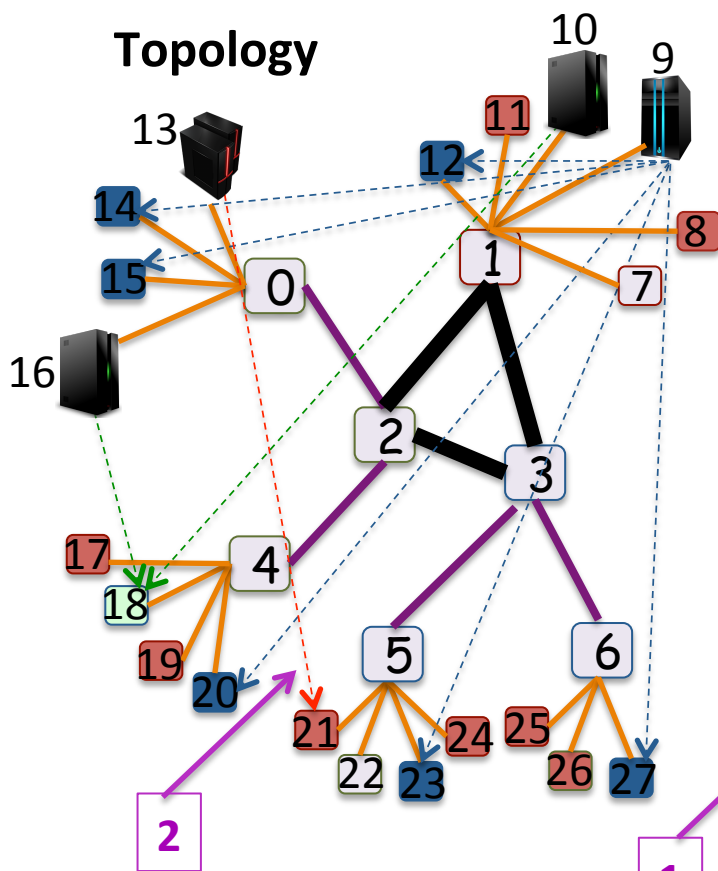
Network Simulation using ns2

1. This is a [group project](#). You can work in groups of at most two people.
2. In this project, you work with network simulator ns2. A copy of ns2 has been installed on virtual server [cs436.cs.csusm.edu](#). The purpose of this project is learning how to simulate a network and analyze the results.
3. Open the ns2-tutorial folder and download all the files. Follow the instructions given in [ns2-tutorial.pdf](#) file.

[ns2-tutorial.pdf](#), [example1.tcl](#), [example1.awk](#), [example2.tcl](#), [example3.tcl](#), [example3delay.awk](#), [example3jitter.awk](#), [example3pktloss.awk](#), [example4.tcl](#)

4. Write an ns2 program that implements the topology and scenario given in [next page](#). Run the file, process the trace files and plot the charts for throughput, delay, jitter, number of sent, received and lost packets at each 0.5 sec time interval during 10 sec simulation for 9→27 and 13→21 and (10→18 and 16→18) traffic flows.
5. **Submit ONLY ONE** .tar or .zip file consisting of a readme file and your .tcl, .awk, and .xls files including your charts. **Don't submit .tr files.**

Topology



Scenario:

At time 1, all sources at 9 start to generate traffic
 At time 2, all sources at 13 start to generate traffic
 At time 3, the source at 10 starts to generate traffic
 At time 4, the source at 16 starts to generate traffic
 At time 6, link 1-3 goes Down, refer to example4.tcl
 At time 7, link 1-3 goes Up, refer to example4.tcl
 At time 10, ns stops

Create 1 UDP agent and 1 CBR traffic generator at node 9 and 1 LossMonitor traffic consumer at dest **PER BLUE CONNECTION**.
 Create 1 UDP agent and 1 EXP traffic generator at node 13 and 1 LossMonitor traffic consumer at dest **PER RED CONNECTION**.
 Create 1 TCP agent and 1 CBR traffic generator at 10 and 16 and 2 **TCPSink** traffic consumers at 18 **FOR GREEN CONNECTIONS**.

Create several traffic generators at 9 and 13, one for each blue or red connection. Create 2 consumers at 18, one for each green connection.

Note: Use flowid to distinguish each traffic (a flow from src to dst).

Network configuration

9 CBR over UDP connected to LossMonitor (cbr packetSize_ 1500 interval_ 0.005 random_ 1).

13 EXP over UDP connected to LossMonitor (exp packetSize_ **200** burst_time_ 0.5s idle_time_ 0.5s rate_ **100k**).

10 CBR over TCP connected to LossMonitor (cbr packetSize_ 1000 interval_ 0.005 random_ 1).
 16

Duplex-link: 1Mbps, 20 ms, Droptail, queue-limit 10, refer to example3.tcl

Duplex-link: 2Mbps, 40 ms, Droptail, queue-limit 15, refer to example3.tcl

Duplex-link: 8Mbps, 50 ms, Droptail, queue-limit 20, refer to example3.tcl

Dynamic routing protocol:
 rtproto DV, refer to example4.tcl

Submission

Write a .tcl file (30 pts), run the simulation and create trace files. Then write the proper awk files to process the data and export the created data to .xls files and plot the charts (70 pts). Attach a readme file.

Notes:

- To distinguish between flows, you may either define a flow id for the traffic flow in the .tcl file, or use the src and dst of packet with type casting (from float to integer).
- Link 1-3 goes down at time 6 and up at time 7. If your traffic flows through this link, its charts must reflect the effect of missing a link at that time. If they don't, it means there is a mistake in tcl or awk files or a wrong traffic flow has been selected and analyzed.
- Traffic flow 16 → 18 starts at time 4. If your charts display a traffic flow before 4, it means there is a mistake in the code or traffic. The same scenario may occur for other flows for example 13→8 (starting at 2).

For each of 10→18 and 16→18 traffic flows, draw Avg Throughput for each 0.5 sec time interval (2*5 points).

For each of 9→27 and 13→21 traffic flows draw the following charts (2*6*5 points).

1. Avg Throughput for each 0.5 sec time interval.
2. Total delay for each individual packet received at destination.
3. Jitter for each individual packet received at destination.
4. Total number of packets sent from source at each 0.5 sec time interval (You may use the number of packets received (r) at the 2nd hop on the src-to-dst path belong to the same flowid)
5. Total number of packets received at destination at each 0.5 sec time interval (You may use the number of packets received (r) at dst).
6. Total number of packets dropped at any hop along the src-to-dst path at each 0.5 sec time interval (You may use the number of packets dropped (d) at any hop).

Submit **ONLY ONE** .tar or .zip file consisting of a readme file and your .tcl, .awk, and .xls files including your charts.

Important note: Don't submit .tr files. They are large and Cougar Courses doesn't allow you to upload such a large file.

Grading Policy

The total grade is 100.

1. 30 points: tcl file
2. 70 points: awk and xls files including charts.

Organize your files as following (numbers indicate the sources of traffics):

A folder with the name of team members.

1. Readme file: provide the names of team members and any extra info you want to give me about your project.
2. (30 points) Your_names.tcl file
3. (5 points) Folder10: 10throughput.awk, 10throughput.xls
4. (5 points) Folder16: 10throughput.awk, 10throughput.xls
5. (30 points) Folder9: 9throughput, 9delay, 9jitter, 9sent, 9received, 9dropped: both awk and xls including charts
6. (30 points) Folder13: 13throughput, 13delay, 13jitter, 13sent, 13received, 13dropped: both awk and xls including charts