High-speed Networks, Cybersecurity, and Software-defined Networking Workshop

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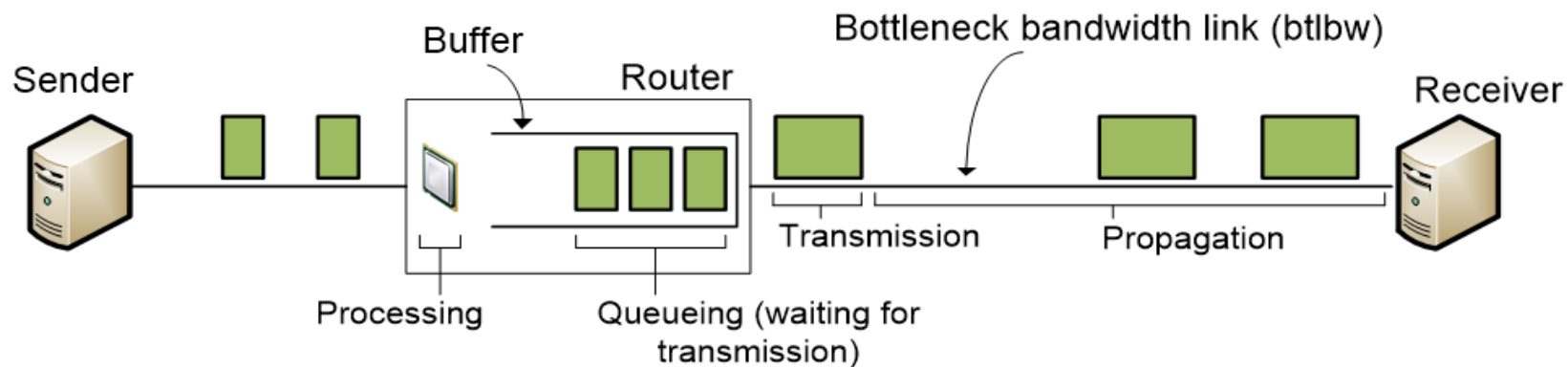
Lab 14: Router's bufferbloat

Content

- Introduction to bufferbloat
- Testing throughput on a network with a small buffer-size switch
- Testing throughput on a network with a 1·BDP buffer-size switch
- Testing throughput on a network with a large buffer-size switch

Section 1: Introduction to bufferbloat

Packet delays

- As a packet travels from a sender to a receiver, it experiences several types of delays at each node (router / switch) along the path
- The most important of these delays are the processing delay, queuing delay, transmission delay, and propagation delay

Bufferbloat

- In modern networks, the processing and transmission delays may be negligible
- The propagation delay can be considered as a constant
- The dynamics of the queues in routers results in varying queueing delays
- An important consideration that affects the queuing delay is the router's buffer size
- There is no consensus on how large the buffer should be
- Rule of thumb: buffer should be equal to the bandwidth-RTT product
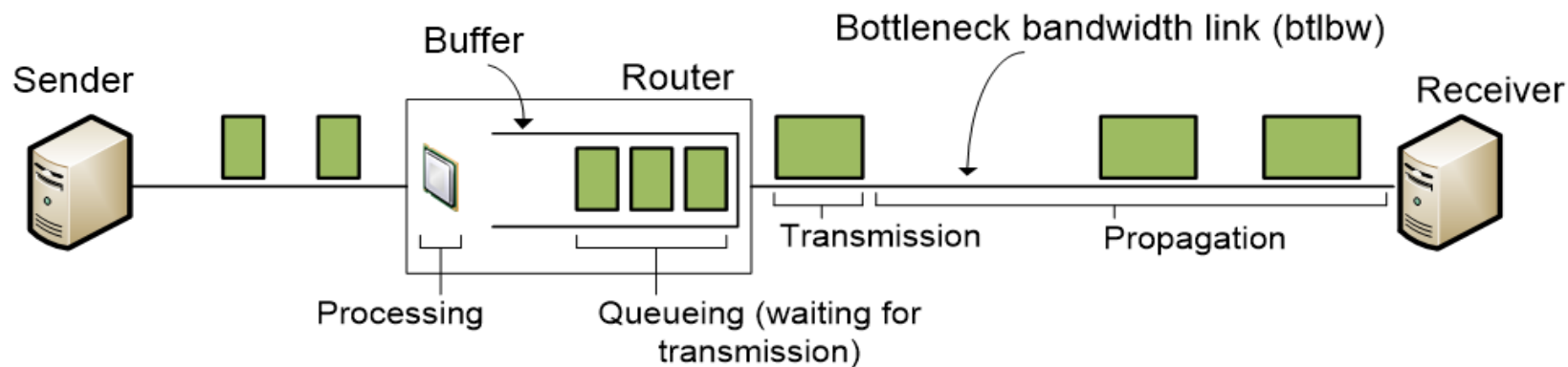
Bufferbloat

- A large-enough router's buffer size is essential to absorbs transitory packet bursts and prevents losses
- However, if a buffer size is excessively large, queues may be formed and substantial queueing delay may be observed
- The bufferbloat problem is caused by routers with large buffer size
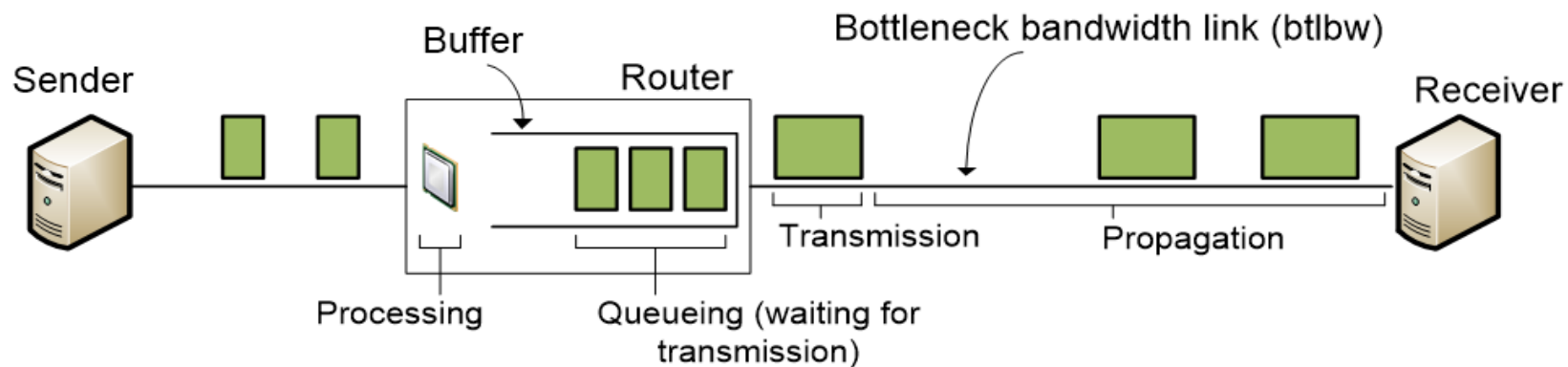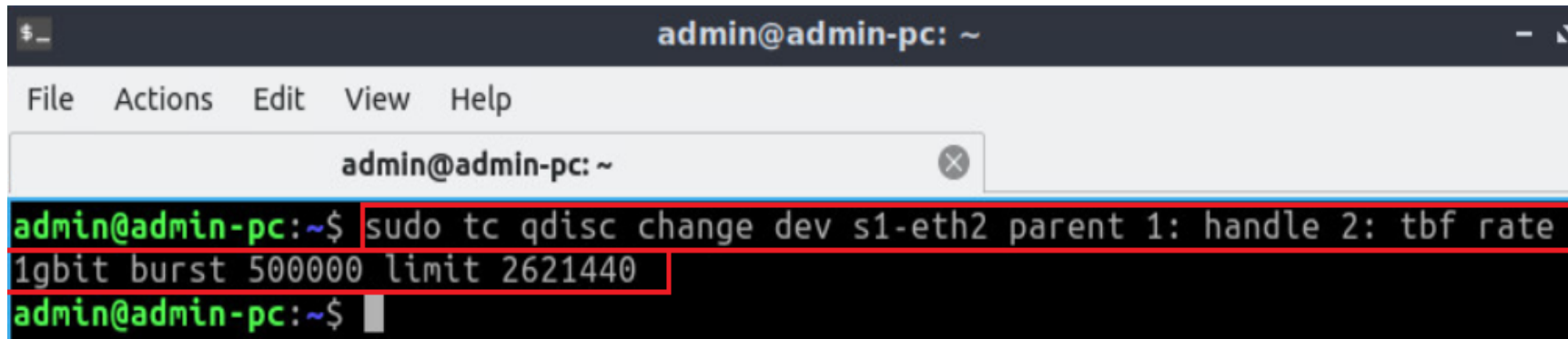
Emulating a wide area network

- The figure below shows the topology and the devices' interfaces
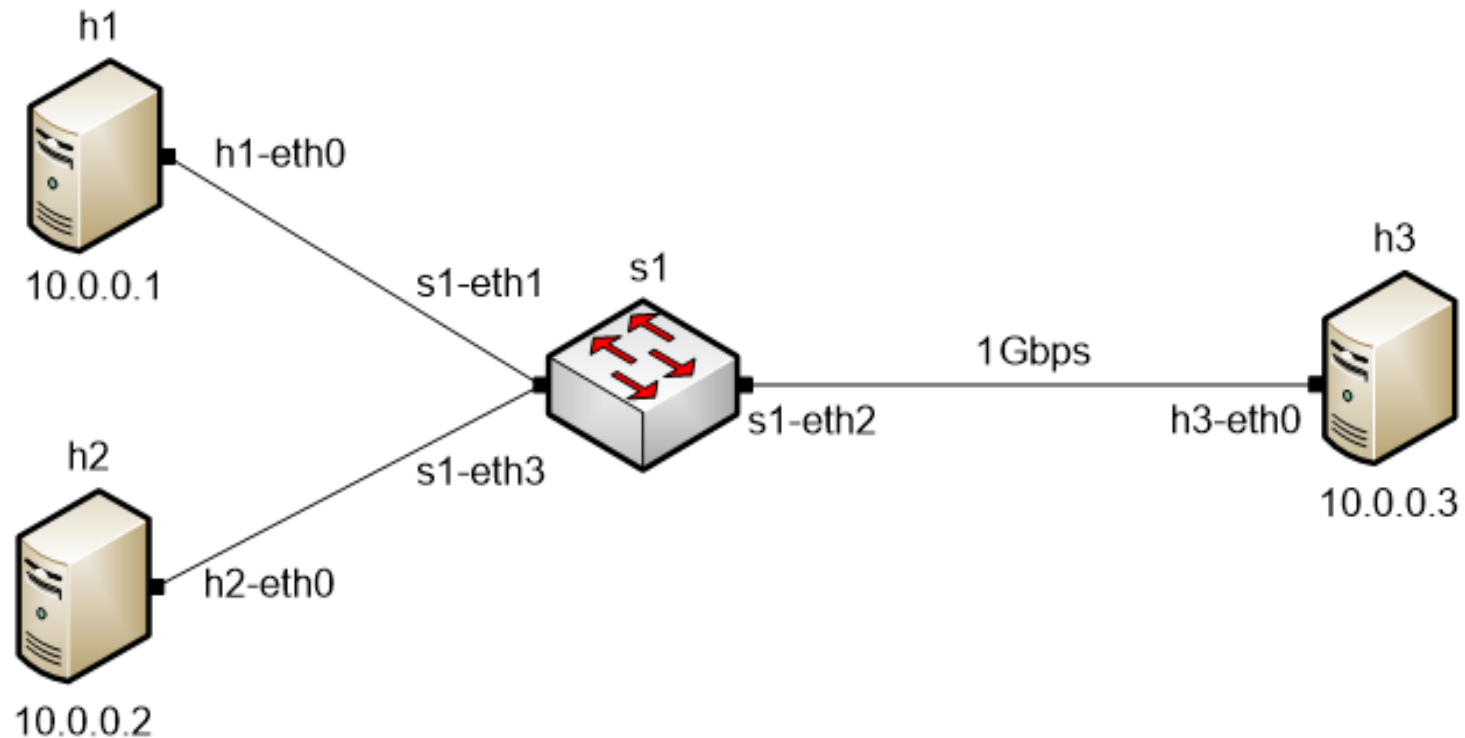
Section 3: Testing throughput on a network with a 1BDP buffer-size switch
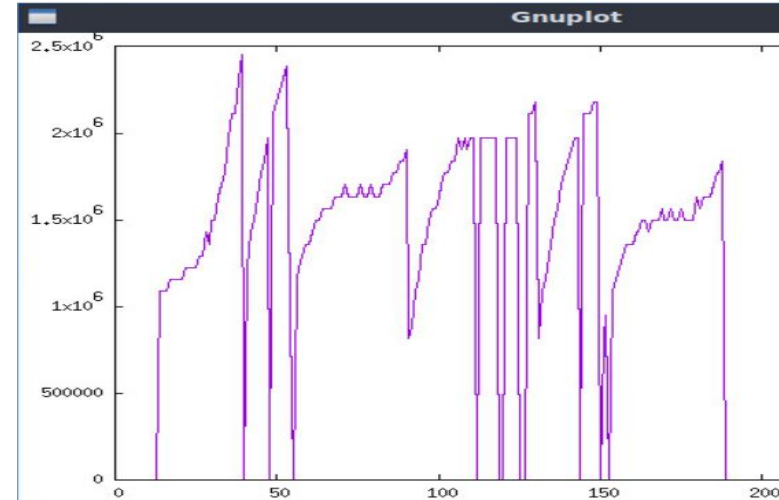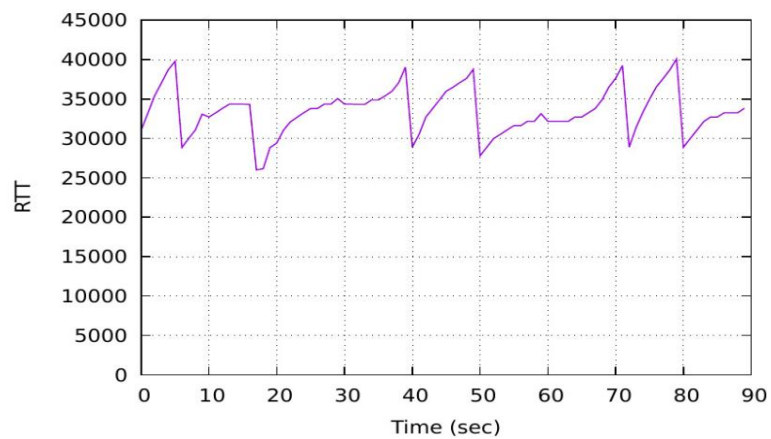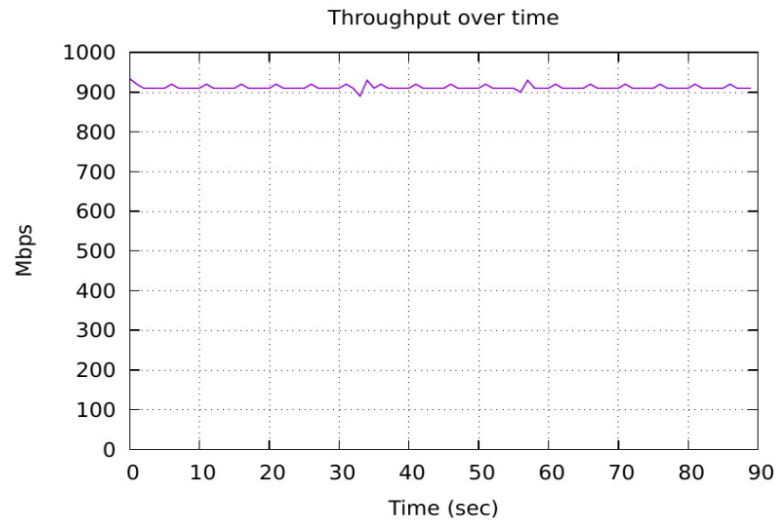
Setting switch s1's buffer size to 1BDP

- The following command configures a buffer size of 2,621,440 bytes (1BDP) to switch s1
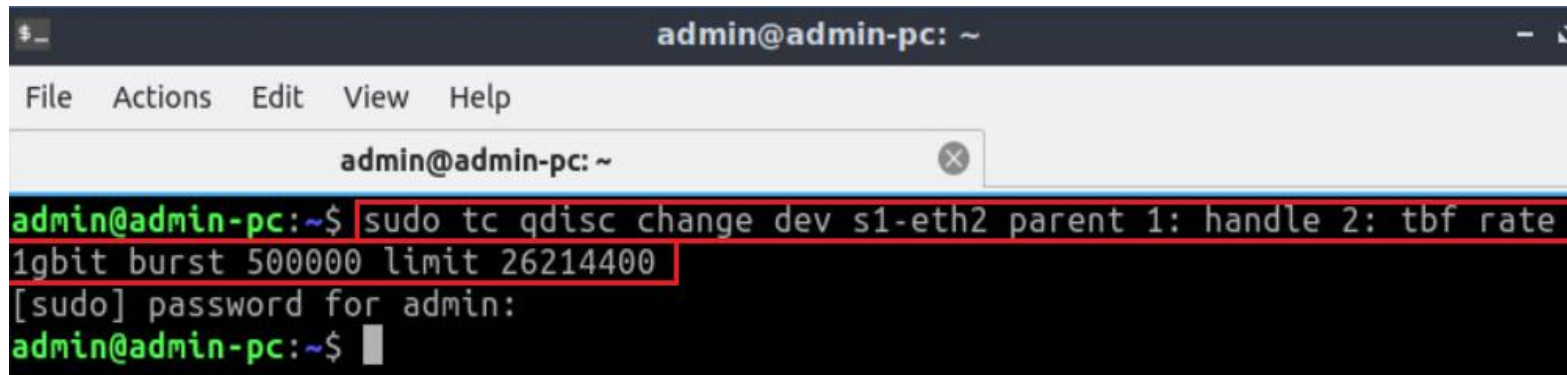
Running a throughput test

- The user performs a throughput test using iperf3 tool
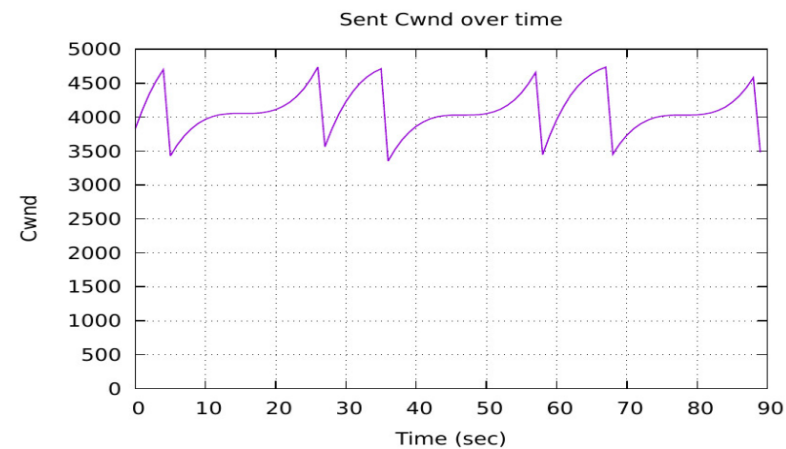
Section 4: Testing throughput on a network with a 100BDP buffer-size switch

Setting switch s1's buffer size to 100BDP

- The following command configures a buffer size of 26,214,400 bytes (100BDP) to switch s1

Running a throughput test

- The user performs a throughput test using iperf3 tool