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Device Independent Router Modeling

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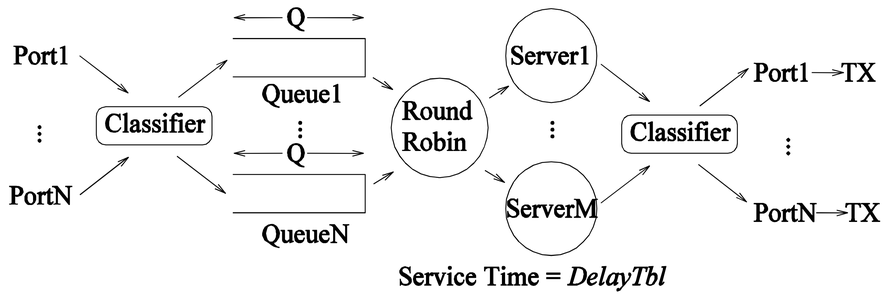
Several popular simulation and emulation environments fail to account for realistic commercial router behaviors. Such simulation or emulation inaccuracies can lead to dramatic and qualitative impacts on the results. In this work, we present a device independent model for routers and other forwarding devices, which we use to simulate commercial routers under varying traffic conditions.

Router Observations

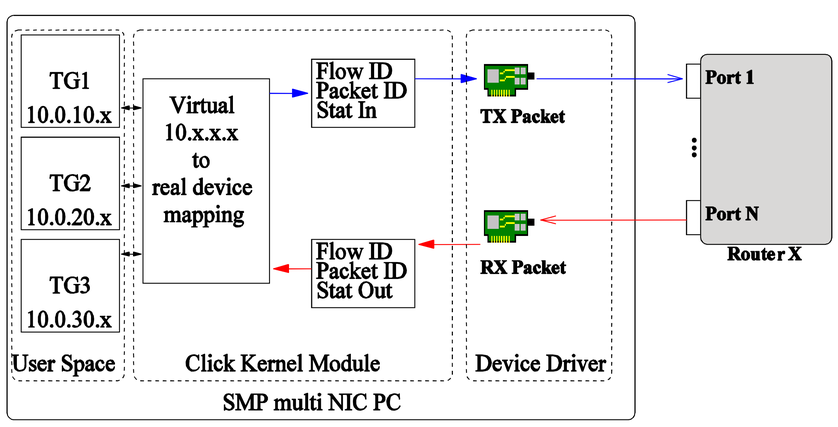
- Packets may get dropped or delayed
- Routers have a number of input and output interfaces
- Routers can have intermediate buffers/queues
- Packet flow in a router is complex and there can be several queues and servers for each part of the path
- Packets can be split into smaller parts
- Shared components can cause interference between packets destined for different output ports
- Packets can be pipelined

Router Model

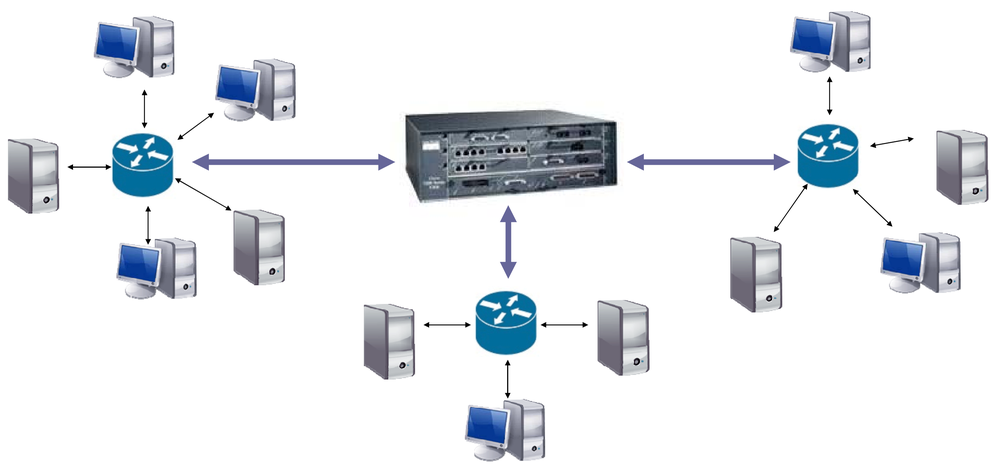


- *N* inputs are served by *M* servers
- Each packet size can have variable queue cost
- Some packets can require more than one server
- *DelayTbl* is the table of observed packet delays

Router Measurement System



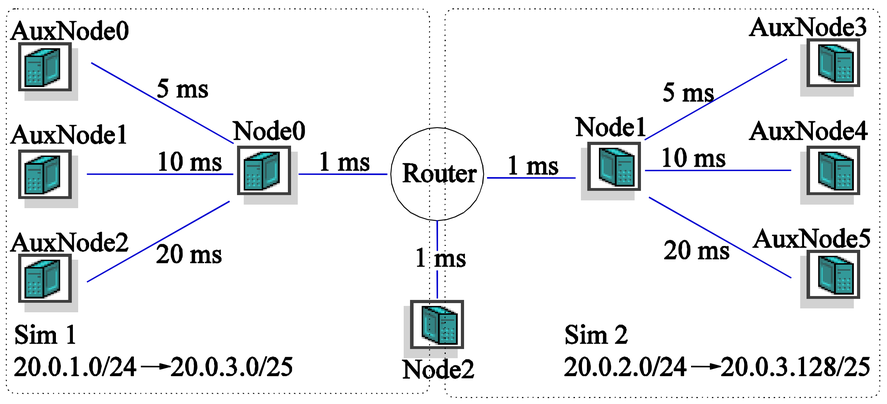
User-space traffic generator (ns-2 simulator) is connected to physical network devices via an emulator. Traffic from multiple "subnets" traverses the router. The system measures packet delay, loss, and corruption.



Network view from the router's stand point.

Model vs. Measurements

168 TCP flow experimental topology



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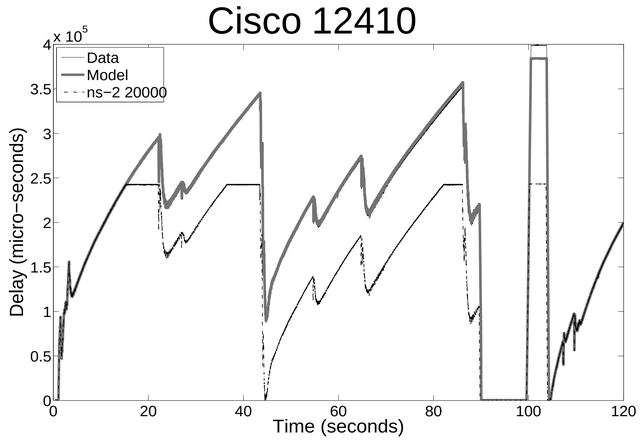

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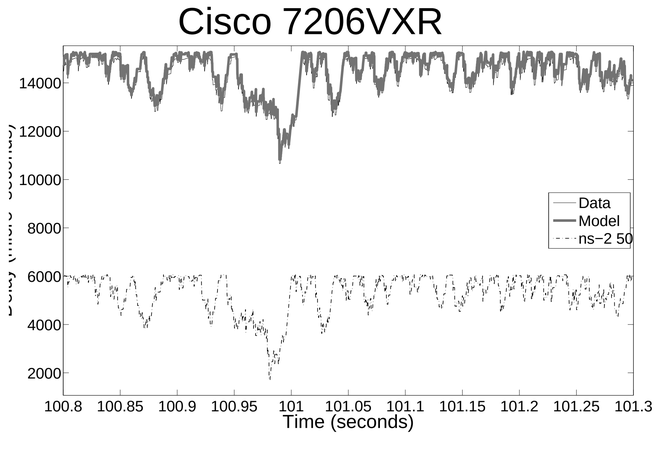

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