COMP1047-Networks-Lab2 Network Calculations

1. How long (in seconds) does it take to transmit a 0.1 GB (Giga Bytes) message over a network with 100Mbps (Mega bits per second) data transfer rate and 100 ms (milliseconds) latency?

$(0.1024 \times 10^9 \times 8) \div (100 \times 10^6) + 0.1 = 8.292$s (seconds)

2. Consider the network of four routers shown in Figure 1. Each link has a capacity of 50Mbps. Assume there is no contention on the access links or for router backplane resources, i.e., the only constraints are the link capacities between routers. There are four flows in the network, labelled *F1*, *F2*, *F3* and *F4*, which pass through the routers indicated. *F1* traverses *R3* → *R1*, *F2* traverses *R1* → *R2*, *F3* traverses *R2* → *R4*, and *F4* shares the links with every other flow and traverses *R3* → *R1* → *R2* → *R4*.

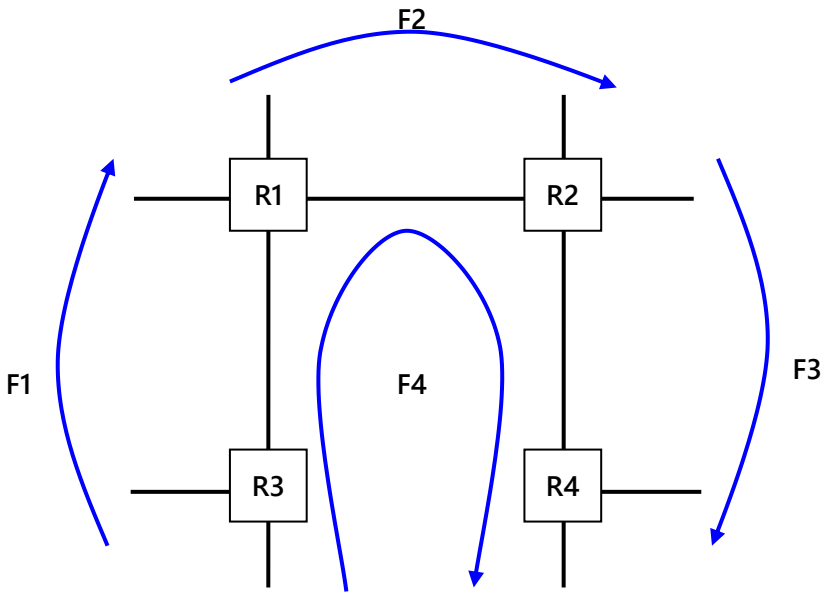

Figure 1

Assume each router implements: First In First Out (FIFO) queuing. If each flow consists of an identical and constant bit rate UDP flow with equal packet sizes, what is the resulting rate for each flow? Assume that FIFO drops packets with a uniform probability.

The resulting rate for each flow is:

F4 competes at *R3* with *F1* at 1:1, giving
F1: (1/2) × 50 Mbps = 25 Mbps
F4: (1/2) × 50 Mbps = 25 Mbps

F4 competes at *R1* with *F2* at (1/2):1, giving
F2: (2/3) × 50 Mbps = 33.33 Mbps
F4: (1/3) × 50 Mbps = 16.67 Mbps

F4 competes at *R2* with *F3* at (1/3):1, giving
F3: (3/4) x 50 Mbps = 37.5 Mbps
F4: (1/4) x 50 Mbps = 12.5 Mbps

3. We assume the URL of a webpage is "http://www.abc.com/index.html", with no web cache on your computer for the corresponding IP address. The file "index.html" has cited 8 small images. In the process, the Domain Name Resolution request and response time is denoted as RTTd, and the Round Trip Time for web object by HTTP request to transmit is denoted as RTTh. Please give:

(1) Domain name.

www.abc.com

(2) The minimum time that the browser resolves the URL for the corresponding IP address.

1RTTd

Explain: Host - local Domain Name Server

(3) If browser has no configuration for parallel TCP connections, how long does it take for us to browse the webpage full content (including the cited images) through HTTP1.0 (excluding the time for the Domain Name Resolution)?

18RTTh

Explain: 2 (Set up connection + Request the homepage) + 2 (Set up connection + Request the small image) × 8 (8 small images) = 18RTTh

(4) If browser has the configuration for 5 parallel TCP connections, how long does it take for us to browse the webpage full content (including the cited images) through HTTP1.0 (excluding the time for the Domain Name Resolution)?

6RTTh

Explain: 2 (Set up connection + Request the homepage) + 2 (Set up connection + Request the small image) × 2 (There are 8 small images in total; as we receive 5 parallel small images each time, so it takes us twice) = 6RTTh