【CN】Day8

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Class	
Type	
Materials	End-To-End Delay and Throughput
Reviewed	☐

【Ch1】Computer Networking and the Internet

1.4.3 End-to-End Delay

Let's now consider the total delay from source to destination.

Suppose there are N-1 routers and the network is uncongested(so that queuing delays are negligible), the processing delay at each router and at the source host is d_{proc}, the propagation on each link is d_{prop}.

The nodal delays accumulate and give an end-to-end delay,

$$d_{end-end} = N(d_{proc} + d_{trans} + d_{prop})$$

where d_{trans}=L/R, where L is the packet size and `R` is the transmission rate.

1.4.4 Throughput in Computer Networks

Let's consider the case where Host A is transferring a large video file to Host B.

The instantaneous throughput at any instant of time is the rate at which Host B is receiving the file.

If the file consists of F bits and the transfer takes T seconds for Host B to receive all F bits, then the average throughput of the file transfer is `F/T` bits/sec.

To gain further insight into the important concept of throughput, let's consider a few examples.

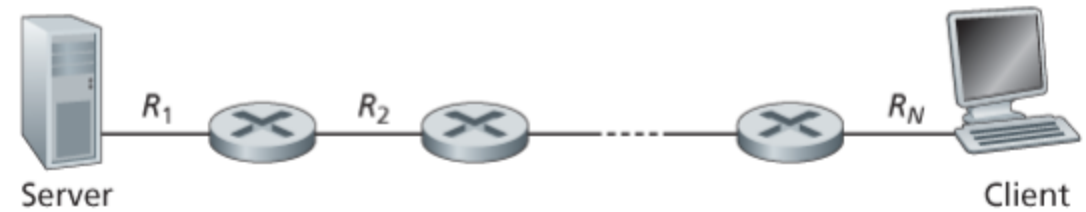
Consider that a server is transferring a file to a client. Let R_s denote the rate of the link between the server and the router; and R_c denote the rate of the link between the router and the client.

- If $R_s < R_c$, then the bits pumped by the server will flow right through the router and arrive at the client at a rate of R_s bps.
- If $R_c < R_s$, then the router will not be able to forward bits as quickly as it receives them. In this case, bits will only leave the router at rate R_c

a.

Thus, for this simple two-link network, the throughput is $min\{R_c, R_s\}$, it is the transmission rate of the bottleneck link.

Thus, the time it takes to transfer a large file of F bits from server to client as $F/min\{R_c, R_s\}$.



b.

Figure 1.19 Throughput for a file transfer from server to client

The figure now shows a network with N links between the server and the client, with the transmission rates of the N links being R1, R2, …, Rn. Now the transmission rate is $min\{R_1, R_2, ..., R_N\}$