

## Notes on Network measures

$l$  = Length of a path, in meters

$v$  = Signal propagation speed, in meters/sec

$L$  = Average length of frame or packet, in bits

$C$  = Transmission rate, in bits/sec

Propagation delay: We need  $l$  &  $v \rightarrow l/v$

Transmission time: need  $L$  &  $C \rightarrow L/C$

Throughput: Number of packets it can transmit per second, single nodes, whole network (sum of each nodes throughput)

Efficiency: current throughput/Max capacity

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Propagated packets/frames = propagation delay / transmission time

Total travel time = transmission time + [n intermediate nodes \* m packets(at each node) \* transmission time]

The pure transmission delay is how long the packet takes to get to receiver excluding queued packets it encounters at each node, i.e.:

pure transmission delay = transmission time + [n nodes \* transmission time]

The queuing delay is the time a packet must wait at a given node based on its position in the queue of other packets i.e.:

node queuing delay = n packets in the queue \* transmission time

Additionally the total queuing delay is  $\rightarrow$  n nodes \* queuing delay, assuming queuing delay is the same at each node.