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Computer Networking HW 1

1. R4

Digital Subscriber Line – Home access

Ethernet – Enterprise access

Wi-Fi – Home/enterprise access

5G – Wide-area wireless access

1. R7

DSL is faster than dial-up because the former uses a different frequency range for transmitting data, while the latter uses voice channels only. Voice channels have much less bandwidth so data transfer is slower.

1. R11

L/R1 + L/R2

1. R18

Total delay = transmission delay + propagation delay

1500 bytes = 12000 bits = 0.012 Mb

Wireless: 0.012 Mb / 2 Mbps + 1000m / 3 \* 108 m/s = 0.00600333… seconds

Wired: 0.012 Mb / 100 Mbps + 1000m / 2 \* 108 m/s = 0.000125 seconds

1. R25

Router: Network layer

Link-layer switch: Data link layer

Host: Application, transport, network, data link, physical layers

1. P5a

175km / (100 km / hr) = 1.75 hr = 105 min propagation delay. 10 cars / (5 cars / min) = 2 min transmission delay. Total time for the trip = 3 \* transmission delay + propagation delay = 111 min.

1. P8a

10 Mbps / (0.2 Mbps / user) = 50 users

1. P8c
2. P12

To transmit the information from the client to the router, it still takes L / R time. However, the router can begin to transmit the information earlier once it has received at least h bytes. This takes h / R time. The router and client are transmitting information at the same time until the last h bytes, so the total end to end delay is (L + h) / R. For n routers, the additional delay of h/R is multiplied by n. So the total delay is now (L + n\*h) / R.

1. P29
2. Propagation delay = 36000000m / 2.4\*108m/s = 0.15s
3. Bandwidth delay product = 10Mbps \* 0.15s = 1.5Mb
4. 10Mbps \* 60s = 600 Mb