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Sprint 1 Performance Solutions

Part 1 Solution

Converting link upload rate: 80 Mbits / sec = 80 * 2^{20} bits / sec * (1 byte / 8 bits) = 10 * 2^{20} bytes / sec = 10,500,000 bytes / sec

Converting 1 Mbyte file: 1 Mbyte = 1 * 2^{20} bytes = 1,050,000 bytes

Expected time to send a 1 Mbyte file on the *first* link: 1,050,000 bytes / (10,500,000 bytes / sec) = 0.1 sec * (1,000 ms / 1 sec) = 100 ms

Converting the round-trip latency to one-way latency: round-trip time / 2 = 20 ms / 2 = 10 ms

Total expected time required to transmit a 1 Mbyte file from source to destination: 100 ms + 10 ms = **110 ms**

Part 2 Solution

Converting link upload rate on the *first* link: 80 Mbits / sec = 80 * 2^{20} bits / sec * (1 byte / 8 bits) = 10 * 2^{20} bytes / sec = 10,500,000 bytes / sec

Converting link upload rate on the *second* link: 60 Mbits / 1 sec = 60 * 2^{20} bits / sec * (1 byte / 8 bits) = 7.5 * 2^{20} bytes / sec = 7,875,000 bytes / sec

Converting 1 Mbyte file: 1 Mbyte = 1 * 2^{20} bytes = 1,050,000 bytes

Expected time to send a 1 Mbyte file on the *first* link: 1,050,000 bytes / (10,500,000 bytes / sec) = 0.1 sec * (1,000 ms / 1 sec) = 100 ms

Expected time to send a 1 Mbyte file on the *second* link: 1,050,000 bytes / (7,875,000 bytes / sec) = 0.133 sec * (1,000 ms / 1 sec) = 133 ms

Converting the round-trip latency to one-way latency: round-trip time / 2 = 20 ms / 2 = 10 ms

Total expected time required to transmit a 1 Mbyte file from source to destination with both links: 100 ms + 133 ms + 10 ms = **243 ms**

Part 3 Solution

Converting link upload rate on the *first* link: 80 Mbits / sec = 80 * 2^{20} bits / sec * (1 byte / 8 bits) = 10 * 2^{20} bytes / sec = 10,500,000 bytes / sec

Converting link upload rate on the *second* link: 60 Mbits / 1 sec = 60 * 2^{20} bits / sec * (1 byte / 8 bits) = 7.5 * 2^{20} bytes / sec = 7,875,000 bytes / sec

Converting 1 Mbyte file: 1 Mbyte = 1 * 2^{20} bytes = 1,050,000 bytes

Expected time to send a 1 Mbyte file on the *first* link: 1,050,000 bytes / (10,500,000 bytes / sec) = 0.1 sec * (1,000 ms / 1 sec) = 100 ms

Expected time for the 512 KB file delay to be uploaded on the *second* link: 512 Kbyte = 512 * 2^{10} bytes = 524,288 bytes / (7,875,000 bytes / sec) = 0.067 sec * (1,000 ms / 1 sec) = 67 ms

Expected time to send a 1 Mbyte file on the *second* link: 1,050,000 bytes / (7,875,000 bytes / sec) = 0.133 sec * (1,000 ms / 1 sec) = 133 ms

Converting the round-trip latency to one-way latency: round-trip time / 2 = 20 ms / 2 = 10 ms

Total expected time required to transmit a 1 Mbyte file from source to destination with both links with the queueing delay: 100 ms + 67 ms + 133 ms + 10 ms = **310 ms**