Chapter 6

13. *M* terminals are attached by a dedicated pair of lines to a hub in a star topology. The distance from each terminal to the hub is *d* meters, the speed of the transmission lines is *R* bits/second, all frames are of length 12500 bytes, and the signal propagates on the line at a speed of 2.5 (10^8) meters/second. For the four combinations of the following parameters {*d* = 25 meters or *d* = 2500 meters; *R* = 10 Mbps or *R* = 10 Gbps}, compare the maximum network throughput achievable when the hub is implementing: Slotted ALOHA; CSMA/CD.

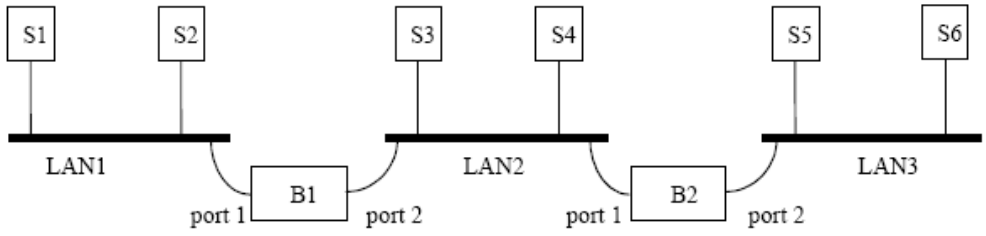
15. A wireless LAN uses polling to provide communications between *M* workstations and a central base station. The system uses a channel operating at 25 Mbps. Assume that all stations are 100 meters from the base station and that polling messages are 64 bytes long. Assume that frames are of constant length of 1250 bytes. Assume that stations indicate that they have no frames to transmit with a 64-byte message.

a. What is the maximum possible arrival rate that can be supported if stations are allowed to transmit an unlimited number of frames/poll?

b. What is the maximum possible arrival rate that can be supported if stations are allowed to transmit *N* frames/poll?

c. Repeat parts (a) and (b) if the transmission speed is 2.5 Gbps.

52. Six stations (S1-S6) are connected to an extended LAN through transparent bridges (B1 and B2), as shown in the figure below. Initially, the forwarding tables are empty. Suppose the following stations transmit frames: S2 transmits to S1, S5 transmits to S4, S3 transmits to S5, S1 transmits to S2, and S6 transmits to S5. Fill in the forwarding tables with appropriate entries after the frames have been completely transmitted.



Station	Port

Station	Port

Chapter 4

10. Suppose a multiplexer has two input streams, each at a nominal rate of 1 Mbps. To accommodate deviations from the nominal rate, the multiplexer transmits at a rate of 2.2 Mbps as follows. Each group of 22 bits in the output of the multiplexer contains 18 positions that always carry information bits, nine from each input. The remaining four positions consist of two flag bits and two data bits. Each flag bit indicates whether the corresponding data bit carries user information or a stuff bit because user information was not available at the input.

a. Suppose that the two input lines operate at exactly 1 Mbps. How frequently are the stuff bits used?

b. How much does this multiplexer allow the input lines to deviate from their nominal rate?

12. SONET allows positive or negative byte stuffing to take place at most once every four frames. Calculate the minimum and maximum rates of the payload that can be carried within an STS-1 SPE.

25. Compare the operation of a multiplexer, an add-drop multiplexer, a switch, and a digital cross-connect.

27. Consider the multistage switch in Figure 4.35 with $N = 16$, $n = 4$, $k = 2$.

a. What is the maximum number of connections that can be supported at any given time? Repeat for $k = 4$ and $k = 10$.

b. For a given set of input-output pairs, is there more than one way to arrange the connections over the multistage switch?

29. Consider the multistage switch in Figure 4.35 with $N = 32$. Compare the number of crosspoints required by a nonblocking switch with $n = 16$, $n = 8$, $n = 4$, and $n = 2$.