

lease point-to-point circuits from common carriers. Digital circuits use time division multiplexing standards (T-standards in North America or E-standards in Europe). High-speed circuits are defined using the Synchronous Transport Signal (North America) or Synchronous Digital Hierarchy (Europe). A parallel set of Optical Carrier standards exists for use with optical fiber; many professionals use the OC standard names, independent of whether the circuit uses fiber or copper.

A telephone company standard known as SONET defines framing for use on a digital circuit. The size of a SONET frame depends on the bit rate of the circuit; one frame always takes 125 μ seconds to send. In addition to its use on point-to-point circuits, SONET can be configured into a ring, which allows hardware to determine if the ring is broken and automatically reconfigure around the malfunction.

EXERCISES

- 12.1 What is an *access technology*?
- 12.2 Why do service providers distinguish between upstream and downstream communication?
- 12.3 Give examples of narrowband and broadband access technologies.
- 12.4 Telephone companies once promoted ISDN as a high-speed access technology. Why has use of ISDN declined?
- 12.5 If a customer intends to transmit more data than they receive, which forms of DSL would be appropriate? If they intend to receive more data than they transmit?
- 12.6 What type of multiplexing does ADSL use?
- 12.7 Two neighbors, who live on the same street, both use ADSL service, but measurements show that one subscriber can download at approximately 1.5 Mbps and the other can download at 2.0 Mbps. Explain.
- 12.8 Why is a splitter used with DSL?
- 12.9 If you had a choice between DSL and cable modem, which would provide the highest potential data rate?
- 12.10 Why would a service provider choose Hybrid Fiber Coax instead of Fiber To The Premises?
- 12.11 Where is a head-end modem located? A tail-end modem?
- 12.12 What is the advantage of WiMAX access technology compared to satellite? What is the advantage of satellite?
- 12.13 If you lease a T1 circuit, what equipment will be installed between the circuit and a computer at your site?
- 12.14 Use the Web to find the approximate size of a movie on DVD. How long does it take to download a movie over a T1 line? Over a T3 line? (Ignore overhead.)
- 12.15 If someone shows you a copper cable and claims that it is an “OC-12 circuit”, what error have they made? What is the correct name they should have used?