CS 2204-01 Communications and Networking

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Written Assignment Unit 2

**1. What is crosstalk? How is it minimized in case of a twisted pair of wire?**

Crosstalk refers to the phenomenon of signal interference between adjacent transmission lines in communication cables and circuits. This can cause unwanted effects on the signals of one circuit or another, potentially degrading the quality of data transmission. In the case of twisted pair lines, crosstalk is minimized primarily by the physical arrangement and electrical characteristics. Twisted pairing consists of Japanese wires twisted closely together, and this twisting offsets the effects of interference. The twist moves some parts of each pair closer to the interference source while other parts move away, thus averaging out the effects of interference on the passing signal. The density of torsion can be varied to reduce interference at specific frequencies, and a protective layer can be applied to prevent external interference and help reduce crosstalk.

**2. Why are two separate frequencies used for uplink and downlink transmission in case of satellite communication?**

The following are four reasons why two separate frequencies are used in satellite communications for the uplink and downlink.

1. Avoidance of interference: Using the same frequency can cause interference between the transmitted and received signals. This is especially problematic when satellites receive and transmit signals at the same time. By using different frequencies, interference can be effectively avoided.
2. Bandwidth optimization: By using different frequency bands for the uplink and downlink, the bandwidth of each link can be adjusted more flexibly. For example, in many cases, higher data rates are required on the downlink, so more bandwidth can be allocated.
3. Flexibility in system design and management: The use of two different frequencies allows greater flexibility in the design of satellite and ground station systems. This allows the system to be more easily tailored to meet specific communication requirements and regulations.
4. efficient use of available frequency spectrum: By using different frequencies, the available frequency spectrum can be used more efficiently to improve the quality and capacity of communication services. This is especially important to maximize the use of limited spectrum resources.

**3. Differentiate between the 2 switching techniques (Circuit Switching and Packet Switching).(4 differences)**

The two switching technologies, circuit switching, and packet switching, have fundamental differences in data communications. Four main differences are listed below.

|  | Circuit Switching | Packet Switching |
| --- | --- | --- |
| Connection Settings | Before communication begins, a physical communication path (circuit) is established between the source and destination. This circuit is dedicated for the duration of the communication session and is not used for any other data transfer. | Data is divided into smaller units called packets, and each packet is transmitted independently. No communication path needs to be established, and packets can reach their destination via different paths in the network. |
| Bandwidth Utilization | During a communication session, the bandwidth of an established circuit is used exclusively but is wasted when no data is being transmitted. | Packets are sent on an as-needed basis, allowing efficient use of network bandwidth. Multiple communications can share the same physical media. |
| Latency and Reliability | Once a connection is established, delays are relatively low, and constant communication quality is guaranteed. However, establishing a connection can take time. | Because each packet goes through a different path, delays and packet reordering are possible, but reliability is ensured through advanced error detection and retransmission. In addition, packet routing is flexible, and reroutes can be selected in the event of a failure. |
| Application Examples | It is suitable for real-time communications where delays are unacceptable, such as telephone networks. | Widely used for data communications, such as the Internet, it can transmit various types of data efficiently. |

**4. What is the answer to Exercise 2.7 from Section 2 of our textbook with this change: the 4th transmission (B sends to D) does not occur?**

When A transmits to D, all switches use fallback-to-flooding because none of the switches know D's location. However, all switches S1-S4 know where A is.

When D transmits to A, S2 knows where A is, so it routes the packet directly to S1, which also knows where A is. S3 and S4 do not know where D is.

When A sends to B, all switches again use fallback-to-flooding, but none of the switches learn anything new.

When B transmits to D, S4 uses fallback-to-flooding because it does not know where D is. However, S2 knows where D is, so S2 forwards the packet only to D.

In summary, the table shows the destinations recognized by each switch.

| switch | known source addresses |
| --- | --- |
| S1 | A,D |
| S2 | A,B,D |
| S3 | A |
| S4 | A,B |

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References

Dordal, P. (2019). *An introduction to computer networks.*

(n.d.). *Computer networks.*