DATA COMMUNICATIONS AND NETWORKING

Chapter 08

Rising Flare Community

Made with LaTeX and ArchLinux.
Source code is available on GitHub. Feel free to check it out!

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2.5 An entry in the switching table of a virtual-circuit network is normally created during the setup phase and deleted during the teardown phase. In other words, the entries in this type of network reflect the current connections, the activity in the network. In contrast, the entries in a routing table of a datagram network do not depend on the current connections; they show the configuration of the network and how any packet should be routed to a final destination. The entries may remain the same even if there is no activity in the network. The routing tables, however, are updated if there are changes in the network. Can you explain the reason for these two different characteristics? Can we say that a virtual-circuit is a connection-oriented network and a datagram network is a connectionless network because of the above characteristics? 7

2.6 The minimum number of columns in a datagram network is two; the minimum number of columns in a virtual-circuit network is four. Can you explain the reason? Is the difference related to the type of addresses carried in the packets of each network? 7
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1 Questions

1.1 Describe the need for switching and define a switch.

A switched network consists of a series of interlinked nodes, called switches. Switching is required to connect multiple devices to a single network.
A switch is a device that connects multiple devices to a single network. For example, routers, bridges, and gateways are all types of switches.

1.2 List the three traditional switching methods. Which are the most common today?

The three traditional switching methods are

- Circuit switching
- Message switching
- Packet switching

Circuit switching and Packet switching is the most common method today.

1.3 What are the two approaches to packet switching?

The two approaches to packet switching are datagram and virtual-circuit.

1.4 Compare and contrast a circuit-switched network and a packet-switched network.

In a circuit-switched network, a dedicated communication path is established between two devices. In a packet-switched network, data is divided into packets and sent over the network.

1.5 What is the role of the address field in a packet traveling through a datagram network?

The address field in a packet traveling through a datagram network is used to identify the destination device.

1.6 What is the role of the address field in a packet traveling through a virtual- circuit network?

The address field in a packet traveling through a virtual-circuit network is used to identify the virtual circuit.

1.7 Compare space-division and time-division switches.

Space-division switches use multiple paths to connect devices, while time-division switches use a single path and divide the time into slots.

1.8 What is TSI and what is its role in time-division switching?

TSI stands for Time Slot Interchange. It is used to switch time slots in a time-division switch.

1.9 Compare and contrast the two major categories of circuit switches.

The two major categories of circuit switches are crossbar switches and time-division switches. Crossbar switches use multiple paths to connect devices, while time-division switches use a single path and divide the time into slots.

1.10 List four major components of a packet switch and their functions.

The four major components of a packet switch are

- Input ports
- Output ports
- Switching fabric
- Routing processor

2 Problems

2.1 A path in a digital circuit-switched network has a data rate of 1 Mbps. The exchange of 1000 bits is required for the setup and teardown phases. The distance between two parties is 5000 km. Answer the following questions if the propagation speed is 2×10^8 m.

1. What is the total delay if 1000 bits of data are exchanged during the data-transfer phase?
2. What is the total delay if 100,000 bits of data are exchanged during the data-transfer phase?
3. What is the total delay if 1,000,000 bits of data are exchanged during the data-transfer phase?
4. Find the delay per 1000 bits of data for each of the above cases and compare them. What can you infer?

2.2 Five equal-size datagrams belonging to the same message leave for the desti- nation one after another. However, they travel through different paths as shown in Table 1.

Datagram	Path Length	Visited Switches
1	3200 km	1, 3, 5
2	11,700 km	1, 2, 5
3	12,200 km	1, 2, 3, 5
4	10,200 km	1, 4, 5
5	10,700 km	1, 4, 3, 5

Table 1: P8-2

hi **We assume that the delay for each switch (including waiting and processing) is 3, 10, 20, 7, and 20 ms respectively. Assuming that the propagation speed is** 2×10^8 **m, find the order the datagrams arrive at the destination and the delay for each. Ignore any other delays in transmission.**

2.3 Transmission of information in any network involves end-to-end addressing and sometimes local addressing (such as VCI). Table 8.2 shows the types of networks and the addressing mechanism used in each of them.

Network	Setup	Data Transfer	Teardown
Circuit-switched	End-to-end		End-to-end
Datagram		End-to-end	
Virtual-Circuit	End-to-end	Local	End-to-end

Table 2: P8-3

Answer the following questions:

1. **Why does a circuit-switched network need end-to-end addressing during the setup and teardown phases? Why are no addresses needed during the data transfer phase for this type of network?**
2. **Why does a datagram network need only end-to-end addressing during the data transfer phase, but no addressing during the setup and teardown phases?**
3. **Why does a virtual-circuit network need addresses during all three phases?**

2.4 We mentioned that two types of networks, datagram and virtual-circuit, need a routing or switching table to find the output port from which the information belonging to a destination should be sent out, but a circuit-switched network has no need for such a table. Give the reason for this difference.

2.5 An entry in the switching table of a virtual-circuit network is normally created during the setup phase and deleted during the teardown phase. In other words, the entries in this type of network reflect the current connections, the activity in the network. In contrast, the entries in a routing table of a datagram network do not depend on the current connections; they show the configuration of the network and how any packet should be routed to a final destination. The entries may remain the same even if there is no activity in the network. The routing tables, however, are updated if there are changes in the network. Can you explain the reason for these two different characteristics? Can we say that a virtual-circuit is a connection-oriented network and a datagram network is a connectionless network because of the above characteristics?

2.6 The minimum number of columns in a datagram network is two; the minimum number of columns in a virtual-circuit network is four. Can you explain the reason? Is the difference related to the type of addresses carried in the packets of each network?

2.7 Figure 8.27 shows a switch (router) in a datagram network.

Destination address	Output port
1233	3
1456	2
3255	1
4470	4
7176	2
8766	3
9144	2

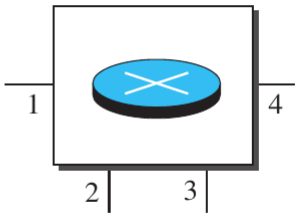

Figure 1: 8.27