CSC360 Homework 3 Due Apr. 15

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1. Please describe concisely how datagram networks and virtual-circuit networks use a forwarding table. (12 points)

* Datagram

In order to achieve a successful transfer of data the algorithm uses a routing table to select a next-hop router as the next destination for a datagram. The IP address that is selected is known as the next-hop address.

* virtual-circuit

Virtual Circuit switches have link-level forwarding tables. Interfaces have forwarding tables that specify the outgoing interface, virtual path identifier, and virtual circuit identifier. When is in use, the virtual circuit switches at the edges of the virtual circuit will map one of the standard virtual circuit end-to-end identifiers, such as an NSAP, to the next-hop VPI/VCI

2. In a router, data may be lost at input port and output port. Why? (12 points)

Data can be lost at an input or output point due to a bit error or spurious packet loss due to noise, which can be caused by unstable current or massive traffic through a single line.

3. What is the 32-bit binary equivalent of the IP address 192.168.200.32? (12 points)

11000000101010001100100000100000

4. Suppose you purchase a wireless router and connect it to your cable modem. Also suppose that your ISP dynamically assigns your connected device (that is, your wireless router) one IP address. Also suppose that you have five PCs at home that use 802.11 to wirelessly connect to your wireless router. How are IP addresses assigned to the five PCs? Does the wireless router use NAT? Why or why not. (12 points)

IP addresses are most frequently assigned dynamically on LANs and broadband networks by the Dynamic Host Configuration Protocol (DHCP). They are used because it avoids the administrative burden of assigning specific static addresses to each device on a network. Furthermore, yes, NAT is used in making a private address, however, in a global environment NAT is not used.

5. Compare and contrast link state and distance vector routing algorithm. (12 points)

The basic concept of link-state routing is that every node constructs a map of the connectivity to the network, in the form of a graph, showing which nodes are connected to which other nodes. Each node then independently calculates the next best logical path from it to every possible destination in the network. The collection of best paths will then form the node's routing table.

A distance-vector routing protocol requires that a router inform its neighbors of topology changes periodically. Compared to link-state protocols, which require a router to inform all the nodes in a network of topology changes, distance-vector routing protocols have less computational complexity and message overhead.[

6. A bare-bone forwarding table in a VC network has four columns. What is the meaning of the values in each of these columns? A bare-bone forwarding table in a datagram network has two columns. What is the meaning of the values in each of these columns? (12 points)

VC ID, Local Label, Egress Label, Data Source

VC ID and Data Source

VC ID is the ID assigned to a virtual connection

Data Source is the destination from which data originates

7. Consider a datagram network using 32-bit host addresses. Suppose a router has four links, numbered 0 through 3, and packets are to be forwarded to the link interfaces as follows:

Destination Address Range Link Interface

11101000 00000000 00000000 00000000

Through 0

11101000 11111111 11111111 11111111

11101001 00000000 00000000 00000000

Through 1

11101001 00000000 11111111 11111111

11101001 00000000 00000000 00000000

Through 2

11101001 11111111 11111111 11111111

Otherwise 3

(a) Provide a forwarding table that has four entries, use longest-prefix matching, and forwards packets to the correct link interfaces.

|  |  |
| --- | --- |
| Prefix Match | Link Interface |
| 11100000 | 0 |
| 11100001 00000000 | 1 |
| 11100001 | 2 |
| otherwise | 3 |

(b) Describe how your forwarding table determines the appropriate link interface for datagram with destination addresses:

11101000 10010001 01010001 01010101

11101001 00000000 11000011 00111100

11100001 10000000 00010001 01110111

|  |  |
| --- | --- |
| IP Number | Interface |
| 11001000 10010001 01010001 01010101 | 3 |
| 11100001 00000000 11000011 00111100 | 1 |
| 11100001 10000000 00010001 01110111 | 2 |

(12 points)

8. Consider a router that interconnects three subnets: Subnet 1, Subnet 2, and Subnet 3. Suppose all of the interfaces in each of these three subnets are required to have the prefix 138.157.45/24. Also suppose that Subnet 1 is required to support up to 111 interfaces, and Subnets 2 and 4 are each required to port up to 63 interfaces.

Provide three network addresses (of the form a.b.c.d/x) that satisfy these constraints. (16 points)

138.157.45.0/25

138.157.45.128/26

138.157.45.192/26