# **Raj Desai**

**CMPEN - 362**

# HW4

## Problem 1

Consider a datagram network using 8-bit host addresses. Suppose a router using longest prefix matching has the following forwarding table:

|  |  |
| --- | --- |
| Prefix | Interface |
| 0 | 0 |
| 001 | 1 |
| 010 | 2 |
| 11 | 2 |
| otherwise | 3 |

For each of the four interfaces, give the associated range of destination host addresses and the number of addresses in the range.

**Ans:**

|  |  |  |
| --- | --- | --- |
| Interface | Range | # of add in range |
| 0 | 00000000 - 00011111 | 32 |
| 1 | 00100000 - 00111111 | 32 |
| 2 | 01000000 - 01011111 | 32 |
| 2 | 11000000 - 11111111 | 64 |
| 3 | 01100000 - 10111111 | 96 |

## Problem 2

Consider an ISP that owns the block of addresses in 123.119.14.64/26. Suppose it wants to create three subnets, where Subnet1 supports at least 30 interfaces, Subnet2 supports at least 12 interfaces, and Subnet3 supports at least 9 interfaces. Provide the network addresses (of the form a.b.c.d/x) of the three subnets that satisfy these requirements.

**Ans:**

|  |  |  |
| --- | --- | --- |
| Subnet | IP Address | # of Interfaces (supports more than that) |
| 1 | 123.119.14.96/27 | 30 |
| 2 | 123.119.14.64/28 | 12 |
| 3 | 123.119.14.80/28 | 9 |

## Problem 3

Consider the network shown in Figure 1.



Figure 1. Illustration for Problem 3.

1. Give the network addresses of Subnets A, B, and C in the form of a.b.c.d/x, such that: Subnet A supports 8 interfaces, Subnet B supports 16 interfaces, Subnet C supports 32 interfaces.

**Ans:**

|  |  |  |
| --- | --- | --- |
| Subnet | IP Address | # of Interfaces |
| A | 223.1.1.7/29 | 8 |
| B | 223.1.2.15/28 | 16 |
| C | 223.1.3.31/27 | 32 |

1. Using answer to a), provide the forwarding tables (each row containing “prefix match” and “outgoing interface” fields) for each of the three routers. Suppose that no packet will have a router interface as the final destination. For the outgoing interface, you only need to specify which subnet the packet needs to be forwarded to (e.g., Router 1 can forward to Subnet A, Subnet D, Subnet F).

**Ans:**

|  |  |  |
| --- | --- | --- |
| Router | Prefix Match | Outgoing Interface (Subnet) |
| 1 | 11011111 00000001 00000001 00000 | A |
| 1 | 11011111 00000001 00001001 | D |
| 1 | 11011111 00000001 00000111 | F |
| 2 | 11011111 00000001 00000010 0000 | B |
| 2 | 11011111 00000001 00001001 | D |
| 2 | 11011111 00000001 00001000 | E |
| 3 | 11011111 00000001 00000011 000 | C |
| 3 | 11011111 00000001 00001000 | E |
| 3 | 11011111 00000001 00000111 | F |

## Problem 4

Consider sending a 5000-byte datagram (including IP header) to a link that has an MTU of 1000 bytes. Suppose that the original datagram has an identification number of 301. Answer the following:

1. How many fragments are generated?
   * Number of fragments is: (5000-20)/(1000-20) => 6
2. Which header fields are used to support fragmentation?
   * Length, ID, Fragflag and offset
3. What are the values of these header fields for each of the fragment?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Packet Number | Length | ID | Fragflag | Offset |
| 1 | 1000 | X | 1 | 0 |
| 2 | 1000 | X | 1 | 123 |
| 3 | 1000 | X | 1 | 245 |
| 4 | 1000 | X | 1 | 368 |
| 5 | 1000 | X | 1 | 490 |
| 6 | 100 | X | 0 | 613 |

## Problem 5

Consider the SDN network shown in Figure 2. Specify the flow table entries in s2 (each row contains “match” and “action” fields) according to the following behaviors:

* datagrams arriving on port 1 from hosts h5 or h6 that are destined to hosts h1 or h2 should be forwarded to port 2;

|  |  |
| --- | --- |
| Match | Action |
| Ingress Port=1 | Forward(2) |
| IP Src = 10.3.\*.\* |  |
| IP Dest = 10.1.\*.\* |  |

* datagrams arriving on port 2 from hosts h1 or h2 that are destined to hosts h5 or h6 should be forwarded to port 1;

|  |  |
| --- | --- |
| Match | Action |
| Ingress Port=2 | Forward(1) |
| IP Src = 10.1.\*.\* |  |
| IP Dest = 10.3.\*.\* |  |

* datagrams arriving on ports 1 or 2 that are destined to hosts h3 or h4 should be delivered to the respective host;

|  |  |
| --- | --- |
| Match | Action |
| Ingress Port =1 | Forward(3) |
| IP Dest = 10.2.0.3 |  |
| Ingress Port = 2 | Forward(3) |
| IP Dest = 10.2.0.3 |  |
| Ingress Port = 1 | Forward(4) |
| IP Dest = 10.2.0.4 |  |
| Ingress Port =2 | Forward(4) |
| IP Dest = 10.2.0.4 |  |

* datagrams from host h3 to hosts h1, h2, h5, and h6 should be forwarded to port 1;

|  |  |
| --- | --- |
| Match | Action |
| Ingress Port = 3 | Forward(1) |
| IP Dest = 10.1.0.1 |  |
| Ingress Port = 3 | Forward(1) |
| IP Dest = 10.1.0.2 |  |
| Ingress Port = 3 | Forward(1) |
| IP Dest = 10.3.0.5 |  |
| Ingress Port = 3 | Forward(1) |
| IP Dest = 10.3.0.6 |  |

* datagrams from host h4 to hosts h1, h2, h5, and h6 should be forwarded to port 2;

|  |  |
| --- | --- |
| Match | Action |
| Ingress Port = 4 | Forward(2) |
| IP Dest = 10.1.0.1 |  |
| Ingress Port = 4 | Forward(2) |
| IP Dest = 10.1.0.2 |  |
| Ingress Port = 4 | Forward(2) |
| IP Dest = 10.3.0.5 |  |
| Ingress Port = 4 | Forward(2) |
| IP Dest = 10.3.0.6 |  |



Figure 2. Illustration for Problem 5.