**LAB 6 SUBNET MASKING**

COMPLETE THE FOLLOWING SUBNETTING PROBLEMS

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Networking Fundamentals Lab Sheet 6

**ANSWER EXAMPLE I**

**Your new Company has applied and received a public IP address from your local ISP. The address is 218.5.67.0/24**

1. What is the Class of this IP address? Class C
2. What is the network address for your company? 218.5.67.0
3. What is the maximum number of hosts you can have on your network? 28 – 2 = 254 hosts
4. What is the broadcast address for your entire network? 218.5.67.0
5. What is the default subnet mask for this network? 255.255.255.224

You require 5 subnets.

/24 + /3 = 27

1. How many host bits do you need to use to create subnet identifiers? 3 bits
2. What is the new customised subnet mask for this network? 255.255.255.224
3. What is the maximum number of hosts that can be connected to each subnet? 25 – 2 = 30 hosts
4. What is the maximum number of hosts you can have on your entire new subnetted network? 8 \* 30 = 240 Hosts

Complete the table overleaf.

The following data packets arrive at your network’s border router.

Determine which subnet that the data is destined for and to which host on that subnet they are addressed for.

1. 218.5.67.89 (Subnet 3) 218.5.67.64 Host
2. 218.5.67.23 (Subnet 1) 218.5.67.0 Host
3. 218.5.67.109 (Subnet 4) 218.5.67.96 Host
4. 218.5.67.91 (Subnet 3) 218.5.67.64 Host
5. 218.5.67.64 (Subnet 3) 218.5.67.64 Host
6. 218.5.67.252 (Subnet 8) 218.5.67.224 Host
7. 218.5.67.115 (Subnet 4) 218.5.67.96 Host
8. 218.5.67.143 (Subnet 5) 218.5.67.128 Host **Check your answers using Solar Winds Subnet Calculator**

**ANSWER EXAMPLE I**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Subnet No.** | **Subnet Bits - Binary** | **Subnet Bits - Decimal** | **Binary Range**  **of Host Bits** | **Decimal Range**  **SN+Host Bits** | **Subnet Address** | **Subnet**  **Broadcast Address** |
| 1 | 000 | 0 | 01 000 0000-1111 | 1 - 30 | 218.5.67.0 | 218.5.67.31 |
| 2 | 001 | 32 | 01 001 0000 - 1111 | 33 - 62 | 218.5.67.32 | 218.5.67.63 |
| 3 | 010 | 64 | 01 010 0000-1111 | 65 - 94 | 218.5.67.64 | 218.5.67.95 |
| 4 | 011 | 96 | 01 011 0000 - 1111 | 97 - 126 | 218.5.67.96 | 218.5.67.127 |
| 5 | 100 | 128 | 01 100 0000-1111 | 129 - 158 | 218.5.67.128 | 218.5.67.159 |
| 6 | 101 | 160 | 01 101 0000 - 1111 | 161 - 190 | 218.5.67.160 | 218.5.67.191 |
| 7 | 110 | 192 | 01 110 0000-1111 | 193 - 222 | 218.5.67.192 | 218.5.67.223 |
| 8 | 111 | 224 | 01 111 0000 - 1111 | 225 - 254 | 218.5.67.224 | 218.5.67.255 |

EXAMPLE II

**Your new Company has applied and received a public IP address from your local ISP. The address is 153.218.0.0/16**

1. What is the Class of this IP address? Class B
2. What is the network address for your company? 153.218.0.0
3. What is the maximum number of hosts you can have on your network? 216 – 2 = 65,534 hosts
4. What is the broadcast address for your entire network? 153.218.255.254
5. What is the default subnet mask for this network? 255.255.240.0

You require 12 subnets.

/16 + /4 = /20

1. How many host bits do you need to use to create subnet identifiers? 4 bits
2. What is the new customised subnet mask for this network? 255.255.240.0
3. What is the maximum number of hosts that can be connected to each subnet? 212 – 2 = 4,094 hosts
4. What is the maximum number of hosts you can have on your entire new subnetted network? 16 \* 4094 = 65,504

Complete the table overleaf .

The following data packets arrive at your network’s border router.

Determine which subnet that the data is destined for and to which host on that subnet they are addressed for.

1. 153.218.206.56 (Subnet 13) 153.218.0.192 Host
2. 153.218.191.255 (Subnet 12) 153.218.0.176 Host
3. 153.218.38.117 (Subnet 3) 153.218.0.32 Host
4. 153.218.127.127 (Subnet 8) 153.218.0.112 Host
5. 153.218.96.0 (Subnet 7) 153.218.96.0 Host
6. 153.218.192.0 (Subnet 13) 153.218.192.0 Host
7. 153.218.15.241(Subnet 1) 153.218.0.0 Host
8. 153.218.241.15(Subnet 16) 153.218.0.240 Host **Check your answers using Solar Winds Subnet Calculator**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Subnet No.** | **Subnet Bits – Binary**  **(octet 3)** | **Subnet Bits - Decimal** | **Binary Range**  **of Host Bits** | **Decimal Range**  **SN+Host Bits**  **(last 2 octets)** | **Subnet Address** | **Subnet**  **Broadcast Address** |
| 1 | 0000 | (0) | 1. 0000 0000-1111 | 0.1 -15.254 | 153.218.0.0 | 153.218.15.255 |
| 2 | 0001 | (+16) | 01 0001 0000 - 1111 | 16.1 – 31.254 | 153.218.16.0 | 153.218.31.255 |
| 3 | 0010 | (+32) | 01 0010 0000-1111 | 32.1 – 47.254 | 153.218.32.0 | 153.218.47.255 |
| 4 | 0011 | (+48) | 01 0011 0000 - 1111 | 48.1 – 63.254 | 153.218.48.0 | 153.218.63.255 |
| 5 | 0100 | (+64) | 01 0100 0000 - 1111 | 64.1 – 79.254 | 153.218.64.0 | 153.218.79.255 |
| 6 | 0101 | (+80) | 01 0101 0000 - 1111 | 80.1 – 95.254 | 153.218.80.0 | 153.218.95.255 |
| 7 | 0110 | (+96) | 01 0110 0000 - 1111 | 96.1 – 111.254 | 153.218.96.0 | 153.218.111.255 |
| 8 | 0111 | (+112) | 01 0111 0000 - 1111 | 112.1 – 127.254 | 153.218.112.0 | 153.218.127.255 |
| 9 | 1000 | (+128) | 01 1000 0000 - 1111 | 128.1 - 143.254 | 153.218.128.0 | 153.218.143.255 |
| 10 | 1001 | (+144) | 01 1001 0000 - 1111 | 144.1 - 159.254 | 153.218.144.0 | 153.218.159.255 |
| 11 | 1010 | (+160) | 01 1010 0000 - 1111 | 160.1 - 175.254 | 153.218.160.0 | 153.218.175.255 |
| 12 | 1011 | (+176) | 01 1011 0000 - 1111 | 176.1 - 191.254 | 153.218.176.0 | 153.218.191.255 |
| 13 | 1100 | (+192) | 01 1100 0000 - 1111 | 192.1 - 207.254 | 153.218.192.0 | 153.218.207.255 |
| 14 | 1101 | (+208) | 01 1101 0000 - 1111 | 208.1 - 223.254 | 153.218.208.0 | 153.218.223.255 |
| 15 | 1110 | (+224) | 01 1110 0000 - 1111 | 224.1 - 239.254 | 153.218.224.0 | 153.218.239.255 |
| 16 | 1111 | (+240) | 01 1111 0000 - 1111 | 239.1 - 255.254 | 153.218.240.0 | 153.218.255.255 |

**EXAMPLE III (more difficult problem!)**

**Your new Company has applied and received a public IP address from your local ISP. The address is 11.5.67.64/26**

1. What is the Class of this IP address? Class A
2. What is the network address for your company? 11.5.67.64
3. What is the maximum number of hosts you can have on your network? 26 – 2 = 62 hosts
4. What is the broadcast address for your entire network? 11.5.67.127
5. What is the subnet mask for this network? 255.255.255.192

You require 3 subnets.

/26 + /2 = /28

1. How many host bits do you need to use to create subnet identifiers? 2 bits
2. What is the new customised subnet mask for this network? 255.255.255.240
3. What is the maximum number of hosts that can be connected to each subnet? 24 – 2 = 14 hosts
4. What is the maximum number of hosts you can have on your entire new subnetted network? 4 \* 14 = 56 hosts

Complete the table overleaf.

Data packets arrive at your network’s border router with the following destination IP addresses.

Determine which subnet that the data is destined for and to which host on that subnet they are addressed for.

1. 11.5.67.89 (Subnet 2) 11.5.67.80 Host
2. 11.5.67.73(Subnet 1) 11.5.67.79 Host
3. 11.5.67.109(Subnet 3) 11.5.67.96 Host
4. 11.5.67.117(Subnet 4) 11.5.67.112 Host
5. 11.5.67.94(Subnet 2) 11.5.67.80 Host
6. 11.5.67.125(Subnet 4) 11.5.67.112 Host
7. 11.5.67.115(Subnet 4) 11.5.67.112 Host
8. 11.5.67.68(Subnet 1) 11.5.67.79 Host

**Check your answers using Solar Winds Subnet Calculator**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Subnet No.** | **Subnet Bits - Binary** | **Subnet Bits - Decimal** | **Binary Range**  **of Host Bits** | **Decimal Range**  **SN+Host Bits** | **Subnet Address** | **Subnet**  **Broadcast Address** |
| 1 | **00** | 64 (0) | 01 00 0000-1111 | 65 - 78 | 11.5.67.64 | 11.5.67.79 |
| 2 | **01** | 80 (+16) | 01 01 0000 - 1111 | 81 - 94 | 11.5.67.80 | 11.5.67.95 |
| 3 | **10** | 96 (+32) | 01 10 0000-1111 | 97 - 110 | 11.5.67.96 | 11.5.67.111 |
| 4 | **11** | 112 (+48) | 01 11 0000 - 1111 | 113 - 126 | 11.5.67.112 | 11.5.67.127 |