**ID515001:**

**Introduction to Networks**

**Subnetting Assignment**

Learning Outcome

1. Design and build a simple local area network using device addressing schemes and basic network configurations.

**Student Name:**

**Course Weighting 20%**

**Due Date/Time:** Friday 27 September

A 10% penalty will be applied for each day late.

**Part 1**

**A)** Explain the difference between FLSM and VLSM. (3 marks)

VLSM is variable length subnet mask while FLSM is fixed length subnet mask.

With VLSM you can have networks with different sized masks while with FLSM each mask is the same length. FLSM is also known as classful addressing while VLSM is class*less* addressing. FLSM is separated into classes which represent how many octets can be used i.e class C = /24 -> 32

**B)** Describe three reasons why it is advantageous to subnet a large network. (3 marks)

Subnetting a large network helps with:  
 breaking down a large network into various smaller networks.

Enhances security by isolating problems to certain smaller networks.

Reduces overall network traffic and buffs performance.

**C)** Describe classful addressing. (3 marks)

Classful addressing is restricts the prefix size you can use based on how many available empty network mask octets there are (i.e /8 -> /15 = class A representing the 255.**0**.. octet).

**D)** Why is classless addressing considered better than classful addressing. (3 marks)

More efficient ip addressing which leads to better efficiency overall, it can have a different amount of hosts per subnet (/7 -> /30) as opposed to classful being contained to each class (/16 -> /23)

**Part 2**



Figure 1

**A)** Review Figure 1. You are provided with the network 10.200.2.0 /24.

Using FLSM how many subnet bits are required? How many subnets does this create?

Show working.

6 networks.

2^n = how many subnets I need.

2^n = 8

8/6 > 1.

n = 3

3 bits are required, 8 subnets are made leaving 2 spare.

(2 marks)

**B)** How many usable hosts are in each subnet created in question A?

Show working.

128 192 224 240 248 252 254 255

128 64 32 16 8 4 2 1

0 0 0 0 0 1 1 1

8 – 2 (2 for broadcast)

6 usable hosts

(2 marks)

**C)** What is the new mask in both dotted decimal and prefix length formats for the subnets created in question A?

**255.255.255.248**

**/29**

(2 marks)

**D)** Provide a table for the FLSM networks in Figure 1. Include the following:

* Network name
* Network IP address
* Broadcast IP address
* First usable IP address
* Last usable IP address

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Device | Network Name | Network IP | Broadcast IP | First IP | Last IP |
| S1 > R1 | S1 | 10.200.2.0 | 10.200.2.7 | 10.200.1 | 10.200.2.6 |
| S2 > R1 | S2 | 10.200.2.8 | 10.200.2.15 | 10.200.2.9 | 10.200.2.14 |
| S3 > R1 | S3 | 10.200.2.16 | 10.200.2.23 | 10.200.2.17 | 10.200.2.22 |
| R1 > R2 | R1 | 10.200.2.24 | 10.200.2.31 | 10.200.2.25 | 10.200.2.30 |
| R2 > S4 | R2 | 10.200.2.32 | 10.200.2.39 | 10.200.2.33 | 10.200.2.38 |
| S4 > HostPC | S4 | 10.200.2.40 | 10.200.2.47 | 10.200.2.41 | 10.200.2.46 |

(5 marks)

**E)** Provide a table for the FLSM networks in Figure 1. This time use the starting network of 10.100.128.0 /22. Provide your working for determining the size of each network.

Include the following:

* Network name
* Network IP address
* Broadcast IP address
* First usable IP address
* Last usable IP address

/24 = 11111111.11111111.11111111.00000000

/22 = 11111111.11111111.11111100.00000000

5 bits for the network instead of 3 as theres 2 extra from /24 -> /22

Creating a /27 network

128 192 224 240 248 252 254 255

128 64 32 16 8 4 2 1

0 0 0 1 1 1 1 1

This means I have 32 ipv4 ip addressing per network

And a total of 30 usable hosts per subnet

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Device | Network Name | Network IP | Broadcast IP | First IP | Last IP |
| S1 > R1 | S1 | 10.200.2.0 | 10.200.2.31 | 10.200.1 | 10.200.2.30 |
| S2 > R1 | S2 | 10.200.2.32 | 10.200.2.63 | 10.200.2.33 | 10.200.2.62 |
| S3 > R1 | S3 | 10.200.2.64 | 10.200.2.95 | 10.200.2.65 | 10.200.2.94 |
| R1 > R2 | R1 | 10.200.2.96 | 10.200.2.127 | 10.200.2.97 | 10.200.2.126 |
| R2 > S4 | R2 | 10.200.2.128 | 10.200.2.159 | 10.200.2.129 | 10.200.2.158 |
| S4 > HostPC | S4 | 10.200.2.160 | 10.200.2.191 | 10.200.2.161 | 10.200.2.190 |

(5 marks)

**Part 3**



Figure 2

**A)** Review Figure 2. You are provided with the network 10.50.3.0 /24.

You are to use VLSM to create subnets of the correct size to meet the needs of Figure 2. Ensure each network is the minimum size needed.

Provide a table for the VLSM networks in Figure 2. Include the following:

* Network name
* Network IP address
* Broadcast IP address
* First usable IP address
* Last usable IP address

Provide your working for determining the size of each network.

/24 = 11111111.11111111.11111111.00000000

128 192 224 240 248 252 254 255

128 64 32 16 8 4 2 1

0 0 0 1 1 1 1 1

S1 = 64 > 100 > **128 = /25**

S2 = 32 > 50 > **64 = /26**

S3 = 16 > 25 > **32 = /27**

R1 = 2 > 3 > **4 = /30**

R2 = 2 > 2 > **4** = **/30**

S4 = 4 > 6 > **8** = **/29**

| Subnet Description | Number of Hosts Needed | Network Address/CIDR | First Usable Host Address | Last Usable Host Address | Broadcast Address |
| --- | --- | --- | --- | --- | --- |
| S1 | 100 | 10.50.3.0/25 | 10.50.3.1 | 10.50.3.126 | 10.50.3.127 |
| S2 | 50 | 10.50.3.128/26 | 10.50.3.129 | 10.50.3.190 | 10.50.3.191 |
| S3 | 25 | 10.50.3.192/27 | 10.50.3.193 | 10.50.3.222 | 10.50.3.223 |
| R1 | 3 | 10.50.3.224/30 | 10.50.3.225 | 10.50.3.226 | 10.50.3.227 |
| R2 | 2 | 10.11.48.228/30 | 10.50.3.229 | 10.50.3.230 | 10.50.3.231 |
| S4 | 6 | 10.11.48.232/29 | 10.50.3.233 | 10.50.3.238 | 10.50.3.239 |

(10 marks)

**B)** Using the network information determined in A, provide an additional table that defines a valid IP address for each router interface and each switch management VLAN 1.

Ensure the switch is assigned the last usable IP address in the network.

(5 marks)

| Device | Interface | Address | Subnet Mask | Default Gateway |
| --- | --- | --- | --- | --- |
|  | G0/0 | 10.11.48.97 | 255.255.255.240 | N/A |
| R1 | G0/1 | 10.11.48.65 | 255.255.255.224 | N/A |
|  | S0/0/0 | 10.11.48.121 | 255.255.255.252 | N/A |

**Part 4**

**A)** What is IPv6 link local addressing used for? (2 marks)

Link local allows IPv6 devices to communicate with other IPv6 Devices on the same link.

**B)** Explain what SLAAC is and how it works (5 marks)

GUA = Global Unicast Address. SLAAC = **S**tate**L**ess **A**ddress **A**uto**C**onfiguration.

SLAAC automatically configures IPv6 Addresses it uses 64 bits for this. It automatically specifies the default gateway to be the routes linklocal. SLAAC can do this with or without DHCPv6. SLAAC is provided to hosts via Router Advertisement messages sent by routers.

**C)** Provide an IPv6 addressing scheme in a table for the network topology shown below in figure 3 by subnetting 2001:DB8:ACCA::/48.

Include the following:

IPv6 global unicast address for each router interface.

IPv6 link local address for each router interface.

(5 marks)

| **Subnet Description** | **Cable** | **Global Unicast Address** | **Link Local Address** |
| --- | --- | --- | --- |
| S1 | G0/1 –> R1 | 2001:DB8:ACCB::/48 | 2001:DB8:ACC1::/48 |
| S2 | G0/2 –> R1 | 2001:DB8:ACCC::/48 | 2001:DB8:ACC1::/48 |
| S3 | G0/3 –> R1 | 2001:DB8:ACCD::/48 | 2001:DB8:ACC1::/48 |
| R1 | G0/4 –> R2 | 2001:DB8:ACCE::/48 | 2001:DB8:ACC1::/48 |
| R2 | G0/2 –> R1 | 2001:DB8:ACCF::/48 | 2001:DB8:ACC1::/48 |
| S4 | G0/1 –> R2 | 2001:DB8:ACC0::/48 | 2001:DB8:ACC1::/48 |



Figure 3

**Assignment of Marks**

You will be assigned marks as follows:-

* **Total Marks available** 55 marks

|  |  |  |
| --- | --- | --- |
| **Section** | **Topic** | **Mark** |
| Part 1 | Questions | 12 |
| Part 2 | FLSM | 16 |
| Part 3 | VLSM | 15 |
| Part 4 | IPv6 | 12 |