COLLEGE OF ENGINEERING
CENTRAL PHILIPPINE UNIVERSITY
ILOILO CITY, PHILIPPINES

SE 3224 LABORATORY

2nd Semester 2022 – 2023

LABORATORY NO. 7

Designing an IP Subnetting Scheme for Growth

Submitted by:

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BSSE – 3

Submitted to:

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Instructor

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I. Objectives

a. To be able to design an IP subnetting scheme that meets a specified network requirement.
b. To efficiently allocate IP addresses to network segments.
c. To design an IP subnetting scheme that can handle future possibility of growth.

II. Design

Step 1: Determining the number of subnets needed.

- Since there are 4 subnets initially required in the problem and the 20% growth requirement, multiply 4 by 1.2.
- This will yield 4.8 subnets or ~5 subnets in order to handle the possibility of future growth.

Step 2: Identify the number of hosts needed for each subnet.

- From the given network requirement based on the problem, the number of hosts for each subnet are as follows:
    - Subnet 1: 20 hosts
    - Subnet 2: 10 hosts
    - Subnet 3: 25 hosts
    - Subnet 4: 15 hosts

Step 3: Subnetting Proper

- Subnet mask: 2^3 = 8
- The subnet mask will be 255.255.255.248, enough to cater the maximum of 25 hosts per subnet

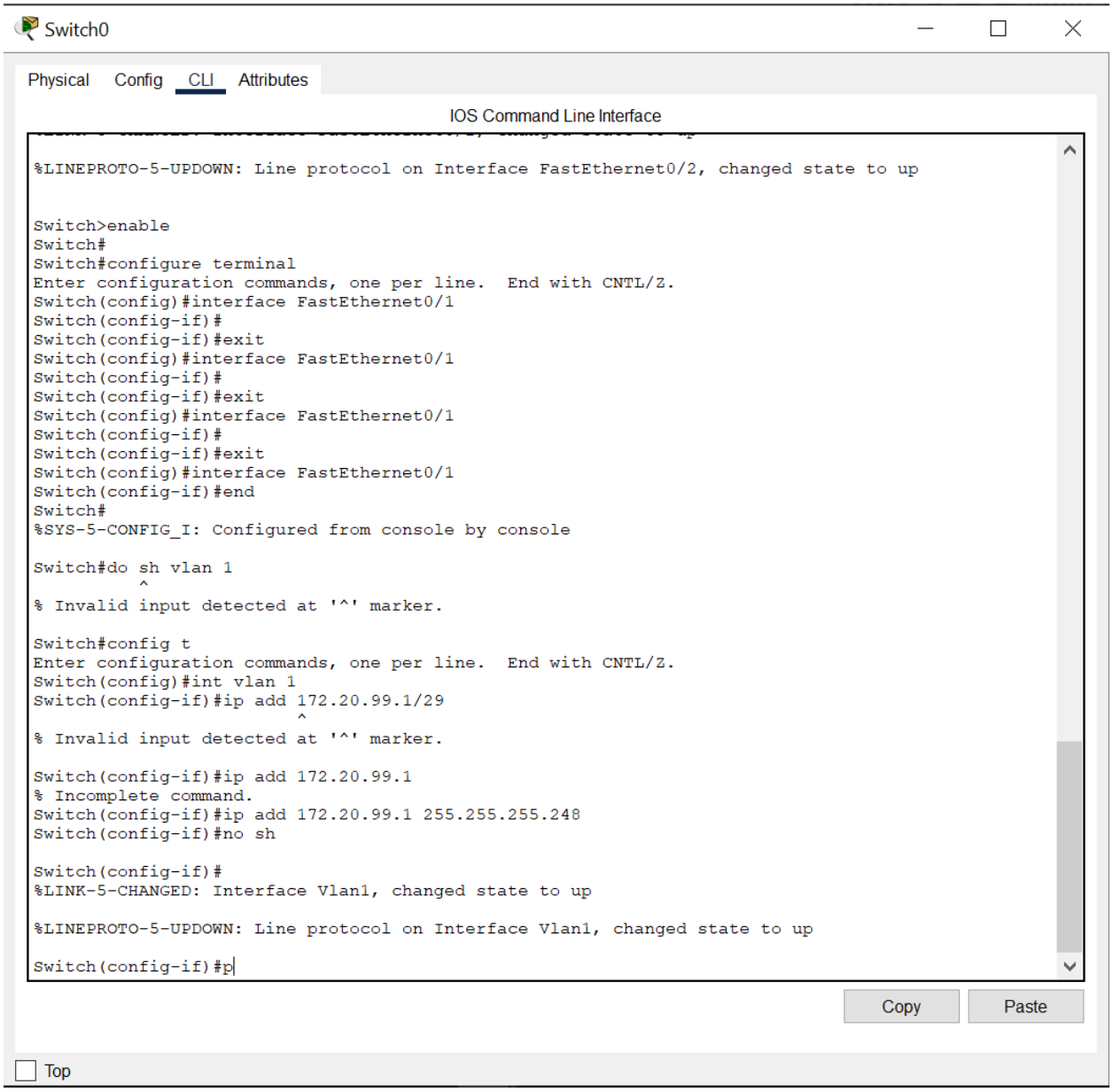
Step 4: Allocation of IP Addresses for the Router

- Router 1: 172.20.99.1/29
- Router 2: 172.20.99.9/29
- Router 3: 172.20.99.17/29
- Router 4: 172.20.99.25/29
- Router 5: 172.20.99.33/29

Step 5: Allocation of IP Addresses for the Hosts

- Subnet 1: 172.20.99.2 to 172.20.99.6 (5 hosts)
- Subnet 2: 172.20.99.10 to 172.20.99.14 (5 hosts)
- Subnet 3: 172.20.99.18 to 172.20.99.22 (5 hosts)
- Subnet 4: 172.20.99.26 to 172.20.99.30 (5 hosts)
- Subnet 5: 172.20.99.34 to 172.20.99.38 (5 hosts)

III. Schematics



Switch1

Physical Config CLI Attributes

IOS Command Line Interface

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state to up


Switch>config t
              ^
% Invalid input detected at '^' marker.

Switch>conf t
            ^
% Invalid input detected at '^' marker.

Switch>config t
              ^
% Invalid input detected at '^' marker.

Switch>end
Translating "end"...domain server (255.255.255.255)
% Unknown command or computer name, or unable to find computer address

Switch>enable
Switch#int vlan 1
           ^
% Invalid input detected at '^' marker.

Switch#do sh vlan br
          ^
% Invalid input detected at '^' marker.

Switch#do sh vlan br
          ^
% Invalid input detected at '^' marker.

Switch#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#int vlan 1
Switch(config-if)#ip add 172.20.99.9 255.255.255.248
Switch(config-if)#no sh

Switch(config-if)#
%LINK-5-CHANGED: Interface Vlan1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to up

Switch(config-if)#
```

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Top

Switch2

Physical Config CLI Attributes

IOS Command Line Interface

```
Model Number                     : WS-C2960-24TT-L
System serial number             : FOC1010X104
Top Assembly Part Number         : 800-27221-02
Top Assembly Revision Number     : A0
Version ID                       : V02
CLEI Code Number                 : COM3L00BRA
Hardware Board Revision Number   : 0x01

Switch Ports Model              SW Version            SW Image
------ ----- -----              ----------            ----------
*    1 26    WS-C2960-24TT-L    15.0(2)SE4            C2960-LANBASEK9-M

Cisco IOS Software, C2960 Software (C2960-LANBASEK9-M), Version 15.0(2)SE4, RELEASE SOFTWARE
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Press RETURN to get started!


%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

%LINK-5-CHANGED: Interface FastEthernet0/2, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state to up


Switch>enable
Switch#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#int vlan 1
Switch(config-if)#ip add 172.20.99.17 255.255.255.248
Switch(config-if)#no sh

Switch(config-if)#
%LINK-5-CHANGED: Interface Vlan1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to up

Switch(config-if)#
```

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Top

Switch3

Physical Config CLI Attributes

IOS Command Line Interface

```
Top Assembly Part Number        : 800-27221-02
Top Assembly Revision Number    : A0
Version ID                      : V02
CLEI Code Number                : COM3L00BRA
Hardware Board Revision Number  : 0x01

Switch Ports Model              SW Version            SW Image
------ ----- -----              ----------            ----------
*    1 26    WS-C2960-24TT-L    15.0(2)SE4            C2960-LANBASEK9-M

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Press RETURN to get started!


%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

%LINK-5-CHANGED: Interface FastEthernet0/2, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state to up


Switch>enable
Switch#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#int vlan 1
Switch(config-if)#int vlan 3
Switch(config-if)#int vlan 1
Switch(config-if)#ip add 172.20.99.25 255.255.255.248
Switch(config-if)#no sh

Switch(config-if)#
%LINK-5-CHANGED: Interface Vlan1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to up

Switch(config-if)#
```

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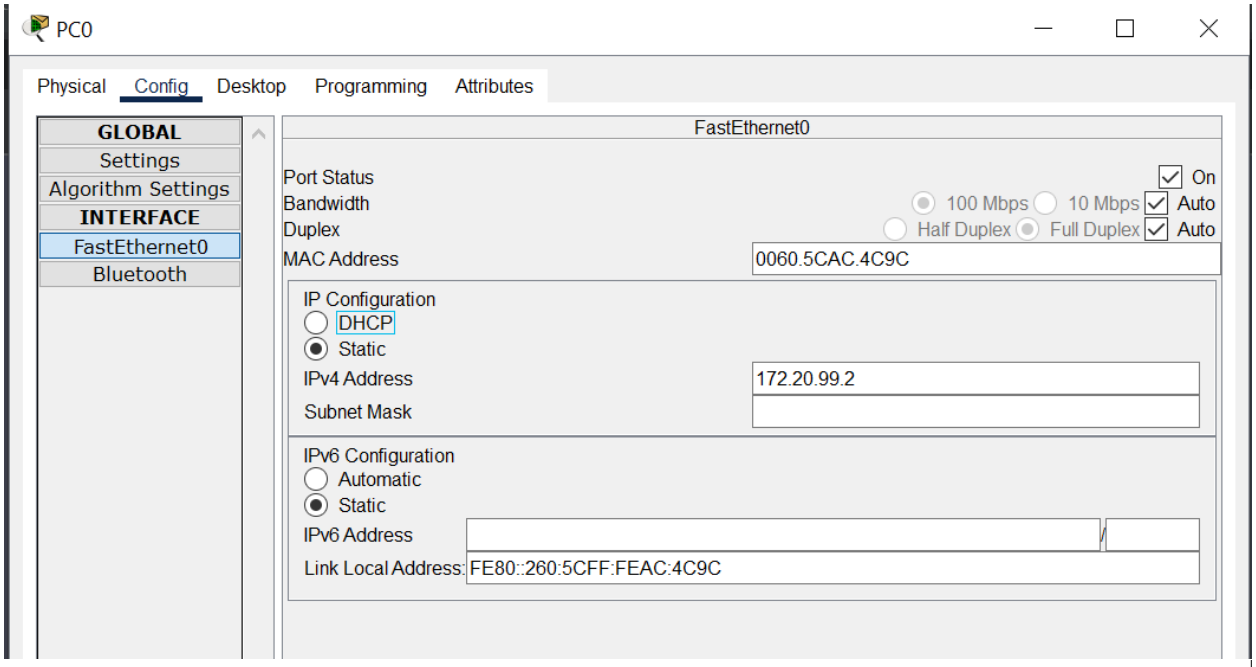
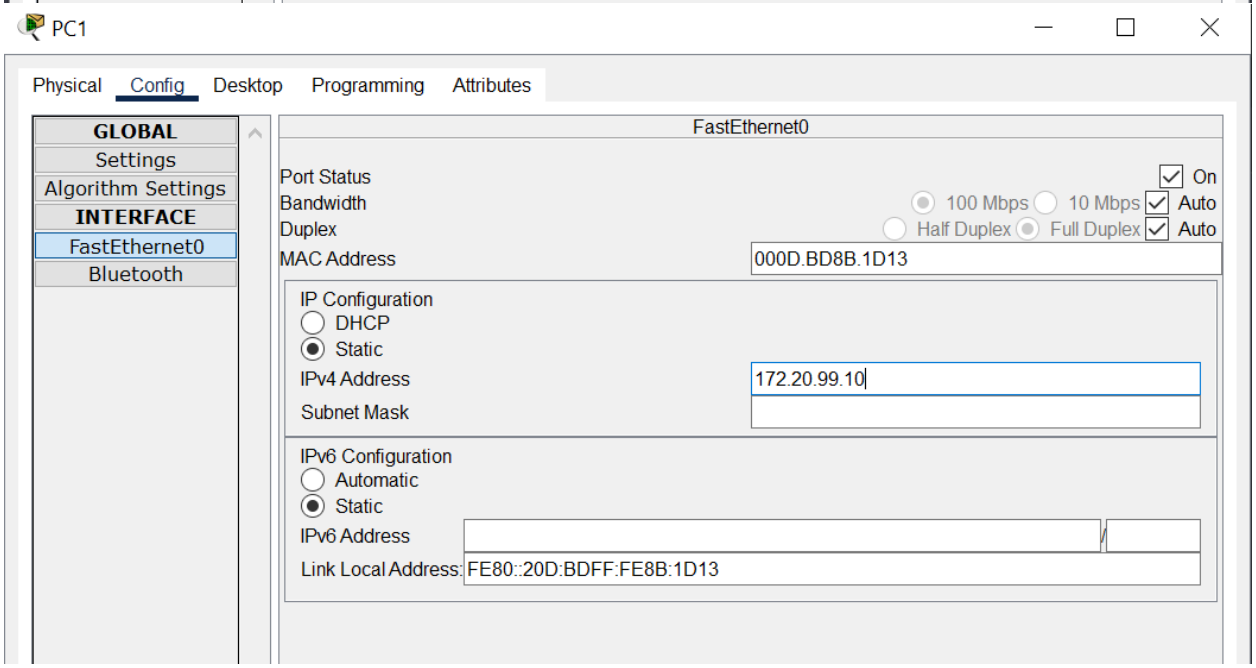
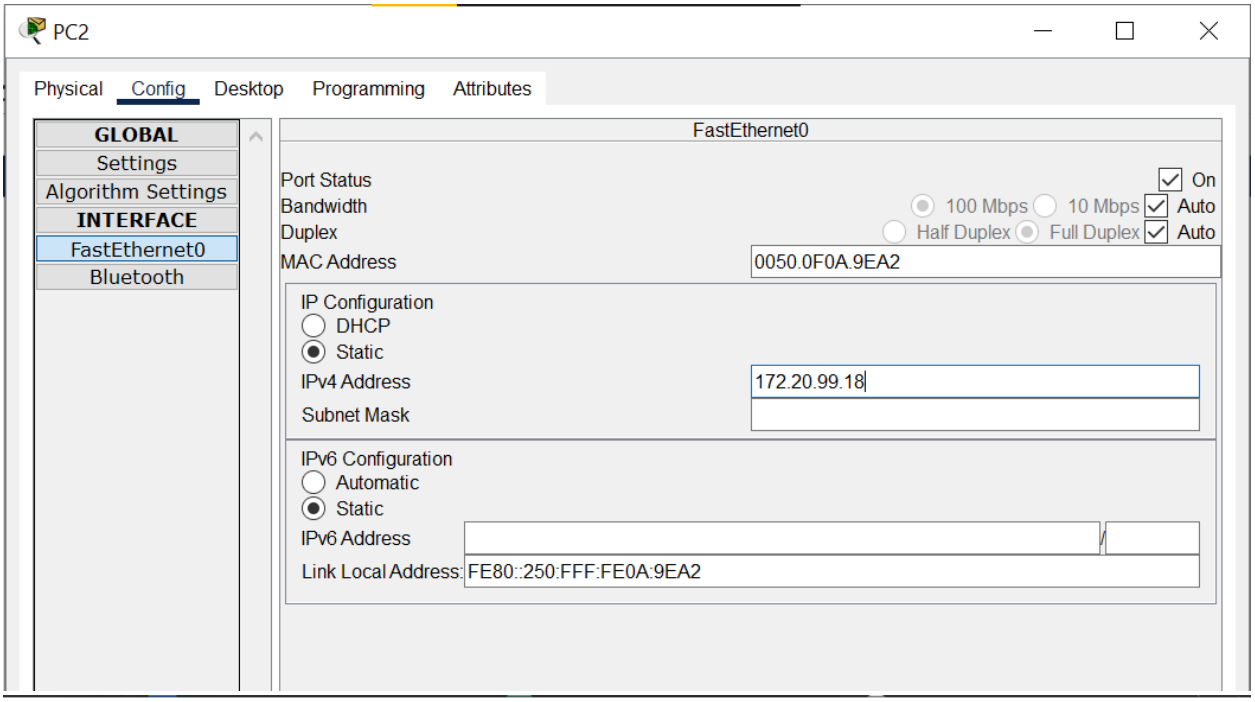
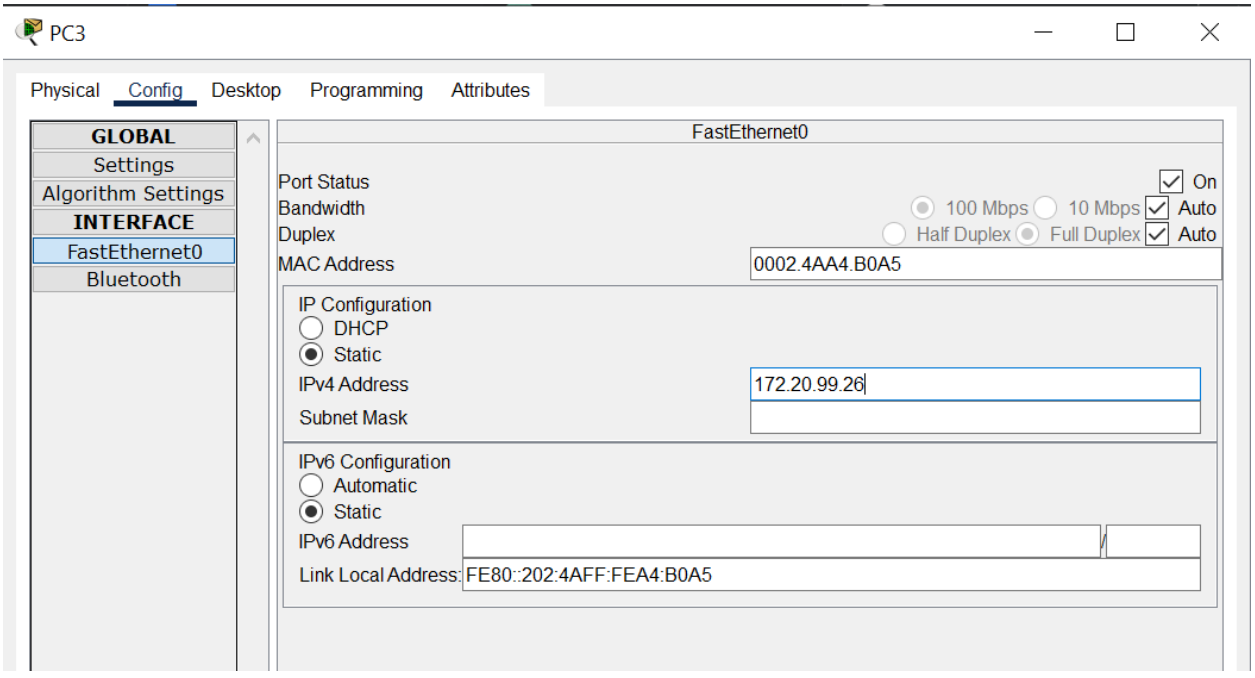
Top


PC0
Physical
Config
Desktop
Programming
Attributes
GLOBAL
Settings
Algorithm Settings
INTERFACE
FastEthernet0
Bluetooth
FastEthernet0
Port Status
On
Bandwidth
100 Mbps
10 Mbps
Auto
Duplex
Half Duplex
Full Duplex
Auto
MAC Address
0060.5CAC.4C9C
IP Configuration
DHCP
Static
IPv4 Address
172.20.99.2
Subnet Mask
IPv6 Configuration
Automatic
Static
IPv6 Address
Link Local Address
FE80::260:5CFF:FEAC:4C9C


PC1
Physical
Config
Desktop
Programming
Attributes
GLOBAL
Settings
Algorithm Settings
INTERFACE
FastEthernet0
Bluetooth
FastEthernet0
Port Status
On
Bandwidth
100 Mbps
10 Mbps
Auto
Duplex
Half Duplex
Full Duplex
Auto
MAC Address
000D.BD8B.1D13
IP Configuration
DHCP
Static
IPv4 Address
172.20.99.10
Subnet Mask
IPv6 Configuration
Automatic
Static
IPv6 Address
Link Local Address
FE80::20D:BDFF:FE8B:1D13


PC2
Physical
Config
Desktop
Programming
Attributes
GLOBAL
Settings
Algorithm Settings
INTERFACE
FastEthernet0
Bluetooth
FastEthernet0
Port Status
On
Bandwidth
100 Mbps
10 Mbps
Auto
Duplex
Half Duplex
Full Duplex
Auto
MAC Address
0050.0F0A.9EA2
IP Configuration
DHCP
Static
IPv4 Address
172.20.99.18
Subnet Mask
IPv6 Configuration
Automatic
Static
IPv6 Address
Link Local Address:
FE80::250:FFF:FE0A:9EA2


PC3
Physical
Config
Desktop
Programming
Attributes
GLOBAL
Settings
Algorithm Settings
INTERFACE
FastEthernet0
Bluetooth
FastEthernet0
Port Status
On
Bandwidth
100 Mbps
10 Mbps
Auto
Duplex
Half Duplex
Full Duplex
Auto
MAC Address
0002.4AA4.B0A5
IP Configuration
DHCP
Static
IPv4 Address
172.20.99.26
Subnet Mask
IPv6 Configuration
Automatic
Static
IPv6 Address
Link Local Address:
FE80::202:4AFF:FEA4:B0A5

IV. Questions

a. How many Ethernet networks currently exist? 4 Ethernet networks
b. How many WAN links currently exist? 1 WAN link
c. How many total networks? 5 network in total
d. How many subnets? There are 4 subnets currently
e. How many subnets with 20% growth? There are 5 subnets with 20% growth

Reflection:

1. With the initial block of addresses assigned by the ISP, and the requirements for future growth, is there any other subnetting scheme that could have worked?

   Yes, an alternative of the Variable Length Subnet Mask (VLSM) could be used given the specific requirements and constraints of the network.

2. If the maximum number of hosts per network segment was only 14, could you have used another scheme? Why?

   Yes, I could have used a /28 subnet mask, which allows for a maximum of 14 usable host addresses per subnet. The reason for using this alternative is because it will be sufficient to cater the maximum number of hosts per network.

3. Although it works for the scenario in item b above, would it be a good idea to use 4 bits for subnets and 4 bits for hosts?

   I believe no, it would be an impractical approach since 4 bits will not be enough to provide the IP addresses in order to meet the requirements of the network constraints.