CYBER SHUJAA CLOUD & NETWORK SECURITY

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Introduction

This exercise introduces you to the fundamentals of subnetting, a critical skill for network administrators. Subnetting allows you to divide a large network into smaller, more manageable segments. This exercise will guide you through the process of subnetting a Class C network address (/24) into five subnets with varying host requirements. You'll learn how to calculate the subnet mask, network address, broadcast address, and usable host range for each subnet.

The second part of the exercise challenges you to apply Fixed Length Subnet Masking (FLSM) to various network addresses. You'll determine the possible subnets, calculate the number of usable hosts per subnet, and identify the network address, broadcast address, and usable IP ranges.

By completing this exercise, you'll gain a practical understanding of subnetting principles and their application in network design.

pen_spark

Subnetting Exercise

Complete the given subnetting exercises..

1. A company has been allocated a Class C network **192.168.5.0 /24**. The physical network should be divided into 5 subnets, which will be interconnected by routers as shown in the figure below. Class C custom subnets need to be designed. Derive the subnets that would meet the requirements shown outlining the;

192.168.5.0/24
5 subnets required

192.168.5.0/24 255.255.255.0

24 bits used for 8 bits remained for the host

5 subnets ….how many bits to be borrowed

2^3= 8

3 bits are required to get >=5 subnets

Add the 3 bits borrowed from the host to network bits

192.168.5.0/27 255.255.255.224

List of the subnets

1. 192.168.5.0/27
2. 192.168.5.32/27
3. 192.168.5.64/27
4. 192.168.5.96/27
5. 192.168.5.128/27
6. 192.168.5.160/27
7. 192.168.5.192/27

8. 192.168.5.224/27

32 hosts each one

30 usable hosts each one

For the below diagram lest give each one their required hosts

For NETB: requires 28 hosts

Give first subnet 192.168.5.0/27 NETb will use 28 hosts, two out of the 30 allocated will be unused

- *Network address (network ID) .192.168.5.0*
- *First and last usable IP addresses 192.168.5.1—-192.168.5.30*
- *Broadcast address (broadcast ID) 192.168.5.31*
- *Hosts per subnet 30 hosts*

For NET;E: requires 28 hosts

Give second subnet 192.168.5.32/27 NETE will use 28 hosts, two out of the 30 allocated will be unused

- *Network address (network ID) .192.168.5.32*
- *First and last usable IP addresses 192.168.5.33—-192.168.5.62*

• *Broadcast address (broadcast ID)* *192.168.5.63*

• *Hosts in this subnet* *30 hosts*

For NETA: requires 14 hosts

Give third subnet 192.168.5.64/27 …but it only requires 14 hosts

Which 2^4-2=14 only 4 host bits required therefore give subnet

192.168.5.64/28 ….the available hosts in this network is 16

• *Network address (network ID) .192.168.5.64*

First and last usable IP addresses *192.168.5.65—-192.168.5.78*

• *Broadcast address (broadcast ID)* *192.168.5.79*

• *Hosts in this subnet* *16 hosts*

For NETD: requires 7 hosts

Give from subnet 192.168.5.80/28

But requires 7 hosts …lets calculate host bits available for this

2^x-2=host bits

2^4-2=14 hosts

Note :7 hosts will be unallocated in this network

• *Network address (network ID) .192.168.5.80*

• *First and last usable IP addresses 192.168.5.81—-192.168.5.94*

• *Broadcast address (broadcast ID) 192.168.5.95*

• *Hosts in this subnet 16 hosts*

For NETC: requires 2 hosts

Give subnet 192.168.5.80/28 but we can us the unallocated hosts of the NETD ,the rest remains fro the same as network D.

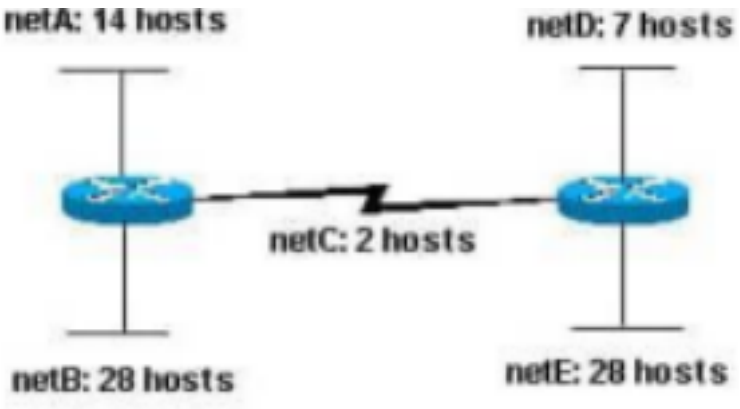
• *Network address (network ID) .192.168.5.80*

• *First and last usable IP addresses 192.168.5.88—-192.168.5.95*

• *Broadcast address (broadcast ID) 192.168.5.31*

• *Hosts per subnet 16 hosts*

Noet still …5 hosts will be unallocated



- Network address (network ID)
- First and last usable IP addresses
- Broadcast address (broadcast ID)
- Hosts per subnet

2. For each of the following IP addresses, carry out fixed length subnetting (FLSM) by applying the given subnet mask and utilizing additional masking bits borrowed from the default subnet mask. Determine the number of possible subnets per the given network ID **but only** state the **first three subnets**, where possible. Consider the zero subnet in each of the below network IDs as your first possible subnet.

Additionally, in every subnet, determine the; number of hosts, network address/ID, first and last usable IP, and the broadcast address.

a) 192.168.10.0 /25 255.255.255.128

2^1= 2 subnets

Subnets

192.168.10.0/25

number of hosts:128 hosts

network address/ID:192.168.10.0

first and last usable IP:192.168.10.1–192.168.10.126

broadcast address: 192.168.10.127

192.168.10.128/25

number of hosts:128 hosts

network address/ID:192.168.10.128

first and last usable IP:192.168.10.129–192.168.10.254

broadcast address: 192.168.10.255

b) 192.168.10.0 /28

2^4=16 subnets

Subnets list

192.168.10.0

number of hosts:16 hosts

network address/ID:192.168.10.0

first and last usable IP:192.168.10.1–192.168.10.14

broadcast address: 192.168.10.15

192.168.10.16

number of hosts:16 hosts

network address/ID:192.168.10.16

first and last usable IP:192.168.10.17–192.168.10.30

broadcast address: 192.168.10.31

192.168.10.32

number of hosts:16hosts

network address/ID:192.168.10.32

first and last usable IP:192.168.10.33–192.168.10.46

broadcast address: 192.168.10.47

c) 10.0.0.0 /30

Number of subnet bits borrowed: 22 bits

Number of subnets:

222=4194304

2^22

=4194304

Number of hosts per subnet:

2(32−30)−2=4−2=2

2

(32−30)

−2=4−2=2

Subnets:

Subnet 1 :

Network Address: 10.0.0.0
First Usable IP: 10.0.0.1
Last Usable IP: 10.0.0.2
Broadcast Address: 10.0.0.3

Subnet 2:

Network Address: 10.0.0.4
First Usable IP: 10.0.0.5
Last Usable IP: 10.0.0.6
Broadcast Address: 10.0.0.7

Subnet 3:

Network Address: 10.0.0.8
First Usable IP: 10.0.0.9
Last Usable IP: 10.0.0.10
Broadcast Address: 10.0.0.11

d) 10.0.0.0 /16

2^8= 256 subnets

Subnets list

10.0.0.0
number of hosts: 65,534

network address/ID: 10.0.0.0

first and last usable IP: 10.0.0.1-10.0.255.253

broadcast address: 10.0.255.255

10.1.0.0

number of hosts: 65,534

network address/ID:10.1.0.0

first and last usable IP: 10.1.0.1-10.1.255.253

broadcast address: 10.1.255.255

10.2.0.0

number of hosts: 65,534

network address/ID:10.2.0.0

first and last usable IP: 10.2.0.1-10.2.255.253

broadcast address: 10.2.255.255

e) 172.16.0.0 /30

Given subnet mask: 255.255.255.252 (/30)

Number of subnet bits borrowed: 14 bits
Number of subnets:
214=16384
2^14
=16384
Subnets:
Subnet 1 :

Network Address: 172.16.0.0
First Usable IP: 172.16.0.1
Last Usable IP: 172.16.0.2
Broadcast Address: 172.16.0.3

Subnet 2 :

Network Address: 172.16.0.4
First Usable IP: 172.16.0.5
Last Usable IP: 172.16.0.6
Broadcast Address: 172.16.0.7

Subnet 3 :

Network Address: 172.16.0.8
First Usable IP: 172.16.0.9
Last Usable IP: 172.16.0.10
Broadcast Address: 172.16.0.11

f) 172.16.0.0 /17

Number of subnet bits borrowed: 1 bit
Number of subnets:
21=2
2

1
=2
Number of hosts per subnet:
2(32−17)−2=32768−2=32766
Subnets:
Subnet 1 :
Network Address: 172.16.0.0
First Usable IP: 172.16.0.1
Last Usable IP: 172.16.127.254
Broadcast Address: 172.16.127.255
Subnet 2 :
Network Address: 172.16.128.0
First Usable IP: 172.16.128.1
Last Usable IP: 172.16.255.254
Broadcast Address: 172.16.255.255

Conclusion

This subnetting exercise equipped you with the ability to:

- Divide a large network into smaller subnets based on specific host requirements.
- Calculate the subnet mask for a desired number of subnets.
- Determine the network address, broadcast address, and usable IP range for each subnet.
- Apply FLSM to various network addresses and identify the resulting subnets.

Understanding subnetting is crucial for efficient network management. By effectively segmenting

your network, you can improve security, performance, and manageability.

This exercise provided a solid foundation for your subnetting skills. As you progress in your networking journey, you'll encounter more complex scenarios involving variable length subnet masks (VLSM) and advanced routing protocols.