

Subnetting

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05:27 PM

Need of subnetting?

-> process of adding bits **from host** part and adding in the **network** part

Avoid unnecessary Broadcasting

Save **ip** addresses

Ip = network + host

The part of **ip** address with subnetting

= network + **Subnetwork** + host

Brakes the bigger network in smaller networks

Prefix notation - total number of n/w bits
In an address

A :/8

B :/16

C :/24

Imp : take care on the wastage of **ip** address and not the network
(Focus on host)

Network bits (1)-on

Host bits (0)-off

example

192.168.250.0/24

Network bits =24

Host bits = 8

Total hosts = $2^8 = 256$

Valid host = $-2 = 254$

$2^8 = 256$

$2^7 = 128$

$2^6 = 64$

$2^5 = 32$

$2^4 = 16$

$2^3 = 8$

$2^2 = 4$

$2^1 = 2$

Conditions

Number of hosts

Number of networks (max)

Steps

- 1) Find a new subnet mask.
- 2) Find the total number of subnetworks obtained.
Formula $2^{\text{new on bits}}$
- 3) Find the total no of hosts per subnet.
Formula $2^{\text{new off/host bits}}$
- 4) Find **ip** range
- 5) Find block sizes

Q) For subnetworks =25
Host = 5
-> as the host is 5 so 8 is enough
11111000

Total host $2^{\text{off bits}} = 2^3 = 8$

Valid host = $8-2 = 6$

Subnetworks $2^{\text{no of new on bits}}$

$2^5 = 32$

(valid in valid only in host
networks are all valid)

192.168.10.0/24
11111111.11111111.11111111.00000000
255.255.255.0

First) Hosts - 5
 $2^3 = 8$
Host bits required - 3

192.168.10.0/29
11111111.11111111.11111111.11111000

Second) Subnetworks - 25
 $2^5 = 32$
Network bits required - 5

Note:
You just have to take care of the wastage of ip addresses not the networks.

Step 2: Find total no. of subnetworks obtained?
New on bits - 5
Formula = $2^{\text{new on bits}}$
 $= 2^5 \Rightarrow 32$

Step 3: Find total no. of hosts per subnet?
Off bits - 3
Formula = $2^{\text{host bits (remaining bits)}}$
 $= 2^3 \Rightarrow 8$

192.168.50.0
Subnetworks - 100
Host - 2
Host $\Rightarrow 2^{\text{no of off bits}}$
 $2^7 = 128$
 $2^2 = 4$
So, host bits required - 2
Total hosts obtained = 4
Valid = $4 - 2 \Rightarrow 2$

11111111.11111111.11111111.11111100
Network bits - 30
New on - 6
Total subnetworks obtained?
 $2^{\text{no of new on bits}}$
 $2^6 = 64$

Not possible in c class
Solution - make changes in b class

Step 4 - find ip range
eg)

255.255.255.255
255.255.255.192
0 . 0 . 0 . 63

Step 5 - Find block sizes

First subnet

Base n/w id + ip range
192.168.250.0 - 192.168.250.63
(n/w id) (broadcast id)

Second subnet

Next n/w id + ip range
192.168.250.64 - 192.168.250.127

Third subnet

192.168.250.128 - 192.168.250.191

Fourth subnet

192.168.250.192 - 192.168.250.255

C class subnetting

192.168.50.0/25	192.168.50.0/26	192.168.50.0/27	192.168.50.0/28	192.168.50.0/29	192.168.50.0/30
11111111.11111111. 11111111.10000000	11111111.11111111. 11111111.11000000	11111111.11111111. 11111111.11100000	11111111.11111111. 11111111.11110000	11111111.11111111. 11111111.11111000	11111111.11111111. 11111111.11111100
255.255.255.128	255.255.255.192	255.255.255.224	255.255.255.240	255.255.255.248	255.255.255.252
New on bits - 1 Subnets=> $2^1 = 2$	New on bits - 2 Subnets=> $2^2 = 4$	New on bits - 3 Subnets=> $2^3 = 8$	New on bits - 4 Subnets=> $2^4 = 16$	New on bits - 5 Subnets=> $2^5 = 32$	New on bits - 6 Subnets=> $2^6 = 64$
Host bits - 7 Total hosts=> $2^7=128$ Valid hosts=> 126	Host bits - 6 Total hosts=> $2^6=64$ Valid hosts=> 62	Host bits - 5 Total hosts=> $2^5=32$ Valid hosts=> 30	Host bits - 4 Total hosts=> $2^4=16$ Valid hosts=> 14	Host bits - 3 Total hosts=> $2^3=8$ Valid hosts=> 6	Host bits - 2 Total hosts=> $2^2=4$ Valid hosts=> 2
IP Range 0.0.0.127	IP Range 0.0.0.63	IP Range 0.0.0.31	IP Range 0.0.0.15	IP Range 0.0.0.7	IP Range 0.0.0.3

Class B subnetting

172.20.0.0/16
n/w bits - 16 host bits - 16
255.255.0.0

Q) Required 100 subnets and 100 hosts

(IP range Network id -- 172.20.0.0
Broadcast id - 172.20.255.255
Ip range - 172.20.0.0 to 172.20.255.255
Valid - 172.20.0.1 to 172.20.255.254
(172.20.0.255 is a valid ip next ip will be 172.20.1.0))

--> Total subnets required - 100
Valid host required - 100

First see hosts
 $2^7=128$ bits read =7
172.20.0/25
11111111.11111111.11111111.10000000

Step 1 _ find new subnet mask?
255.255.255.128

Step 2 - find total no of subnets?
 $2^{\text{no of new on bits}} = 2^9 = 512$

Step 3 - find total no of host per subnet?
Host bits =7
Total = $2^{\text{off bits}} = 2^7 = 128$
Valid = $128 - 2 = 126$

Step 4 - find new ip range
255.255.255.255
255.255.255.128

0.0.0.127

Step 5 - find block size.

- 1) 172.20.0.0 - 172.20.0.127 - 1
 - 2) 172.20.0.128 - 172.20.0.255 - 2
 - 3) 172.20.1.0 - 172.20.1.127
 - 4) 172.20.1.128 - 172.20.1.254
-
- 512) 172.20.255.128 - 172.20.255.255

0 to 255
 $256 * 2 = 512$

Another example

172.17.0.0/22

1111 1111.1111 1111.1111 1100. 0000 0000

Step 1 - find subnet mask

255.255.252.0

Step 2 - find total number of subnet obtain

new on bits - 6

Total subnets - $2^6 = 64$

Step 3 - find total number of subnet

off bits - 10

$2^{10} = 1,024$

Step 4 - find ip range

255.255.255.255

255.255.252.0

0.0.3.255

Step 5 - find block size

172.17.0.0 + 0.0.3.2555

172.17.0.0 - 172.17.3.255

172.17.0.1

...

Last 172.27.3.254

172.27.3.255 - invalid

Second subnet

172.17.4.0 + 172.17.7.255

64th subnet

172.17.252.0 - 172.17.255.255

(broadcast)

-3

-255

Imp note

Network id + ip range = Broadcast id

Broadcast id - ip range = network id

Class A subnetting

10.0.0.0/8

Network bit - 8

Host bit - 24

255.0.0.0

Range - 10.0.0.0 to 10.255.255.255

Q) 10.0.0.0/11

1111 1111.1110 0000.0000 0000.0000 0000

$128 + 64 + 32 + 0 + 0 + 0 + 0 = 224$

1) Find subnet mask 255.224.0.0

2) new on bit = 3

Total no of subnets = $2^3 = 8$

3) Off bits = 21

Total no of host per subnet = $2^{21} = 20,97,152$

4) 0.31.255.255 (255.255.255.255 - 255.224.0.0)

First subnet 10.0.0.0 - 10.31.255.255 (+0.31.255.255)

valid = 10.0.0.1 - 10.31.255.254

Second subnet

10.32.0.0 - 10.63.255.255

Valid = 10.32.0.1 - 10.63.255.254

8th subnet

10.224.0.0(broadcast id - range) - 10.255.255.255

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Answer of 1 :

192.168.1.0/24 -> 4 subnets

2^n -> Subnets $2^2 = 4$

1111 1111.1111 1111.1111.1111.0000 0000 =24

255.255.255.0

Network subnet host

192.168.1.	00	00 0000 = 192.168.1.0/26
192.168.1.	01	00 0000 =192.168.1.64/26
192.168.1.	10	00 0000 =192.168.1.128/26
192.168.1.	11	00 0000 =192.168.1.192/26

Net = 192.168.1.00 0000

1st = 192.168.1.00 0001

Last = 192.168.1.00 11 1110

Broad = 192.168.1.00 11 1111

192.168.1.0/26

192.168.1.1/26

192.168.1.62/26

192.168.1.63/26

Ref - Network Nuggets(ccna playlist)