

## Subnetting

Class C.

① 192.168.1.0 /25

New subnet mask :  $111111.111111.111111.10000000$   
~~111111.111111.111111.111111~~  
~~111111.111111.111111.111111~~

$$\text{No. of network} = 2^{\frac{n}{\text{on bit}}} = 2^1 = 2$$

$$\text{No. of hosts} = 2^{\frac{n}{\text{off bit}}} = 2^7 = 128$$

$$\text{No. of valid hosts} = 2^7 - 2 = 128 - 2 = 126$$

$$\text{Block size} = 256 - 128 = 128$$

Table

| Network Id      | First IP | Last IP | Broadcast Id  |
|-----------------|----------|---------|---------------|
| 192.168.1.0     | 1.1.1    | 1.126   | 192.168.1.127 |
| 192.168.1.128   | 1.127    | 1.254   | 192.168.1.255 |
| X 192.168.1.256 |          |         |               |

② 192.168.1.0 /26

$1111111.1111111.1111111.11000000$

255.255.255.192

$$\text{No. of network} = 2^{\frac{n}{\text{on bit}}} = 2^2 = 4$$

$$\text{No. of valid hosts} = 2^{\frac{n}{\text{off bit}}} - 2 = 2^6 - 2 = 64 - 2 = 62$$

$$\text{No. of Block size} = 256 - 192 = 64$$

Table

| Net Id        | First IP      | Last IP       | B Id          |
|---------------|---------------|---------------|---------------|
| 192.168.1.0   | 192.168.1.1   | 192.168.1.62  | 192.168.1.63  |
| 192.168.1.64  | 192.168.1.65  | 192.168.1.126 | 192.168.1.127 |
| 192.168.1.128 | 192.168.1.129 | 192.168.1.190 | 192.168.1.191 |
| 192.168.1.192 | 192.168.1.193 | 192.168.1.255 | 192.168.1.256 |
| 192.168.1.256 |               |               |               |

③ 192.168.1.0 /27

New Subnet mask =  $\underline{\underline{1111111.1111111.1111111.11100000}}$

$255.255.255.224$

$$\text{No. of network} = 2^n - 2^3 = 8$$

$$\text{No. of valid hosts} = 2^5 - 2 = 30$$

$$\text{Block size} = 256 - 224 = 32 \quad } 2^{n(\text{off bit})}$$

Table

| Nid           | 1st IP       | Last IP | Bid           |
|---------------|--------------|---------|---------------|
| 192.168.1.0   | 192.168.1.1  | -       | 192.168.1.31  |
| 192.168.1.32  | 192.168.1.33 | -       | 192.168.1.63  |
| 192.168.1.84  | -            | -       | 192.168.1.95  |
| :             | :            | -       |               |
| 192.168.1.224 | 192.168.1.23 | -       | 192.168.1.255 |
| 192.168.1.256 |              |         |               |

④ 192.168.1.0 /28

New subnet mask

$255.255.255.21110000$

$255.255.255.240$

$$\text{No. of network} = 2^n - 2^4 = 16$$

$$\text{No. of valid hosts} = 2^4 - 2 = 14$$

$$\text{Block size} = 256 - 240 = 16$$

Table

| N id            | 1st IP        | Last IP       | B id          |
|-----------------|---------------|---------------|---------------|
| 192.168.1.0     | 192.168.1.1   | 192.168.1.14  | 192.168.1.15  |
| 192.168.1.16    | 192.168.1.17  | 192.168.1.45  | 192.168.1.43  |
| 192.168.1.32    | 192.168.1.33  | 192.168.1.46  | 192.168.1.44  |
| 192.168.1.48    | 192.168.1.49  | 192.168.1.62  | 192.168.1.63  |
| 192.168.1.240   | 192.168.1.241 | 192.168.1.254 | 192.168.1.255 |
| X 192.168.1.256 |               |               |               |

(5) 192.168.1.0 /29

New subnet mask

255.255.255.21111000

255.255.255.248

No. of network =  $2^n = 2^5 = 32$ No. of valid host =  $2^n - 2 = 2^3 - 2 = 6$ 

Block size = 256 - 248 = 8

Table

| N Id            | 1st IP        | Last IP       | B Id          |
|-----------------|---------------|---------------|---------------|
| 192.168.1.0     | 192.168.1.1   | 192.168.1.6   | 192.168.1.7   |
| 192.168.1.8     | 192.168.1.9   | 192.168.1.14  | 192.168.1.15  |
| 192.168.1.16    | 192.168.1.17  | 192.168.1.22  | 192.168.1.23  |
| 192.168.1.24    | 192.168.1.25  | 192.168.1.30  | 192.168.1.31  |
| 192.168.1.248   | 192.168.1.249 | 192.168.1.254 | 192.168.1.255 |
| X 192.168.1.256 |               |               |               |

⑥ 192.168.1.0 /23

New subnet mask

255.255.255.1111100

No. of subnets =  $2^7 = 128$

$$\text{No. of valid hosts} = 2^7 - 2 = 128 - 2 = 126$$

$$\text{Block size} = 256 - 252 = 4$$

Table

| NID           | 1st IP        | Last IP       | BID           |
|---------------|---------------|---------------|---------------|
| 192.168.1.0   | 192.168.1.1   | 192.168.1.2   | 192.168.1.3   |
| 192.168.1.4   | 192.168.1.5   | 192.168.1.6   | 192.168.1.7   |
| 192.168.1.8   | 192.168.1.9   | 192.168.1.10  | 192.168.1.11  |
| 192.168.1.12  | 192.168.1.13  | 192.168.1.14  | 192.168.1.15  |
| ⋮             | ⋮             | ⋮             | ⋮             |
| 192.168.1.248 | 192.168.1.249 | 192.168.1.250 | 192.168.1.251 |
| 192.168.1.252 | 192.168.1.253 | 192.168.1.254 | 192.168.1.255 |
| 192.168.1.256 |               |               |               |

⑦ 192.168.1.0 /32

New subnet mask

255.255.255.255

No. of networks =  $2^0 = 2^0 = 1$

No. of valid hosts =  $2^0 - 2 = 0$

$$\text{Block size} = 256 - 254 = 2$$

Table

| NID         | Valid IPs   | BID           |
|-------------|-------------|---------------|
| 192.168.1.0 | No valid IP | 192.168.1.255 |

172.16.4.0 - ~~Sub~~. 31.255.255  
172

(8) 172.16.4.0 / 17

New subnet mask

255.255.10000000.00000000

255.255.192.0

No. of network =  $2^1 = 2$

No. of valid hosts =  $2^{15} - 2 = 32768 - 2 = 32766$

Jumping value =  $256 \div 192 = 128$

| Nid          | 1 <sup>st</sup> IP | last IP        | Bid            |
|--------------|--------------------|----------------|----------------|
| 172.16.0.0   | 172.16.0.1         | 172.16.15.254  | 172.16.15.255  |
| 172.16.128.0 | 172.16.128.1       | 172.16.255.254 | 172.16.255.255 |
| 172.16.256.0 |                    |                |                |

(9) 172.16.4.0 / 18

New subnet mask

255.255.11000000.00000000

255.255.192.0

No. of network =  $2^2 = 4$

No. of valid hosts =  $2^{19} - 2 = 16384 - 2 = 16382$

Block size =  $256 - 192 = 64$

| Nid          | 1 <sup>st</sup> IP | last IP        | Bid            |
|--------------|--------------------|----------------|----------------|
| 172.16.0.0   | 172.16.0.1         | 172.16.64.254  | 172.16.63.255  |
| 172.16.64.0  | 172.16.64.1        | 172.16.127.254 | 172.16.127.255 |
| 172.16.128.0 | 172.16.128.1       | 172.16.191.254 | 172.16.191.255 |
| 172.16.192.0 | 172.16.192.1       | 172.16.255.254 | 172.16.255.255 |
| 172.16.256.0 |                    |                |                |

10) 172.16.4.0 /19

New subnet mask

255.255.2~~1~~11000000.00000000

255.255.224.0

No. of networks =  $2^3 = 8$

No. of valid hosts =  $2^5 - 2 = 32 - 2 = 30$

Block size =  $256 - 224 = 32$

| Network Id   | First IP     | Last IP         | Broadcast Id   |
|--------------|--------------|-----------------|----------------|
| 172.16.0.0   | 172.16.0.1   | 172.16.31.254   | 172.16.31.255  |
| 172.16.32.0  | 172.16.32.1  | 172.16.63.254   | 172.16.63.255  |
| 172.16.64.0  | 172.16.64.1  | 172.16.95.254   | 172.16.95.255  |
| 172.16.96.0  | 172.16.96.1  | 172.16.127.254  | 172.16.127.255 |
| 172.16.128.0 | 172.16.128.1 | 172.16.159.254  | 172.16.159.255 |
| 172.16.160.0 | 172.16.160.1 | 172.168.191.254 | 172.16.191.255 |
| 172.16.192.0 | 172.16.192.1 | 172.168.223.254 | 172.16.223.255 |
| 172.16.224.0 | 172.16.224.1 | 172.16.255.254  | 172.16.255.255 |
| 172.16.256.0 | X            |                 |                |

11) 172.16.4.0 /20

New subnet mask

255.255.1110000000000000

255.255.240.0

No. of networks =  $2^4 = 16$

No. of valid hosts =  $2^8 - 2 = 254$

Block size =  $256 - 240 = 16$

| Network ID   | First IP     | Last IP        | Broadcast IP   |
|--------------|--------------|----------------|----------------|
| 172.16.0.0   | 172.16.0.1   | 172.16.0.254   | 172.16.0.255   |
| 172.16.16.0  | 172.16.16.1  | 172.16.31.254  | 172.16.31.255  |
| 172.16.32.0  | 172.16.32.1  | 172.16.47.254  | 172.16.47.255  |
| 172.16.48.0  | 172.16.48.1  | 172.16.63.254  | 172.16.63.255  |
| 172.16.96.0  | 172.16.96.1  | 172.16.96.254  | 172.16.96.255  |
| 172.16.128.0 | 172.16.128.1 | 172.16.128.254 | 172.16.128.255 |
| 172.16.160.0 | 172.16.160.1 | 172.16.160.254 | 172.16.160.255 |
| 172.16.192.0 | 172.16.192.1 | 172.16.192.254 | 172.16.192.255 |
| 172.16.224.0 | 172.16.224.1 | 172.16.239.254 | 172.16.239.255 |
| 172.16.240.0 | 172.16.240.1 | 172.16.255.254 | 172.16.255.255 |
| 172.16.256.0 |              |                |                |

(52) 172.16.4.0 /21

| Network ID    | First IP | Last IP | Broadcast IP |
|---------------|----------|---------|--------------|
| 8D            | IP       | IP      | IP           |
| 172.16.0.0    |          |         |              |
| 172.16.4.0    |          |         |              |
| 172.16.8.0    |          |         |              |
| 172.16.12.0   |          |         |              |
| 172.16.16.0   |          |         |              |
| 172.16.20.0   |          |         |              |
| 172.16.24.0   |          |         |              |
| 172.16.28.0   |          |         |              |
| 172.16.32.0   |          |         |              |
| 172.16.36.0   |          |         |              |
| 172.16.40.0   |          |         |              |
| 172.16.44.0   |          |         |              |
| 172.16.48.0   |          |         |              |
| 172.16.52.0   |          |         |              |
| 172.16.56.0   |          |         |              |
| 172.16.60.0   |          |         |              |
| 172.16.64.0   |          |         |              |
| 172.16.68.0   |          |         |              |
| 172.16.72.0   |          |         |              |
| 172.16.76.0   |          |         |              |
| 172.16.80.0   |          |         |              |
| 172.16.84.0   |          |         |              |
| 172.16.88.0   |          |         |              |
| 172.16.92.0   |          |         |              |
| 172.16.96.0   |          |         |              |
| 172.16.100.0  |          |         |              |
| 172.16.104.0  |          |         |              |
| 172.16.108.0  |          |         |              |
| 172.16.112.0  |          |         |              |
| 172.16.116.0  |          |         |              |
| 172.16.120.0  |          |         |              |
| 172.16.124.0  |          |         |              |
| 172.16.128.0  |          |         |              |
| 172.16.132.0  |          |         |              |
| 172.16.136.0  |          |         |              |
| 172.16.140.0  |          |         |              |
| 172.16.144.0  |          |         |              |
| 172.16.148.0  |          |         |              |
| 172.16.152.0  |          |         |              |
| 172.16.156.0  |          |         |              |
| 172.16.160.0  |          |         |              |
| 172.16.164.0  |          |         |              |
| 172.16.168.0  |          |         |              |
| 172.16.172.0  |          |         |              |
| 172.16.176.0  |          |         |              |
| 172.16.180.0  |          |         |              |
| 172.16.184.0  |          |         |              |
| 172.16.188.0  |          |         |              |
| 172.16.192.0  |          |         |              |
| 172.16.196.0  |          |         |              |
| 172.16.200.0  |          |         |              |
| 172.16.204.0  |          |         |              |
| 172.16.208.0  |          |         |              |
| 172.16.212.0  |          |         |              |
| 172.16.216.0  |          |         |              |
| 172.16.220.0  |          |         |              |
| 172.16.224.0  |          |         |              |
| 172.16.228.0  |          |         |              |
| 172.16.232.0  |          |         |              |
| 172.16.236.0  |          |         |              |
| 172.16.240.0  |          |         |              |
| 172.16.244.0  |          |         |              |
| 172.16.248.0  |          |         |              |
| 172.16.252.0  |          |         |              |
| 172.16.256.0  |          |         |              |
| 172.16.260.0  |          |         |              |
| 172.16.264.0  |          |         |              |
| 172.16.268.0  |          |         |              |
| 172.16.272.0  |          |         |              |
| 172.16.276.0  |          |         |              |
| 172.16.280.0  |          |         |              |
| 172.16.284.0  |          |         |              |
| 172.16.288.0  |          |         |              |
| 172.16.292.0  |          |         |              |
| 172.16.296.0  |          |         |              |
| 172.16.300.0  |          |         |              |
| 172.16.304.0  |          |         |              |
| 172.16.308.0  |          |         |              |
| 172.16.312.0  |          |         |              |
| 172.16.316.0  |          |         |              |
| 172.16.320.0  |          |         |              |
| 172.16.324.0  |          |         |              |
| 172.16.328.0  |          |         |              |
| 172.16.332.0  |          |         |              |
| 172.16.336.0  |          |         |              |
| 172.16.340.0  |          |         |              |
| 172.16.344.0  |          |         |              |
| 172.16.348.0  |          |         |              |
| 172.16.352.0  |          |         |              |
| 172.16.356.0  |          |         |              |
| 172.16.360.0  |          |         |              |
| 172.16.364.0  |          |         |              |
| 172.16.368.0  |          |         |              |
| 172.16.372.0  |          |         |              |
| 172.16.376.0  |          |         |              |
| 172.16.380.0  |          |         |              |
| 172.16.384.0  |          |         |              |
| 172.16.388.0  |          |         |              |
| 172.16.392.0  |          |         |              |
| 172.16.396.0  |          |         |              |
| 172.16.400.0  |          |         |              |
| 172.16.404.0  |          |         |              |
| 172.16.408.0  |          |         |              |
| 172.16.412.0  |          |         |              |
| 172.16.416.0  |          |         |              |
| 172.16.420.0  |          |         |              |
| 172.16.424.0  |          |         |              |
| 172.16.428.0  |          |         |              |
| 172.16.432.0  |          |         |              |
| 172.16.436.0  |          |         |              |
| 172.16.440.0  |          |         |              |
| 172.16.444.0  |          |         |              |
| 172.16.448.0  |          |         |              |
| 172.16.452.0  |          |         |              |
| 172.16.456.0  |          |         |              |
| 172.16.460.0  |          |         |              |
| 172.16.464.0  |          |         |              |
| 172.16.468.0  |          |         |              |
| 172.16.472.0  |          |         |              |
| 172.16.476.0  |          |         |              |
| 172.16.480.0  |          |         |              |
| 172.16.484.0  |          |         |              |
| 172.16.488.0  |          |         |              |
| 172.16.492.0  |          |         |              |
| 172.16.496.0  |          |         |              |
| 172.16.500.0  |          |         |              |
| 172.16.504.0  |          |         |              |
| 172.16.508.0  |          |         |              |
| 172.16.512.0  |          |         |              |
| 172.16.516.0  |          |         |              |
| 172.16.520.0  |          |         |              |
| 172.16.524.0  |          |         |              |
| 172.16.528.0  |          |         |              |
| 172.16.532.0  |          |         |              |
| 172.16.536.0  |          |         |              |
| 172.16.540.0  |          |         |              |
| 172.16.544.0  |          |         |              |
| 172.16.548.0  |          |         |              |
| 172.16.552.0  |          |         |              |
| 172.16.556.0  |          |         |              |
| 172.16.560.0  |          |         |              |
| 172.16.564.0  |          |         |              |
| 172.16.568.0  |          |         |              |
| 172.16.572.0  |          |         |              |
| 172.16.576.0  |          |         |              |
| 172.16.580.0  |          |         |              |
| 172.16.584.0  |          |         |              |
| 172.16.588.0  |          |         |              |
| 172.16.592.0  |          |         |              |
| 172.16.596.0  |          |         |              |
| 172.16.600.0  |          |         |              |
| 172.16.604.0  |          |         |              |
| 172.16.608.0  |          |         |              |
| 172.16.612.0  |          |         |              |
| 172.16.616.0  |          |         |              |
| 172.16.620.0  |          |         |              |
| 172.16.624.0  |          |         |              |
| 172.16.628.0  |          |         |              |
| 172.16.632.0  |          |         |              |
| 172.16.636.0  |          |         |              |
| 172.16.640.0  |          |         |              |
| 172.16.644.0  |          |         |              |
| 172.16.648.0  |          |         |              |
| 172.16.652.0  |          |         |              |
| 172.16.656.0  |          |         |              |
| 172.16.660.0  |          |         |              |
| 172.16.664.0  |          |         |              |
| 172.16.668.0  |          |         |              |
| 172.16.672.0  |          |         |              |
| 172.16.676.0  |          |         |              |
| 172.16.680.0  |          |         |              |
| 172.16.684.0  |          |         |              |
| 172.16.688.0  |          |         |              |
| 172.16.692.0  |          |         |              |
| 172.16.696.0  |          |         |              |
| 172.16.700.0  |          |         |              |
| 172.16.704.0  |          |         |              |
| 172.16.708.0  |          |         |              |
| 172.16.712.0  |          |         |              |
| 172.16.716.0  |          |         |              |
| 172.16.720.0  |          |         |              |
| 172.16.724.0  |          |         |              |
| 172.16.728.0  |          |         |              |
| 172.16.732.0  |          |         |              |
| 172.16.736.0  |          |         |              |
| 172.16.740.0  |          |         |              |
| 172.16.744.0  |          |         |              |
| 172.16.748.0  |          |         |              |
| 172.16.752.0  |          |         |              |
| 172.16.756.0  |          |         |              |
| 172.16.760.0  |          |         |              |
| 172.16.764.0  |          |         |              |
| 172.16.768.0  |          |         |              |
| 172.16.772.0  |          |         |              |
| 172.16.776.0  |          |         |              |
| 172.16.780.0  |          |         |              |
| 172.16.784.0  |          |         |              |
| 172.16.788.0  |          |         |              |
| 172.16.792.0  |          |         |              |
| 172.16.796.0  |          |         |              |
| 172.16.800.0  |          |         |              |
| 172.16.804.0  |          |         |              |
| 172.16.808.0  |          |         |              |
| 172.16.812.0  |          |         |              |
| 172.16.816.0  |          |         |              |
| 172.16.820.0  |          |         |              |
| 172.16.824.0  |          |         |              |
| 172.16.828.0  |          |         |              |
| 172.16.832.0  |          |         |              |
| 172.16.836.0  |          |         |              |
| 172.16.840.0  |          |         |              |
| 172.16.844.0  |          |         |              |
| 172.16.848.0  |          |         |              |
| 172.16.852.0  |          |         |              |
| 172.16.856.0  |          |         |              |
| 172.16.860.0  |          |         |              |
| 172.16.864.0  |          |         |              |
| 172.16.868.0  |          |         |              |
| 172.16.872.0  |          |         |              |
| 172.16.876.0  |          |         |              |
| 172.16.880.0  |          |         |              |
| 172.16.884.0  |          |         |              |
| 172.16.888.0  |          |         |              |
| 172.16.892.0  |          |         |              |
| 172.16.896.0  |          |         |              |
| 172.16.900.0  |          |         |              |
| 172.16.904.0  |          |         |              |
| 172.16.908.0  |          |         |              |
| 172.16.912.0  |          |         |              |
| 172.16.916.0  |          |         |              |
| 172.16.920.0  |          |         |              |
| 172.16.924.0  |          |         |              |
| 172.16.928.0  |          |         |              |
| 172.16.932.0  |          |         |              |
| 172.16.936.0  |          |         |              |
| 172.16.940.0  |          |         |              |
| 172.16.944.0  |          |         |              |
| 172.16.948.0  |          |         |              |
| 172.16.952.0  |          |         |              |
| 172.16.956.0  |          |         |              |
| 172.16.960.0  |          |         |              |
| 172.16.964.0  |          |         |              |
| 172.16.968.0  |          |         |              |
| 172.16.972.0  |          |         |              |
| 172.16.976.0  |          |         |              |
| 172.16.980.0  |          |         |              |
| 172.16.984.0  |          |         |              |
| 172.16.988.0  |          |         |              |
| 172.16.992.0  |          |         |              |
| 172.16.996.0  |          |         |              |
| 172.16.1000.0 |          |         |              |

No. of network =  $2^7 - 2 = 128 - 2 = 126$

No. of valid hosts =  $2^7 - 2 = 128 - 2 = 126$

Block size =  $2^{11} = 2048$

| Network ID    | First IP    | Last IP       | Broadcast IP  |
|---------------|-------------|---------------|---------------|
| 192.168.0.0   | 192.16.0.1  | 192.16.7.254  | 192.16.7.255  |
| 192.16.8.0    | 192.16.8.1  | 192.16.8.254  | 192.16.8.255  |
| 192.16.16.0   | 192.16.16.1 | 192.16.23.254 | 192.16.23.255 |
| 192.16.24.0   | 192.16.24.1 | 192.16.31.254 | 192.16.31.255 |
| 192.16.32.0   | 192.16.32.1 | 192.16.47.254 | 192.16.47.255 |
| 192.16.40.0   | 192.16.40.1 | 192.16.47.254 | 192.16.47.255 |
| 192.16.48.0   | 192.16.48.1 | 192.16.45.254 | 192.16.45.255 |
| 192.16.56.0   | X           |               |               |
| 192.16.4.0/22 |             |               |               |

New subnet mask

255.255.1111100.00000000

255.255.252.0

No. of networks =  $2^6 = 64$ , No. of valid hosts =  $2^{10} - 2 = 2048 - 2 = 2046$

Block size =  $256 - 252 = 4$

| N.ID          | First IP      | Last IP         | Broadcast IP    |
|---------------|---------------|-----------------|-----------------|
| 192.168.0.0   | 192.168.0.1   | 192.168.3.254   | 192.168.3.255   |
| 192.168.4.0   | 192.168.4.1   | 192.168.7.254   | 192.168.7.255   |
| 192.168.8.0   | 192.168.8.1   | 192.168.11.254  | 192.168.11.255  |
| 192.168.244.0 | 192.168.244.1 | 192.168.247.254 | 192.168.247.255 |
| 192.168.248.0 | 192.168.248.1 | 192.168.251.254 | 192.168.251.255 |
| 192.168.252.0 | 192.168.252.1 | 192.168.255.254 | 192.168.255.255 |
| 192.168.256.0 | X             |                 |                 |

94

172.16.4.0 / 23

New subnet mask

255.255.111110.00000000

255.255.254.0

No. of networks =  $2^7 = 128$ No. of valid hosts =  $2^9 - 2 = 512 - 2 = 510$ Block size =  $256 - 254 = 2$ 

Table

| Network Id     | 1 <sup>st</sup> IP | Last IP        | Broadcast Id   |
|----------------|--------------------|----------------|----------------|
| 172.16.0.0     | 172.16.0.1         | 172.16.1.255   | 172.16.1.255   |
| 172.16.2.0     | 172.16.2.1         | 172.16.3.254   | 172.16.3.255   |
| 172.16.4.0     | 172.16.4.1         | 172.16.5.254   | 172.16.5.255   |
| 172.16.6.0     | 172.16.6.1         | 172.16.7.254   | 172.16.7.255   |
| 172.16.252.0   | 172.16.252.1       | 172.16.253.254 | 172.16.253.255 |
| 172.16.254.0   | 172.16.254.1       | 172.16.255.254 | 172.16.255.255 |
| X 172.16.256.0 |                    |                |                |

Q1) 172.16.4.0 | 24 Default

New subnet mask 111111.111111.111111.00000000

255.255.255.0

No. of networks =  $2^8 - 2 = 256 - 2 = 254$

No. of valid host =  $2^8 - 2 = 254$

Jumping value =  $256 - 254 = 2$

~~NEP~~

| Nid        | 1st IP     | last IP      | BID          |
|------------|------------|--------------|--------------|
| 172.16.0.0 | 172.16.0.1 | 172.16.0.254 | 172.16.1.255 |
| 172.16.1.0 | 172.16.1.1 | 172.16.1.254 | 172.16.2.255 |
| 172.16.2.0 | 172.16.2.1 | 172.16.2.254 | 172.16.3.255 |
| 172.16.3.0 | 172.16.3.1 | 172.16.3.254 | 172.16.4.255 |
| 172.16.4.0 | 172.16.4.1 | 172.16.4.254 | 172.16.5.255 |
| 172.16.5.0 | 172.16.5.1 | 172.16.5.254 | 172.16.6.255 |
| 172.16.6.0 | 172.16.6.1 | 172.16.6.254 | 172.16.7.255 |
| 172.16.7.0 | 172.16.7.1 | 172.16.7.254 | 172.16.8.255 |
| 172.16.8.0 | 172.16.8.1 | 172.16.8.254 | 172.16.9.255 |

Q2) 172.16.4.0 | 25

New subnet mask

255.255.255.10000000

255.255.255.10000000

No. of networks =  $2^7 - 2 = 128 - 2 = 126$

No. of valid hosts =  $2^7 - 2 = 128 - 2 = 126$

Block size =  $256 - 128 = 128$

| Nid          | 1st IP       | last IP      | BID          |
|--------------|--------------|--------------|--------------|
| 172.16.4.0   | 172.16.4.1   | 172.16.4.126 | 172.16.4.127 |
| 172.16.4.128 | 172.16.4.129 | 172.16.4.254 | 172.16.4.255 |
| 172.16.4.256 | 172.16.4.257 | 172.16.4.383 | 172.16.4.384 |
| X            | X            | X            | X            |
| 172.16.4.384 | 172.16.4.385 | 172.16.4.511 | 172.16.4.512 |
| 172.16.4.512 | 172.16.4.513 | 172.16.4.640 | 172.16.4.641 |
| 172.16.4.640 | 172.16.4.641 | 172.16.4.767 | 172.16.4.768 |

17

172.16.4.0 /26 New subnet mask

17

172.16.4.0 /26 New subnet mask

New subnet mask 255.255.255.192

255.255.255.11000000

255.255.255.192

No. of networks =  $2^2 = 4$ No. of valid hosts =  $2^6 - 2 = 62$ Block size =  $256 - 192 = 64$ 

NID

1<sup>st</sup> IP

last IP

BPD

|              |              |              |              |
|--------------|--------------|--------------|--------------|
| 172.16.4.0   | 172.16.4.1   | 172.16.4.62  | 172.16.4.63  |
| 172.16.4.84  | 172.16.4.65  | 172.16.4.126 | 172.16.4.127 |
| 172.16.4.128 | 172.16.4.129 | 172.16.4.190 | 172.16.4.191 |
| 172.16.4.192 | 172.16.4.193 | 172.16.4.254 | 172.16.4.255 |
| 172.16.4.256 |              |              |              |

18

172.16.4.0 /27

New subnet mask

255.255.255.11100000

255.255.255.11101000

No. of networks =  $2^2 = 8$ No. of valid hosts =  $2^5 = 30$ Block size =  $256 - 8 = 224 = 32$ 

NID

1<sup>st</sup> IP

last IP

BPD

|              |              |              |              |
|--------------|--------------|--------------|--------------|
| 172.16.4.0   | 172.16.4.1   | 172.16.4.30  | 172.16.4.31  |
| 172.16.4.32  | 172.16.4.33  | 172.16.4.62  | 172.16.4.63  |
| 172.16.4.64  | 172.16.4.65  | 172.16.4.94  | 172.16.4.95  |
| 172.16.4.96  | 172.16.4.97  | 172.16.4.126 | 172.16.4.127 |
| 172.16.4.128 | 172.16.4.129 | 172.16.4.222 | 172.16.4.223 |
| 172.16.4.224 | 172.16.4.225 | 172.16.4.254 | 172.16.4.255 |
| 172.16.4.256 |              |              |              |

(19) 172.16.4.0 | 28

New subnet mask

255.255.255.1110000

255.255.255.240

$$\text{No. of networks} = 2^4 = 16$$

$$\text{No. of valid hosts} = 2^4 - 2 = 14$$

$$\text{Block size} = 256 - 240 = 16$$

| Net          | 1st IP       | Last IP      | Brd          |
|--------------|--------------|--------------|--------------|
| 172.16.4.0   | 172.16.4.1   | 172.16.4.14  | 172.16.4.95  |
| 172.16.4.16  | 172.16.4.17  | 172.16.4.30  | 172.16.4.31  |
| 172.16.4.32  | 172.16.4.33  | 172.16.4.46  | 172.16.4.47  |
| 172.16.4.48  | 172.16.4.49  | 172.16.4.62  | 172.16.4.63  |
| 172.16.4.64  | 172.16.4.65  | 172.16.4.78  | 172.16.4.79  |
| 172.16.4.80  | 172.16.4.81  | 172.16.4.94  | 172.16.4.95  |
| 172.16.4.96  | 172.16.4.97  | 172.16.4.110 | 172.16.4.111 |
| 172.16.4.112 | 172.16.4.113 | 172.16.4.126 | 172.16.4.127 |
| 172.16.4.128 | 172.16.4.129 | 172.16.4.142 | 172.16.4.143 |
| 172.16.4.144 | 172.16.4.145 | 172.16.4.158 | 172.16.4.159 |
| 172.16.4.160 | 172.16.4.161 | 172.16.4.174 | 172.16.4.175 |
| 172.16.4.176 | X            |              |              |

(20) 172.16.4.0 | 29

New subnet mask: 255.255.255.248

$$\text{No. of networks} = 2^5 = 32$$

$$\text{No. of valid hosts} = 2^3 - 2 = 6$$

$$\text{Block size} = 256 - 248 = 8$$

| Net         | 1st IP      | Last IP     | Brd         |
|-------------|-------------|-------------|-------------|
| 172.16.4.0  | 172.16.4.1  | 172.16.4.6  | 172.16.4.7  |
| 172.16.4.8  | 172.16.4.9  | 172.16.4.14 | 172.16.4.15 |
| 172.16.4.16 | 172.16.4.17 | 172.16.4.22 | 172.16.4.23 |
| 172.16.4.24 | 172.16.4.25 | 172.16.4.39 | 172.16.4.40 |
| 172.16.4.40 | 172.16.4.41 | 172.16.4.54 | 172.16.4.55 |
| 172.16.4.48 | 172.16.4.49 | 172.16.4.62 | 172.16.4.63 |
| 172.16.4.64 | X           |             |             |

Q2

172.168.4.0

/30

Now subnet mask = 255.255.255.1111100

255.255.255.252

No. of networks =  $2^6 = 64$ No. of valid hosts =  $2^2 - 2 = 2$ Block size =  $256 - 252 = 4$ 

Ans

| NID           | 1st IP       | Last IP      | BID           |
|---------------|--------------|--------------|---------------|
| 172.168.4.0   | 172.16.4.1   | 172.16.4.2   | 172.16.4.3    |
| 172.168.4.4   | 172.16.4.3   | 172.16.4.4   | 172.16.4.7    |
| 172.168.4.8   | 172.16.4.9   | 172.16.4.10  | 172.16.4.11   |
| 172.168.4.12  | 172.16.4.13  | 172.16.4.14  | 172.168.4.15  |
| :             | :            | :            | :             |
| 172.168.4.248 | 172.16.4.249 | 172.16.4.250 | 172.168.4.251 |
| 172.168.4.252 | 172.16.4.253 | 172.16.4.254 | 172.16.4.255  |
| 172.168.4.256 |              |              | 172.168.4.256 |

Q2

172.168.4.0

/31

Now subnet mask . 255.255.255.128

No. of networks =  $2^7 = 128$ No. of valid hosts =  $2^1 - 2 = 0$ Block size =  $255 - 254 = 1$ 

Ans

| BID NID      | BID          |
|--------------|--------------|
| 172.16.4.0   | 172.16.4.1   |
| 172.16.4.1   | 172.16.4.3   |
| 172.16.4.4   | 172.16.4.5   |
| 172.16.4.252 | 172.16.4.253 |
| 172.16.4.254 | 172.16.4.255 |
| 172.16.4.256 |              |

## Class A

10.0.0.0 - 10.255.255.255

(23) 10.168.4.0 = 109

New subnet mask

11111110.00000000.00000000.00000000

255.0.0.0 255.128.0.0

No. of network =  $2^7 = 128$

No. of valid hosts =  $2^{23} - 2 = 8388606$

Jumping value = 128

Ans

| NID          | first IP   | last IP    | BID            |
|--------------|------------|------------|----------------|
| 10.168.4.0   |            |            | 10.168.4.255   |
| 10.168.4.228 |            |            |                |
| 10.168.4.256 |            |            |                |
| 10.0.0.0     | 10.0.0.1   | 10.0.0.2   | 10.127.255.254 |
| 10.128.0.0   | 10.128.0.1 | 10.128.0.2 | 10.255.255.254 |
| 10.256.0.0   |            |            | 10.255.255.255 |

(24) 10.168.4.0 / 10

New subnet mask

1111111.11000000.00000000.00000000  
255.192.0.0

No. of network =  $2^2 = 4$

No. of valid hosts =  $2^{22} - 2 = 4194302$

Jumping value =  $256 - 192 = 64$

| NID        | first IP   | last IP        | BID            |
|------------|------------|----------------|----------------|
| 10.0.0.0   | 10.0.0.1   | 10.4.63.255    | 10.127.255.255 |
| 10.64.0.0  | 10.64.0.1  | 10.127.255.254 | 10.127.255.255 |
| 10.128.0.0 | 10.128.0.1 | 10.191.255.254 | 10.191.255.255 |
| 10.192.0.0 | 10.192.0.1 | 10.255.255.254 | 10.255.255.255 |
| 10.256.0.0 | X          |                |                |

4 8

25) 10.162.0.0 / 21

Solution:

New subnet mask = 255.1110000.0000000.0000000  
255.224.0.0

No. of networks =  $2^3 = 8$

No. of hosts =  $2^{21} = 2097152$

No. of valid hosts =  $2^{21} - 2 = 2097150$

Block size value =  $256 - 224 = 32$

| NPD                   |            |                | BFD            |
|-----------------------|------------|----------------|----------------|
| 10.0.0.0              | 10.0.0.1   | 10.31.255.254  | 10.31.255.255  |
| 10.32.0.0             | 10.32.0.1  | 10.63.255.254  | 10.63.255.255  |
| 10.64.0.0             | 10.64.0.1  | 10.95.255.254  | 10.95.255.255  |
| 10.96.0.0             | 10.96.0.1  | 10.127.255.254 | 10.127.255.255 |
| 10.128.0.0            | 10.128.0.1 | 10.159.255.254 | 10.159.255.255 |
| <del>10.160.0.0</del> |            |                |                |
| 10.160.0.0            | 10.160.0.1 | 10.191.255.254 | 10.191.255.255 |
| 10.192.0.0            | 10.192.0.1 | 10.223.255.254 | 10.223.255.255 |
| 10.224.0.0            | 10.224.0.1 | 10.255.255.254 | 10.255.255.255 |
| X 10.256.0.0          |            |                |                |

(26) 10.162.0.0 / 12

New subnet mask = 255.11110000.00000000.00000000  
255.240.0.0

No. of networks =  $2^4 = 16$

No. of valid hosts =  $2^{20} - 2 = 1048576 - 2 = 1048574$

No. of Block size value =  $256 - 240 = 16$

| NID          | 1st IP     | Last IP        | BID             |
|--------------|------------|----------------|-----------------|
| 10.0.0.0     | 10.0.0.1   | 10.15.255.254  | 10.15.255.255   |
| 10.16.0.0    | 10.16.0.1  | 10.31.255.254  | 10.031.255.255  |
| 10.32.0.0    | 10.32.0.1  | 10.47.255.254  | 10.47.255.255   |
| 10.48.0.0    | 10.48.0.1  | 10.63.255.254  | 10.63.255.255   |
| ⋮ ⋮ ⋮        | ⋮ ⋮ ⋮      | ⋮ ⋮ ⋮          | ⋮ ⋮ ⋮           |
| 10.224.0.0   | 10.224.0.1 | 10.289.255.254 | 10.239.255.255  |
| 10.240.0.0   | 10.240.0.1 | 10.255.255.254 | 10.0255.255.255 |
| X 10.256.0.0 |            |                |                 |

Q27 10.162.0.0/13

New subnet mask = 255.1111000.00000000.00000000  
 $= 255.248.0.0$

No. of networks =  $2^5 = 32$

No. of valid hosts =  $2^{12} - 2 = 4096 - 2 = 4094$

Block size = 256 - 248 = 8

| NID          | 1st IP     | Last IP        | BID            |
|--------------|------------|----------------|----------------|
| 10.0.0.0     | 10.0.0.1   | 10.7.255.254   | 10.7.255.255   |
| 10.8.0.0     | 10.8.0.1   | 10.15.255.254  | 10.15.255.255  |
| 10.16.0.0    | 10.16.0.1  | 10.23.255.254  | 10.23.255.255  |
| ⋮ ⋮ ⋮        | ⋮ ⋮ ⋮      | ⋮ ⋮ ⋮          | ⋮ ⋮ ⋮          |
| 10.240.0.0   | 10.240.0.1 | 10.249.255.254 | 10.247.255.255 |
| 10.248.0.0   | 10.248.0.1 | 10.255.255.254 | 10.255.255.255 |
| X 10.256.0.0 |            |                |                |

(18) 10.162.0.0 / 14

New subnet mask = 255.1111100.00000000.00000000

255.252.0.0.

No. of networks =  $2^6 = 64$

No. of valid hosts =  $2^{18} - 2 = 262142$

Block size =  $256 - 252 = 4$

| Net ID     | 1st IP     | Last IP        | Block ID       |
|------------|------------|----------------|----------------|
| 10.0.0.0   | 10.0.0.1   | 10.8.255.254   | 10.3.255.255   |
| 10.4.0.0   | 10.4.0.1   | 10.7.255.254   | 10.7.255.255   |
| 10.8.0.0   | 10.8.0.1   | 10.11.255.254  | 10.11.255.255  |
| 10.12.0.0  | 10.12.0.1  | 10.15.255.251  | 10.15.255.255  |
| 10.244.0.0 | 10.244.0.1 | 10.247.255.254 | 10.247.255.255 |
| 10.248.0.0 | 10.248.0.1 | 10.251.255.254 | 10.251.255.255 |
| 10.252.0.0 | 10.252.0.1 | 10.255.255.254 | 10.255.255.255 |
| 10.256.0.0 |            |                |                |

(29) 10.162.0.0 / 15

New subnet mask = 255.11111000000000.00000000

= 255.254.0.0

No. of networks =  $2^7 = 128$

No. of valid hosts =  $2^{17} - 2 = 131072 - 2 = 131070$

Block size =  $256 - 254 = 2$

| NID        | 1st ID     | last ID        | BID            |
|------------|------------|----------------|----------------|
| 10.0.0.0   | 10.0.0.1   | 10.1.255.254   | 10.1.255.255   |
| 10.2.0.0   | 10.2.0.1   | 10.3.255.254   | 10.3.255.255   |
| 10.4.0.0   | 10.4.0.1   | 10.5.255.254   | 10.5.255.255   |
| 10.6.0.0   | 10.6.0.1   | 10.7.255.254   | 10.7.255.255   |
| ⋮          | ⋮          | ⋮              | ⋮              |
| 10.250.0.0 | 10.250.0.1 | 10.251.255.254 | 10.251.255.255 |
| 10.252.0.0 | 10.252.0.1 | 10.253.255.254 | 10.253.255.255 |
| 10.254.0.0 | 10.254.0.1 | 10.255.255.254 | 10.255.255.255 |
| 10.256.0.0 |            |                |                |

Q)

10.162.0.0 ~~KI~~ 16

~~B~~ Sub net mask 255.255.0.0

~~N~~ Network =  $2^8 = 256$

No. of valid hosts =  $2^{16} - 2 = 65536 - 2 = 65534$

Block size = 0

| Nid            | FID      | LID | BID |
|----------------|----------|-----|-----|
| 10.0.0.0       | 10.0.0.1 |     |     |
| 10.01.0.0      |          |     |     |
| 10.2.0.0       |          |     |     |
| ⋮              | ⋮        | ⋮   | ⋮   |
| 10.255.255.255 |          |     |     |

(31) 10.162.0.0 / 17

\* New subnet mask

255.255.10000000.00000000

255.255.192.0

No. of networks =  $2^3 = 2^1 = 2$

No. of valid hosts =  $2^{11} - 2 = 2048 - 2 = 2046$

Block size = 256 - 192 = 64

| NID          | 1st IP       | last IP        | BID            |
|--------------|--------------|----------------|----------------|
| 10.162.0.0   | 10.162.0.1   | 10.162.127.254 | 10.162.128.0   |
| 10.162.128.0 | 10.162.128.1 | 10.162.255.254 | 10.162.255.255 |
| 10.162.255.0 |              |                |                |

(32) 10.162.0.0 / 18

\* New subnet mask

255.255.11000000.00000000

255.255.192.0

No. of networks =  $2^2 = 4$

No. of valid hosts =  $2^{10} - 2 = 1024 - 2 = 1022$

Block size = 256 - 192 = 64

| NID          | 1st IP       | last IP        | BID          |
|--------------|--------------|----------------|--------------|
| 10.162.0.0   | 10.162.0.1   | 10.162.63.254  | 10.162.64.0  |
| 10.162.64.0  | 10.162.64.1  | 10.162.127.254 | 10.162.128.0 |
| 10.162.128.0 | 10.162.128.1 | 10.162.223.254 | 10.162.224.0 |
| 10.162.224.0 | 10.162.224.1 | 10.162.223.254 | 10.162.223.0 |
| 10.162.223.0 | 10.162.223.1 | 10.162.223.254 | 10.162.224.0 |
| 10.162.224.0 | 10.162.224.1 | 10.162.223.254 | 10.162.223.0 |
| 10.162.223.0 |              |                |              |

Y

(33) 10.162.0.0/19

New subnet mask

255.255.11100000.00000000

255.255.0.224.0

No. of networks:  $2^3 = 8$

No. of valid hosts =  $2^{13} - 2 = 8190$

Block size =  $256 - 224 = 32$

| NID          | 1st IP | last IP | BFD            |
|--------------|--------|---------|----------------|
| 10.162.0.0   | 0.0    | 31.254  | 10.162.31.255  |
| 10.162.32.0  | 32.0   | 63.254  | 10.162.63.255  |
| 10.162.64.0  | 64.0   | 95.254  | 10.162.95.255  |
| 10.162.96.0  | 96.0   | 127.254 | 10.162.127.255 |
| 10.162.128.0 | 128.0  | 159.254 | 10.162.159.255 |
| 10.162.160.0 | 160.0  | 191.254 | 10.162.191.255 |
| 10.162.192.0 | 192.0  | 223.254 | 10.162.223.255 |
| 10.162.224.0 | 224.0  | 255.254 | 10.162.255.255 |
| 10.162.256.0 | 256.0  | 287.254 | 10.162.287.255 |

(34) 10.162.0.0/12

New subnet mask

255.255.200.0

No. of networks =  $2^4 = 16$

No. of valid hosts =  $2^{12} - 2 = 4094$

Block size =  $256 - 240 = 16$

| NID          | 1st IP       | last IP | BFD            |
|--------------|--------------|---------|----------------|
| 10.162.0.0   | 10.162.0.1   | 19.254  | 10.162.19.255  |
| 10.162.16.0  | 10.162.16.1  | 31.254  | 10.162.31.255  |
| 10.162.224.0 | 10.162.224.1 | 239.255 | 10.162.239.255 |
| 10.162.240.0 | 240.0        | 255.254 | 10.162.255.255 |
| 10.162.256.0 | 256.0        | 287.254 | 10.162.287.255 |

30. 162.0.0/22

NSM = 255.255.255.0

No. of networks =  $2^6 = 64$

No. of hosts =  $2^{10} - 2 = 2048 - 2 = 2046$

Block size = 4

~~NSM~~

NID | 1<sup>st</sup> IP | last IP | BID

10.162.0.0 | 0.1 | 10.162.0.254 | 10.162.0.255

10.162.8.0 | 8.1 | 10.162.8.254 | 10.162.8.255

10.162.16.0 | 16.1 | 10.162.16.254 | 10.162.16.255

10.162.24.0

10.162.24.0 | 24.1 | 10.162.24.254 | 10.162.24.255

X 10.162.25.0

36

10.162.0.0/22

NSM | 255.255.252.0

No. of networks =  $2^6 = 64$

No. of hosts =  $2^{10} - 2 = 2048 - 2 = 2046$

Block size = 4

NID | 1<sup>st</sup> IP | last IP | BID

10.162.0.0 | 10.162.0.2 | 10.162.3.254 | 10.162.3.255

10.162.4.0 | 10.162.4.1 | 10.162.7.254 | 10.162.7.255

10.162.8.0 | 10.162.8.1 | 10.162.11.254 | 10.162.11.255

10.162.12.0 | 10.162.12.1 | 10.162.15.254 | 10.162.15.255

10.162.16.0 | 10.162.16.1 | 10.162.19.254 | 10.162.19.255

10.162.20.0 | 10.162.20.1 | 10.162.23.254 | 10.162.23.255

10.162.24.0 | 10.162.24.1 | 10.162.27.254 | 10.162.27.255

10.162.28.0 | 10.162.28.1 | 10.162.31.254 | 10.162.31.255

10.162.32.0 | 10.162.32.1 | 10.162.35.254 | 10.162.35.255

37

10.162.0.0 | 23

$$\text{NSM} = 255.255.252.0$$

$$\text{No. of network} = 2^7 - 128$$

$$\text{No. of valid hosts} = 2^9 - 2 = 512 - 2 = 510$$

$$\text{Block size} = 2$$

| NID          | 1st IP | last IP | BID            |
|--------------|--------|---------|----------------|
| 10.162.0.0   | 0.1    | 1.254   | 10.162.0.255   |
| 10.162.2.0   | 2.1    | 3.254   | 10.162.3.255   |
| 10.162.4.0   | 4.1    | 5.284   | 10.162.5.255   |
| 10.162.6.0   | 6.1    | 7.284   | 10.162.7.255   |
| 10.162.252.0 | 252.1  | 253.234 | 10.162.253.255 |
| 10.162.254.0 | 252.1  | 255.234 | 10.162.255.255 |

38

10.162.0.0 | 25

$$\text{NSM} = 255.255.255.128$$

$$\text{No. of network} = 2^2 = 2$$

$$\text{No. of valid hosts} = 2^7 - 2 = 126$$

$$\text{Block size} = 128$$

| NID          | 1st IP     | last IP    | BID          |
|--------------|------------|------------|--------------|
| 10.162.0.0   | 10.162.0.1 | 10.162.0.2 | 10.162.0.255 |
| 10.162.0.256 | 0.27       | 0.28       | 10.162.0.255 |
| 10.162.0.256 | 0          |            |              |

(38)

10.162.0.0/28

$$N.SM = 255.255.255.192$$

$$\text{No. of networks} = 2^2 - 2$$

$$\text{No. of valid hosts} = 256 - 28 = 262$$

$$\text{Block size} = 64$$

Answer:

| NID         | 1st IP     | Last IP | BID   |
|-------------|------------|---------|-------|
| 10.162.0.0  | 10.162.0.1 | -       | 0.62  |
| 10.162.0.64 | 0.65       | -       | 0.128 |
| 0.128       | 0.129      | -       | 0.192 |
| 0.192       | 0.193      | -       | 0.256 |
| 0.256       | -          | -       | -     |

(39)

10.162.0.0/27

$$N.SM = 255.255.255.224$$

$$\text{No. of networks} = 2^3 - 8$$

$$\text{No. of valid hosts} = 2^5 - 2 = 30$$

$$\text{Block size} = 32$$

| NID        | 1st IP | Last IP | BID   |
|------------|--------|---------|-------|
| 10.162.0.0 | 0.1    | 0.30    | 0.031 |
| 0.032      | 0.33   | 0.934   | 0.035 |
| 0.036      | 0.65   | 1.256   | 0.165 |
| 0.192      | 0.193  | 0.400   | 0.223 |
| 0.224      | 0.225  | 0.512   | 0.285 |
| 0.256      | -      | -       | -     |

(39) 10.162.0.0/27

$$NSM = 255.255.255.224$$

$$\text{No. of networks} = 2^3 = 8$$

$$\text{No. of valid hosts} = 2^5 - 2 = 30$$

$$\text{Block size} = 256 - 224 = 32$$

| NID          | 1 <sup>st</sup> IP | Last IP      | BID          |
|--------------|--------------------|--------------|--------------|
| 10.162.0.0   | 10.162.0.1         | 10.162.0.30  | 10.162.0.31  |
| 10.162.0.32  | 10.162.0.33        | 10.162.0.62  | 10.162.0.63  |
| 10.162.0.64  | 10.162.0.65        | 10.162.0.94  | 10.162.0.95  |
| 10.162.0.192 | 10.162.0.191       | 10.162.0.222 | 10.162.0.223 |
| 10.162.0.224 | 10.162.0.225       | 10.162.0.254 | 10.162.0.255 |

(40) 10.162.0.0/28

$$NSM = 255.255.255.240$$

$$\text{No. of networks} = 2^4 = 16$$

$$\text{No. of valid hosts} = 2^4 - 2 = 14$$

$$\text{Block size} = 256 - 240 = 16$$

| NID          | 1 <sup>st</sup> IP | Last IP      | BID          |
|--------------|--------------------|--------------|--------------|
| 10.162.0.0   | 10.162.0.1         | 10.162.0.14  | 10.162.0.15  |
| 10.162.0.16  | 10.162.0.17        | 10.162.0.30  | 10.162.0.31  |
| 10.162.0.32  | 10.162.0.33        | 10.162.0.46  | 10.162.0.47  |
| 10.162.0.240 | 10.162.0.241       | 10.162.0.254 | 10.162.0.255 |
| 10.162.0.256 |                    |              |              |

(41)

10.162.0.0 / 29

$$\text{NSM} = 255.255.255.248$$

$$\text{No. of network} = 2^5 = 32$$

$$\text{No. of valid hosts} = 2^3 - 2 = 6$$

$$\text{Net. Block size} = 8$$

| NID          | 1st IP       | Last IP      | BID          |
|--------------|--------------|--------------|--------------|
| 10.162.0.0   | 10.162.0.1   | 10.162.0.6   | 10.162.0.7   |
| 10.162.0.8   | 10.162.0.9   |              | 10.162.0.15  |
| 10.162.0.16  | 10.162.0.17  |              | 10.162.0.23  |
| 10.162.0.240 | 10.162.0.241 | 10.162.0.246 | 10.162.0.244 |
| 10.162.0.248 | 10.162.0.249 | 10.162.0.254 | 10.162.0.253 |
| 10.162.0.256 |              |              |              |

(42)

10.162.0.0 / 30

$$\text{NSM} = 255.255.255.252$$

$$\text{No. of network} = 2^6 = 64$$

$$\text{No. of valid hosts} = 2^2 - 2 = 2$$

$$\text{Block size} = 4$$

| NID          | 1st IP       | Last IP      | BID          |
|--------------|--------------|--------------|--------------|
| 10.162.0.0   | 10.162.0.1   | 10.162.0.2   | 10.162.0.3   |
| 10.162.0.4   | 10.162.0.5   | 10.162.0.6   | 10.162.0.7   |
| 10.162.0.8   | 10.162.0.9   | 10.162.0.16  | 10.162.0.11  |
| 10.162.0.248 | 10.162.0.249 | 10.162.0.256 | 10.162.0.254 |
| 10.162.0.252 | 10.162.0.253 | 10.162.0.252 | 10.162.0.255 |
| 10.162.0.256 |              |              |              |

(3)

10.162.0.0 | 310

so

NSM = ~~255~~ 255. 255. 255.

No. of network =  $2^1 = 2$

No. of valid hosts = 0

\* Block size = 2

| NID          | Valid IP | BID          |
|--------------|----------|--------------|
| 10.162.0.0   | —        | 10.162.0.1   |
| 10.162.0.02  | —        | 10.162.0.3   |
| 10.162.0.31  | —        | 10.162.0.5   |
| 10.162.0.63  | —        | 10.162.0.7   |
| 10.162.0.98  | —        | 10.162.0.9   |
| .. .. ..     | —        | .. .. ..     |
| 10.162.0.252 | —        | 10.162.0.253 |
| 10.162.0.254 | —        | 10.162.0.255 |
| 10.162.0.256 | —        |              |

# VLSI

103.292.152.0/12

172.168.0.0/16

Requirements      240, 200, 150, 50, 2 wan link  
 ↓                  ↓                  ↓  
 HR      sales    guest    mgmt

For HR      240 hosts

$$2^8 = 256$$

NSM = 255.255.255.0

NID = 172.168.1.0

Valid IP = 1.1 - 254

For sales 200 hosts

$$2^8 = 256$$

NSM = 255.255.255.0

NID = 172.168.2.0

Valid IP = 1.1 - 254

For guest } 150 hosts  
 guest }

$$2^8 = 256$$

NID = 172.168.3.0

Valid IP = 1.1 - 254

For mgmt 50 hosts 2^6 = 64

NID = 172.168.3.1 - 172.168.3.62

For 2 wan link

WAN 1 link 1

$$2^2 = 4 \quad NSM = 255.255.255.192$$

NID = 172.168.3.64. Valid IP: 3.65 - 3.60

WAN 2

$$2^4 = 16 \quad NSM = 255.255.255.252$$

NID = 172.168.3.68. Valid IP: 3.69 - 3.70

177.60.X.X 126 920 , 600 , 400 , 280  
 ↑ ↑ ↑ ↑  
 ISP A ISP B orange.com

for 920 hosts

$$2^{10} - 2 = 1022$$

4 wan link

~~ISP~~  
~~255.255.1111100.00000000~~  
~~255.255.252.0~~

| NID    | BID      |
|--------|----------|
| 60.0.0 | 60.3.285 |
| 60.4.0 |          |

for 600 hosts

$$2^{10} - 2 = 1022$$

~~ISP~~  
~~255.255.252.0~~  
~~valid IP 0-1 - 3.284~~

| NID    | BID      |
|--------|----------|
| 60.4.0 | 60.7.285 |
| 60.8.0 |          |

for 400 hosts

$$2^9 - 2 = 512 - 2 = 510$$

~~ISP~~  
~~255.255.1111110.00000000~~  
~~255.255.254.0~~

| NID  | BID   |
|------|-------|
| 8.0  | 8.2   |
| 10.0 | 9.284 |

NID 8.1 172.60.8.0

NSM 255.255.284.0 /23

valid IP = 172.60.8.1 - 172.60.9.284

Orange Ltd

for 7150 hosts

$$\text{NPD} \cdot 2^8 - 2 = 286 - 2 = 284 \quad 286$$

2SS.2SS.2SS.0

NID

10.0

110.00

10.1 - - - - . 10.254

BID

10. 10.255

$$\text{NID} = 172.60.10.0 | 24$$

NSM = 2SS.2SS.2SS

Valid IP = 172.60.10.1 - 172.60.10.254

WAN link 1

1111.

$$2^2 = 4 - 2 = 2$$

130

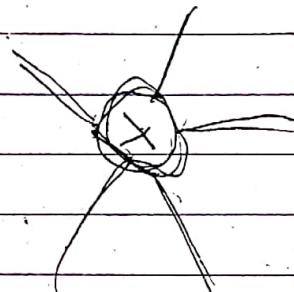
2SS.2SS.2SS.2SS



$$\text{NID} = 172.60.11.0$$

NSM = 2SS.2SS.2SS.2SS

Valid IP = 11.1 - , 11.2



WAN link 2

$$\text{NID} = 172.60.11.4$$

NSM1 = 2SS.2SS.2SS.2SS

Valid IP = 11.3 - 11.11.5. 11.6

WAN link 3

$$\text{NID} = 172.60.11.98$$

NSM = 2SS.2SS.2SS.2SS

Valid IP = 11.9.10.67 - 11.9.11.10

WAN link 4

$$\text{NID} = 172.60.11.12$$

NSM1 = 2SS.2SS.2SS.2SS

Valid IP = 11.13, 11.14