

Assignment: Calculating IPv4 Subnets

Part 1: Determine IPv4 Address Subnetting

(!) Network address= IP Address octets(According Class) ||(And Operation)
Subnet Mask

1st:

IPv4 Address/Prefix: 192.168.100.25/28

So, IP Address: 192.168.100.25

192. 168. 100.00011001

And, Subnet Mask: 11111111.11111111.11111111.11110000

So,#Network Add: 192. 168. 100.00010000(16)

#BroadCast Add: 192. 168. 100.00011111(31)

#Total Number of Host Bits: 4 (following the number of Zero in Subnet Mask)

Total Number of Hosts: $(2^4)-2 = 16-2 = 14$

Result: 192.168.100.16 || 192.168.100.31 || 4 || 14

2nd:

IPv4 Address/Prefix: 172.30.10.130/30

So, IP Address: 172.30.10.130

172. 30. 10.10000010

And, Subnet Mask: 11111111.11111111.11111111.11111100

So,#Network Add: 172. 30. 10.10000000(128)

#BroadCast Add: 172. 30. 10.10000011(131)

#Total Number of Host Bits: 2 (following the number of Zero in Subnet Mask)

Total Number of Hosts: $(2^2)-2 = 4-2 = 2$

Result: 172.30.10.128 || 172.30.10.131 || 2 || 2

3rd:

IPv4 Address/Prefix: 10.1.113.75/19

So, IP Address: 10.1.113.75

10. 1.01110001.01001011

And, Subnet Mask: 11111111.11111111.11100000.00000000

So,#Network Add: 10. 1.01100000(96).00000000(0)

#BroadCast Add: 10. 1.01111111(127).11111111(225)

#Total Number of Host Bits:13 (following the number of Zero in Subnet Mask)

Total Number of Hosts: $(2^{13})-2 = 8192-2 = 8190$

Result: 10.1.96.0 || 10.1.127.225 || 13 || 8190

4th:

IPv4 Address/Prefix: 198.133.219.250/24

So, IP Address: 198.133.219.250

198. 133. 219.11111010

And, Subnet Mask: 11111111.11111111.11111111.00000000

So, #Network Add: 198. 133. 219.00000000(0)

#BroadCast Add: 198. 133. 219.11111111(255)

#Total Number of Host Bits: 8 (following the number of Zero in Subnet Mask)

Total Number of Hosts: $(2^8)-2 = 256-2 = 254$

Result: 198.133.219.0 || 198.133.219.255 || 8 || 254

5th:

IPv4 Address/Prefix: 128.107.14.191/22

So, IP Address: 128.107.14.191

128. 107.00001110.191

And, Subnet Mask: 11111111.11111111.11111100.00000000

So, #Network Add: 128. 107.00001100(12).00000000(0)

#BroadCast Add: 128. 107.00001111(15).11111111(255)

#Total Number of Host Bits: 10 (following the number of Zero in Subnet Mask)

Total Number of Hosts: $(2^{10})-2 = 1024-2 = 1022$

Result: 128.107.12.0 || 128.107.15.255 || 10 || 1022

6th:

IPv4 Address/Prefix: 172.16.104.99/27

So, IP Address: 172.16.104.99

172. 16. 104.01100011

And, Subnet Mask: 11111111.11111111.11111111.11100000

So, #Network Add: 172. 16. 104.01100000(96)

#BroadCast Add: 172. 16. 104.01111111(127)

#Total Number of Host Bits: 5 (following the number of Zero in Subnet Mask)

Total Number of Hosts: $(2^5)-2 = 32-2 = 30$

Result: 172.16.104.96 || 172.16.104.127 || 5 || 30

IPv4 Address/ Prefix	Network Address	Broadcast Address	Total Number of Host Bits	Total Number of Hosts
192.168.100.25/28	192.168.100.16	192.168.100.31	4	14
172.30.10.130/30	172.30.10.128	172.30.10.131	2	2
10.1.113.75/19	10.1.96.0	10.1.127.255	13	8190
198.133.219.250/24	198.133.219.0	198.133.219.255	8	254
128.107.14.191/22	128.107.12.0	128.107.15.255	10	1022
172.16.104.99/27	172.16.104.96	172.16.104.127	5	30

Part 2: Calculate IPv4 Address Subnetting

Problem 1:

Host IP Address: 192.168.200.139 (Class: C)

192.168.200.10001011

Original Subnet Mask: 255.255.255.00000000 (0)

New Subnet Mask: 255.255.255.11100000 (224)

#Number of Subnet Bits: 3 (Total number of 1 in the 4th Octet in the new subnet mask)

#Number of Subnets Created: 2^3 (Number of Subnet Bits)

= 8

#Number of Host Bits per Subnet: 5 (Total number of 0 in the 4th Octet in the new subnet mask)

#Number of Hosts per Subnet: 2^5 (Number of Host Bits per Subnet) - 2

= 32 - 2

= 30

Host IP Address: 192.168.200.10001011(139)
 New Subnet Mask: 255.255.255.11100000(224)[last 5 bits is host
 #Network Address of this Subnet: 192.168.200.10000000(128) portion]
 #IPv4 Address of First Host on this
 Subnet: 192.168.200.10000001(129)
 #IPv4 Address of Last Host on this
 Subnet: 192.168.200.10011110(158)
 #IPv4 Broadcast Address on this
 Subnet: 192.168.200.10011111(159)[All host portions
 filled with 1]

Host IP Address	192.168.200.139
Original Subnet Mask	255.255.255.0
New Subnet Mask	255.255.255.224
Answer:	
Number of Subnet Bits	3
Number of Subnets Created	8
Number of Host Bits per Subnet	5
Number of Hosts per Subnet	30
Network Address of this Subnet	192.168.200.128
IPv4 Address of First Host on this Subnet	192.168.200.129
IPv4 Address of Last Host on this Subnet	192.168.200.158
IPv4 Broadcast Address on this Subnet	192.168.200.159

Problem 2:

Host IP Address: 128.107.0.55 (Class: B)

128.107.00000000.00110111

Original Subnet Mask: 255.255.00000000.00000000 (0)

New Subnet Mask: 255.255.11111111(255).00000000 (0)

#Number of Subnet Bits: 8 (Total number of 1 in the 3rd Octet in the new subnet mask)

#Number of Subnets Created: 2^8 (Number of Subnet Bits)
= 256

#Number of Host Bits per Subnet: 8 (Total number of 0 in the 3rd Octet and the rest, in the new subnet mask)

#Number of Hosts per Subnet: 2^8 (Number of Host Bits per Subnet) - 2
= 256 - 2
= 254

Host IP Address: 128.107.00000000.00110111(55)

New Subnet Mask: 255.255.11111111.00000000 [last 8 bit is

#Network Address of this Subnet: 128.107.00000000.00000000 host part]

#IPv4 Address of First Host on this

Subnet: 128.107.00000000.00000001(1)

#IPv4 Address of Last Host on this

Subnet: 128.107.00000000.11111110(254)

#IPv4 Broadcast Address on this

Subnet: 128.107.00000000.11111111(255)[All host
Portions filled with 1]

Host IP Address	128.107.0.55
Original Subnet Mask	255.255.0.0
New Subnet Mask	255.255.255.0
Answer:	
Number of Subnet Bits	8
Number of Subnets Created	256
Number of Host Bits per Subnet	8
Number of Hosts per Subnet	254
Network Address of this Subnet	128.107.0.0
IPv4 Address of First Host on this Subnet	128.107.0.1
IPv4 Address of Last Host on this Subnet	128.107.0.254
IPv4 Broadcast Address on this Subnet	128.107.0.255

Problem 3:

Host IP Address: 192.135.250.180 (Class: C)

192.135.250.10110100

Original Subnet Mask: 255.255.255.00000000 (0)

New Subnet Mask: 255.255.255.11111000 (248)

#Number of Subnet Bits: 5 (Total number of 1 in the 4th Octet in the new subnet mask)

#Number of Subnets Created: 2^5 (Number of Subnet Bits)
= 32

#Number of Host Bits per Subnet: 3 (Total number of 0 in the 4th Octet in the new subnet mask)

#Number of Hosts per Subnet: 2^3 (Number of Host Bits per Subnet) - 2
= 8 - 2
= 6

Host IP Address: 192.135.250.10110100(180)
 New Subnet Mask: 255.255.255.11111000(248) [last 3 bits is host
 #Network Address of this Subnet: 192.135.250.10110000(176) portion]
 #IPv4 Address of First Host on this
 Subnet: 192.135.250.10110001(177)
 #IPv4 Address of Last Host on this
 Subnet: 192.135.250.10110110(182)
 #IPv4 Broadcast Address on this
 Subnet: 192.135.250.10110111(183)[All host portions
 filled with 1]

Host IP Address	192.135.250.180
Original Subnet Mask	255.255.255.0
New Subnet Mask	255.255.255.248
Answer:	
Number of Subnet Bits	5
Number of Subnets Created	32
Number of Host Bits per Subnet	3
Number of Hosts per Subnet	6
Network Address of this Subnet	192.135.250.176
IPv4 Address of First Host on this Subnet	192.135.250.177
IPv4 Address of Last Host on this Subnet	192.135.250.182
IPv4 Broadcast Address on this Subnet	192.135.250.183

Part 3: Design and Implement a VLSM Addressing Scheme

By observing the figure we can conclude that:

Host Requirements:

LAN	Number of Addresses Required
HQ-2	28
HQ-1	11
Remote-1	5
Remote-2	4
WAN (HQ - Remote)	2

So, We need Subnetting:

For 28 host (32 hosts)

11 host (16 hosts)

5 host (8 hosts)

4 host (8 hosts)

2 host (4 hosts)

Subnetting:

27 => 224

28 => 240

29 => 248

30 => 252

Network Address: 10.1.1.0/24

Network Portion | Host Portion 1st usable host ⇔ Broadcast Address

10.1.1.000|00000 (10.1.1.000|00001 ⇔ 10.1.1.000|11111)

10.1.1.0010|0000 (10.1.1.0010|0001 ⇔ 10.1.1.0010|1111)

10.1.1.00110|000 (10.1.1.00110|001 ⇔ 10.1.1.00110|111)

10.1.1.00111|000 (10.1.1.00111|001 ⇔ 10.1.1.00111|111)

10.1.1.010000|00 (10.1.1.010000|01 ⇔ 10.1.1.010000|11)

Table:

Subnet Description:	Number of Hosts Needed	Network Address/CIDR	First Usable Host Address	Broadcast Address
HQ-2	28	10.1.1.0/27	10.1.1.1	10.1.1.31
HQ-1	11	10.1.1.32/28	10.1.1.33	10.1.1.47
Remote-1	5	10.1.1.48/29	10.1.1.49	10.1.1.55
Remote-2	4	10.1.1.56/29	10.1.1.57	10.1.1.63
WAN	2	10.1.1.64/30	10.1.1.65	10.1.1.67

Addressing Table:

Device	Interface	IP Address	Subnet Mask	Default Gateway
Remote	G0/0	10.1.1.49	255.255.255.248	N/A
	G0/1	10.1.1.57	255.255.255.248	N/A
	S0/0/0	10.1.1.65	255.255.255.252	N/A
HQ	G0/0	10.1.1.33	255.255.255.240	N/A
	G0/1	10.1.1.1	255.255.255.224	N/A
	S0/0/0	10.1.1.66	255.255.255.252	N/A
Remote-1	VLAN 1	10.1.1.50	255.255.255.248	10.1.1.49
Remote-2	VLAN 1	10.1.1.58	255.255.255.248	10.1.1.57
HQ-1	VLAN 1	10.1.1.34	255.255.255.240	10.1.1.33
HQ-1	VLAN 1	10.1.1.2	255.255.255.224	10.1.1.1
WS203	NIC	10.1.1.54	255.255.255.248	10.1.1.49
WS234	NIC	10.1.1.62	255.255.255.248	10.1.1.57
WS145	NIC	10.1.1.30	255.255.255.224	10.1.1.1
WS116	NIC	10.1.1.46	255.255.255.240	10.1.1.33

