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## IP Addressing, Subnetting, VLSM and IPv6

### Introduction

An *IP address* is a numeric identifier assigned to each machine on an IP network. It designates the specific location of a device on the network. There are different classes of IP address from Class A to E.

IP addresses can be subnetted, it allows you to take one larger network and break it into a bunch of smaller networks.

VLSM

### Objectives

Upon completion of this laboratory exercise, the student will be able to

- Determine whether an IP address is Class A, B or C
- Determine the how to subnet a network given either networks or host needed
- Know how to use VLSM
- Learn how to shorten an IPv6 address

### Equipment

None

*Laboratory Activity #8*  
Address Class Identification

*IP Addressing, Subnetting and IPv6*

Determine the whether the Address is Class A, B or C. Also determine which is the network and the host portion.

Address	Class	Network	Host
10.0.1.3	A	10.0.1.3	10.0.1.3
150.2.1.0	B	150.2.1.0	150.2.1.0
192.168.2.0	C	192.168.2.0	192.168.2.0
223.0.1.7	C	223.0.1.7	223.0.1.7
126.30.0.1	A	126.30.0.1	126.30.0.1
220.1.252.254	C	220.1.252.254	220.1.252.254
11.1.1.1	A	11.1.1.1	11.1.1.1
126.1.7.9	A	126.1.7.9	126.1.7.9
200.0.0.1	C	200.0.0.1	200.0.0.1
99.0.1.250	A	99.0.1.250	99.0.1.250

Subnetting Part 1

Complete the table based from the given network and the number of networks needed.

Network	Number of Networks Needed	No of Bits Needed	Subnet Mask	/Subnets Mask	Octet, Increment	Subnets	Usable IP	Broadcast
10.0.0.0	100	7	255.254.0.0	/8+7=/15	2 <sup>nd</sup> , 2i	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
						10.8.0.0	10.8.0.1 - 10.9.255.254	10.9.255.255
						...	...	...
						10.254.0.0	10.254.0.1 - 10.255.255.254	10.255.255.255
172.0.0.0	30	5	255.255.248.0	/16 + /5 = /21	3 <sup>rd</sup> , 8i	172.0.0.0	172.0.0.1 - 172.0.7.254	172.0.7.255
						172.0.8.0	172.0.8.1 - 172.0.15.254	172.0.15.255
						172.0.16.0	172.0.16.1 - 172.0.23.254	172.0.23.255
						172.0.24.0	172.0.24.1 - 172.0.31.254	172.0.31.255
						172.0.32.0	172.0.32.1 - 172.0.39.254	172.0.39.255
						172.0.40.0	172.0.40.1 - 172.0.47.254	172.0.47.255
						172.0.48.0	172.0.48.1 - 172.0.55.254	172.0.55.255
						...	...	...
192.168.0.0	8	3	225.255.255.24	/24 + /3 = /27	4 <sup>th</sup> , 32i	172.0.248.0	172.0.248.1 - 172.0.247.254	172.0.255.255
						192.168.0.0	192.168.0.1 - 192.168.0.30	192.168.0.31
						192.168.0.32	192.168.0.33 - 192.168.0.62	192.168.0.63
						192.168.0.64	192.168.0.65 - 192.168.0.94	192.168.0.95
						192.168.0.96	192.168.0.97 - 192.168.0.126	192.168.0.127
						192.168.0.128	192.168.0.129 - 192.168.0.158	192.168.0.159
						192.168.0.160	192.168.0.161 - 192.168.0.190	192.168.0.191
						192.168.0.192	192.168.0.193 - 192.168.0.222	192.168.0.223
						192.168.0.224	192.168.0.225 - 192.168.0.224	192.168.0.225

Subnetting Part 2: Complete the table based from the given network and the number of host needed.

Network	Number of Hosts Needed	No of Bits Needed	/32-bits	Octet, Increment	Subnets	Usable IP	Broadcast
<b>10.0.0.0</b>	2000	11	/32-11=/21	3 <sup>rd</sup> , 8i	10.0.0.0 10.0.8.0 10.0.16.0 10.0.24.0 ... 10.255.248.0	10.0.0.1 - 10.0.7.254 10.0.8.1 - 10.0.15.254 10.0.16.1 - 10.0.23.254 10.0.24.1 - 10.0.31.254 ... 10.0.248.1 - 10.0.255.254	10.0.7.255 10.0.15.255 10.0.23.255 10.0.31.255 ... 10.0.255.255
<b>172.0.0.0</b>	500	9	/32 - /9 = /23	3 <sup>rd</sup> , 2i	172.0.0.0 172.0.2.0 172.0.4.0 172.0.6.0 172.0.8.0 172.0.10.0 ... 172.0.254.0	172.0.0.1 - 172.0.1.254 172.0.2.1 - 172.0.3.254 172.0.4.1 - 172.0.5.254 172.0.6.1 - 172.0.7.254 172.0.8.1 - 172.0.9.254 172.0.10.1 - 172.0.11.254 ... 172.0.254.1 - 172.0.254.254	172.0.1.255 172.0.3.255 172.0.5.255 172.0.7.255 172.0.9.255 172.0.11.255 ... 172.0.255.255
<b>192.168.0.0</b>	5	3	/32 - /3 = /29	4 <sup>th</sup> , 8i	192.168.0.0 192.168.0.8 192.168.0.16 192.168.0.24 192.168.0.32 192.168.0.40 192.168.0.48 ... 192.168.0.248	192.168.0.1 - 192.168.0.6 192.168.0.9 - 192.168.0.14 192.168.0.17 - 192.168.0.22 192.168.25 - 192.168.0.30 192.168.0.33 - 192.168.0.38 192.168.0.41 - 192.168.0.46 192.168.0.49 - 192.168.0.54 ... 192.168.0.249 - 192.168.0.254	192.168.0.7 192.168.0.15 192.168.0.23 192.168.0.31 192.168.0.39 192.168.0.47 192.168.0.55 ... 192.168.0.255

VLSM: Complete the table given the network address and host needed.

Network	Number of Hosts Needed	No of Bits Needed	/32-bits	Octet, Increment	Subnet Mask	Subnets	Usable IP	Broadcast
<b>192.168.0.0</b>	120	7	25	128i	255.255.255.128	192.168.0.0	192.168.0.1-192.168.0.126	192.168.0.127
	60	6	26	64i	255.255.255.192	192.168.0.128	192.168.0.129-192.168.0.190	192.168.0.191
	20	5	27	32i	255.255.255.224	192.168.0.192	192.168.0.193-192.168.0.222	192.168.0.223
	5	3	29	8i	255.255.255.248	192.168.0.224	192.168.0.225-192.168.0.230	192.168.0.231
	2	2	30	4i	255.255.255.252	192.168.0.232	192.168.0.233-192.168.0.234	192.168.0.235
<b>10.0.0.0</b>	1000	10	22	3 <sup>rd</sup> , 4i	255.255.252.0	10.0.0.0	10.0.0.1 - 10.0.3.254	10.0.3.255
	500	9	23	3 <sup>rd</sup> , 2i	255.255.254.0	10.0.4.0	10.0.4.1 - 10.0.5.254	10.0.5.255
	500	9	23	3 <sup>rd</sup> , 2i	255.255.254.0	10.0.6.0	10.0.6.1 - 10.0.7.254	10.0.7.255
	210	8	24	3 <sup>rd</sup> , 1i	255.255.255.0	10.0.8.0	10.0.8.1 - 10.0.9.254	10.0.9.255
	125	7	25	4 <sup>th</sup> , 128i	255.255.255.128	10.0.9.0	10.0.9.1 - 10.0.9.126	10.0.9.127
	64	7	25	4 <sup>th</sup> , 128i	255.255.255.128	10.0.9.128	10.0.9.129 - 10.0.9.254	10.0.9.255
	15	5	27	4 <sup>th</sup> , 32i	255.255.255.224	10.0.10.0	10.0.10.1 - 10.0.10.30	10.0.10.31
	5	3	29	4 <sup>th</sup> , 8i	255.255.255.248	10.0.10.32	10.0.10.33 - 10.0.10.38	10.0.10.39
	2	2	30	4 <sup>th</sup> , 4i	255.255.255.252	10.0.10.40	10.0.10.41 - 10.0.10.42	10.0.10.43
<b>172.16.0.0</b>	1000	10	22	3 <sup>rd</sup> , 4i	255.255.252.0	172.16.0.0	172.16.0.1 - 172.16.3.254	172.16.3.255
	500	9	23	3 <sup>rd</sup> , 2i	255.255.254.0	172.16.4.0	172.16.4.1 - 172.16.5.254	172.16.5.255
	200	8	23	3 <sup>rd</sup> , 2i	255.255.254.0	172.16.6.0	172.16.6.1 - 172.16.7.254	172.16.7.255
	60	6	26	4 <sup>th</sup> , 64i	255.255.255.192	172.16.8.0	172.16.8.1 - 172.16.8.62	172.16.8.63
	60	6	26	4 <sup>th</sup> , 64i	255.255.255.192	172.16.8.64	172.16.8.65 - 172.16.8.126	172.16.8.127
	10	4	28	4 <sup>th</sup> , 16i	255.255.255.240	172.16.8.128	172.16.8.129 - 172.16.8.142	172.16.8.143
	10	4	28	4 <sup>th</sup> , 16i	255.255.255.240	172.16.8.144	172.16.8.145 - 172.16.8.158	172.16.8.159
	5	3	29	4 <sup>th</sup> , 8i	255.255.255.248	172.16.8.160	172.16.8.161 - 172.16.8.162	172.16.8.163
	2	2	30	4 <sup>th</sup> , 4i	255.255.255.252	172.16.8.164	172.16.8.165 - 172.16.8.166	172.16.8.167

## IPv6

Shorten the following IPv6 address

FE80:0000:0000:0000:a00a:0000:a10a:0000 /64	FE80::a00a:0:a10a:0
2000:1000:0000:0000:0000:a10a:0000:0000 /64	2000:1000::a10a:0:0
0000:0000:0000:0000:0000:0000:0000:0000 /64	::
FE00:0001:0002:0003:a00a:0000:0000:0000 /0	FE00:1:2:3:a00a::
FE80:0000:0H00:0000:a00a:0000:a00a:0000 /64	FE80:0:H00:0:a00a:0:a0aa:0

## Conclusion:

In this lab, fundamental network addressing concepts were explored, starting with the classification of IPv4 addresses into classes A, B, and C. The practical application of subnetting was then performed, involving the calculation of necessary bits, subnet masks, network increments, and the resulting usable IP address ranges and broadcast addresses to meet specific host requirements. And Finally shortening the IPv6, which is then is there a zeroes, just use "::" and if leading zeroes, just remove those.