



Republic of the Philippines
Department of Education
National Capital Region
Schools Division Office – Muntinlupa City

**SPECIAL PROGRAM IN TECHNICAL VOCATIONAL EDUCATION (SPTVE)
COMPUTER SYSTEMS SERVICING 9 Q3-W8**

I. Topic: IP ADDRESSING and SUBNETTING CLASS C

II. Objectives:

1. recognize the different network address and its classes;
2. appreciate the importance of IP addressing and subnetting and;
3. perform IP subnetting.

III. Brief Introduction of the Lesson

IP addresses: Networks and hosts

An IP address is a 32-bit number that uniquely identifies a host (computer or other device, such as a printer or router) on a TCP/IP network.

IP addresses are normally expressed in dotted-decimal format, with four numbers separated by periods, such as 192.168.123.132. To understand how subnet masks are used to distinguish between hosts, networks, and subnetworks, examine an IP address in binary notation.

For example, the dotted-decimal IP address 192.168.123.132 is (in binary notation) the 32 bit number 110000000101000111101110000100. This number may be hard to make sense of, so divide it into four parts of eight binary digits.

These eight bit sections are known as octets. The example IP address, then, becomes 11000000.10101000.01111011.10000100. This number only makes a little more sense, so for most uses, convert the binary address into dotted-decimal format (192.168.123.132). The decimal numbers separated by periods are the octets converted from binary to decimal notation.

IP Address Classes

Class A 1 – 127 (Network 127 is reserved for loopback and internal testing)

Leading bit pattern 0 00000000.00000000.00000000.00000000

Class B 128 – 191 Leading bit pattern 10 10000000.00000000.00000000.00000000

Class C 192 – 223 Leading bit pattern 110 11000000.00000000.00000000.00000000

Class D 224 – 239 (Reserved for multicast)

Class E 240 – 255 (Reserved for experimental, used for research)

Private Address Space

Class A 10.0.0.0 to 10.255.255.255

Class B 172.16.0.0 to 172.31.255.255

Class C 192.168.0.0 to 192.168.255.255

Default Subnet Masks

Class A 255.0.0.0

Class B 255.255.0.0

Class C 255.255.255.0

EXAMPLE OF CUSTOM SUBNET MASK





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Number of needed subnets **14**
 Number of needed usable hosts **14**
 Network Address **192.10.10.0**

Address class C

Default subnet mask 255 . 255 . 255 . 0

Custom subnet mask 255 . 255 . 255 . 240

Total number of subnets 16

Total number of host addresses 16

Number of usable addresses 14

Number of bits borrowed 4

Show your work for **Problem 1** in the space below.

<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right;">Number of Subnets</td> <td style="text-align: center;">256 128 64 32</td> <td style="text-align: center;">16 8 4 2</td> <td style="text-align: center;">- Number of Hosts</td> </tr> <tr> <td style="text-align: right;">-</td> <td style="text-align: center;">2 4 8 16</td> <td style="text-align: center;">32 64 128 256</td> <td></td> </tr> <tr> <td style="text-align: right;">192 . 10 . 10 .</td> <td style="text-align: center;">128 64 32 16</td> <td style="text-align: center;">8 4 2 1</td> <td style="text-align: center;">- Binary values</td> </tr> <tr> <td style="text-align: right;"></td> <td style="text-align: center;">0 0 0 0</td> <td style="text-align: center;">0 0 0 0</td> <td></td> </tr> </table> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right;">128</td> <td></td> </tr> <tr> <td style="text-align: right;">64</td> <td></td> </tr> <tr> <td style="text-align: right;">32</td> <td></td> </tr> <tr> <td style="text-align: right;">+16</td> <td></td> </tr> <tr> <td style="text-align: right; border-top: 1px solid black;">240</td> <td></td> </tr> </table> <p style="font-size: small;">Add the binary value numbers to the left of the line to create the custom subnet mask.</p>	Number of Subnets	256 128 64 32	16 8 4 2	- Number of Hosts	-	2 4 8 16	32 64 128 256		192 . 10 . 10 .	128 64 32 16	8 4 2 1	- Binary values		0 0 0 0	0 0 0 0		128		64		32		+16		240		<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right;">16</td> <td></td> </tr> <tr> <td style="text-align: right;">-2</td> <td></td> </tr> <tr> <td style="text-align: right; border-top: 1px solid black;">14</td> <td></td> </tr> </table> <p style="font-size: small;">Observe the total number of hosts. Subtract 2 for the number of usable hosts.</p>	16		-2		14	
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(9)	1	0	0	0	192.10.10.128	to	192.10.10.143																																																																																																																																																																				
(10)	1	0	0	1	192.10.10.144	to	192.10.10.159																																																																																																																																																																				
(11)	1	0	1	0	192.10.10.160	to	192.10.10.175																																																																																																																																																																				
(12)	1	0	1	1	192.10.10.176	to	192.10.10.191																																																																																																																																																																				
(13)	1	1	0	0	192.10.10.192	to	192.10.10.207																																																																																																																																																																				
(14)	1	1	0	1	192.10.10.208	to	192.10.10.223																																																																																																																																																																				
(15)	1	1	1	0	192.10.10.224	to	192.10.10.239																																																																																																																																																																				
(16)	1	1	1	1	192.10.10.240	to	192.10.10.255																																																																																																																																																																				
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Number of needed subnets **14**
 Number of needed usable hosts **14**
 Network Address **192.10.10.0**

Address class C

Default subnet mask 255 . 255 . 255 . 0

Custom subnet mask 255 . 255 . 255 . 240

Total number of subnets 16

Total number of host addresses 16

Number of usable addresses 14

Number of bits borrowed 4

What is the 4th subnet range? 192.10.10.48 to 192.10.10.63

What is the subnet number for the 8th subnet? 192 . 10 . 10 . 112

What is the subnet broadcast address for the 13th subnet? 192 . 10 . 10 . 207

What are the assignable addresses for the 9th subnet? 192.10.10.129 to 192.10.10.142

The binary value of the last bit borrowed is the range. In this problem the range is 16.
 The first address in each subnet range is the subnet number.
 The last address in each subnet range is the subnet broadcast address.





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IV. Activities:

Activity 1

Get the subnet mask

No. of needed subnets: 6
No. of needed usable hosts: 30
Network Address: 195.85.8.0
Address Class: _____
Default subnet mask: _____
Custom subnet mask: _____
Total number of subnets: _____
Total number of hosts address: _____
No. of usable address: _____
No. of bits borrowed: _____

Number of Subnets	256	128	64	32	16	8	4	2	-	Number of Hosts
	2	4	8	16	32	64	128	256		
	128	64	32	16	8	4	2	1	-	Binary values
195 . 85 . 8 . 0	0	0	0	0	0	0	0	0	0	

Activity 2

Subnetting: Give what is asked in the problem below.

No. of needed subnets: 6
No. of needed usable hosts: 30
Network Address: 195.85.8.0
Address Class: _____
Default subnet mask: _____
Custom subnet mask: _____
Total number of subnets: _____
Total number of hosts address: _____
No. of usable address: _____
No. of bits borrowed: _____

What is the 9th subnet range? _____
What is the subnet no. for the 4th subnet? _____
What is the subnet broadcast address for the 12th subnet? _____
What are the assignable addresses for the 10th subnet? _____





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Activity 3

Get the subnet mask

No. of needed usable hosts: 25
Network Address: 218.35.50.0
Address Class: _____
Default subnet mask: _____
Custom subnet mask: _____
Total number of subnets: _____
Total number of hosts address: _____
No. of usable address: _____

V. Assessment:

Problem Solving: Get the subnet Mask

No. of needed usable hosts: 60
Network Address: 198.100.10.0
Address Class: _____
Default subnet mask: _____
Custom subnet mask: _____
Total number of subnets: _____
Total number of hosts address: _____
No. of usable address: _____
No. of bits borrowed: _____

VI. Reflection:

As CSS student, can you tell why IP addressing and subnetting is essential skill to learn?

References:

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Writer: Eddie I. Villamor

Validator: Gregorio S. Quineri



Centennial Ave., Brgy. Tunasan, Muntinlupa City
Telephone No: 805-9935 / 805-9938
www.depedmuntinlupa.edu.ph; sdo.muntinlupa@gmail.com

