GUIDED PRACTICE

Class: Technology 4120
Date assigned: week 10
Date due: week 11
Time estimate to complete this assignment: 2 Days

Overview/Introduction

The purpose of this topic on IP Addressing is to comprehend how the internet functions and how companies such as AT&T, Verizon, and more utilize this to create Ecommerce and more. If one were to ask the question, will society of today ever give up their electronic devices and stay unconnected? Of course not, this is why the companies mentioned above need talented and skilled people to keep communication going.

Learning Objectives

Basic objectives

1. List 3-5 learning objectives that you expect students to be able to master on their own before class

Basic Student Learning Outcomes:
1. Explain how sub-netting segments a network to enable better communication.

2. Define some examples as to how sub-netting is used in real life

3. Explain how to calculate IPv4 subnets for a /24 prefix

Advanced objectives

1. List 3-4 learning objectives that you expect students to need help mastering in class and after class

Advanced Student Learning Outcomes:
1. Explain how to calculate IPv4 subnets for a /16 and /8 prefix

2. Given a set of requirements for sub-netting, implement an IPv4 addressing scheme.

3. Explain how to create a flexible addressing scheme using variable length subnet masking (VLSM).

Preparatory Activities and Resources:

1. Give detailed, action-oriented instructions for completing the Guided Practice assignment

Step 1:
1. Instructor will: Introduce the IP topic briefly at the end of week 9 to spawn interest for the topic

- **The IP topic for the students is as follows:** *The business model of large companies such as (AT&T, Verizon, etc.), utilize this IP addressing and sub-netting scheme to generate large amounts of ($$$) Revenue from consumers every day who use the internet. This chapter will define how this topic is used.*

2. Give a "playlist" of resources such as readings, videos, audio, or other content delivery methods that provide students the content to work with

   Students are to watch videos **Prior** the beginning of week 10.
   a. Video on internet protocol What is IP (Internet Protocol) (6:11)
   b. Video on **Binary and decimal conversion** (10:49)
   c. Video describing what a subnet is and why is sub-netting important: What is a subnet and why subnet (8:47)
   d. Video on definition of TCP/IP: TCP/IP Subnet Masking made easy (19:12)
   e. Video discussing and describing the IP addressing: Understanding an IP Address: Cisco Router Training 101 (15:46 min)

Exercises: Please complete by Week 11

- Give a method for students to submit their work online BEFORE the face to face class meeting. Google forms, Surveymonkey, and tools in your LMS will all work.
  - Students: Please complete the on-line activities on the cisco.netacad.com website for chapters 7 & 8 **Prior** to class week 10
  - Students **Please** view the videos listed above prior to week 10
- The submitted work should demonstrate students' mastery of the basic learning objectives.
  - Week 10 activities for the student will be to complete several worksheets to be distributed, completed in class, and collected without the use of any Electronic Devices.
    - (see attached worksheets)

Students will be given worksheets (+6) more to completed in class (see attached worksheets).

- Textbook activities will be the responsibility of the student to complete, and the textbook will be collected at the day of the final exam. No textbook no credit. Any questions on this chapter can be addressed during week 10, after the worksheets have been submitted.
  - **Lab 8.1.2.8: Converting IPv4 Addresses to Binary**
  - **Lab 8.1.4.8: Identifying IPv4 Addresses**
  - **Lab 9.1.4.8: Calculating IPv4 Subnets**
  - **Lab 9.1.4.9: Sub-netting Network Topologies**

Students : The chapter exam will be given the following class meeting.

Questions?

Students can view tutorials on IP Addressing and Sub-netting from the video list above.

References

Attached Worksheet

particular address will fall into.

In the next set of problems you will determine the necessary information to determine the

ANDING With
Default subnet masks

Every IP address must be accompanied by a subnet mask. By now you should be able to look at an IP address and tell what class it is. Unfortunately your computer doesn't think that way. For your computer to determine the network and subnet portion of an IP address it must "AND" the IP address with the subnet mask.

Default Subnet Masks:

Class A	255.0.0.0
Class B	255.255.0.0
Class C	255.255.255.0

ANDING Equations:

1 AND 1 = 1
1 AND 0 = 0
0 AND 1 = 0
0 AND 0 = 0

Sample:

What you see...

IP Address: 192 . 100 . 10 . 33

What you can figure out in your head...

Address Class:	C
Network Portion:	**192 . 100 . 10** . 33
Host Portion:	192 . 100 . 10 . **33**

In order for you computer to get the same information it must AND the IP address with the subnet mask in binary.

	Network	Host	
IP Address:	11000000.01100100.00001010	.00100001	(192 . 100 . 10 . 33)
Default Subnet Mask:	11111111.11111111.11111111	.00000000	(255 . 255 . 255 . 0)
AND:	11000000.01100100.00001010	.00000000	(192 . 100 . 10 . 0)

ANDING with the default subnet mask allows your computer to figure out the network portion of the address.

Default Subnet Masks

Write the correct default subnet mask for each of the following addresses:

177.100.18.4	255 . 255 . 0 . 0
119.18.45.0	255 . 0 . 0 . 0
191.249.234.191	255.255.0.0
223.23.223.109	
10.10.250.1	
126.123.23.1	
223.69.230.250	
192.12.35.105	
77.251.200.51	
189.210.50.1	
88.45.65.35	
128.212.250.254	
193.100.77.83	
125.125.250.1	
1.1.10.50	
220.90.130.45	
134.125.34.9	
95.250.91.99	

Custom Subnet Masks

Problem 1

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.

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
192 . 10 . 10 .	0 0 0 0	0 0 0 0	

Add the binary value numbers to the left of the line to create the custom subnet mask.

128
64
32
+16
240

16 Observe the total number of hosts.
−2 Subtract 2 for the number of usable hosts.
14

Custom Subnet Masks

Problem 2

Number of needed subnets **1000**
Number of needed usable hosts **60**
Network Address **165.100.0.0**

Address class B

Default subnet mask 255 . 255 . 0 . 0

Custom subnet mask 255 . 255 . 255 . 192

Total number of subnets 1,024

Total number of host addresses 64

Number of usable addresses 62

Number of bits borrowed 10

Show your work for Problem 2 in the space below.

	65,536	32,768	16,384	8,192	4,096	2,048	1,024	512	. 256	128	64	32	16	8	4	2
Number of Hosts -										512	1024	2048	4,096	8,192	16,384	32,768	65,536
Number of Subnets -		2	4	8	16	32	64	128	256.								
Binary values -		128	64	32	16	8	4	2	1 .	128	64	32	16	8	4	2	1
165 . 100 .		0	0	0	0	0	0	0	0 .	0	0	0	0	0	0	0	0

128 + 64 + 32 + 16 + 8 + 4 + 2 + 1 = 255

128 + 64 = 192

Add the binary value numbers to the left of the line to create the custom subnet mask.

64 Observe the total number of hosts.

−2 Subtract 2 for the number of usable hosts.

62

Custom Subnet Masks

Problem 4

Number of needed subnets **6**
Number 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 host addresses _____

Number of usable addresses _____

Number of bits borrowed _____

Show your work for Problem 5 in the space below.

		256	128	64	32	16	8	4	2	– Number of Hosts
Number of Subnets	–	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	

Problem 5

Number of needed subnets **6**
Number of needed usable hosts **30**
Network Address **210.100.56.0**

Address class _____

Default subnet mask _____

Custom subnet mask _____

Total number of subnets _____

Total number of host addresses _____

Number of usable addresses _____

Number of bits borrowed _____

Show your work for Problem 4 in the space below.

		256	128	64	32	16	8	4	2	– Number of Hosts
Number of Subnets	–	2	4	8	16	32	64	128	256	
		128	64	32	16	8	4	2	1	– Binary values
210 . 100 . 56 .		0	0	0	0	0	0	0	0	

How to determine the number of subnets and the number of hosts per subnet

Two formulas can provide this basic information:

Number of subnets = 2^s (Second subnet formula: **Number of subnets = 2^s - 2**)

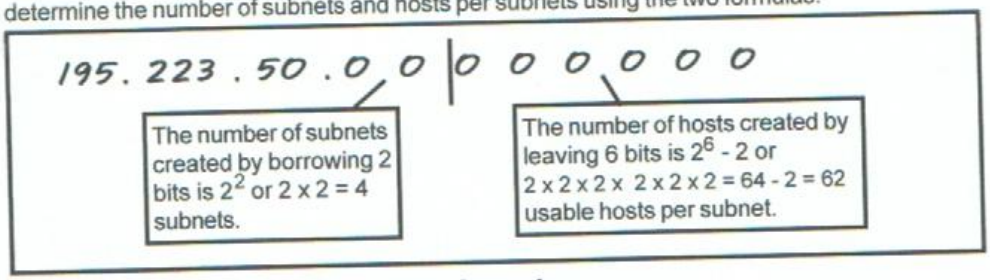
Number of hosts per subnet = 2^h - 2

Both formulas calculate the number of hosts or subnets based on the number of binary bits used. For example if you borrow three bits from the host portion of the address use the *number of subnets* formula to determine the total number of subnets gained by borrowing the three bits. This would be 2^3 or 2 x 2 x 2 = 8 subnets

To determine the number of hosts per subnet you would take the number of binary bits used in the host portion and apply this to the *number of hosts per subnet* formula If five bits are in the host portion of the address this would be 2^5 or 2 x 2 x 2 x 2 x 2 = 32 hosts.

When dealing with the *number of hosts per subnet* you have to subtract two addresses from the range. The first address in every range is the subnet number. The last address in every range is the broadcast address. These two addresses cannot be assigned to any device in the network which is why you have to subtract two addresses to find the number of usable addresses in each range.

For example if two bits are borrowed for the network portion of the address you can easily determine the number of subnets and hosts per subnets using the two formulas.



What about that second subnet formula:

Number of subnets = 2^s - 2

In some instances the first and last subnet range of addresses are reserved. This is similar to the first and last host addresses in each range of addreses.

The first range of addresses is the ***zero subnet***. The subnet number for the *zero subnet* is also the subnet number for the classful subnet address.

The last range of addresses is the ***broadcast subnet***. The broadcast address for the last subnet in *the broadcast subnet* is the same as the classful broadcast address.

Lesson Plan

Lesson: **CH 7 &8 IP Addressing and Subnetting**

Timeframe: Note how long will it take the learner to complete all of the activities from pre-class to post-class activities.

2 days

Materials needed: Describe what items will be needed to complete the in-class activities.

Worksheets involving various IP conversions and subnetting.
Website: **Cisco.netacad.com**
Youtube.com resources:

1. What is IP (Internet Protocol)
2. What is a subnet and why subnet
3. **Binary and decimal conversion**

Objectives: List out the basic objectives tied to pre-class activities and the advanced objectives tied to in-class and post-class activities.

Basic Student Learning Outcomes:
1. Explain how sub-netting segments a network to enable better communication.

2. Define some examples as to how sub-netting is used in real life

3. Explain how to calculate IPv4 subnets for a /24 prefix

Advanced Student Learning Outcomes:
1. Explain how to calculate IPv4 subnets for a /16 and /8 prefix

2. Given a set of requirements for sub-netting, implement an IPv4 addressing scheme.

3. Explain how to create a flexible addressing scheme using variable length subnet masking (VLSM).

Background to the Lesson: Note the typical composition of learners in the class, how this lesson fits into the course design/schedule, prerequisite knowledge required, and typical challenges that learners face with this content area.

The goal of this lesson is to introduce the students to fundamental networking concepts and technologies, IP networking addresses and subnets are embedded within this lesson.

The typical challenge students might face would be to discover a new system of numbering process, calculating and converting binary numbers without the use of an **electronic device**.

In this chapter students will need to have the knowledge of how to identify the binary system and converting the binary system to decimals without the use of electronic devices.

Introduction to Lesson: Describe the purpose of this content area for learners and an overview of the activities and resources for the flipped lesson.

The purpose of this content area is to

- Demonstrate the knowledge of identifying, designing, and managing an effective IP addressing scheme
- Ensure that networks can operate effectively and efficiently as the number of host connections to a network increases.
- Identify the hierarchical structure of the IP address
- Identify how to modify that hierarchy in order to more efficiently meet routing requirements is an important part of planning an IP addressing scheme.
- Collaboratively students will be working in small groups to complete a series of worksheets.

Procedure [Time needed, include additional steps if needed].

Pre-Class Individual Space Activities and Resources: Outline the major steps for the preparatory activities and be sure to tie the steps to the basic learning objectives you have noted above. Note resources required for learner preparation.

Steps	**Purpose**	**Estimated Time**	**Learning Objective**
Step 1: ***Instructor* will: (lecture in-class activity from previous week.)** - **Introduce and explain to the students of the business model on how large companies (AT&T, Verizon, etc.), utilize this IP addressing and sub-netting scheme to generate large amounts of $$$ from consumers every day who use the internet. Also the instructor will quickly define why they are doing the worksheets.** **Instructor will: assign the following videos to watch: (pre-class activity)** - What is IP (Internet Protocol)	**To draw attention to real world business practices which use the IP addressing scheme.** **To identify IP addressing and comprehend how IP addressing and subnets are used.**	**30 min**	**To define how IP addresses and subnets are used in industry.**

- What is a subnet and why subnet -			
Step 2: ***Instructor* will – (have assigned pre-class activity)** - **Referred students to the website cisco.netacad.com for their online reading material. Chapter 7 & 8** - **Review the binary & decimal conversion process, with the aid of a video (if needed) Binary and decimal conversion** - **Demonstrate to the students what they will be doing on worksheet *without an electronic device*.** - ***Students will be reminded that the Cisco's CCNA certification exam does not allow electronic devices during testing.***	**To describe to the students how to fill out an IP Addressing and sub-netting worksheet during class to further enhance the learning process, *without an electronic device*.**	**20 min**	**To define what IP addresses and subnets are used for in industry.**

In-Class Group Space Activities and Resources. Outline the major steps for the in-class activities and be sure to tie the steps to the advanced learning objectives you have noted above. Also note any resources needed/developed to provide effective active learning activities within class.

Steps	**Purpose**	**Estimated Time**	**Learning Objective**
Step 1: **Worksheets will be distributed to students and to be filled out without the use of electronic devices.**	**Students will;** **- Learn to calculate and process the IP Addressing and sub-netting process.** **-Solve problems using critical thinking skills (analyze, synthesize, and evaluate) independently and in teams.**	**1.5 hrs.**	**To have students define and describe what IP addresses and subnets are and how it is used in everyday**

Standards utilized E1 Ch. 5.5.1: Use knowledge of network structure to help a technician troubleshoot a hidden gateway problem. E1 Ch. 6.1.3: Convert given binary numbers to decimal values; 6.1.5: convert given decimal numbers to binary values. E1 Ch. 6.3.1: Identify classifications of address assignment within the network organization structure of a client company. E1 Ch.10.3.2: Based on network requirements, design an addressing solution that meets current as well as future customer needs.	**- Solve problems using creativity and innovation.** ***(without the use of an electronic device)***		**activities including industry.**

Post-Class Individual Space Activities and Resources. Outline the major steps for the post-class activities and be sure to tie the steps to the advanced learning objectives you have noted above. Also note any resources learners will need to complete any post-class activities assigned after the group space activities.

Steps	**Purpose**	**Estimated Time**	**Learning Objective**
Step 1: **Students will submit worksheets for grading**	**1. To verify that students can identify different IP address classes** **2. Identify sub-nets requirements.**	**10 min**	**Assessment/evaluation**
Step 2: **Students will complete an on-line post test detailing what is learned**	**To verify students comprehension on ip addressing and sub-netting**	**1 hr**	**Evaluation or assessment**

Evaluation:

Analysis.In this section, note what you think will work and what challenges you think you may face in implementation.

Cell phone interruption or usage, during worksheet activity

Connections to Future Lessons. In this section, note how you think this lesson plan connects to your next topics in the course.

Students will design a simple network for a given scenario such as implementing an IP addressing scheme for a school.

References

Worksheets involving various IP conversions and sub-netting exercises (one worksheet is posted)
Cisco-Networking-Academy-Alignment-to-STEM-and-Ed-Standards.pdf
***Website for Assessment*: Cisco.netacad.com**
Youtube.com resources:

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2. What is a subnet and why subnet
3. **Binary and decimal conversion**

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192.12.35.105	
77.251.200.51	
189.210.50.1	
88.45.65.35	
128.212.250.254	
193.100.77.83	
125.125.250.1	
1.1.10.50	
220.90.130.45	
134.125.34.9	
95.250.91.99	