

## Learning Objectives

*After completing this unit, you should be able to:*

- Describe the physical structure of the Internet (routers, cables).
- Define CSMA/CD, CSMA/CA, and the hidden terminal problem.
- Explain the purpose of the protocols: IP, TCP, DNS, and HTTP.
- Summarize the contents of individual packets using Wireshark.
- Describe how the World Wide Web works (servers, browsers).
- Use a web browser's developer tools to navigate HTML source.
- Write HTML for a web page using eight or more different tags.

## Textbook Sections

- 4.1 Network Fundamentals
- 4.2 The Internet
- 4.3 The World Wide Web

## Video Lectures

- The Internet
- World Wide Web
- How the Internet Works (Videos 1–5)

## Assignments

**Act05** The Internet; Chapter 4 Problems

**Lab05** Networking Tutorials; Wireshark, mtr, Web Tools

## Unit 5 Checklist: Sep 23 – Sep 29

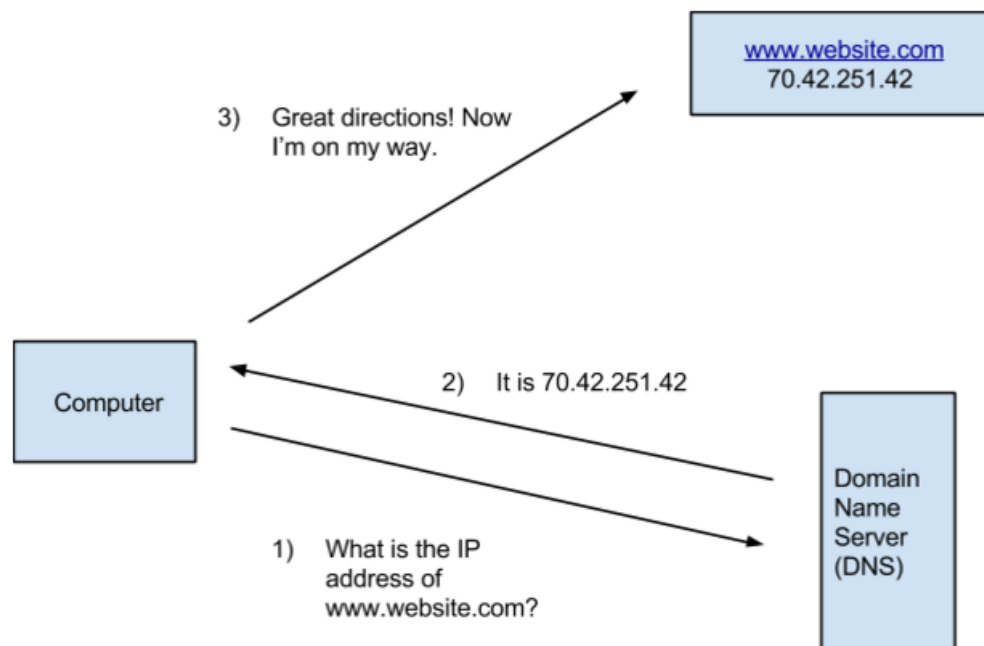
Before Wednesday	Date Completed
FINISH models 1 and 2 of the Internet activity	
READ textbook 4.2 The Internet (take notes) ANSWER questions 5 and 7 in your notes	
READ textbook 4.3 The World Wide Web (take notes) ANSWER question 2, 4, and 5 in your notes	
WATCH video lecture: The Internet (take notes)	
WATCH video lecture: World Wide Web (take notes)	
DO tutorial: Wireshark and Chrome Dev Tools	
START Lab05: Wireshark, mtr, web tools	(10 pts)
Before Friday	Date Completed
READ textbook 4.1 Network Fundamentals (take notes) ANSWER questions 1, 3, and 4 in your notes	
WATCH Code.org #1: What is the Internet? (take notes) WATCH Code.org #2: Wires, Cables & Wifi (take notes) WATCH Code.org #3: IP Addresses & DNS (take notes) WATCH Code.org #4: Packets and Routing (take notes) WATCH Code.org #5: HTTP & HTML (take notes)	
START Act05 exercises (complete at least 75%)	(15 pts)
WRITE title, etc. for your PT1 topic in Google Drive	(10 pts)
Before Monday	Date Completed
COMPARE your Lab05 and Act05 with the solutions in Canvas	
SUBMIT Quiz05 – 1st attempt closed: see what you don't know	
STUDY your notes, ask questions on Piazza, meet with the TAs	
SUBMIT Quiz05 – 2nd attempt open: try to get the full 10 points	(10 pts)
TAKE Exam05	(40 pts)

# Activity 5: The Internet

The Internet is the underlying global network that supports Email, the World Wide Web, and other applications. It consists of many different local networks that are connected together.

## Model 1 How the Internet Works

All devices connected to the Internet are assigned an *IP address* made up of four 8-bit numbers separated by dots (e.g., 173.194.208.139). Some are assigned a *static* (permanent) IP address, whereas others are assigned a *dynamic* (temporary) IP address. Since it's difficult for people to remember numbers, we typically use *domain names* when referring to websites.



### Questions (15 min)

Start time: \_\_\_\_\_

1. Based on the paragraph above:
  - a) How many bits does an IP address have?
  - b) What is the largest possible IP address?
2. Based on the diagram above:
  - a) What is the domain name of the requested server?
  - b) What is the IP address of the requested server?

3. In your own words, what is the function of a DNS server?
  
  
  
  
  
  
  
  
  
  
4. Give examples of domain names that you use frequently. Name at least two .com, two .org, two .edu, and two of something else.
  
  
  
  
  
  
  
  
  
  
5. How are domain names an example of an abstraction?
  
  
  
  
  
  
  
  
  
  
6. List the IP addresses for two of your lab computers and two of your phones. (You can search Google for "IP address" to find them.)
  
  
  
  
  
  
  
  
  
  
7. Go to [TCPIPutils.com](http://TCPIPutils.com) and search for your school's domain name. Scroll down half-way to "Network information".
  - a) Identify the range of IP addresses used by your school.
  
  
  
  
  
  
  
  
  
  
  - b) Does the university have enough IP addresses for all students, faculty, and staff (and their multiple devices)? Explain your answer.

## Model 2 Measuring Your Network

Your network performance can be measured in two ways:

- **bandwidth** – the rate at which data is downloaded or uploaded to a network, measured in bits per second (bps), kilobits per second (kbps), or megabits per second (Mbps)
- **latency** – how much time it takes (in milliseconds) for a request to reach its destination

### Questions (10 min)

Start time: \_\_\_\_\_

8. Consider how performance should be measured:

- a) For bandwidth, would good performance be a large number or a small number?
- b) For latency, would good performance be a large number or a small number?

9. Use an Internet speed test (<https://www.google.com/search?q=speed+test>) to measure bandwidth here on campus and later at home.

- a) On campus:
- b) At home:

10. Use Pingdom's speed test (<https://tools.pingdom.com/>) to measure the average latency between San Francisco and:

- a) <http://google.com>
- b) <http://whitehouse.gov>
- c) Any website you use

11. Search for "Internet speed by state" and "Internet speed by country" to find the interactive maps on [fastmetrics.com](http://fastmetrics.com).

- a) Which state in the US has the fastest **average peak speed**? Which state has the slowest?
- b) What is the difference between the fastest and slowest states?
- c) Which country has the fastest **average speed**? How does the US compare?

## **Chapter 4: Networking and the Internet**

*Complete the following Chapter Review Problems on pages 199–200.*

**#5** (open vs closed network)

**#6** (CSMA/CD in wireless)

**#11** (network vs an internet)

**#14** (dotted decimal notation)

**#25** (Internet vs World Wide Web)

#27 (describe five HTML tags)

#28 (hypertext link) – *only write what changed*

#34 (components of a URL)