### CMPT 165 INTRODUCTION TO THE INTERNET AND THE WORLD WIDE WEB







#### Unit I The World Wide Web

Copyright © 2014 by Stephen Makonin Slides based on course material © SFU Icons © their respective owners



# Learning Objectives

In this unit you will learn the following.

- **Explain** how information is transmitted on the Internet.
- **Describe** how computers are connected on the Internet.
- **Describe** the way a web page gets to your computer.
- List some services available on the Internet and their protocols.

# Topics

I. Define the Internet 2. History of the Internet 3. Internet Basics 4. Protocols 5. Surfing the Web 6. MINE Types 7. Fetching a Web Page

#### Lecture I

Lecture 2

## What is the Internet?

On an iPhone ask:



#### "Siri define the Internet?"

\*\*\* Apple's Siri uses the Internet to answer your questions.



Source: Wolfram Alpha <u>query</u> Copyright © 2014 by Stephen Makonin

## History of the Internet

# 30% of the Internet in 2005

Lines are colour-coded according to their corresponding <u>RFC 1918</u> allocation as follows:

Dark blue: net, ca, us

Green: com, org

Red: mil, gov, edu

Yellow: jp, cn, tw, au, de

Magenta: uk, it, pl, fr

Gold: br, kr, nl

White: unknown

Source: <u>Wikipedia</u> The Opte Project - CC2.5 Copyright © 2014 by Stephen Makonin



### How Does the Internet Work?

### Some Definitions

- ADSL, Cable, Dial-Up are ways to connect to the Internet
- **Ethernet** is a wired connection (desktop PCs)
- Wi-Fi is a wireless connection (laptops, phones, tables)
- **Router** forwards packets from one network to another often in a star topology. Like a hub or switch but having more features (e.g. firewall, NAT)
- LAN is local area network, e.g. office
- **WAN** is wide area network, e.g. many offices
- HAN / PAN sensor networks in the home or on the person
- **ISP** is Internet Service Provider, e.g. Shaw, Telus, Rogers
- IP Address unique numeric identifier on the can be dynamic or static
- BGP is border gateway protocol used to connect IPS to each other

### How We Connect

![](_page_8_Figure_1.jpeg)

# Net Neutrality

... is the principle that ISPs and governments should treat all data on the Internet equally, not discriminating or charging differentially by user, content, site, platform, application, type of attached equipment, and modes of communication.

Examples:

- Throttle bandwidth if watching a movie on Netflix
- Charge more to download a movie bought from iTunes
- Filter out content based on ideology, i.e. censorship

### HOW DOES THIS AFFECT YOU?

Source: Wikipedia - <u>http://en.wikipedia.org/wiki/Net\_neutrality</u> Copyright © 2014 by Stephen Makonin

# Cloud Computing

... is the delivery of computing as a service rather than a product, whereby shared resources, software, and information are provided to computers and other devices as a utility (like the power grid) over the Internet.

Examples:

- Storage: Amazon S3, Dropbox, Sparkfun Phant
- Applications: <u>Apple iCloud</u>, <u>GMail</u>
- Distributed Computing: <u>Amazon EC2</u>

### HOW SECURE IS YOUR DATA?

Source: Wikipedia - <u>http://en.wikipedia.org/wiki/Cloud\_computing</u> Copyright © 2014 by Stephen Makonin

![](_page_11_Picture_0.jpeg)

### **QUESTIONS?**

## **Clients and Servers**

**Client:** simply the comupter making a request for info

- Info e.g. web page, an song, a movie, etc
- Usually has a dynamic IP address
  - Means that it is not directly connected to the Internet
- The computer you or I do our work on:
  - e.g. web browser, word processor
- Cannot have a nice host name like <u>www.sfu.ca</u>
  - Assigned by ISP: akjx74wuc23nf.bc.hsia.telus.net or h24-84-78-194.vc. shawcable.net
     Unless you use a service

like DynaDNS

## **Clients and Servers**

Server: simply the computer sending the requested info

- Usually has a static IP address (direct connection).
- Often sits in a server room, hidden and locked up.
- Has special apps called server programs running:
  - e.g. web server, file server, database server

![](_page_13_Figure_6.jpeg)

Source: CMPT 165 Course Study Guide, p. 23

### Protocols

def. a set of rules governing the exchange or transmission of data between devices (Apple's Amaerican Dictionaty)

#### OR

the specific language a client and a server use to exchange information when connected.

e.g. HTTP for surfing the web and view webpages

## HTTP

#### or HyperText Transfer Protocol

HyperText *def.* is a software system that links topics on the screen to related information and graphics, which are typically accessed by a point-and-click method. (Apple's Amaerican Dictionaty)

- The default port for HTTP is **port 80**.
- Port def. a numerical designation for a protocol.
- Humans love text. Computers love numbers!

## Some Standard Protocols

Task	Protocol	Port
Secure Web Browsing	HTTPS	443
Non-Secure Email	SMPT	25
Non-Secure File Transfer	FTP	21
Remote Terminal (Non-Secure/Secure)	Telnet/SSH	23/22

# Proprietary Protocols

def. protocols that are private, use by companies to create a "closed system".

- Instant messaging: iMessage and Skype, others Yahoo!, Google, Facebook.
- Peer-to-peer file transfer: Napster, Apple's AirDrop, BitTorrent (sort of).
- Network gaming: any multi-player game, MMORPG
- **Streaming:** iTunes, Netflix, YouTube, Vimeo, CBC Music.

#### WHAT IS THE DIFFERENCE BETWEEN FILE TRANSFERRING AND STREAMING?

# Surfing the Web

To do this we use a **web browser app**.

- e.g. Safari, Firefox, Chrome, Internet Explorer
- this is the client app that takes the **URL** you input and displays the corresponding webpage.

![](_page_18_Picture_4.jpeg)

# URI

#### **Uniform Resource Locator**

http://www.sfu.ca/~somebody/page.html
---------------------------------------

scheme

path

÷

www.i

Figure 1.3: The parts of a simple URL

Scheme: is the type of network protocol

server

• e.g. http, https, ftp, file (local)

**Server:** the host name + domain name ( $\rightarrow$  IP address)

• www is usually default hostname for the web server

Path: the location of the server of a specific resource

A URI (Identifier) does not specify the scheme

• e.g. <u>WWW.sfu.ca/~somebody/page.html</u> Source: CMPT 165 Course Study Guide, p. 26 Copyright © 2014 by Stephen Makonin 20

### MIME Types Multipurpose Internet Mail Extensions

def. a way of communicating the type of file being sent.

- First used to identify types of email attachments.
- Help identify how the browser will treat the file.
- Two parts to a MIME:
  - I. the type, which indicates the overall kind of file,
  - 2. The second is the subtype, which is the specific kind of file.
- if not sure bowser may ask: save or open?
  - or download it to you Downloads folder.

# **MIME Examples**

Content-Type: text/http

• An HTML file, render in browser.

Content-Type: text/plain

• A text file, display in bowser using a monospaced font.

Content-Type: audio/mp4

• A song, place song player on web page.

Content-Type: image/jpeg

• An image, place image on web page.

Content-Type: video/mp4

• A video, open with iTunes or media player app.

Content-Type: application/zip

• A compressed file, download and automatically run the app to uncompress it.

# Fetching a Web Page

#### URL: examples/iphone.html

![](_page_22_Figure_2.jpeg)

	1. Please send me the web page.	
	<ul><li>Send me this image.</li></ul>	
	4. Here it is.	
Your Computer		Web Server

URL: http://cmpt165.csil.sfu.ca/~smakonin/iphone.html

The web browser contacts the server specified in the Server (host + domain), cmpt165.csil.sfu.ca. It asks for the file with path: /home/smakonin/public\_html/iphone.html

Source: CMPT 165 Course Study Guide, p. 23

	1. Please send me the w	veb page.	
		2. Here it is.	
250	3. Send me this image.		
	-	4. Here it is.	
Your Computer			Web Server

The server responds with an **OK** message, indicating that the page has been found and will be sent. It indicates that the MIME type of the file is **text/html**—it's an HTML page. Then it sends the contents of the file, so the browser can display it.

	1. Please send me the web page. 2. Here it is.	
	3. Send me this image.	
Your Computer	<ul> <li>4. Here It is.</li> </ul>	Web Server
•		

The browser notices that the web page contains an image with URL:

http://cmpt165.csil.sfu.ca/~smakonin/iphone.png

It asks for the file with path:

/home/smakonin/public\_html/iphone.png

Source: CMPT 165 Course Study Guide, p. 23

	1. Please send me the web page.	
	<ul> <li>Here it is.</li> </ul>	
	3. Send me this image.	0
	4. Here it is.	
Your Computer		Web Server

The server again responds with an **OK** and gives the MIME type **image/png**, which indicates a PNG format image. Then it sends the actual contents of the image file.

Finally the full webpage is displayed!

Source: CMPT 165 Course Study Guide, p. 23

## Files Used

#### iphone.html

#### <html> <head> <title>The iPhone</title> </head> <body> <center> <h1>The iPhone</h1> This is the iPhone 4s. <img src="iphone.png" /> </center> </body> </html>

iphone.png

# Summary

- Looked at the history of the Internet.
- Introduced to how the WWW and the Internet work.
- Understand what goes on behind the scenes when you use the Internet for various tasks.
- Learnt high-level topics that will help you later in the course.

**Next Unit:** we look at HTML and XHTML and learn markup.

![](_page_29_Picture_0.jpeg)

### **QUESTIONS?**