Introduction to Computing

By:
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Table of Contents

Chapter 1

Introduction

1.1 CSC1010-Introduction[1]

1.1.1 CSC1010 - Introduction

1.1.1.1 Computing?

This is the "introduction" to the Introduction of Computing. We explore the differences between data, knowledge, and information and their uses. There is a short exercise at the end of the module.

We all have this end user computing[2] frustration.

There are devices[3] that cause frustration.

We have data input[4] that causes frustration.

And sometimes we want to act out our frustration[5] on computers.

1.1.1.2 Data, Information, & Knowledge

This is the "introduction" to the Introduction of Computing. We explore the differences between data, knowledge, and information and their uses. This is a short exercise at the end of the module.

What is data?

What is information?

What is knowledge?

[1] This content is available online at <http://cnx.org/content/m55633/1.6/>.
[2] http://www.youtube.com/watch?v=I3Xn-GBxRWQ&feature=em-share_video_user
[3] http://www.youtube.com/watch?v=I3Xn-GBxRWQ&feature=em-share_video_user
[4] http://www.youtube.com/watch?v=FM6JposvOeQ&feature=em-share_video_user
[5] http://www.youtube.com/watch?v=MAVnRv3nZVo&feature=em-share_video_user

The Distribution of Understanding

Figure 1.1: Diagram by RobOnKnowledge (Own work) [CC-BY-SA-3.0 (http://creativecommons.org/licenses/by-sa/3.0)], via Wikimedia Commons from Wikimedia Commons.

1.1.1.3 What's the Difference?

- One perspective[6] from Bob Boiko of the University of Washington (video)
- A more detailed explanation[7]

1.1.1.4 Information = Data + Context

- Group multiple pieces of data together
- Establish relationships between data items
- Provide context/framework for data
- Interpret resulting combination

1.1.1.5 Validity of Information

- Valid Data -> Valid Information?
- Not necessarily!
  - What if the data is incomplete?
  - What if the data is inaccurate?
  - What if the context for the data is missing?
- If information is invalid, what happens to knowledge?

1.1.1.6 Where do computers fit in?

- Computers store data.
- Computers process data
- Computers generate information

[6] http://youtu.be/vDt3ik2v-Wg
[7] http://www.diffen.com/difference/Data_vs_Information

1.1.1.7 Data Processing Examples

- Organize data
- Calculate new data
- Interpret data in a different format
- Spreadsheets
- Database management systems
- Accounting software
- Graphics manipulation programs

1.1.1.8 Visualation as a Tool

- David McCandless uses visualizations to turn large amounts of data into information.
- Ted Talk 2010[8]
- Data, Information, Knowledge, Wisdom[9]
  - Note his take on the diagram on page 3
- His Information is Beautiful[10] website has many more examples of visualizations of data.

1.1.1.9 Reflect and Investigate

1. Give your own example of valid data producing invalid information.
2. Explore the Information is Beautiful[11] website and find a visualization, either in the blog or the Our Data section, that you think does a particularly good job of turning data into information. Why did you choose this particular item, and what makes it so good?

[8] http://www.ted.com/talks/david_mccandless_the_beauty_of_data_visualization
[9] http://www.informationisbeautiful.net/2010/data-information-knowledge-wisdom/
[10] http://informationisbeautiful.net/
[11] http://informationisbeautiful.net/

Chapter 2

Chapter1

2.1 CSC1010-Chapter1[1]

2.1.1 CSC1010 – Chapter1 – History of Computing

2.1.1.1 Before the Industrial Revolution

The Renaissance was a time of great philosophical and scientific progress, including critical milestones in mathematics that would lead toward the invention of the computer.

Boolean Algebra: This was published by George Boole in 1854. It clarified the mathematical field of Booldan logic and algebra. It formed the basis for computer hardware. For further details, please visit George Boole's Contribution[2]

2.1.1.2 Early Calculating Devices

These appeared approximately before 1820. The basic calculating devices were invented to support simple mathematics. This category of devices were mechanical in nature and could not store any data.

Abacus

- Invented about 3000 BC
- Originated in either China or the Indus River Valley area
- Discussion of the abacus[3]
- Demonstration of an abacus[4] (video)

Napier's Bones

- Device using lattice multiplication for calculating products and quotients
- Mechanical, but not mechanized
- Napier's Bones: How They Work[5] (video)

Slide Rule

- Invented by William Oughtred in 1622
- Following up on Napier's work with both logarithms & Napier's Bones
- Performs a variety of mathematical calculations

[1] This content is available online at <http://cnx.org/content/m61611/1.2/>.
[2] http://history-computer.com/ModernComputer/thinkers/Boole.html
[3] http://history-computer.com/CalculatingTools/abacus.html
[4] http://youtu.be/CvsnftXXKdw
[5] http://youtu.be/3gjDfc2AF3w

- How to Use a Slide Rule[6] (video)

The Rechenuhr (Calculating Clock)

- First mechanical calculating device
- Built by Wilhelm Schickard in 1623
- Functioned accurately but had several mechanical flaws and was never placed into full production

Pascaline

- Developed in 1643 by French mathematician Blaise Pascal
- Mechanical device that could add and subtract (in other words, a basic calculator)
- Pascal and his Calculator[7]
- How the Pascaline Works[8] (video)

Von Leibnitz "Stepped Reckoner[9] "

- Built in 1673 by German mathematician Gottfried Wilhelm von Leibnitz
  - Inventor of differential & integral calculus
- Calculating device improving on the Pascaline
- Could multiply as well as add and subtract (but still couldn't divide).

2.1.1.3 The Industrial Revolution

The 1700s and early 1800s were a time of great political and social unrest (examples: the American and French Revolutions). As a result, mathematics and science took a back seat to other endeavors until the political and social climate settled down and the Industrial Revolution began early in the 19^{th} century.

2.1.1.4 19^{th} Century Computing Devices

- Products of the Industrial Revolution
  - Mechanical devices
  - Limited data storage
    - Small quantities
    - Clumsy methods
  - Design often outpaced available technology
- 19th century contributions to computing[10]

Jacquard's Loom

- Invented by Joseph Jacquard between 1801-1804
- Built upon the work of Basile Bouchon, Jean Falcon and Jacques de Vaucanson to create an automatic weaving loom.
- Wove intricately patterned cloth based on instructions contained on punched cards.
- The first programmable stored instruction machine actually built.
- Jacquard Loom: Early Computer Programing[11] (video)

[6] http://youtu.be/uUzSStVnAHk
[7] http://history-computer.com/MechanicalCalculators/Pioneers/Pascal.html
[8] http://youtu.be/3h71HAJWnVU
[9] http://ds.haverford.edu/bitbybit/bit-by-bit-contents/chapter-one/1-8-leibniz-and-the-stepped-reckoner/
[10] http://cgi.csc.liv.ac.uk/~ped/teachadmin/histsci/htmlform/lect4.html
[11] http://youtu.be/lwozgRPLVC8

Charles Babbage

- Charles Babbage[12] can be considered the single most important individual in the pre-20th century development of the computer.
- Lucasian Professor of Mathematics at Cambridge University
- Co-founder of the Royal Astronomical Society
- Cryptographer who broke Vignere's autokey cypher (thought to be unbreakable)
- Inventor of the locomotive cow-catcher

Difference Engine

- Version 1: 1820-1830
- Solved polynomial equations of the form ax2+bx+c to an accuracy of six places
- Gear-driven machine
- All calculating was done with repeated addition
- Difference Engine Simulator[13]
- Prototype consisting of 1/7 of the final machine was built in 1832
- Remainder was never completed

NOTE: Image from the Science Museum via computerhistory.org

Analytical Engine

- Designed 1833-1842
- Stored program machine to perform any type of arithmetic calculation

[12] http://www.charlesbabbage.net/
[13] http://www.fampennings.nl/maarten/diffeng/index.htm

- Numerous limitations prevented Babbage from actually building it
  - Politics, economics, personalities were as much a factor as technology
- Comprised of three main parts
  - "Mill" for calculations
  - "Store" for storing data
  - Input/output device
- Design corresponds in many ways to the basic architecture of the modern computer
- Babbage describes the Analytical Engine[14] in his autobiography
- Machine has not been built to this day
- Plan28.org[15] Has been established to build the Analytical Engine by 2020
- Watch John Graham-Cunningham's TEDx talk on "The Greatest Machine that Never Was"[16]

Difference Engine #2

- Designed between 1847 and 1849
- Improved upon the original Difference Engine with a simpler design to achieve the same computing power
- Again, not built during Babbage's lifetime
- Was finally built[17] between 1985 and 2002 by the Science Museum of London, exactly to Babbage's original plans

[14] http://www.fourmilab.ch/babbage/lpae.html
[15] http://plan28.org/
[16] http://youtu.be/4rzAL5YwFow
[17] http://www.computerhistory.org/babbage/modernsequel/

Chapter 3

Chapter2.1

3.1 CSC1010-Chapter-2-1[1]

3.1.1 CSC1010 - Chapter 2-1

3.1.1.1 Industry of Computing

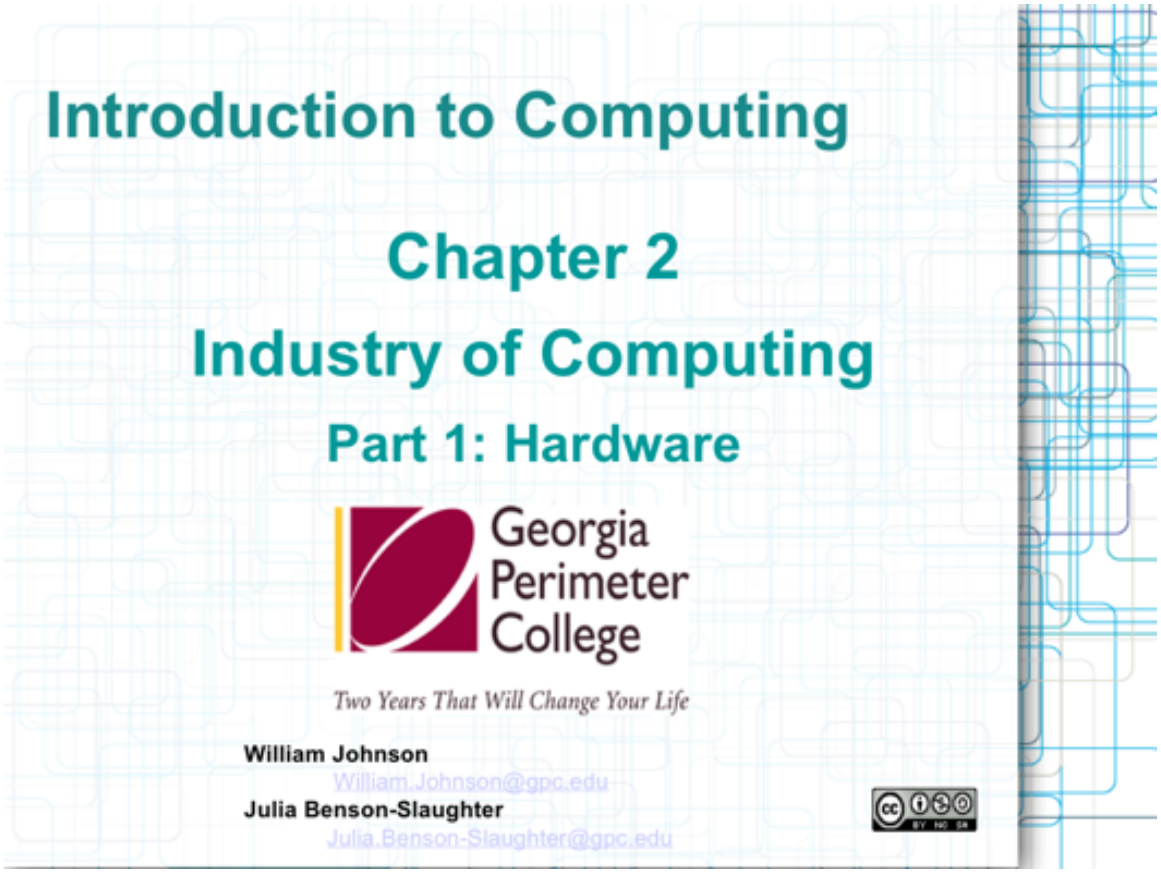


Figure 3.1

[1] This content is available online at <http://cnx.org/content/m61600/1.1/>.

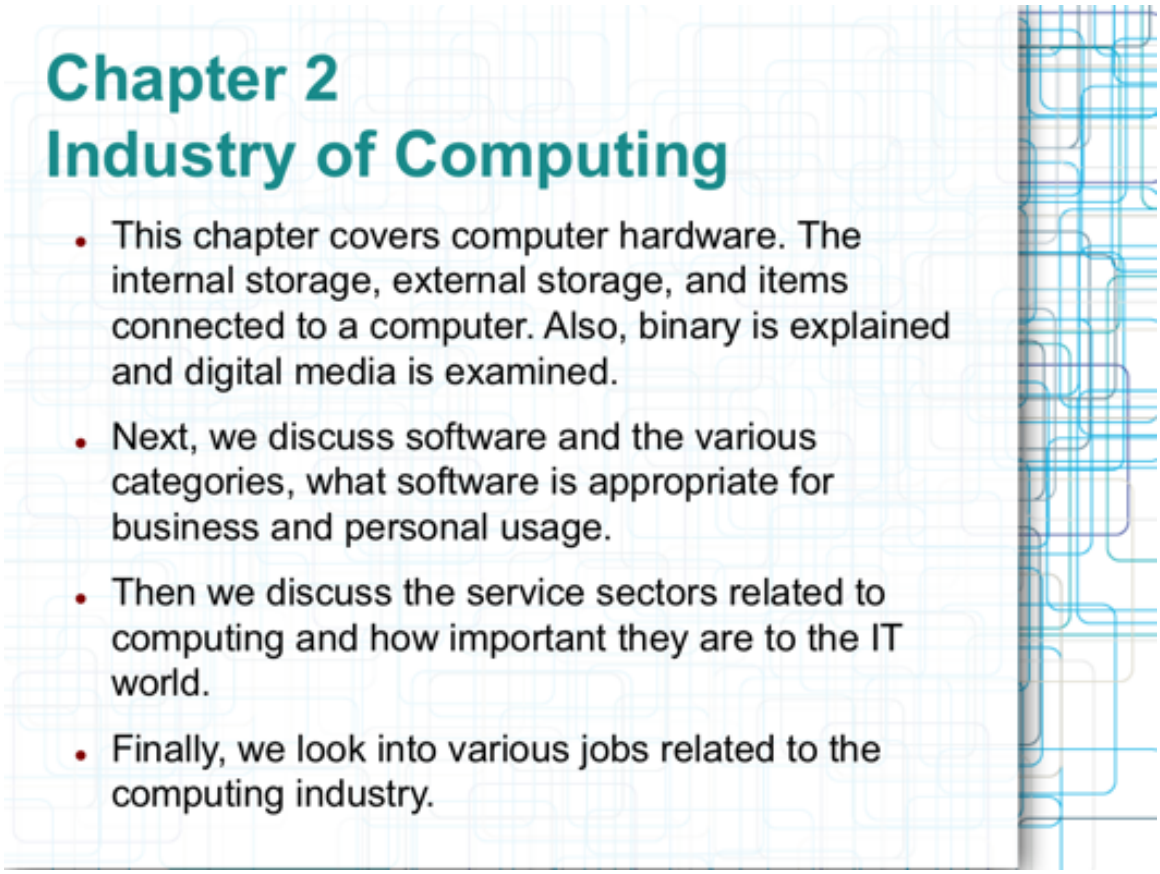

Chapter 2
Industry of Computing
This chapter covers computer hardware. The internal storage, external storage, and items connected to a computer. Also, binary is explained and digital media is examined.
Next, we discuss software and the various categories, what software is appropriate for business and personal usage.
Then we discuss the service sectors related to computing and how important they are to the IT world.
Finally, we look into various jobs related to the computing industry.

Figure 3.2

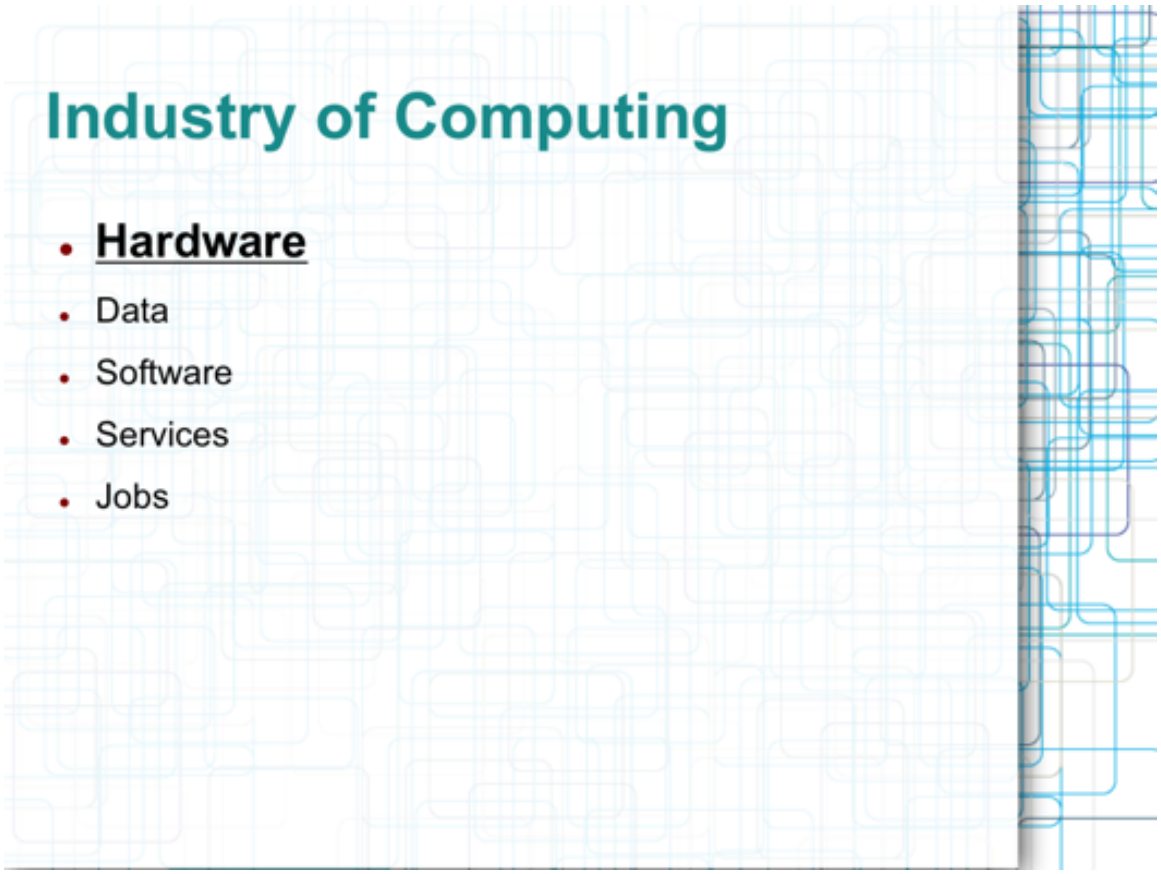

Industry of Computing
Hardware
Data
Software
Services
Jobs

Figure 3.3

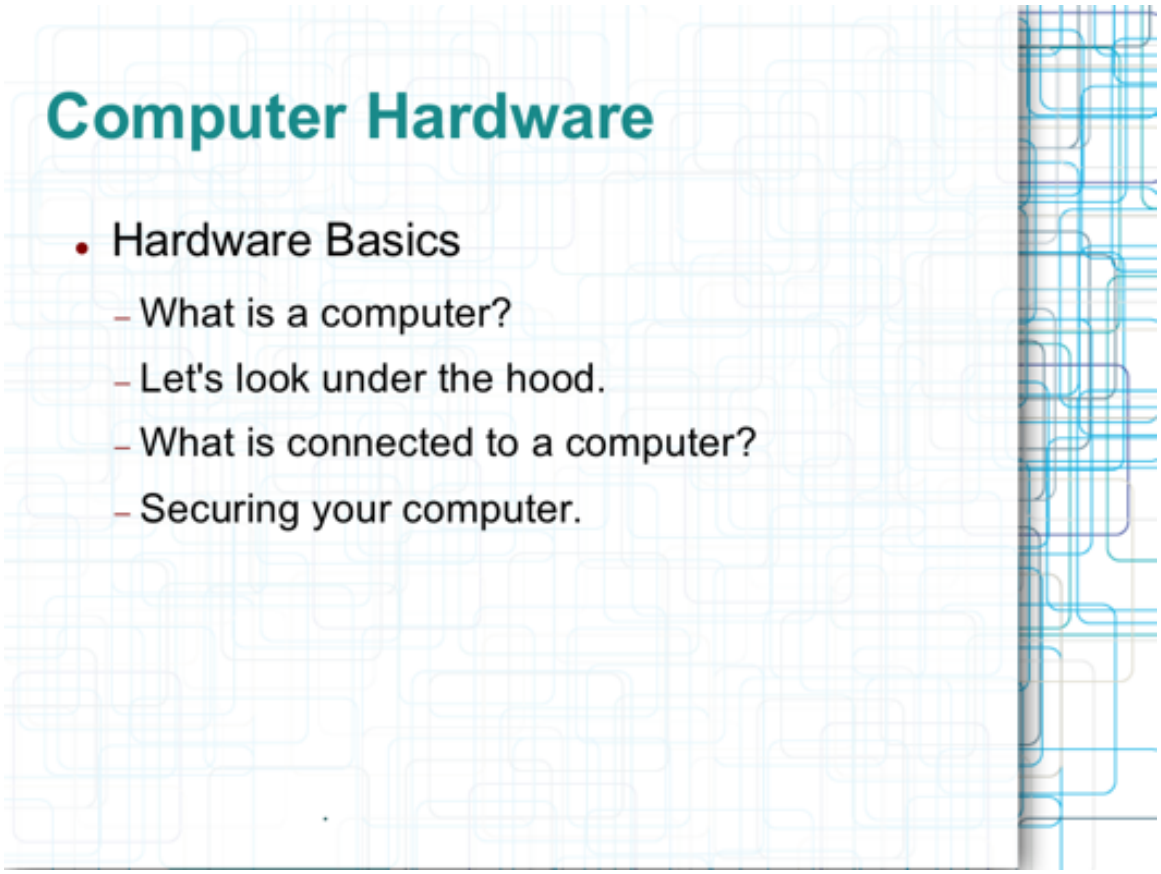

Computer Hardware
Hardware Basics
What is a computer?
Let's look under the hood.
What is connected to a computer?
Securing your computer.

Figure 3.4


Overview
Computer Basics (video)
Computers: A Chronological Timeline (infographic)
Make Use Of's Your PC Inside & Out, Part 1
Make Use Of's Your PC Inside & Out, Part 2
What's Inside Your Computer: The Story Of Every Compon
You Need To Know

Figure 3.5

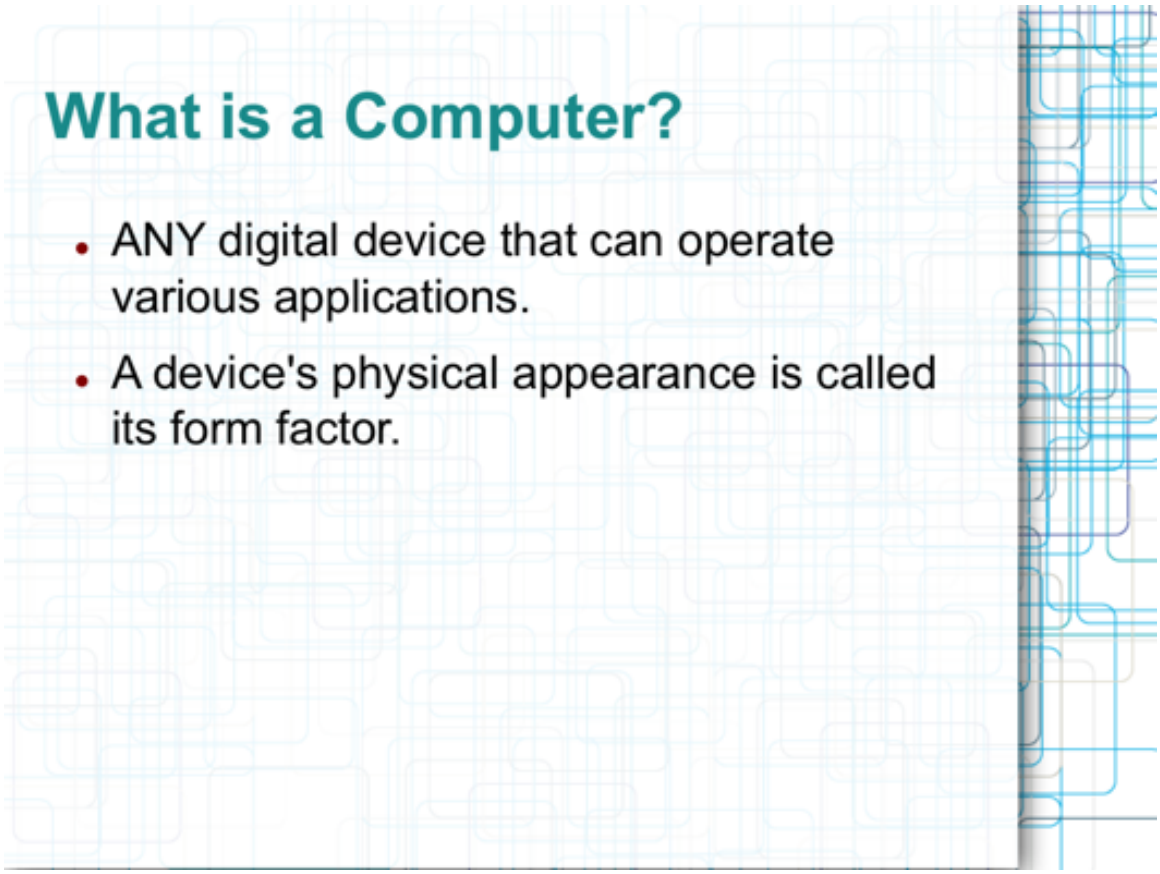

What is a Computer?
ANY digital device that can operate various applications.
A device's physical appearance is called its form factor.

Figure 3.6

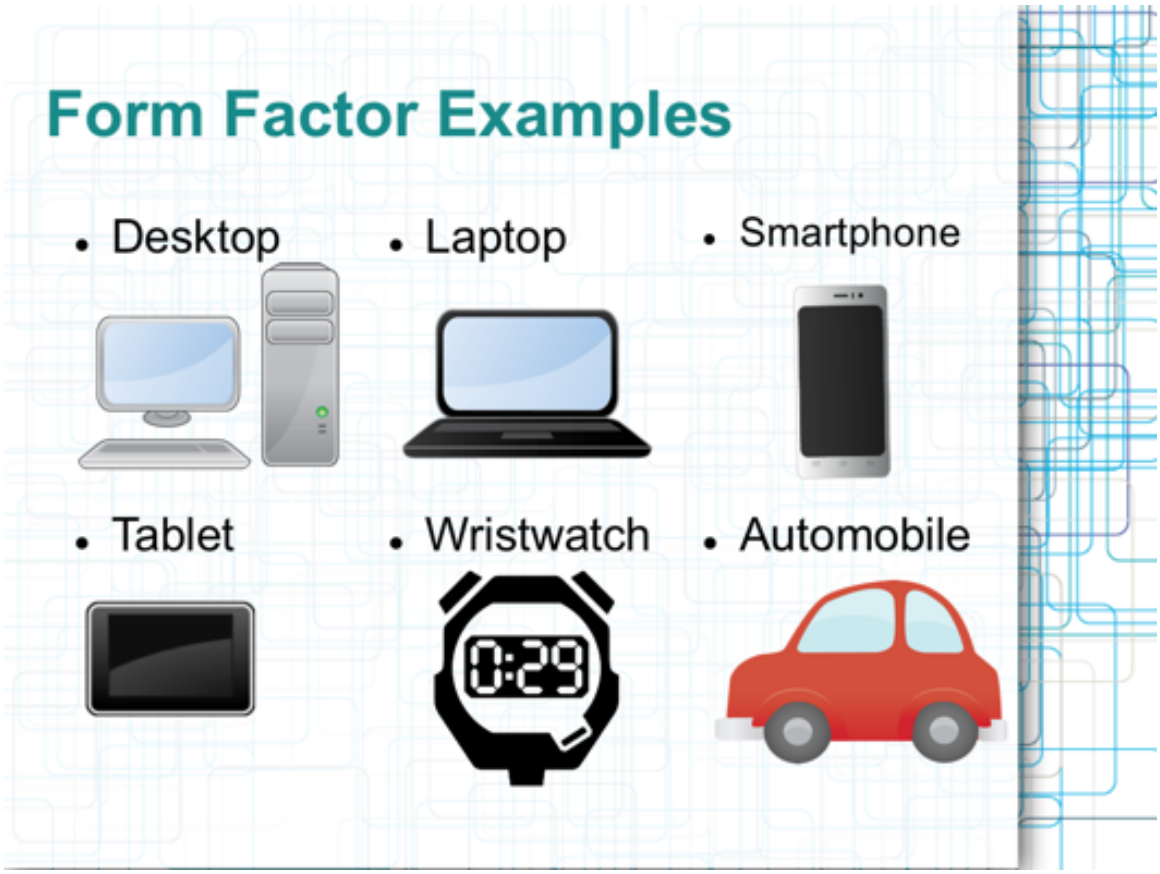

Form Factor Examples
Desktop
Laptop
Smartphone
Tablet
Wristwatch
Automobile
0:29

Figure 3.7

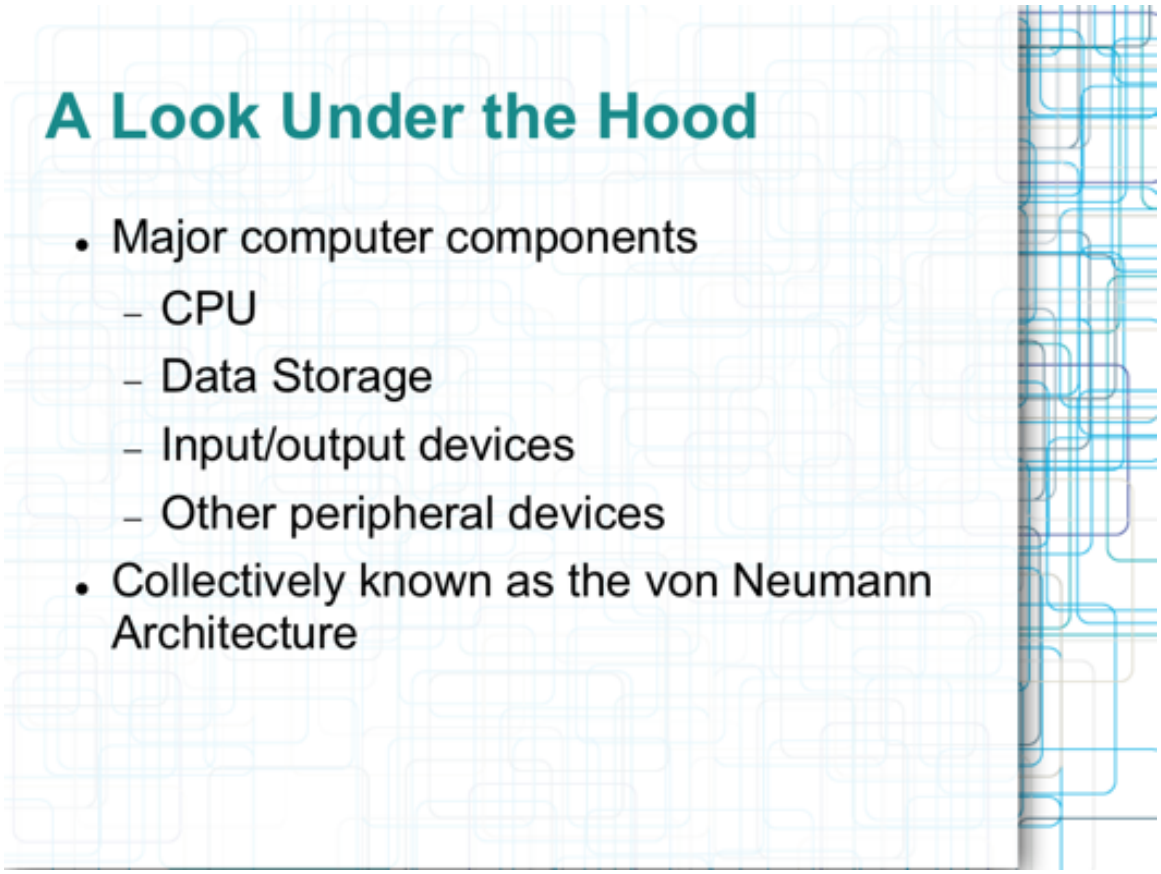

A Look Under the Hood
Major computer components
CPU
Data Storage
Input/output devices
Other peripheral devices
Collectively known as the von Neumann Architecture

Figure 3.8

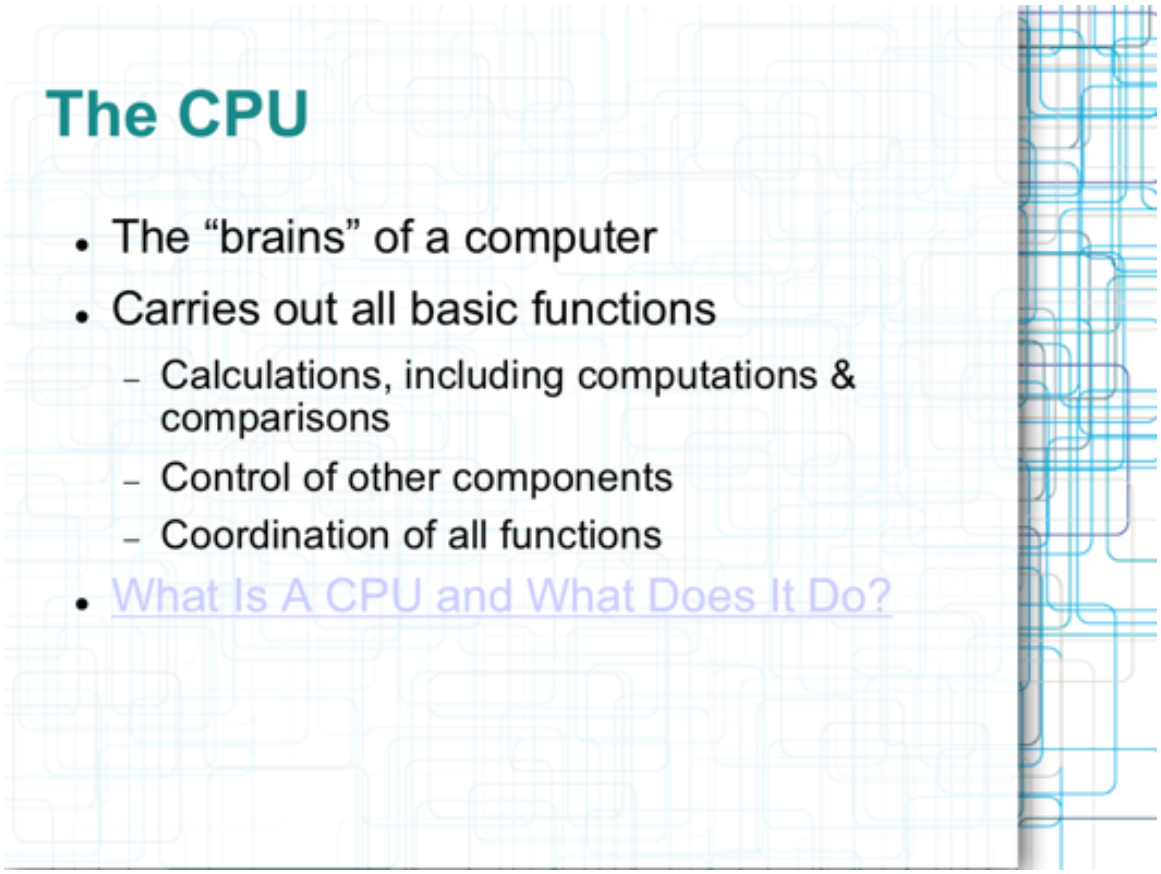
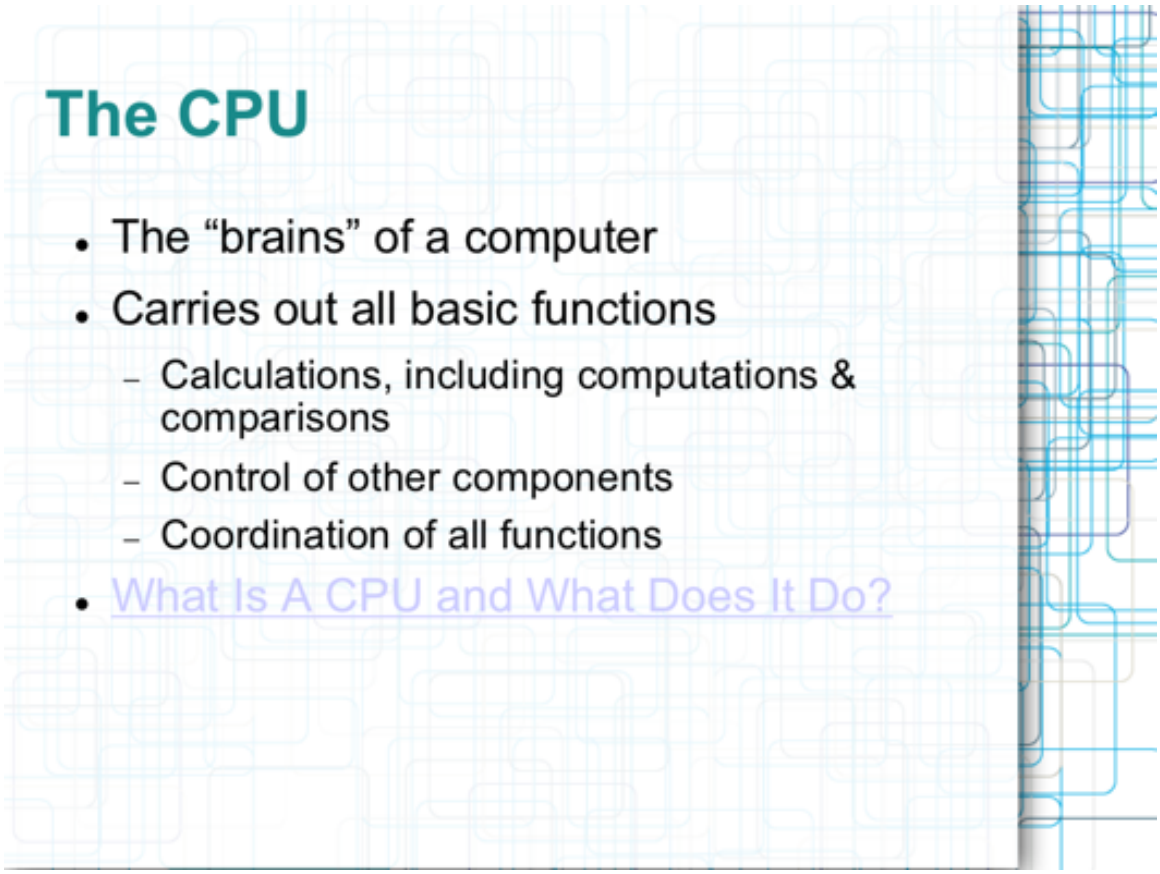

The CPU
The “brains” of a computer
Carries out all basic functions
Calculations, including computations & comparisons
Control of other components
Coordination of all functions
What Is A CPU and What Does It Do?

Figure 3.9


The CPU
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What Is A CPU and What Does It Do?

Figure 3.10

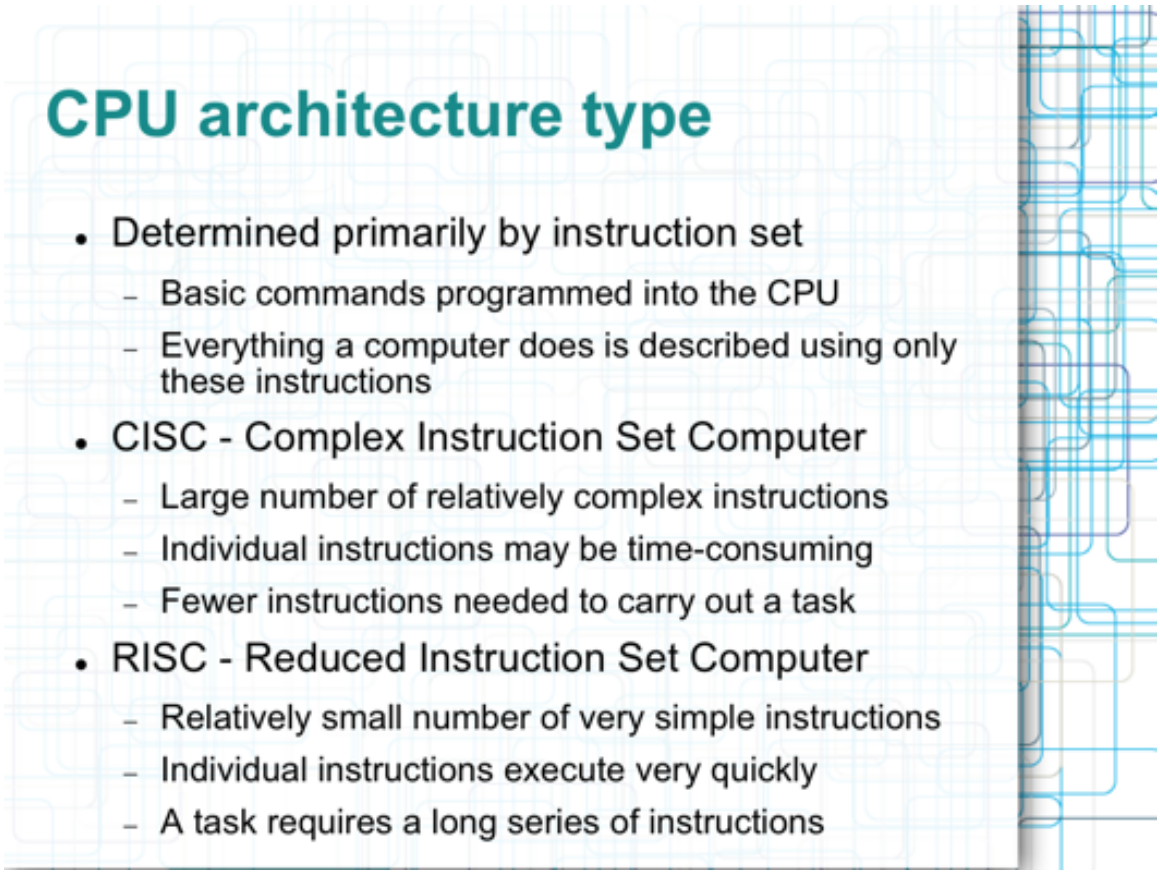

CPU architecture type
Determined primarily by instruction set
Basic commands programmed into the CPU
Everything a computer does is described using only these instructions
CISC - Complex Instruction Set Computer
Large number of relatively complex instructions
Individual instructions may be time-consuming
Fewer instructions needed to carry out a task
RISC - Reduced Instruction Set Computer
Relatively small number of very simple instructions
Individual instructions execute very quickly
A task requires a long series of instructions

Figure 3.11

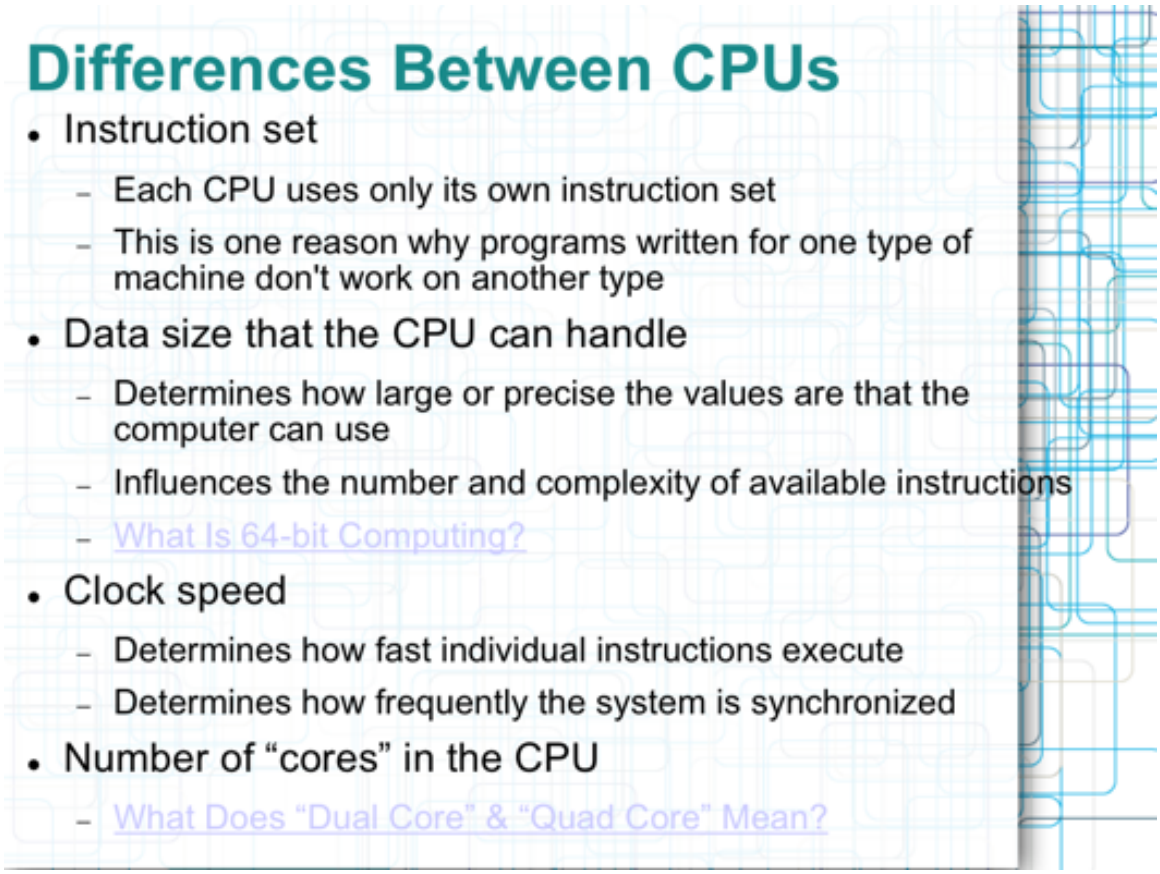

Differences Between CPUs
Instruction set
Each CPU uses only its own instruction set
This is one reason why programs written for one type of machine don't work on another type
Data size that the CPU can handle
Determines how large or precise the values are that the computer can use
Influences the number and complexity of available instructions
What Is 64-bit Computing?
Clock speed
Determines how fast individual instructions execute
Determines how frequently the system is synchronized
Number of "cores" in the CPU
What Does "Dual Core" & "Quad Core" Mean?

Figure 3.12

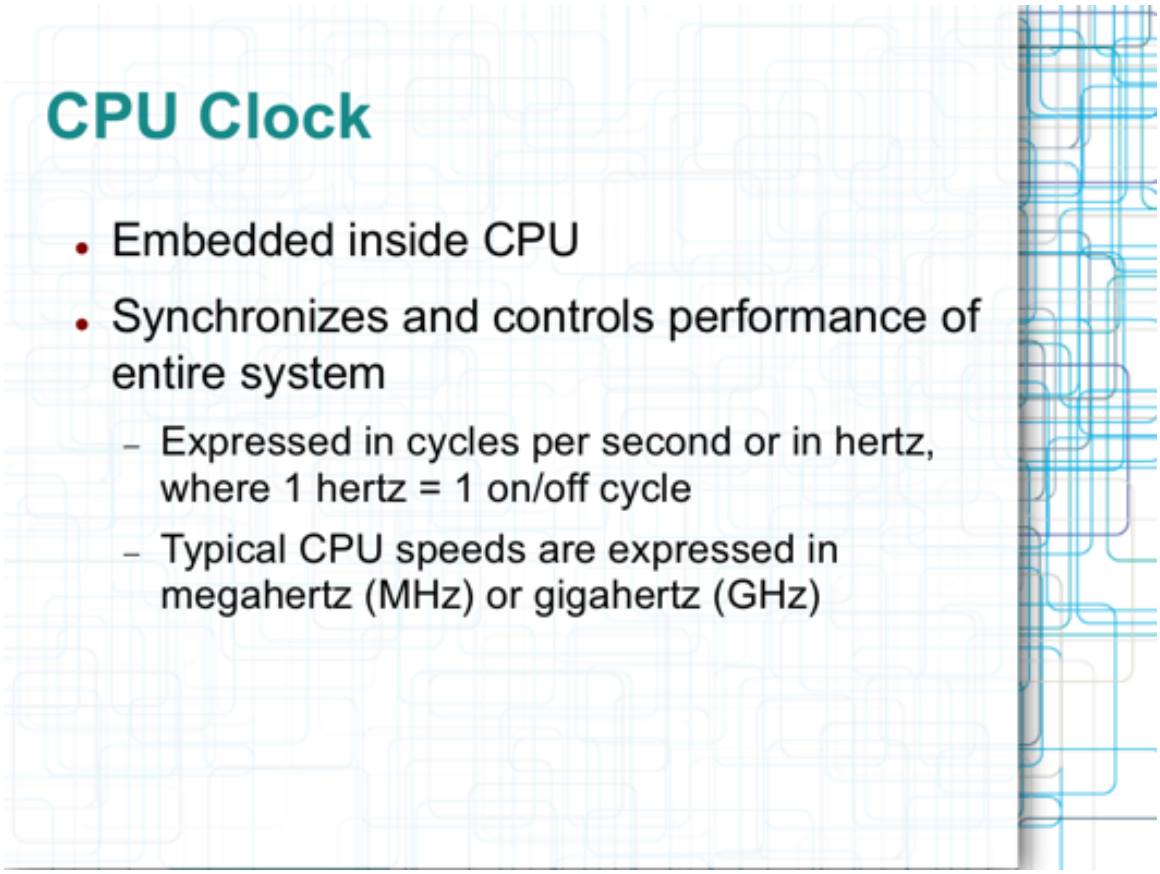

CPU Clock
Embedded inside CPU
Synchronizes and controls performance of entire system
Expressed in cycles per second or in hertz, where 1 hertz = 1 on/off cycle
Typical CPU speeds are expressed in megahertz (MHz) or gigahertz (GHz)

Figure 3.13

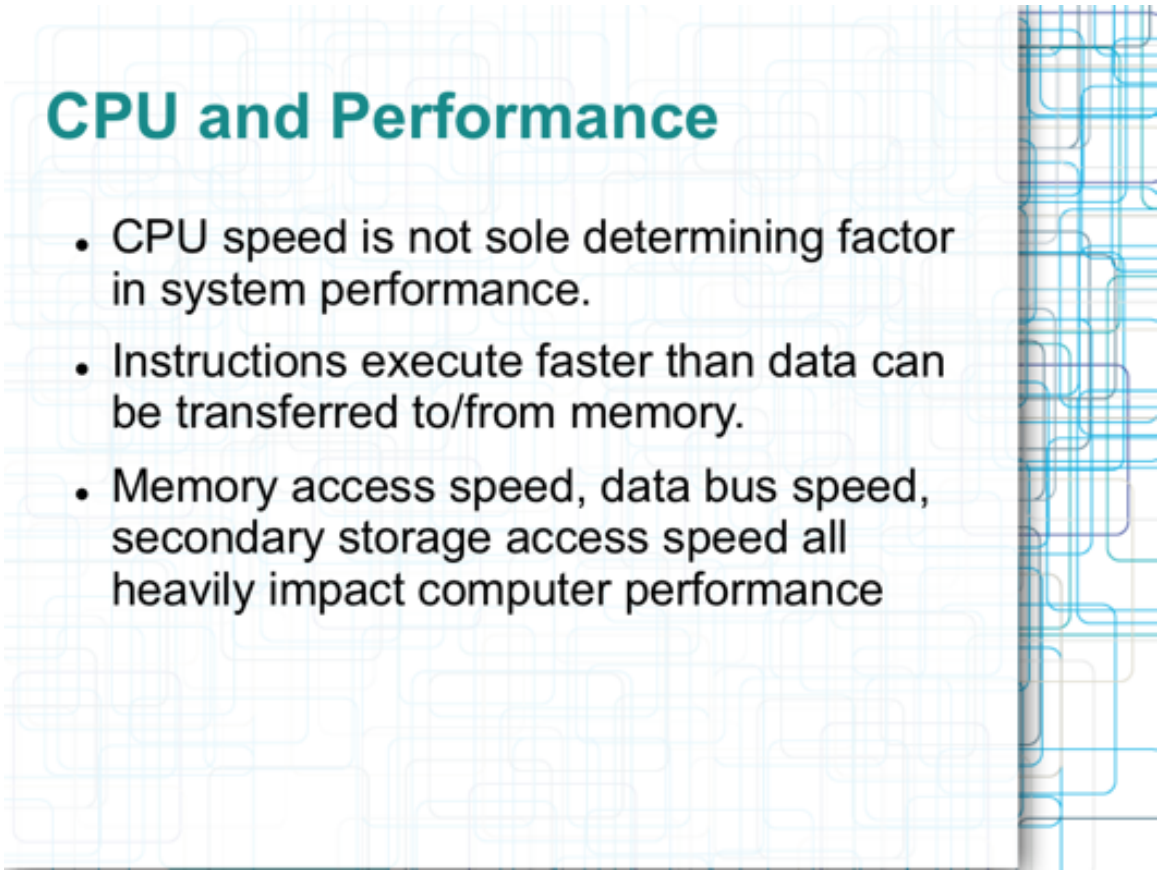

CPU and Performance
• CPU speed is not sole determining factor in system performance.
• Instructions execute faster than data can be transferred to/from memory.
• Memory access speed, data bus speed, secondary storage access speed all heavily impact computer performance

Figure 3.14

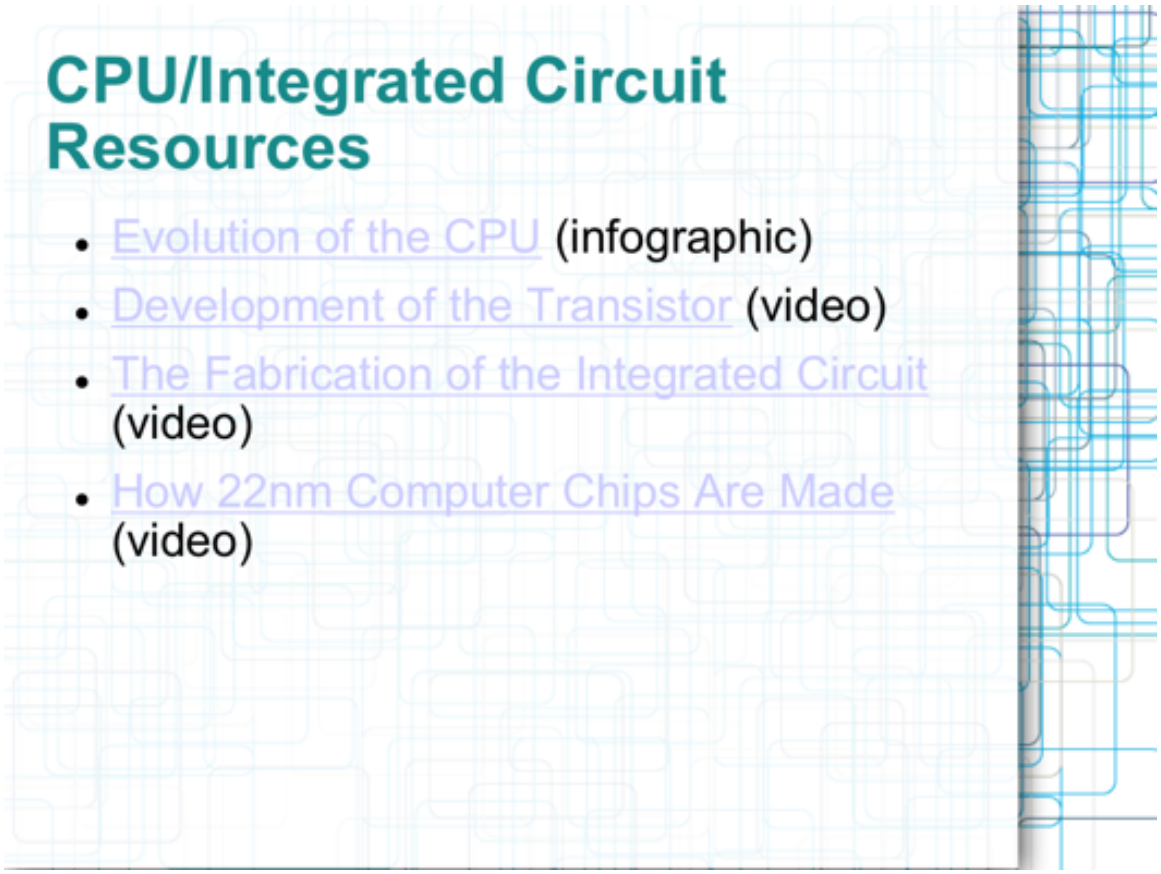

CPU/Integrated Circuit Resources
Evolution of the CPU (infographic)
Development of the Transistor (video)
The Fabrication of the Integrated Circuit (video)
How 22nm Computer Chips Are Made (video)

Figure 3.15

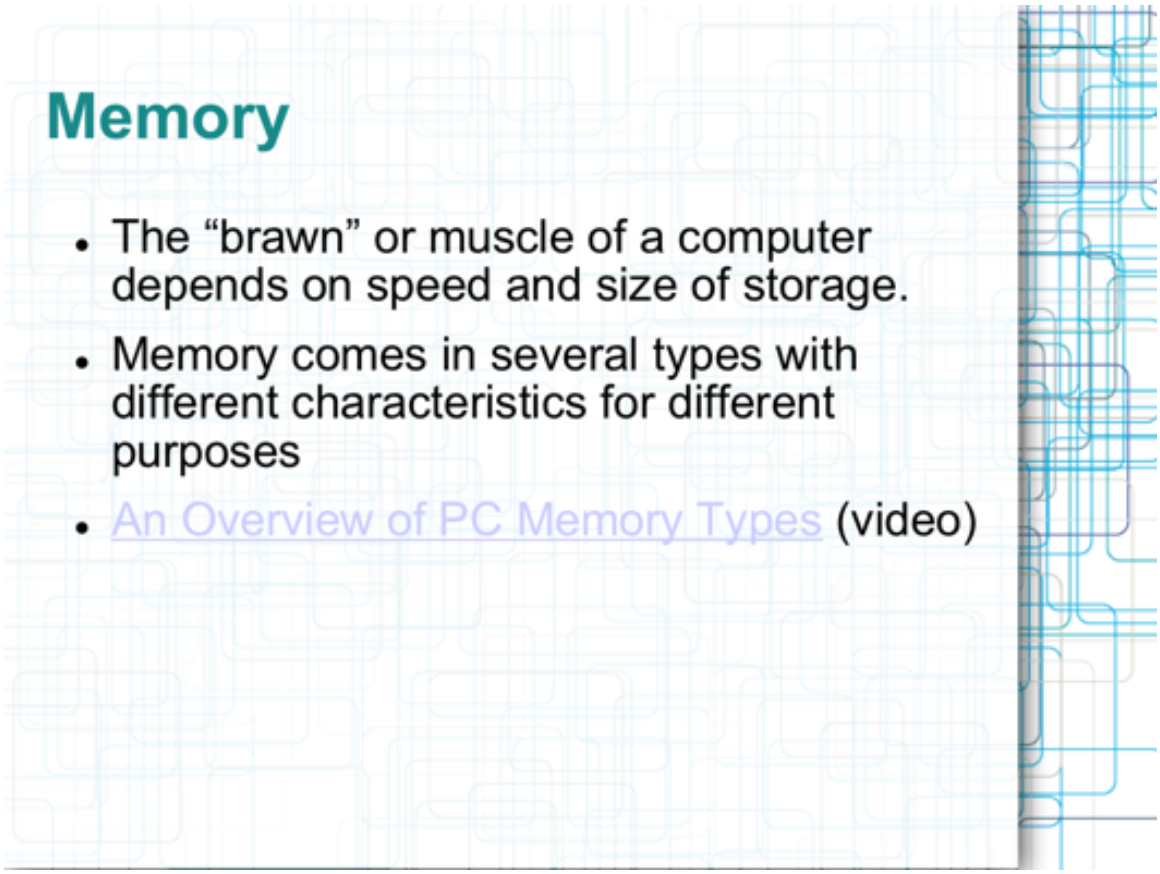

Memory
The “brawn” or muscle of a computer depends on speed and size of storage.
Memory comes in several types with different characteristics for different purposes
An Overview of PC Memory Types (video)

Figure 3.16

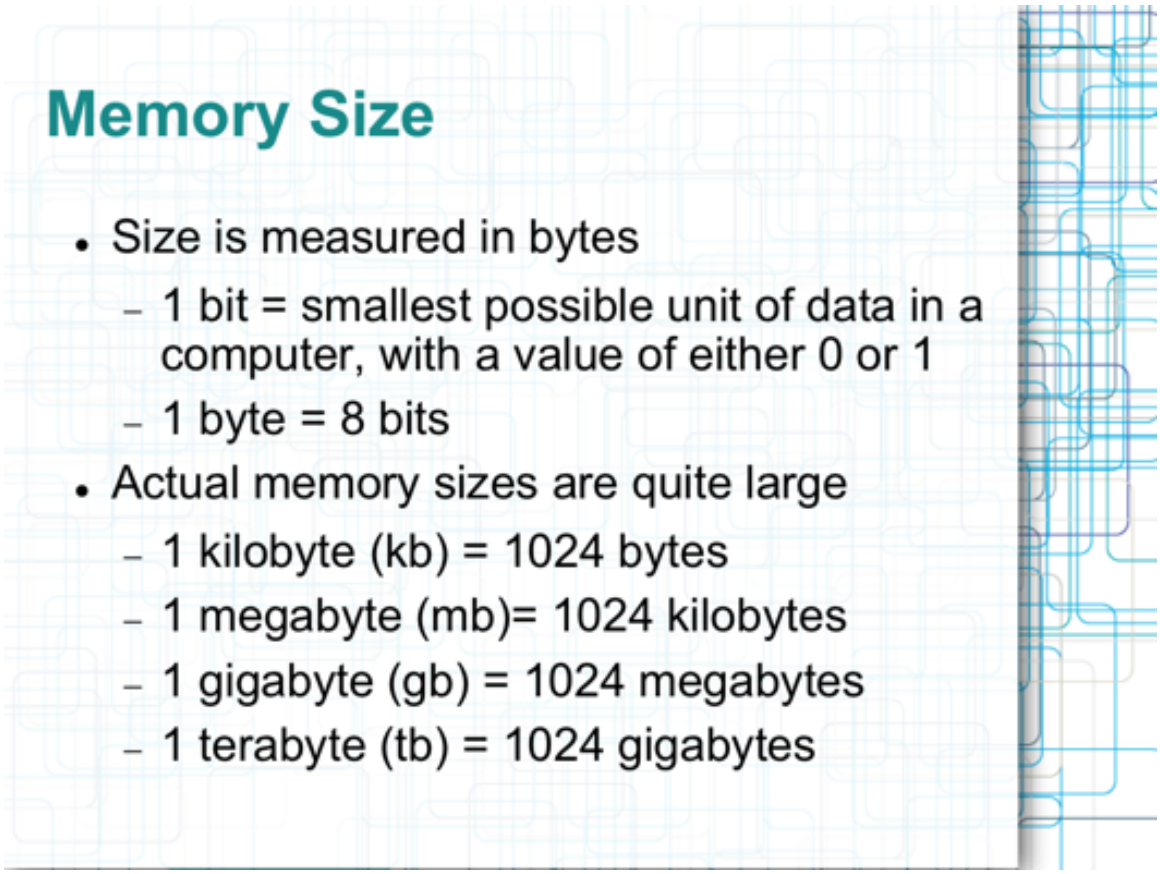

Memory Size
• Size is measured in bytes
– 1 bit = smallest possible unit of data in a computer, with a value of either 0 or 1
– 1 byte = 8 bits
• Actual memory sizes are quite large
– 1 kilobyte (kb) = 1024 bytes
– 1 megabyte (mb)= 1024 kilobytes
– 1 gigabyte (gb) = 1024 megabytes
– 1 terabyte (tb) = 1024 gigabytes

Figure 3.17

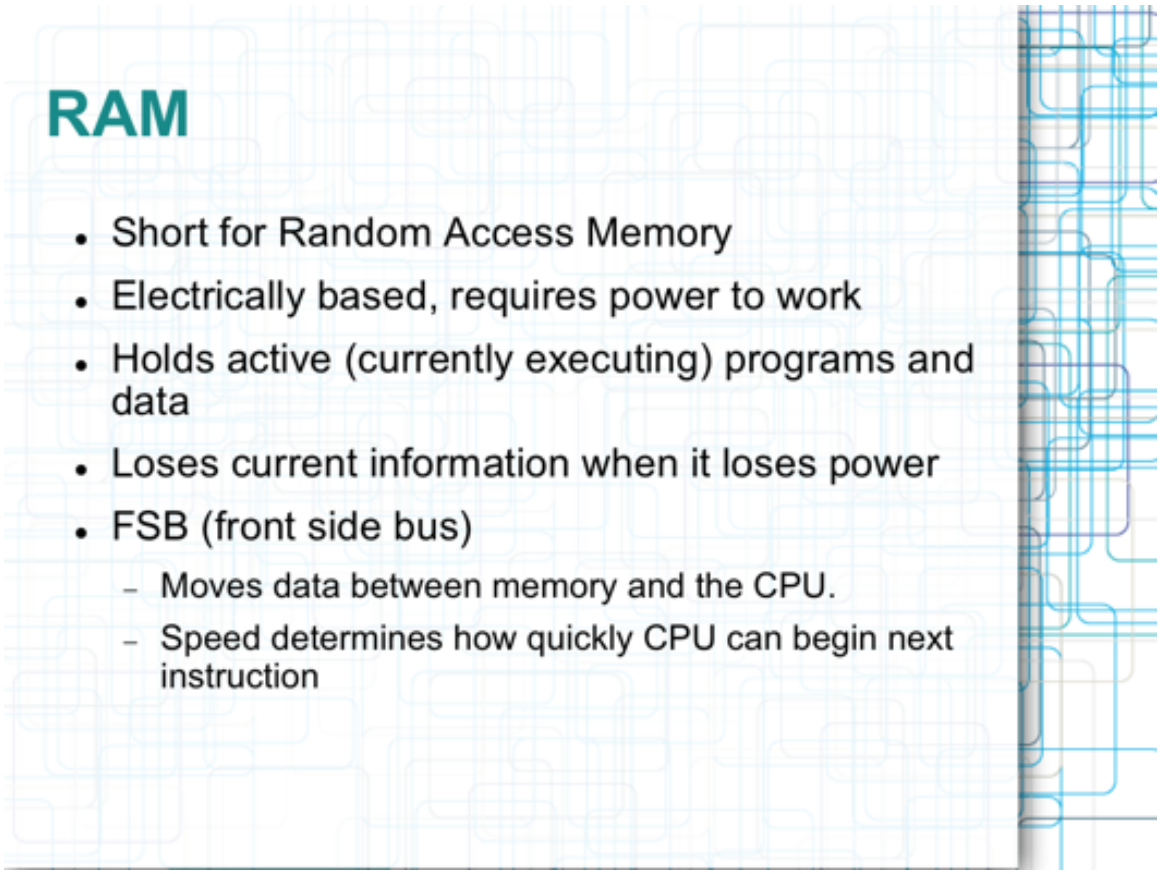

RAM
Short for Random Access Memory
Electrically based, requires power to work
Holds active (currently executing) programs and data
Loses current information when it loses power
FSB (front side bus)
Moves data between memory and the CPU.
Speed determines how quickly CPU can begin next instruction

Figure 3.18

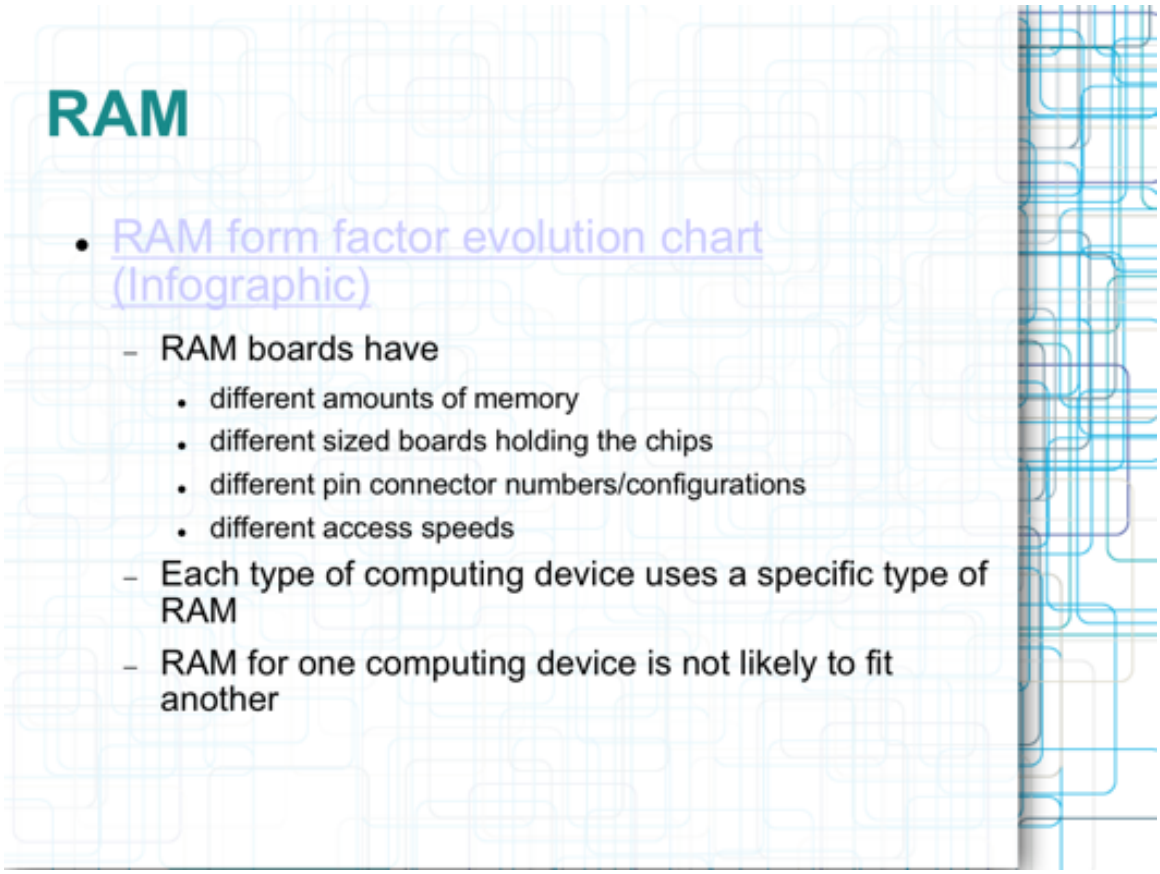

RAM
RAM form factor evolution chart (Infographic)
RAM boards have
different amounts of memory
different sized boards holding the chips
different pin connector numbers/configurations
different access speeds
Each type of computing device uses a specific type of RAM
RAM for one computing device is not likely to fit another

Figure 3.19

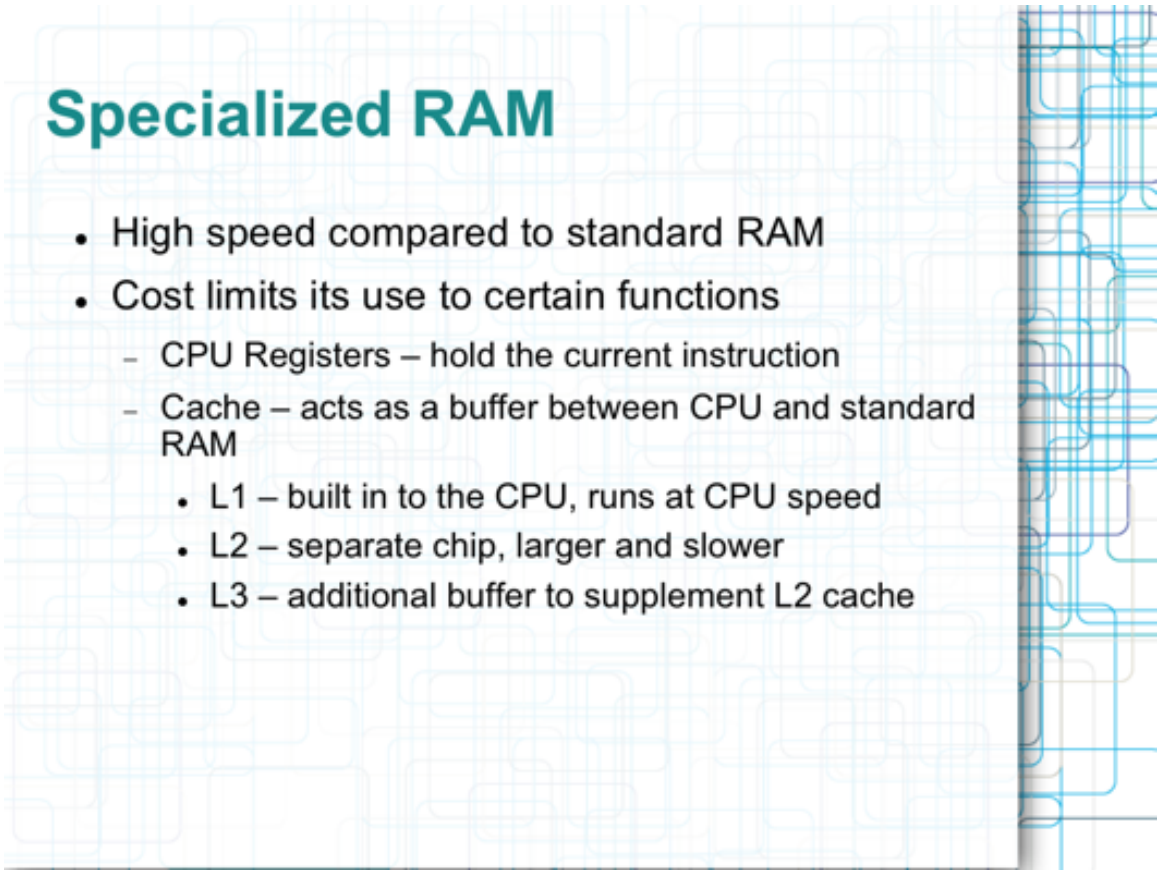

Specialized RAM
High speed compared to standard RAM
Cost limits its use to certain functions
CPU Registers – hold the current instruction
Cache – acts as a buffer between CPU and standard RAM
L1 – built in to the CPU, runs at CPU speed
L2 – separate chip, larger and slower
L3 – additional buffer to supplement L2 cache

Figure 3.20

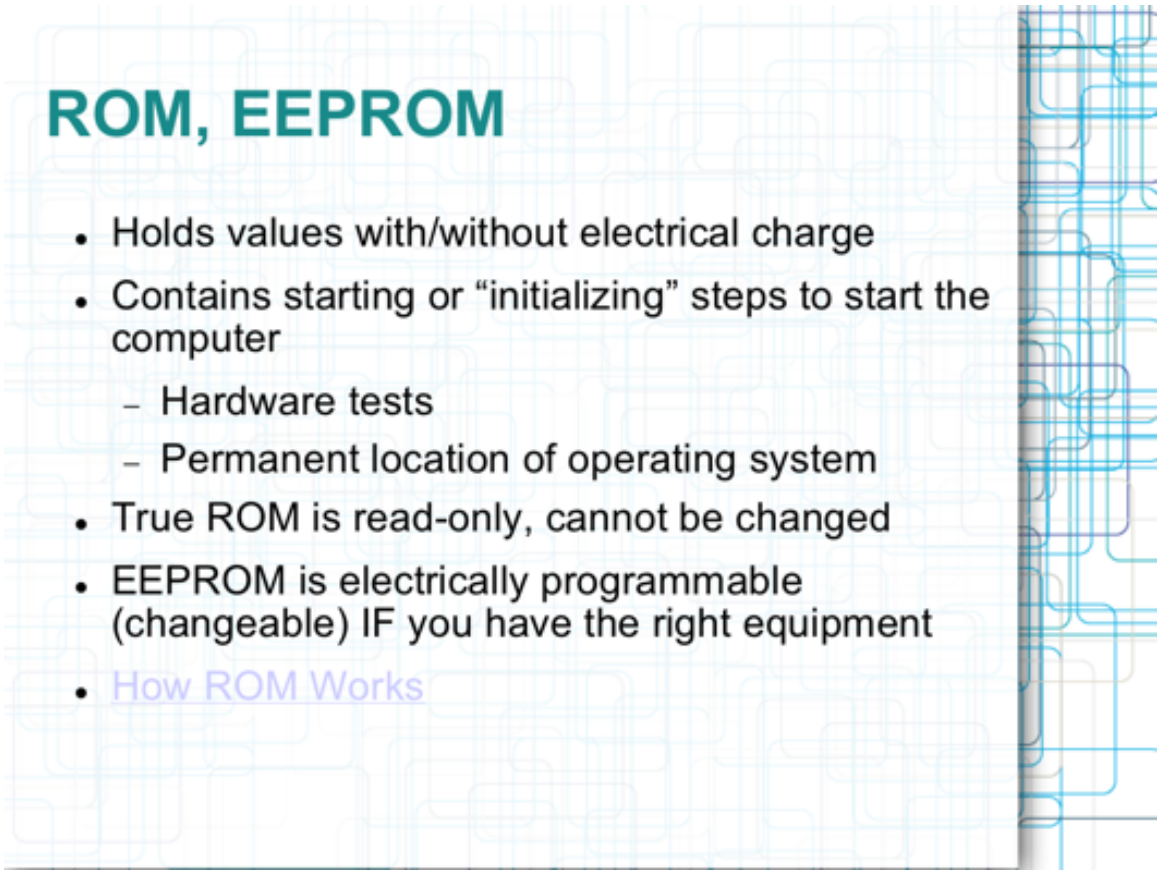

ROM, EEPROM
Holds values with/without electrical charge
Contains starting or "initializing" steps to start the computer
Hardware tests
Permanent location of operating system
True ROM is read-only, cannot be changed
EEPROM is electrically programmable (changeable) IF you have the right equipment
How ROM Works

Figure 3.21

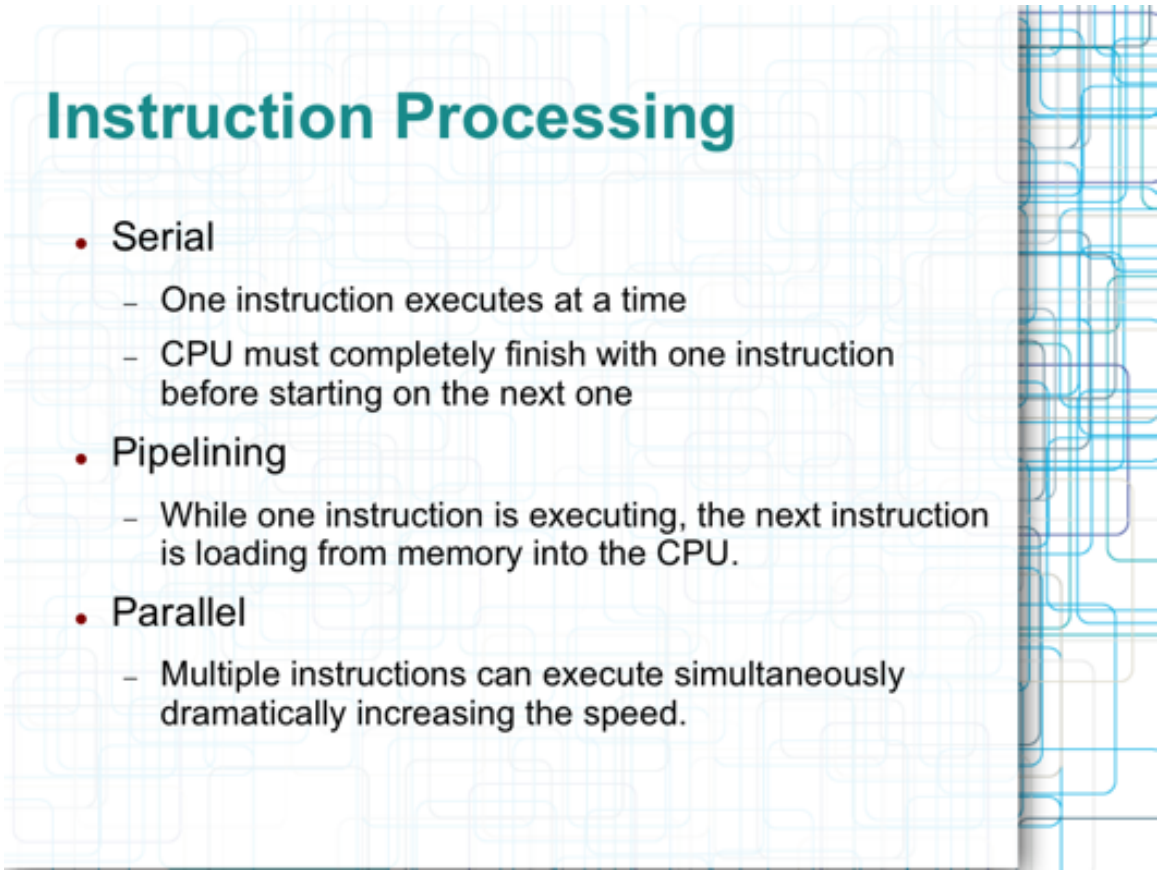

Instruction Processing
Serial
One instruction executes at a time
CPU must completely finish with one instruction before starting on the next one
Pipelining
While one instruction is executing, the next instruction is loading from memory into the CPU.
Parallel
Multiple instructions can execute simultaneously dramatically increasing the speed.

Figure 3.22

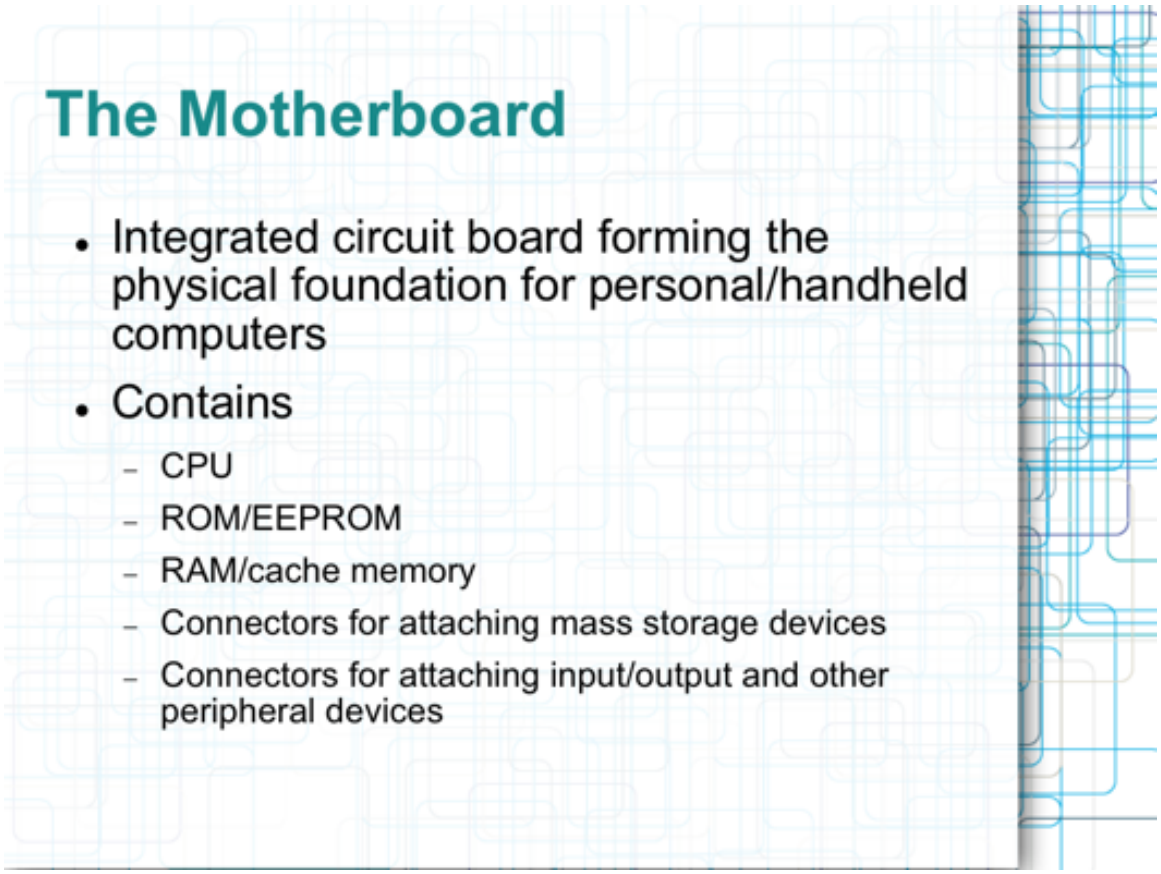

The Motherboard
Integrated circuit board forming the physical foundation for personal/handheld computers
Contains
CPU
ROM/EEPROM
RAM/cache memory
Connectors for attaching mass storage devices
Connectors for attaching input/output and other peripheral devices

Figure 3.23


The Motherboard
Motherboard Parts & Functions (video)
How a Motherboard is Made (video)

Figure 3.24

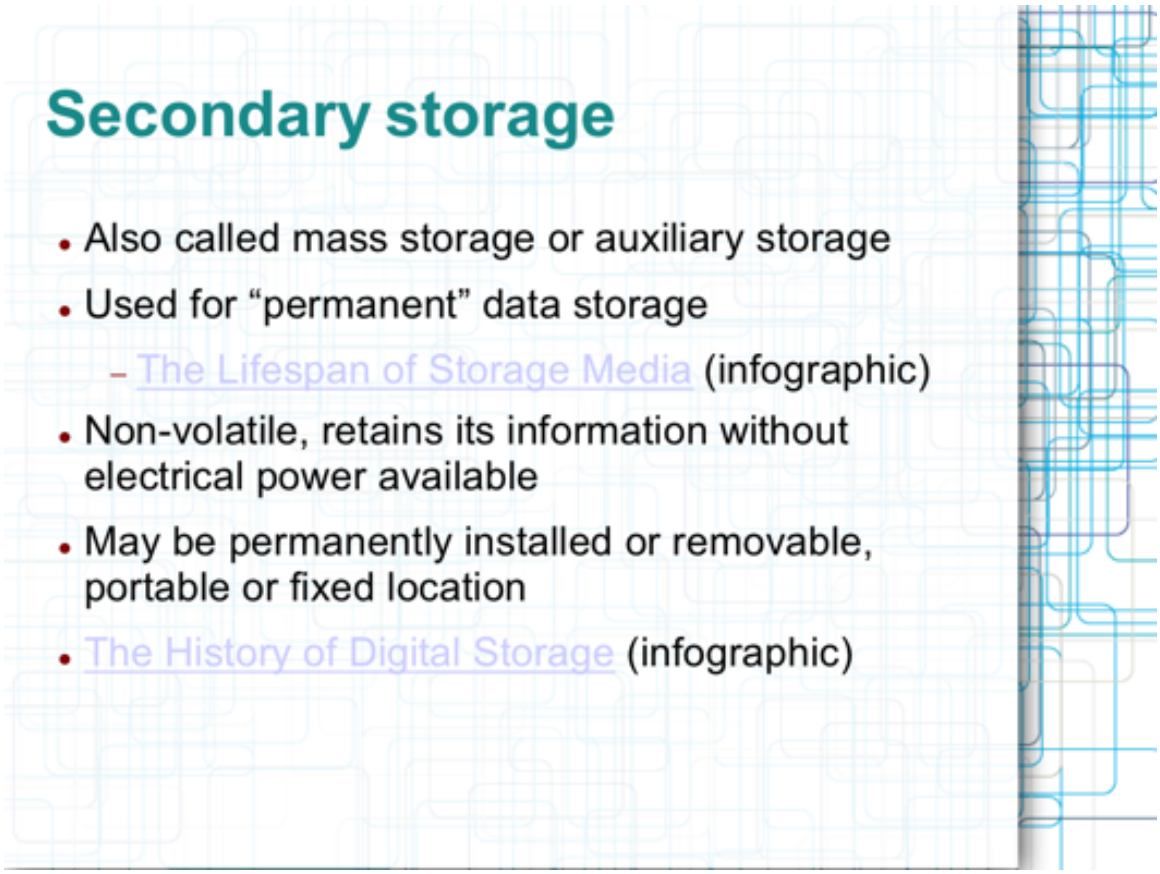

Secondary storage
Also called mass storage or auxiliary storage
Used for "permanent" data storage
The Lifespan of Storage Media (infographic)
Non-volatile, retains its information without electrical power available
May be permanently installed or removable, portable or fixed location
The History of Digital Storage (infographic)

Figure 3.25

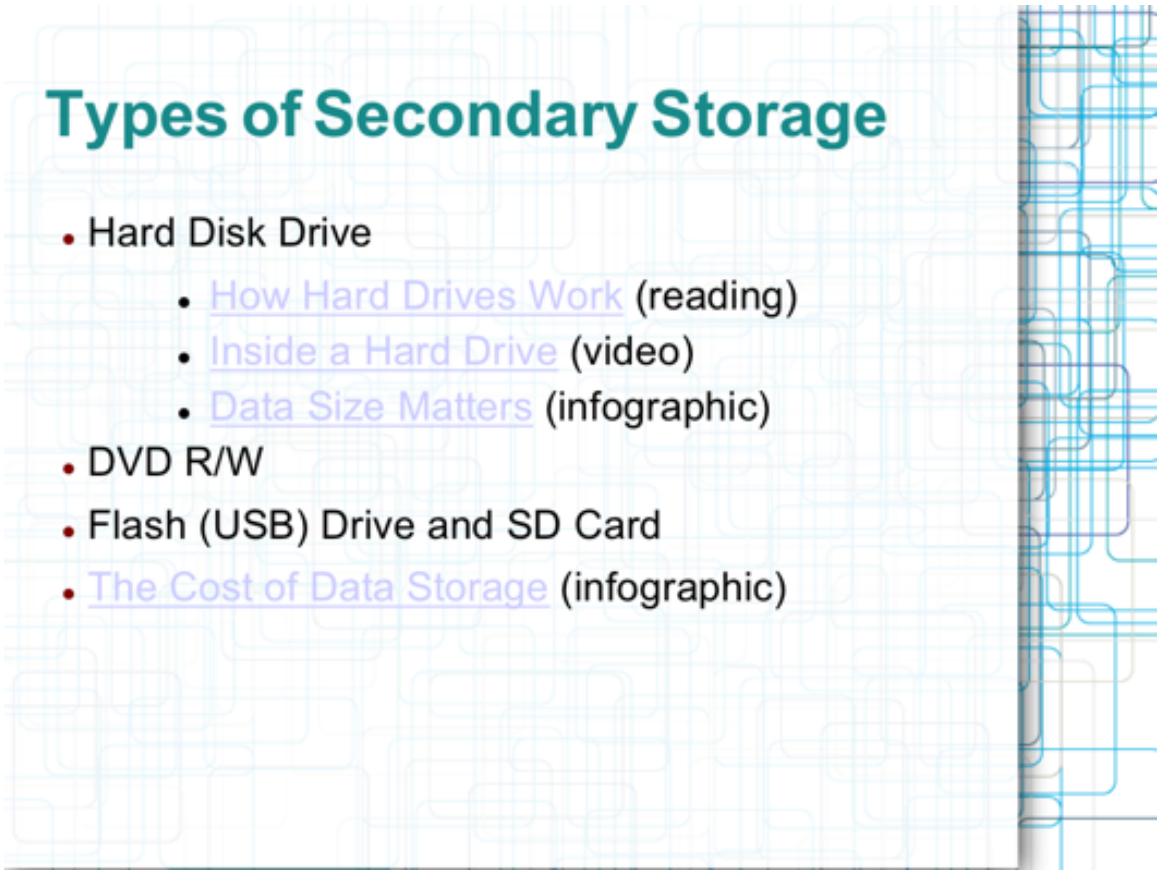

Types of Secondary Storage
Hard Disk Drive
How Hard Drives Work (reading)
Inside a Hard Drive (video)
Data Size Matters (infographic)
DVD R/W
Flash (USB) Drive and SD Card
The Cost of Data Storage (infographic)

Figure 3.26

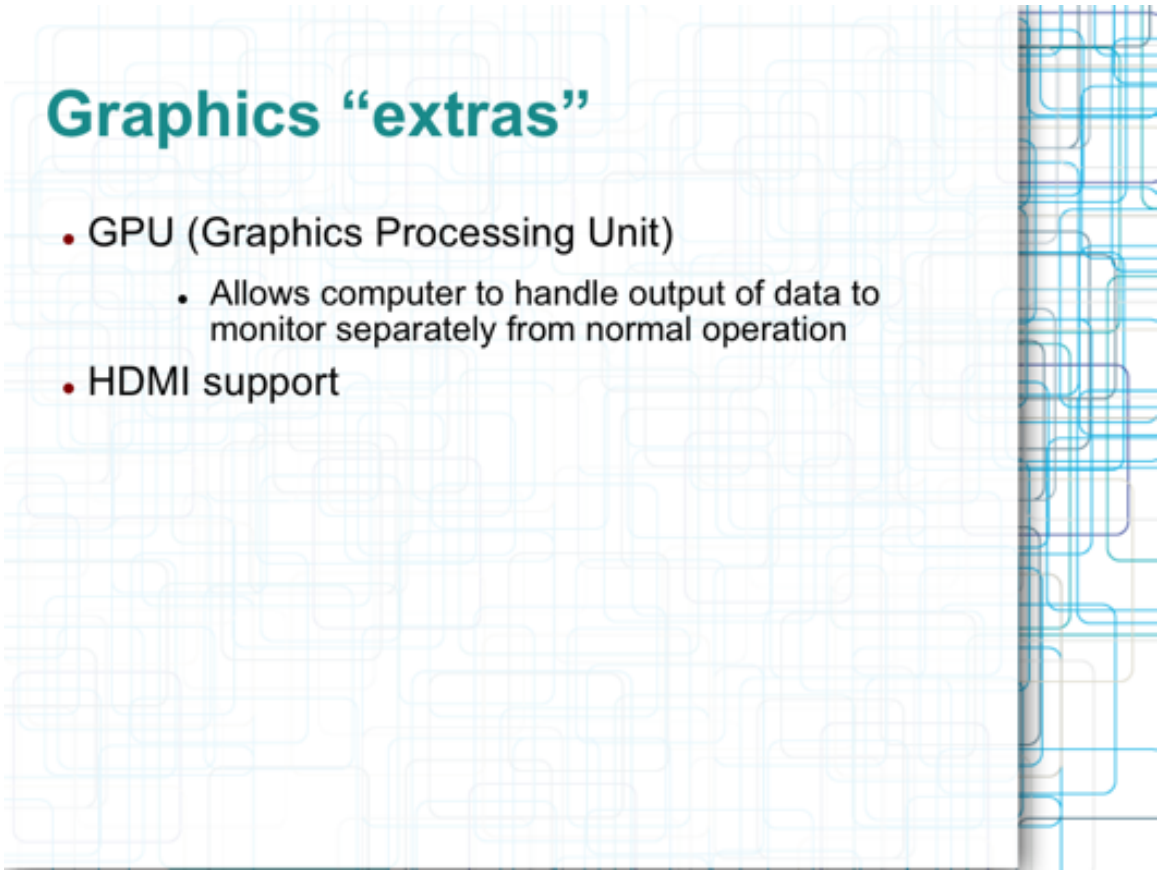

Graphics “extras”
GPU (Graphics Processing Unit)
Allows computer to handle output of data to monitor separately from normal operation
HDMI support

Figure 3.27

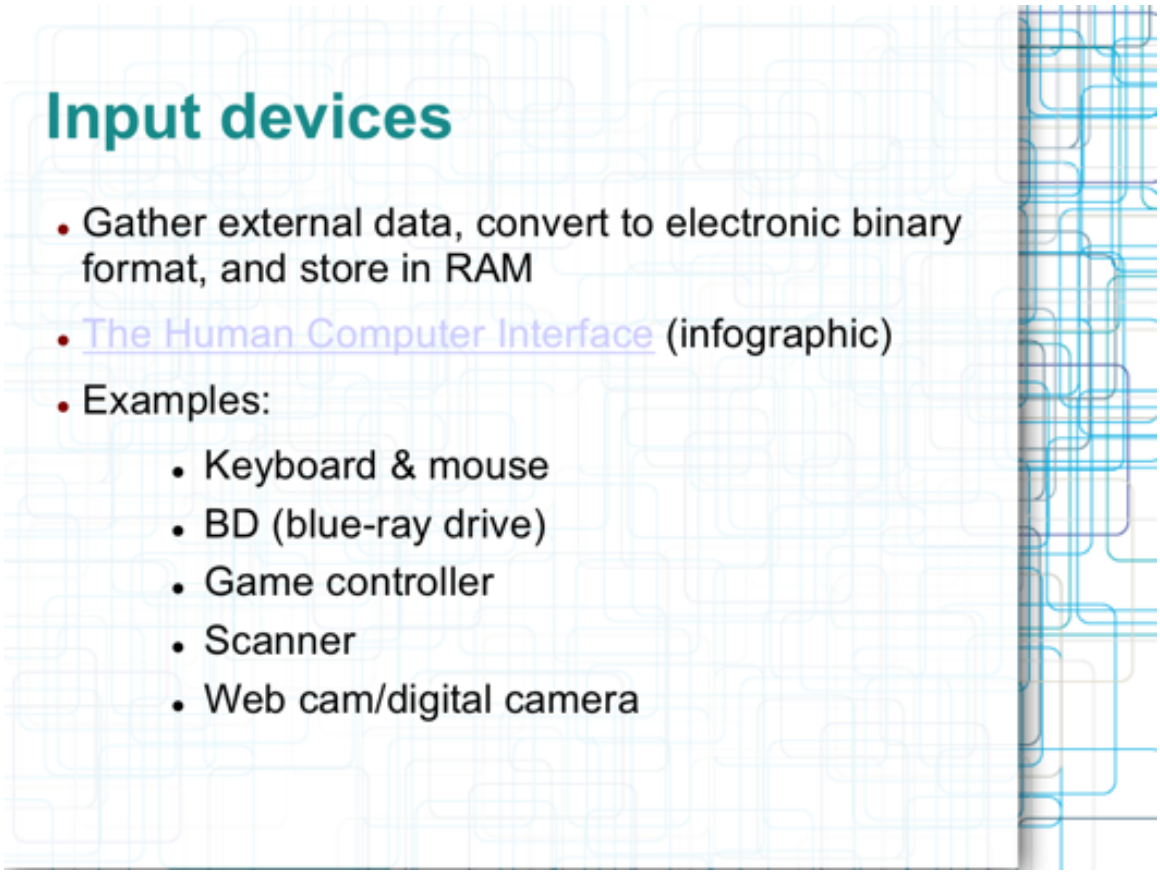

Input devices
Gather external data, convert to electronic binary format, and store in RAM
The Human Computer Interface (infographic)
Examples:
Keyboard & mouse
BD (blue-ray drive)
Game controller
Scanner
Web cam/digital camera

Figure 3.28

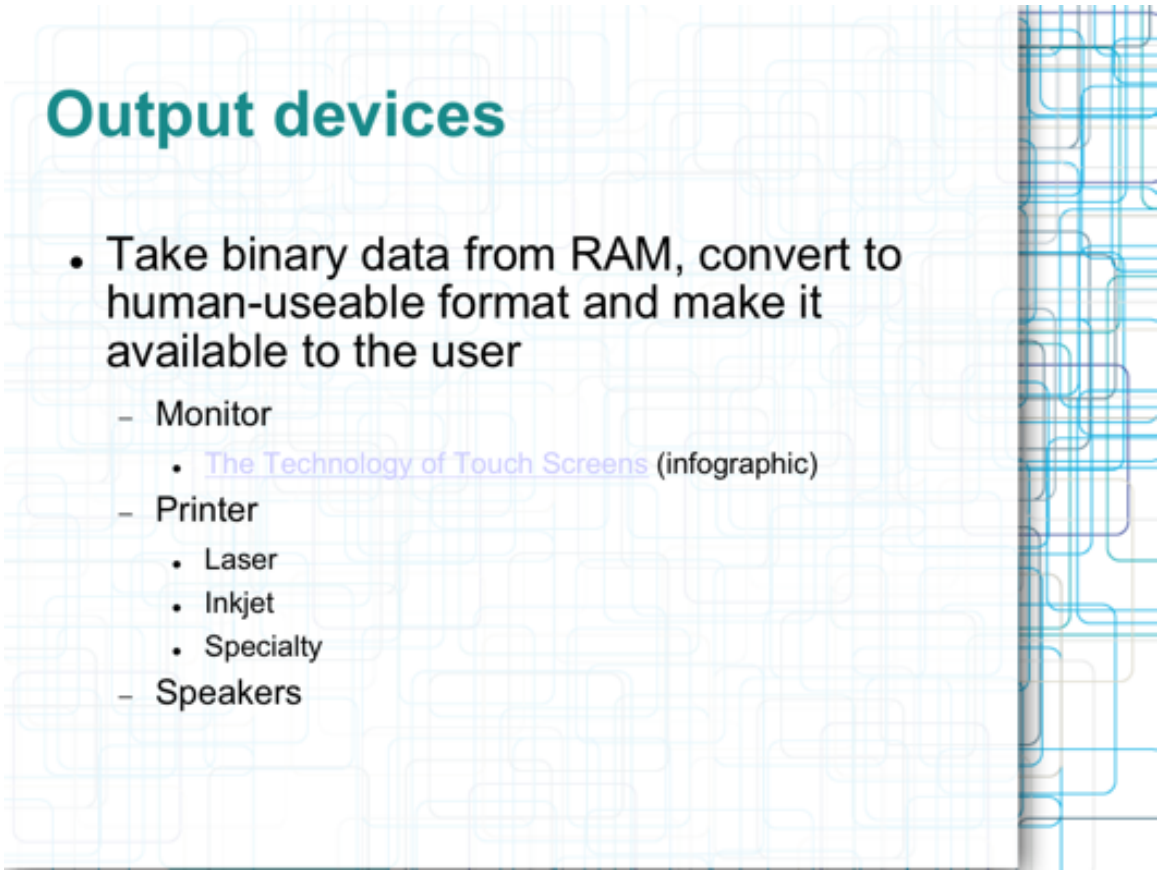

Output devices
Take binary data from RAM, convert to human-useable format and make it available to the user
Monitor
The Technology of Touch Screens (infographic)
Printer
Laser
Inkjet
Specialty
Speakers

Figure 3.29

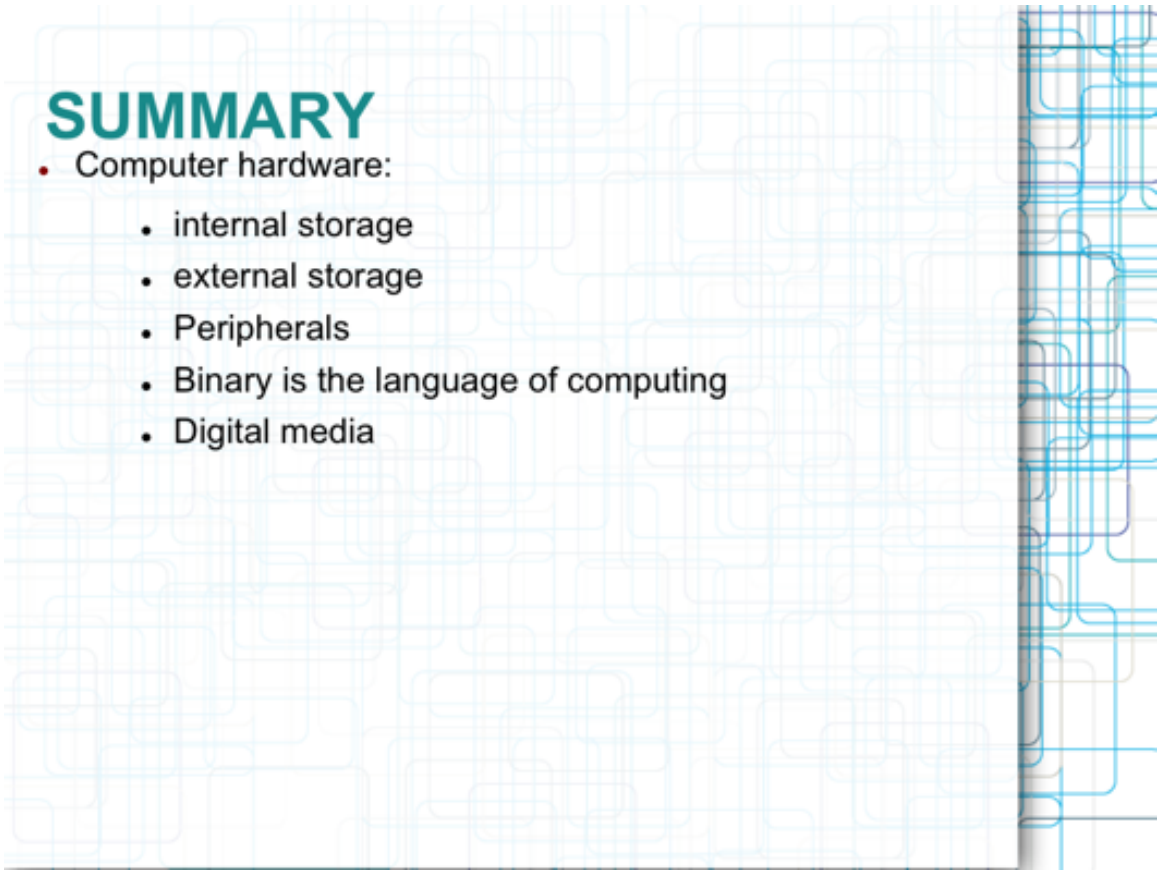

SUMMARY
Computer hardware:
internal storage
external storage
Peripherals
Binary is the language of computing
Digital media

Figure 3.30

Chapter 4

Chapter2.2

4.1 CSC1010-Chapter2-2[1]

4.1.1 CSC1010 – Chapter-2-2

4.1.1.1 Industry of Computing

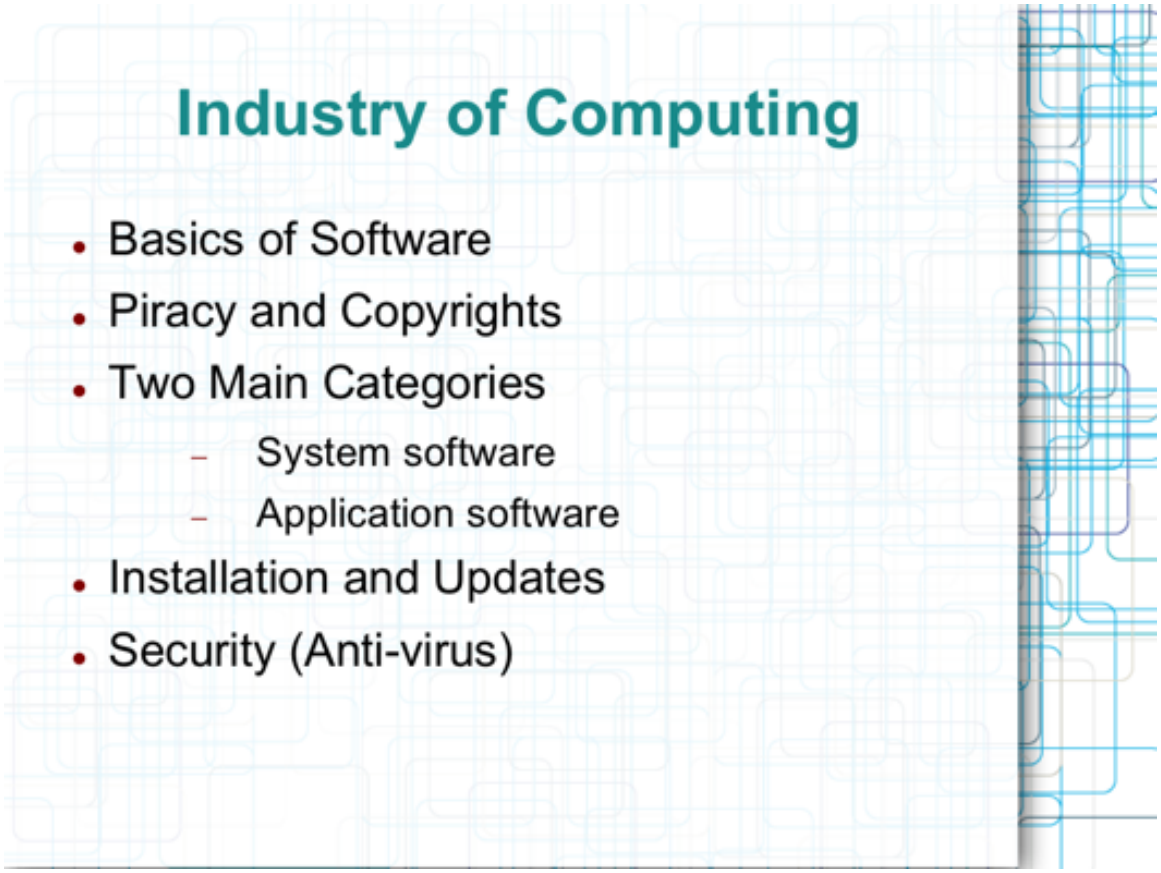


Figure 4.1

[1] This content is available online at <http://cnx.org/content/m61601/1.1/>.

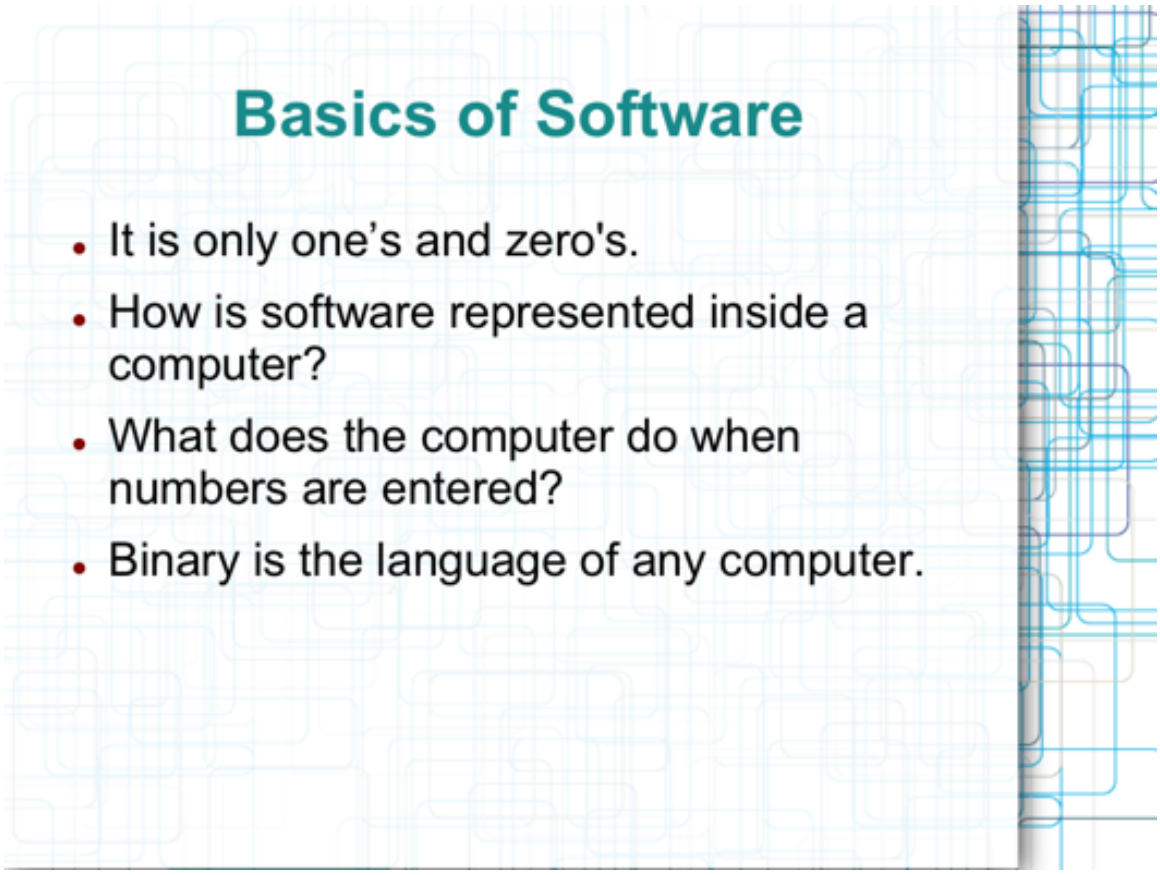

Basics of Software
It is only one's and zero's.
How is software represented inside a computer?
What does the computer do when numbers are entered?
Binary is the language of any computer.

Figure 4.2

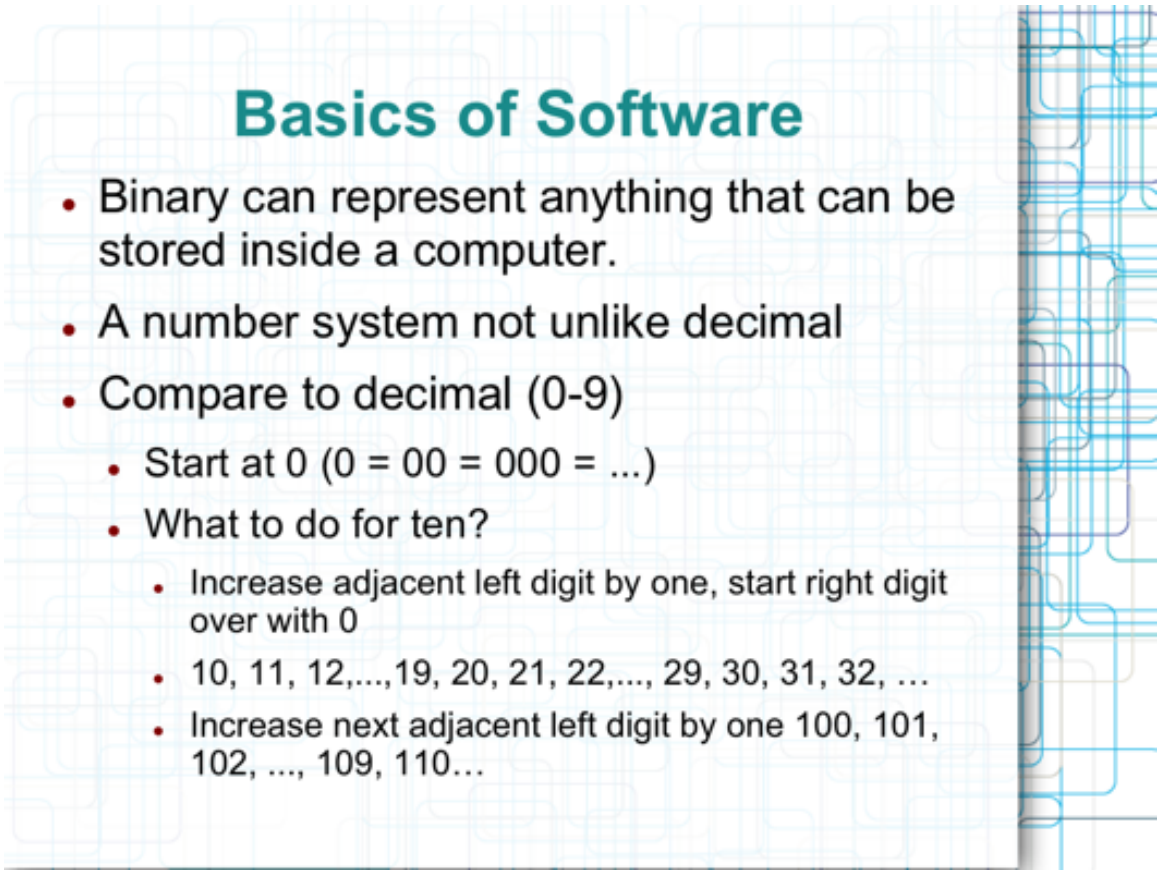

Basics of Software
Binary can represent anything that can be stored inside a computer.
A number system not unlike decimal
Compare to decimal (0-9)
Start at 0 (0 = 00 = 000 = ...)
What to do for ten?
Increase adjacent left digit by one, start right digit over with 0
10, 11, 12,...,19, 20, 21, 22,..., 29, 30, 31, 32, …
Increase next adjacent left digit by one 100, 101, 102, ..., 109, 110…

Figure 4.3

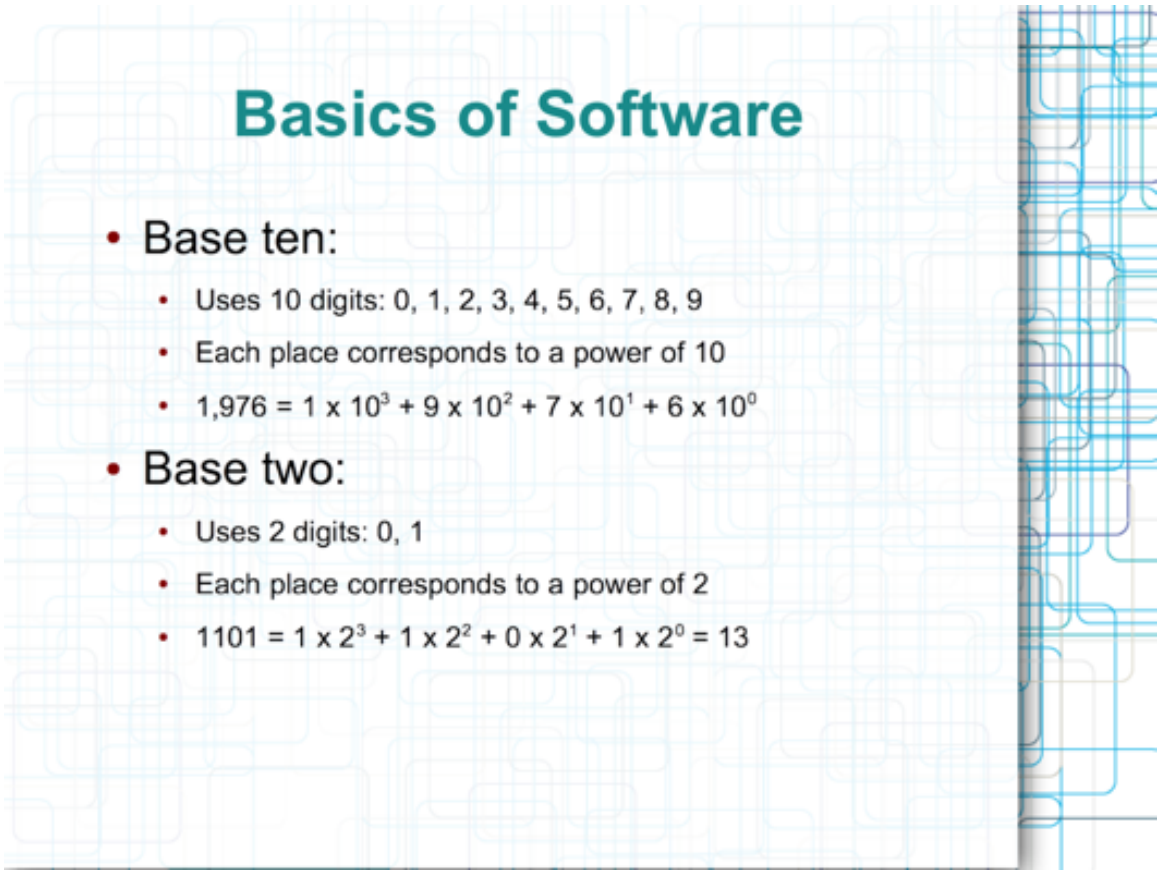

Basics of Software
Base ten:
Uses 10 digits: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9
Each place corresponds to a power of 10
1,976 = 1 x 10^3 + 9 x 10^2 + 7 x 10^1 + 6 x 10^0
Base two:
Uses 2 digits: 0, 1
Each place corresponds to a power of 2
1101 = 1 x 2^3 + 1 x 2^2 + 0 x 2^1 + 1 x 2^0 = 13

Figure 4.4

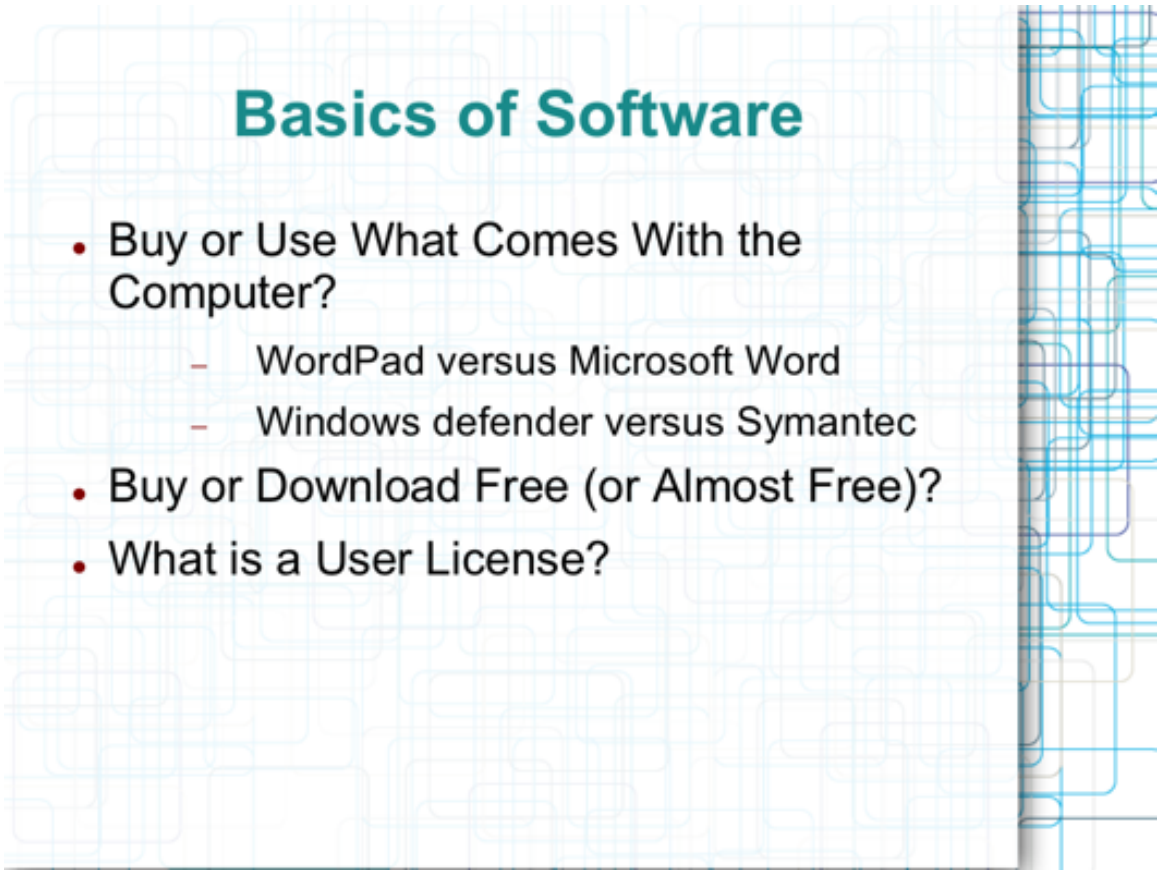

Basics of Software
Buy or Use What Comes With the Computer?
WordPad versus Microsoft Word
Windows defender versus Symantec
Buy or Download Free (or Almost Free)?
What is a User License?

Figure 4.5

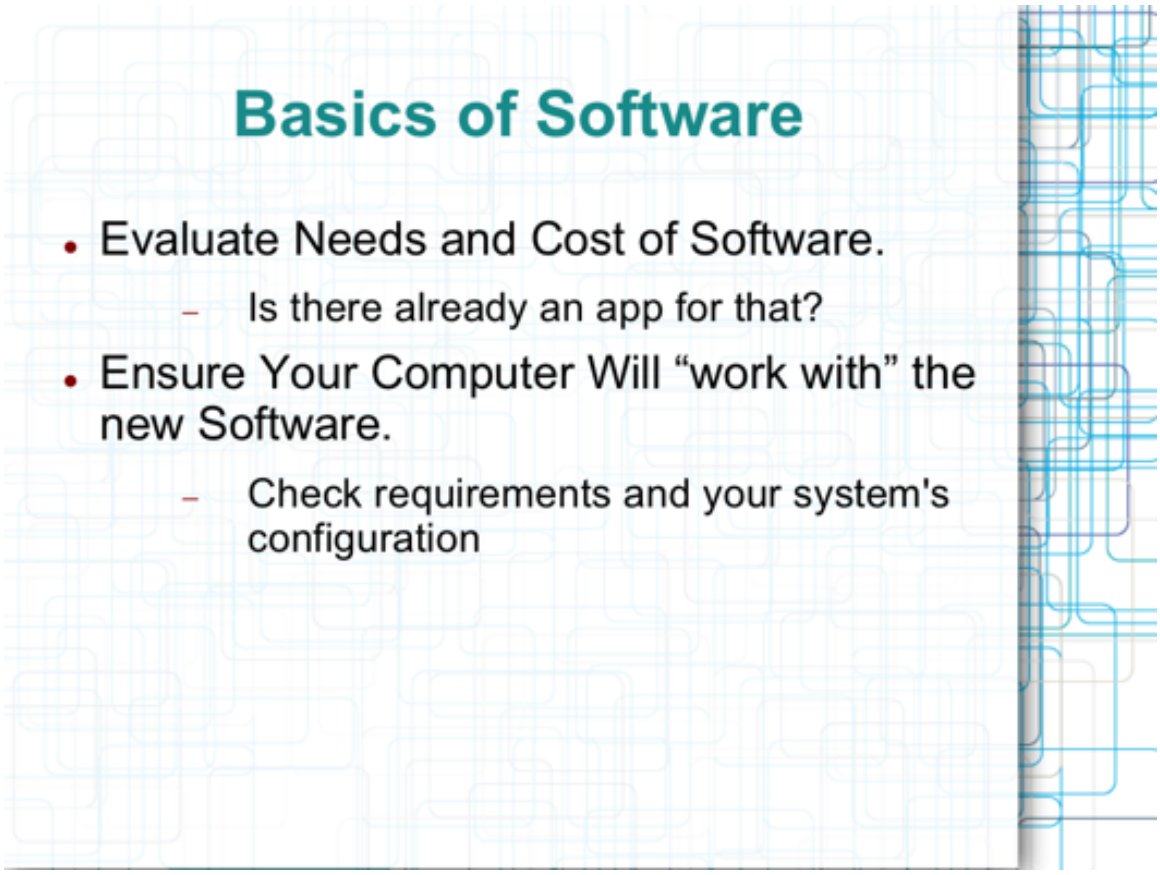

Basics of Software
Evaluate Needs and Cost of Software.
Is there already an app for that?
Ensure Your Computer Will "work with" the new Software.
Check requirements and your system's configuration

Figure 4.6

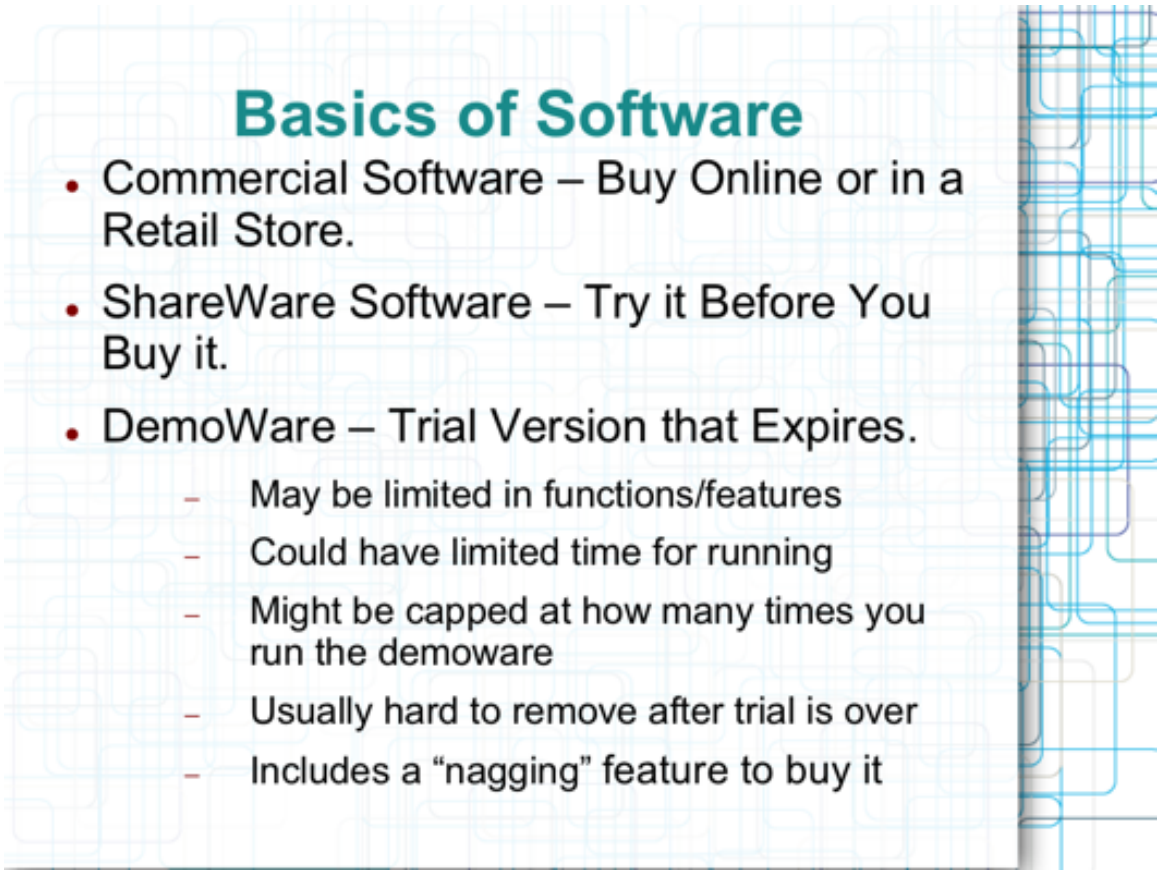

Basics of Software
Commercial Software – Buy Online or in a Retail Store.
ShareWare Software – Try it Before You Buy it.
DemoWare – Trial Version that Expires.
May be limited in functions/features
Could have limited time for running
Might be capped at how many times you run the demoware
Usually hard to remove after trial is over
Includes a "nagging" feature to buy it

Figure 4.7

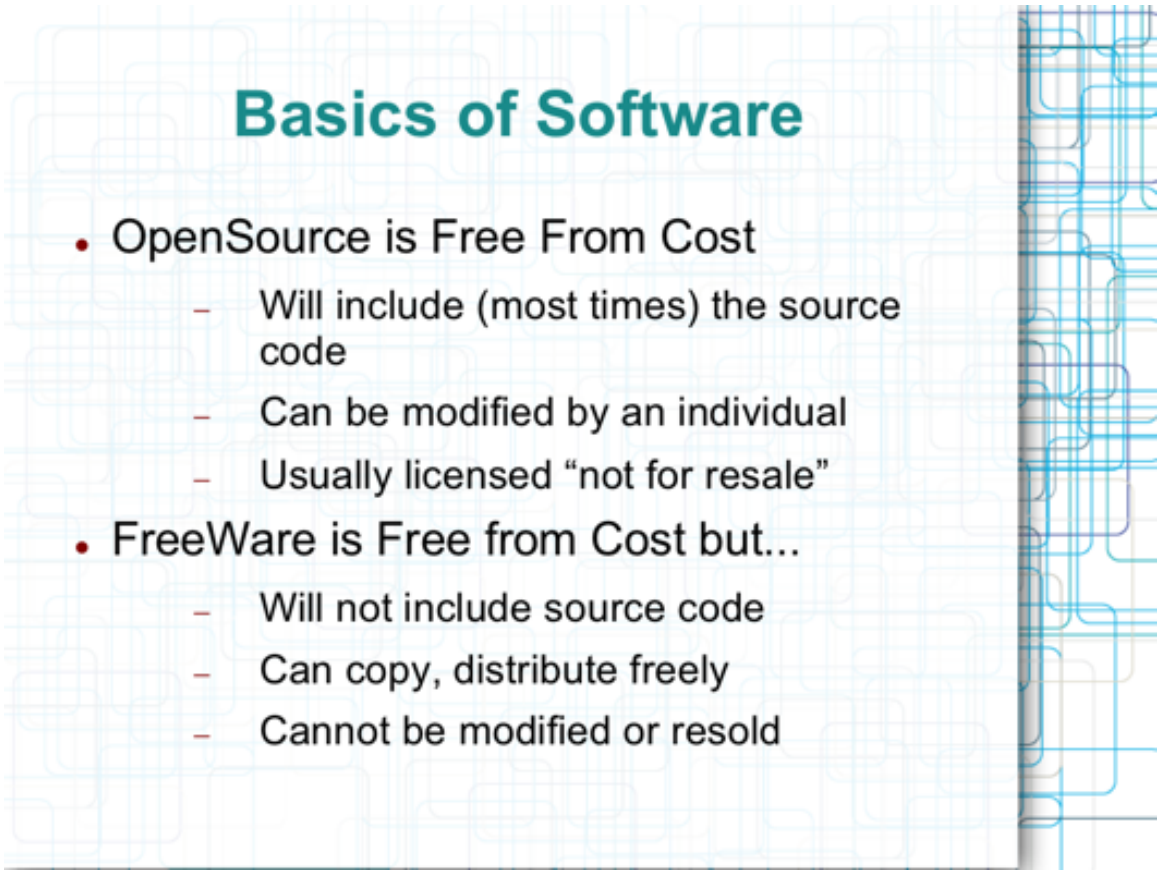

Basics of Software
OpenSource is Free From Cost
Will include (most times) the source code
Can be modified by an individual
Usually licensed “not for resale”
FreeWare is Free from Cost but...
Will not include source code
Can copy, distribute freely
Cannot be modified or resold

Figure 4.8

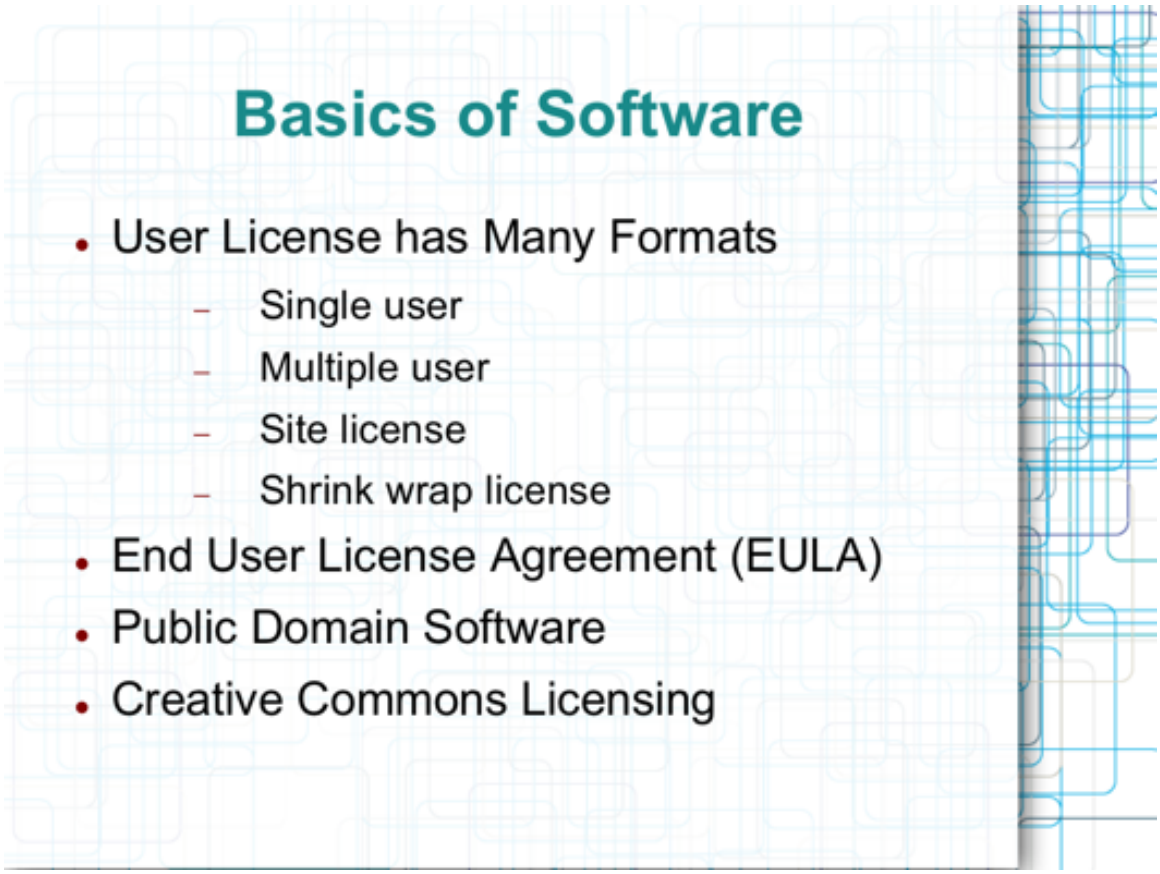

Basics of Software
User License has Many Formats
Single user
Multiple user
Site license
Shrink wrap license
End User License Agreement (EULA)
Public Domain Software
Creative Commons Licensing

Figure 4.9

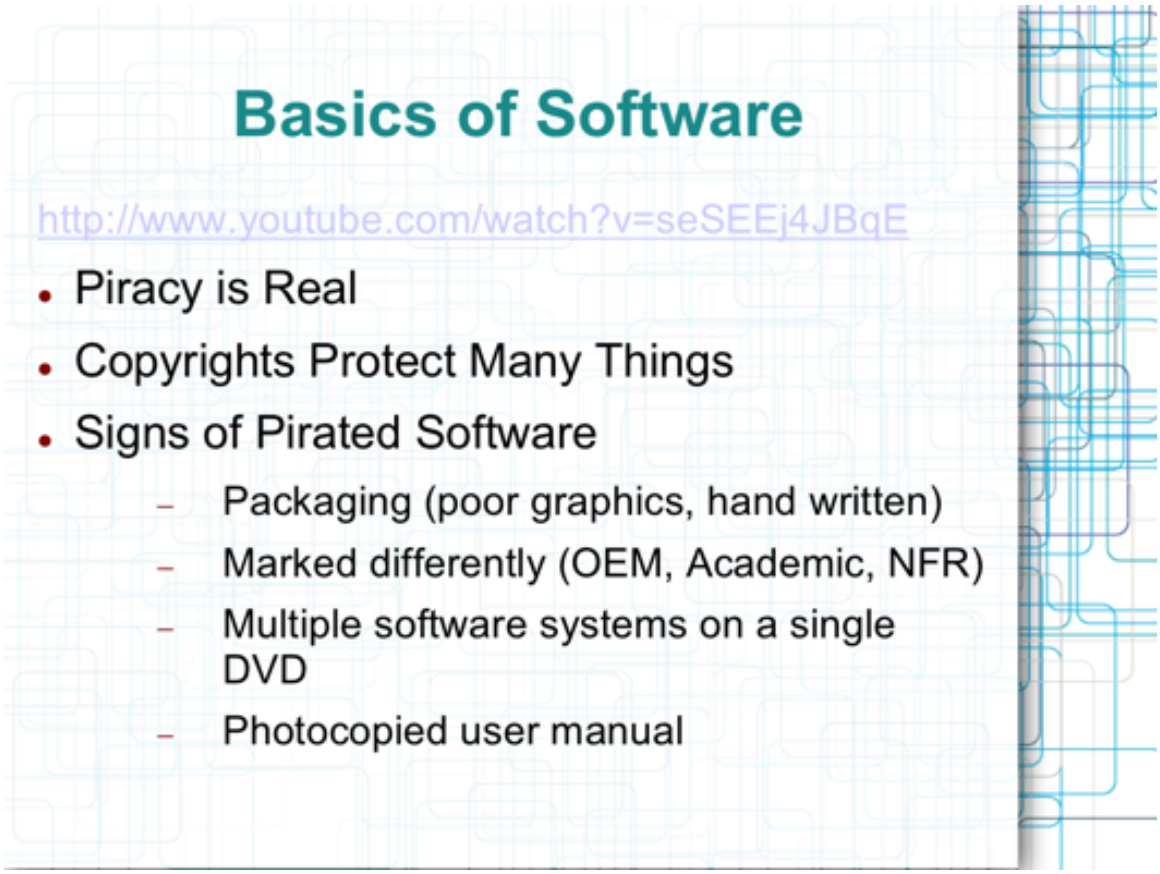

Basics of Software
http://www.youtube.com/watch?v=seSEEj4JBqE
Piracy is Real
Copyrights Protect Many Things
Signs of Pirated Software
Packaging (poor graphics, hand written)
Marked differently (OEM, Academic, NFR)
Multiple software systems on a single DVD
Photocopied user manual

Figure 4.10

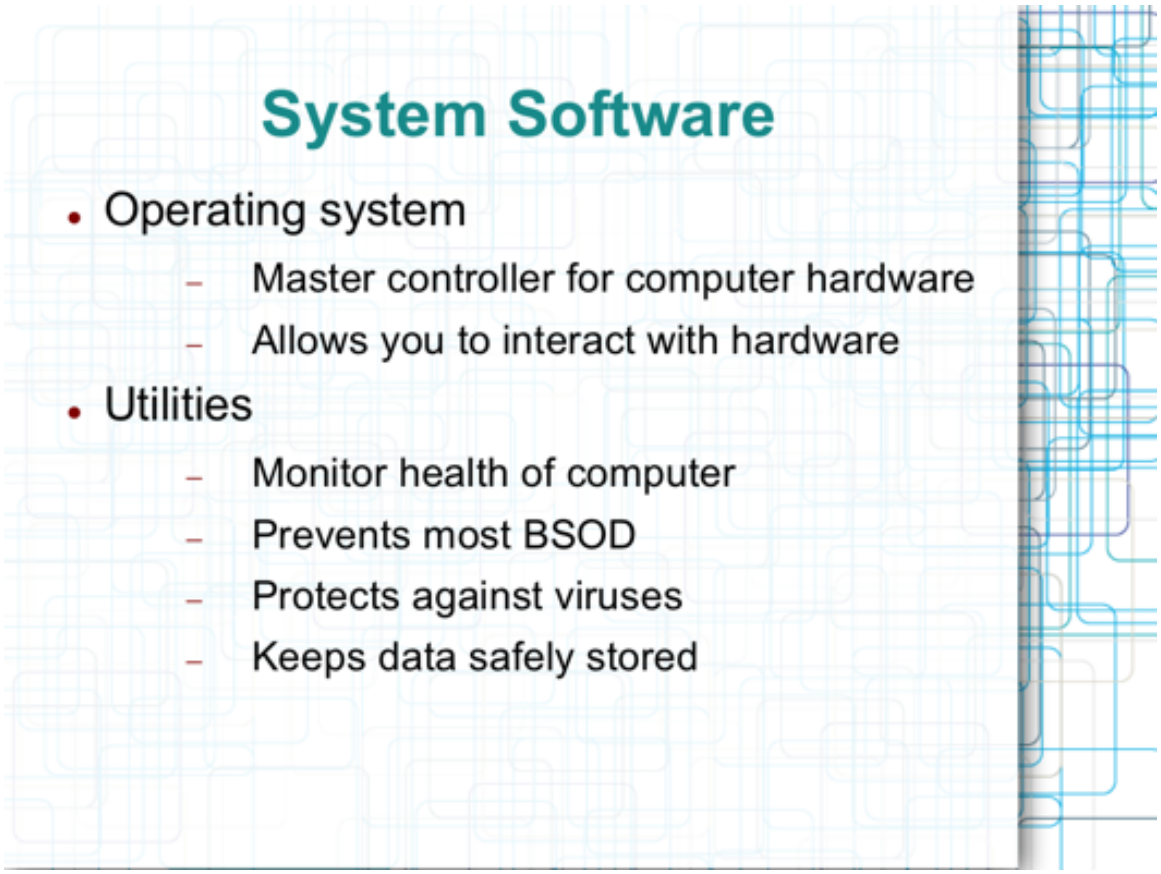

System Software
Operating system
Master controller for computer hardware
Allows you to interact with hardware
Utilities
Monitor health of computer
Prevents most BSOD
Protects against viruses
Keeps data safely stored

Figure 4.11

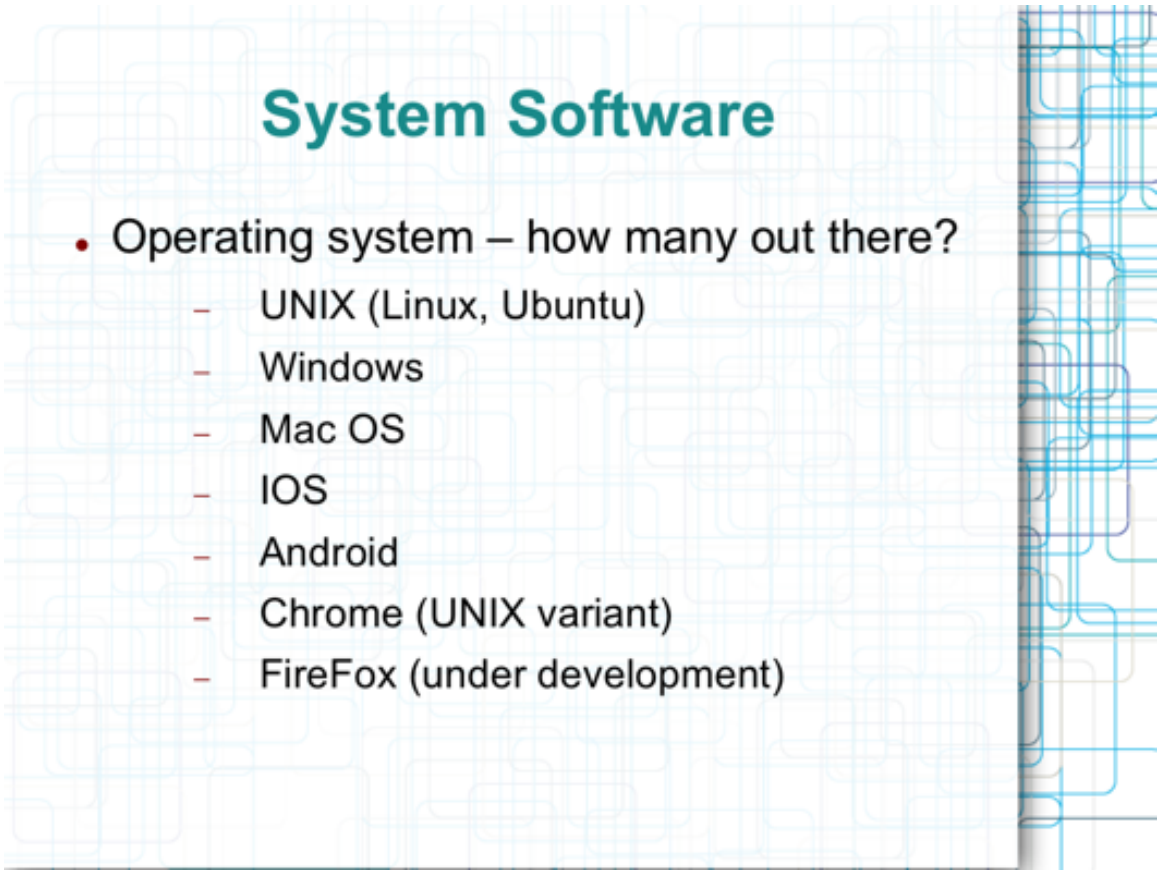

System Software
Operating system – how many out there?
UNIX (Linux, Ubuntu)
Windows
Mac OS
IOS
Android
Chrome (UNIX variant)
FireFox (under development)

Figure 4.12

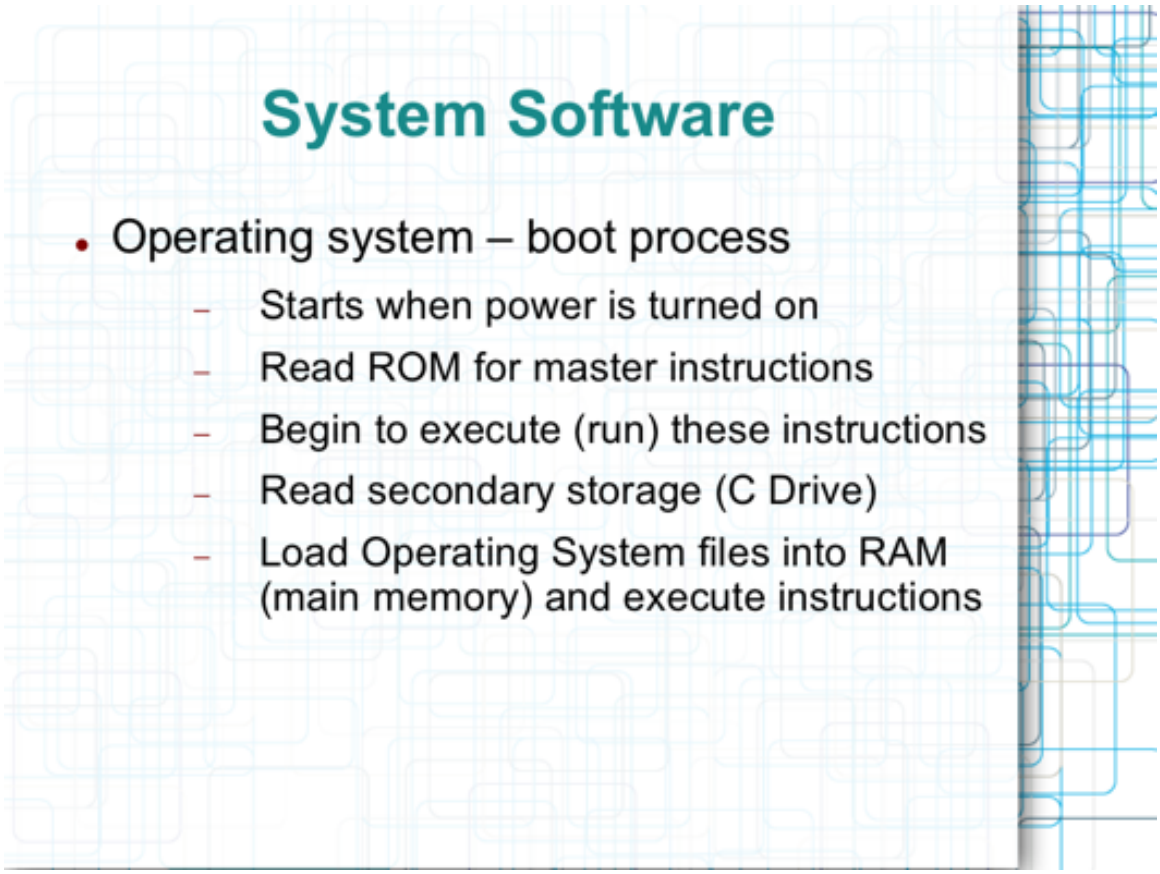

System Software
Operating system – boot process
Starts when power is turned on
Read ROM for master instructions
Begin to execute (run) these instructions
Read secondary storage (C Drive)
Load Operating System files into RAM (main memory) and execute instructions

Figure 4.13

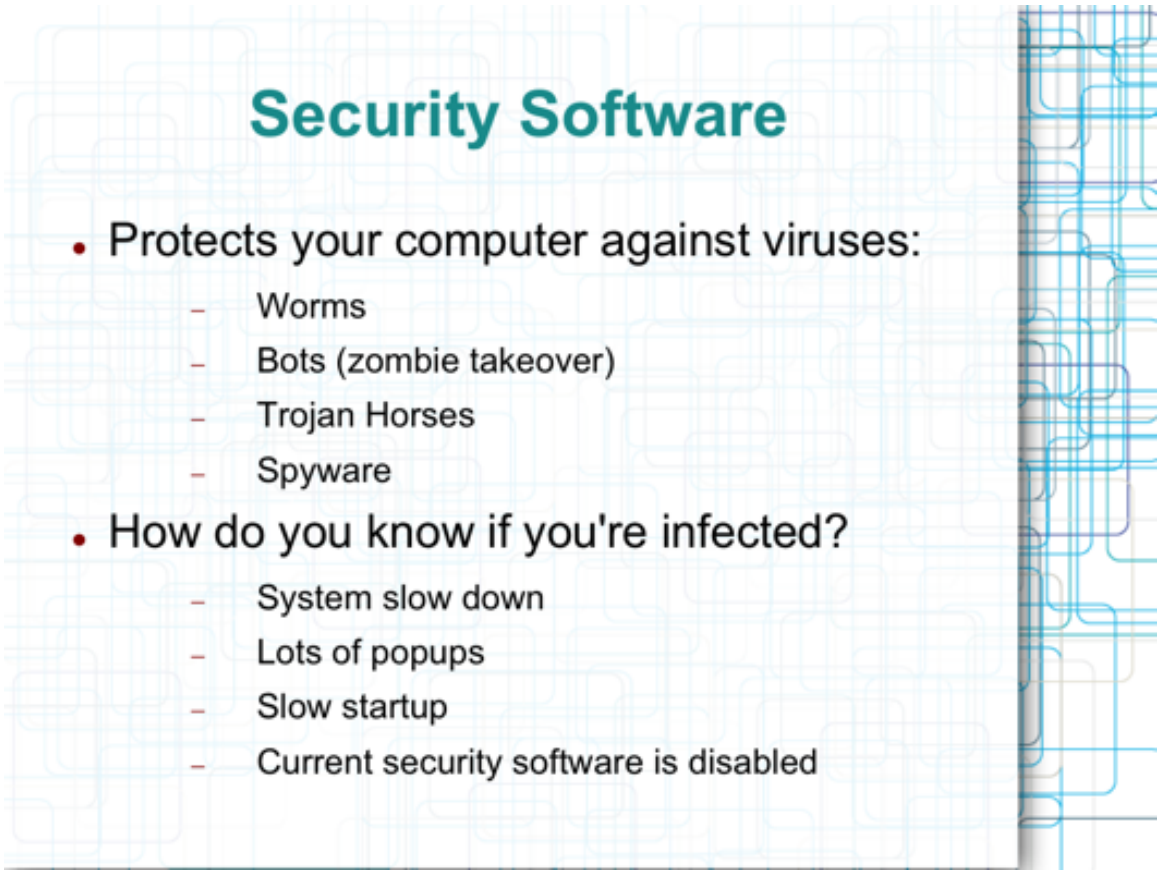

Security Software
Protects your computer against viruses:
Worms
Bots (zombie takeover)
Trojan Horses
Spyware
How do you know if you're infected?
System slow down
Lots of popups
Slow startup
Current security software is disabled

Figure 4.14

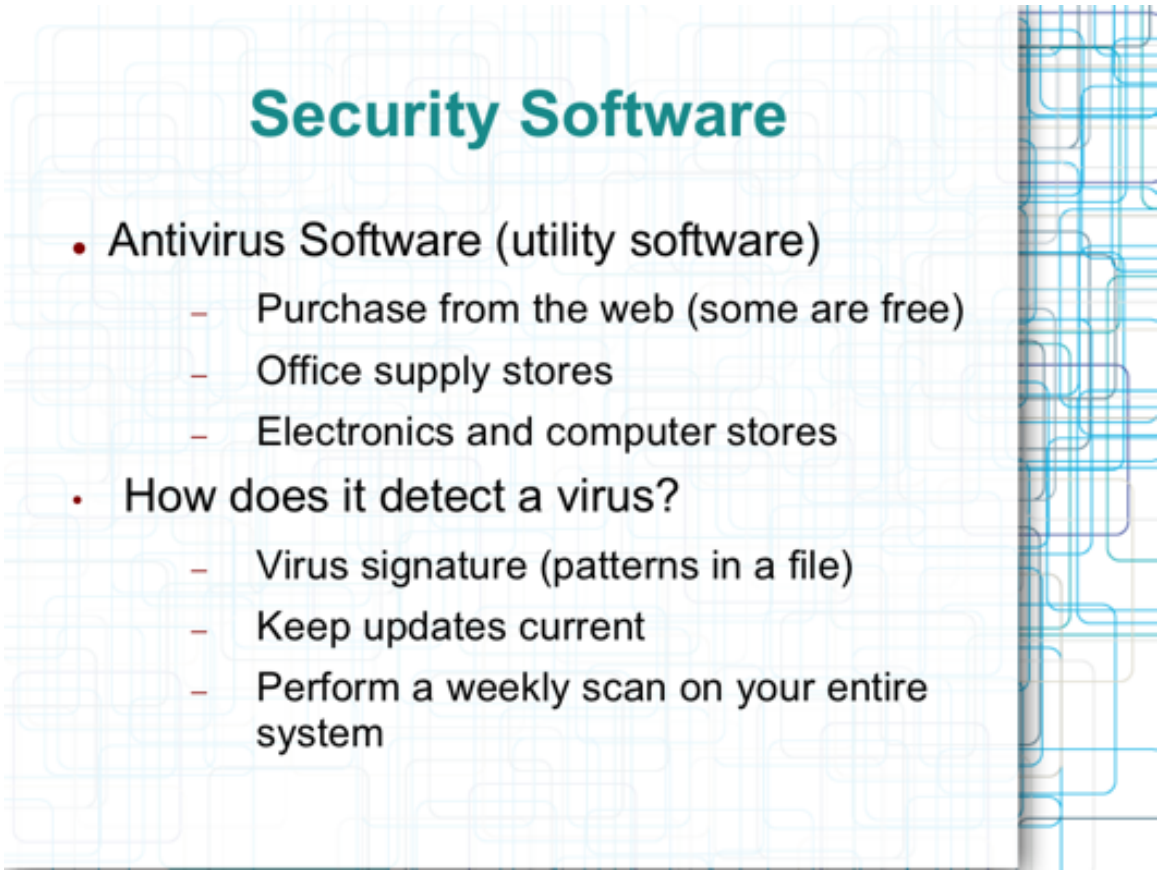

Security Software
Antivirus Software (utility software)
Purchase from the web (some are free)
Office supply stores
Electronics and computer stores
How does it detect a virus?
Virus signature (patterns in a file)
Keep updates current
Perform a weekly scan on your entire system

Figure 4.15


Application Software
Productivity
Financial
Entertainment
Web Apps
Portable / Mobile Apps

Figure 4.16

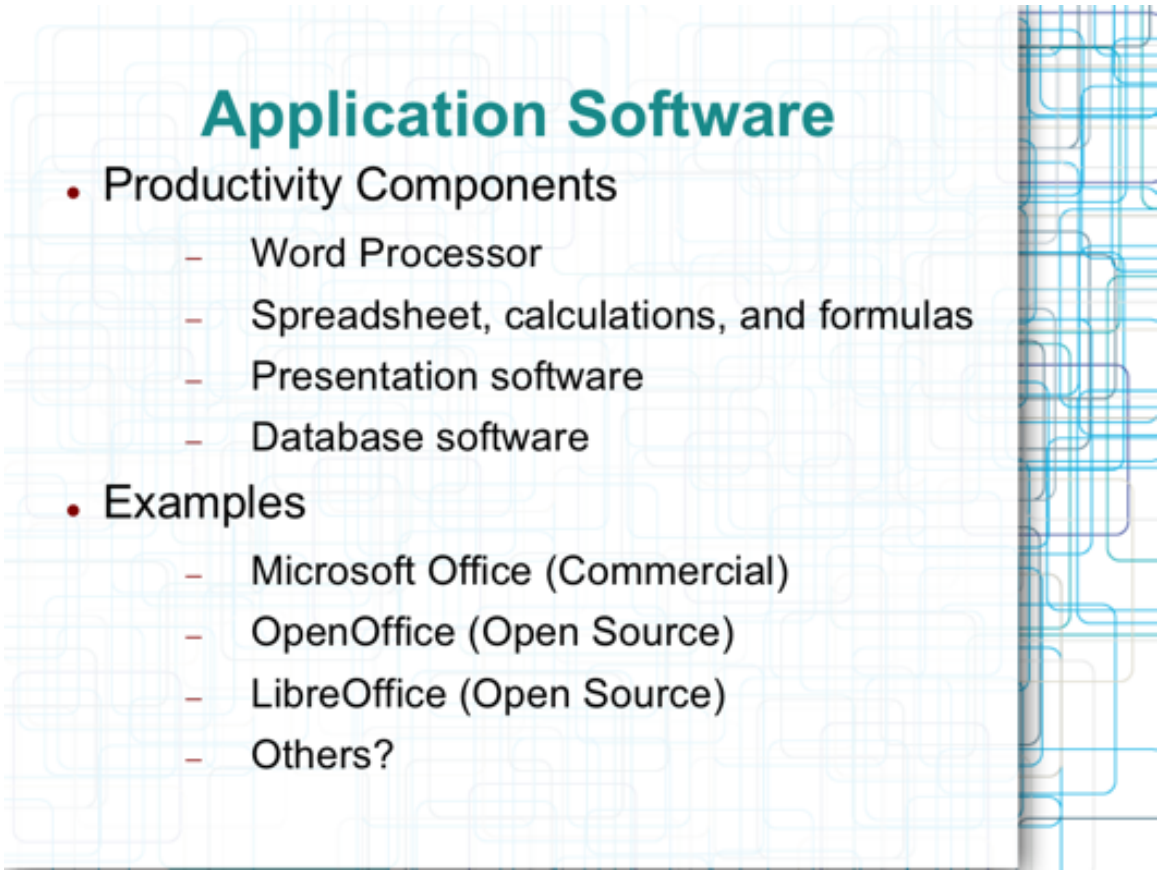

Application Software
Productivity Components
Word Processor
Spreadsheet, calculations, and formulas
Presentation software
Database software
Examples
Microsoft Office (Commercial)
OpenOffice (Open Source)
LibreOffice (Open Source)
Others?

Figure 4.17

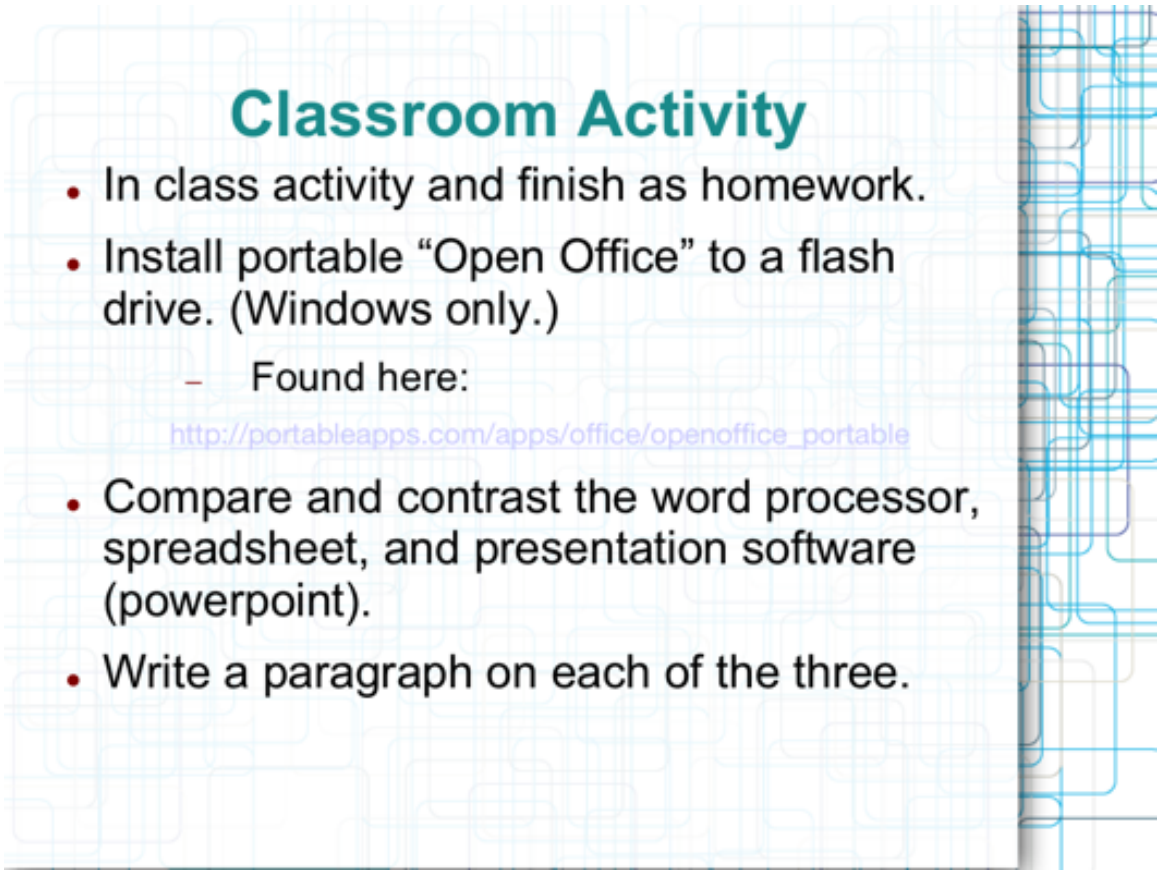

Classroom Activity
In class activity and finish as homework.
Install portable "Open Office" to a flash drive. (Windows only.)
Found here:
http://portableapps.com/apps/office/openoffice_portable
Compare and contrast the word processor, spreadsheet, and presentation software (powerpoint).
Write a paragraph on each of the three.

Figure 4.18

Figure 4.19

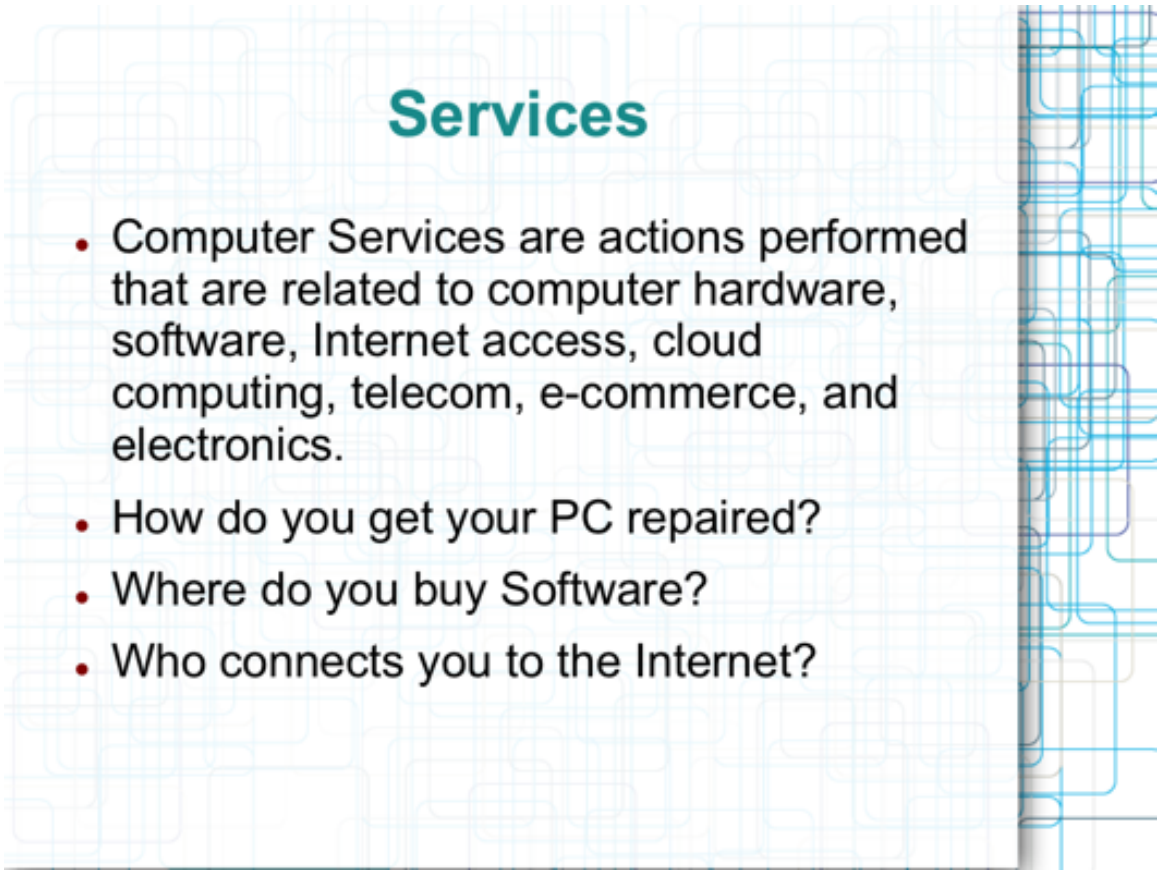

Services
Computer Services are actions performed that are related to computer hardware, software, Internet access, cloud computing, telecom, e-commerce, and electronics.
How do you get your PC repaired?
Where do you buy Software?
Who connects you to the Internet?

Figure 4.20

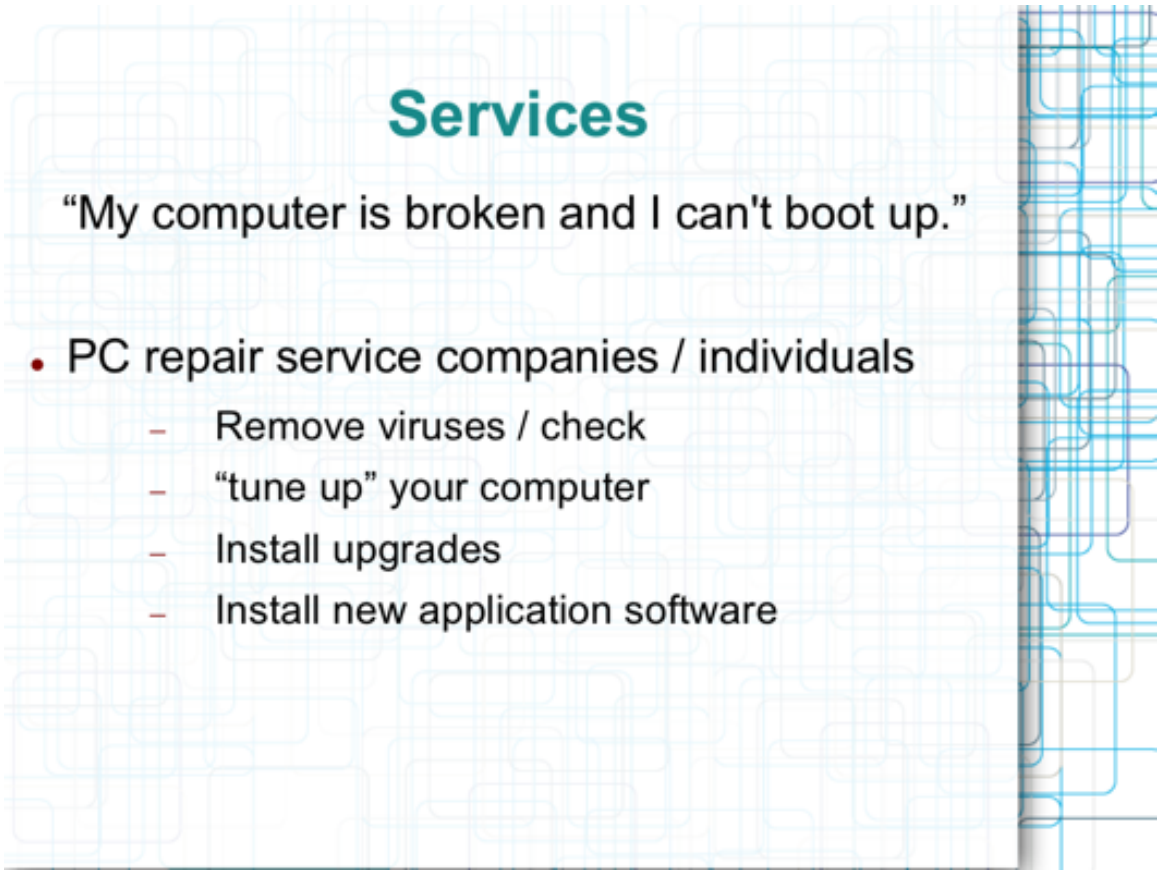

Services
"My computer is broken and I can't boot up."
PC repair service companies / individuals
Remove viruses / check
"tune up" your computer
Install upgrades
Install new application software

Figure 4.21

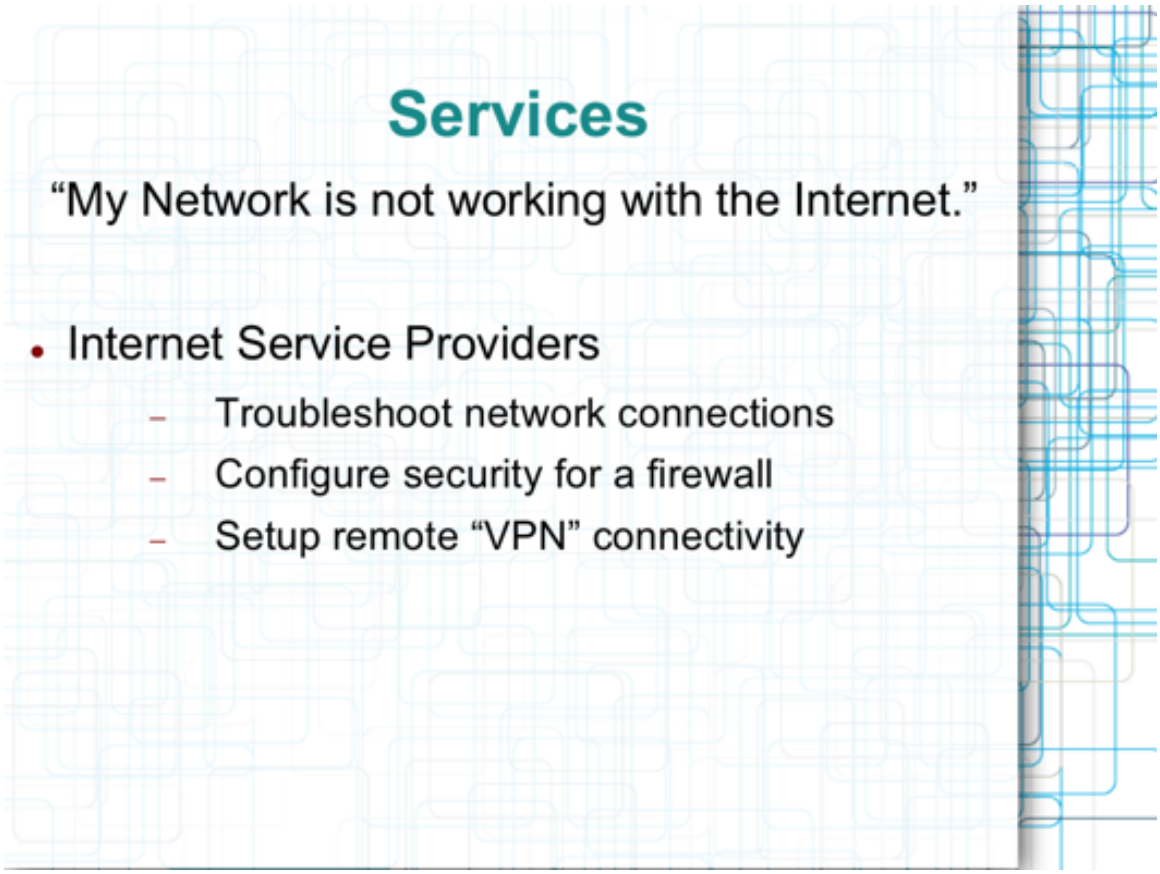

Services
"My Network is not working with the Internet."
Internet Service Providers
Troubleshoot network connections
Configure security for a firewall
Setup remote "VPN" connectivity

Figure 4.22

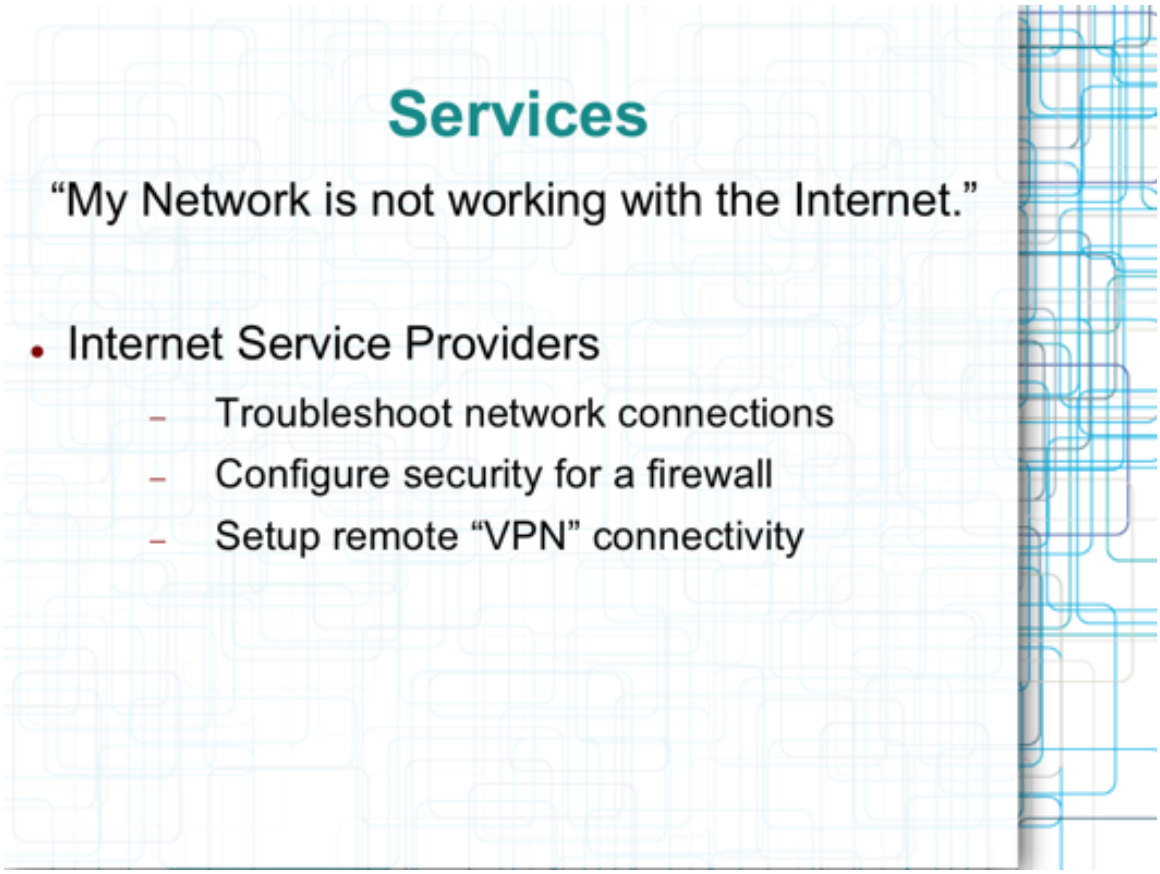

Services
"My Network is not working with the Internet."
Internet Service Providers
Troubleshoot network connections
Configure security for a firewall
Setup remote "VPN" connectivity

Figure 4.23

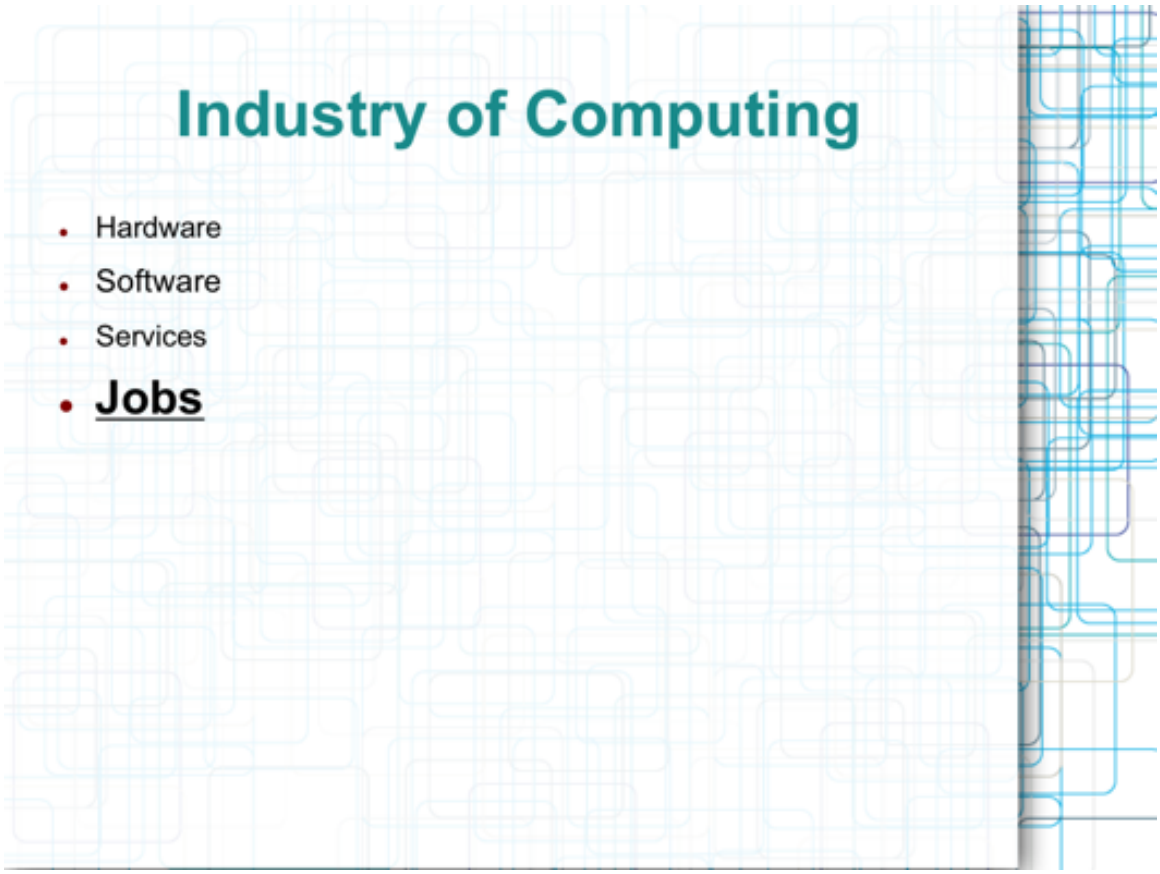


Figure 4.24

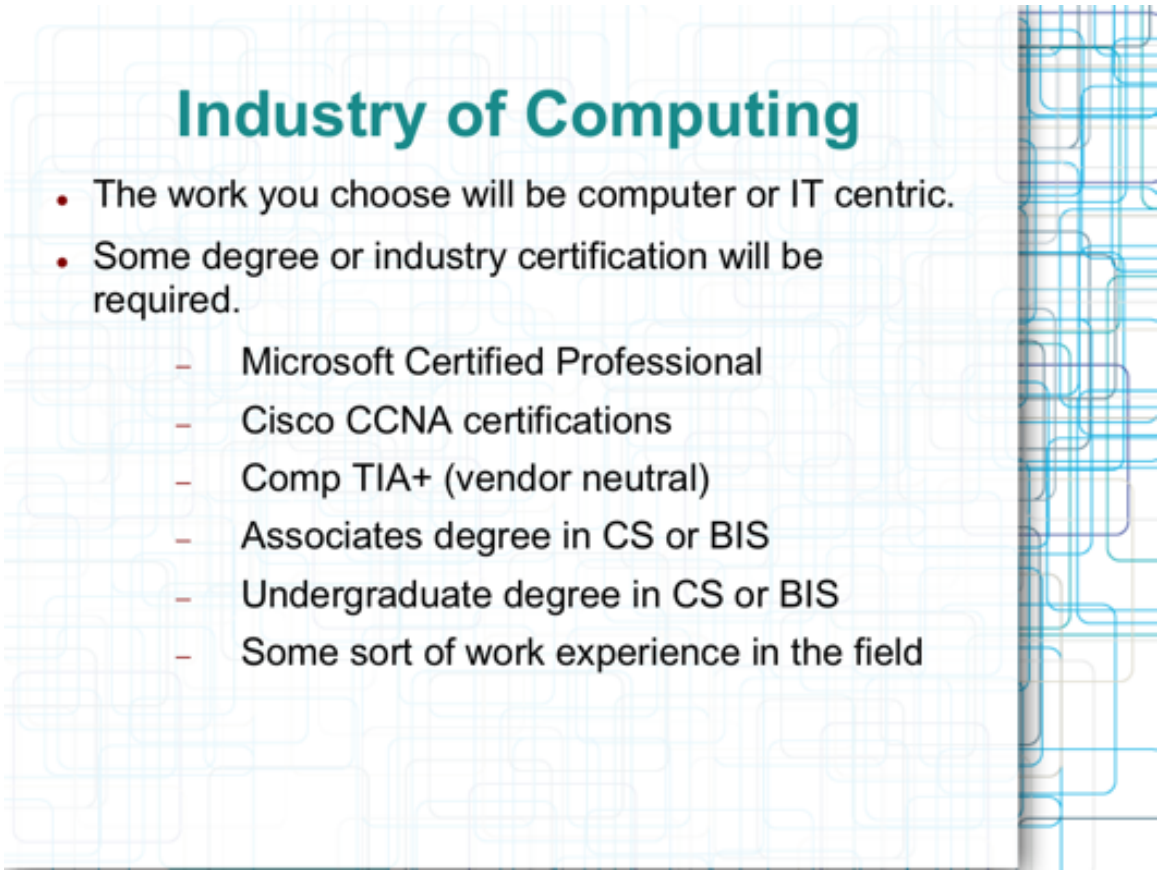

Industry of Computing
The work you choose will be computer or IT centric.
Some degree or industry certification will be required.
Microsoft Certified Professional
Cisco CCNA certifications
Comp TIA+ (vendor neutral)
Associates degree in CS or BIS
Undergraduate degree in CS or BIS
Some sort of work experience in the field

Figure 4.25


Industry of Computing
Resources for finding jobs:
Www.Monster.com
Www.ComputerJobs.com
Www.USAjob.gov
Www.Careers.yahoo.com
Www.Techjobs.com
Others??

Figure 4.26

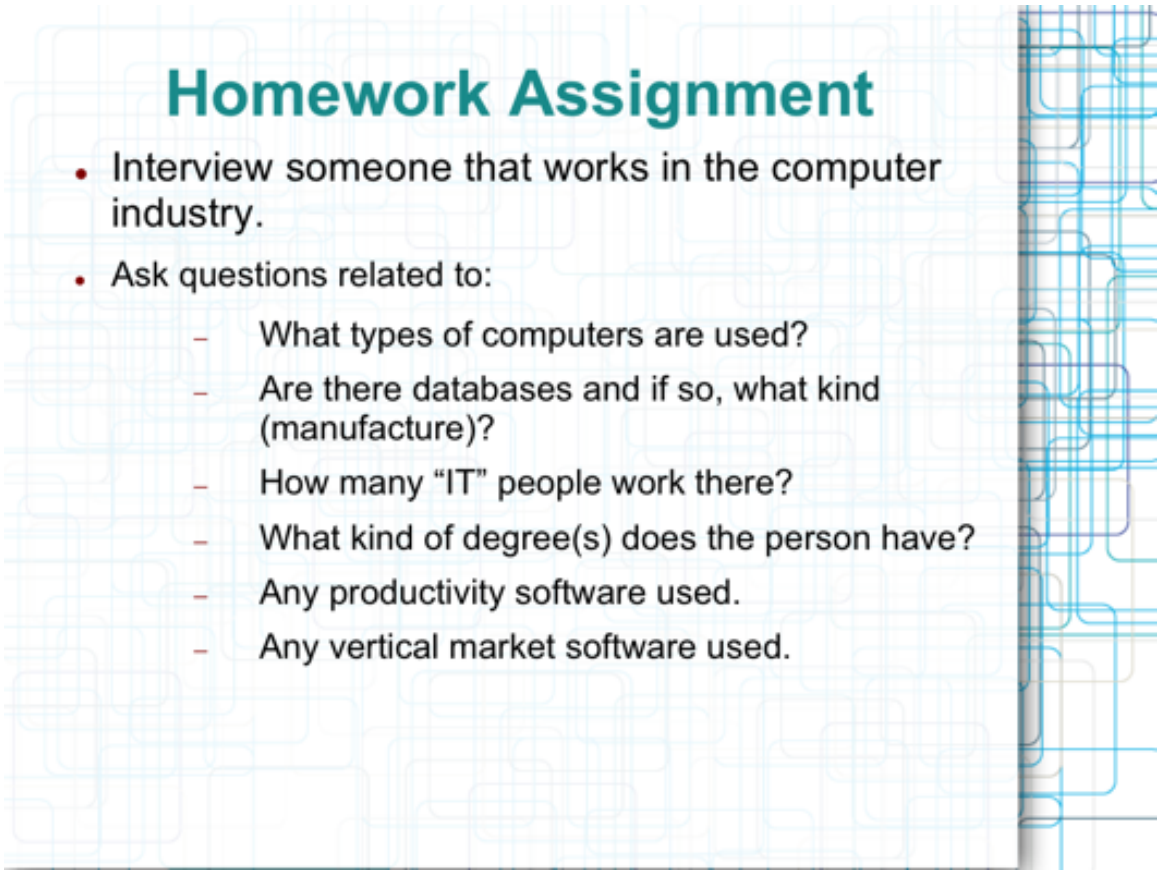

Homework Assignment
Interview someone that works in the computer industry.
Ask questions related to:
What types of computers are used?
Are there databases and if so, what kind (manufacture)?
How many "IT" people work there?
What kind of degree(s) does the person have?
Any productivity software used.
Any vertical market software used.

Figure 4.27

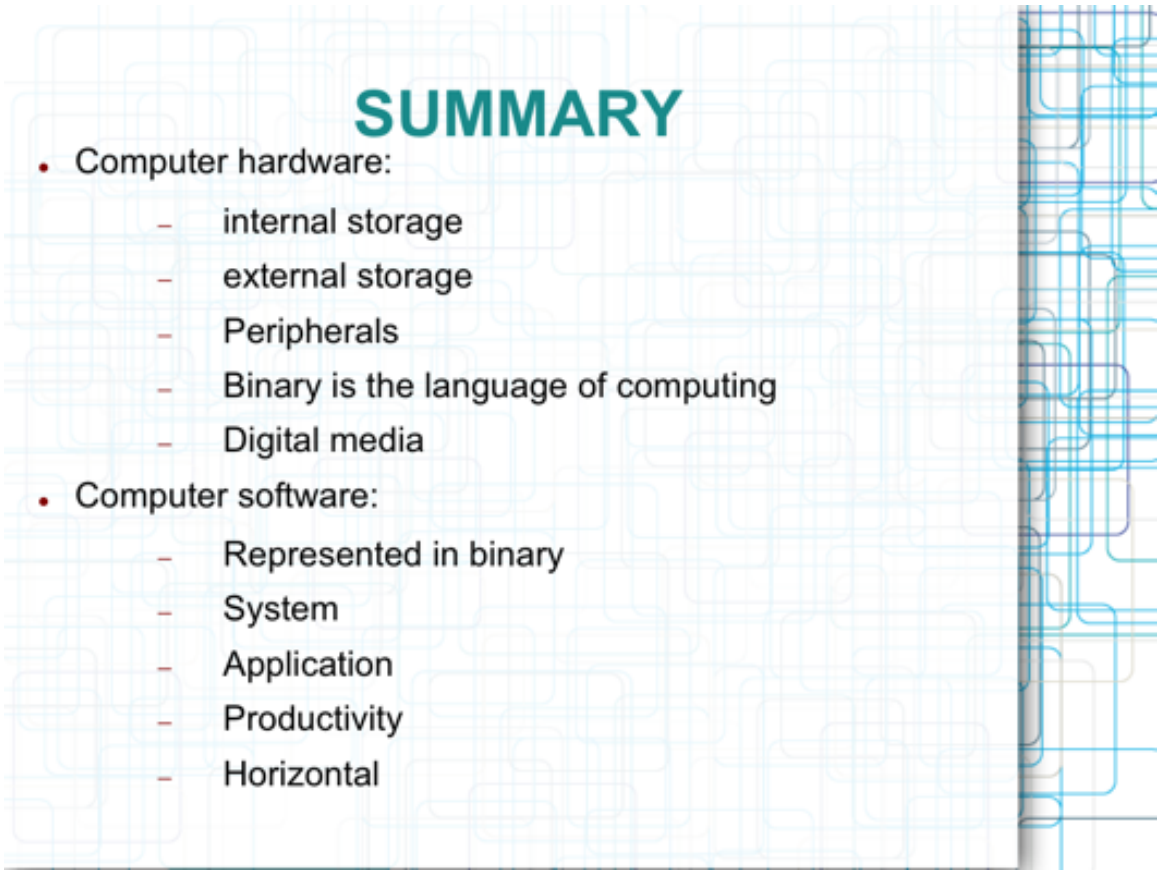

SUMMARY
Computer hardware:
internal storage
external storage
Peripherals
Binary is the language of computing
Digital media
Computer software:
Represented in binary
System
Application
Productivity
Horizontal

Figure 4.28

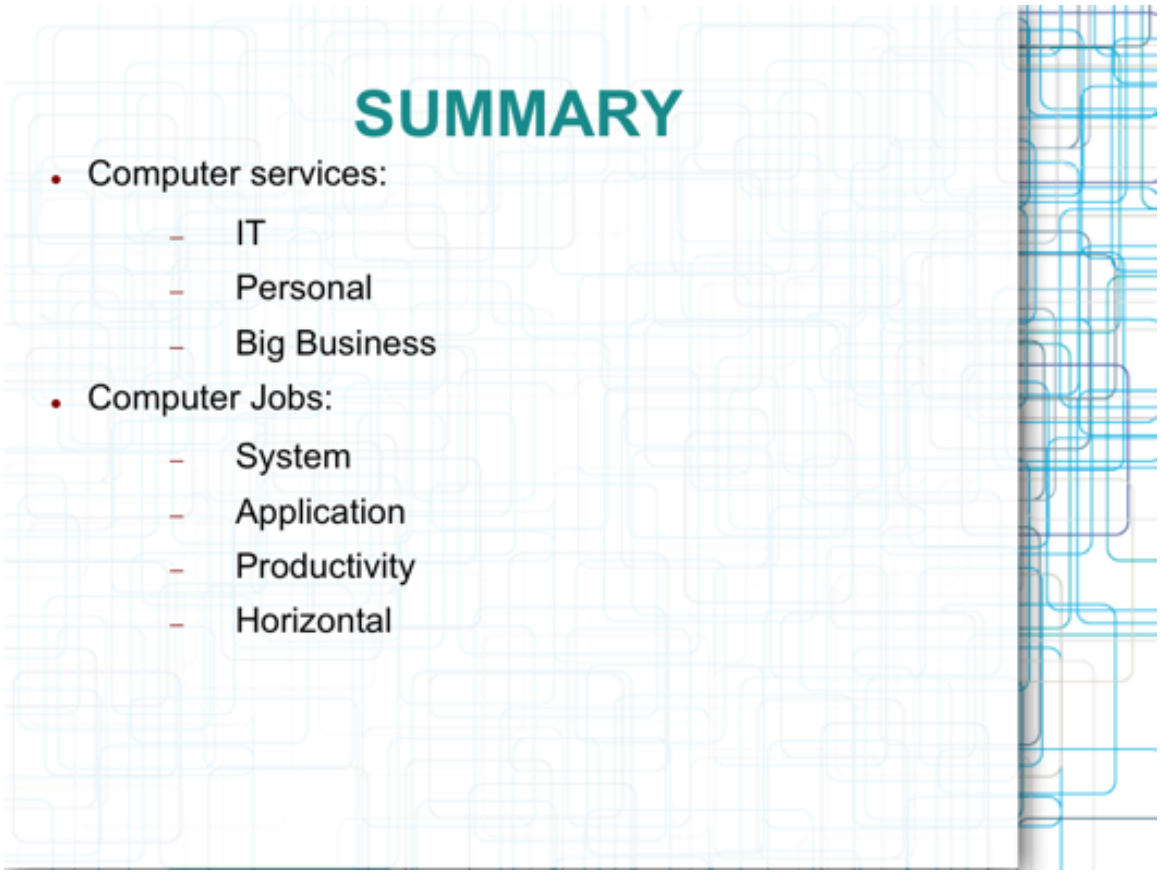

SUMMARY
Computer services:
IT
Personal
Big Business
Computer Jobs:
System
Application
Productivity
Horizontal

Figure 4.29


Resources
http://www.yevol.com/en/vcsharp/applicationdesign/lesson10.htm
http://hephaestusaudio.com/delphi/2009/07/
http://www.thestudentroom.co.uk/showthread.php?t=2514471

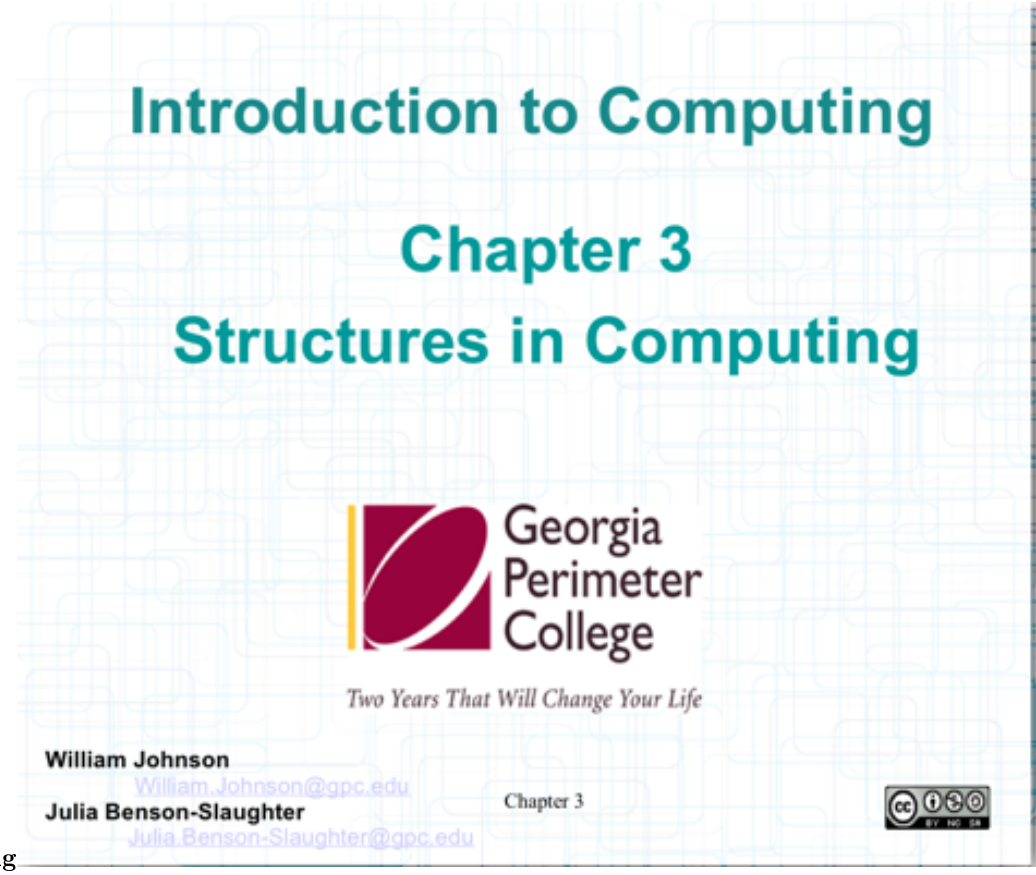
Figure 4.30

Chapter 5

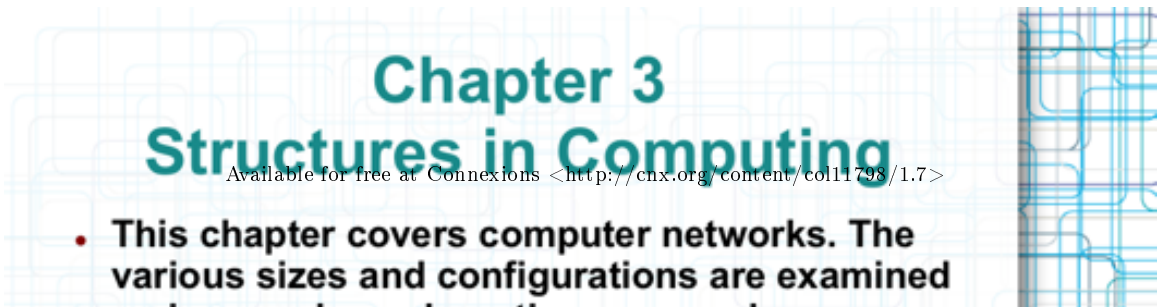
Chapter3.1

5.1 Chapter-3-1[1]

5.1.1 CSC1010 – Introduction to Computing



5.1.1.1 Structures in Computing



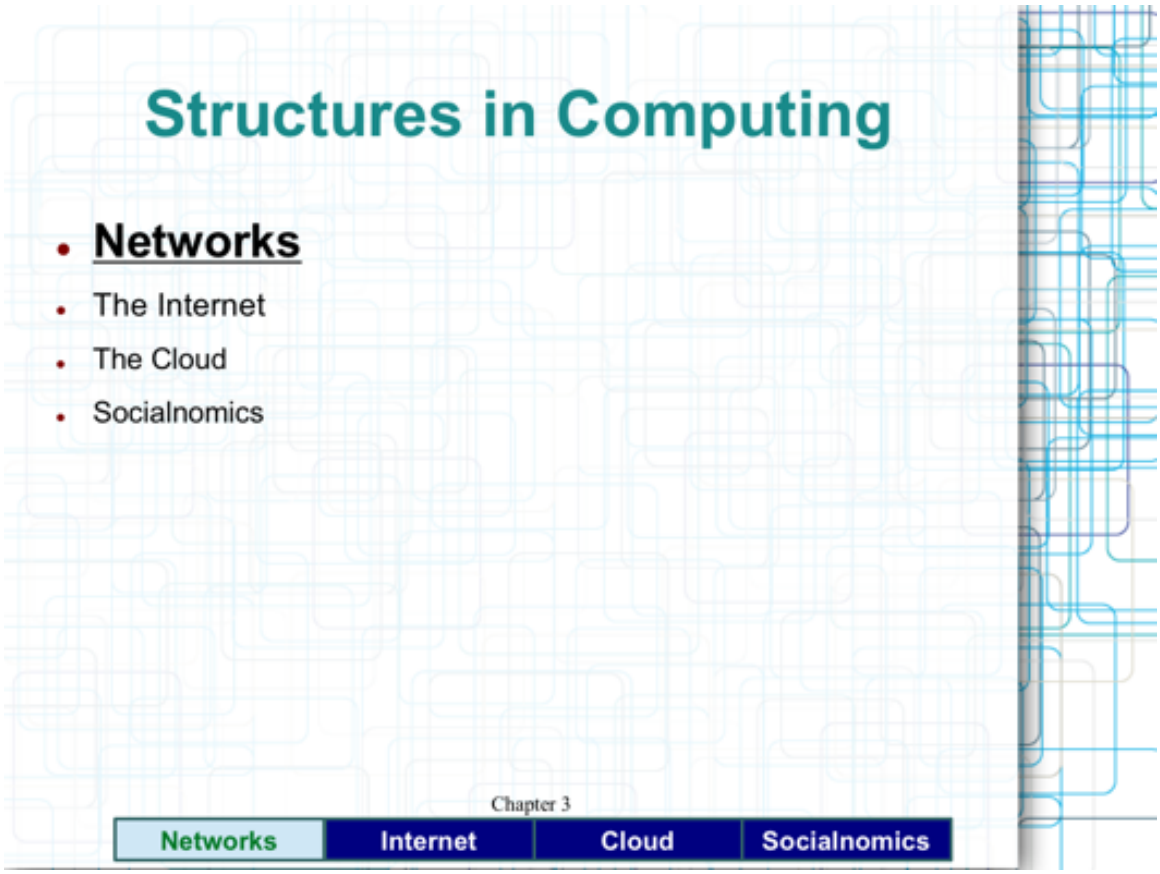

Structures in Computing
Networks
The Internet
The Cloud
Socialnomics
Chapter 3
Networks
Internet
Cloud
Socialnomics

Figure 5.2

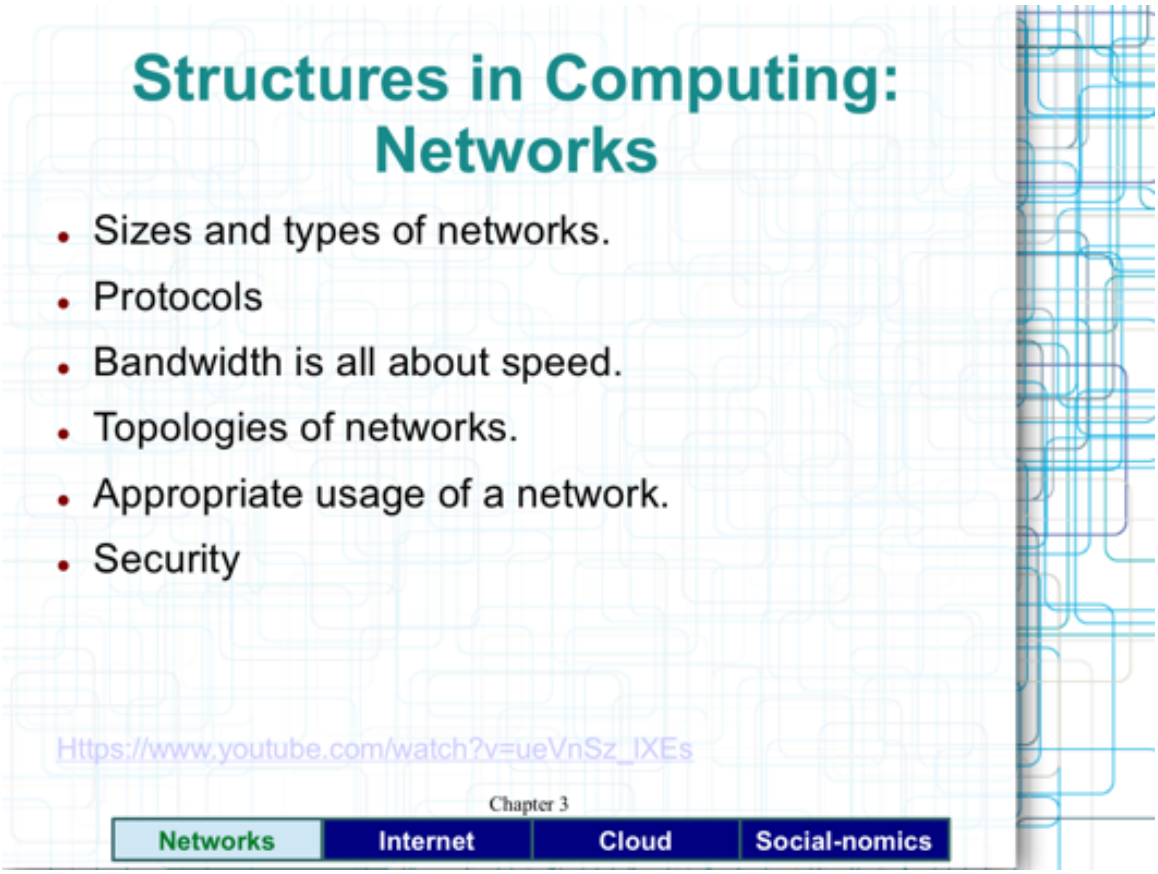

Structures in Computing:
Networks
Sizes and types of networks.
Protocols
Bandwidth is all about speed.
Topologies of networks.
Appropriate usage of a network.
Security
Https://www.youtube.com/watch?v=ueVnSz_IXEs
Chapter 3
Networks
Internet
Cloud
Social-nomics

Figure 5.3

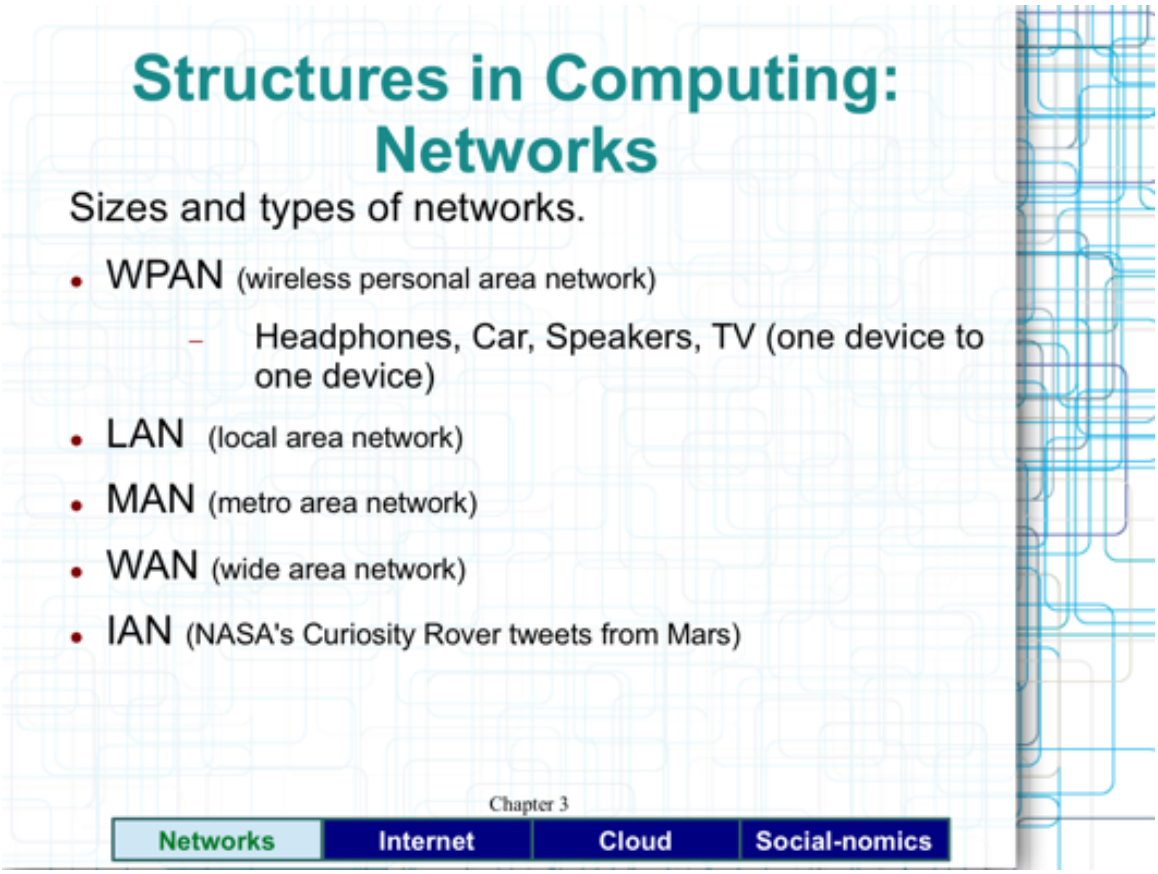

Structures in Computing: Networks
Sizes and types of networks.
WPAN (wireless personal area network)
Headphones, Car, Speakers, TV (one device to one device)
LAN (local area network)
MAN (metro area network)
WAN (wide area network)
IAN (NASA's Curiosity Rover tweets from Mars)
Chapter 3
Networks
Internet
Cloud
Social-nomics

Figure 5.4

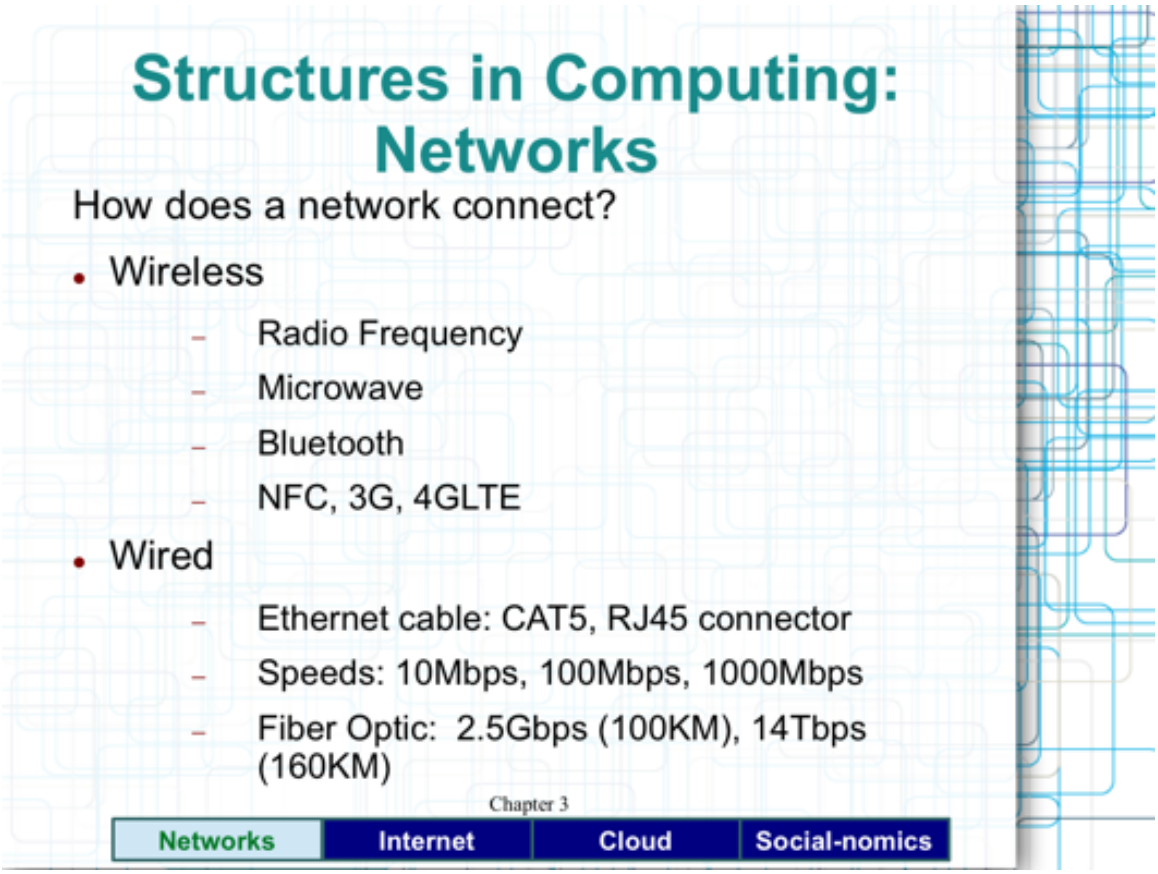

Structures in Computing: Networks
How does a network connect?
Wireless
Radio Frequency
Microwave
Bluetooth
NFC, 3G, 4GLTE
Wired
Ethernet cable: CAT5, RJ45 connector
Speeds: 10Mbps, 100Mbps, 1000Mbps
Fiber Optic: 2.5Gbps (100KM), 14Tbps (160KM)
Chapter 3
Networks
Internet
Cloud
Social-nomics

Figure 5.5

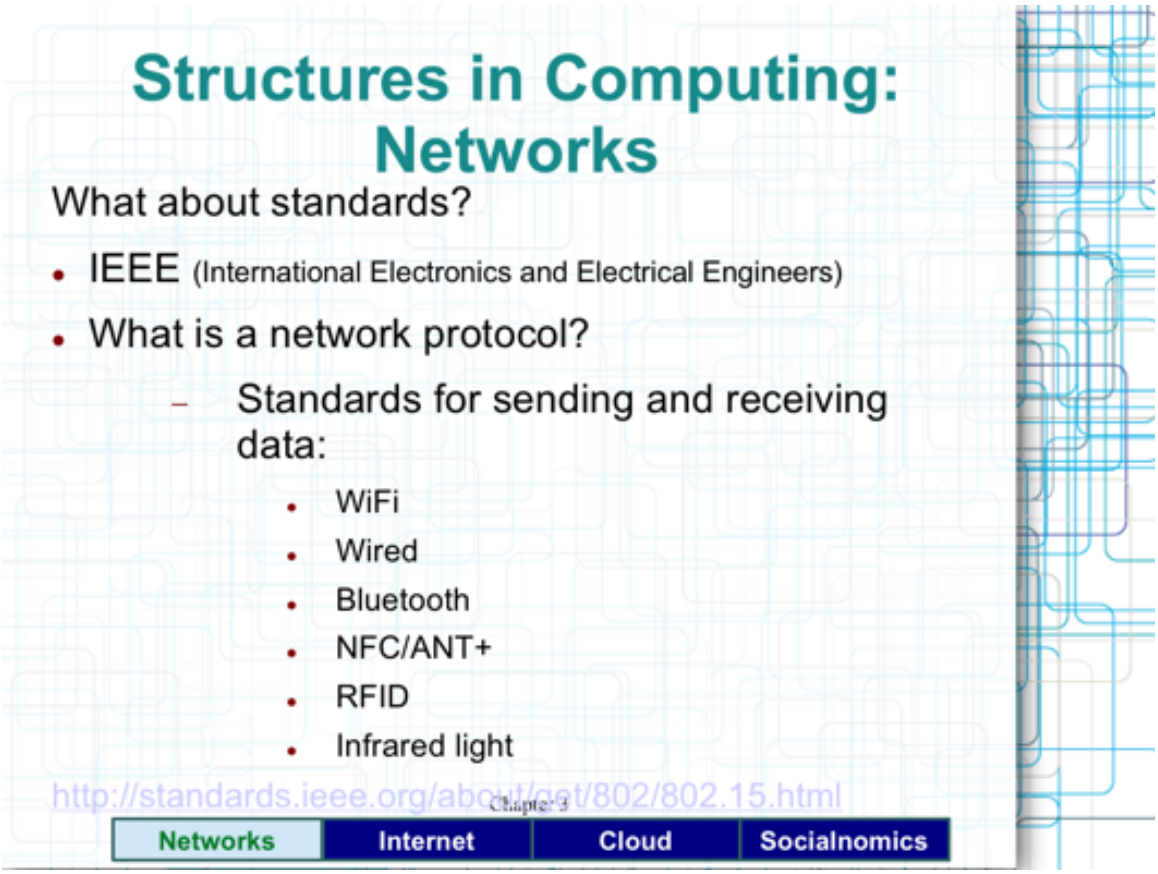

Structures in Computing: Networks
What about standards?
IEEE (International Electronics and Electrical Engineers)
What is a network protocol?
Standards for sending and receiving data:
WiFi
Wired
Bluetooth
NFC/ANT+
RFID
Infrared light
http://standards.ieee.org/about/get/802/802.15.html
Networks
Internet
Cloud
Socialnomics

Figure 5.6

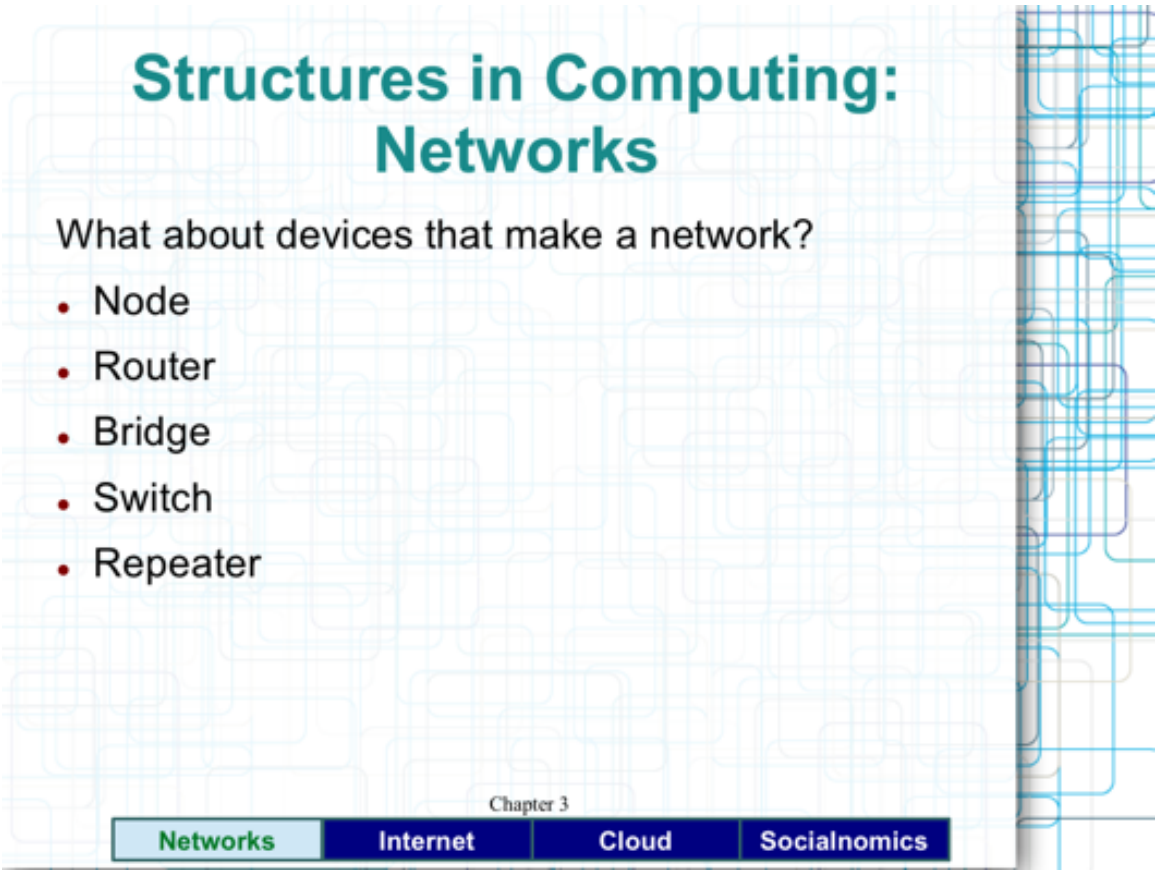

Structures in Computing: Networks
What about devices that make a network?
Node
Router
Bridge
Switch
Repeater
Chapter 3
Networks
Internet
Cloud
Socialnomics

Figure 5.7

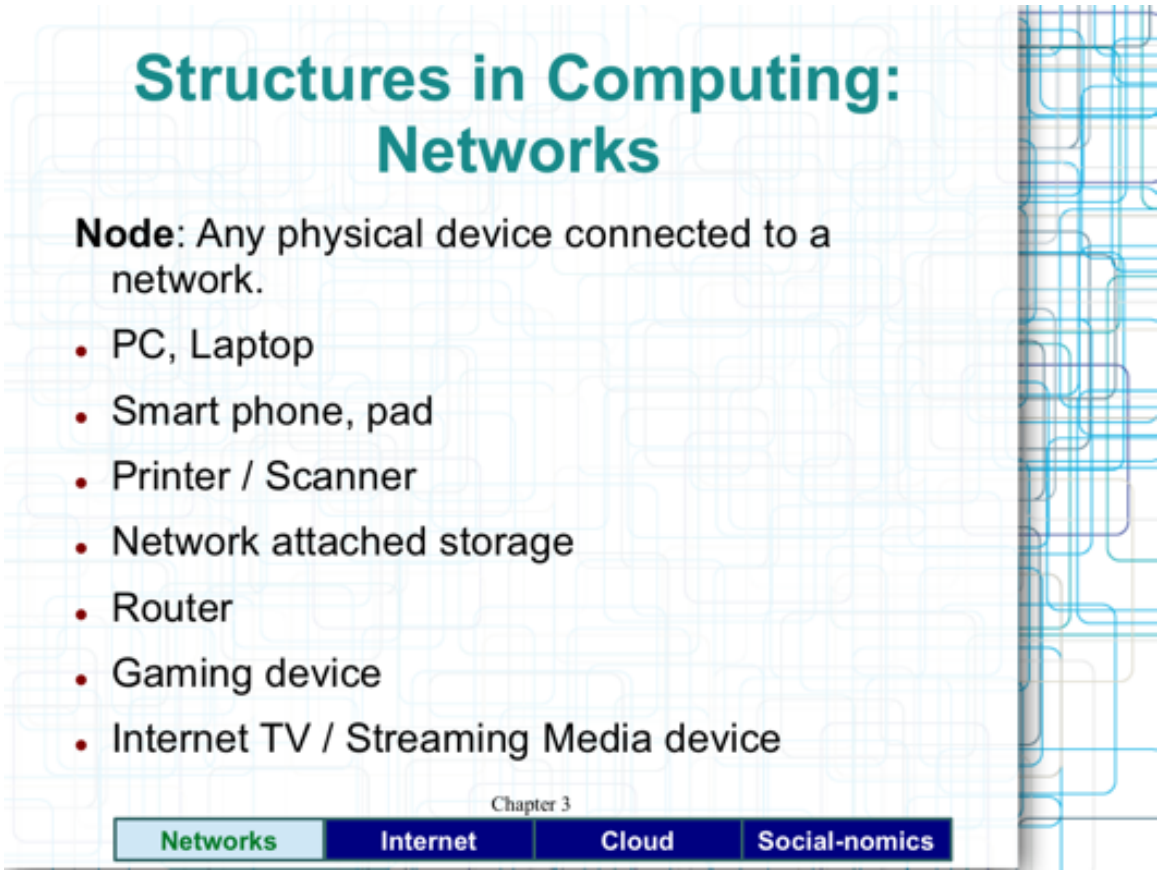

Structures in Computing: Networks
Node: Any physical device connected to a network.
PC, Laptop
Smart phone, pad
Printer / Scanner
Network attached storage
Router
Gaming device
Internet TV / Streaming Media device
Chapter 3
Networks
Internet
Cloud
Social-nomics

Figure 5.8

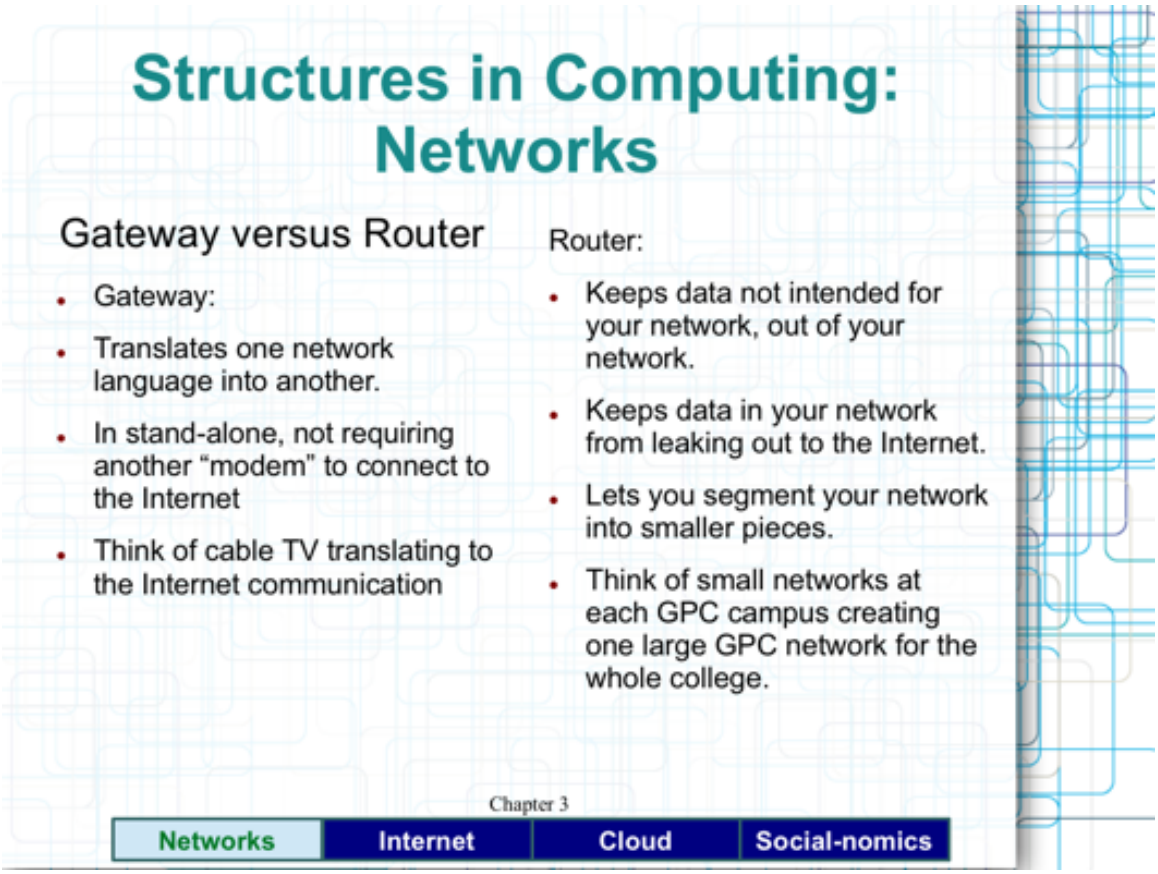

Structures in Computing: Networks
Gateway versus Router
Gateway:
Translates one network language into another.
In stand-alone, not requiring another "modem" to connect to the Internet
Think of cable TV translating to the Internet communication
Router:
Keeps data not intended for your network, out of your network.
Keeps data in your network from leaking out to the Internet.
Lets you segment your network into smaller pieces.
Think of small networks at each GPC campus creating one large GPC network for the whole college.
Chapter 3
Networks
Internet
Cloud
Social-nomics

Figure 5.9

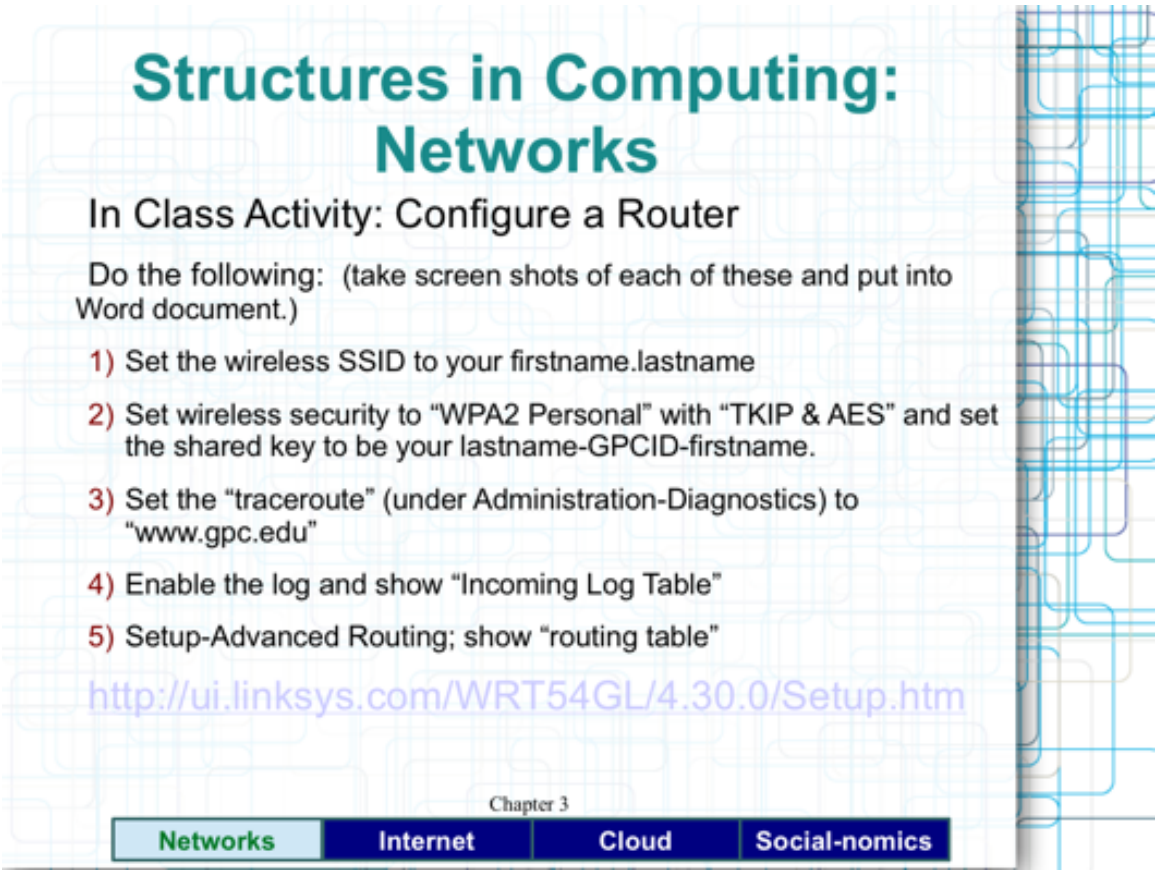

Structures in Computing: Networks
In Class Activity: Configure a Router
Do the following: (take screen shots of each of these and put into Word document.)
1) Set the wireless SSID to your firstname.lastname
2) Set wireless security to "WPA2 Personal" with "TKIP & AES" and set the shared key to be your lastname-GPCID-firstname.
3) Set the "traceroute" (under Administration-Diagnostics) to "www.gpc.edu"
4) Enable the log and show "Incoming Log Table"
5) Setup-Advanced Routing; show "routing table"
http://ui.linksys.com/WRT54GL/4.30.0/Setup.htm
Chapter 3
Networks
Internet
Cloud
Social-nomics

Figure 5.10

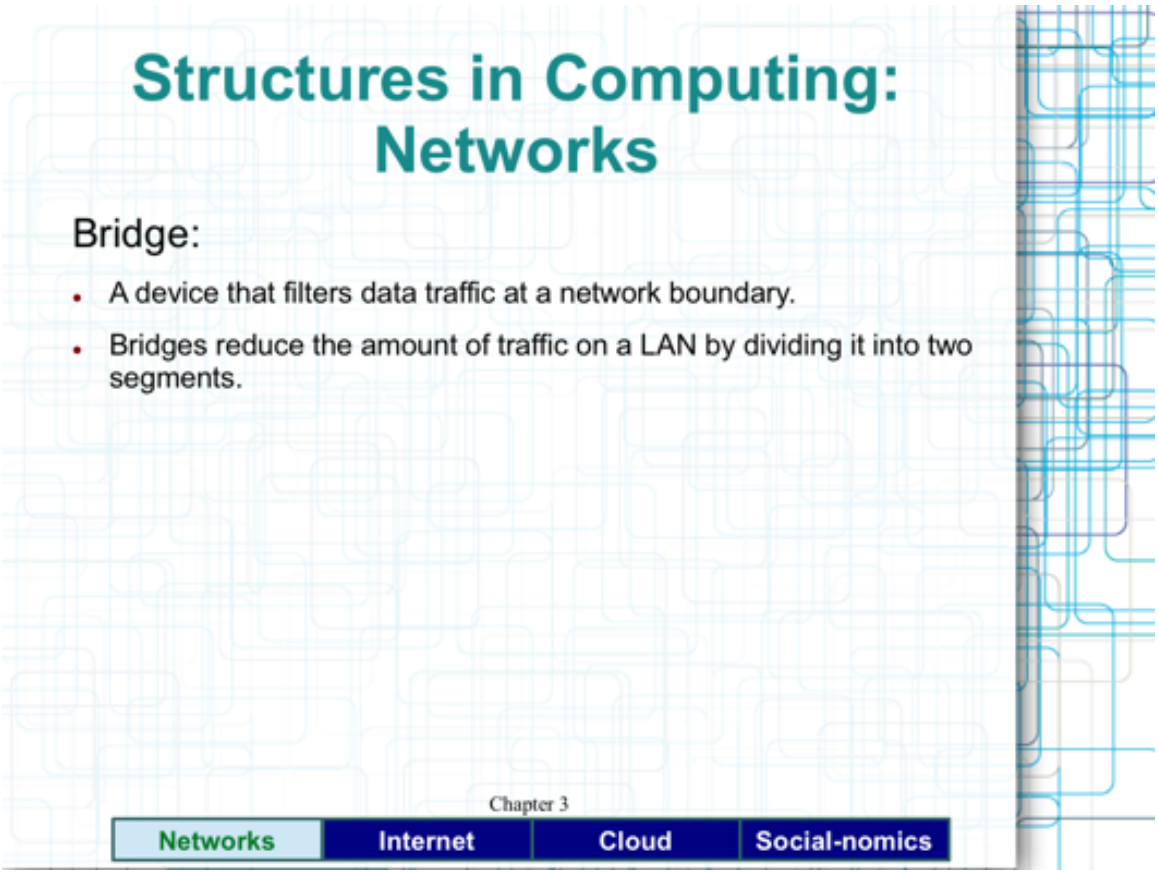

Structures in Computing:
Networks
Bridge:
A device that filters data traffic at a network boundary.
Bridges reduce the amount of traffic on a LAN by dividing it into two segments.
Chapter 3
Networks
Internet
Cloud
Social-nomics

Figure 5.11

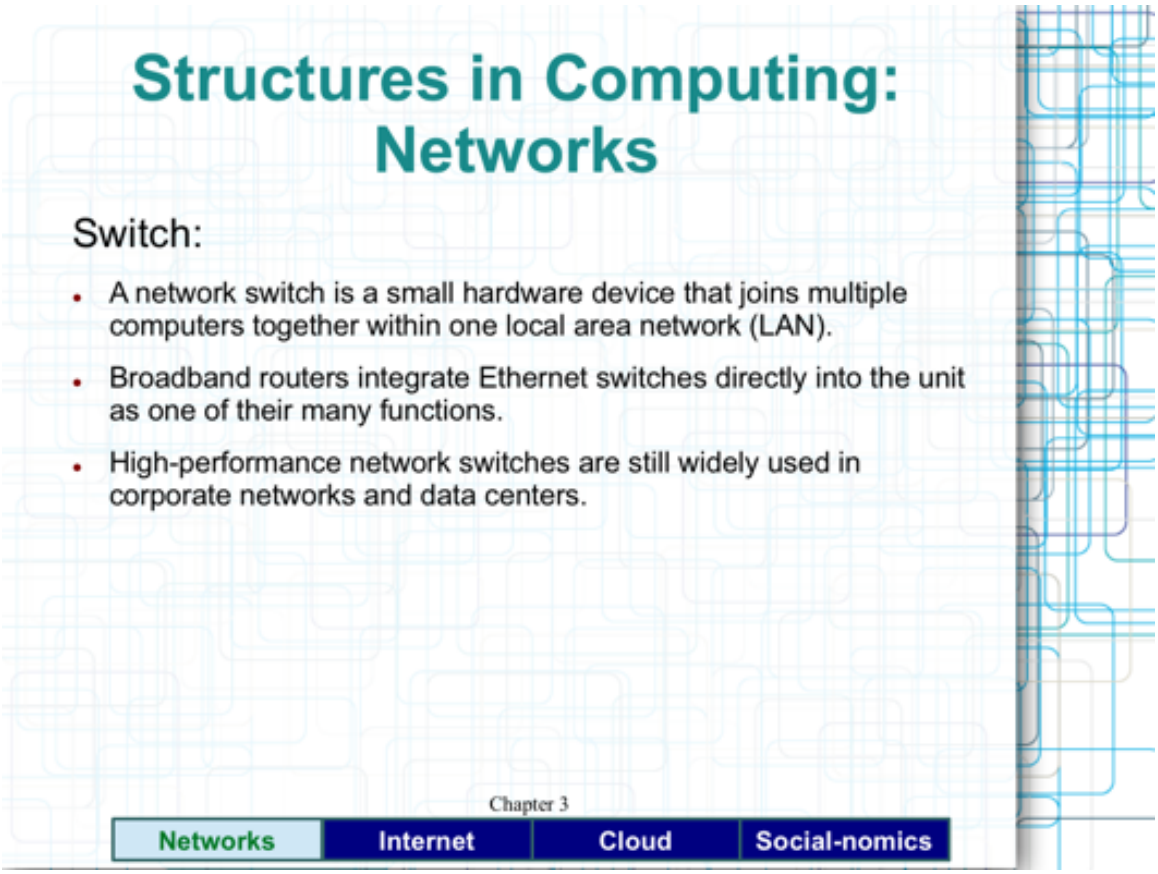

Structures in Computing: Networks
Switch:
A network switch is a small hardware device that joins multiple computers together within one local area network (LAN).
Broadband routers integrate Ethernet switches directly into the unit as one of their many functions.
High-performance network switches are still widely used in corporate networks and data centers.
Chapter 3
Networks
Internet
Cloud
Social-nomics

Figure 5.12

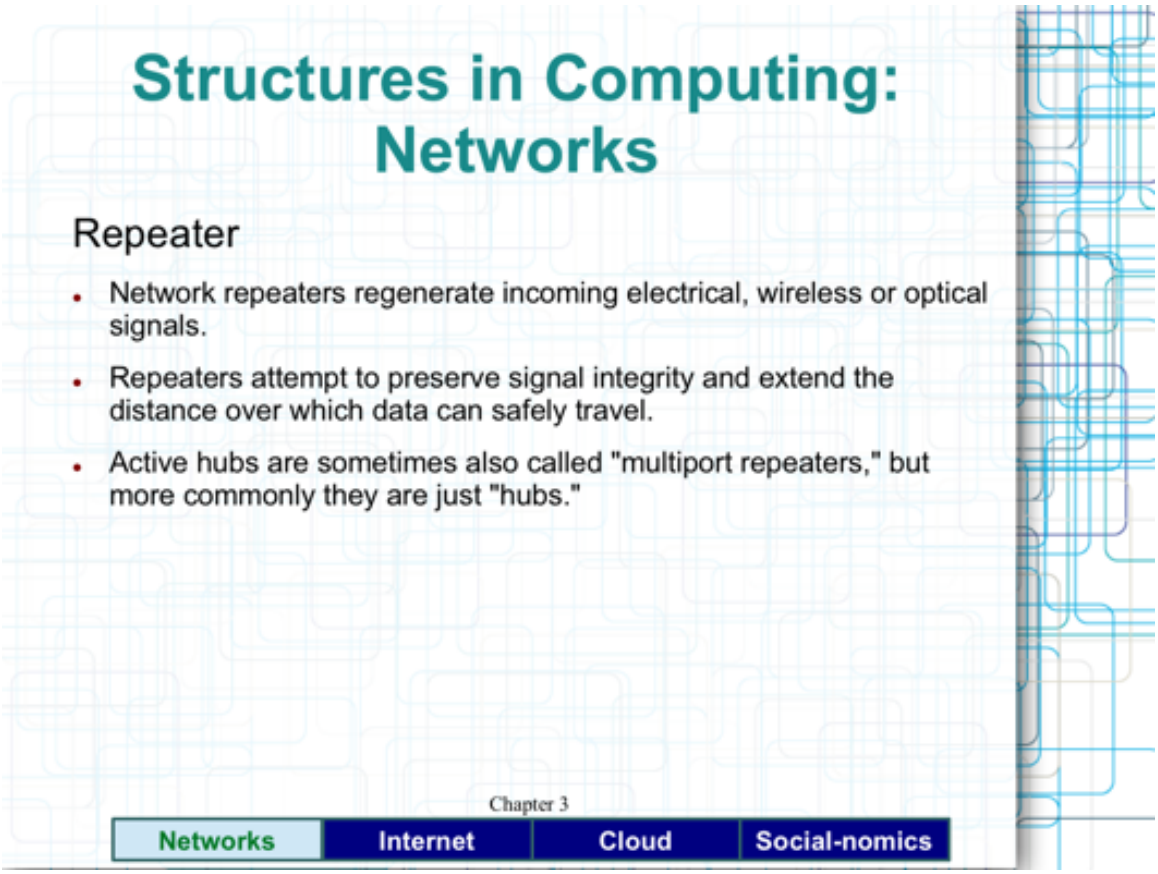

Structures in Computing: Networks
Repeater
Network repeaters regenerate incoming electrical, wireless or optical signals.
Repeaters attempt to preserve signal integrity and extend the distance over which data can safely travel.
Active hubs are sometimes also called "multiport repeaters," but more commonly they are just "hubs."
Chapter 3
Networks
Internet
Cloud
Social-nomics

Figure 5.13

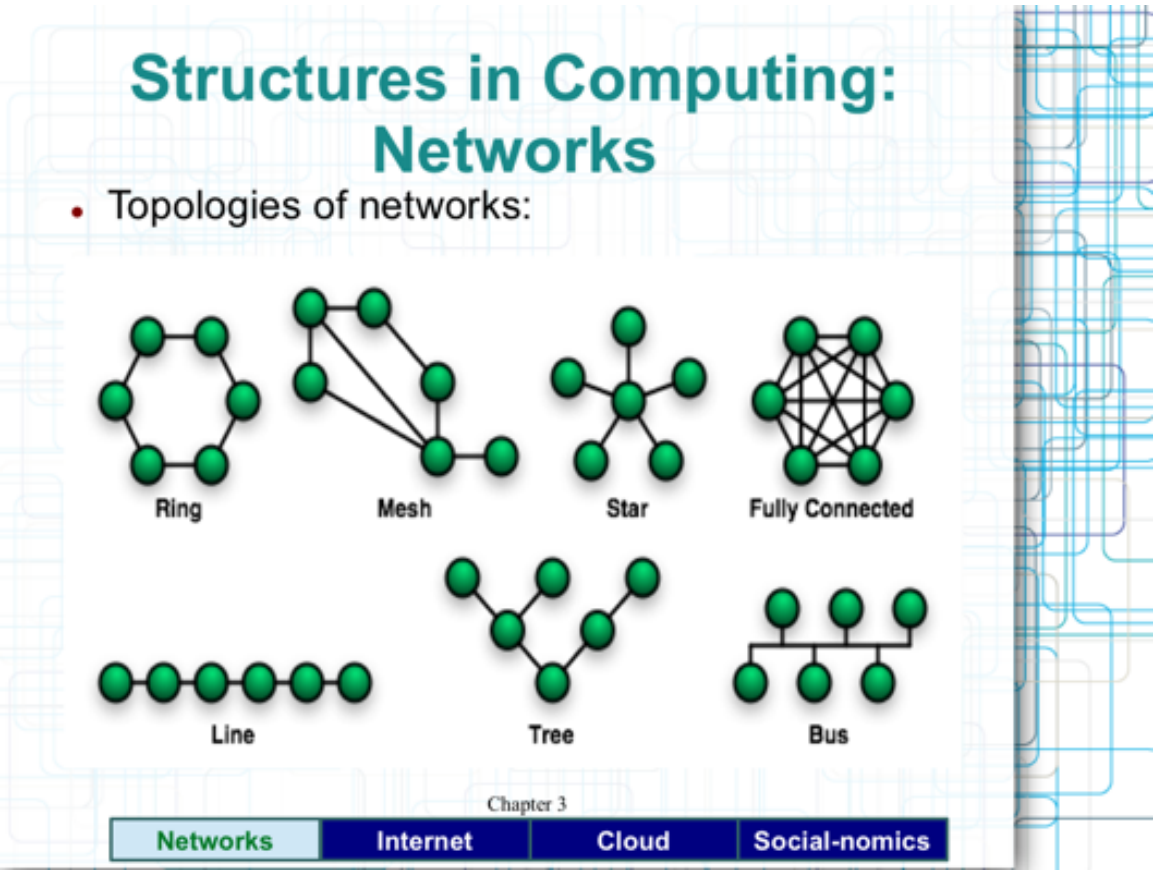

Structures in Computing: Networks
Topologies of networks:
Ring
Mesh
Star
Fully Connected
Line
Tree
Bus
Chapter 3
Networks
Internet
Cloud
Social-nomics

Figure 5.14

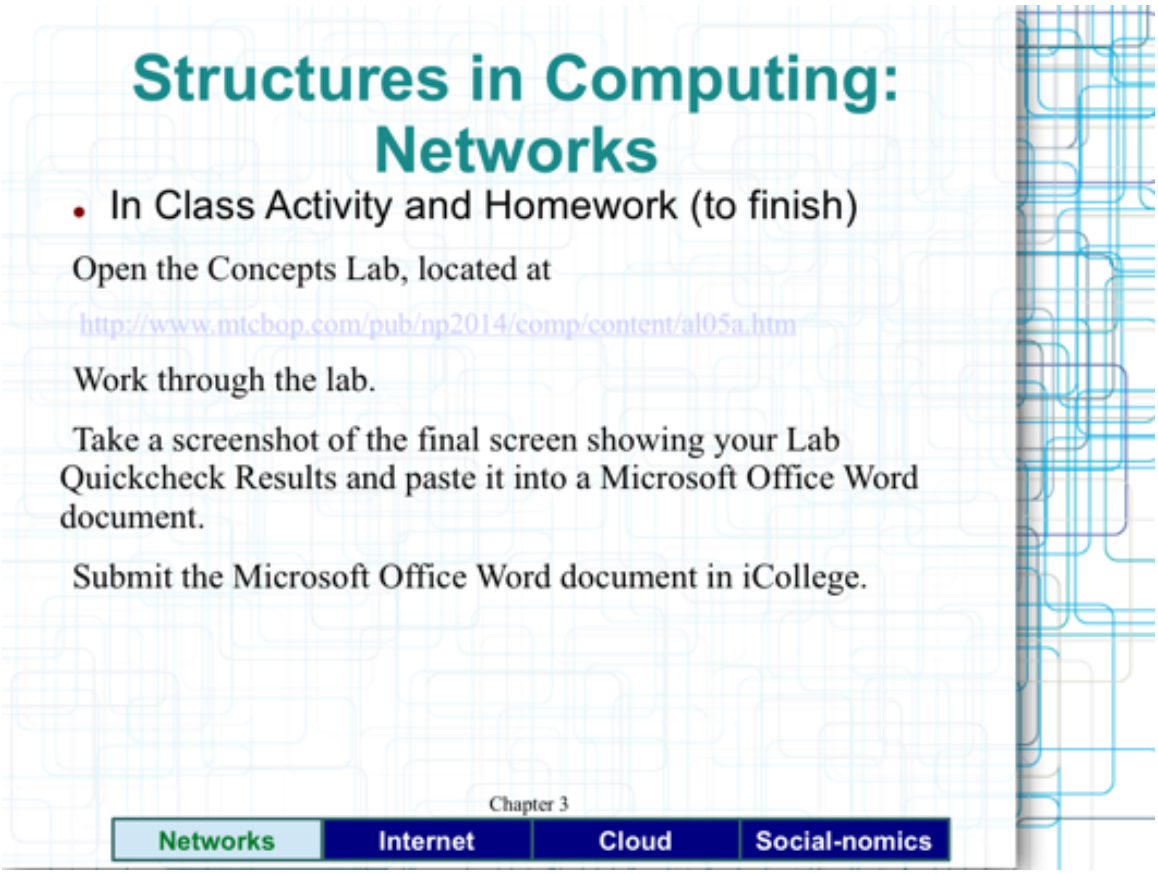

Structures in Computing: Networks
In Class Activity and Homework (to finish)
Open the Concepts Lab, located at
http://www.mtcbop.com/pub/np2014/comp/content/al05a.htm
Work through the lab.
Take a screenshot of the final screen showing your Lab Quickcheck Results and paste it into a Microsoft Office Word document.
Submit the Microsoft Office Word document in iCollege.
Chapter 3
Networks
Internet
Cloud
Social-nomics

Figure 5.15

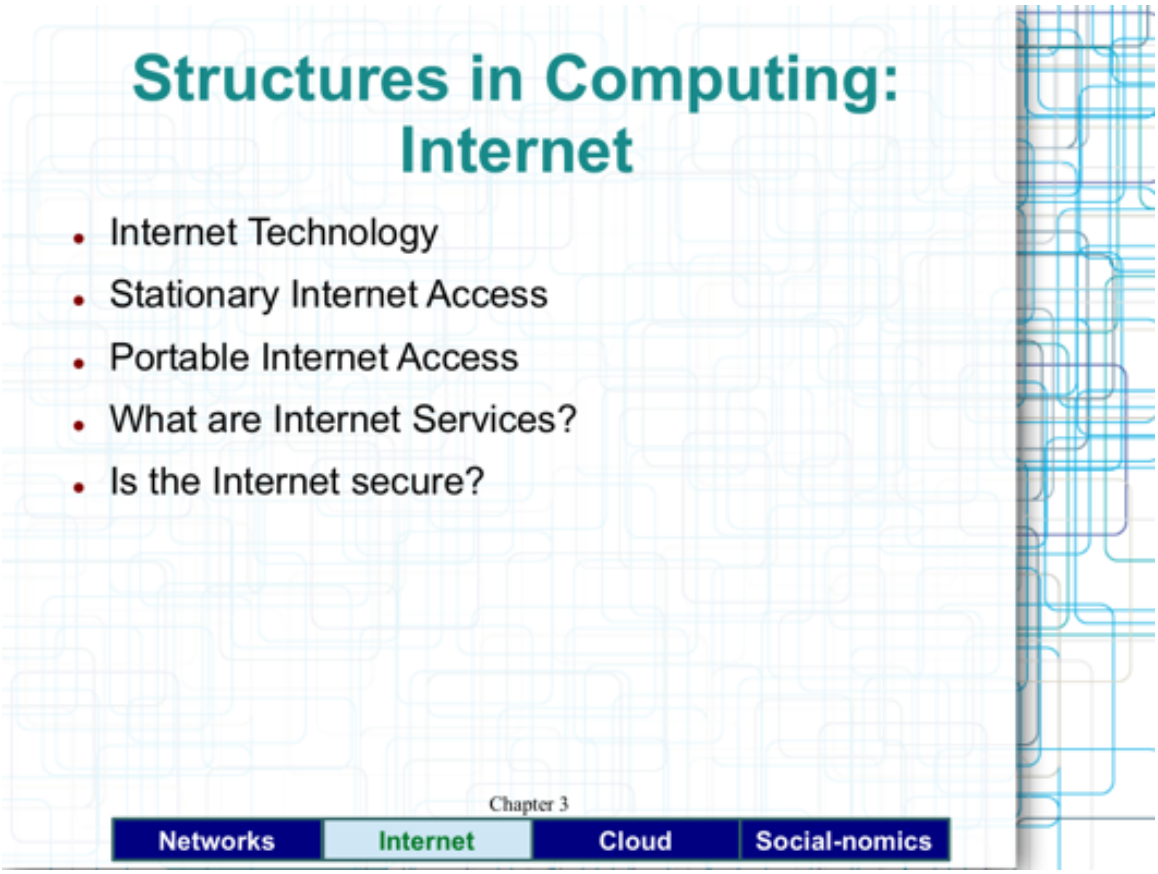

Structures in Computing: Internet
Internet Technology
Stationary Internet Access
Portable Internet Access
What are Internet Services?
Is the Internet secure?
Chapter 3
Networks
Internet
Cloud
Social-nomics

Figure 5.16

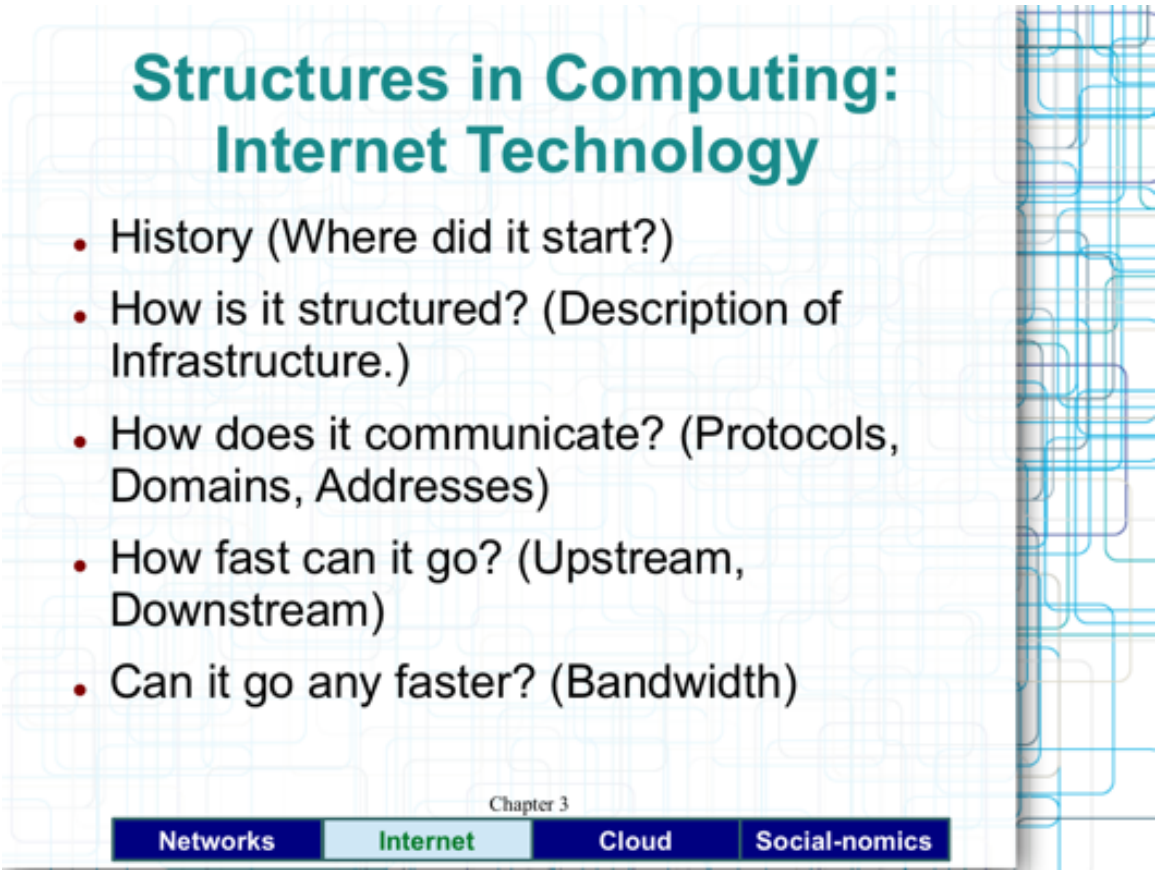

Structures in Computing:
Internet Technology
History (Where did it start?)
How is it structured? (Description of Infrastructure.)
How does it communicate? (Protocols, Domains, Addresses)
How fast can it go? (Upstream, Downstream)
Can it go any faster? (Bandwidth)
Chapter 3
Networks
Internet
Cloud
Social-nomics

Figure 5.17

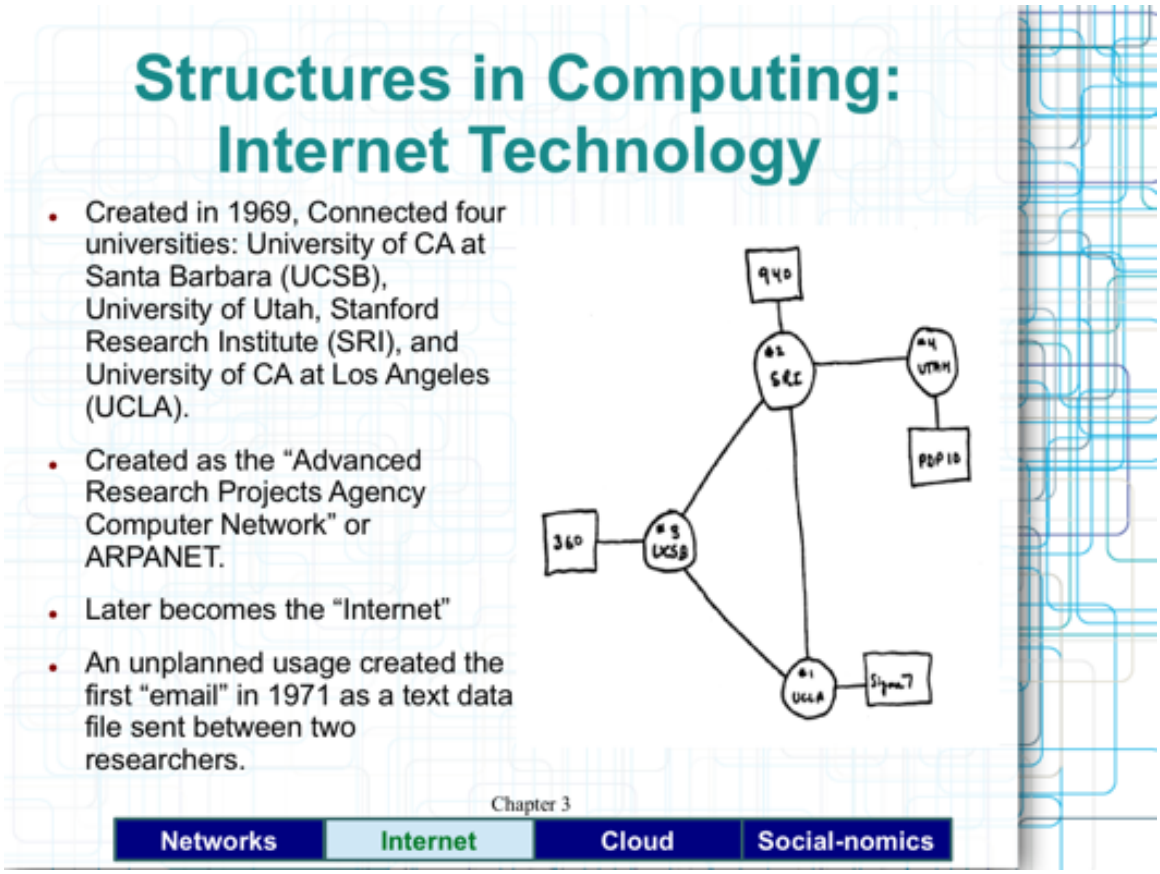

Structures in Computing:
Internet Technology
Created in 1969, Connected four universities: University of CA at Santa Barbara (UCSB), University of Utah, Stanford Research Institute (SRI), and University of CA at Los Angeles (UCLA).
Created as the "Advanced Research Projects Agency Computer Network" or ARPANET.
Later becomes the "Internet"
An unplanned usage created the first "email" in 1971 as a text data file sent between two researchers.
940
360
Chapter 3
Networks
Internet
Cloud
Social-nomics

Figure 5.18

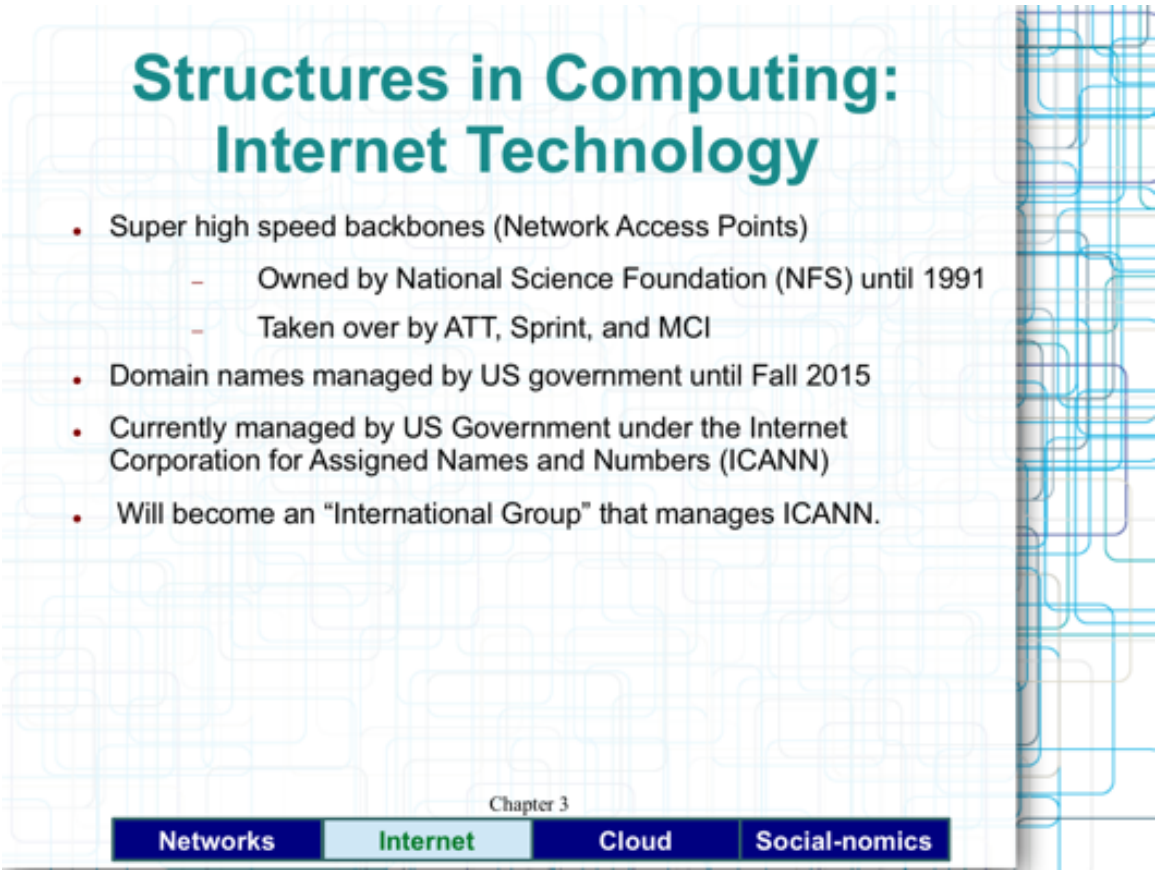

Structures in Computing:
Internet Technology
Super high speed backbones (Network Access Points)
Owned by National Science Foundation (NFS) until 1991
Taken over by ATT, Sprint, and MCI
Domain names managed by US government until Fall 2015
Currently managed by US Government under the Internet Corporation for Assigned Names and Numbers (ICANN)
Will become an "International Group" that manages ICANN.
Chapter 3
Networks
Internet
Cloud
Social-nomics

Figure 5.19

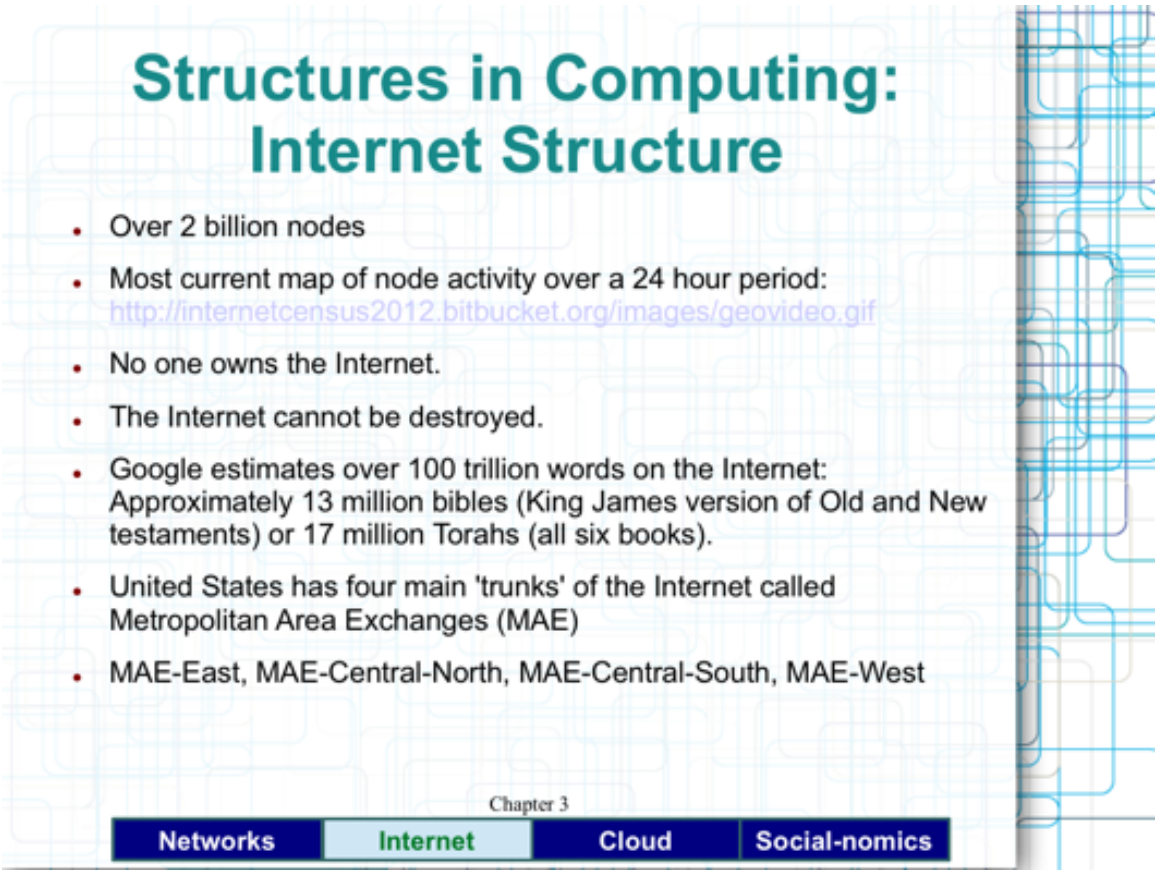

Structures in Computing:
Internet Structure
Over 2 billion nodes
Most current map of node activity over a 24 hour period:
http://internetcensus2012.bitbucket.org/images/geovideo.gif
No one owns the Internet.
The Internet cannot be destroyed.
Google estimates over 100 trillion words on the Internet:
Approximately 13 million bibles (King James version of Old and New testaments) or 17 million Torahs (all six books).
United States has four main 'trunks' of the Internet called Metropolitan Area Exchanges (MAE)
MAE-East, MAE-Central-North, MAE-Central-South, MAE-West
Chapter 3
Networks
Internet
Cloud
Social-nomics

Figure 5.20

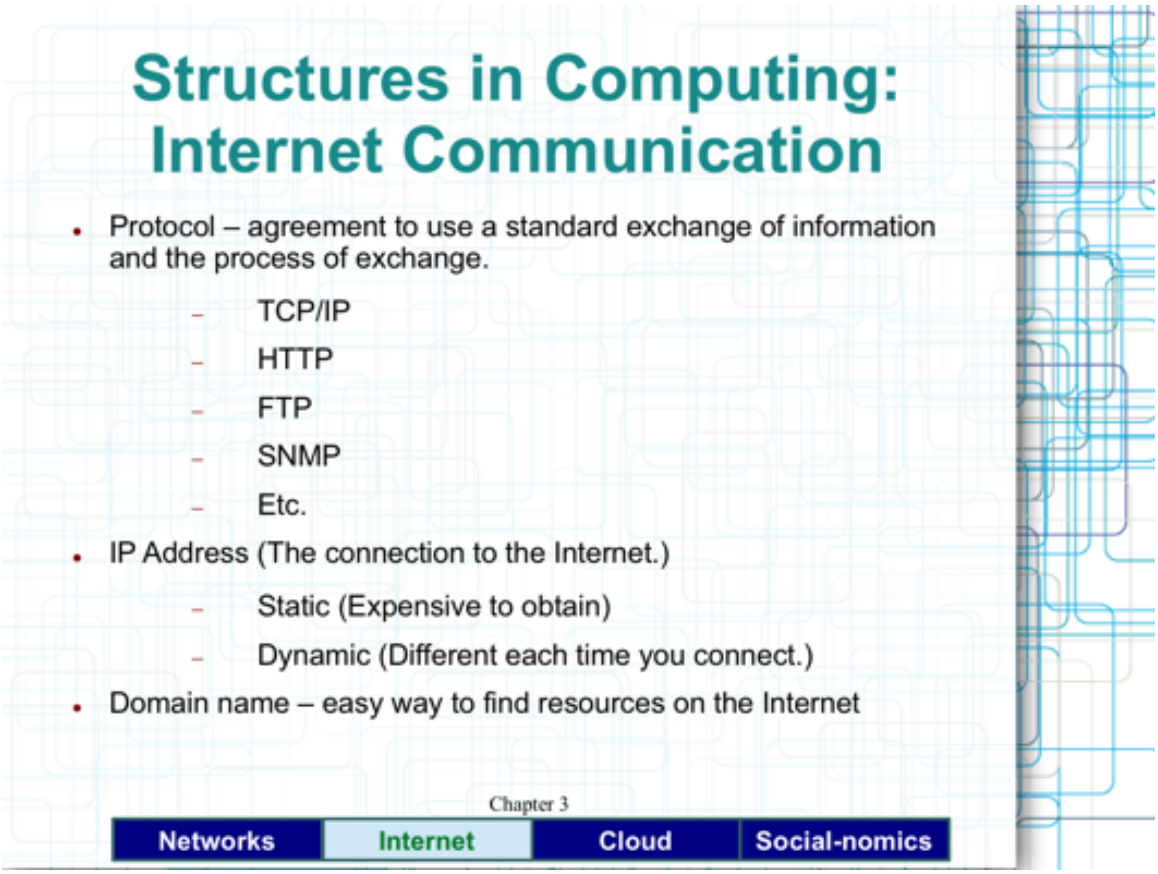
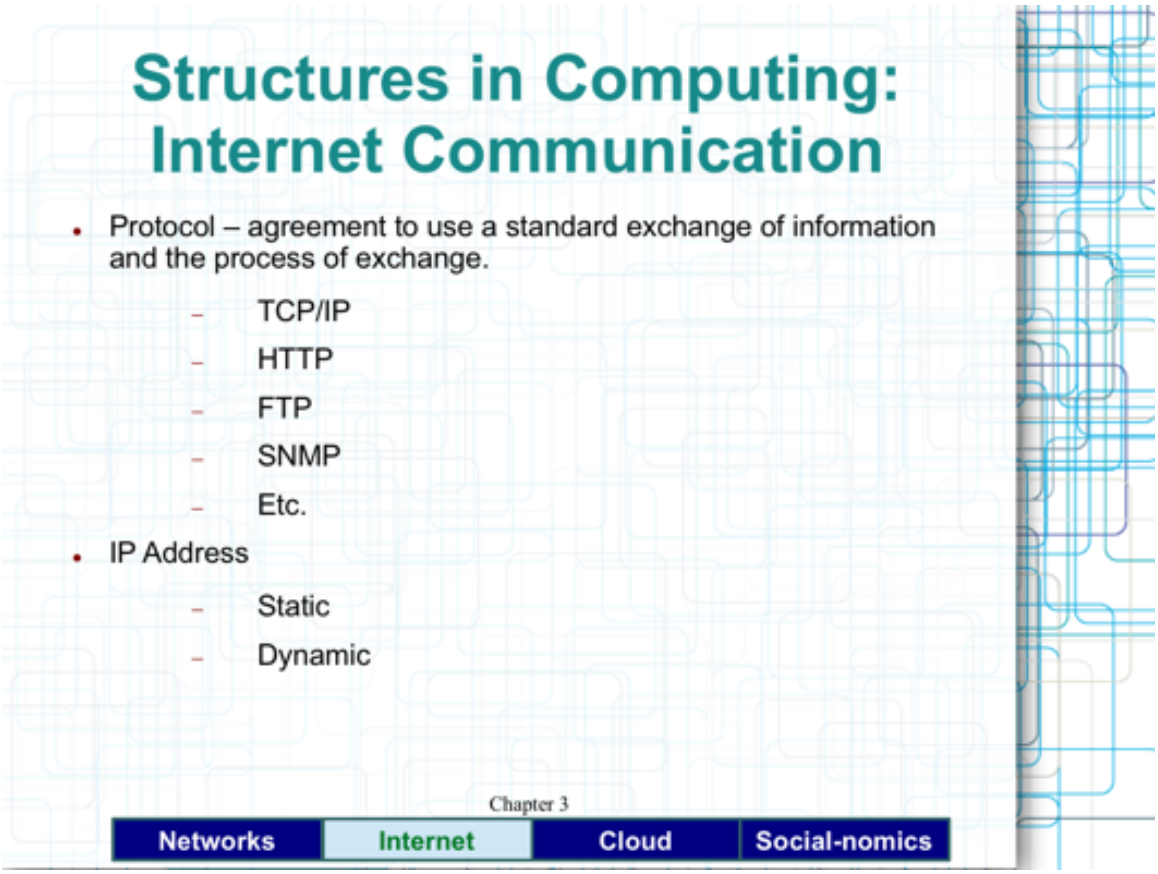

Structures in Computing:
Internet Communication
Protocol – agreement to use a standard exchange of information and the process of exchange.
TCP/IP
HTTP
FTP
SNMP
Etc.
IP Address (The connection to the Internet.)
Static (Expensive to obtain)
Dynamic (Different each time you connect.)
Domain name – easy way to find resources on the Internet
Chapter 3
Networks
Internet
Cloud
Social-nomics

Figure 5.21


Structures in Computing:
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Protocol – agreement to use a standard exchange of information and the process of exchange.
TCP/IP
HTTP
FTP
SNMP
Etc.
IP Address
Static
Dynamic
Chapter 3
Networks
Internet
Cloud
Social-nomics

Figure 5.22

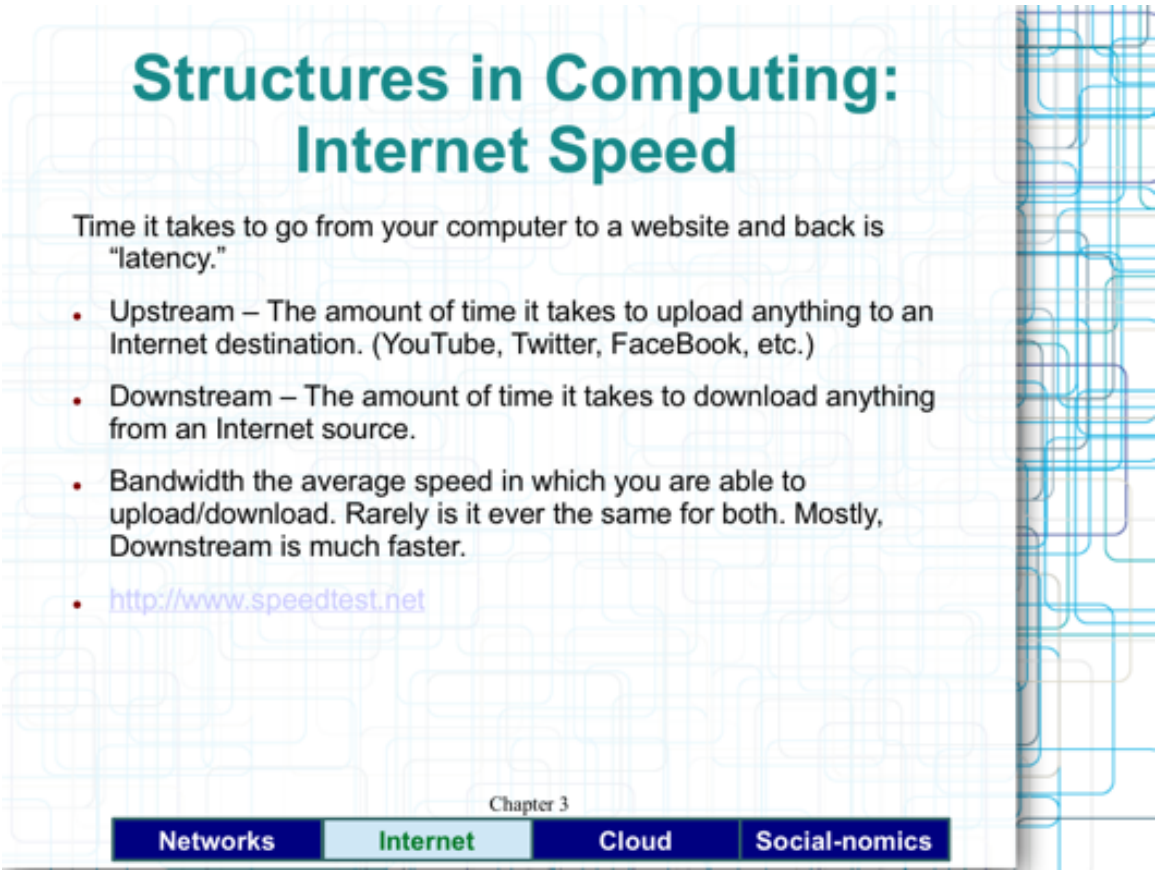

Structures in Computing:
Internet Speed
Time it takes to go from your computer to a website and back is "latency."
Upstream – The amount of time it takes to upload anything to an Internet destination. (YouTube, Twitter, FaceBook, etc.)
Downstream – The amount of time it takes to download anything from an Internet source.
Bandwidth the average speed in which you are able to upload/download. Rarely is it ever the same for both. Mostly, Downstream is much faster.
http://www.speedtest.net
Chapter 3
Networks
Internet
Cloud
Social-nomics

Figure 5.23

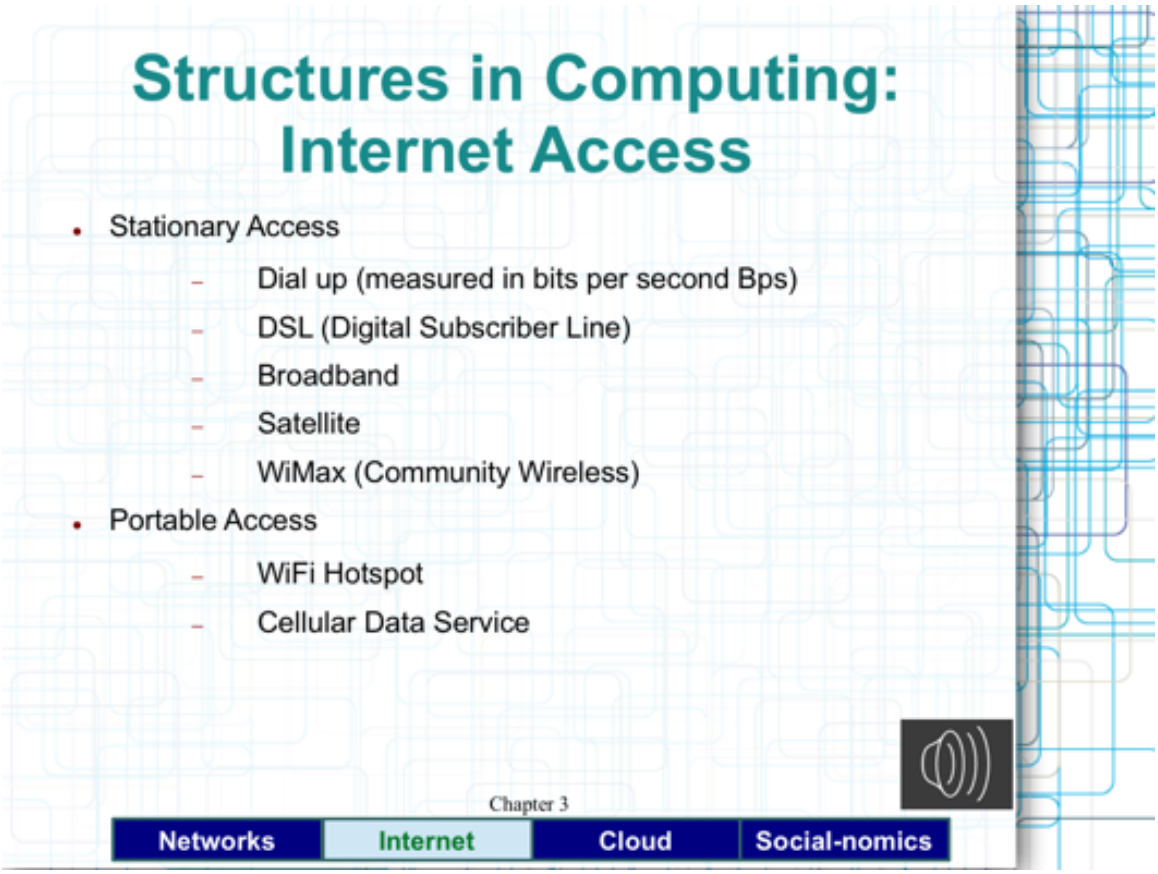

Structures in Computing:
Internet Access
Stationary Access
Dial up (measured in bits per second Bps)
DSL (Digital Subscriber Line)
Broadband
Satellite
WiMax (Community Wireless)
Portable Access
WiFi Hotspot
Cellular Data Service
Chapter 3
Networks
Internet
Cloud
Social-nomics

Figure 5.24

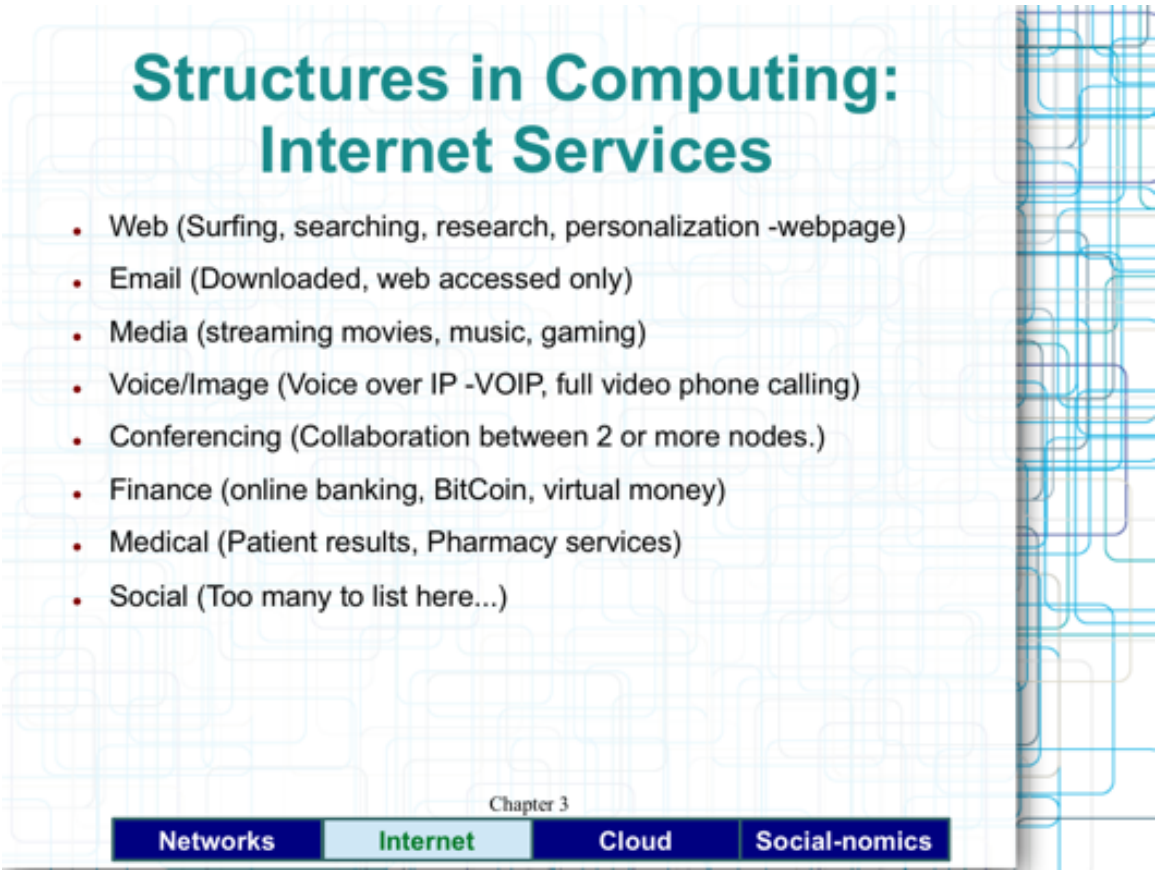

Structures in Computing:
Internet Services
Web (Surfing, searching, research, personalization -webpage)
Email (Downloaded, web accessed only)
Media (streaming movies, music, gaming)
Voice/Image (Voice over IP -VOIP, full video phone calling)
Conferencing (Collaboration between 2 or more nodes.)
Finance (online banking, BitCoin, virtual money)
Medical (Patient results, Pharmacy services)
Social (Too many to list here...)
Chapter 3
Networks
Internet
Cloud
Social-nomics

Figure 5.25

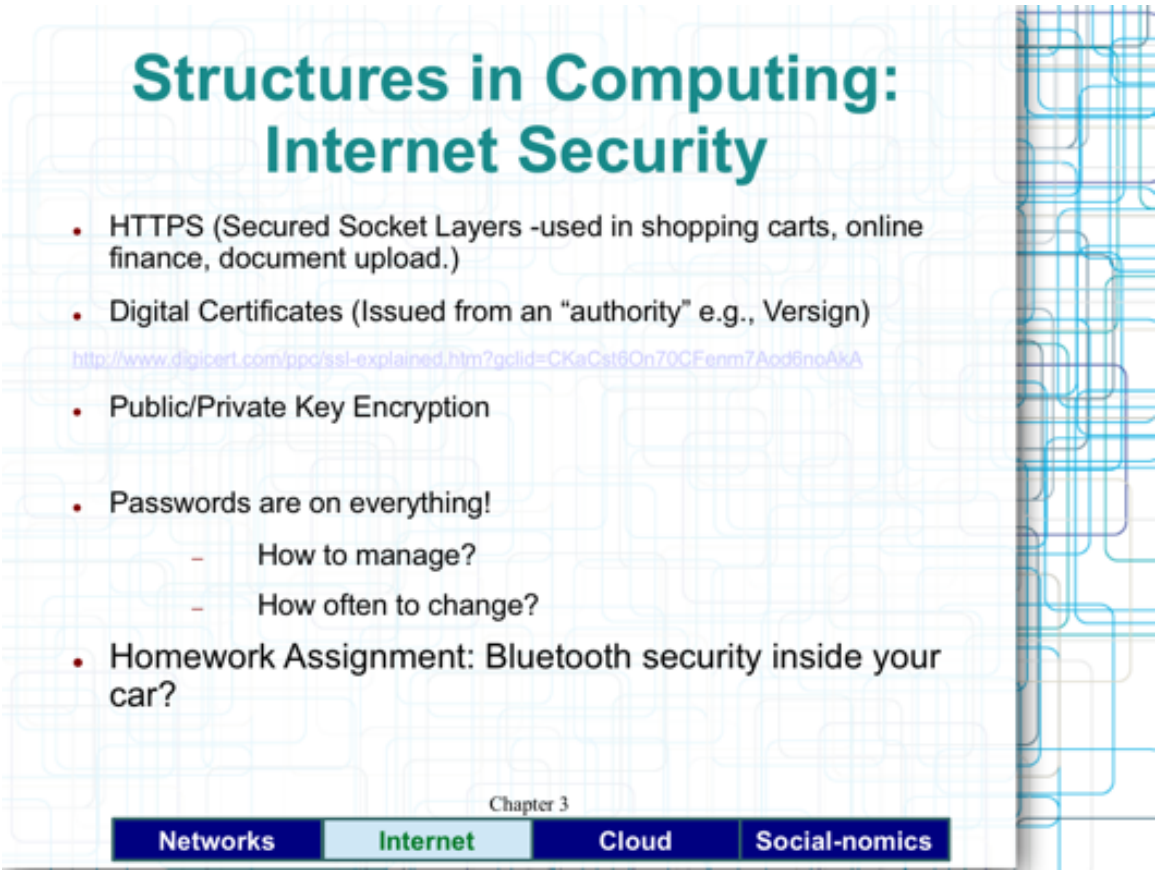

Structures in Computing:
Internet Security
HTTPS (Secured Socket Layers -used in shopping carts, online finance, document upload.)
Digital Certificates (Issued from an "authority" e.g., Versign)
http://www.digicert.com/ppc/ssl-explained.htm?gclid=CKaCst6On70CFenm7Aod6noAkA
Public/Private Key Encryption
Passwords are on everything!
How to manage?
How often to change?
Homework Assignment: Bluetooth security inside your car?
Chapter 3
Networks
Internet
Cloud
Social-nomics

Figure 5.26

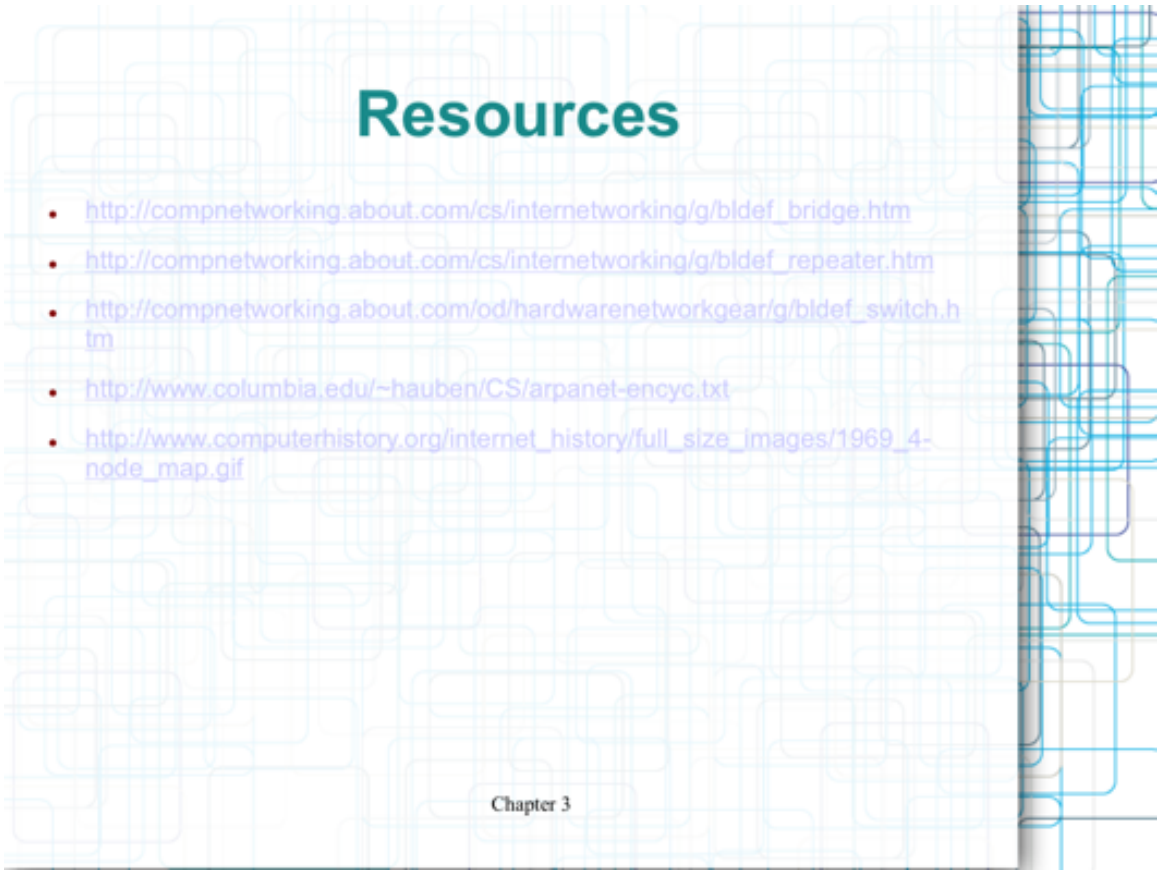

Resources
http://compnetworking.about.com/cs/internetworking/g/bldef_bridge.htm
http://compnetworking.about.com/cs/internetworking/g/bldef_repeater.htm
http://compnetworking.about.com/od/hardwarenetworkgear/g/bldef_switch.htm
http://www.columbia.edu/~hauben/CS/arpanet-encyc.txt
http://www.computerhistory.org/internet_history/full_size_images/1969_4-node_map.gif
Chapter 3

Figure 5.27

Chapter 6

Chapter3.2

6.1 Chapter-3-2[1]

6.1.1 CSC1010 – Introduction To Computing

6.1.1.1 Chapter 3-2

6.1.1.2 Structures in Computing.

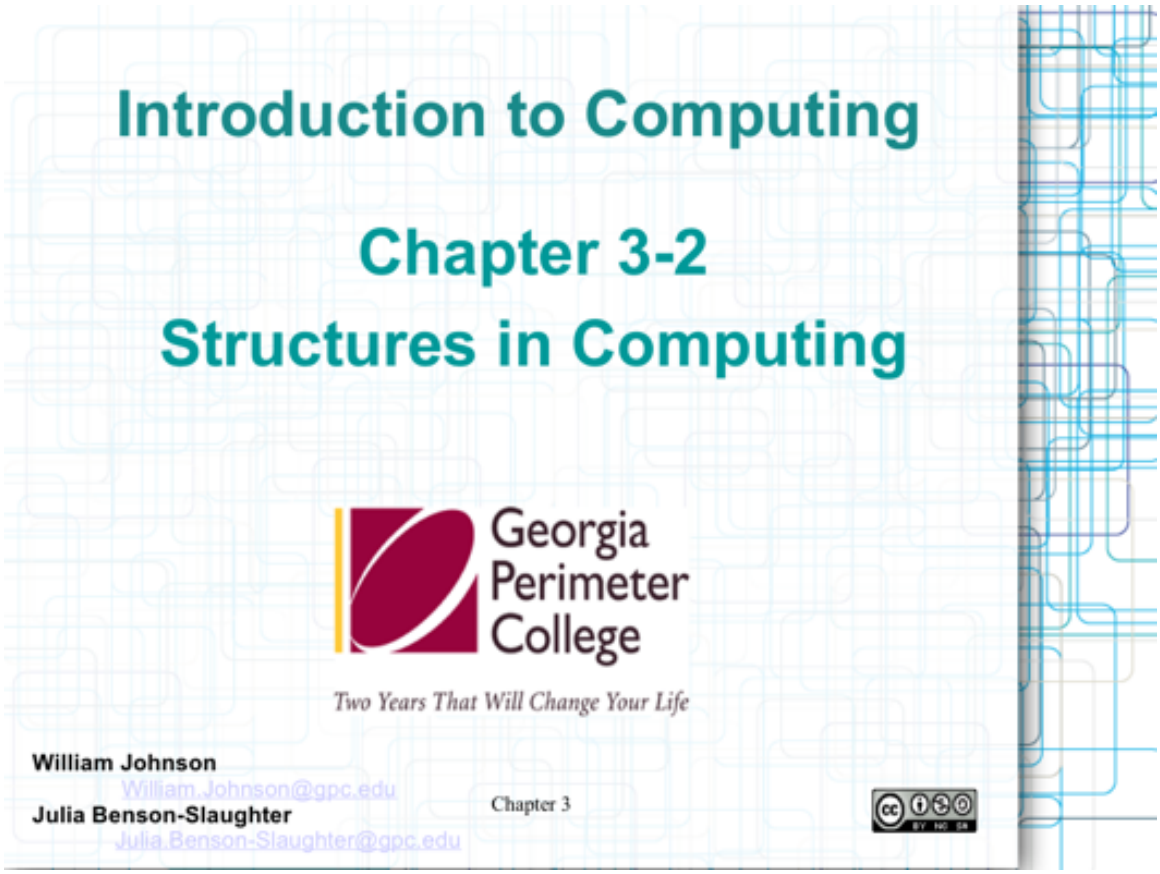


Figure 6.1
Available for free at Connexions <http://cnx.org/content/col11798/1.7>

[1] This content is available online at <http://cnx.org/content/m61604/1.3/>.

This chapter covers computer networks. The various sizes and configurations are examined and we explore where they are used. Next, we discuss the Internet and its various acpects. The basics of the Internet, how it move information, and how it has changed our everyday life.

Then we discuss the Cloud. This topic reveals how thte Cloud is structured, what factors are related to using it, and future possibilities. Lastly, we explore the new world of Socialnomics in computing.

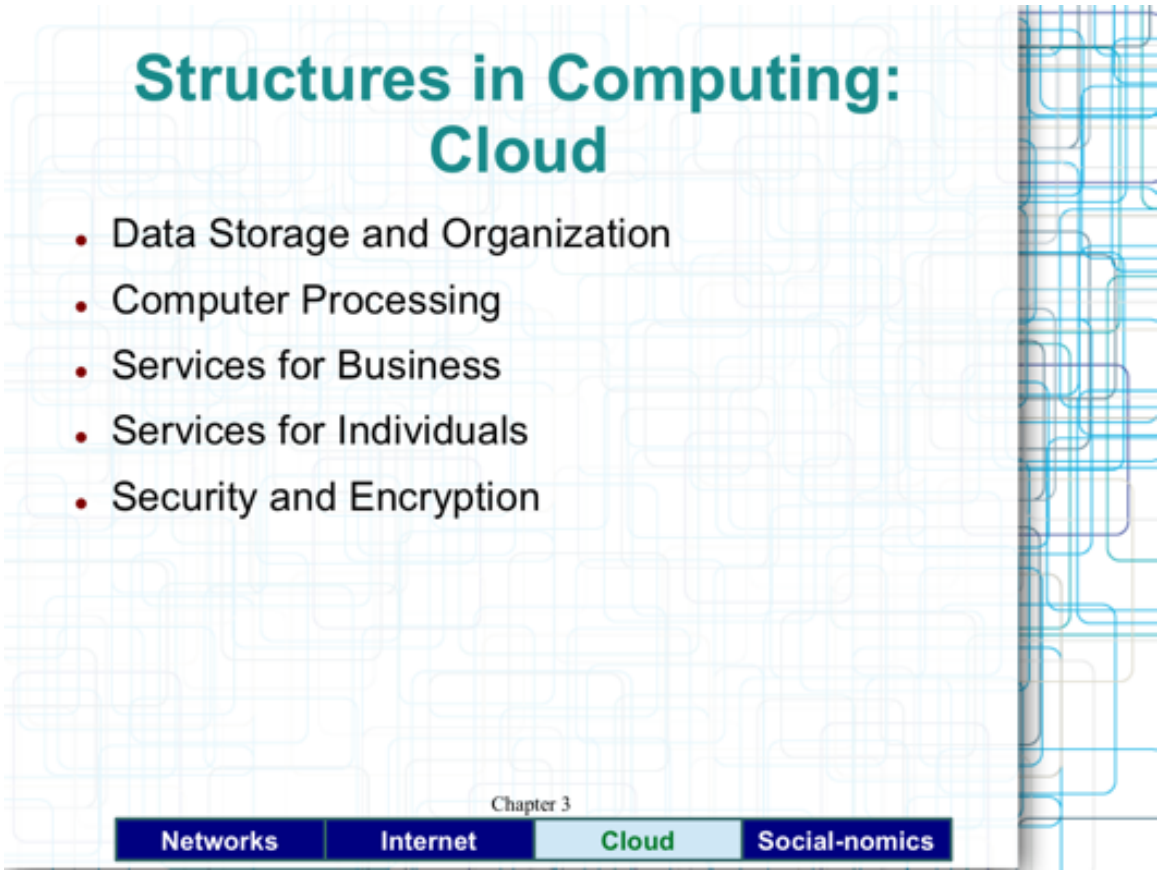


Figure 6.2

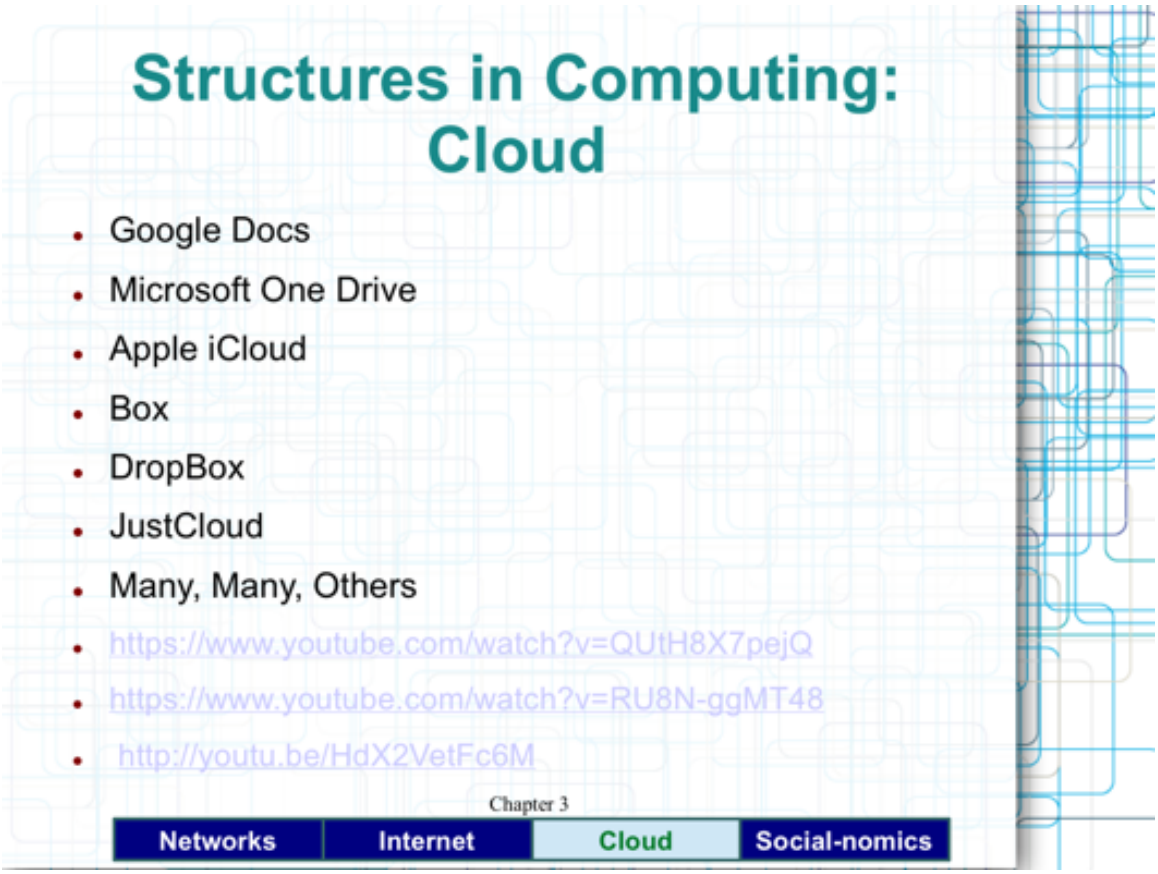

Structures in Computing:
Cloud
Google Docs
Microsoft One Drive
Apple iCloud
Box
DropBox
JustCloud
Many, Many, Others
https://www.youtube.com/watch?v=QUtH8X7pejQ
https://www.youtube.com/watch?v=RU8N-ggMT48
http://youtu.be/HdX2VetFc6M
Chapter 3
Networks
Internet
Cloud
Social-nomics

Figure 6.3

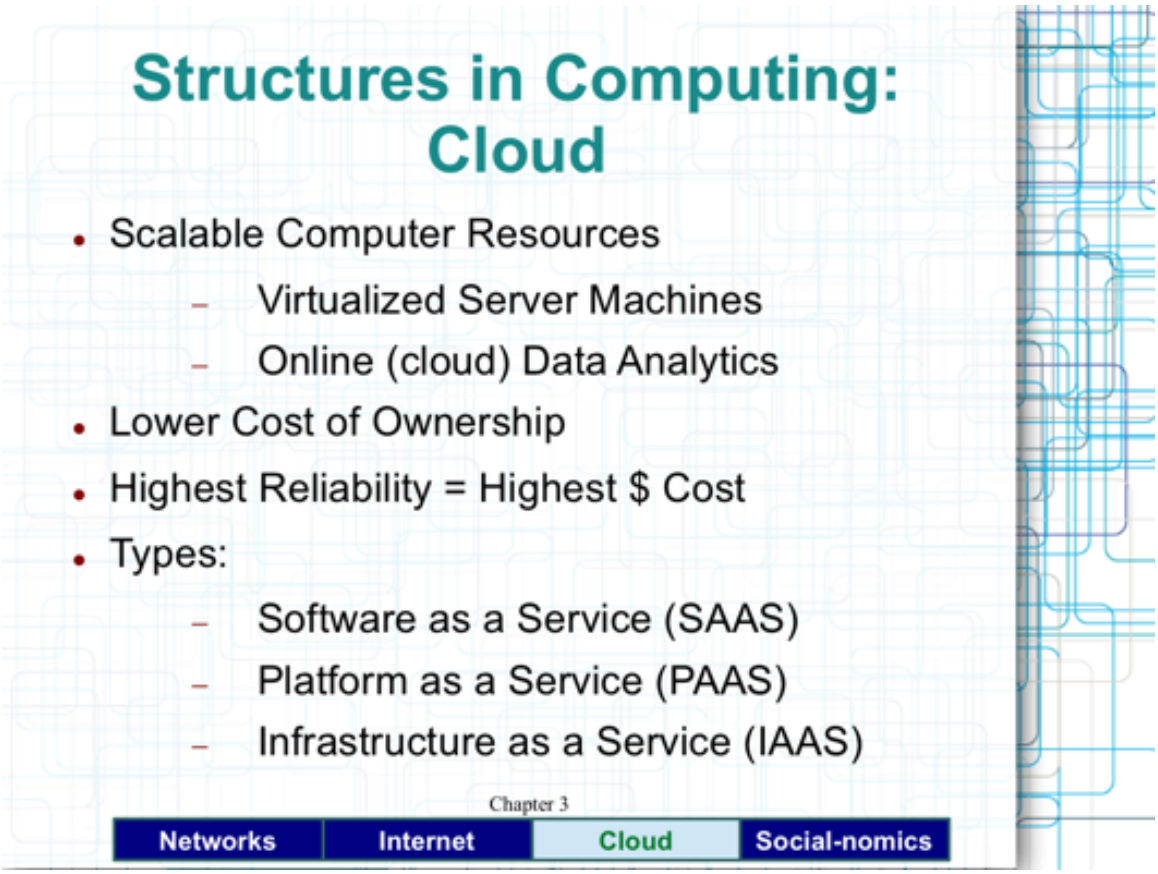
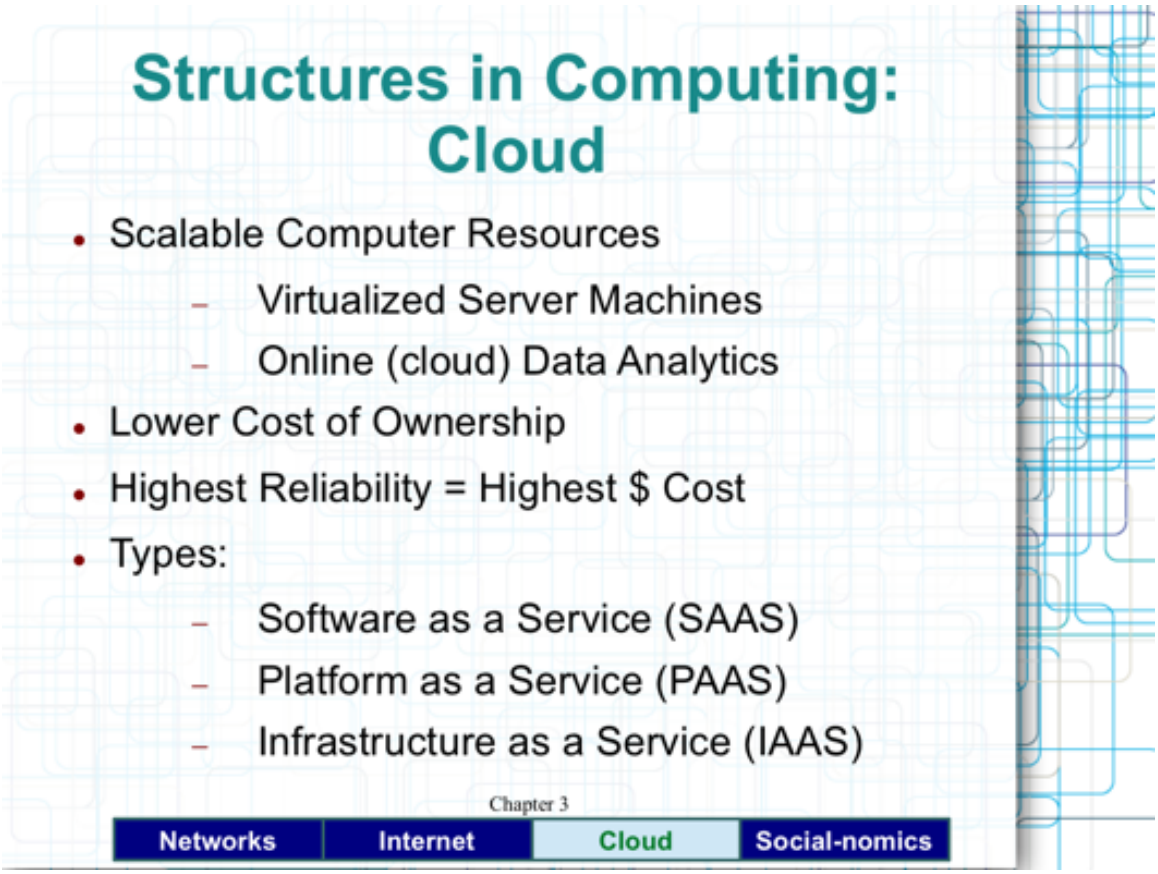

Structures in Computing: Cloud
Scalable Computer Resources
Virtualized Server Machines
Online (cloud) Data Analytics
Lower Cost of Ownership
Highest Reliability = Highest $ Cost
Types:
Software as a Service (SAAS)
Platform as a Service (PAAS)
Infrastructure as a Service (IAAS)
Chapter 3
Networks
Internet
Cloud
Social-nomics

Figure 6.4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Scalable Computer Resources
Virtualized Server Machines
Online (cloud) Data Analytics
Lower Cost of Ownership
Highest Reliability = Highest $ Cost
Types:
Software as a Service (SAAS)
Platform as a Service (PAAS)
Infrastructure as a Service (IAAS)
Chapter 3
Networks
Internet
Cloud
Social-nomics

Figure 6.5

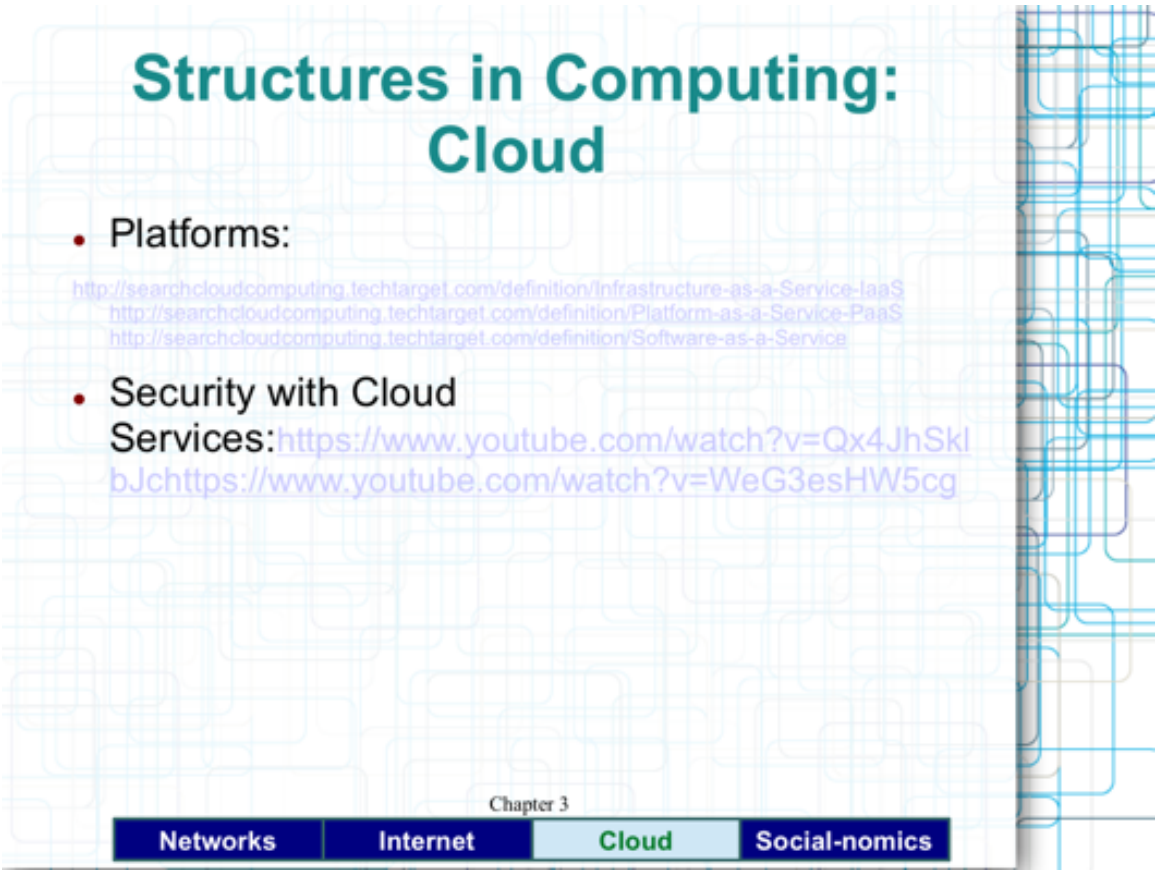

Structures in Computing: Cloud
Platforms:
http://searchcloudcomputing.techtarget.com/definition/Infrastructure-as-a-Service-IaaS
http://searchcloudcomputing.techtarget.com/definition/Platform-as-a-Service-PaaS
http://searchcloudcomputing.techtarget.com/definition/Software-as-a-Service
Security with Cloud Services:https://www.youtube.com/watch?v=Qx4JhSkIbJchttps://www.youtube.com/watch?v=WeG3esHW5cg
Chapter 3
Networks
Internet
Cloud
Social-nomics

Figure 6.6

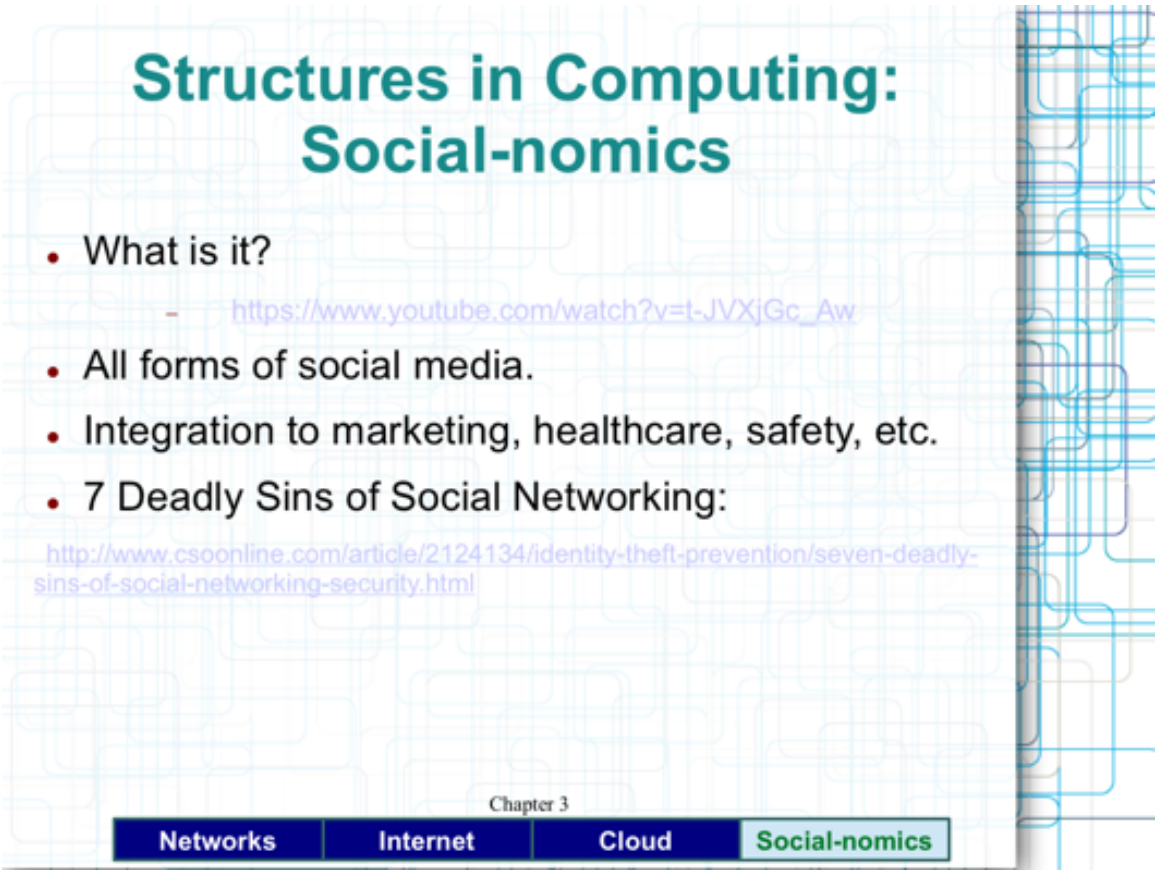

Structures in Computing:
Social-nomics
What is it?
https://www.youtube.com/watch?v=t-JVXjGc_Aw
All forms of social media.
Integration to marketing, healthcare, safety, etc.
7 Deadly Sins of Social Networking:
http://www.csoonline.com/article/2124134/identity-theft-prevention/seven-deadly-sins-of-social-networking-security.html
Chapter 3
Networks
Internet
Cloud
Social-nomics

Figure 6.7

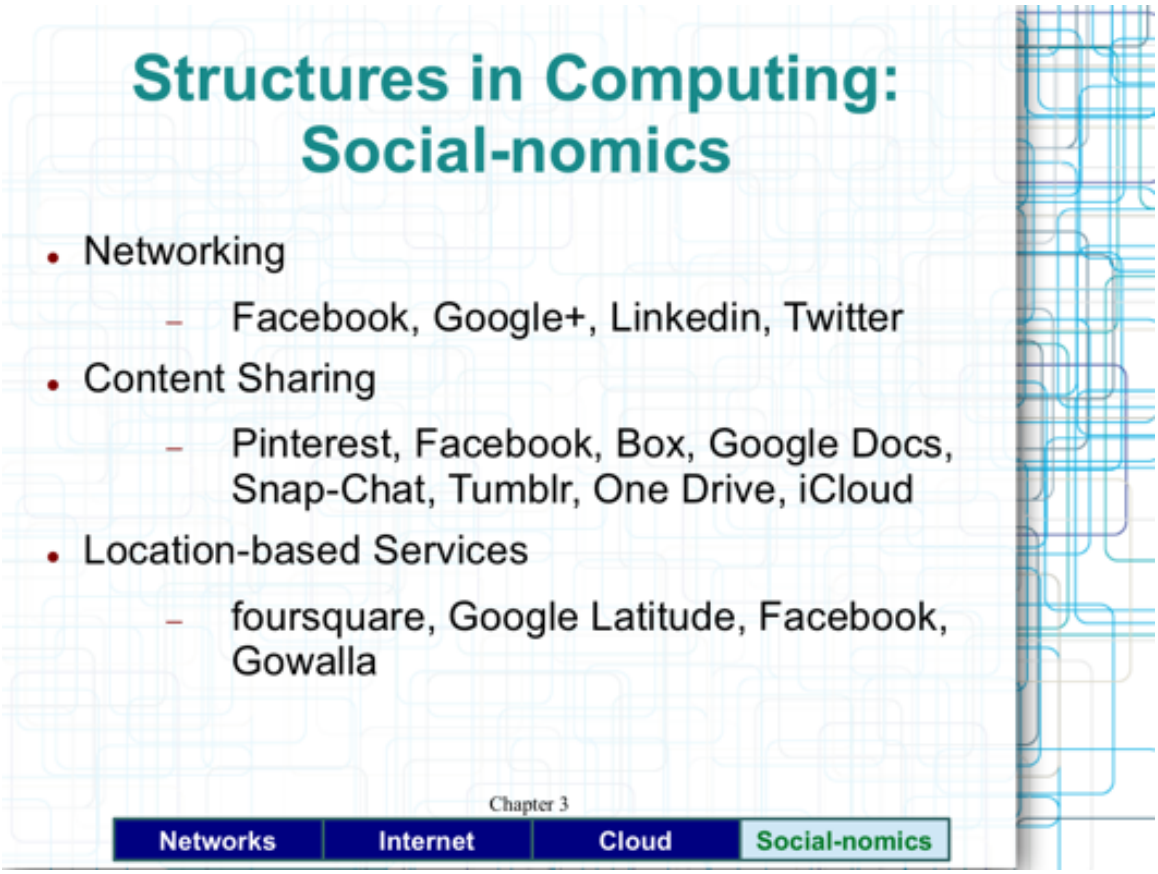

Structures in Computing:
Social-nomics
Networking
Facebook, Google+, Linkedin, Twitter
Content Sharing
Pinterest, Facebook, Box, Google Docs, Snap-Chat, Tumblr, One Drive, iCloud
Location-based Services
foursquare, Google Latitude, Facebook, Gowalla
Chapter 3
Networks
Internet
Cloud
Social-nomics

Figure 6.8

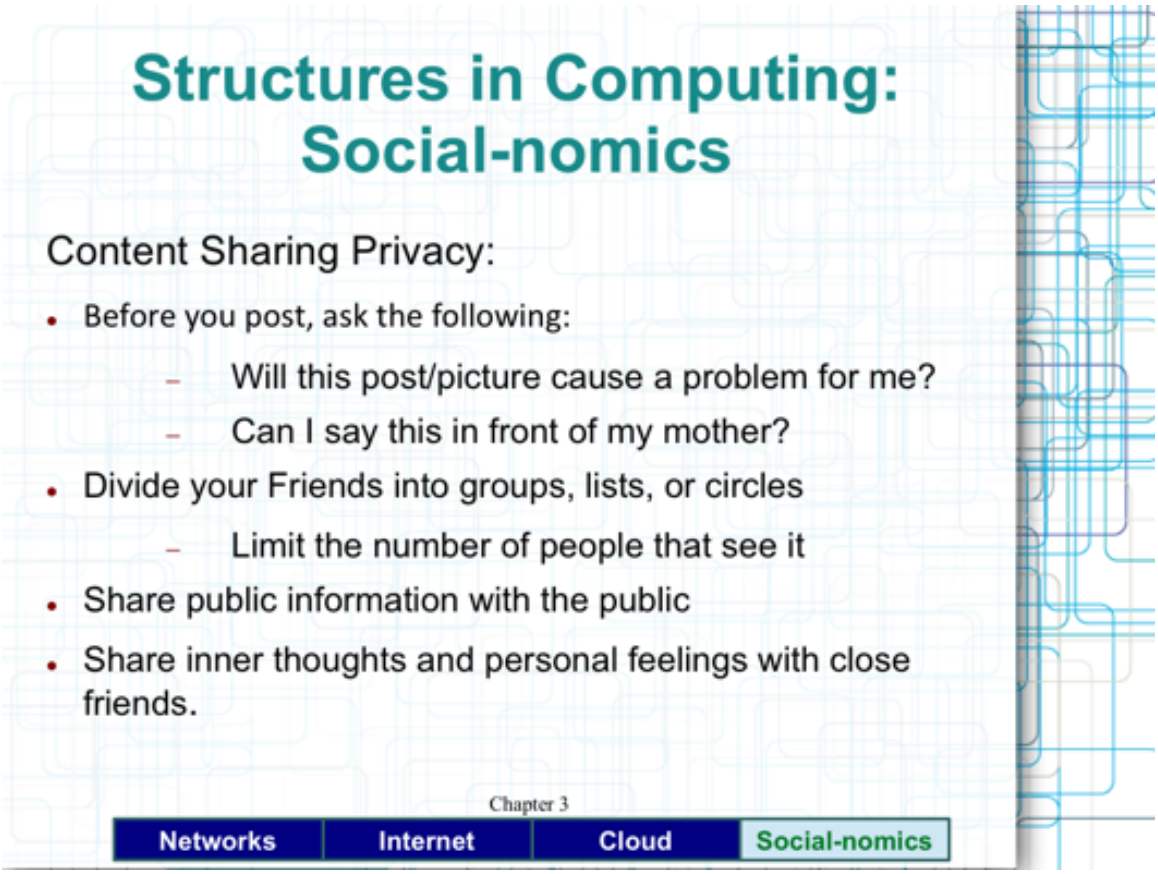

Structures in Computing:
Social-nomics
Content Sharing Privacy:
Before you post, ask the following:
Will this post/picture cause a problem for me?
Can I say this in front of my mother?
Divide your Friends into groups, lists, or circles
Limit the number of people that see it
Share public information with the public
Share inner thoughts and personal feelings with close friends.
Chapter 3
Networks
Internet
Cloud
Social-nomics

Figure 6.9

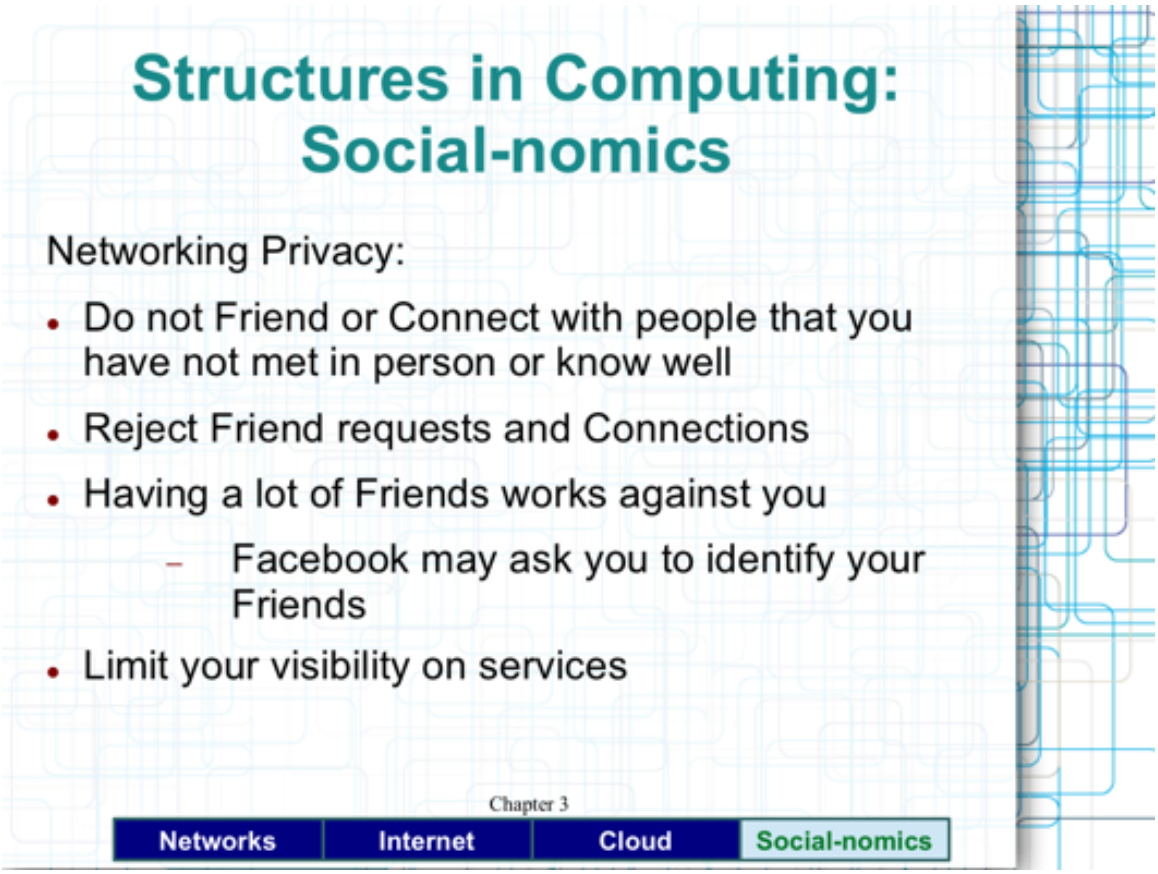

Structures in Computing:
Social-nomics
Networking Privacy:
Do not Friend or Connect with people that you have not met in person or know well
Reject Friend requests and Connections
Having a lot of Friends works against you
Facebook may ask you to identify your Friends
Limit your visibility on services
Chapter 3
Networks
Internet
Cloud
Social-nomics

Figure 6.10

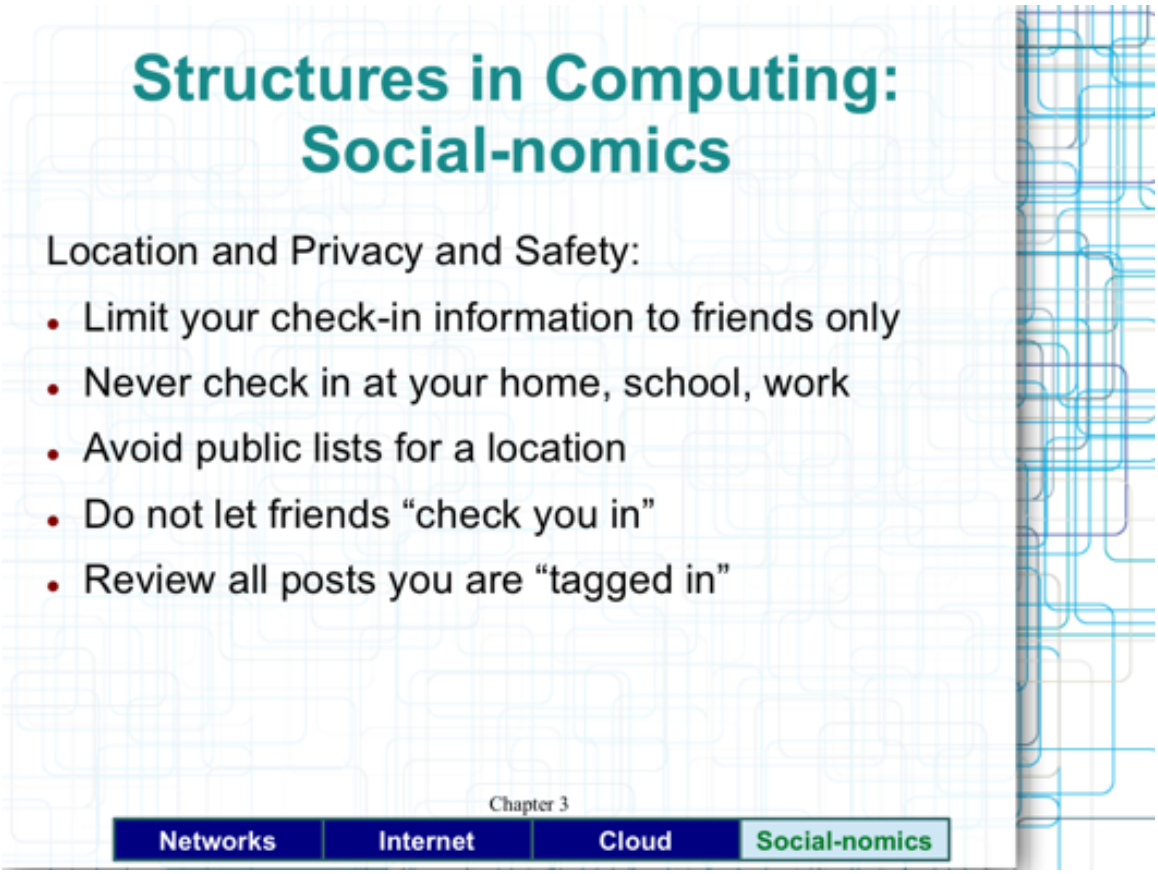

Structures in Computing:
Social-nomics
Location and Privacy and Safety:
Limit your check-in information to friends only
Never check in at your home, school, work
Avoid public lists for a location
Do not let friends "check you in"
Review all posts you are "tagged in"
Chapter 3
Networks
Internet
Cloud
Social-nomics

Figure 6.11

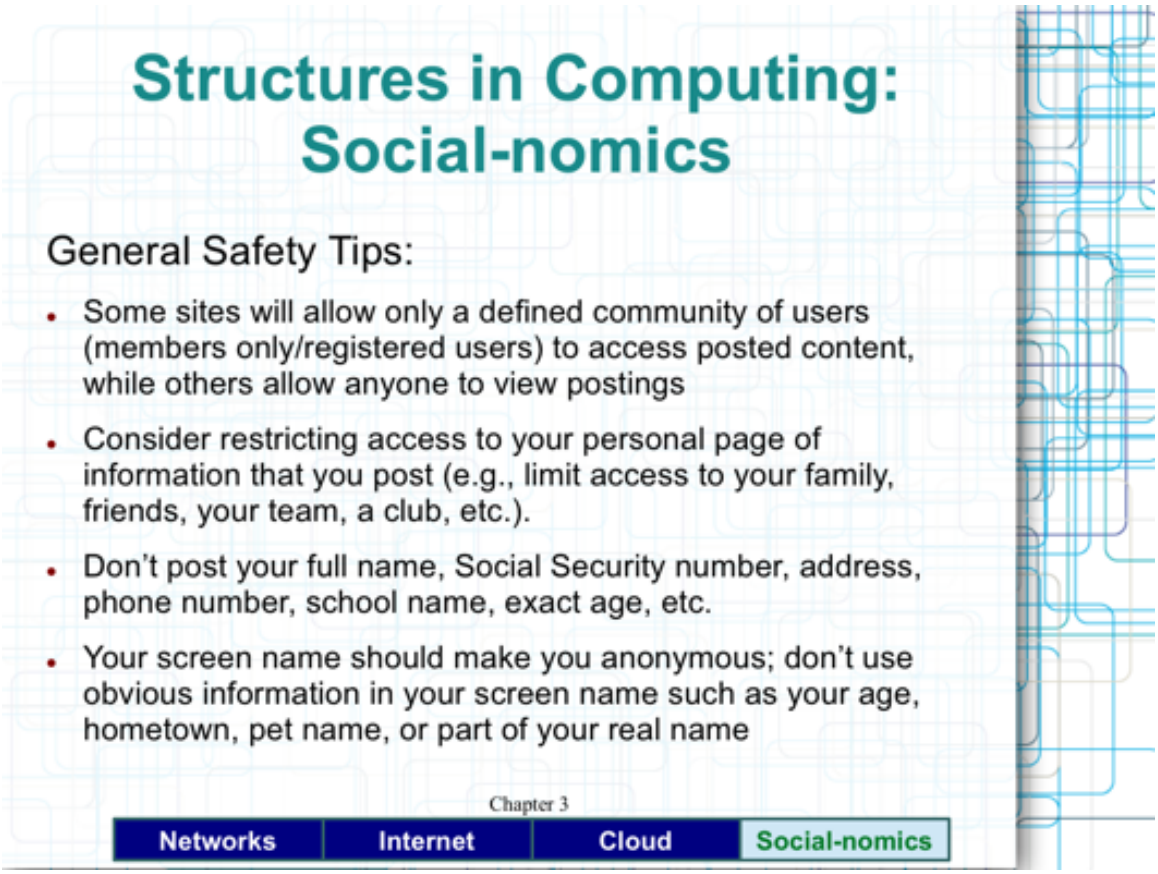
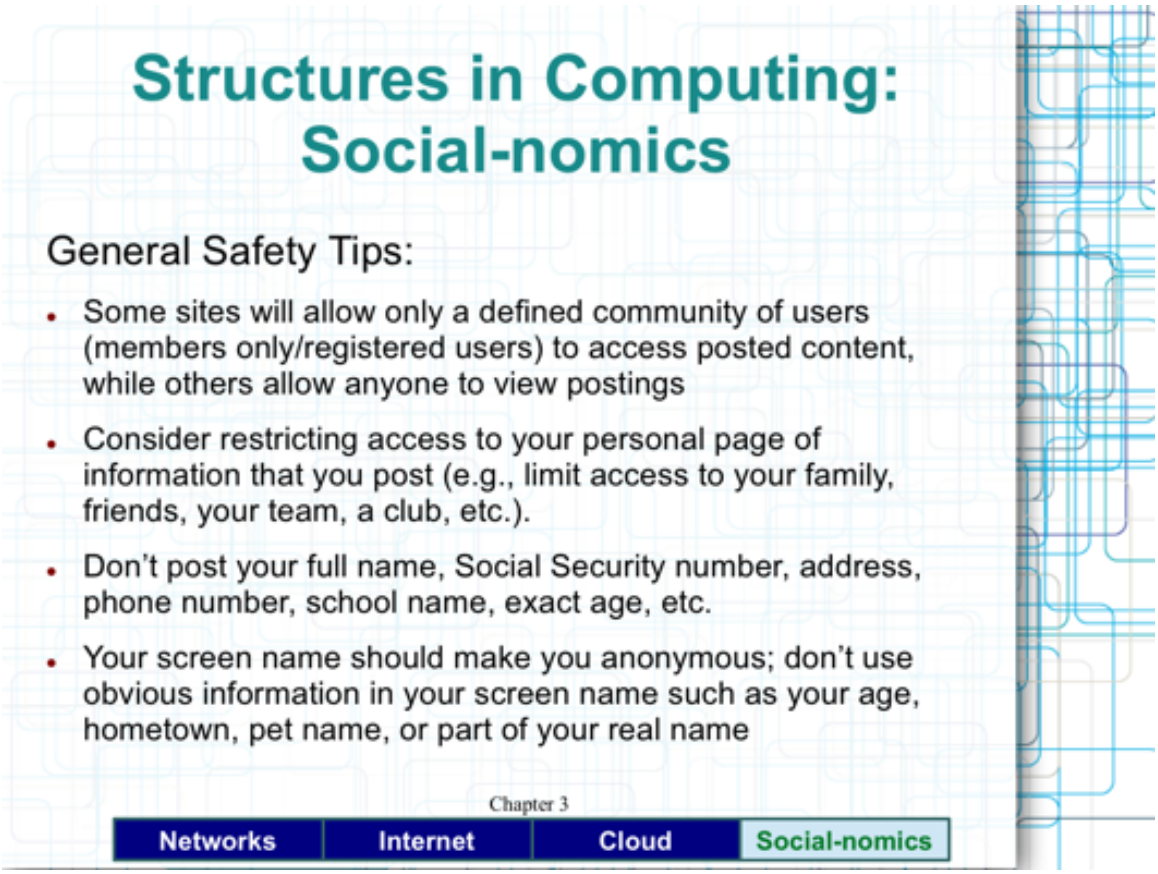

Structures in Computing:
Social-nomics
General Safety Tips:
Some sites will allow only a defined community of users (members only/registered users) to access posted content, while others allow anyone to view postings
Consider restricting access to your personal page of information that you post (e.g., limit access to your family, friends, your team, a club, etc.).
Don't post your full name, Social Security number, address, phone number, school name, exact age, etc.
Your screen name should make you anonymous; don't use obvious information in your screen name such as your age, hometown, pet name, or part of your real name
Chapter 3
Networks
Internet
Cloud
Social-nomics

Figure 6.12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Chapter 3
Networks
Internet
Cloud
Social-nomics

Figure 6.13


Resources
http://compnetworking.about.com/cs/internetworking/g/bldef_bridge.htm
http://compnetworking.about.com/cs/internetworking/g/bldef_repeater.htm
http://compnetworking.about.com/od/hardwarenetworkgear/g/bldef_switch.htm
http://www.columbia.edu/~hauben/CS/arpanet-encyc.txt
http://www.computerhistory.org/internet_history/full_size_images/1969_4-node_map.gif
Http://www.ncpc.org
Chapter 3

Figure 6.14

Chapter 7

Chapter4

7.1 CSC1010-Chapter-4[1]

7.1.1 CSC1010 – Introduction to Computing

7.1.1.1 Security, Privacy, and Ethics in Computing

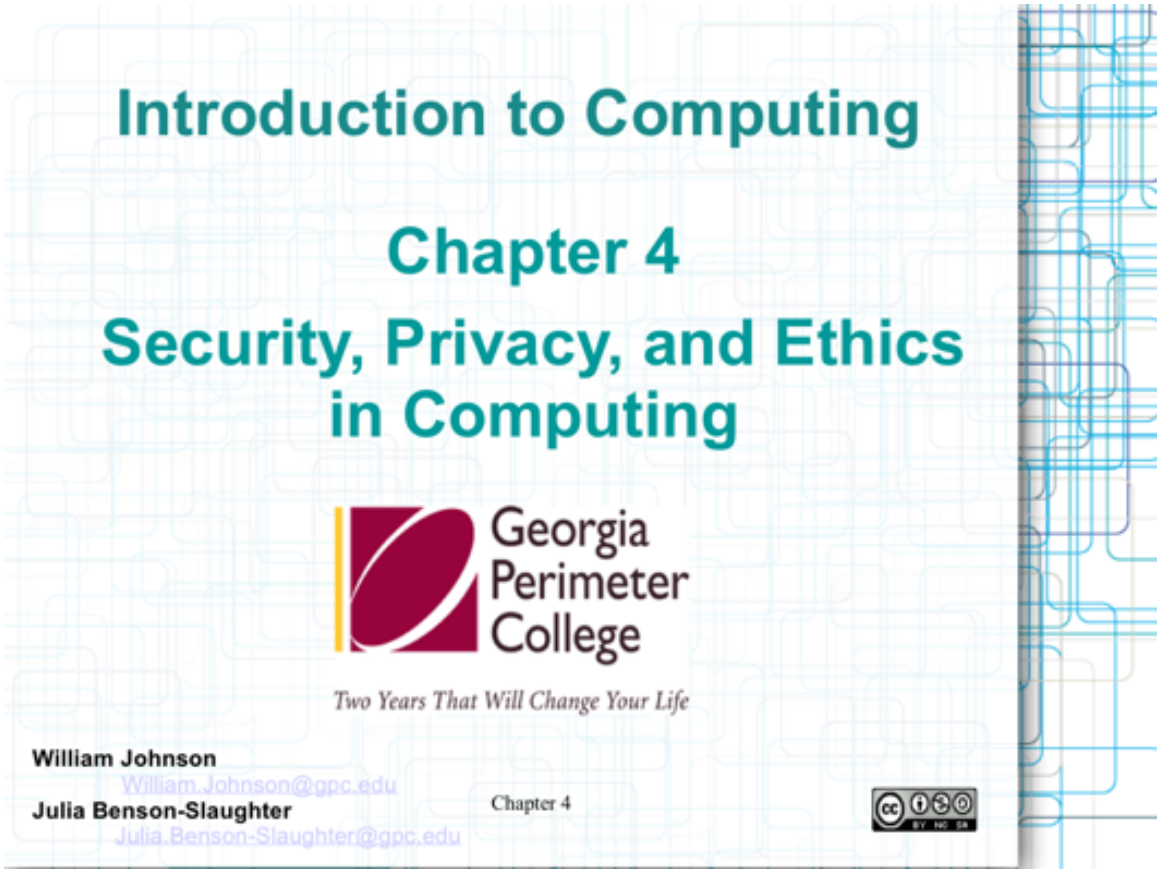

Figure 7.1

[1] This content is available online at <http://cnx.org/content/m61606/1.1/>.

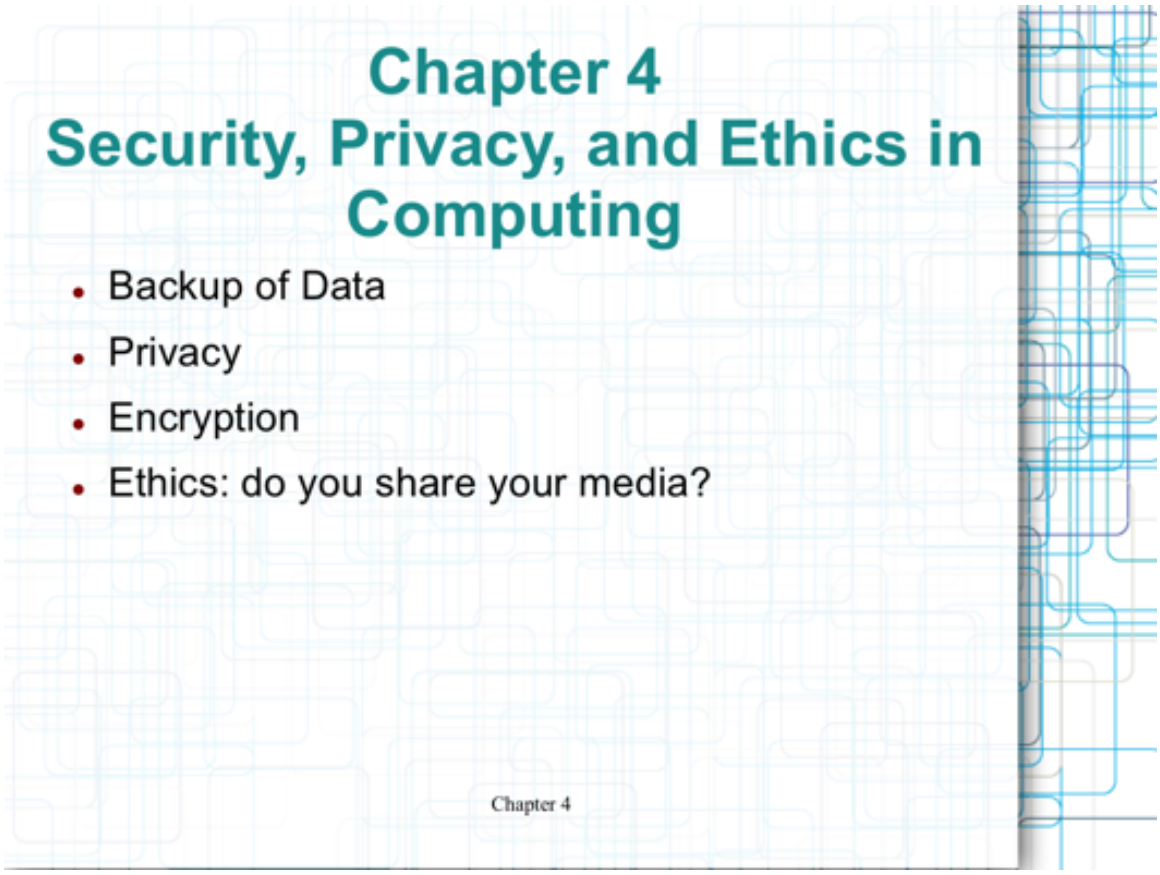
Chapter 4
Security, Privacy, and Ethics in Computing
Backup of Data
Privacy
Encryption
Ethics: do you share your media?
Chapter 4

Figure 7.2

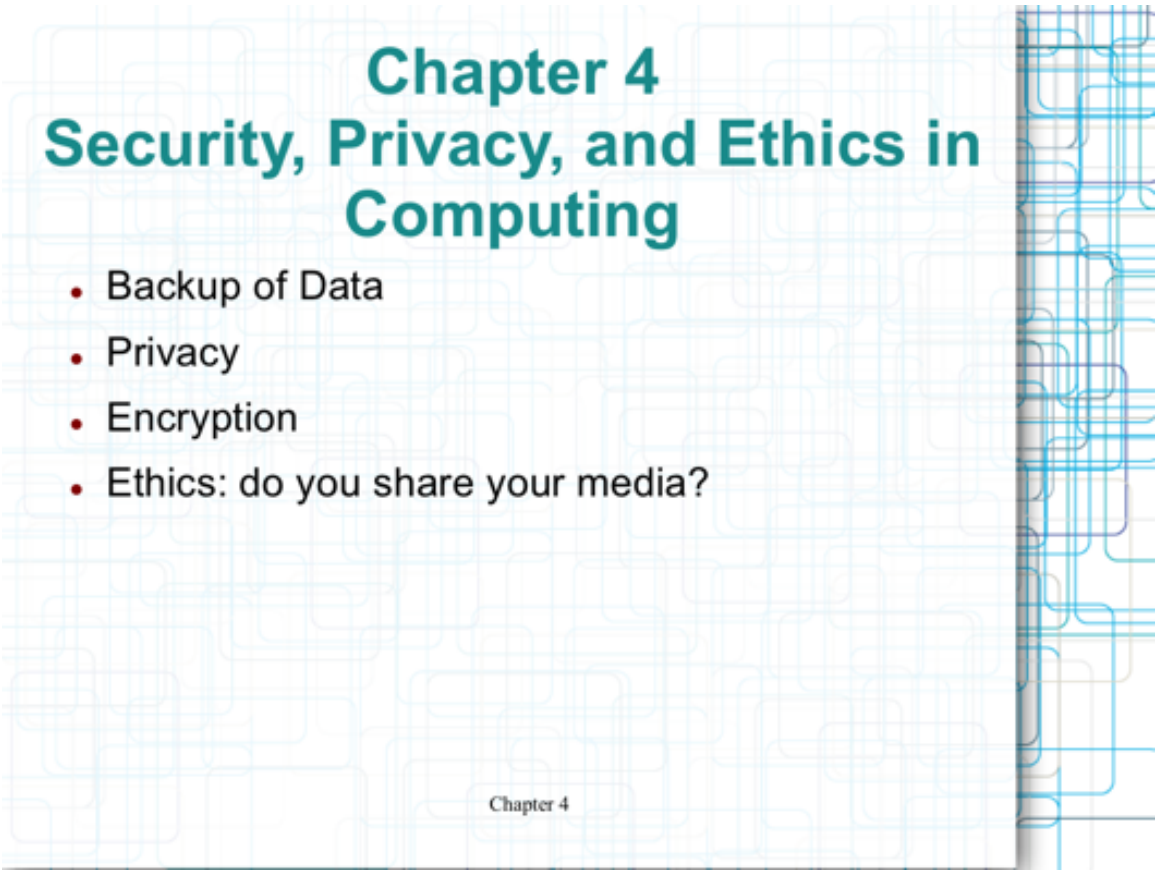
Chapter 4
Security, Privacy, and Ethics in Computing
Backup of Data
Privacy
Encryption
Ethics: do you share your media?
Chapter 4

Figure 7.3

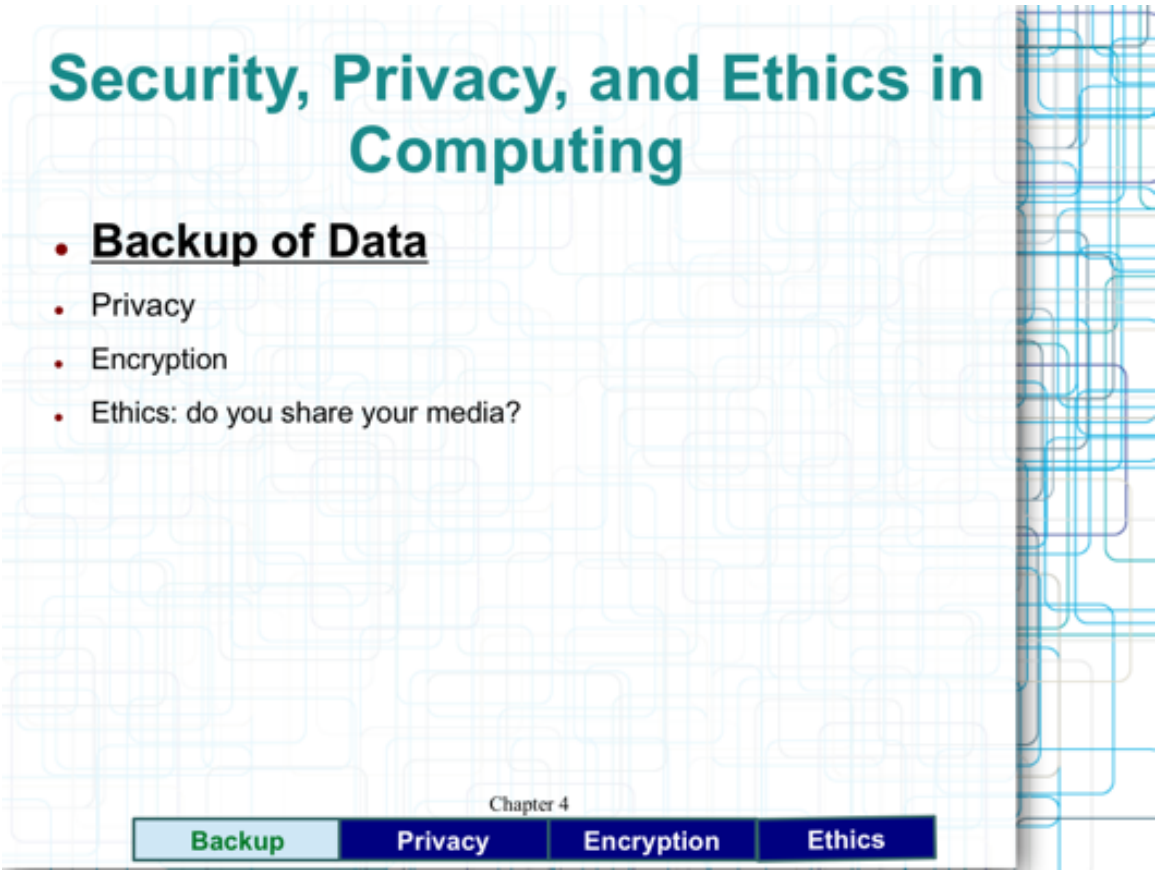
Security, Privacy, and Ethics in Computing
Backup of Data
Privacy
Encryption
Ethics: do you share your media?
Chapter 4
Backup
Privacy
Encryption
Ethics

Figure 7.4

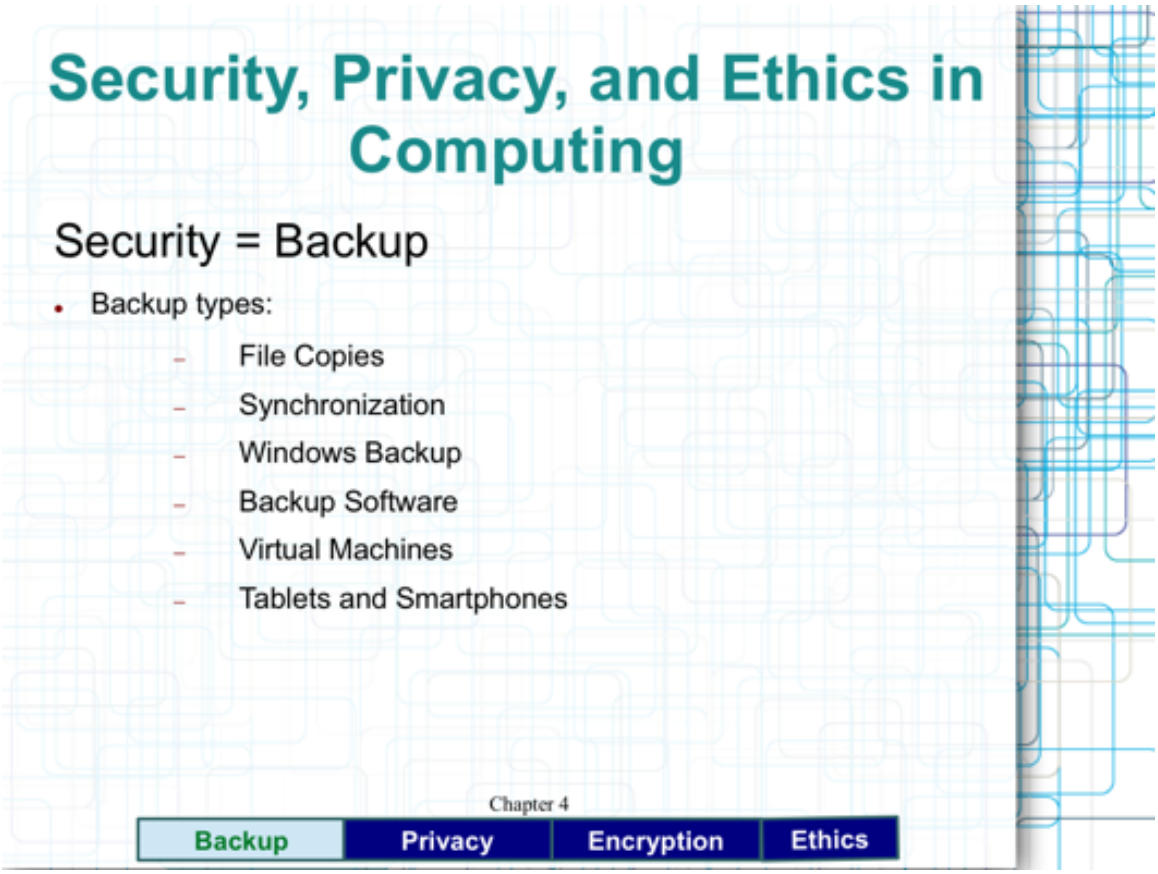
Security, Privacy, and Ethics in Computing
Security = Backup
Backup types:
File Copies
Synchronization
Windows Backup
Backup Software
Virtual Machines
Tablets and Smartphones
Chapter 4
Backup
Privacy
Encryption
Ethics

Figure 7.5

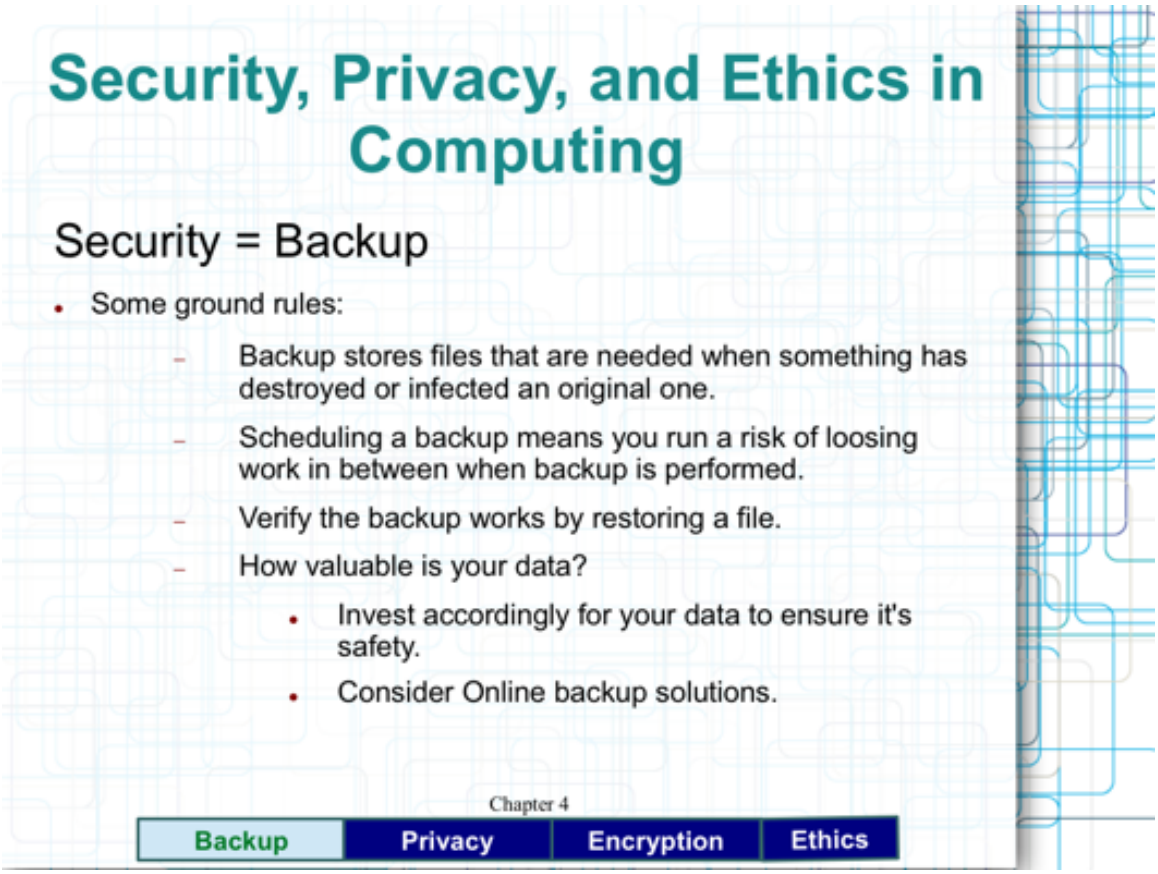
Security, Privacy, and Ethics in Computing
Security = Backup
Some ground rules:
Backup stores files that are needed when something has destroyed or infected an original one.
Scheduling a backup means you run a risk of loosing work in between when backup is performed.
Verify the backup works by restoring a file.
How valuable is your data?
Invest accordingly for your data to ensure it's safety.
Consider Online backup solutions.
Chapter 4
Backup
Privacy
Encryption
Ethics

Figure 7.6

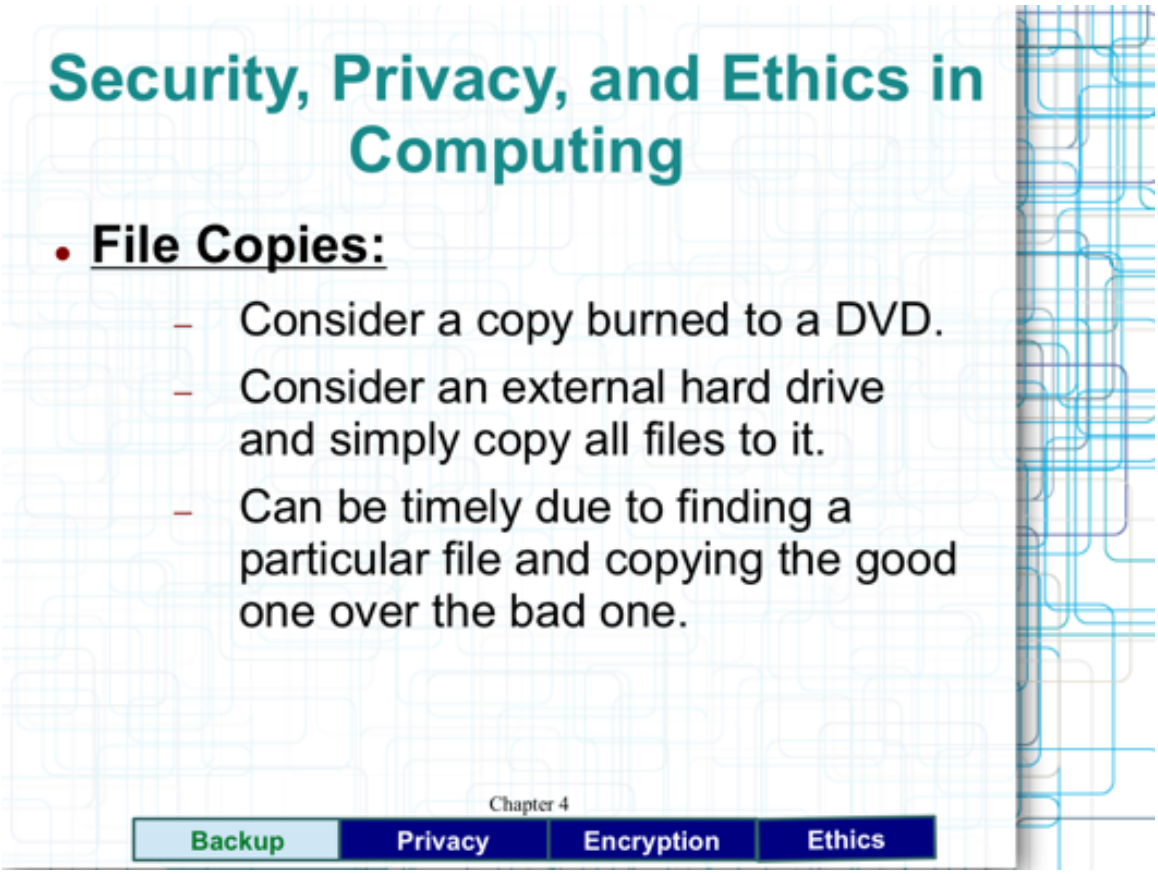
Security, Privacy, and Ethics in Computing
File Copies:
Consider a copy burned to a DVD.
Consider an external hard drive and simply copy all files to it.
Can be timely due to finding a particular file and copying the good one over the bad one.
Chapter 4
Backup
Privacy
Encryption
Ethics

Figure 7.7

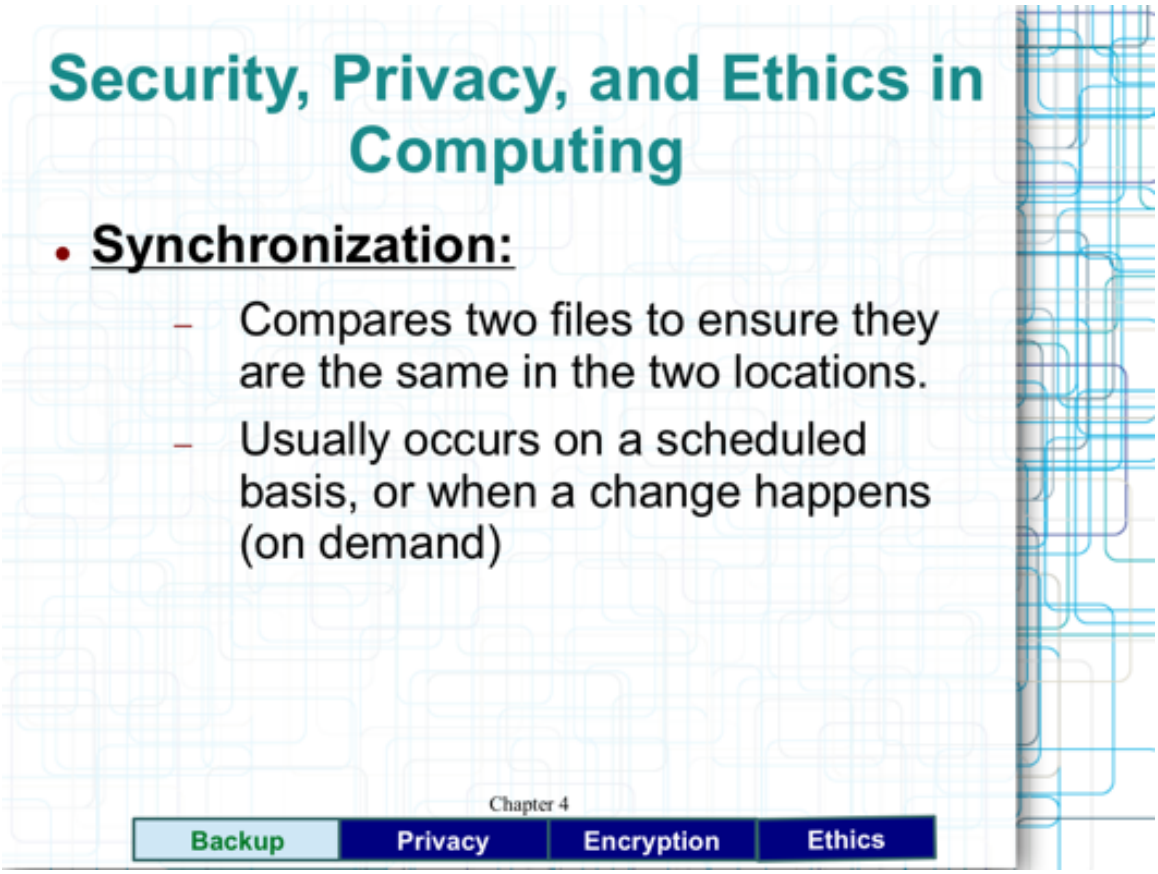
Security, Privacy, and Ethics in Computing
Synchronization:
Compares two files to ensure they are the same in the two locations.
Usually occurs on a scheduled basis, or when a change happens (on demand)
Chapter 4
Backup
Privacy
Encryption
Ethics

Figure 7.8

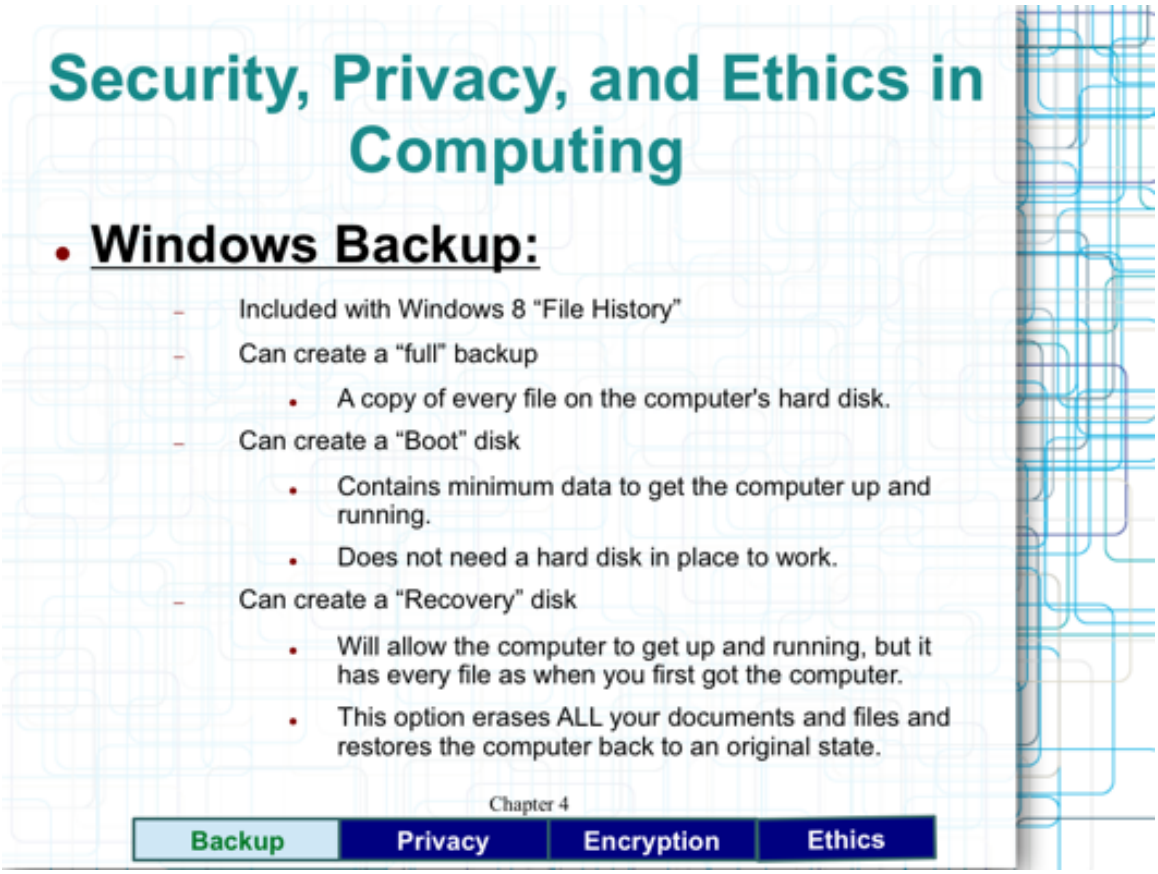
Security, Privacy, and Ethics in Computing
Windows Backup:
Included with Windows 8 "File History"
Can create a "full" backup
A copy of every file on the computer's hard disk.
Can create a "Boot" disk
Contains minimum data to get the computer up and running.
Does not need a hard disk in place to work.
Can create a "Recovery" disk
Will allow the computer to get up and running, but it has every file as when you first got the computer.
This option erases ALL your documents and files and restores the computer back to an original state.
Chapter 4
Backup
Privacy
Encryption
Ethics

Figure 7.9

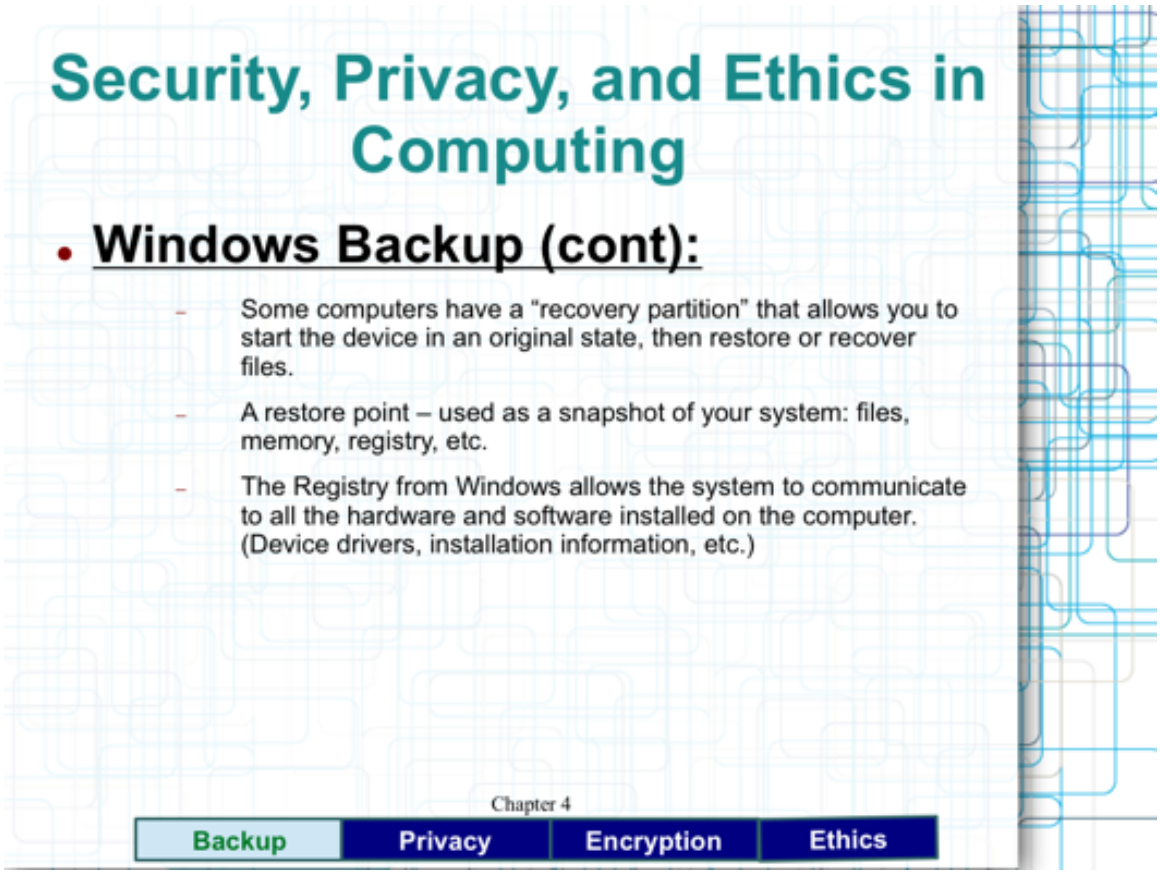
Security, Privacy, and Ethics in Computing
Windows Backup (cont):
Some computers have a "recovery partition" that allows you to start the device in an original state, then restore or recover files.
A restore point – used as a snapshot of your system: files, memory, registry, etc.
The Registry from Windows allows the system to communicate to all the hardware and software installed on the computer. (Device drivers, installation information, etc.)
Chapter 4
Backup
Privacy
Encryption
Ethics

Figure 7.10

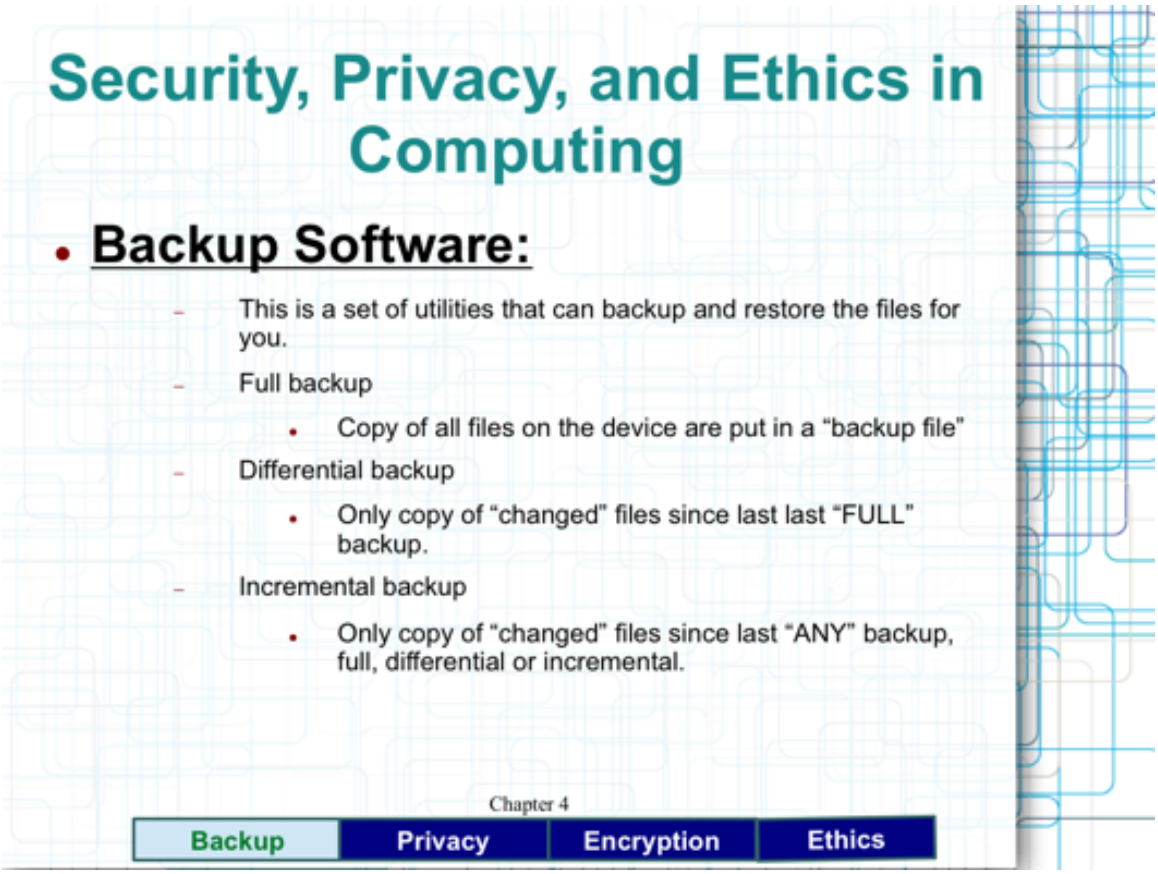
Security, Privacy, and Ethics in Computing
Backup Software:
This is a set of utilities that can backup and restore the files for you.
Full backup
Copy of all files on the device are put in a "backup file"
Differential backup
Only copy of "changed" files since last last "FULL" backup.
Incremental backup
Only copy of "changed" files since last "ANY" backup, full, differential or incremental.
Chapter 4
Backup
Privacy
Encryption
Ethics

Figure 7.11

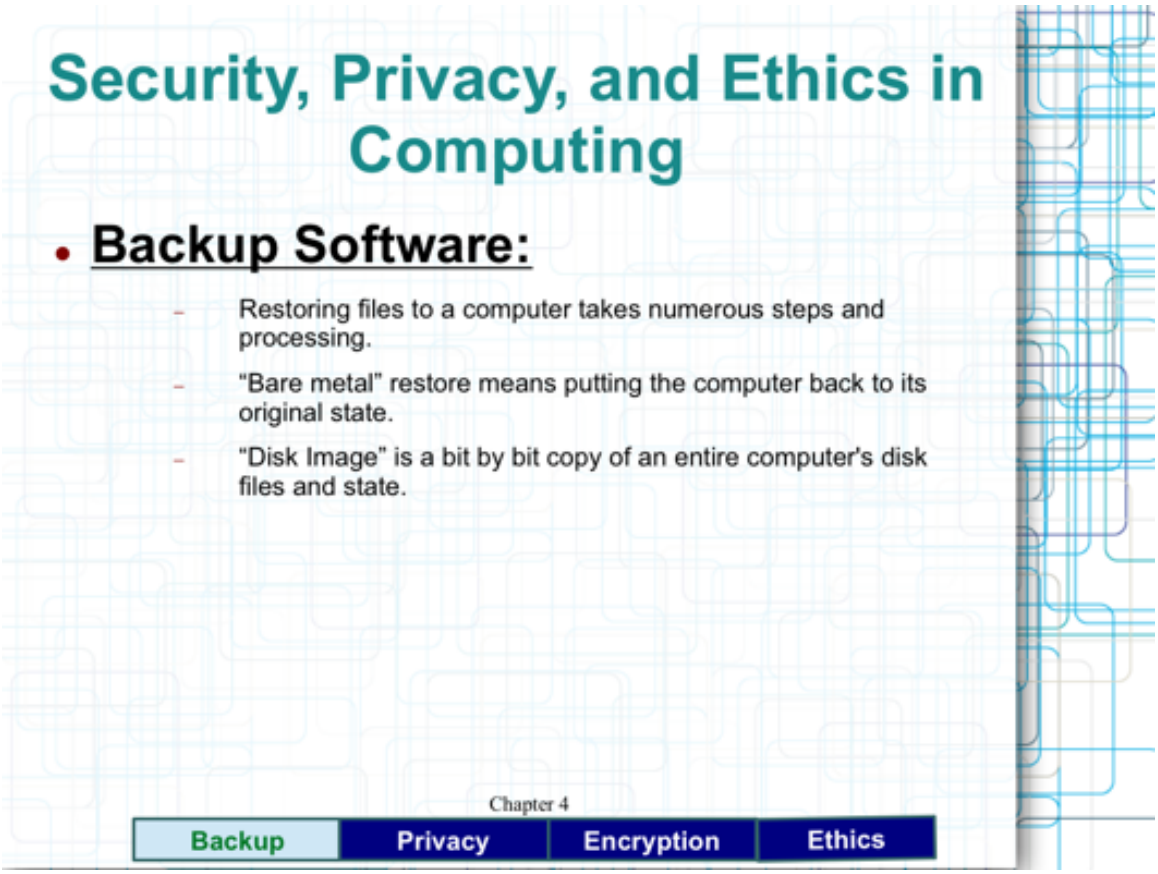
Security, Privacy, and Ethics in Computing
Backup Software:
Restoring files to a computer takes numerous steps and processing.
"Bare metal" restore means putting the computer back to its original state.
"Disk Image" is a bit by bit copy of an entire computer's disk files and state.
Chapter 4
Backup
Privacy
Encryption
Ethics

Figure 7.12

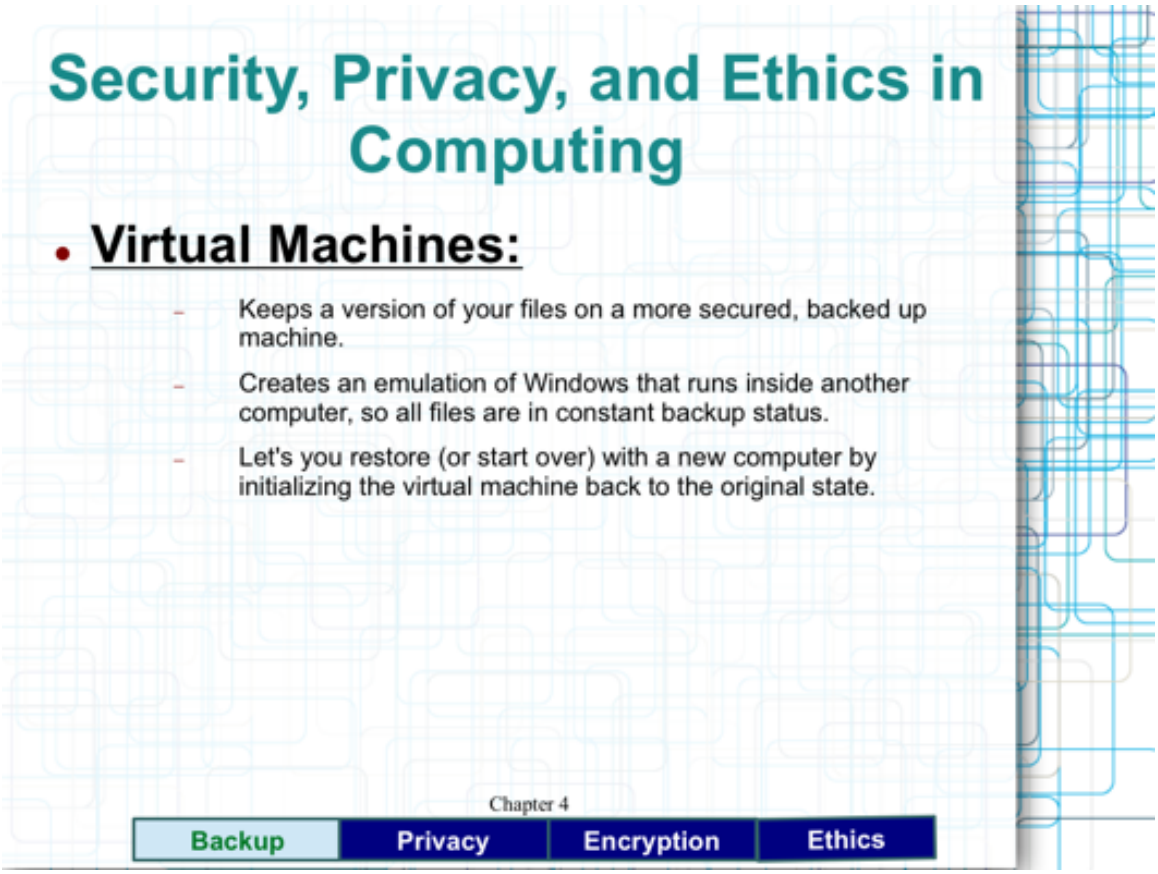
Security, Privacy, and Ethics in Computing
Virtual Machines:
Keeps a version of your files on a more secured, backed up machine.
Creates an emulation of Windows that runs inside another computer, so all files are in constant backup status.
Let's you restore (or start over) with a new computer by initializing the virtual machine back to the original state.
Chapter 4
Backup
Privacy
Encryption
Ethics

Figure 7.13

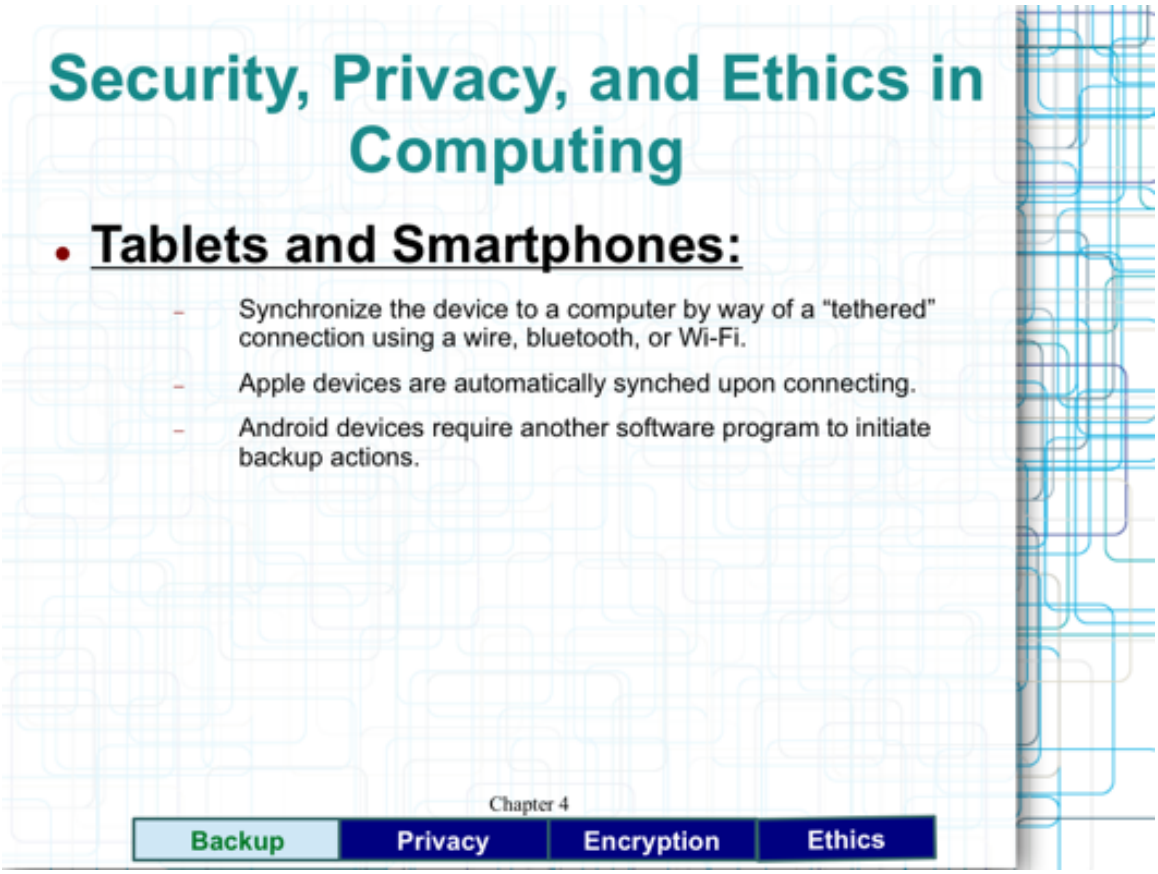
Security, Privacy, and Ethics in Computing
Tablets and Smartphones:
Synchronize the device to a computer by way of a "tethered" connection using a wire, bluetooth, or Wi-Fi.
Apple devices are automatically synched upon connecting.
Android devices require another software program to initiate backup actions.
Chapter 4
Backup
Privacy
Encryption
Ethics

Figure 7.14


Security, Privacy, and Ethics in Computing
Backup of Data
Privacy
Encryption
Ethics: do you share your media?
Chapter 4
Backup
Privacy
Encryption
Ethics

Figure 7.15

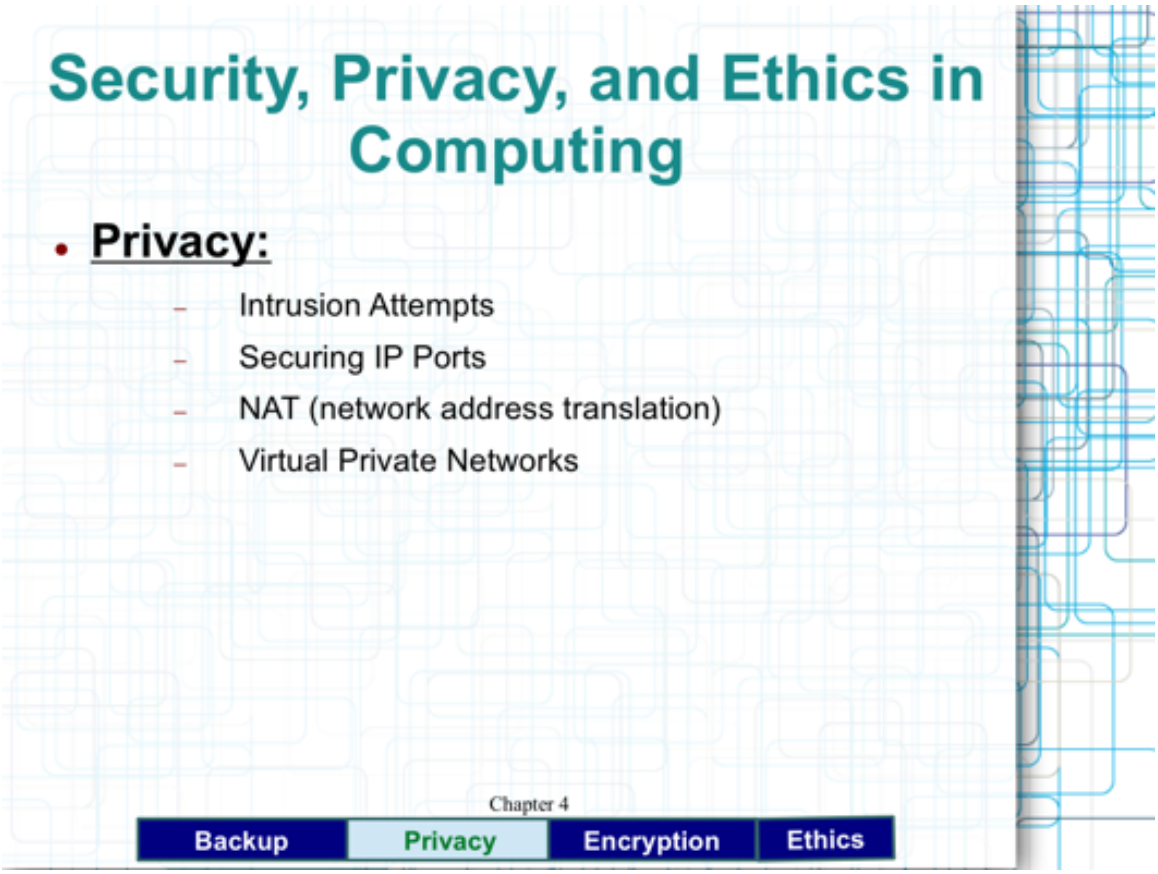
Security, Privacy, and Ethics in Computing
Privacy:
Intrusion Attempts
Securing IP Ports
NAT (network address translation)
Virtual Private Networks
Chapter 4
Backup
Privacy
Encryption
Ethics

Figure 7.16

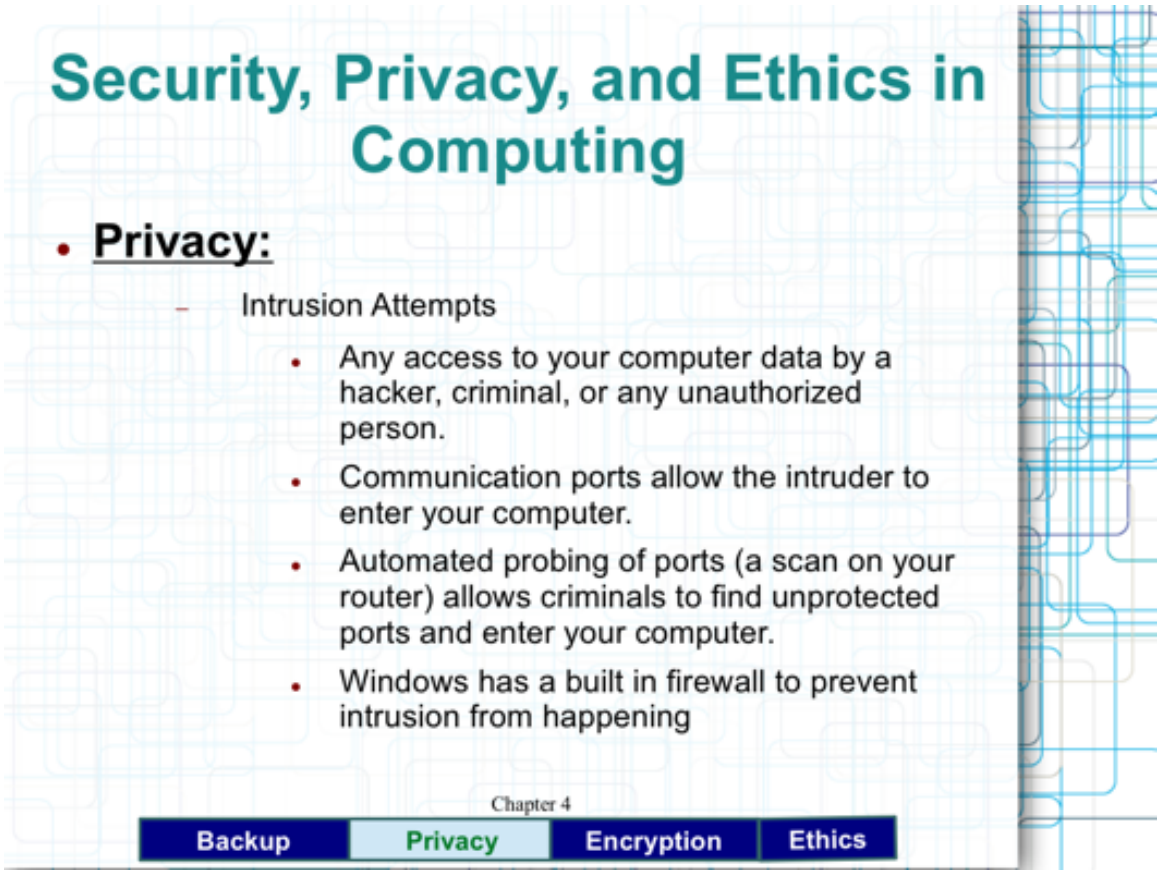
Security, Privacy, and Ethics in Computing
Privacy:
Intrusion Attempts
Any access to your computer data by a hacker, criminal, or any unauthorized person.
Communication ports allow the intruder to enter your computer.
Automated probing of ports (a scan on your router) allows criminals to find unprotected ports and enter your computer.
Windows has a built in firewall to prevent intrusion from happening
Chapter 4
Backup
Privacy
Encryption
Ethics

Figure 7.17

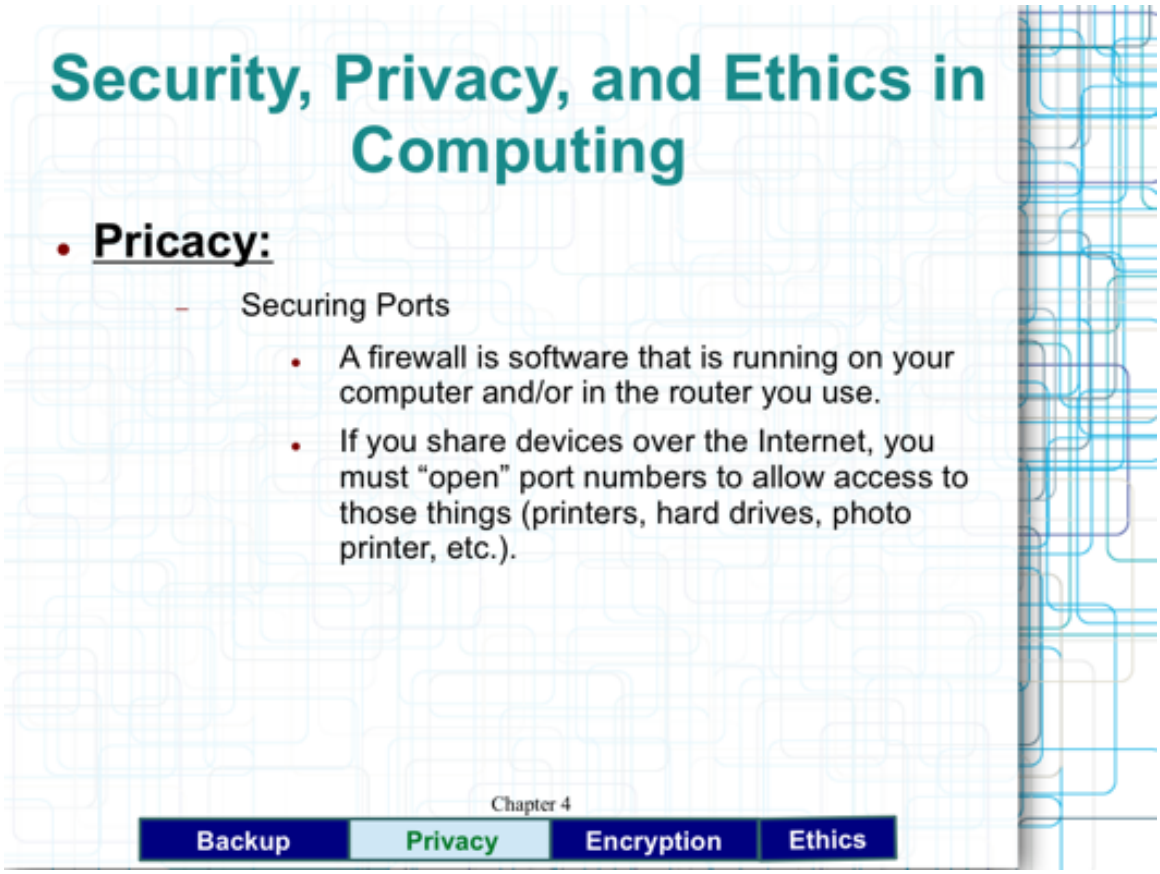
Security, Privacy, and Ethics in Computing
Pricacy:
Securing Ports
A firewall is software that is running on your computer and/or in the router you use.
If you share devices over the Internet, you must "open" port numbers to allow access to those things (printers, hard drives, photo printer, etc.).
Chapter 4
Backup
Privacy
Encryption
Ethics

Figure 7.18

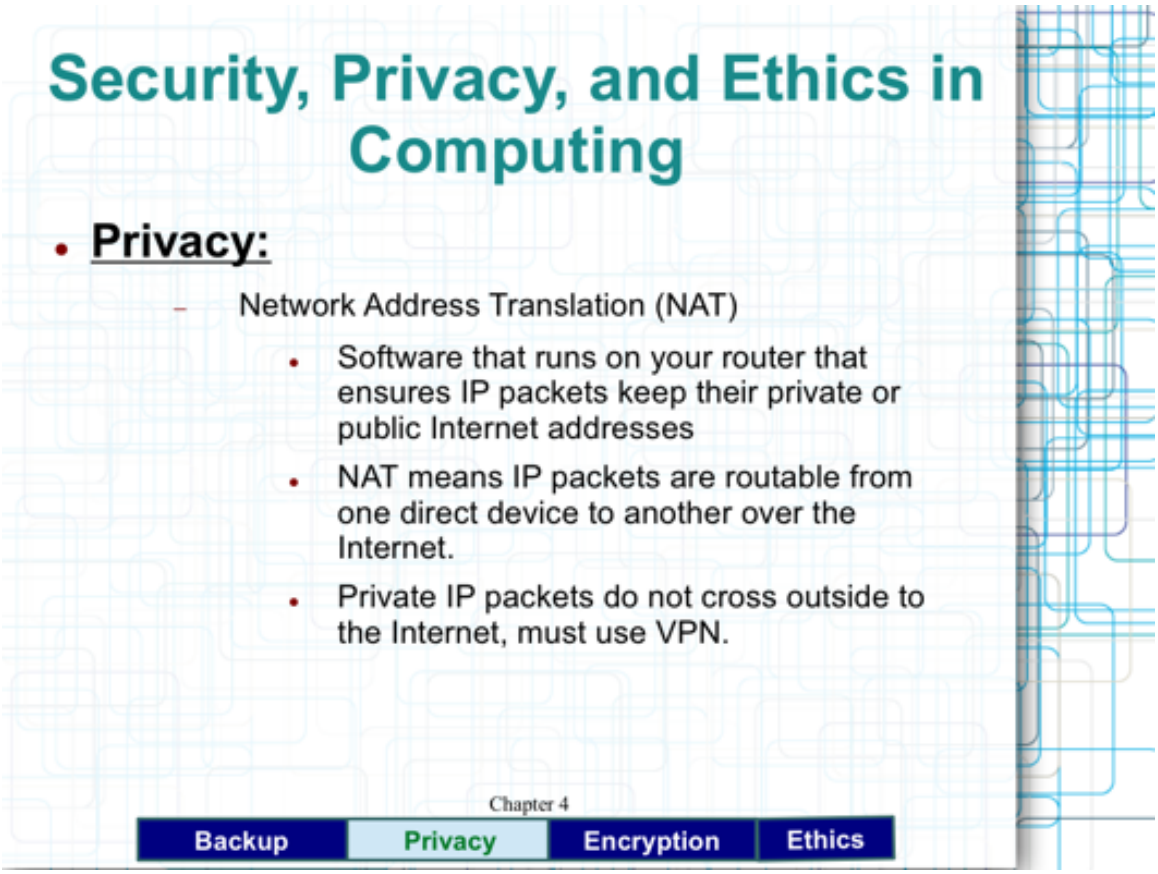
Security, Privacy, and Ethics in Computing
Privacy:
Network Address Translation (NAT)
Software that runs on your router that ensures IP packets keep their private or public Internet addresses
NAT means IP packets are routable from one direct device to another over the Internet.
Private IP packets do not cross outside to the Internet, must use VPN.
Chapter 4
Backup
Privacy
Encryption
Ethics

Figure 7.19

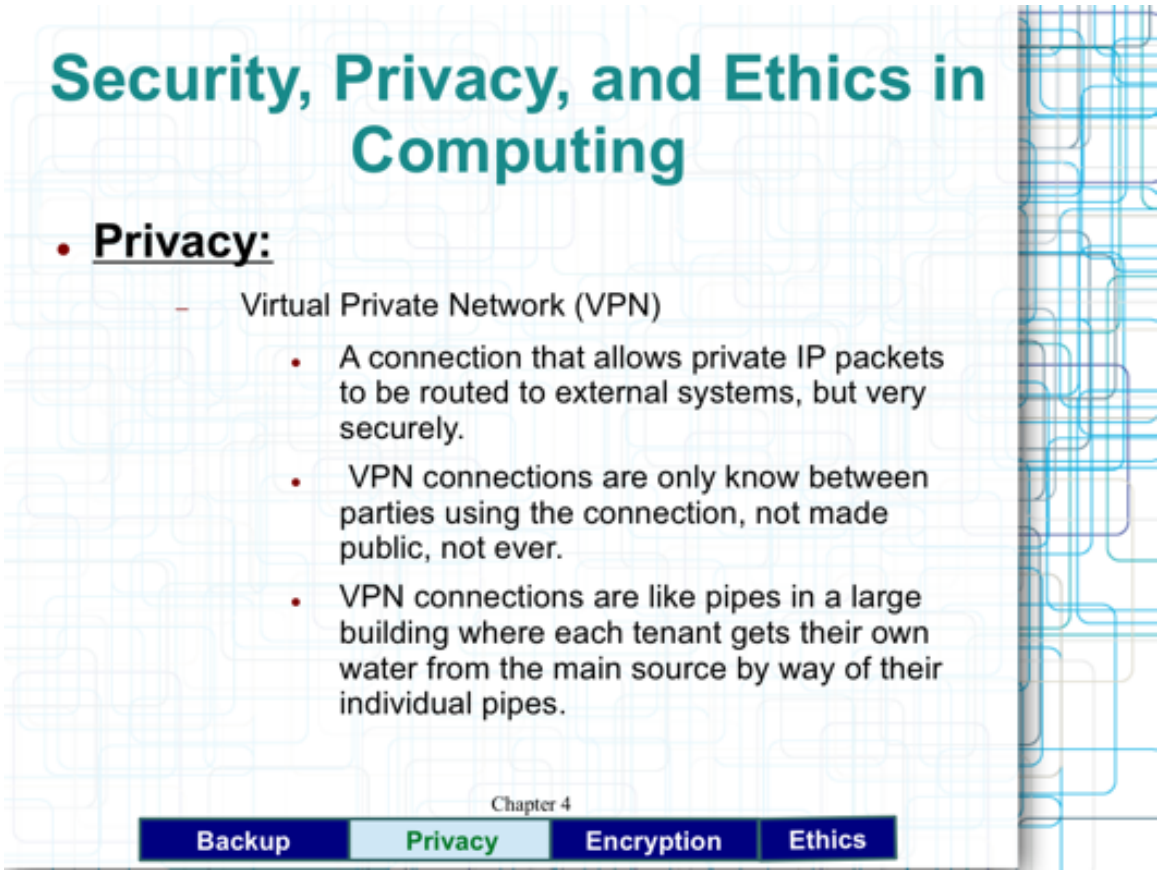
Security, Privacy, and Ethics in Computing
Privacy:
Virtual Private Network (VPN)
A connection that allows private IP packets to be routed to external systems, but very securely.
VPN connections are only know between parties using the connection, not made public, not ever.
VPN connections are like pipes in a large building where each tenant gets their own water from the main source by way of their individual pipes.
Chapter 4
Backup
Privacy
Encryption
Ethics

Figure 7.20

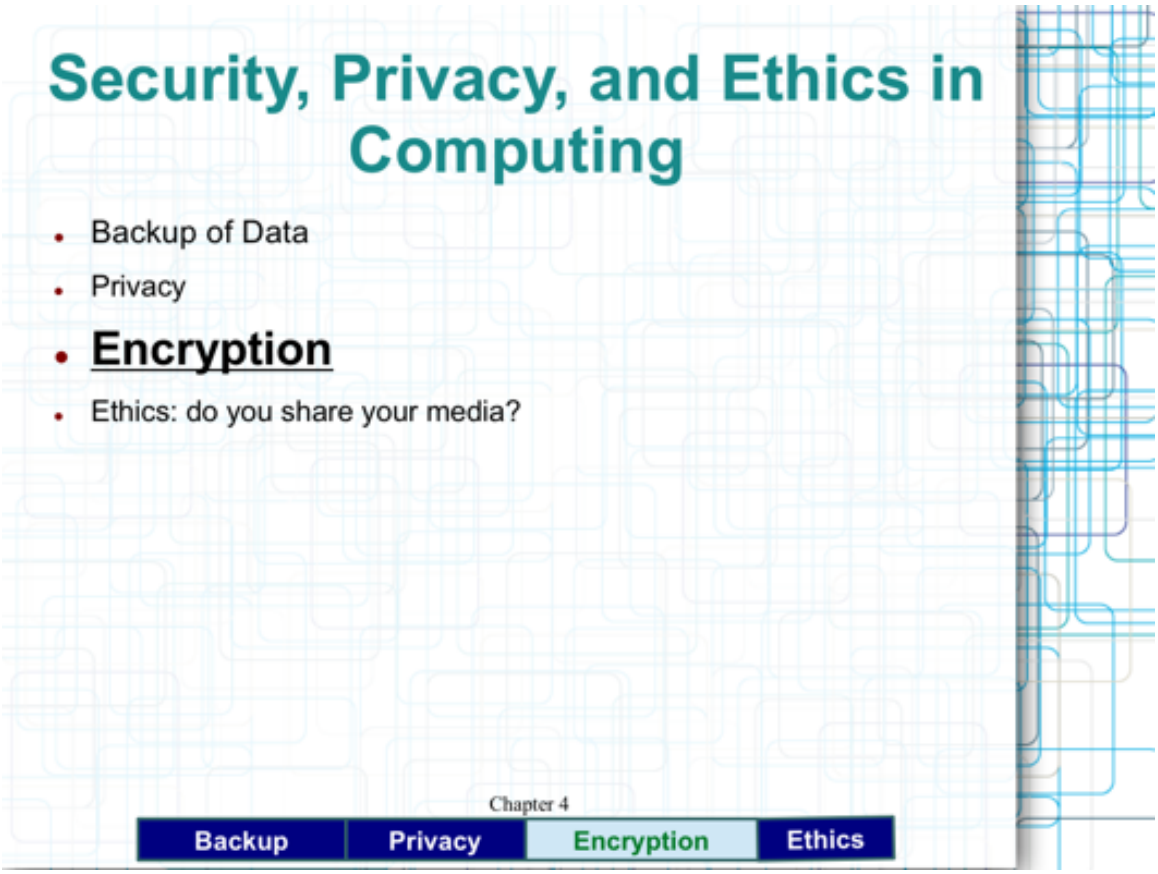
Security, Privacy, and Ethics in Computing
Backup of Data
Privacy
Encryption
Ethics: do you share your media?
Chapter 4
Backup
Privacy
Encryption
Ethics

Figure 7.21

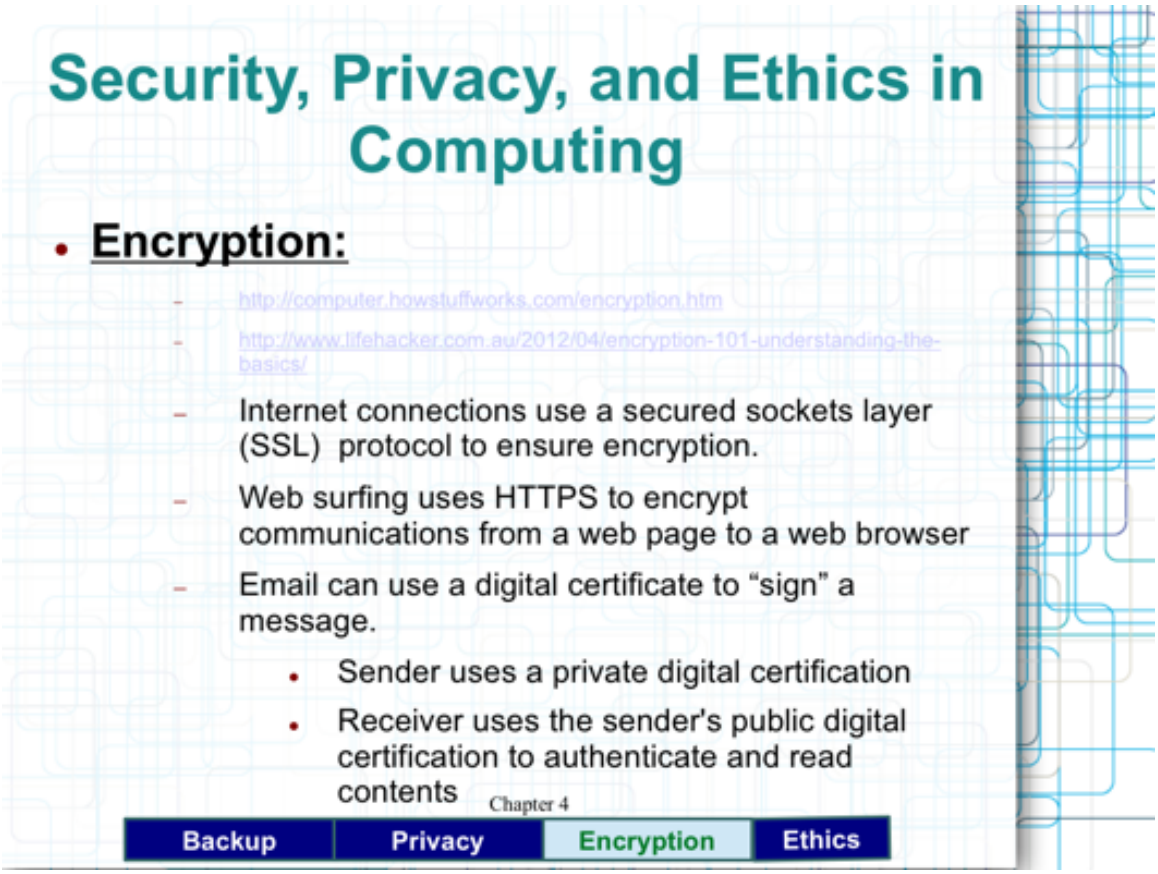
Security, Privacy, and Ethics in Computing
Encryption:
http://computer.howstuffworks.com/encryption.htm
http://www.lifehacker.com.au/2012/04/encryption-101-understanding-the-basics/
Internet connections use a secured sockets layer (SSL) protocol to ensure encryption.
Web surfing uses HTTPS to encrypt communications from a web page to a web browser
Email can use a digital certificate to "sign" a message.
Sender uses a private digital certification
Receiver uses the sender's public digital certification to authenticate and read contents
Chapter 4
Backup
Privacy
Encryption
Ethics

Figure 7.22


Security, Privacy, and Ethics in Computing
Backup of Data
Privacy
Encryption
Ethics: do you share your media?
Chapter 4
Backup
Privacy
Encryption
Ethics

Figure 7.23

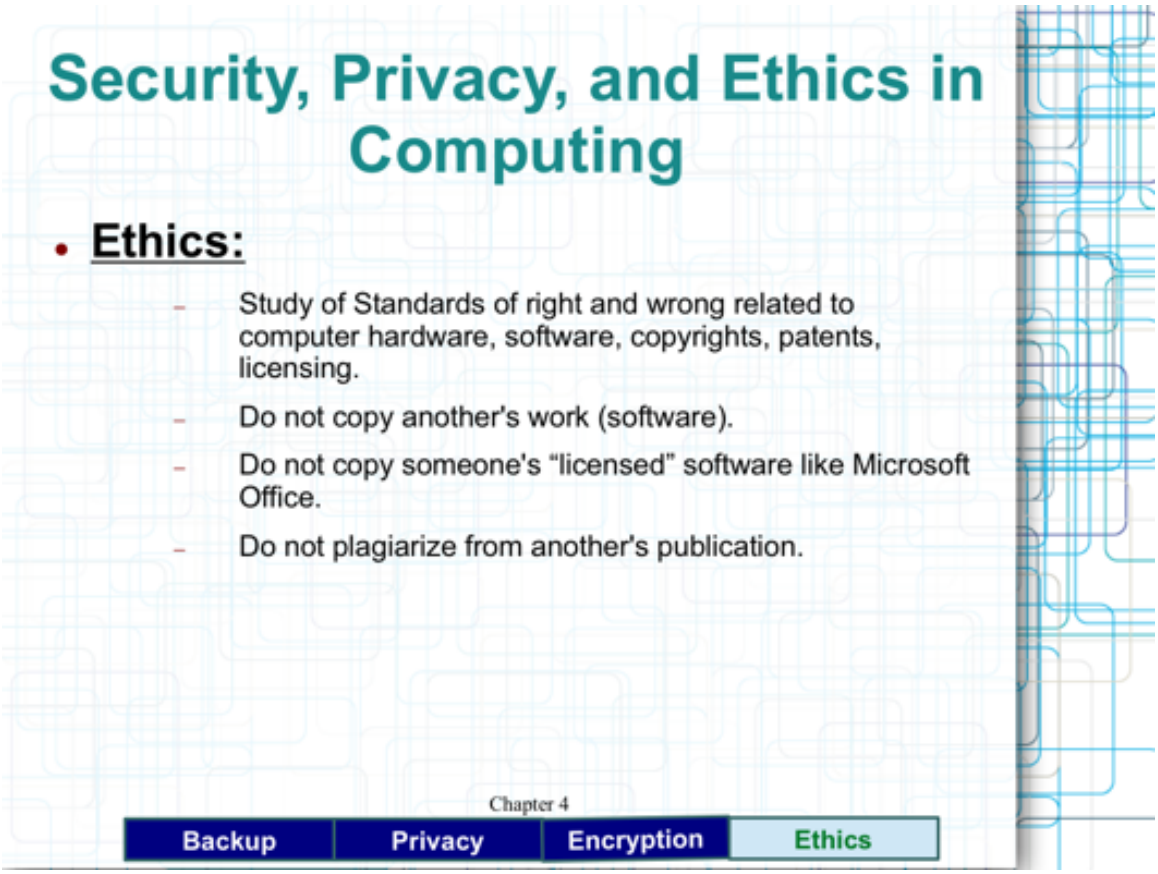
Security, Privacy, and Ethics in Computing
Ethics:
Study of Standards of right and wrong related to computer hardware, software, copyrights, patents, licensing.
Do not copy another's work (software).
Do not copy someone's "licensed" software like Microsoft Office.
Do not plagiarize from another's publication.
Chapter 4
Backup
Privacy
Encryption
Ethics

Figure 7.24

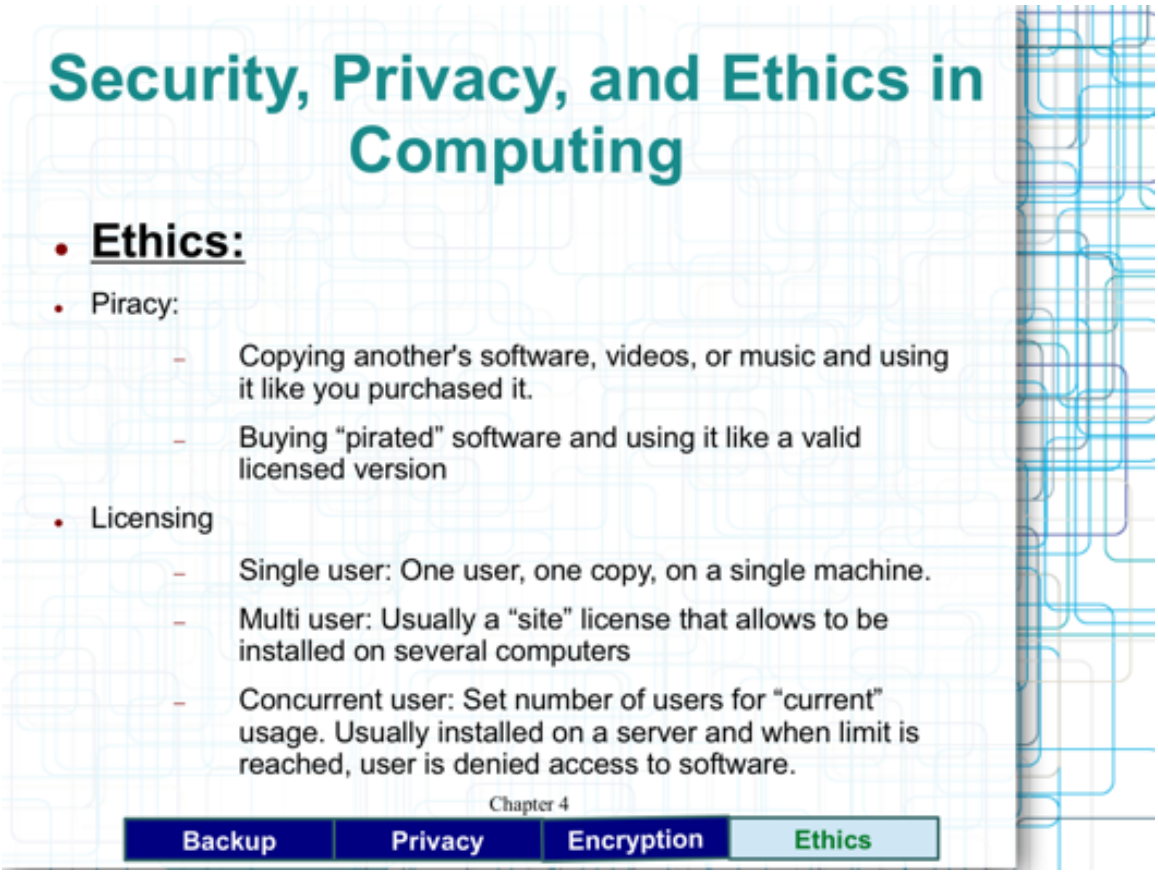
Security, Privacy, and Ethics in Computing
Ethics:
Piracy:
Copying another's software, videos, or music and using it like you purchased it.
Buying "pirated" software and using it like a valid licensed version
Licensing
Single user: One user, one copy, on a single machine.
Multi user: Usually a "site" license that allows to be installed on several computers
Concurrent user: Set number of users for "current" usage. Usually installed on a server and when limit is reached, user is denied access to software.
Chapter 4
Backup
Privacy
Encryption
Ethics

Figure 7.25

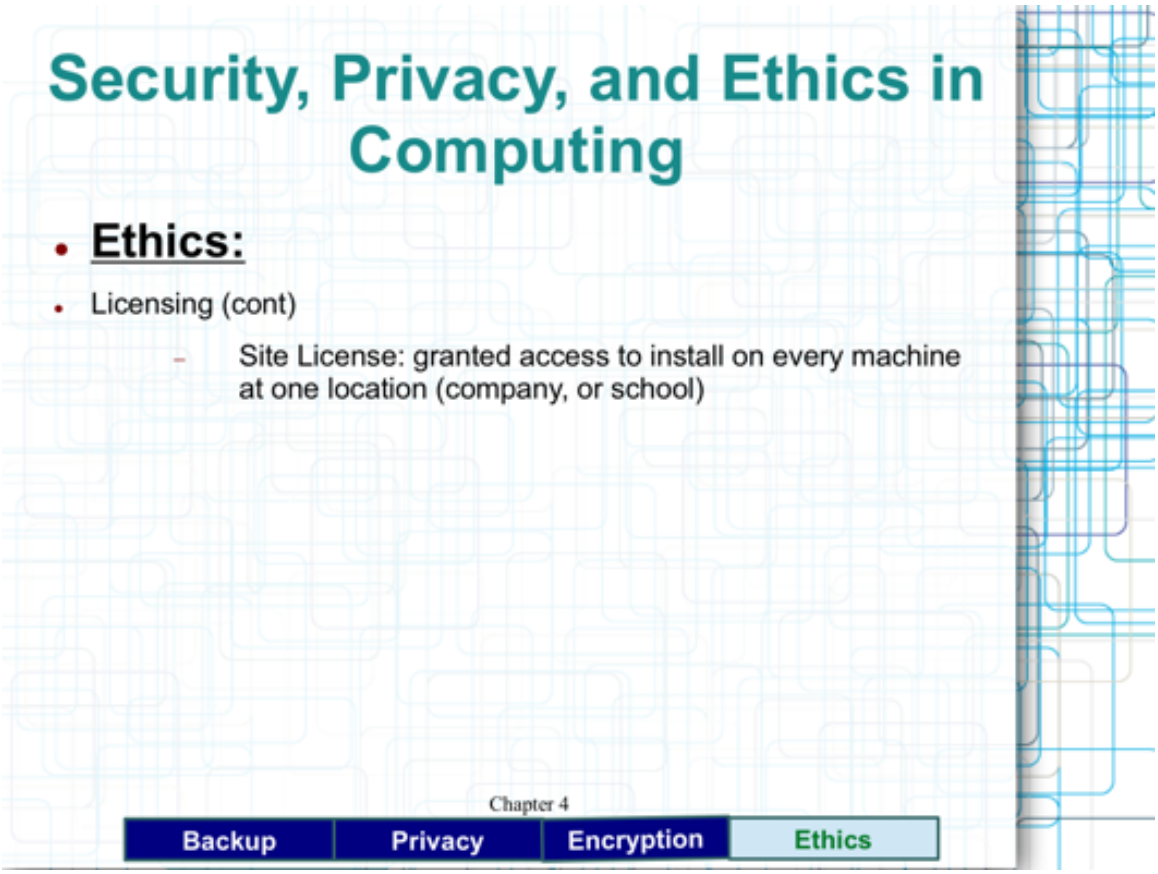
Security, Privacy, and Ethics in Computing
Ethics:
Licensing (cont)
Site License: granted access to install on every machine at one location (company, or school)
Chapter 4
Backup
Privacy
Encryption
Ethics

Figure 7.26

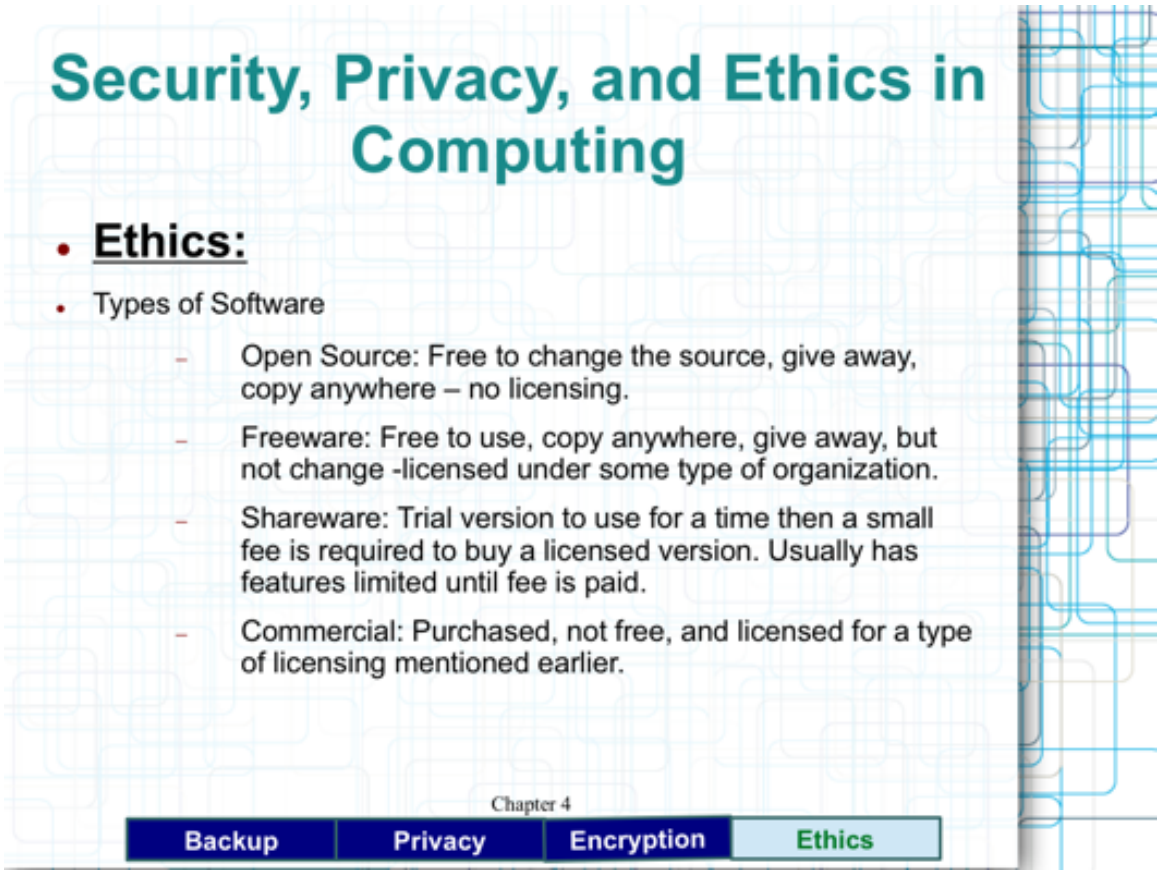
Security, Privacy, and Ethics in Computing
Ethics:
Types of Software
Open Source: Free to change the source, give away, copy anywhere – no licensing.
Freeware: Free to use, copy anywhere, give away, but not change -licensed under some type of organization.
Shareware: Trial version to use for a time then a small fee is required to buy a licensed version. Usually has features limited until fee is paid.
Commercial: Purchased, not free, and licensed for a type of licensing mentioned earlier.
Chapter 4
Backup
Privacy
Encryption
Ethics

Figure 7.27

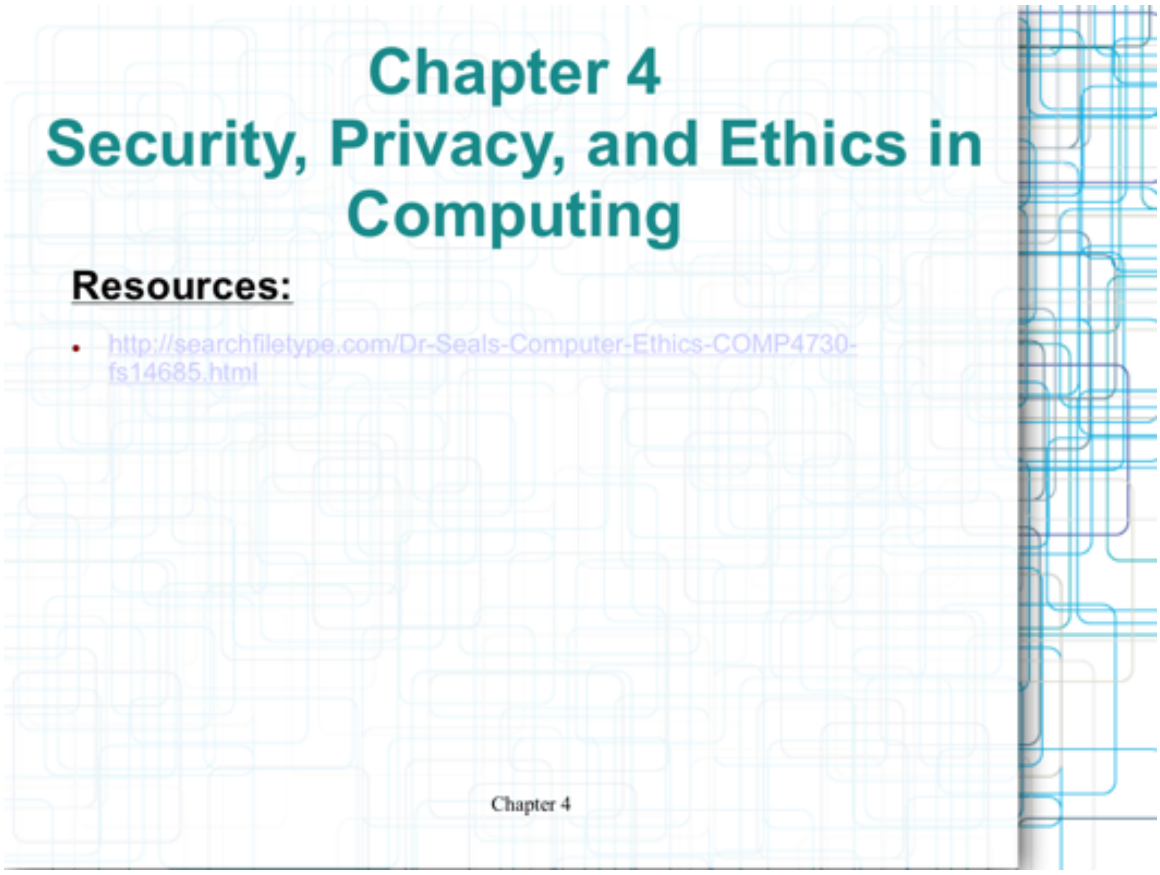
Chapter 4
Security, Privacy, and Ethics in Computing
Resources:
http://searchfiletype.com/Dr-Seals-Computer-Ethics-COMP4730-fs14685.html
Chapter 4

Figure 7.28

Chapter 8

Instructor Resources

Chapter 9

Student Resources

Index of Keywords and Terms

Keywords are listed by the section with that keyword (page numbers are in parentheses). Keywords do not necessarily appear in the text of the page. They are merely associated with that section. *Ex.* apples, § 1.1 (1) **Terms** are referenced by the page they appear on. *Ex.* apples, 1

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Pages: 118-145

Introduction to Computing
This course is designed to transport the user to an understanding of the basics of computing. The journey begins with a brief introduction, then moves into the history of computer science. Next, the user learns about hardware, then software, then the Internet, and finally the Cloud and socialnomics.

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