



Module 3 – Nautical Science

Unit 5 – Physical Science

Chapter 22 – Computers and the Internet

Section 1 – Computers and the Internet



What You Will Learn to Do

Demonstrate understanding of Physical
Science



Objectives

1. Define the concept of a computer
2. Discuss how modern computers evolved
3. Explain the basics of computer architecture
4. Describe the evolution of the modern internet



Objectives

5. Describe the attributes of a computer server
6. Explain how the internet is organized, controlled and accessed
7. Explain the concepts of cyberspace and the importance of internet security



Key Terms



CPS Key Term
Questions 1 - 36



Key Terms

- Modem -** A device for exchanging digital data between computers or other devices
- Peripheral device -** Connects to a computer system to add functionality, such as a mouse, keyboard or printer
- Central Processing Unit (CPU) -** The part of a computer in which operations are controlled and executed



Key Terms

Personal computer (PC) -

A compact computer that uses a microprocessor, designed for use by one person at a time

Laptop computer -

A personal computer that is easily portable

Integrated circuits -

An electronic circuit formed on a small piece of semiconducting material, Performing the same function as a larger circuit made from discrete components



Key Terms

Main frame - A data processing system employed mainly by a large organization for managing information

Computer operating system - Software that manages computer hardware and software, central to all processing



Key Terms

**Hardware
(computer) -**

The physical components of a computer such as the monitor, hard drive, memory, sound cards, DVD drive, etc.

**Software
(computer) -**

Programs that operate the computer hardware to provide basic functionality, or to perform any number of processes under the control of the user



Key Terms

Binary numbers -

A method of representing numbers that has 2 as its base and uses only digits 0 and 1

Byte -

A group of binary digits or bits(usually eight) operated as a unit

Hard drives -

A data storage device used for storing and retrieving digital information using rapidly rotating disks coated with magnetic material



Key Terms

**Random
access
memory
(RAM) -**

Volatile storage area on a computer; if power is lost, the data will also be lost; used for working storage in computer processing

**Device
driver -**

A computer program that operates or controls a particular type of device that is connected to a computer



Key Terms

**Analog
computer -**

A computer that represents data by measurable quantities in order to solve a problem, rather than by expressing the data as numbers

**Server
(computer) -**

A system that manages computer files and responds to requests to create, access and update those files, from remote computer devices



Key Terms

- Internet -** A global system of interconnected computer networks that use the standard internet protocol suite(TCP/IP) to link devices worldwide
- DARPA -** Defense Advanced Research Projects Agency; an agency of the US Department of Defense responsible for the development of new technologies for use by the military



Key Terms

- E-mails -** Messages distributed by electronic means from one computer user to one or more recipients via a network
- Website Address -** A location connected to the internet that maintains one or more pages on the World Wide Web
- Domain Name System -** The system by which internet domain names and addresses are tracked and regulated



Key Terms

- Internet Protocol (IP) -** A set of rules governing the format of data sent over the Internet or other network
- World Wide Web -** An information system on the Internet that allows documents to be connected to other documents by hypertext links, enabling the user to search for information by moving from one document to another



Key Terms

Browser - A program with a graphical user interface for displaying HTML files, used to navigate the World Wide Web

Search engine - A program that searches for and identifies items in a database that correspond to keywords or characters specified by the user, especially for finding particular sites on the World Wide Web



Key Terms

- Internet service provider (ISP) -** A company that provides access to the internet to subscriber-based customers
- Cloud computing -** The practice of using a network of remote servers hosted on the Internet to store, manage and process data, rather than a local server or a personal computer
- Webcasting -** Broadcasting through the internet



Key Terms

Broadband -

A high-capacity transmission technique using a wide range of frequencies, which enables a large number of messages to be communicated simultaneously

Information technology (IT) -

The study or use of systems (especially computers and telecommunications) for storing, retrieving and sending information



Key Terms

- Cyberspace** - The notational environment in which communication over computer network occurs
- Hacker** - A person who uses computers to gain unauthorized access to data
- Identity theft** - The fraudulent acquisition and use of a person's private identifying information, usually for financial gain



Key Terms

Cyberterrorism - The politically motivated use of computers and information technology to cause severe disruption or widespread fear in society

Cyber warfare - The use of computers and other devices to attack an enemy's information systems as opposed to an enemy's armies or factories



Opening Question



How do you think computers all over the world connect via the internet?

1.

2.

3.

(Use CPS "Pick a Student" for this question.)





Warm Up Questions



CPS Lesson
Questions 1 - 2



Introduction

A **computer** is a device that can carry out a finite set of arithmetic or logical instructions.

The electronic digital computer always contains a **central processing unit(CPU)** and some form of memory.



It may also have other internal components, and/or peripheral devices which are attached either wirelessly or with cables.

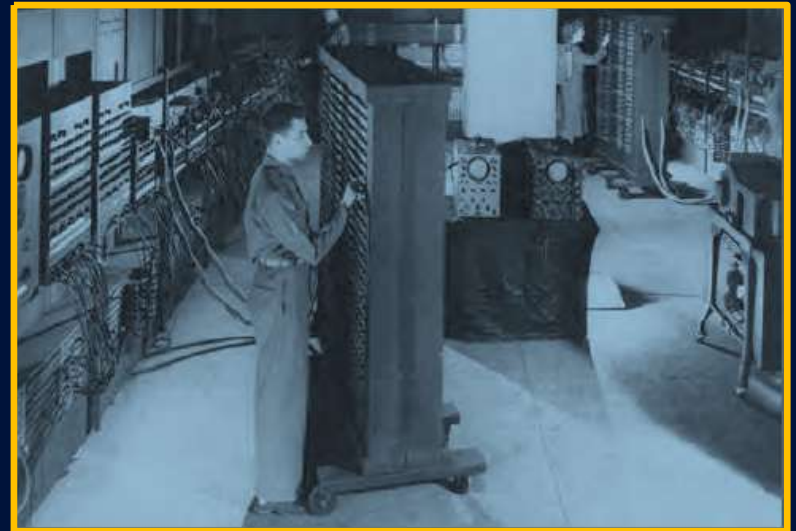


Introduction

The first electronic digital computers were developed in the U.K. and the U.S. in the 1940's.

They...

- Used vacuum tubes
- Were about the size of a small room
- Used a great deal of power



Advances in solid state electronic technology include greatly improved architecture, size and operation.



Modern Digital Computers

- Modern computers are based on **integrated circuits**.
- Chips are combined with other electronic components on printed circuit boards.
- Chips can process millions of times faster with more power than the computers of 40's.
- Digital computers can be programmed using both **machine language** and **computer language**.





Modern Digital Computers

Some common current uses for computers:

Personal Computers

Consumer electronics interfaces

Computation

Social information networking

Communication such as email

Large Mainframe Computers

Corporate and government accounting

Transaction processing

Production and transmission of electrical power

High-capacity data processing

Manufacturing processes



Modern Digital Computers

Microsoft Windows and Apple Mac OS are two common operating system programs.

They are used to control a computer's hardware and software and designed to be "user-friendly."

Programming that controls computers and their concurrent processes is called **software**. All physical components of computers and devices attached to them are called **hardware**.





Computer Architecture

Computers store data and use computation that are in the form of a **binary number system**, using only digits 0 (no charge) and 1 (some charge).

They are organized into groups of eight binary numbers, called **bytes**(B), each one capable of representing 2^8 or 256 different numbers.

- Longer numbers need more consecutive bytes
- Fractions are represented by digital representation of fractional powers
- Negative numbers shown by an auxiliary data bit



Computer Architecture

All input from a keyboard or mouse, or any multimedia objects(video, audio) or colors – are coded/linked to combinations of numbers defined by certain standards:

- American Standard Code for Information Interchange(**ASCII**) for keyboard functions and characters
- Joint Photographic Experts Group(**JPEG**) for images
- Moving Picture Experts Group (**MPEG**) for video





Computer Architecture

Computers are rated according to computational speed and capacity.

Speed: number of computational cycles the CPU can perform per second, in Hertz(Hz), MilliHertz(MHz), GigaHertz(GHz)

Capacity: Memory expressed in multiples of number of bytes that can be stored:

- Kilobytes(KB) – a few thousand bytes
- Megabytes(MB) – millions of bytes
- Gigabytes(GB) – billions of bytes
- Terrabytes(TB) – trillions of bytes



Computer Architecture

Internal (main memory), also called **random access memory (RAM)**, is located close to the CPU to minimize data transmission time. Made up of microscopic semiconductor cells. Measured in nanoseconds (billionth of a second)

Secondary memory is typically called a **hard drive**. Older technology was made up of spinning disks, but newer disks have solid state technology that does not rotate. Speed is measured in milliseconds (thousandth of a second).



Hard drive



Computer Architecture

Computer peripherals examples:

- Keyboard
- Mouse
- Monitor
- Printer
- Microphone
- Speakers
- Camera
- DVD drive

These use **device drivers**; software which manages the interface between computer and that device.



Computer Architecture

In contrast to **digital** computers, **analog** computers can simulate mathematical calculations or physical behavior by analogous current or fluid flow through an array of components, gear rotations or scale manipulations. *Digital computers are far superior.*

Analog computers were once widely used for:

- Thermostats
- Process control
- Torpedo solutions on surface warships and submarines
- Military aircraft bombsights
- Large-caliber naval gunfire control



Computer Architecture



In both military and civilian world, computers are extensively used for a wide variety of operations and functions.

They are integral parts of almost every major shipboard system and enable instant communication.

Computers are used for many applications in naval aircraft, cruise missiles and guided munitions of all kinds.



Check On Learning Questions



CPS Lesson
Questions 3 - 4



The Internet

- 1950's: First attempts to link computers together
- 1960's: Birth of modern internet with work funded by Defense Advanced Research Projects Agency (**DARPA**)
- ARPANET: First computer network intended to facilitate communication and research among various government agencies and contractors
- Late 1969: Four host computers linked; grew to hundreds in just a few years



The Internet

Though initially restricted to DOD, interest in internet grew among other users.



By late 1970's, network standards were developed and implemented, guided by DARPA.

Electronic mail(**e-mail**) was standardized and led to establishment of **Domain Names System(DNS)** in 1983.



The Internet

DNS is a standardized system of addresses wherein various types of information (domains) are associated with multilevel domain names assigned to entities such as:

- Individual computers
- Servers
- Websites



The Internet

Domain name - A human-friendly linkage to corresponding 32-bit numerical **Internet Protocol (IP)** addresses needed by computers access a location in the network.

Examples of top-level domain names in the U.S.:

.gov .com .org .edu .mil .net

It must be registered with a domain name registrar.

Recently added:

- 1400 new domain types in different languages
- 250 top-level two-letter country codes

Lower level domain names fall to the left of the “dot.”



The Internet

Mid 1980s:

Interlinked computer systems continued to grow.

“Internet” became standard term, short for internetworking

Late 1980's:

Worldwide Web(WWW) coined by contractor at the CERN atomic research facility in Switzerland.

Became prefix for all internet addresses



The Internet

Hypertext Text Transfer Protocol(HTTP) – A set of procedures used by internet

This protocol defines how transmissions on the web are formatted and transmitted, and how servers respond to user commands.

A prefix of **https:** indicates a secure website;
http: indicates a website that is NOT secure.



Servers

A **server** is a system of software run on one or more linked computers, to provide a resource to a user through a network and/or the internet.

They may serve a small group of users or general public.

Examples of servers:

- Database
- Email
- Web
- Gaming
- Offsite storage



Servers

Any computer can function as a server but most are large main- frame computers with faster CPUs, huge memory capacity, multiple hard drives and redundant power supplies.



Servers are accessed by using a numerical IP address.



Check On Learning Questions



CPS Lesson
Questions 5 - 6



Internet Features

Internet Milestone #1 - **Browser**:

Late 1980's:

Development of first **browser**. Major milestone for locating information on web.

1993:

Greatly improved browser developed at University of Illinois; basis for more sophisticated browsers and modern search engines developed in recent years.



Internet Features

Internet Milestone #2 - **ISPs**:

Formation of commercial companies called **Internet Service Providers (ISPs)** in mid 1990's, facilitating consumer access to internet

- Initially via standard phone lines
- Then high speed service via phone, tv cable or broadband wireless transmission
- ISP's assigned email addresses to their users and hosted email accounts
- ISPs supported use of browsers and other services



Internet Features

Internet Milestone #3 – Cloud computing:

- Recent milestone is increasing use of **cloud computing**. Data and application programming stored at a remote location (the “cloud”) instead of user’s device
- Increased capabilities of those devices, decreasing cost; making better, more efficient use of available internet resources



Internet Features

Common means of connecting to internet:

- Personal computers
- Cell phones
- Tablets



Methods of connection to internet:

1. Traditional phone lines(*dial-up* and DSL)
2. Dedicated hardline wires(Ethernet)
3. TV coaxial cable service
4. Wireless radio(WiFi) transmission

**All above are broadband transmission, except Dial-up*



Internet Features

Broadband = simultaneous use of a broad range of carrier wave frequencies with bandwidths of 6MHz. Allows at least 1.5 Megabits (1.5 millions bits) of information to be transmitted each second.

In contrast...

Narrowband uses single carrier-wave frequencies with a bandwidth of only 3 kHz. Allows a maximum of 56 kilobits, and 56,000 bits per second.



Internet Features

Fourth Generation (4G) Wireless Fidelity (WiFi) has peak download rates as high as 1 gigabit (1 billion bits) per second.

This is *18,000 times more bits per second* than traditional voice phone service.

Long Term Evolution (LTE) 4G networks offer even faster transmission with new digital signal processing(DSP) technology.



Internet Features

The internet has no formal international governing or regulating body, but all networks are required to confirm to established IP address and domain-name systems.

An estimated 1/3 of the world's current population uses the internet.



Internet Features

Satellite-based communication systems facilitate internet use worldwide by military personnel on land, sea or in the air.

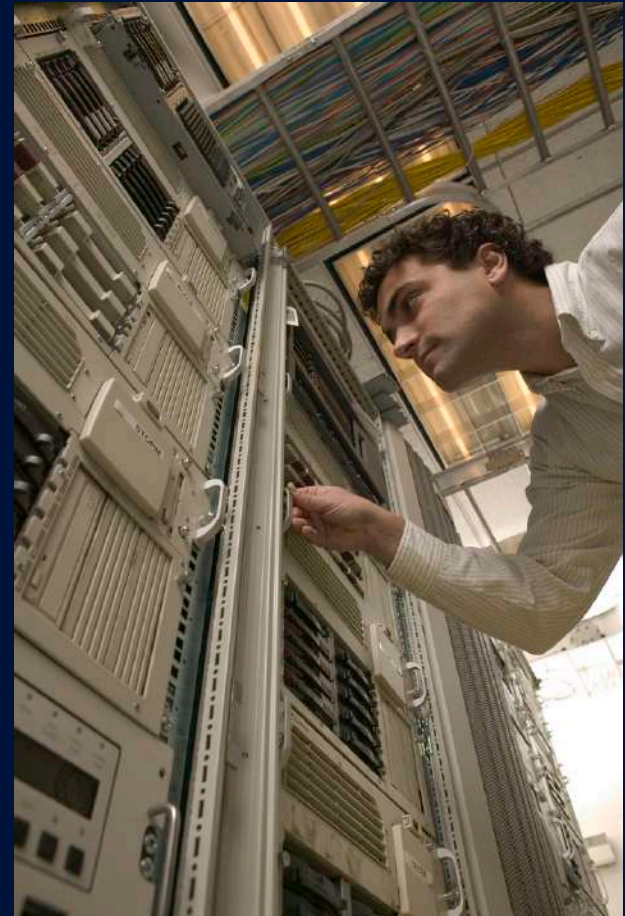
Internet links were even installed onboard the *International Space Station* in 2010.





Internet Features

Information technology (IT) refers to anything related to computing or networking technology. IT departments are an important part of any corporate or government organization.





Cyberspace and Security

Cyberspace is the sum total of all the world's computers, servers and networks interconnecting them.

Security of cyberspace has become a huge and very sensitive issue, as “**hackers**” engage in illegal activity via the internet worldwide.





Cyberspace and Security

Hacker activity might include:

- Breaking into financial networks to steal personal information(**identify theft**) or divert funds for their own gain
- Breaking into corporate, industrial or government systems to conduct espionage(spying)
- Infecting various systems with viruses that impair or destroy systems or computers





Cyberspace and Security

An attempt to damage computer systems by extremists or terrorists would be considered **cyber terrorism**.

If these actions are done by foreign governments or other foreign entities on a large scale, they are called **cyber warfare**.





Cyberspace and Security

Countermeasures known as **cyber security**, are taken to guard against cyber crimes, including:

- Data encryption
- Antivirus programs
- Firewalling

Federal, state and local government , as well as private organizations provide these security services, including the U.S. Cyber Command for military applications, and the Department of Homeland Security.



Review Question



Identify and describe the major advances in computer technology that you think will be in place by the year 2100.

1.

2.

3.

(Use CPS "Pick a Student" for this question.)





Closing Questions



CPS Lesson
Questions 7 - 8



Questions?

