

CS161: Introduction to Computer Science I

Week 1

10/2022

Course description



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Introduction to fundamental concepts of computer science. Problem solving, algorithm and program design, data types, control structures, subprograms.

Objectives



Introduce to the fundamental concepts of computing

Emphasize problem solving, the design of algorithms for solutions, and the translation of tested algorithms into the grammar of a high-level computer language.

Encourage students to develop a consistent programming style and a systematic method of internal program documentation.

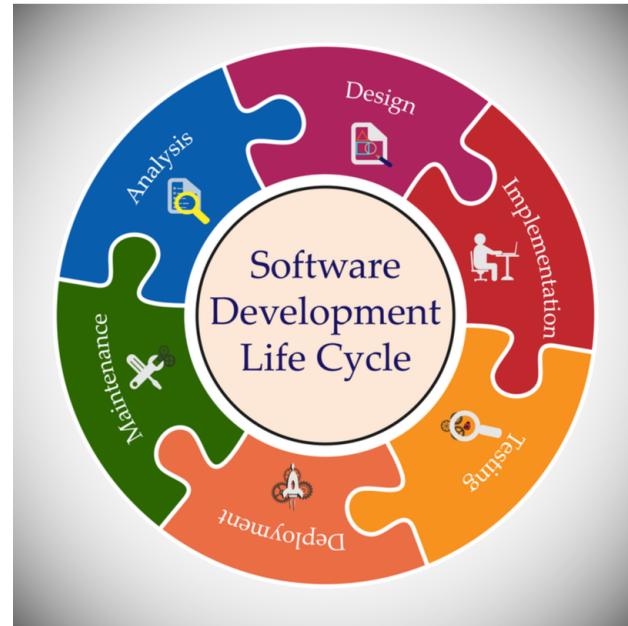
This course is not just
a programming or C++ class!

Objectives(cont)

This course introduces the **software life cycle** along with the goals of *systems design*

Reliable, modifiable, understandable, and efficient program development is emphasized.

Students gain experience with **design notations** using data flow diagrams and structure charts.



Exams and Marking



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Quiz: 5 quizzes, 10% (must have at least 3)

Homework: 2 assignments, 5%

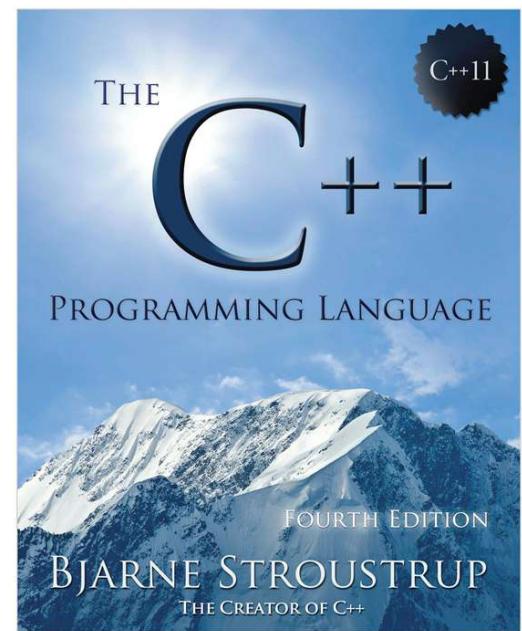
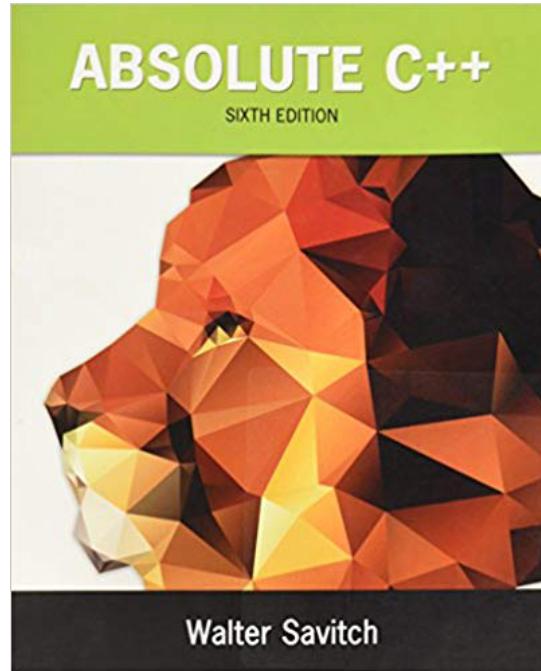
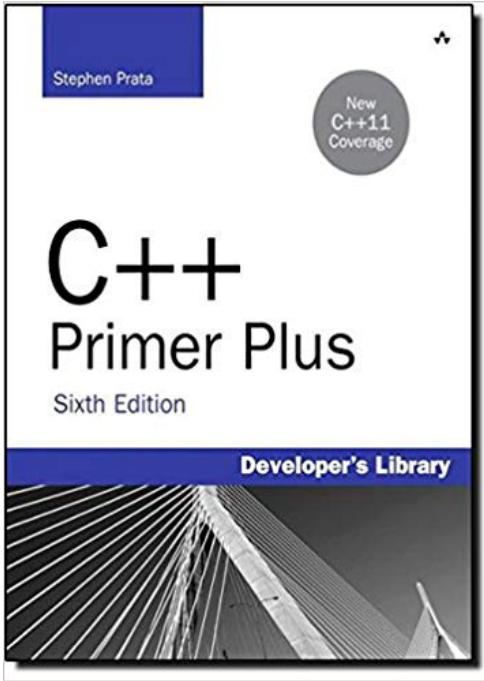
Lab: 2-3 projects/exercises, 15%

Mid-term exam : 20% (lab 10% + theory 10%)

Final exam: 50% (lab 10% + theory 40%)

Any zero-point component score → not qualified for final exam.

Students are not allowed to cheat in every assignments, tests, examinations. You will be grade 0 for the whole course if you are caught cheating.



Books and references

C++ Primer Plus, Stephen Prata, SAMS.
Absolute C++, Sixth Edition, by Walter Savitch, Addison Wesley.
The C++ Programming Language, Bjarne Stroustrup.

Topics covered



Topic #1: Introduction

Topic #2: A simple program

Topic #3: Using Math Library

Topic #4: Selective Execution and Logical Operations

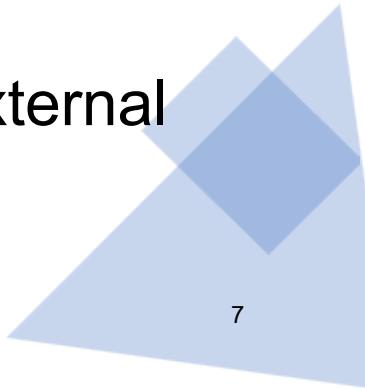
Topic #5: Functions

Topic #6: Repetition

Topic #7: String and Arrays

Topic #8: Structures

Topic #9: Working with External Files



What is a computer?

A computer is an electronic device that accepts information and instructions from a user, manipulates the information according to the instructions, displays the information in some way, and stores the information for retrieval later.

Computer ad

Computers offer strong performance at MicroPlus computers feature superior with a processor and a motherboard specifically to take advantage of the latest components. Of course, you are covered by one-year parts and labor warranty.*

This desktop PC is powerful enough to meet your demanding computing needs.

Specifications:



All credit cards welcome. Call 1-800-555-0000 today!

WARE ONLY AND MAY NOT BE AVAILABLE IN CERTAIN DEALING EXTRA. RETURNS ACCEPTED; CALL FOR AN RMA (1). ALL RETURNS MUST BE IN ORIGINAL BOX WITH ALL PARTS INCLUDED AT THE DISCRETION OF MICROPLUS. PRICES AND AVAILABILITY SUBJECT TO CHANGE WITHOUT NOTICE.

- Processor: 2.6 GHz AMD Athlon 64 X2 dual-core processor
- Memory: 1 GB DDR2 SDRAM (expandable to 2 GB)
- Hard drive: 250 GB Single Serial ATA Hard Drive
- DVD: 16x DVD+/-RW Drive
- Operating system: Microsoft Windows XP
- Monitor: 17-inch flat panel
- Video: 256 MB ATI Radeon X1300 Pro
- Keyboard: MicroPlus ergonomic keyboard
- Mouse: Optical wheel mouse
- Sound: X-Fi Sound Card
- Speakers: MicroPlus elite speakers
- Expansion slots: 2 PCI expansion slots
- External ports: 6 USB, and parallel, serial
- Controller: Integrated Serial ATA controller
- Network Card: Integrated 10/100 Ethernet
- Installed software: Microsoft Office Home and Business (1-year subscription)
- Printer (not shown): MicroPlus PhotoPlus printer

Limited Warranty Program: 1 year limited pa

Types of computer

Personal computers (PCs)

Desktop computers

Notebook (laptop) computers

Tablets

PDA (personal digital assistant)

Mainframe computers

Supercomputers

...

Types of computer



Figure 1-1 The IBM z14



Computer Systems



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Includes computer hardware and software

- o **Hardware** refers to the **physical components** of a computer
- o **Software** refers to the **intangible components** of a computer system, particularly the programs, or lists of instructions, the computer needs to perform a specific task

The design and construction of the hardware of a particular computer is referred to as its **architecture** or **configuration**

The technical details about each component are called **specifications**

Computer Configuration & Specification



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Intel® Core™2 Duo Desktop Processor E6420

Processor Specifications:

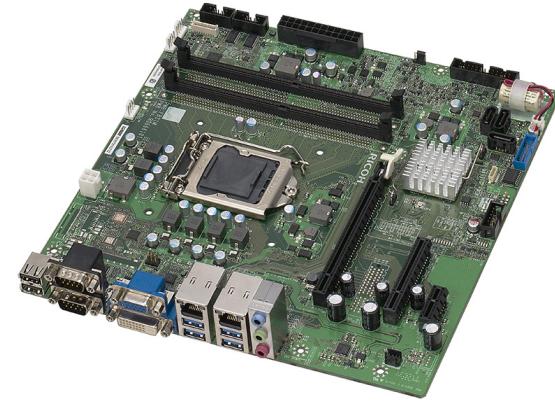
Spec Number: SLA4T
CPU Speed: 2.13 GHz
PCG: 06
Bus Speed: 1066 MHz
Bus/Core Ratio: 8
L2 Cache Size: 4 MB
L2 Cache Speed: 2.13 GHz
Package Type: LGA775
Manufacturing Technology: 65 nm
Core Stepping: B2
CPUID String: 06F6h
Thermal Design Power: 65W
Thermal Specification: 60.1°C
Core Voltage:

Processing Hardware

The **motherboard** is the main electronic component of the computer (circuit board)

The **microprocessor** is one of the most important pieces of processing hardware on the motherboard

Cards are removable circuit boards



Input and Output

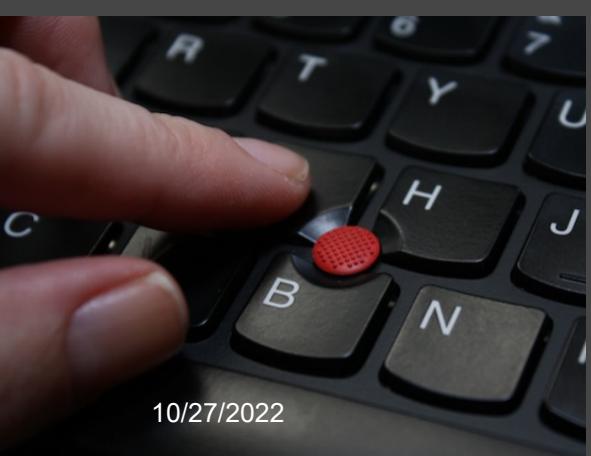


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The data or instructions you type into the computer are called **input**

The result of the computer processing your input is referred to as **output**

Peripheral devices accomplish input and output functions



Input Devices



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You use an **input device**, such as a keyboard or a mouse, to input data and issue commands

- Keyboard
- Ergonomic
- Pointing device
- Mouse
 - Scroll wheel
 - Trackball
 - Touch pad
 - Pointing stick
- Scanner

Output Devices

Output devices
show you the results
of processing data

- Monitor: CRT, LCD, TN, IPS, OLED, Retina, ...
- Printer:
 - Laser
 - Inkjet
 - Dot matrix



Data Representation

- Binary digits (bits)
- A series of eight bits is called a **byte**
- Kilobyte (KB or K)
 - Megabyte (MB)
 - Gigabyte (GB)
 - Terabyte (TB)
 - ASCII
 - American Standard Code

ASCII Code

Char.	ASCII	Char.	ASCII	Char.	ASCII
@	64	U	85	j	106
A	65	V	86	k	107
B	66	W	87	l	108
C	67	X	88	m	109
D	68	Y	89	n	110
E	69	Z	90	o	111
F	70	[91	p	112
G	71	\	92	q	113
H	72]	93	r	114
I	73	^	94	s	115
J	74	-	95	t	116
K	75	_	96	u	117
L	76	a	97	v	118
M	77	b	98	w	119
N	78	c	99	x	120
O	79	d	100	y	121
P	80	e	101	z	122
Q	81	f	102	{	123
R	82	g	103		124
S	83	h	104	}	125
T	84	i	105	~	126

B → 1000010

L → 1101100

U → 1110101

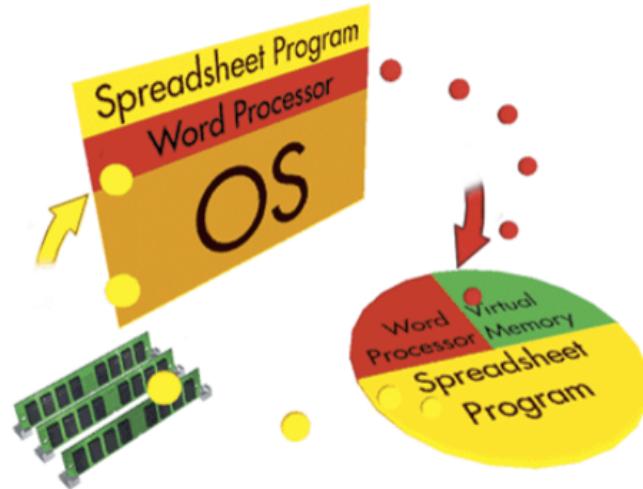
e → 1100101

Figure 14

How virtual memory works

1. Your computer is running a word processing program that takes up most of the program area in RAM, but you want to run a spreadsheet program at the same time.

2. The operating system moves the least-used segment of the word processing program into virtual memory on disk.



3. The spreadsheet program can now be loaded into the RAM vacated by the least-used segment of the word processing program.

4. If the least-used segment of the word processing program is later needed, it is copied from virtual memory back into RAM. To make room, some other infrequently used segment of a program will need to be transferred into virtual memory.

Memory

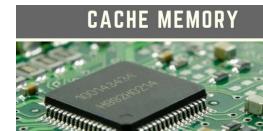
Random access memory (RAM)

- Volatile memory
- SDRAM, DDR RAM, DDR2, DDR3, DDR4...



Cache memory

Virtual memory

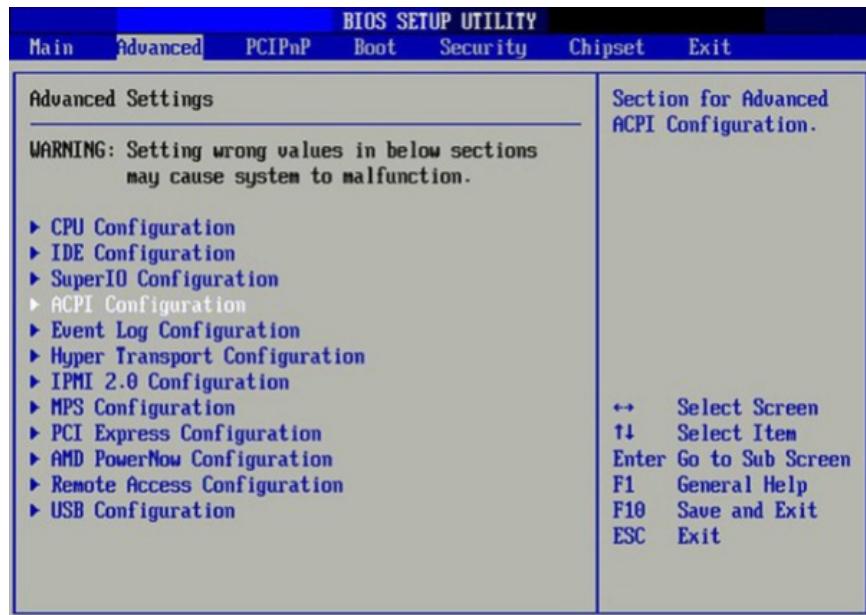
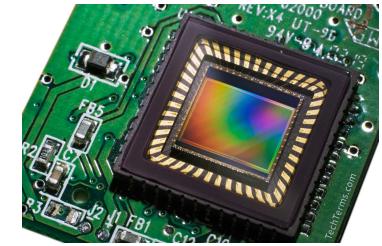
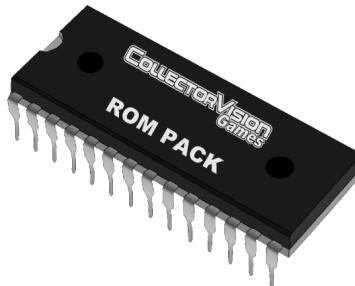


Read-only memory (ROM)

- BIOS
- Nonvolatile memory

Complementary metal
oxide semiconductor
memory (CMOS)

Semi-permanent
memory



Storage Media



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A computer **file** is a named collection of stored data

An **executable file** contains the instructions that tell a computer how to perform a specific task

A **data file** is created by a user

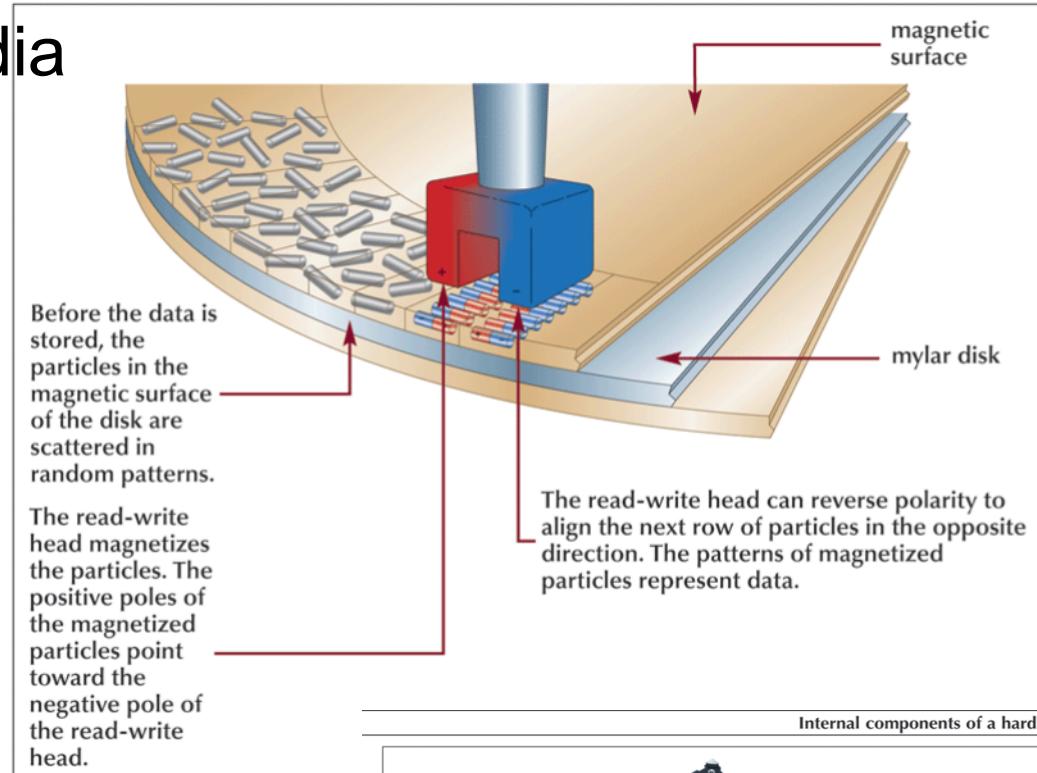
Storage Media

Storing data on magnetic media

Figure 16

Magnetic media

- Hard disk
- Tape
- Floppy disk



Internal components of a hard disk

Figure 17



Storage Media

Optical storage device

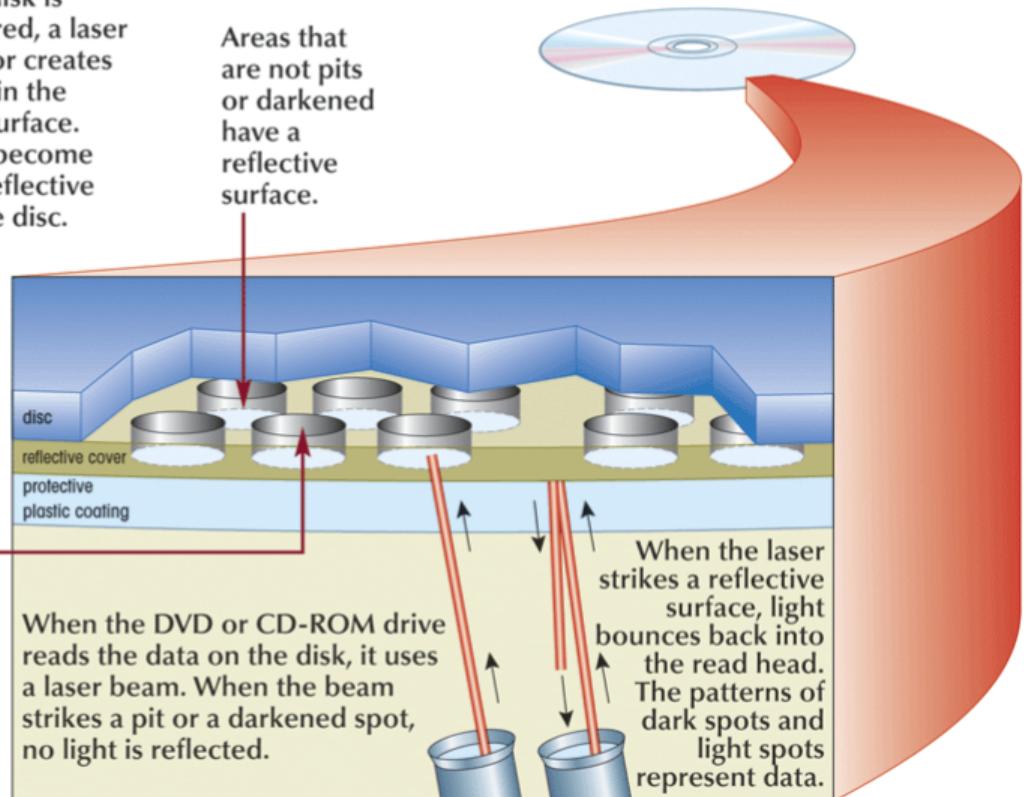
- CD, CD-ROM, CD-R, CD-RW
- DVD
- HD-DVD
- Blueray

Figure 18

How data is stored on an optical disc

When a DVD or CD-ROM disk is manufactured, a laser burns pits or creates dark spots in the reflective surface. These pits become dark, nonreflective areas of the disc.

Areas that are not pits or darkened have a reflective surface.



Storage Media

Flash memory

- Memory cards
- USB flash storage device
- Solid state drive (SSD)

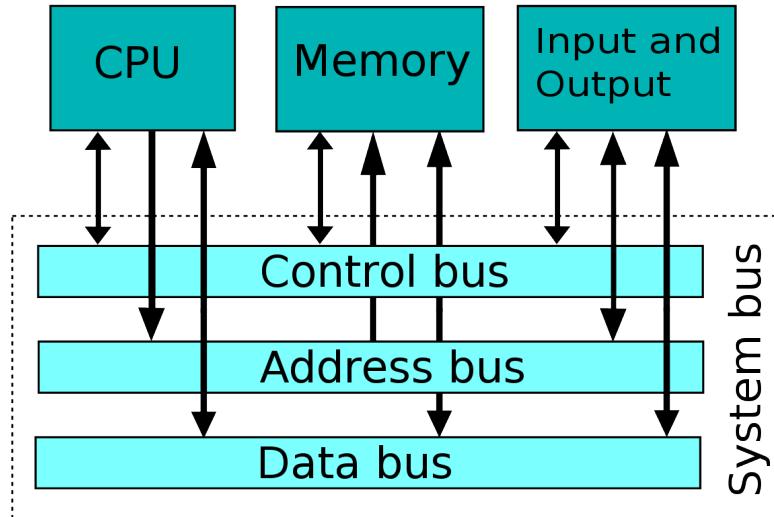


The transmission of text, numeric, voice, or video data from one computer to another or to a peripheral device is called **data communications**

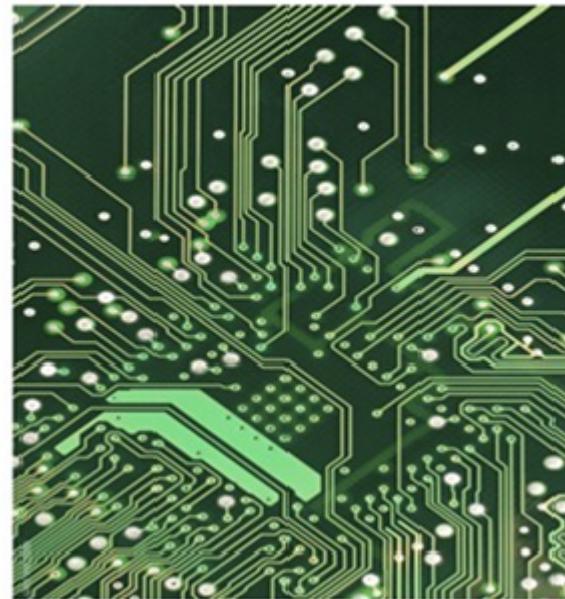
- Sender and receiver
- Channel
- Protocol
- Device driver (driver)

Data Bus

This path between the microprocessor, RAM, and peripherals is called the **data bus**



Buses - Motherboard Buses



A **network** connects one computer to other computers and peripheral devices, enabling you to share data and resources with others

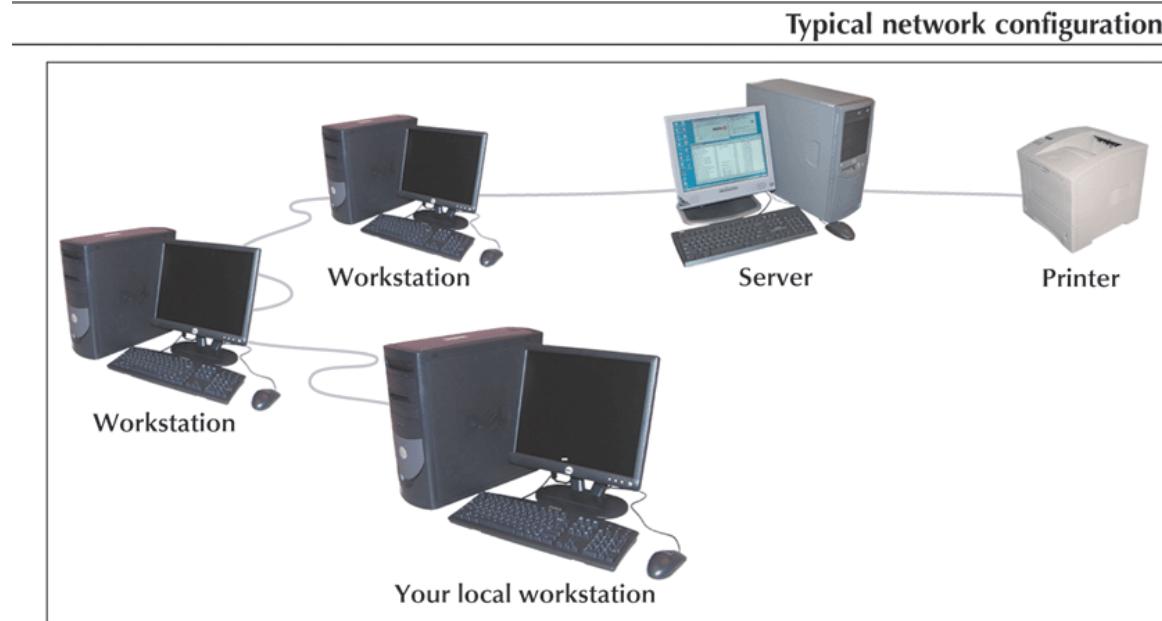
Network interface card (NIC)

LAN

WAN

WLAN

WiMax



Telecommunications means communicating over a comparatively long distance using a phone line or some other data conduit

- Modem
 - Digital and analog signals
- DSL
- ADSL

The Internet



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The Internet is the largest network in the world, connecting millions of people

- Electronic mail
- World Wide Web

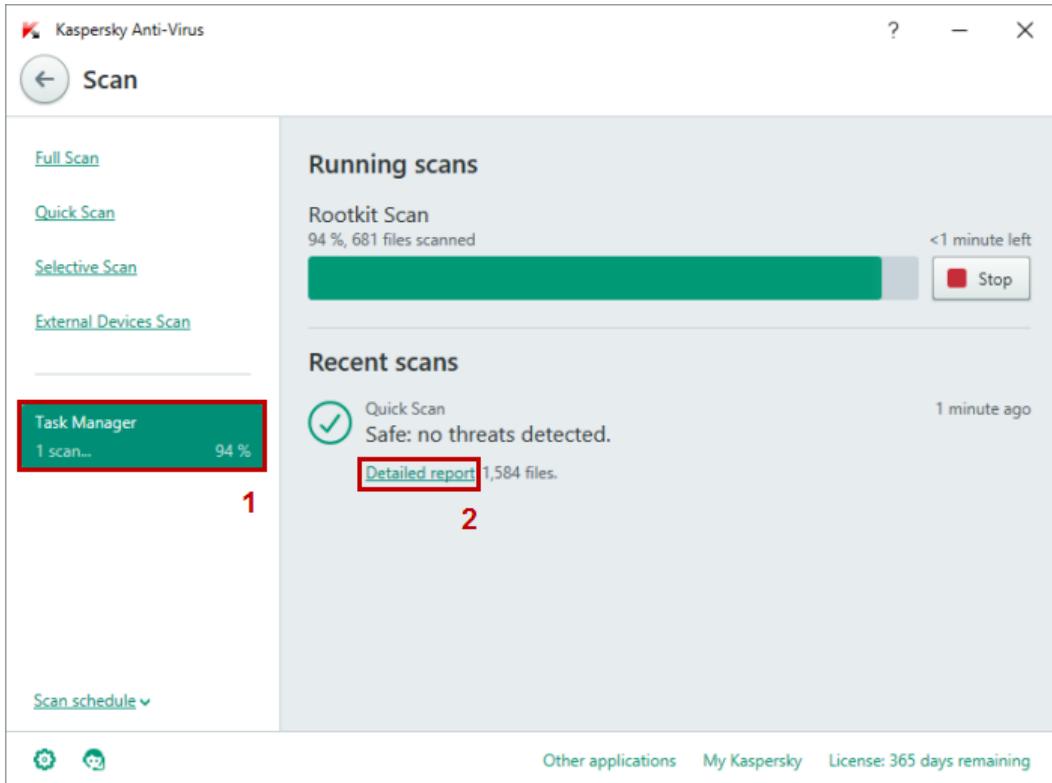
Web page
Web site

The screenshot shows a web browser window with the title "Quality Information Portal ...". The URL in the address bar is "www.informationq.com". The main content area displays a news article titled "Computer Input and Output Devices". The article features a small illustration of a person sitting at a desk with a computer monitor, keyboard, and mouse. Below the article, there is a summary of the content and a link to continue reading. The page has a blue header with categories: NEWS, COMPUTER, LAPTOP, MOBILES, TABLETS, GADGETS, and TECHNOLOGY. On the right side, there is a sidebar with a search bar, social media links (Facebook, Google+, Twitter, Pinterest, Email), a "Follow us" section with a Facebook page thumbnail, and a "Recent Posts" section.

Security Threats on Your Computer



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Security refers to the steps a computer owner takes to prevent unauthorized use of or damage to the computer

- Malware
 - Viruses
 - Antivirus software
 - Spyware
 - Adware
- Firewall
- Phishing
- Pharming

System Software

System software
manages the
fundamental
operations of your
computer

- Operating system
 - System resource
 - Multitasking
- Utilities
- Programming Languages



Application Software

Application software enables you to perform specific computer tasks, such as document production, spreadsheet calculations, database management, ...