UNIV 103
CS MAJORS FRESHMAN SEMINAR

Dr. Blaise W. Liffick
Algorithms → Implementation → Abstractions
Programming Techniques

Problem Analysis
Program Design
• Algorithms & Design Patterns
• Data Structures
Paradigms

Languages
Java
C++

Programming Environments
Hardware
Network
Linux
Eclipse
Early Computers

• Colossus (Turing)
• John Atanasoff, Clifford Berry
• Zuse
Generation 1 - 1946

- Vacuum tube
- Hardwired
- Scientific
- Very expensive (one of a kind)

- Huge
- Hot
Generation 2 - 1955

- Transistor
- Smaller
- Less heat
- More reliable

- Still expensive - $Ms
- Led to data processing
Generation 3 - 1964

- Integrated Circuit boards
- Families of computers
- Smaller (minicomputers)
- Cheaper - $30-100Ks
Generation 4 – 1974 and beyond

- Very Large Scale Integration
- Microcomputers (desktop)
- $K$s
Popular Science

New $595 home computer

Low-cost models can change your life-style

GM and CHRYSLER for '78: the shrink goes on

First really promising U.S. MAN-POWERED AIRCRAFT

VW's 60-MPG TURBO-DIESEL SAFETY CAR

Our changing weather: COLDER WINTERS AHEAD?
THE HARD DISK
YOU'VE BEEN WAITING FOR

$3398
10 MB

XCOMP introduces a complete microdrive disk subsystem with more:

- MORE STORAGE
- MORE SPEED
- MORE VALUE
- MORE SUPPORT

$100 users - The XCOMP subsystem is now available with 10 megabytes of storage. It will also be available at $2,488.90. Compare the price and features of any other 5 1/4-inch system, and you'll agree the XCOMP's value is unbeatable.

OUTPERFORMS OTHER HARD DISKS

Polymer disk and larger, more expensive hard disks are no match for this powerful subsystem. More data is available on every seek. 64-bit (10MB) and 32-bit (4MB) controllers provide increased performance for tasks such as video and graphics. The XCOMP uses 20-sector reads and data is stored in the smallest possible sectors to optimize performance. The optional power backup plugs directly into the 5100 bus and provides power for the drive.

FAST CONTROLLER

The XCOMP controller is the key to its superior efficiency. It has a built-in hard drive buffer, which reduces seek time and enhances performance. A high-speed 32-bit interface connects the system to the 5100 bus. The controller is also compatible with other hard drive interfaces, allowing for easy upgrades. The XCOMP controller is designed to be future-proof, ensuring compatibility with emerging technologies.

MORE SOFTWARE

Included with the system is software for loading, formatting, and management. The included software includes automatic error correction, disk maintenance, and backup utilities. The easy-to-use interface makes it simple to manage your data. The XCOMP also supports third-party software for additional functionality.

WARRANTY

The XCOMP subsystem includes a full one-year warranty on parts and labor.

ALSO AVAILABLE FROM XCOMP

- General purpose controllers (8-bit interface) with support for multiprogrammed systems.
- 32-bit interface controller for 5100-based systems.
- STR storage controller for 5100-based systems.
- 32-bit interface controller for storage module drives.
- 5100 bus and 5100 interface packets are available from XCOMP.

See your local dealer or call:

XCOMP, Inc.
7666 Trade Street
San Diego, CA 92121
Tel: (714) 771-3731
Fax: (714) 771-3730
Categories of Computers

- Supercomputers
- Mainframe
- Minicomputers
- Microcomputers
- Mobile devices

Power
Size
Cost
Computer Hardware

• **CPU** - central processing unit
  – Where decisions are made, computations are performed, and input/output requests are delegated

• **Main Memory**
  – Stores information being processed by the CPU

• **Secondary Memory (Mass Storage)**
  – Stores data and programs
Computer Hardware

• Input devices
  – Allow people to supply information to computers

• Output devices
  – Allow people to receive information from computers

• Peripheral Devices
  – Generally I/O, mass storage

• Network connection
  – Modems
  – Ethernet interface
Figure 1.2  Computer components

Mass storage

Secondary memory

Main memory

Central processing unit

Modem

Keyboard

Mouse

Monitor

Printer
CPU

• “Brains” of the computer
  – Arithmetic calculations are performed using the Arithmetic/Logical Unit or ALU
  – Control unit decodes and executes instructions
  – Registers hold information and instructions for CPU to process

• Arithmetic operations are performed using binary number system
Memory

• Stores
  – programs
    • operating system
    • applications
  – data

• Types
  – RAM - volatile
  – ROM

• Composed of **bits**, which are combined into **bytes**
Memory Cells

<table>
<thead>
<tr>
<th>Address</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-27.2</td>
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<tr>
<td>1</td>
<td>354</td>
</tr>
<tr>
<td>2</td>
<td>0.005</td>
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<tr>
<td>3</td>
<td>-26</td>
</tr>
<tr>
<td>4</td>
<td>H</td>
</tr>
<tr>
<td>5</td>
<td>RTV 001</td>
</tr>
<tr>
<td>6</td>
<td>...</td>
</tr>
<tr>
<td>...</td>
<td>X</td>
</tr>
<tr>
<td>999</td>
<td>75.62</td>
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</table>
Input / Output Devices

• Accessories that allow computer to perform specific tasks
  – Receiving information for processing
  – Return the results of processing

• Common input and output devices
  – Keyboard    Joystick       Scanner
  – Printer     Monitor        Speaker
Computer Networks

• Allows multiple computers to connect together to share resources and/or data

• LAN - Local area network
  – Organizational

• WAN - Wide area network
  – Internet

• Requires additional hardware
  – modem
  – network interface
  – servers
The “Cloud” – Someone Else’s Computer

• Wireless access
  – WiFi
  – Cell

• Servers
  – Storage
  – Applications
World Wide Web

• Introduced 1989
• Developed by CERN
  – European Laboratory for Particle Physics
• Web browser - GUI
  – Netscape
  – IE
  – Firefox
1.3 Computer Software

- Operating system
- Other system software
  - utilities
  - programming language systems
- Applications
Operating System

• E.g. Windows®, Linux, Mac OS X, Unix®

• Controls
  – the interaction of system with the user
  – hardware interactions

• Part is usually stored on ROM, rest on hard drive
  – This arrangement requires booting the system
Some OS Responsibilities

- Communicating with the user; receiving user commands
- Managing allocation of memory, processor time, file system, and other resources
- Collecting input from keyboard, mouse, etc.
- Conveying output to screen, printer, etc.
- Writing data to secondary storage devices
Application Software

• Does the “real” work

• Common application software
  – Word processors
  – Desktop publishing programs
  – Spreadsheets
  – Presentation managers
  – Drawing programs
Programming Languages

• Machine Language
  – Most fundamental language of the computer
  – Unique for each processor type
  – Binary 0s and 1s that specify what to do
    • 0010 0000 0000 0100
    • 1000 0000 0000 0101
    • 0011 0000 0000 0110
### Table 1.2  A Program in Machine and Assembly Language

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<td>00000000</td>
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<tr>
<td>00000001</td>
<td>00010110</td>
<td>ADD B</td>
</tr>
<tr>
<td>00000010</td>
<td>00110101</td>
<td>STO A</td>
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<tr>
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<td>01110111</td>
<td>HLT</td>
</tr>
<tr>
<td>00000100</td>
<td>?</td>
<td>A ?</td>
</tr>
<tr>
<td>00000101</td>
<td>?</td>
<td>B ?</td>
</tr>
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High - Level Languages

• Resemble human language
  – Java, C++, C, Pascal, FORTRAN, Ada

\[ a = a + b; \]

• More compact and human understandable than machine language

• Must be translated into machine language
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COMPUTER SCIENCE

What my friends think I do
What my mom thinks I do
What society thinks I do

What clients think I do
What I think I do
What I really do