The Big Picture

Chapter 1

- Describe the layers of a computer system
- Describe the history of computer hardware and software
- Describe the changing role of the computer user

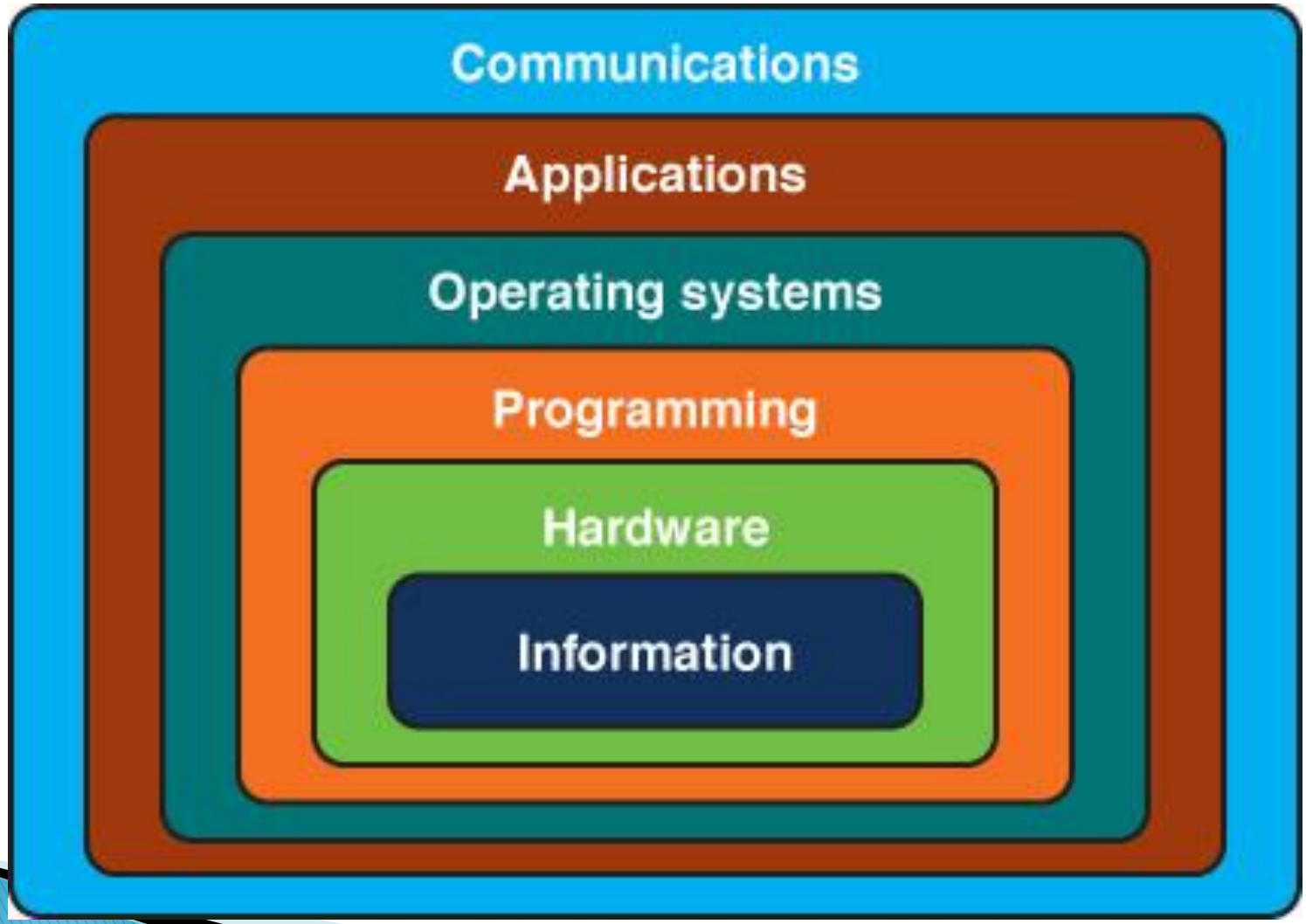
Computing System

A DYNAMIC collection of:

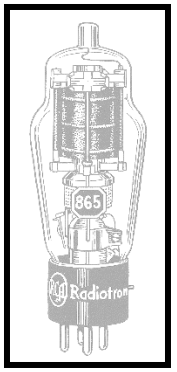
- Hardware,
- Software,
- Data,

used to solve problems and interact with the environment.

Layers of a Computing System



First Generation Hardware (1951-1959)



Vacuum Tubes

Large, not very reliable, generated a lot of heat

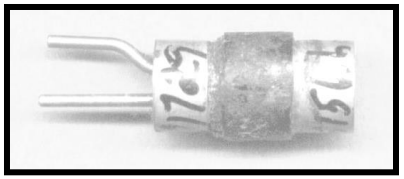
Magnetic Drum

Memory device that rotated under a read/write head

Card Readers → Magnetic Tape Drives

Sequential auxiliary storage devices

Second Generation Hardware (1959–1965)



Transistor

Replaced vacuum tube, fast, small, durable, cheap

Magnetic Cores

Replaced magnetic drums, information available instantly

Magnetic Disks

Replaced magnetic tape, data can be accessed directly

Third Generation Hardware (1965-1971)

Integrated Circuits

Replaced circuit boards, smaller, cheaper, faster, more reliable

Transistors

Now used for memory construction

Terminal

An input/output device with a keyboard and screen

Fourth Generation Hardware (1971–?)

Large-scale Integration

Great advances in chip technology

PCs, the Commercial Market, Workstations

Personal Computers and Workstations emerge
New companies emerge: Apple, Sun, Dell …

Laptops

Everyone has his/her own portable computer

Parallel Computing and Networking

Parallel Computing

Computers rely on interconnected central processing and/or memory units that increase processing speed

Networking

Ethernet connects small computers to share resources
File servers connect PCs in the late 1980s

ARPANET and LANs → Internet

First Generation Software (1951–1959)

Machine Language

Computer programs written in binary (1s and 0s)

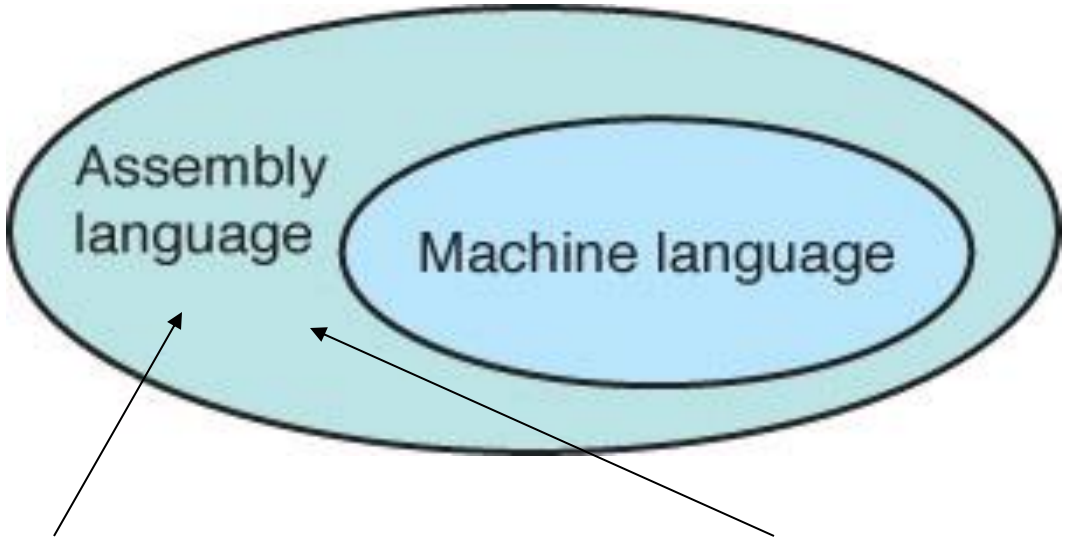
Assembly Languages and Translators

Programs written using mnemonics, which were translated into machine language

Programmer Changes

Programmers divide into two groups: application programmers and systems programmers

Assembly/Machine



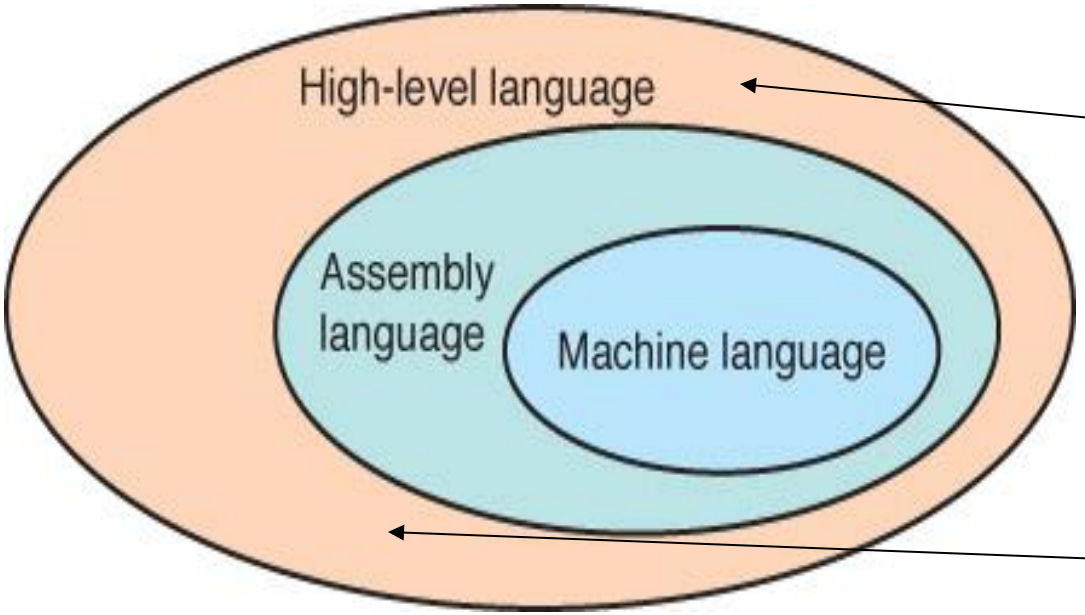
Systems programmers *write* the assembler (translator)

Applications programmers *use* assembly language to solve problems

Second Generation Software (1959–1965)

High-level Languages

English-like statements made programming easier:
Fortran, COBOL, Lisp



Systems programmers *write* translators for high-level languages

Application programmers *use* high-level languages to solve problems

Third Generation Software (1965–1971)

Systems Software

Utility programs

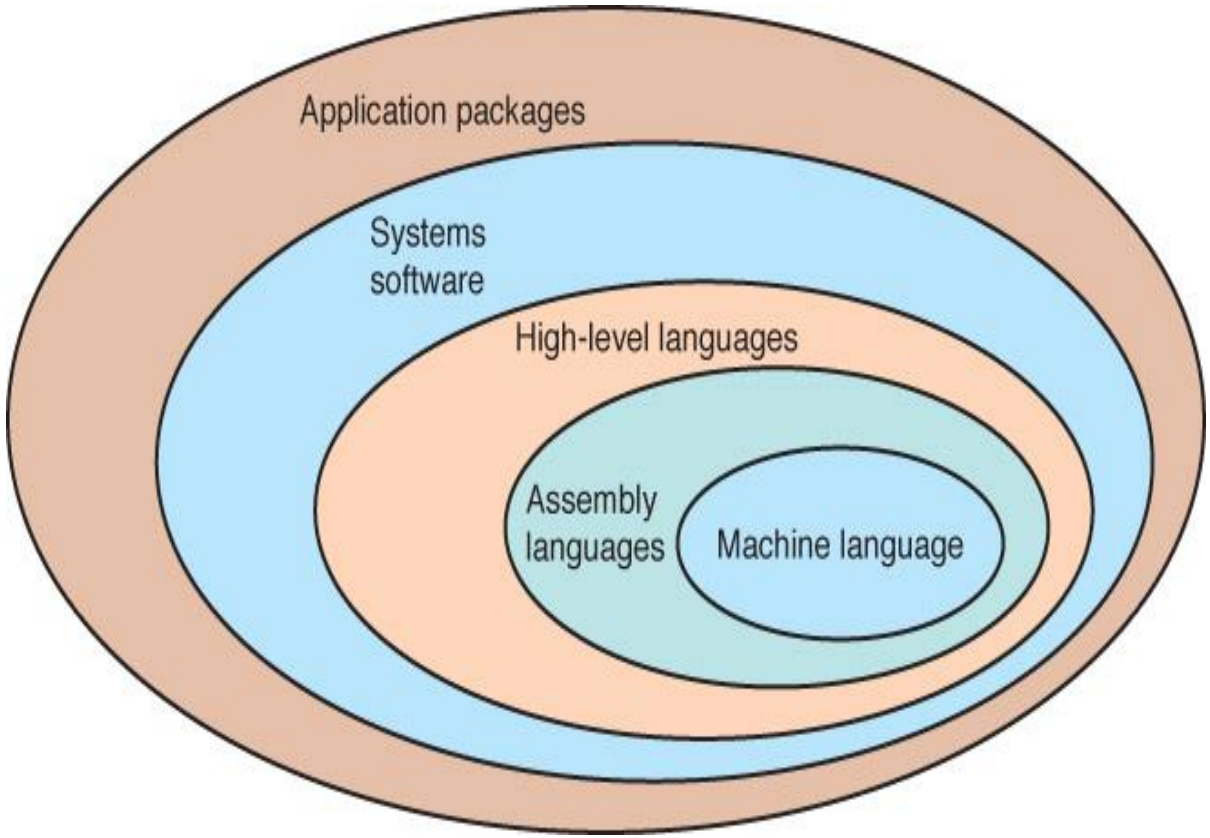
Language translators

Operating system, which decides which programs to run and when

Separation between Users and Hardware

Computer programmers write programs to be used by general public (i.e., nonprogrammers)

Third Generation Software (1965–1971)



Fourth Generation Software (1971–1989)

Structured Programming

Pascal
C
C++

New Application Software for Users

Spreadsheets
Word processors
Database management systems

Fifth Generation Software (1990- present)

Microsoft

Windows operating system and other Microsoft application programs dominate the market

Object-Oriented Design

Based on a hierarchy of data objects (i.e. Java)

World Wide Web

Allows easy global communication through the Internet

New Users

Today's user needs no computer knowledge

Computing as a Tool