Introduction to Computing

Chapter 1 – The Big Picture

A Computing System

The History of Computing

Computing as a Tool & a Discipline

Part 1

A Computing System

A Computing System

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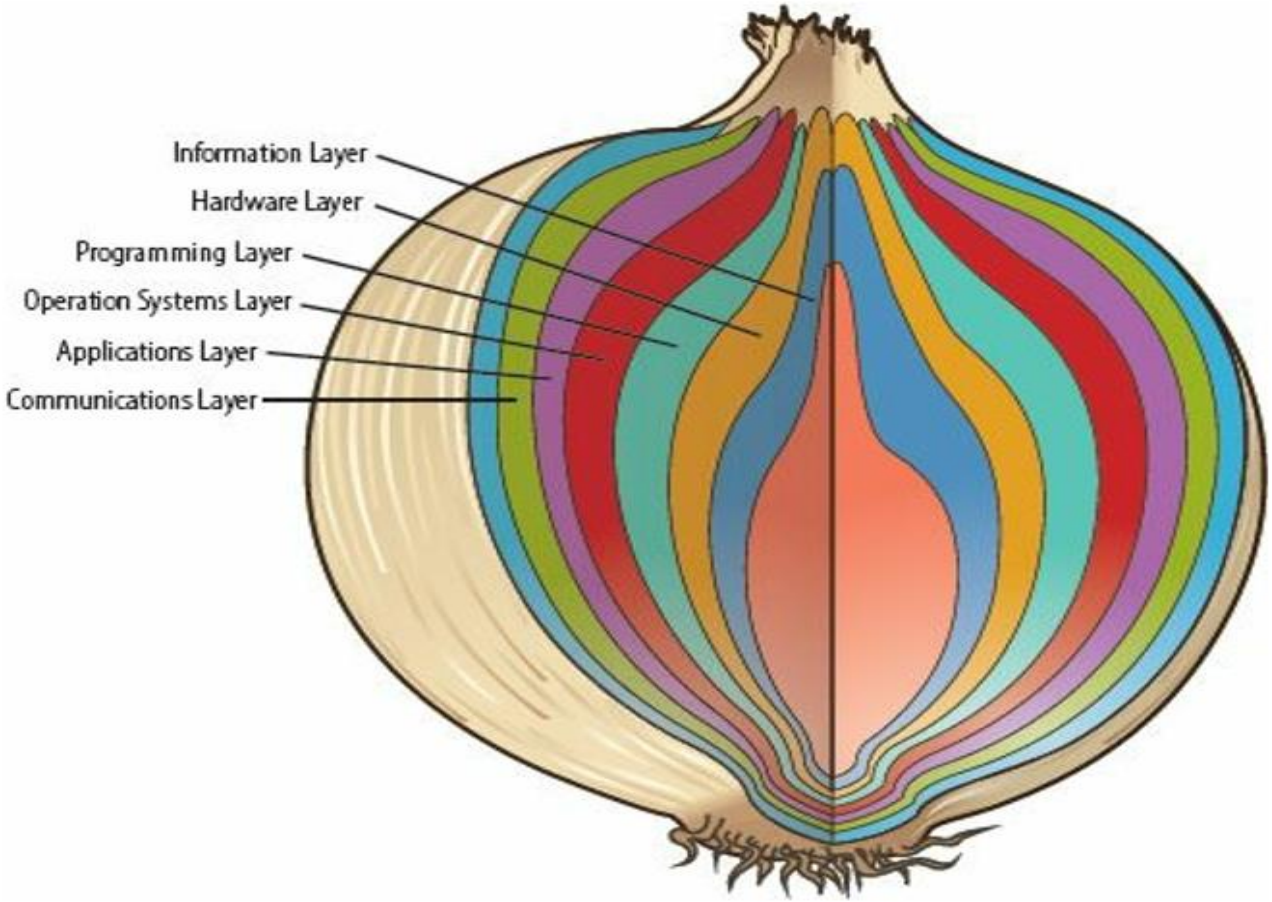
- A computer is just a device
- A computing system: dynamic entity, consists of:
  - Hardware: The physical elements of a computing system (printer, circuit boards, wires, keyboard…)
  - Software: The programs that provide the instructions for a computer to execute
  - Data

→ solve problems

Layers of a Computing System



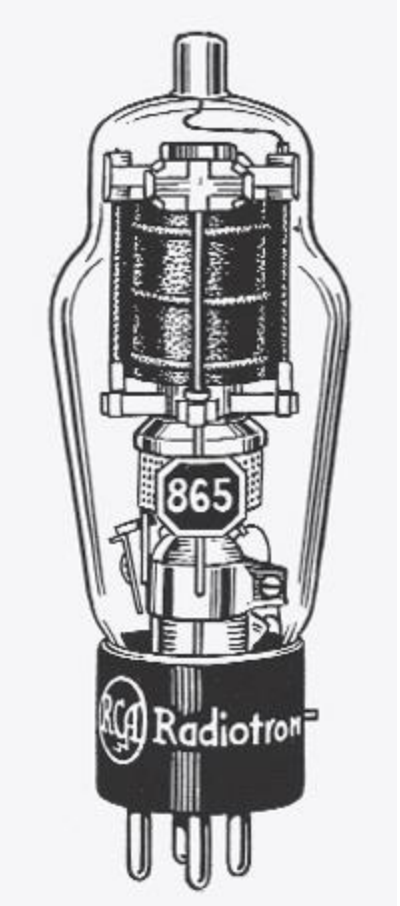
- This is just **one of the views** about parts of computing systems

Part 2

The History of Computing

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)

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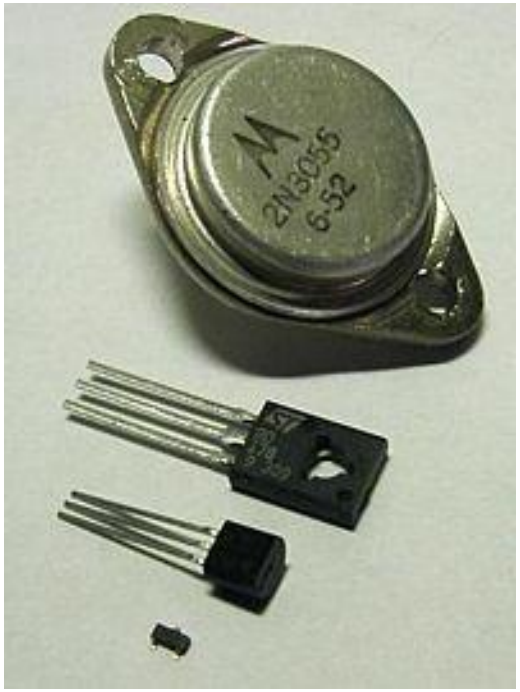
- **Transistor**
  - Replaced vacuum tube, fast, small, durable, cheap
- **Magnetic Cores**
  - Replaced magnetic drums, information available instantly
- **Magnetic Disks**
  - Replaced magnetic tape, data can be accessed directly



Third Generation Hardware (1965-1971)

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- **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-?)

SCSE

- **Large-scale Integration**
  - Great advances in chip technology
- **PCs, the Commercial Market, Workstations**
  - Personal Computers were developed
  - Workstations emerged.

IBM Roadrunner

Parallel Computing and Networking

SCSE

- **Parallel Computing**
  - Computers rely on interconnected central processing units that increase processing speed.
- **Networking**
  - With the Ethernet small computers could be connected and share resources. A file server connected PCs in the late 1980s.
- **ARPANET and LANs → Internet**

First Generation Software (1951-1959)

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Machine Language

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

Assembly Languages and translators

Programs were written in artificial programming languages and were then translated into machine language

Programmer Changes

Programmers divide into application programmers and systems programmers

Second Generation Software (1959-1965)

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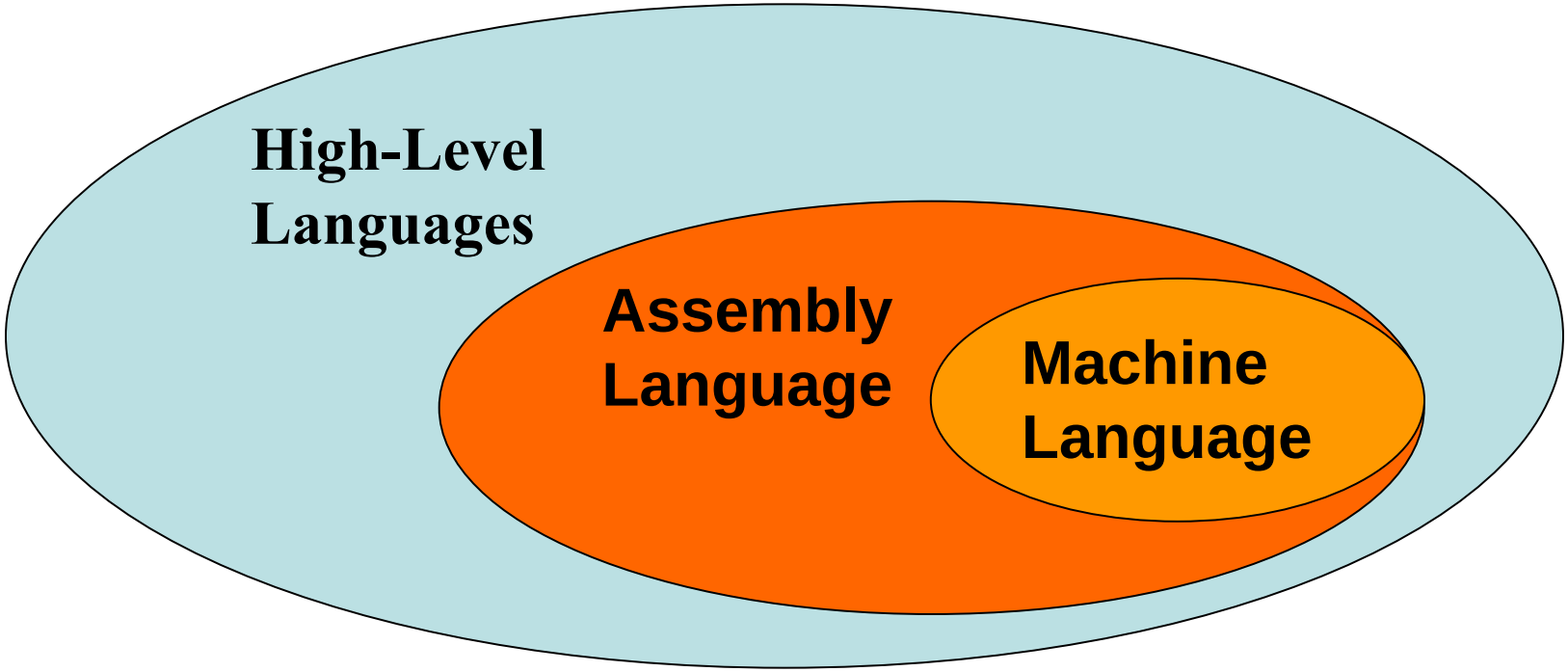
High Level Languages

Use English-like statements and make programming easier.
Fortran, COBOL, Lisp are examples.



Third Generation Software (1965-1971)

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- **Systems Software**
  - utility programs,
  - language translators,
  - and the operating system, which decides which programs to run and when.
- **Separation between Users and Hardware**

  Computer programmers began to write programs to be used by people who did not know how to program

Third Generation Software (1965-1971)

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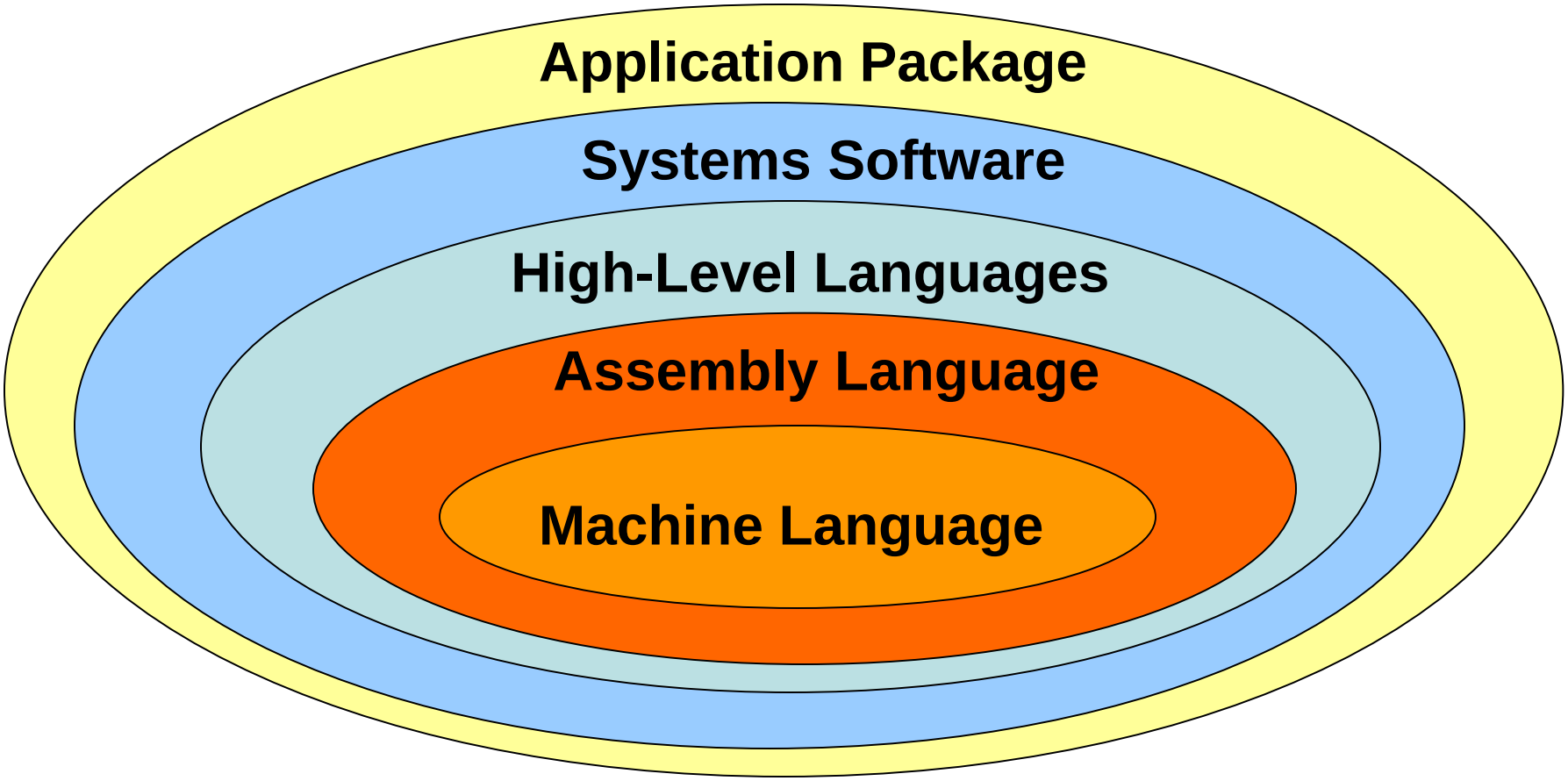

Fourth Generation Software (1971-1989)

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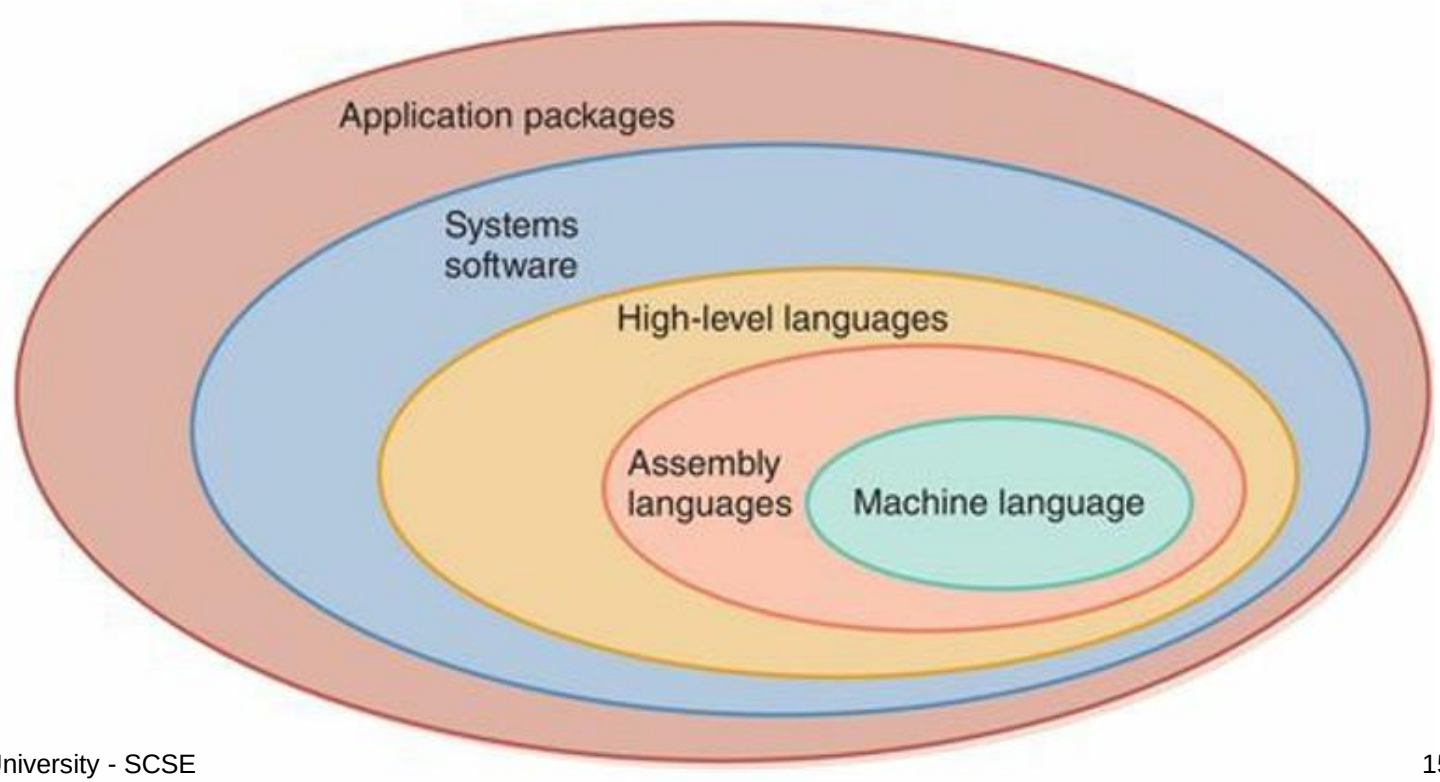
Structured Programming: Pascal, C, C++

New Application Software for Users: Spreadsheets, word processors, database management systems



Fifth Generation Software (1990- present)

SCSE

Microsoft

The 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

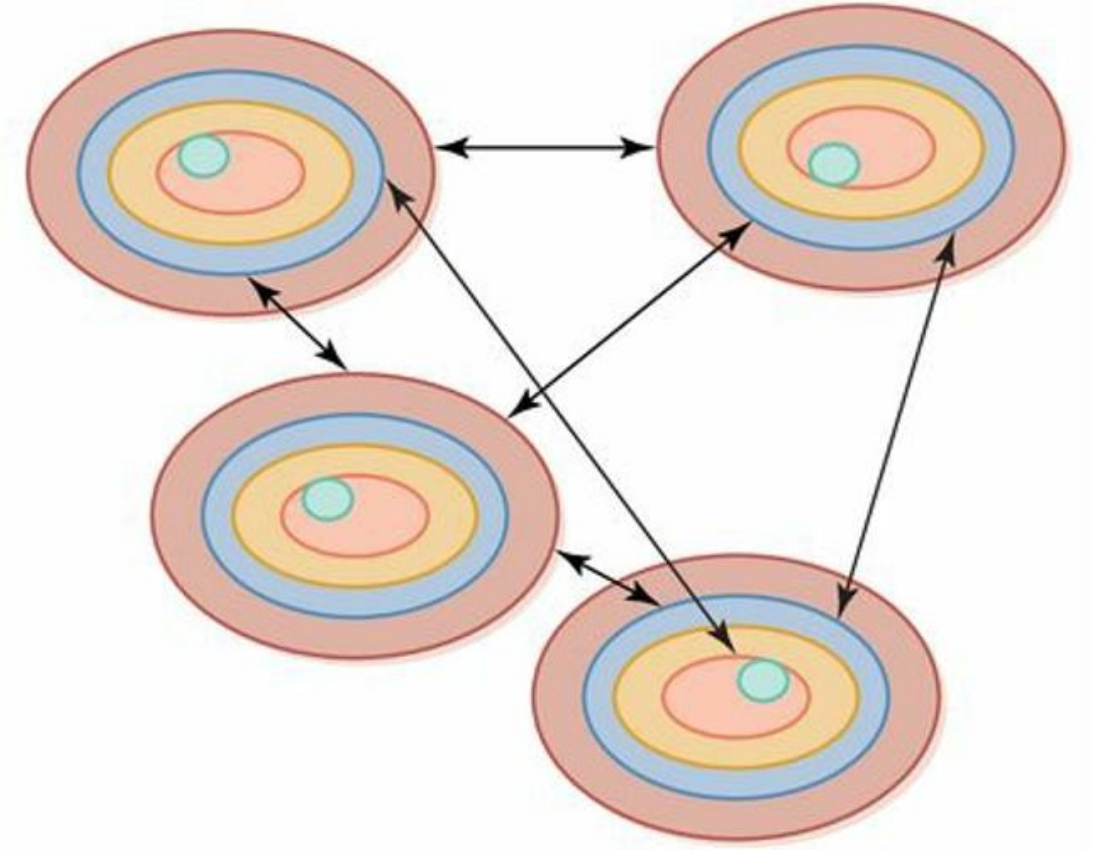
Allows easy global communication through the Internet

New Users

Today's user needs no computer knowledge

Fifth Generation Software (1990- present)

SCSE



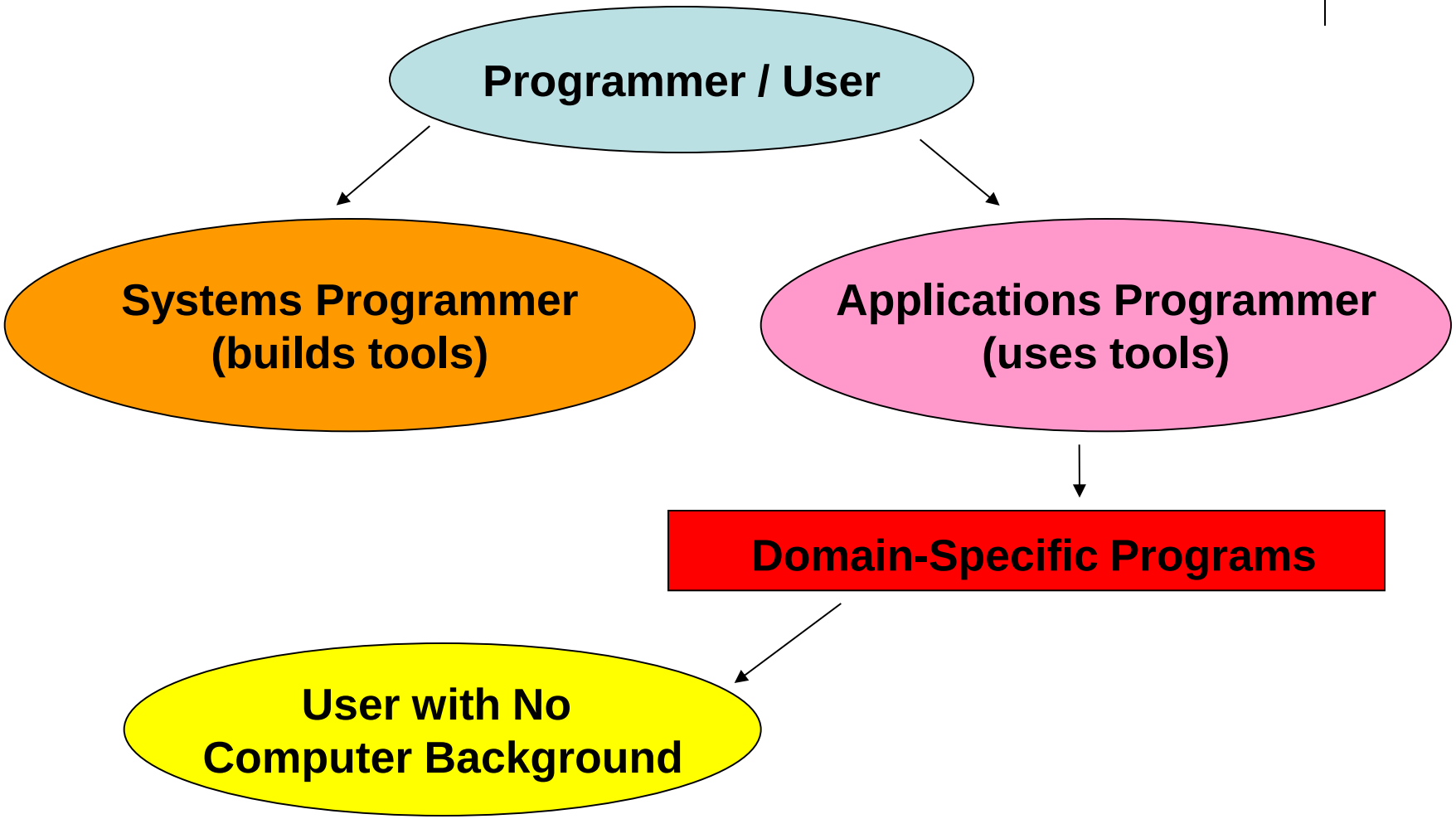
SharinginformationontheWorld WideWeb

Part 3

Computing as a Tool & a Discipline

Computing as a Tool

SCSE



Computing as a Discipline

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Four Necessary Skills

1. Algorithmic Thinking
2. Representation
3. Programming
4. Design

Review

SCSE

1. What are the main components of a computing system?

A) Memory, Storage, and CPU
B) Hardware, Software, and Data
C) Hardware, Firmware, and Middleware
D) Input, Output, and Storage

B) Memory, Storage, and CPU

SCSE

2. What technology replaced vacuum tubes in the second generation of computing hardware?

A) Magnetic Drums
B) Transistors
C) Integrated Circuits
D) Magnetic Disks

B) Transistors

SCSE

3. What was a major characteristic of third-generation hardware (1965-1971)?

A) Use of vacuum tubes
B) Development of magnetic tapes
C) Introduction of integrated circuits
D) Introduction of large-scale integration

C) Introduction of integrated circuits

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4. What is an example of a high-level programming language from the second generation of software?

AA) Assembly

B) Machine Language

C) Fortran

D) Python

C) Fortran

SCSE

5. Which of the following is a characteristic of the fifth generation of software?

A) Assembly languages
B) Structured programming
C) Object-Oriented Design
D) Vacuum tubes

C) Object-Oriented Design

SCSE

6. Which of these is NOT considered a necessary skill in computing as a discipline?

A) Algorithmic Thinking
B) Data Entry
C) Representation
D) Programming

B) Data Entry

SCSE

7. Which hardware development led to the creation of personal computers (PCs)?

A) Transistors
B) Magnetic Cores
C) Large-scale Integration
D) Vacuum Tubes

C) Large-scale Integration

SCSE

8. What enabled the creation of networks and resource sharing among computers in the 1980s?

A) Integrated Circuits
B) Ethernet
C) Magnetic Disks
D) Assembly Language

B) Ethernet

SCSE

9. What type of software was developed during the third generation (1965-1971)?

A) Object-Oriented Software
B) Systems Software, such as operating systems
C) Spreadsheet applications
D) High-Level Languages like Python

B) Systems Software, such as operating systems

SCSE

10. Which programming languages are associated with structured programming in the fourth generation of software?

A) Python, Java, Ruby
B) Fortran, COBOL, Lisp
C) Pascal, C, C++
D) HTML, CSS, JavaScript

C) Pascal, C, C++

Quiz 1
by individual

SCSE

1. Summarize the history of hardware, software.

2. List at least three reasons why you choose SCSE to study and describe the future job you wish.