Introduction to Computing
Section 1 – The Big Picture

A Computing System

The History of Computing

Computing as a Tool & a Discipline
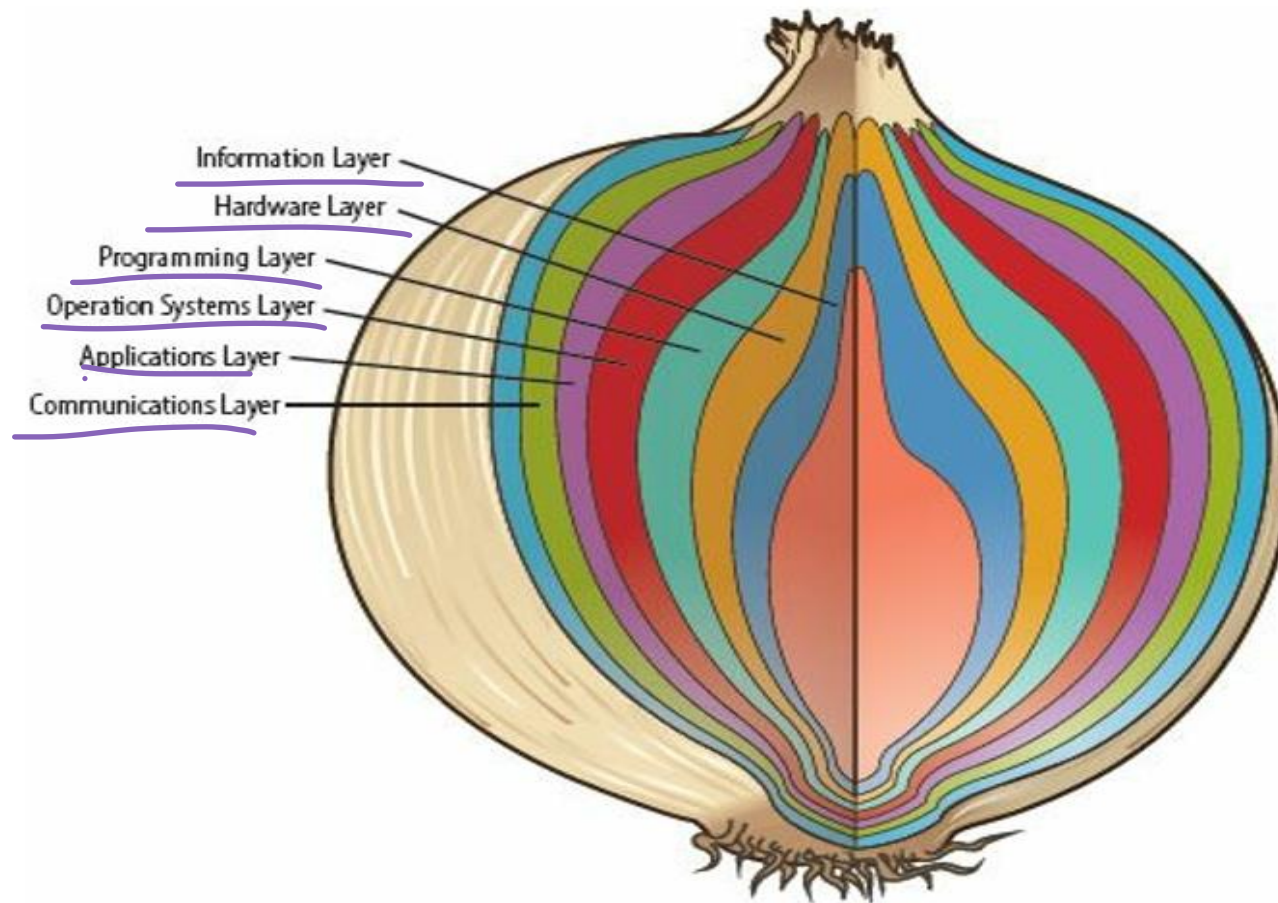
Part 1

A Computing System

A Computing System

to solve problem

hardware
software

Data

- 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

Information Layer
Hardware Layer
Programming Layer
Operation Systems Layer
Applications Layer
Communications Layer

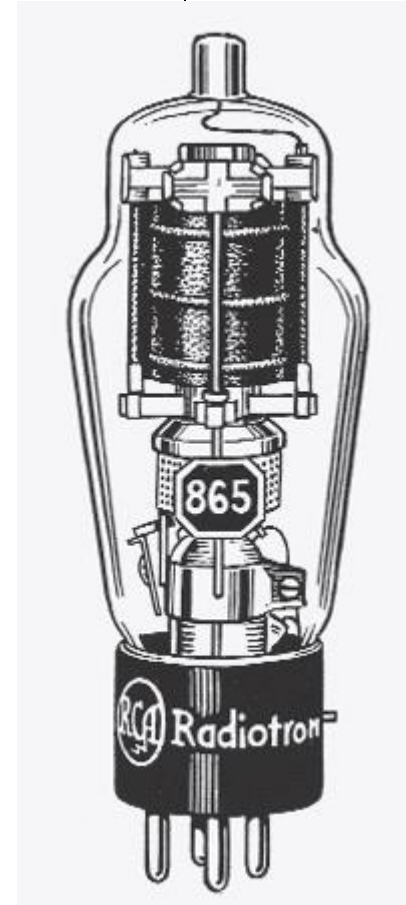- This is just **one of the views** about parts of computing systems

Part 2

The History of Computing

First Generation Hardware (1951-1959) *1950S*

- **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) 1960s

- **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)

1960s

- **Integrated Circuits**
  - Replaced circuit boards, smaller, cheaper, faster, more reliable.

- **Transistors**
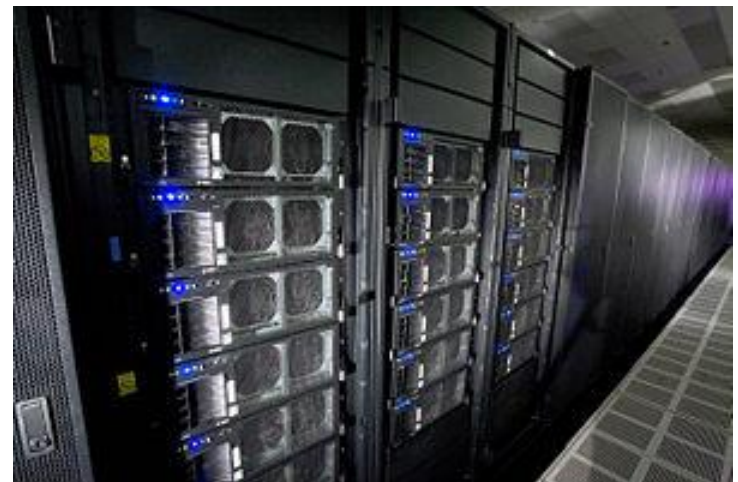 - Now used for memory construction

- **Terminal**
  - An input/output device with a keyboard and screen

Fourth Generation Hardware (1971-?)

1970s

- **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

- **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**

End of Hardware

First Generation Software (1951-1959) 1950s

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
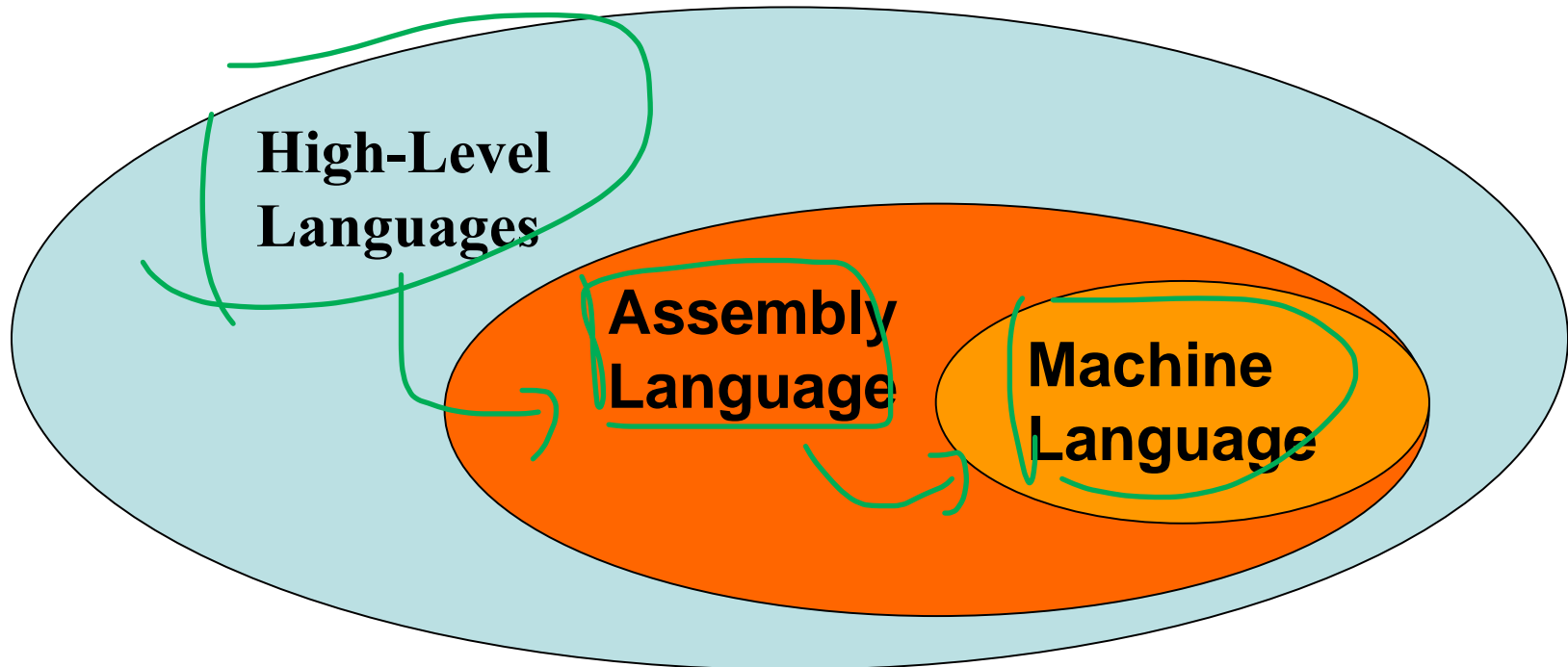
Programmer Changes
Programmers divide into application programmers and systems programmers

Second Generation Software (1959-1965)

High Level Languages

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

High-Level Languages

Assembly Language

Machine Language

Third Generation Software (1965-1971)

*[handwritten: 1970S]*

- 🔵 **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

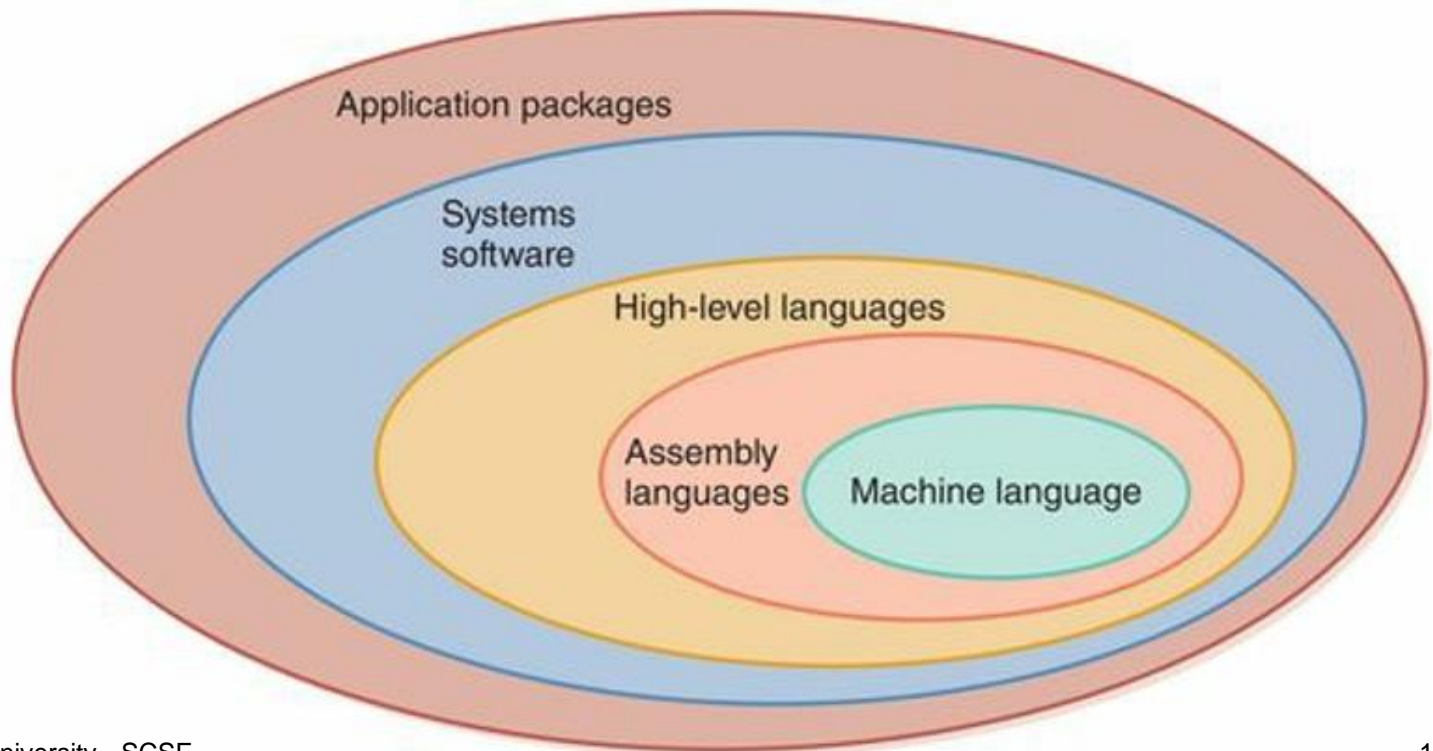*[handwritten: User → program → Hardware]*

Third Generation Software (1965-1971)

Application Package

Systems Software

High-Level Languages

Assembly Language

Machine Language
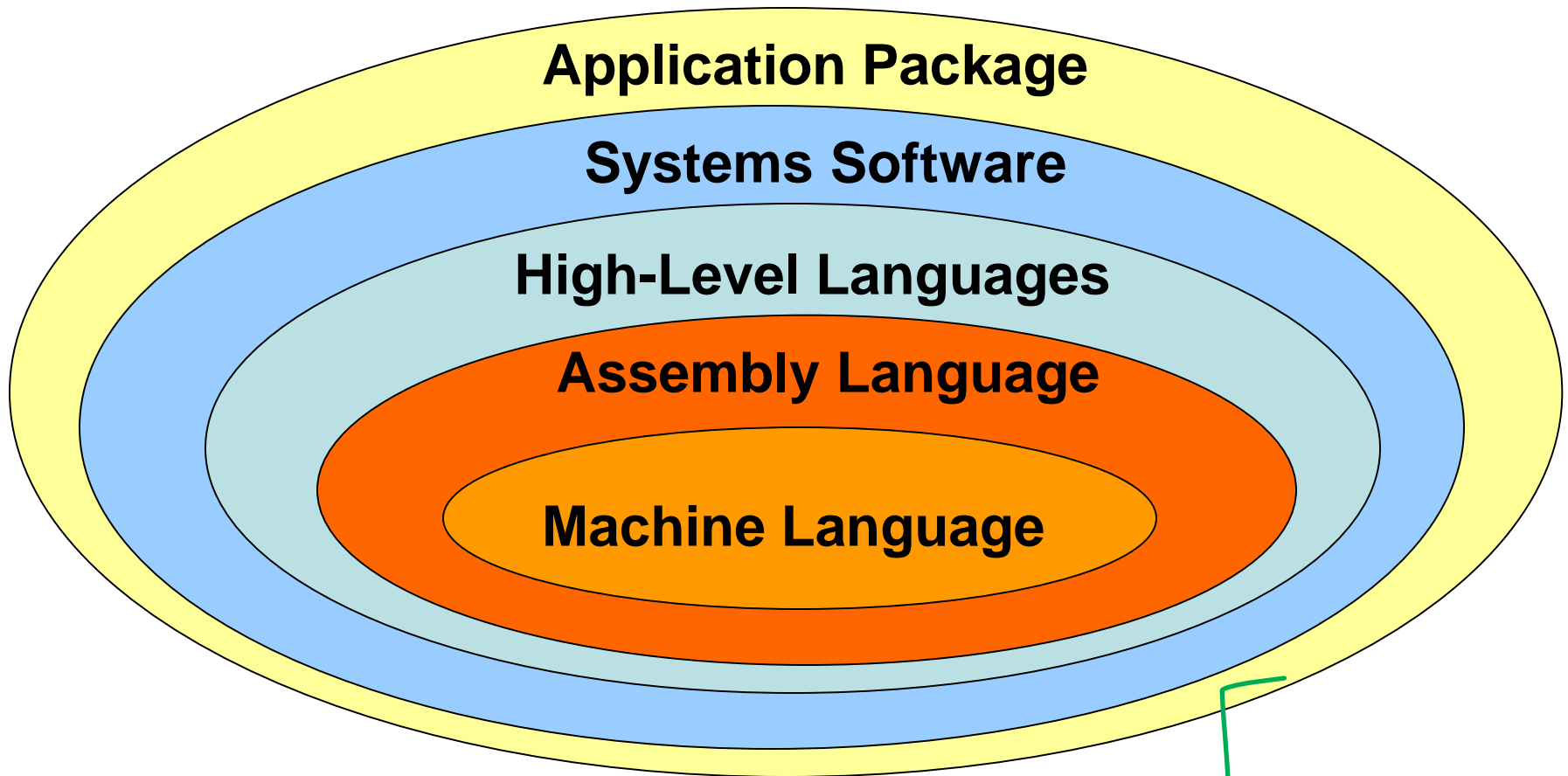
Fourth Generation Software (1971-1989)

Structured Programming: Pascal, C, C++
New Application Software for Users: Spreadsheets, word processors, database management systems

Fifth Generation Software (1990- present)

Microsoft

The Windows operating system, and other Microsoft application programs dominate the market

Object-Oriented Design

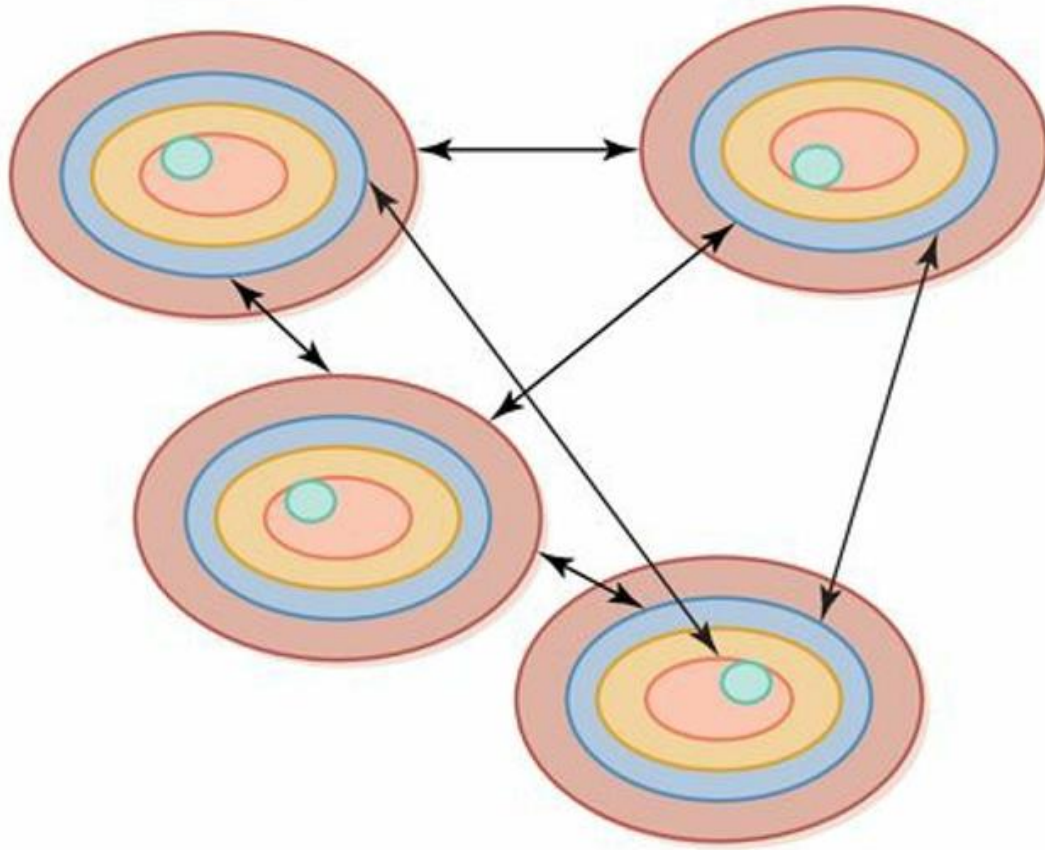Based on a hierarchy of data objects (i.e. Java)

World Wide Web

Allows easy global communication through the Internet

New Users

Today's user needs no computer knowledge

Fifth Generation Software (1990- present)
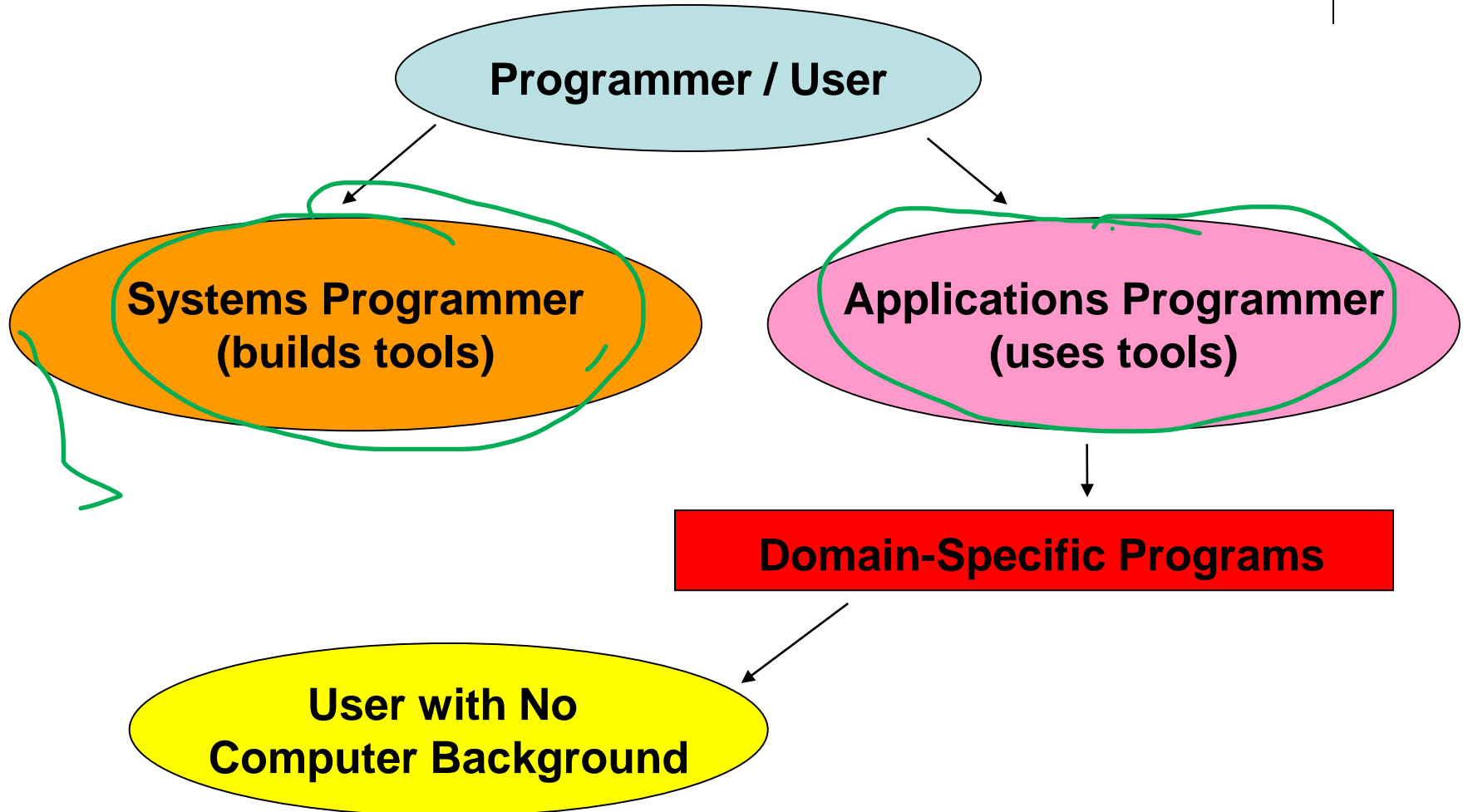

SharinginformationontheWorld WideWeb

Part 3

Computing as a Tool & a Discipline

Computing as a Tool

Programmer / User

Systems Programmer (builds tools)

Applications Programmer (uses tools)

Domain-Specific Programs

User with No Computer Background

Computing as a Discipline

Four Necessary Skills

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

Quiz 1
by individual

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.