Programming for Engineers

Introduction

ICEN 200– Spring 2018

Prof. Dola Saha

Introductions

- Instructor
  - Prof. Dola Saha, PhD University of Colorado Boulder
  - http://www.albany.edu/faculty/dsaha/
  - dsaha@albany.edu
- Teaching Assistant
  - Jorge Gomez
- Students

Information

- Course Website:
  - https://www.albany.edu/faculty/dsaha/teach/2018Spring_CEN200/2018Spring_CEN200.html
- Blackboard:
  - https://blackboard.albany.edu/

Course Website	Blackboard
Lecture Slides	Homework Assignments
Class Calendar / Schedule	Homework Submission
Other Information	Homework Solutions
	Announcements
	Grades

Office Hours

Instructor	Teaching Assistant
LI 89B	LI 89
Monday – 12:30-1:30pm	Tuesday – 12-1pm
Wednesday – 11:30-12:30pm	Thursday – 11-12pm
By appointment	

Textbooks

- Required:
  - "C How to Program, 8th Edition", Paul Deitel and Harvey Deitel, Pearson

- Reference:
  - "The C Programming Language", Brian W. Kernighan and Dennis Ritchie, Pearson
  - "Problem Solving and Program Design in C", Jeri R. Hanly and Elliot B. Koffman, Pearson

Assignments & Grading

- Assignments
  - No late assignments will be accepted.
  - All assignments are due by 11:59PM on the due date in Blackboard.
  - Re-grading requests will be considered up to 5 business days after posting the grades for the corresponding assignment.
- Grading
  - Attendance - 5%
  - Lab Assignments - 15%
  - Homework Assignments - 20%
  - Midterm 1 - 20%
  - Midterm 2 - 20%
  - Final Exam - 20%

Academic Integrity

- Undergraduate Academic Regulations
  - http://www.albany.edu/undergraduate_bulletin/regulations.html
- Academic Dishonesty
  - Plagiarism, Cheating on examinations, unauthorized collaboration, etc.
- Practicing Academic Integrity
  - Citation
- Penalties for Violation
  - Warning, lowering grade, failing grade

What is Plagiarism?

- Getting code from the Internet
- Asking someone else to write the code for you
- Copying your friend's code

In Class Decorum

- No use of phones
- No use of Computers / laptops
- Computers will be used only when directed in the class
- DO NOT browse random things in class
- No crosstalk
- No Food/Drink
- Raise hand to ask questions

Why this course?

By end of the semester

- Demonstrate basic proficiency in the C programming language.
- Formulate algorithms to solve basic computational problems.
- Construct larger programs by identifying and solving sub-problems.
- Apply basic concepts of software engineering.
- Apply pointers, arrays, and structures correctly.
- Apply dynamic memory allocation correctly.
- Apply basic I/O operations to read and write data files.
- Understand the basic concepts of algorithmic complexity.
- Apply basic architectural concepts to program design.

Course Calendar

- https://www.albany.edu/faculty/dsaha/teach/2018Spring_CEN200/2018Spring_CEN200.html

Practical use of Computers & Programming

- Electronic Health Records
- Human Genome Project
- AMBER Alert
- World Community Grid
- Medical Imaging
- One laptop per child
- Cloud Computing
- GPS
- Robots
- Email, Social Network
- Internet TV
- Game Programming

Computers: Hardware & Software

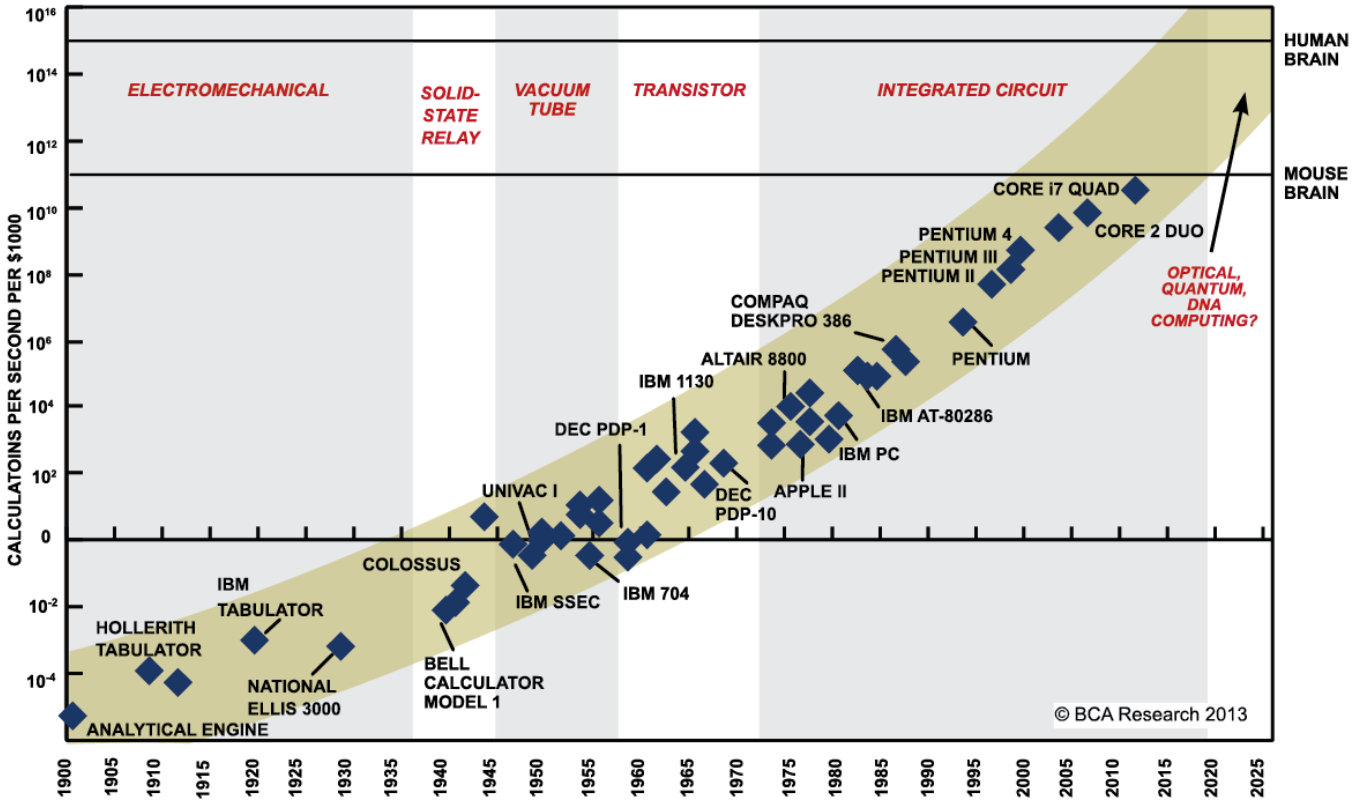
- In use today are
  - more than a billion general-purpose computers, and
  - billions more *embedded* computers are used in cell phones, smartphones, tablet computers, home appliances, automobiles and more.
- Computers can perform computations and make logical decisions phenomenally faster than human beings can

Terminology

- Computers process data under the control of sets of instructions called computer programs
- These programs guide the computer through ordered actions specified by people called computer programmers
- The programs that run on a computer are referred to as software

Moore's Law

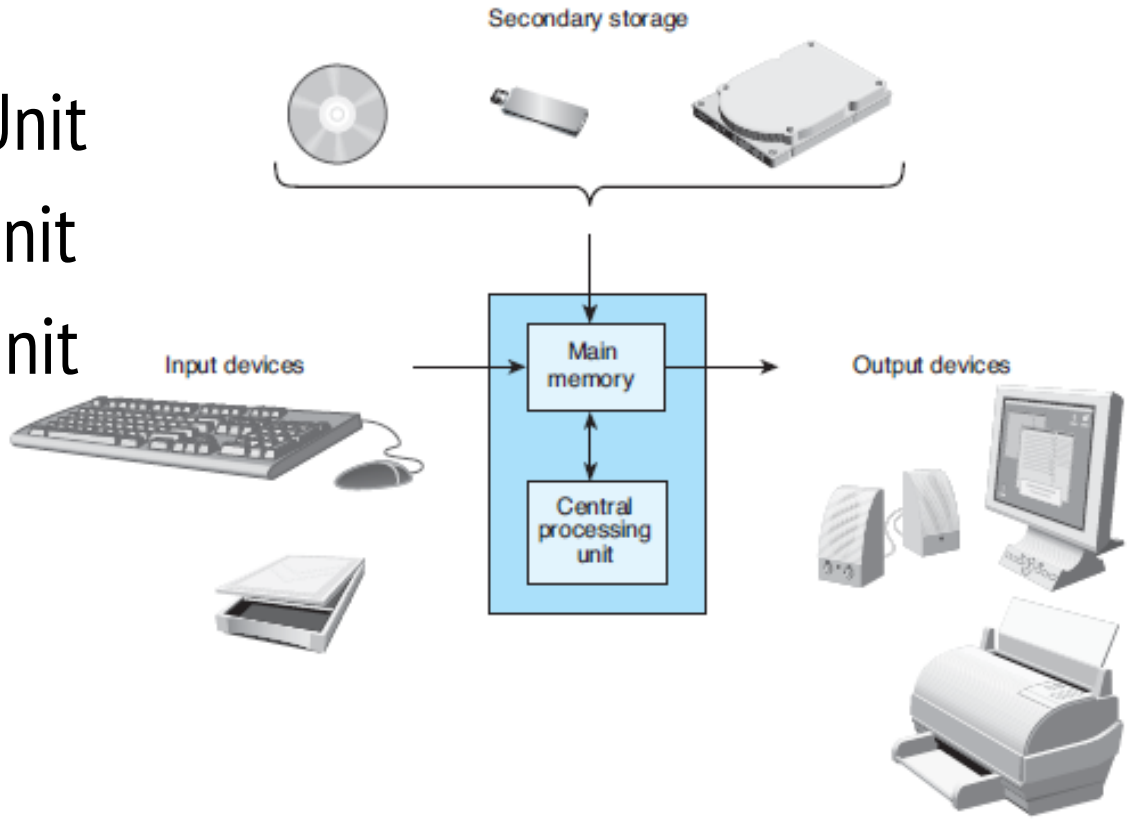
- The number of transistors in a dense integrated circuit doubles approximately every two years.



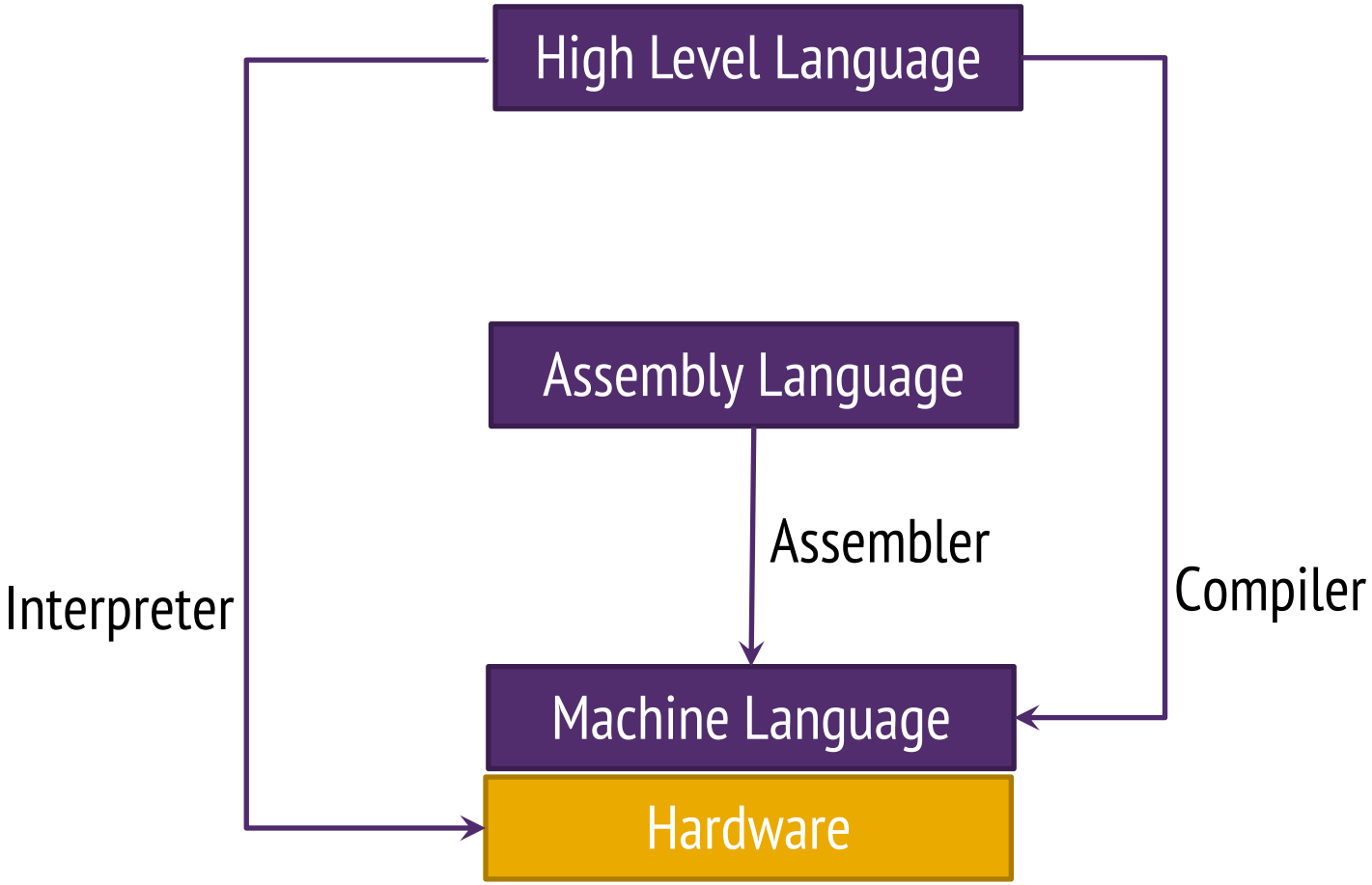
SOURCE: RAY KURZWEIL, "THE SINGULARITY IS NEAR: WHEN HUMANS TRANSCEND BIOLOGY", P.67, *THE VIKING PRESS*, 2006. DATAPOINTS BETWEEN 2000 AND 2012 REPRESENT BCA ESTIMATES.

Computer Organization

- Input Unit
- Output Unit
- Memory Unit
- Arithmetic & Logic Unit
- Central Processing Unit
- Secondary Storage Unit



Programming Languages



The C Language

- Currently, the most commonly-used language for embedded systems
- Very portable: compilers exist for virtually every processor
- Easy-to-understand compilation
- Produces efficient code
- Fairly concise

C History

- Developed between 1969 and 1973 along with Unix
- Due mostly to Dennis Ritchie
- Designed for systems programming
  - Operating systems
  - Utility programs
  - Compilers
  - Filters
- Evolved from B, which evolved from BCPL

C History

- Original machine (DEC PDP-11) was very small
  - 24K bytes of memory, 12K used for operating system
- Written when computers were big, capital equipment
  - Group would get one, develop new language, OS

C – Built for Performance

- Operating Systems
  - Unix, Linux, Android, portions of Windows, OS-X built on Objective C
- Embedded Systems
  - GPS, Intelligent Traffic Alert, Robots
- Real-time Systems
  - Air traffic control, Industrial automation
- Communication Systems
- C-based programming languages
  - Objective C, Java, Visual C#

C Program Development

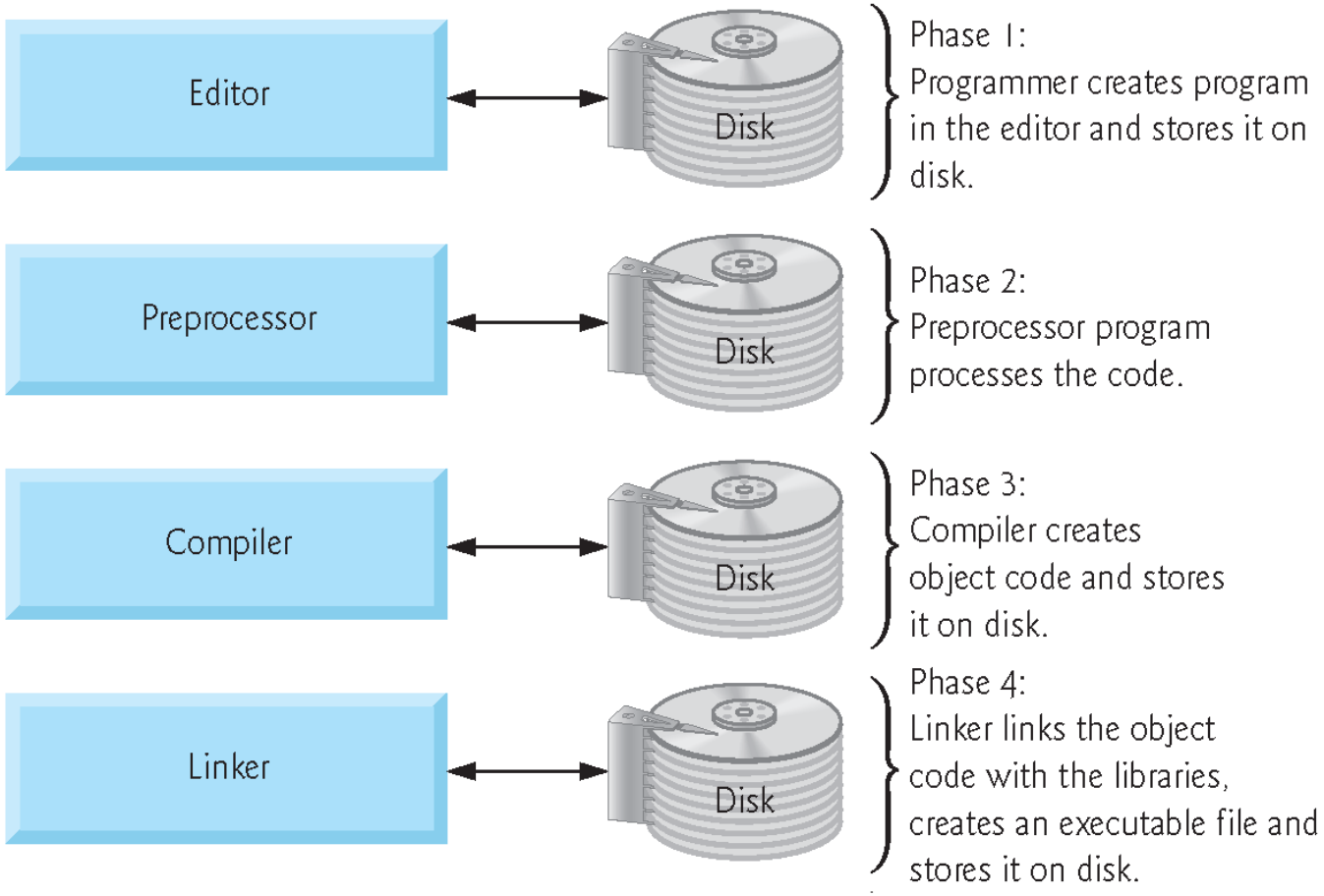


Fig. 1.7 | Typical C development environment. (Part 1 of 3.)

C Program Development

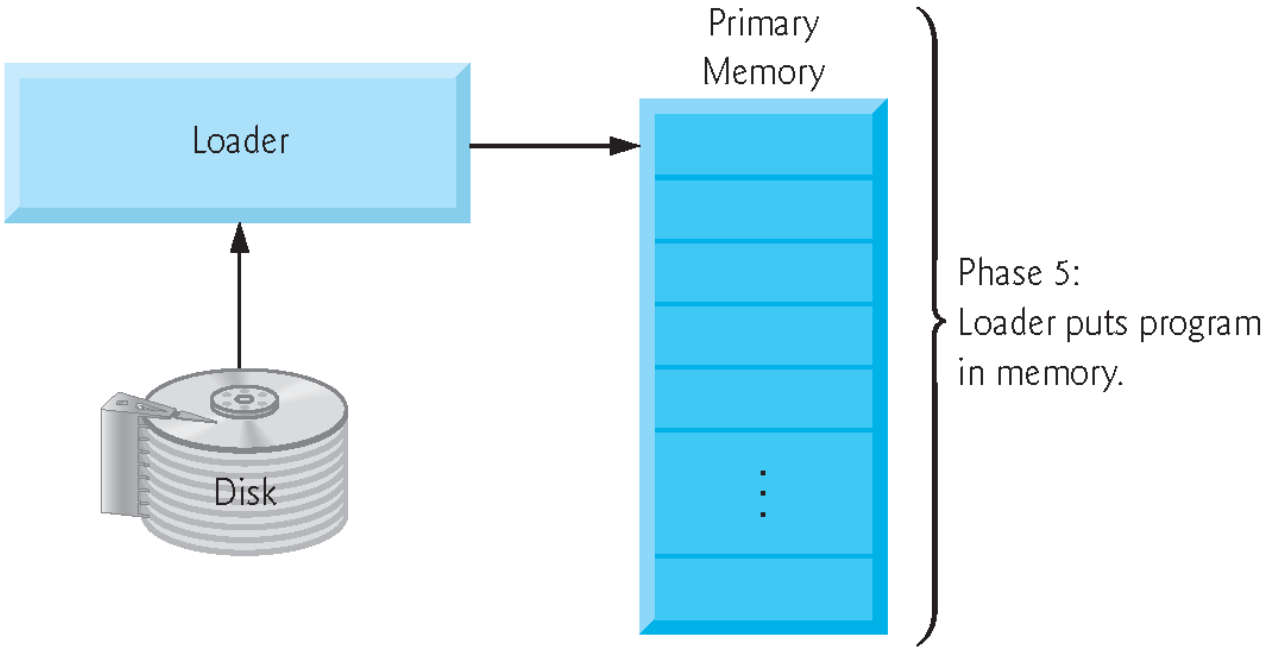


Fig. 1.7 | Typical C development environment. (Part 2 of 3.)

C Program Development

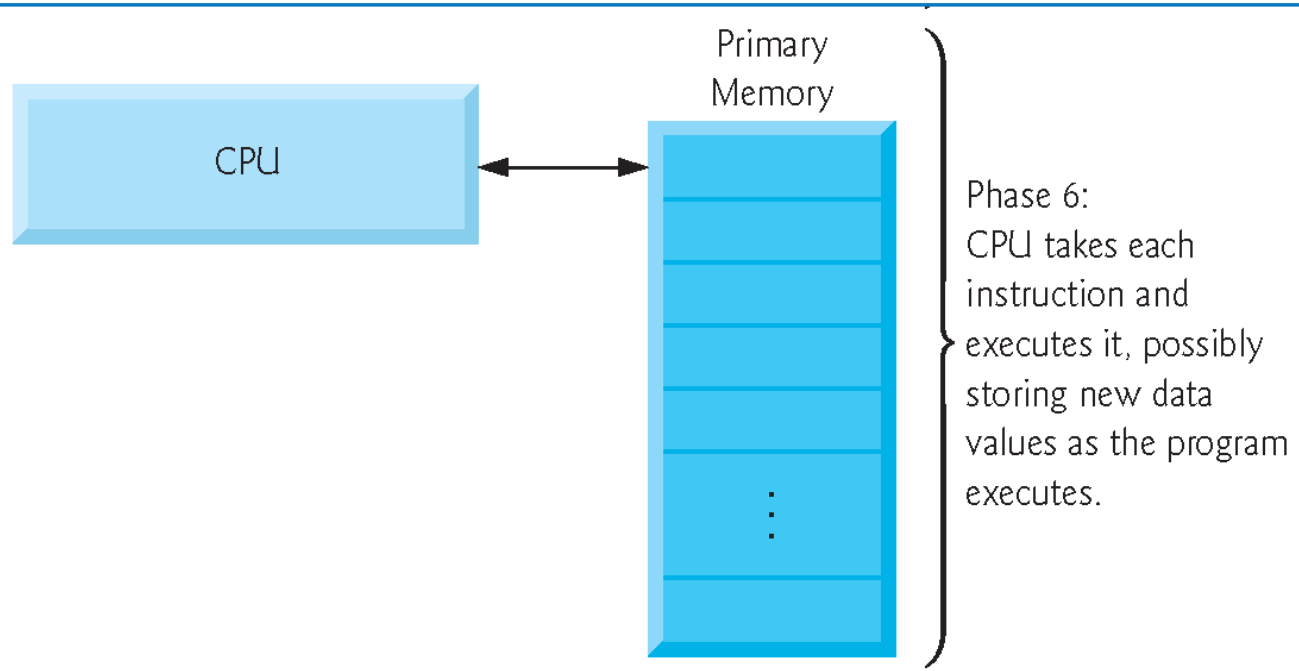


Fig. 1.7 | Typical C development environment. (Part 3 of 3.)

Environment to be used in class

- Cloud 9
  - https://c9.io
  - Invitation will be sent to your albany.edu email to join