

Overview of a System

Systems Programming

(CST-210)

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Outline

- ▶ **Revisit C Compilation**
- ▶ Tour of a Computer System
- ▶ Running a C program
- ▶ Cache Memory
- ▶ Storage Hierarchy
- ▶ Operating System Concepts

Revisit C Compilation

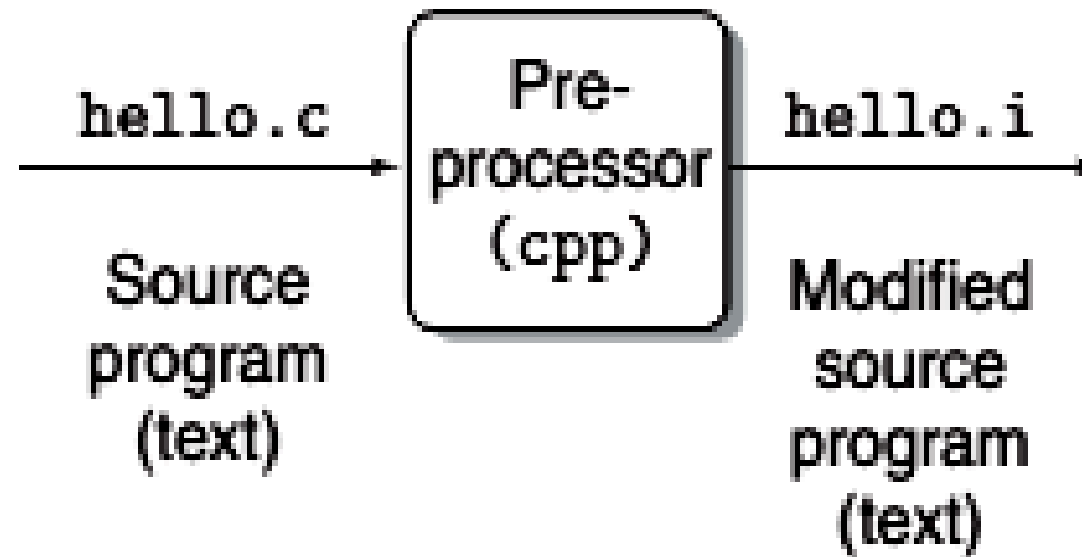
- ▶ A very simple C program:

```
#include<stdio.h>
void main() {
    printf("Hello World \n");
}
```

- ▶ We stored the program in *hello.c*

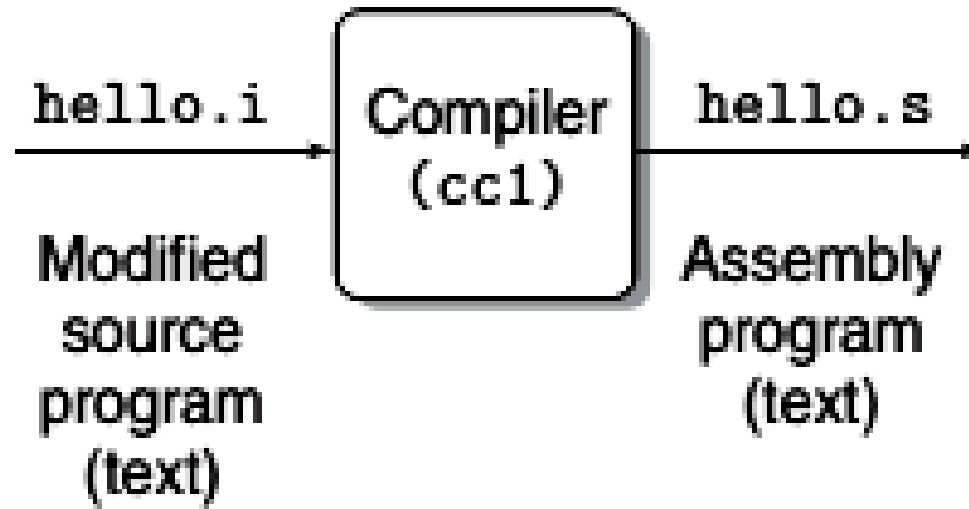
Revisit C Compilation (contd.)

▶ STEP 1:



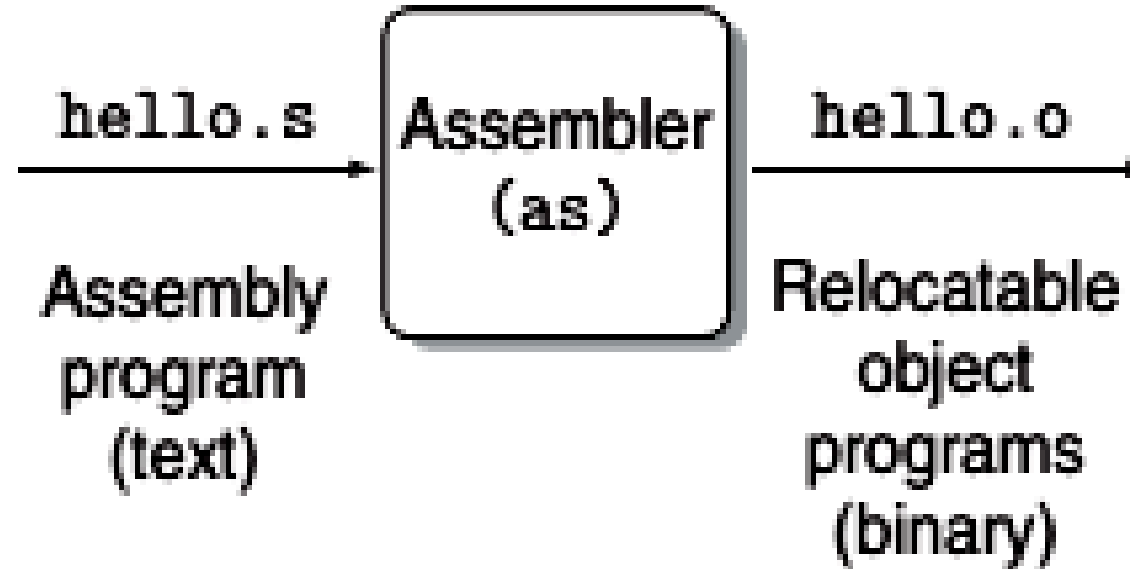
Revisit C Compilation (contd.)

▶ STEP 2:



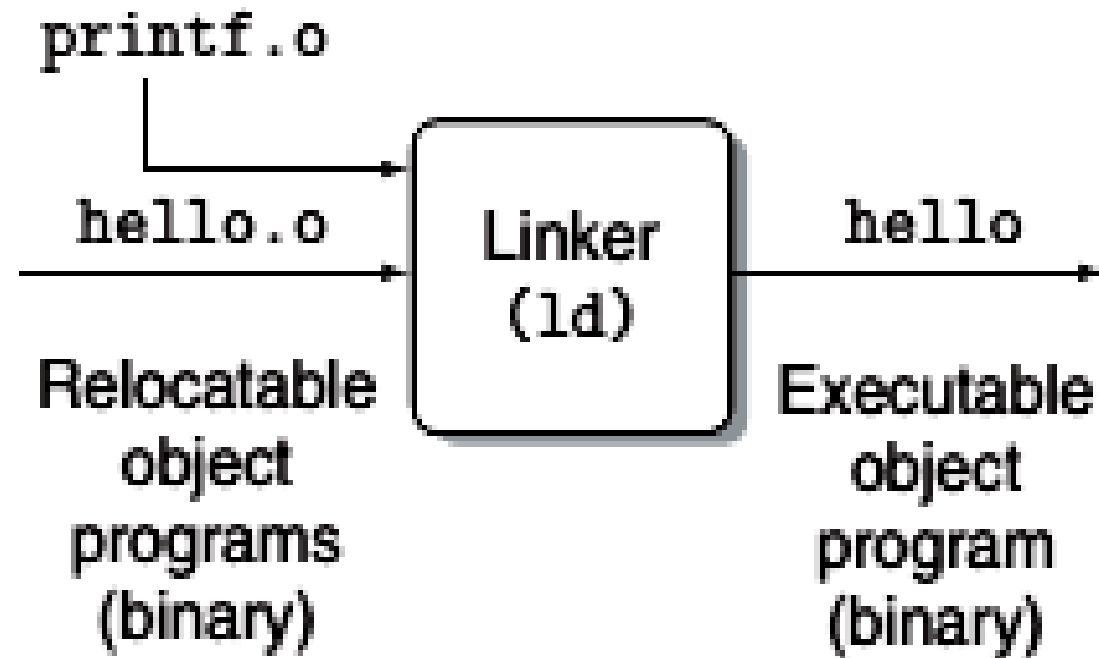
Revisit C Compilation (contd.)

▶ STEP 3

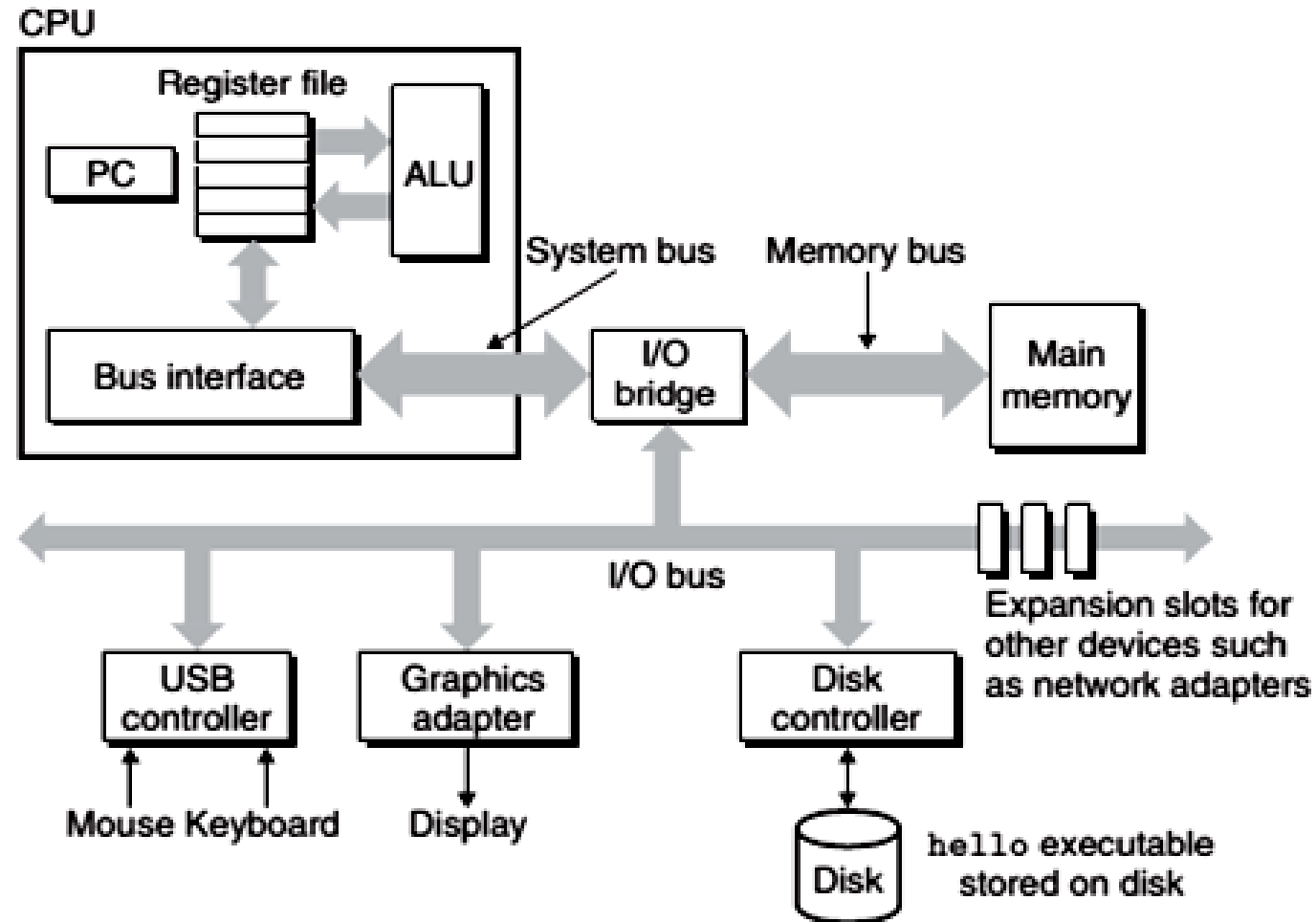


Revisit C Compilation (contd.)

► STEP 4:



Tour of a Computer System



Running a C program

- ▶ Compile:

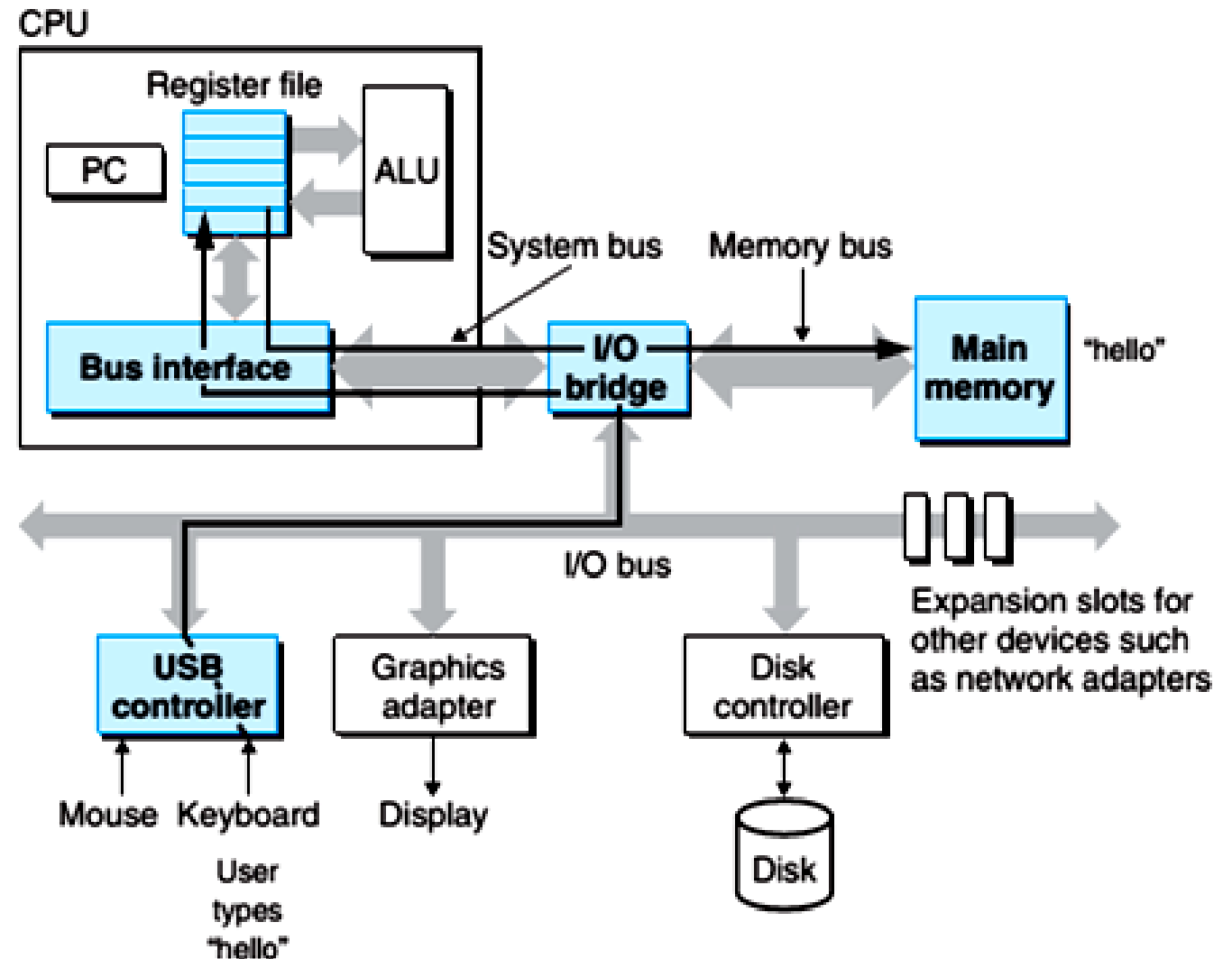
```
$ gcc -o hello hello.c
```

- ▶ Run

```
$ ./hello  
Hello World  
$ _
```

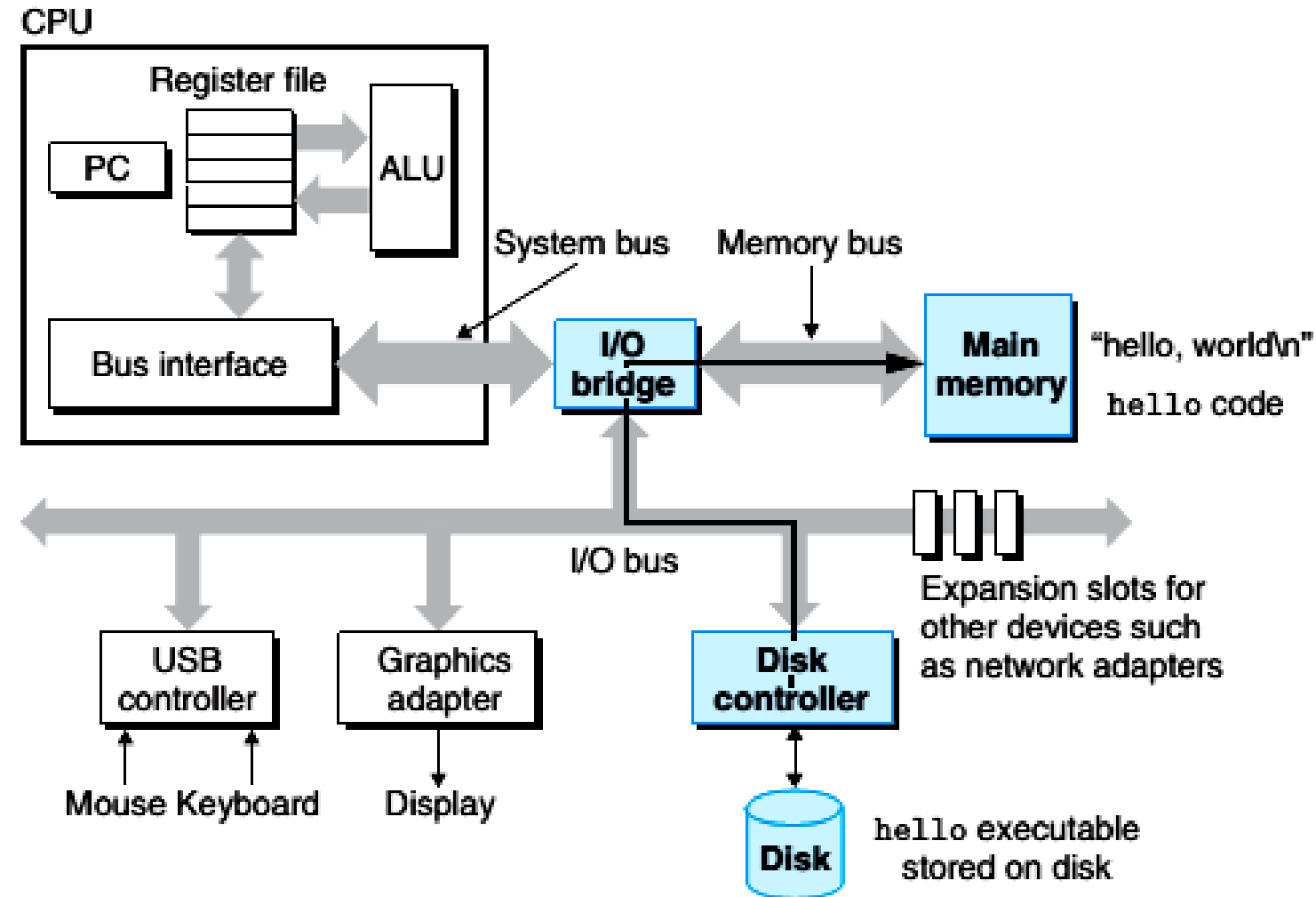
Running a C program (contd.)

- ▶ Reading ./hello



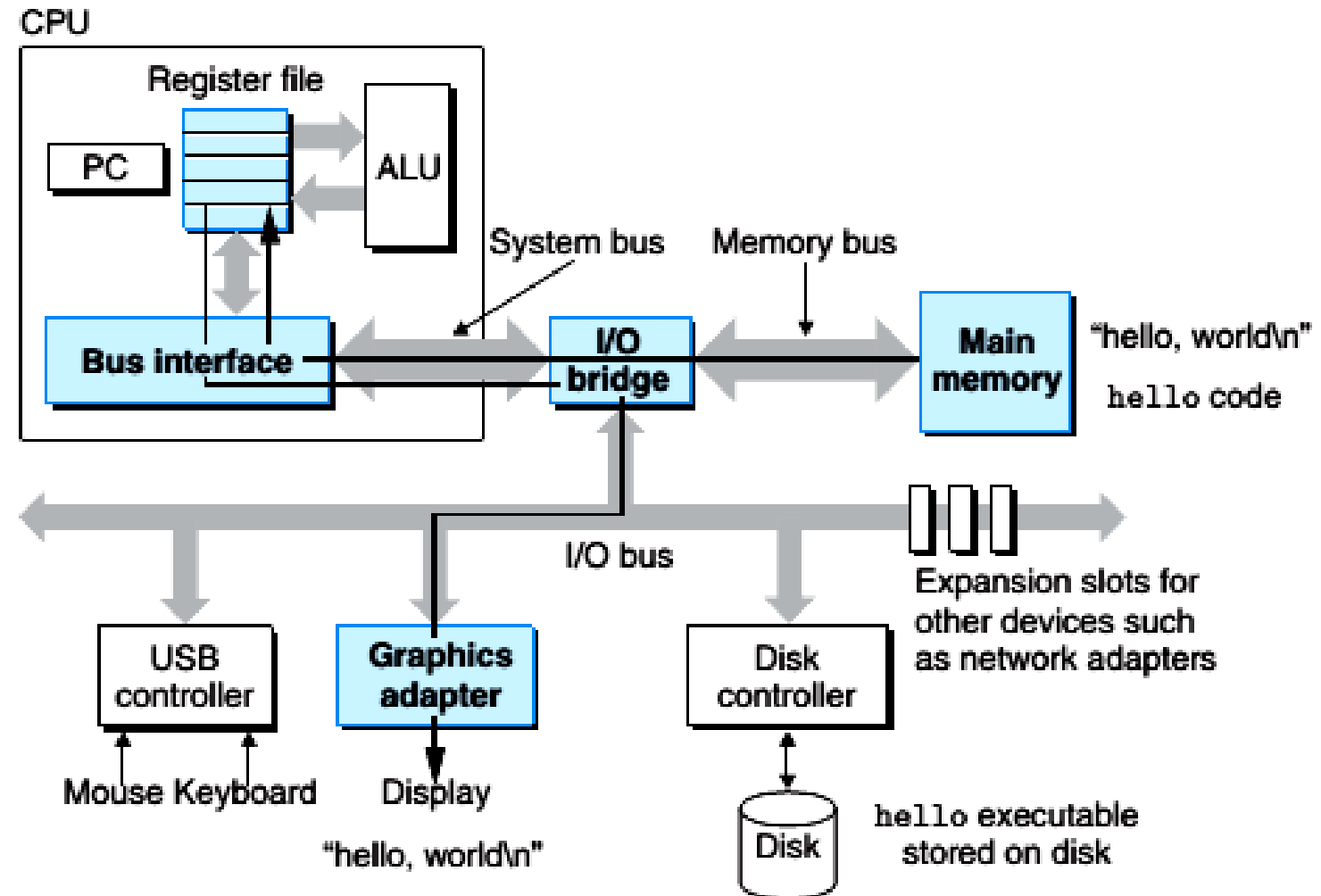
Running a C program (contd.)

- ▶ Loading the executable

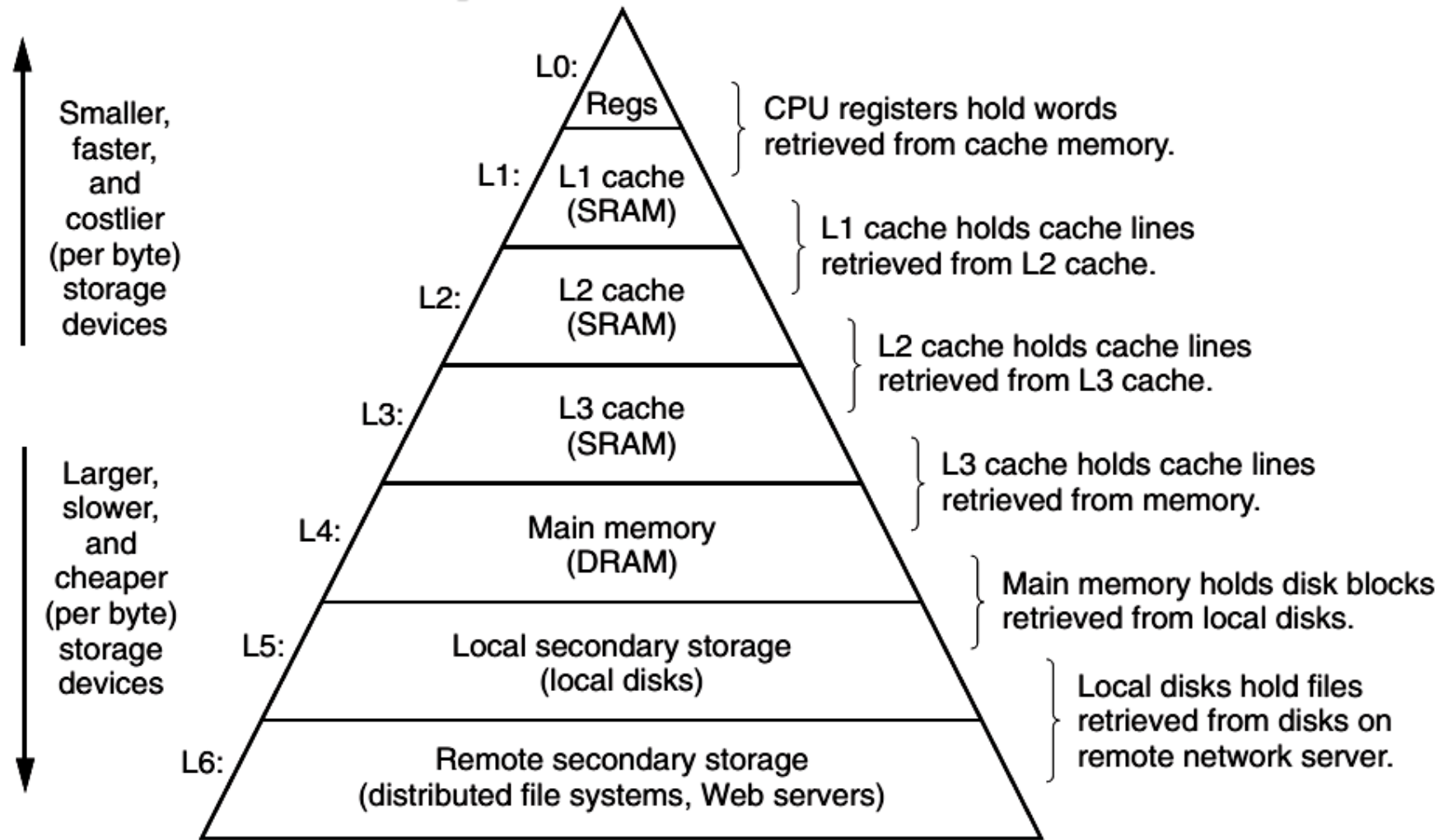


Running a C program (contd.)

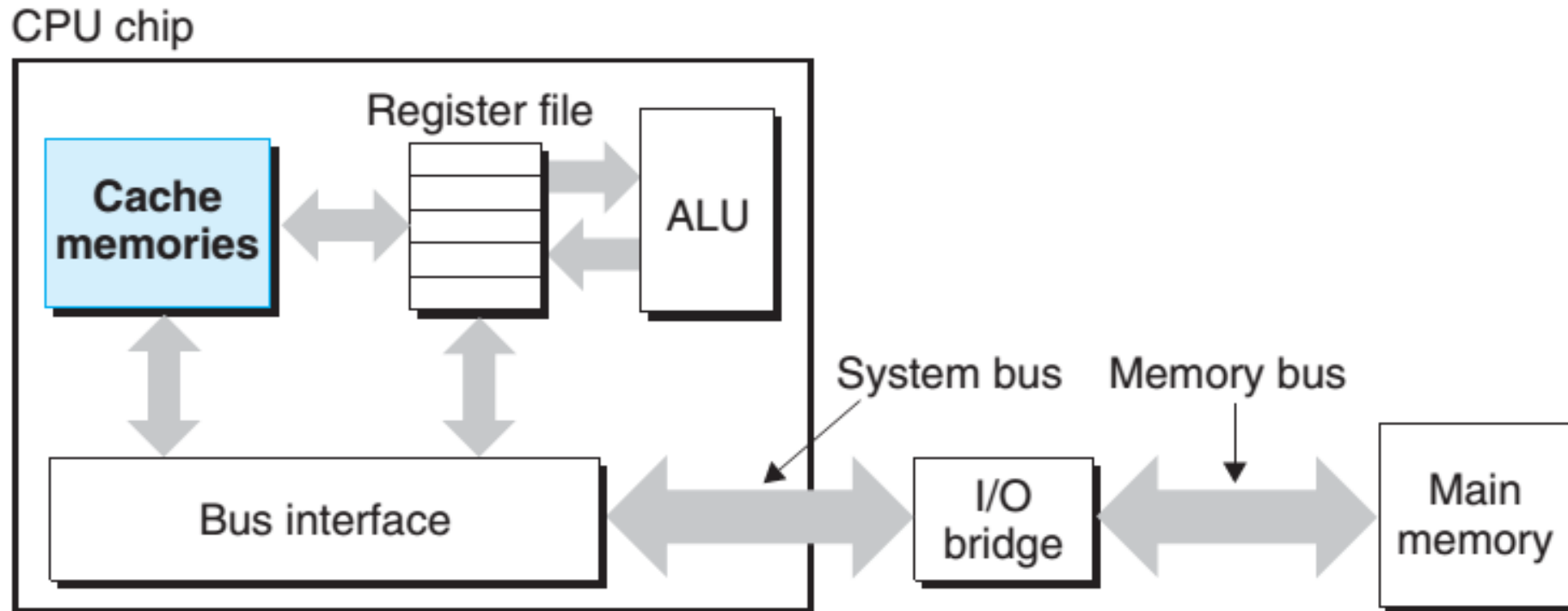
- ▶ Writing output “String”



Storage Hierarchy

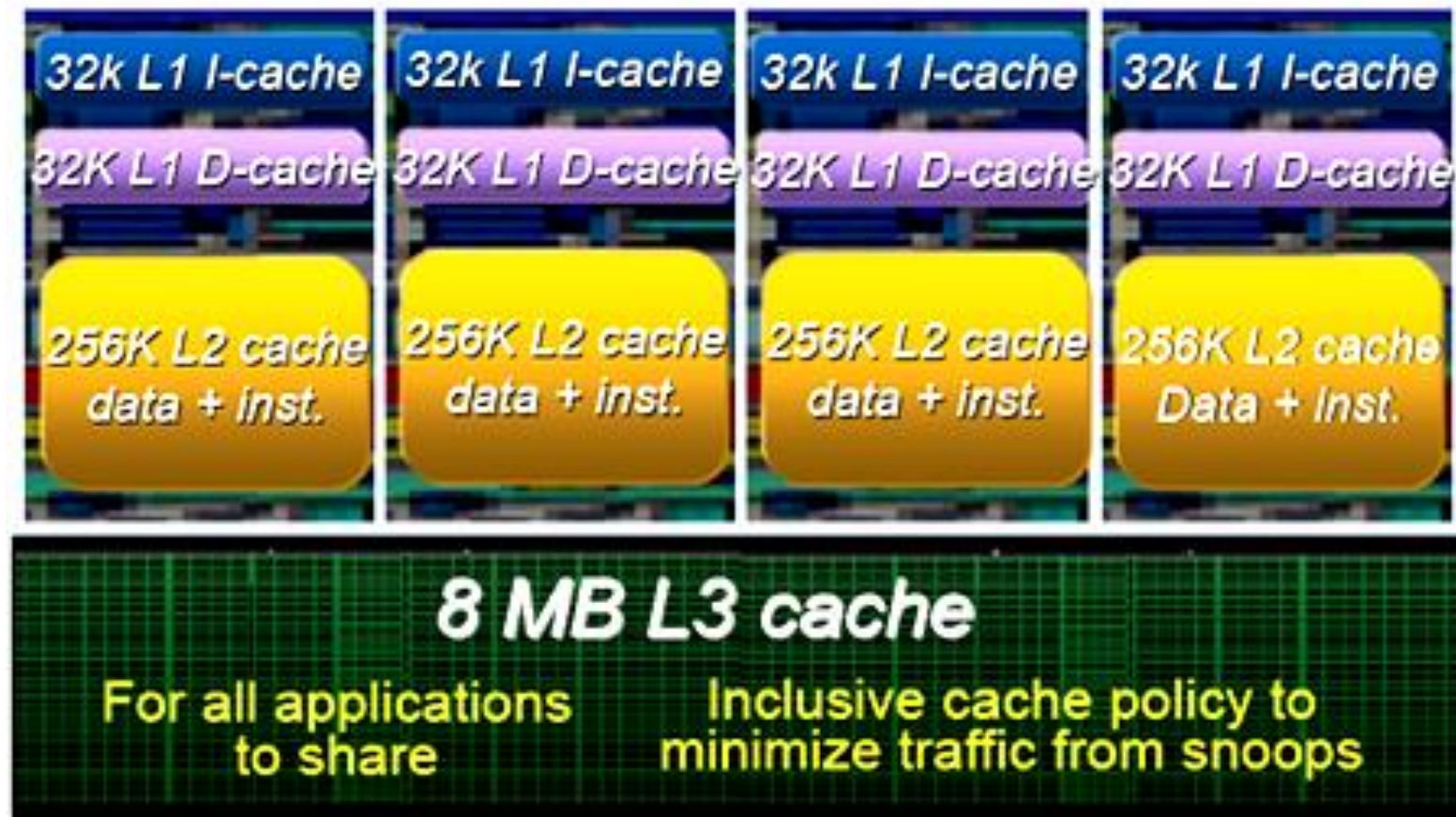


Cache Memory



Cache Memory (contd.)

- Intel Core i7



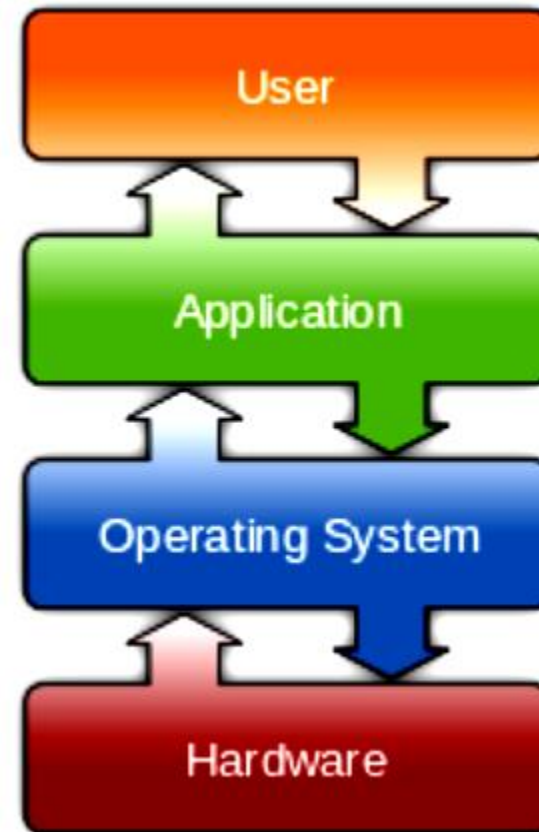
Cache Memory (contd.)

- ▶ **Cache: L1**
 - As fast as the Registers
- ▶ **Cache: L2**
 - 5–10 times faster than main memory
- ▶ **Cache: L3**
 - About 2–times faster
- ▶ **All types are implemented using SRAM**

Operating System Concepts

- ▶ A software layer that abstracts away the messy details of hardware into a useful, portable, powerful interface
 - Modules:
 - File-system, virtual memory management, network stack, protection system, scheduler
 - Each of these “subsystems” is a major system of its own!
- ▶ Design and implementation has many engineering tradeoffs
 - e.g., speed vs. portability, maintainability, simplicity etc.

Operating System Concepts

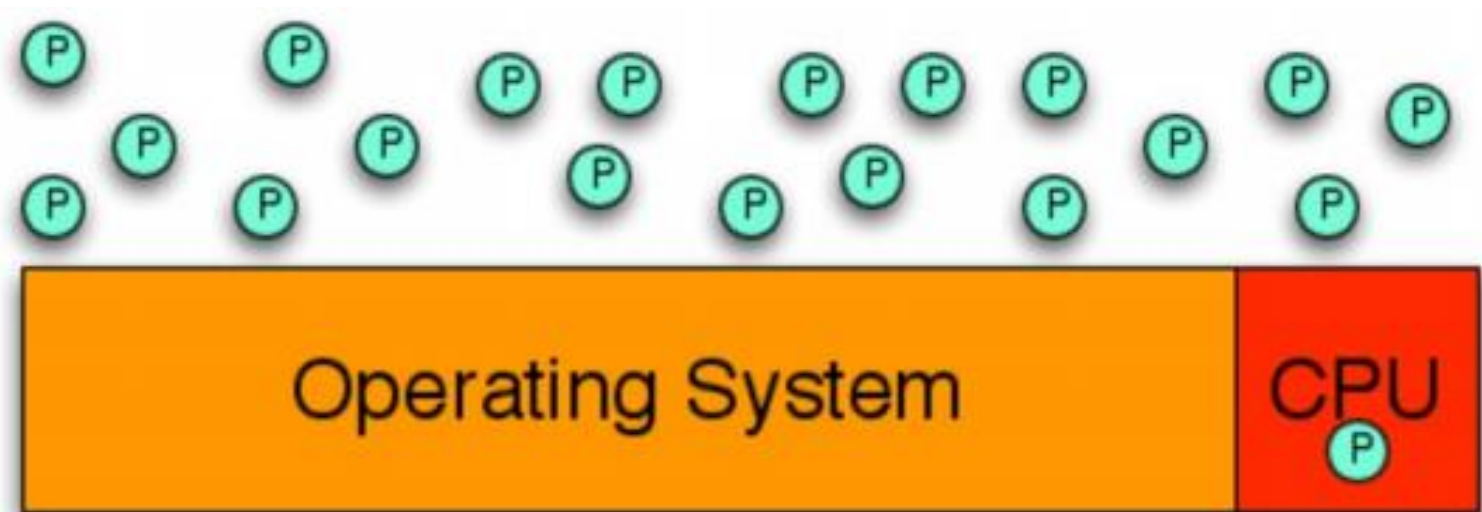


Operating System Concepts (contd.)

- ▶ Single-Tasking
- ▶ Multi-Tasking
- ▶ Multi-User / Time-Shared
- ▶ Real-Time
- ▶ Distributed
- ▶ Embedded

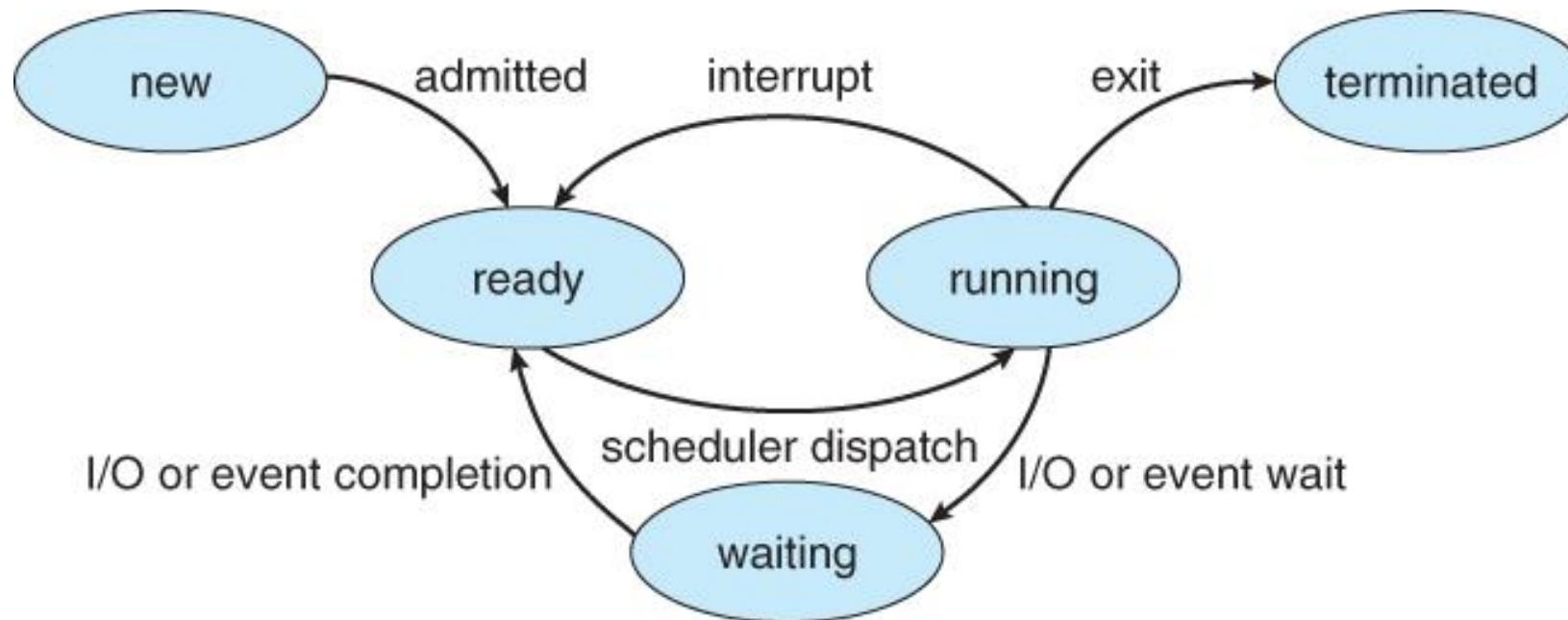
Operating System Concepts (contd.)

- ▶ Process: *Program in Execution*
- ▶ Processes are independent programs running concurrently within the operating system
- ▶ to see what processes are running on a UNIX system, use the **ps** command



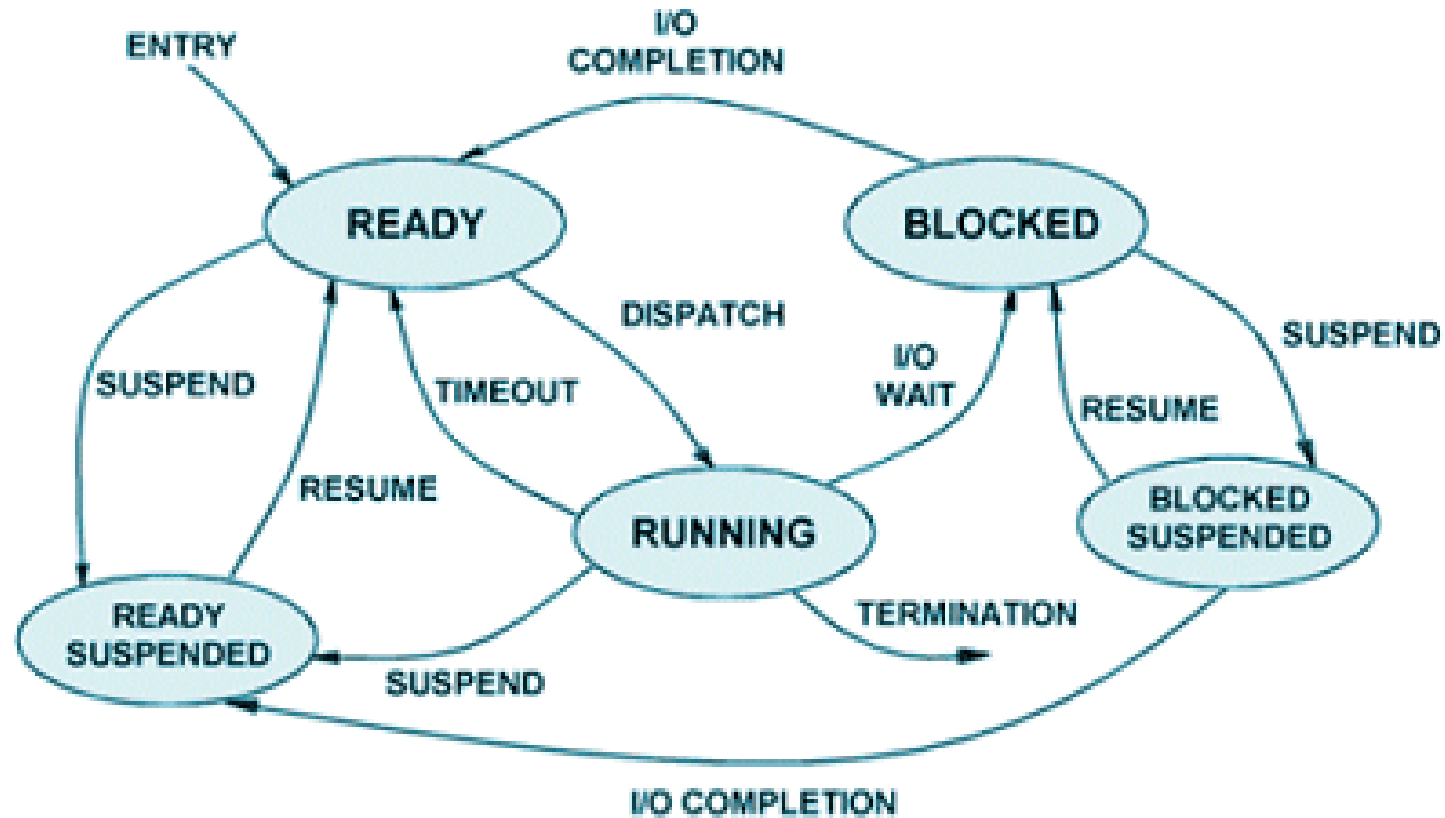
Operating System Concepts (contd.)

► Process States

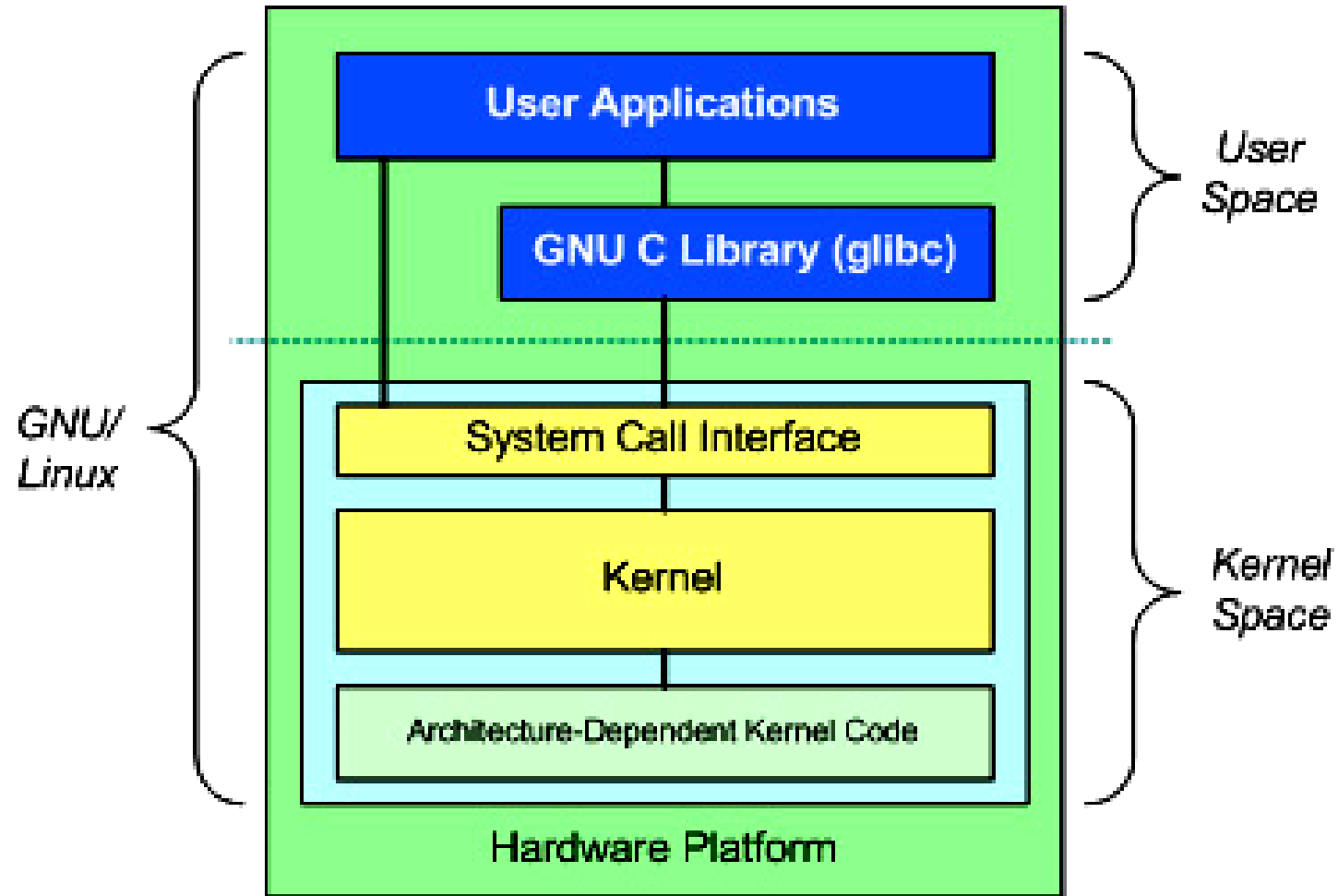


Operating System Concepts (contd.)

► Process States (advanced)

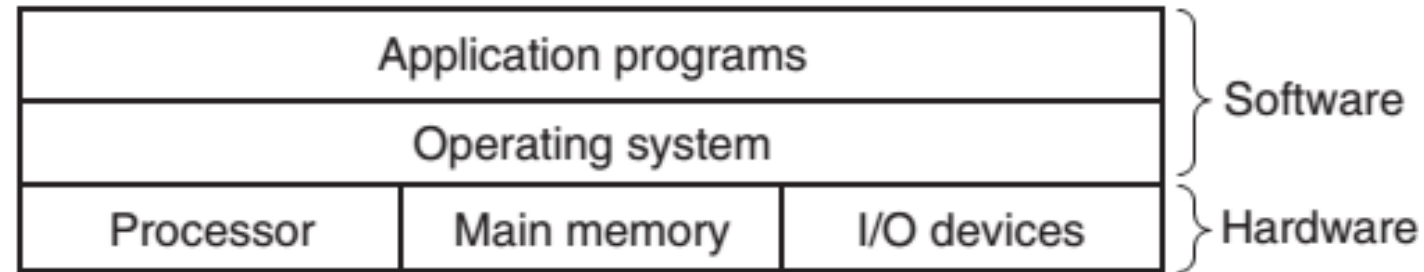


Operating System Concepts (contd.)

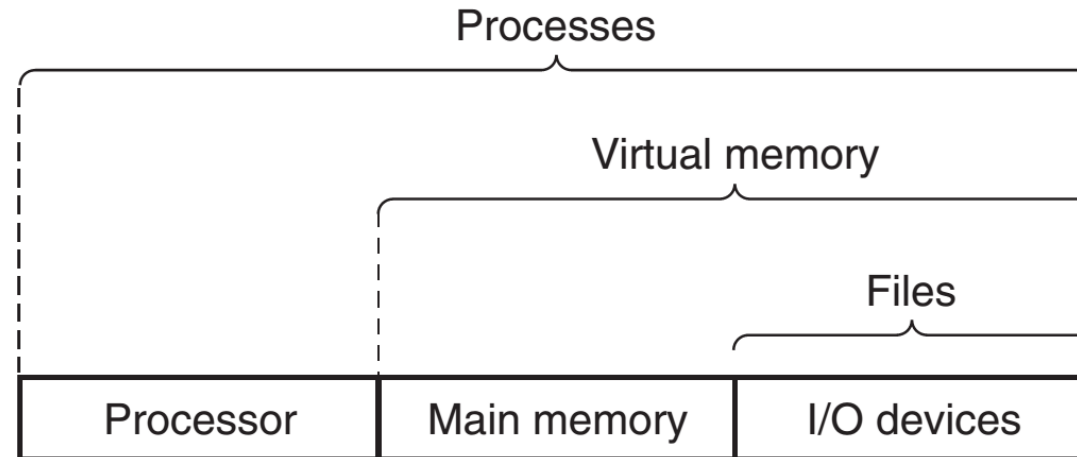


Operating System Concepts (contd.)

- ▶ Layered view

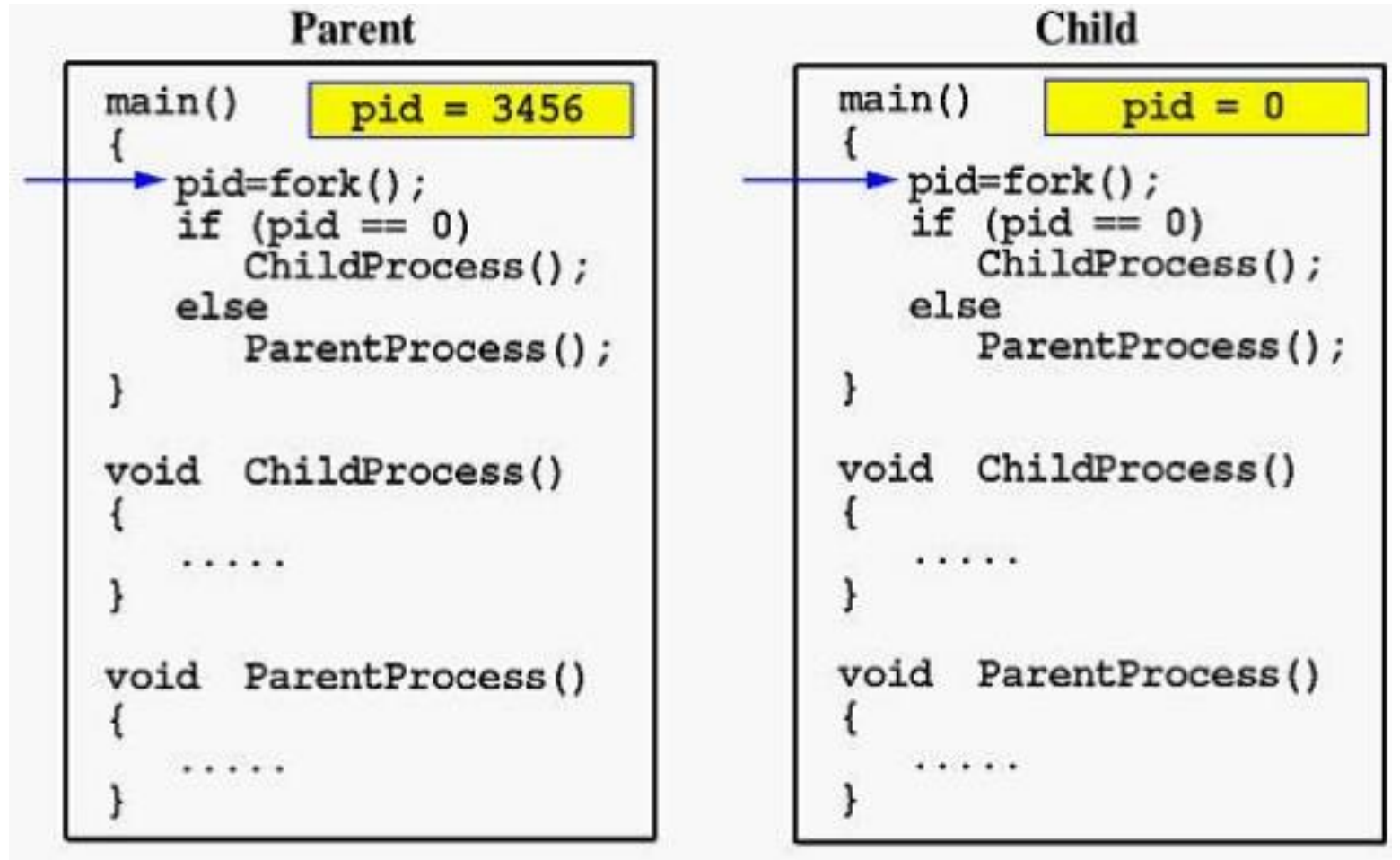


- ▶ Abstraction view



Operating System Concepts (contd.)

Process Creation



Operating System Concepts (contd.)

Context Switching

