



Operating Systems

Introduction

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Textbook

- **Operating System Concepts**, 10th Edition, Wiley publishing
 - By A. Silberschatz, P. Galvin, & G. Gagne



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- Other References:
 - Operating systems: design & implementation,
 - ▶ By A. Tanenbaum and A. Woodhull, 3rd edition, 2006.

 - Operating systems: internals and design principles,
 - ▶ By W. Stallings, 5th edition, 2005.

Syllabus

- **Introduction to operating systems**
- **Process management**
 - **Threads**
 - **Synchronization**
 - **Scheduling**
- **Memory management**
- **Protection and security**
- **File systems**



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Slides are based on the slides of the main **textbook**.

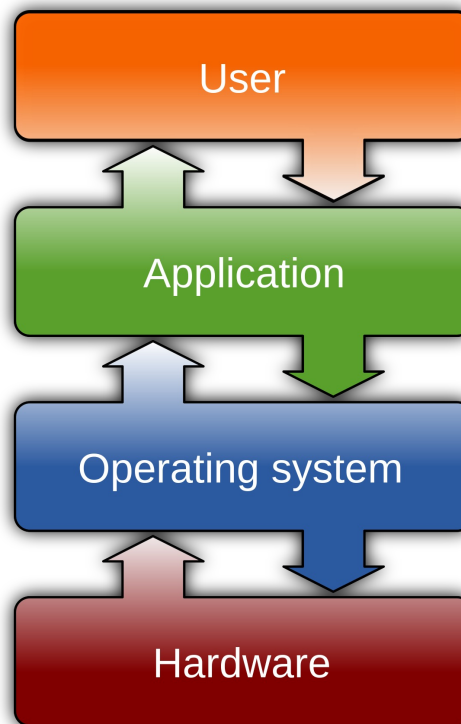
Silberschatz

<https://www.os-book.com/OS10/slide-dir/index.html>



What is an Operating System?

- A **program** that acts as an **intermediary** between a user of a computer and the computer hardware.
 - User can execute programs **conveniently** & **efficiently**



Operating System Goals

- Execute user programs and make solving user problems easier.

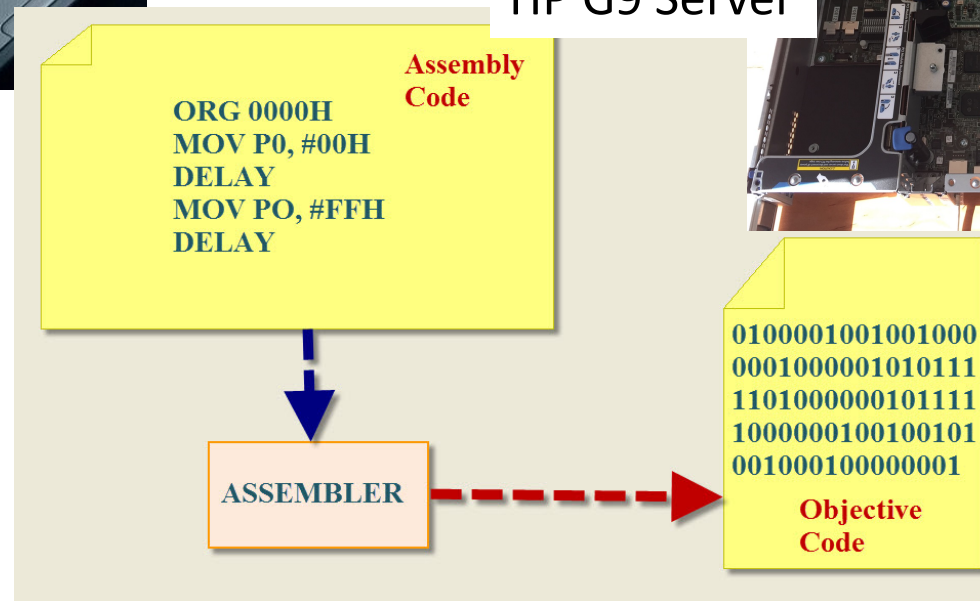


Operating System Goals (cont.)

- Make the computer system convenient to use.

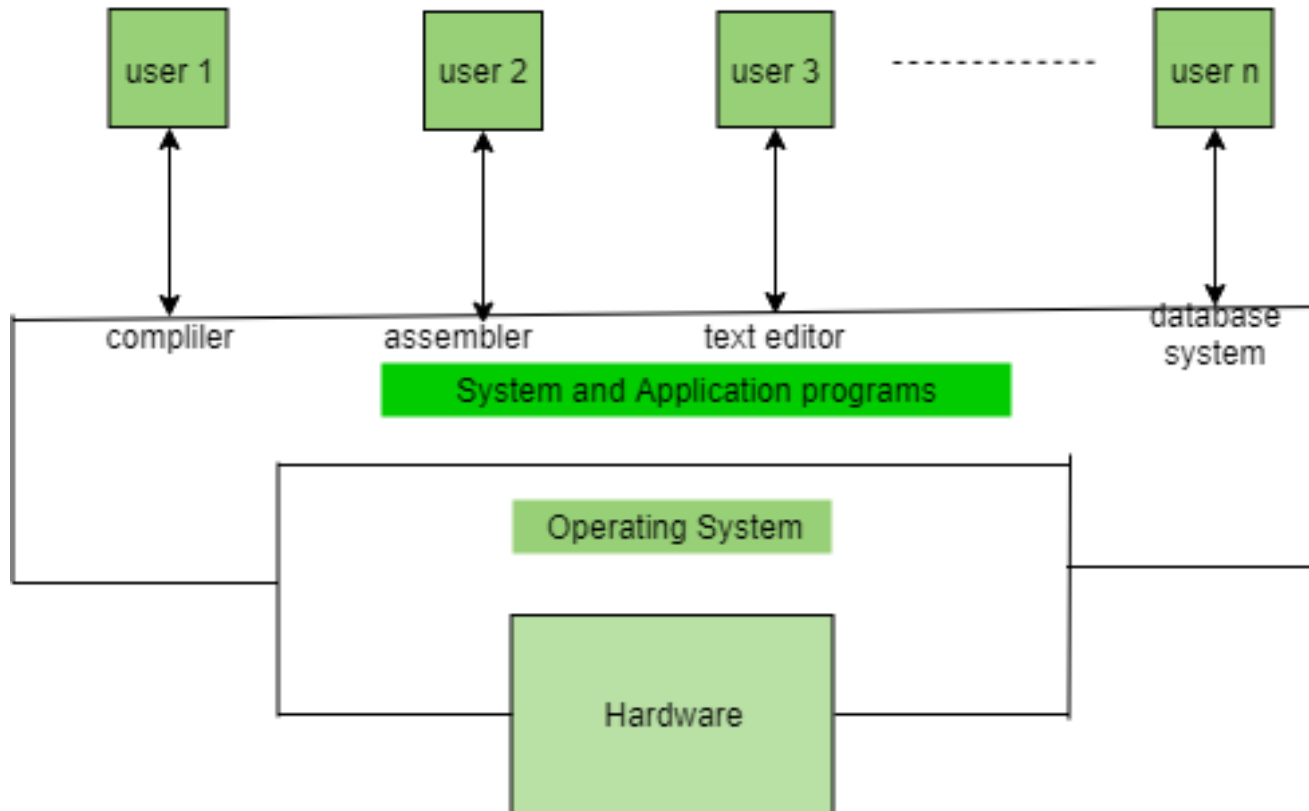


HP G9 Server



Operating System Goals (cont.)

- Use the computer hardware in an efficient manner.



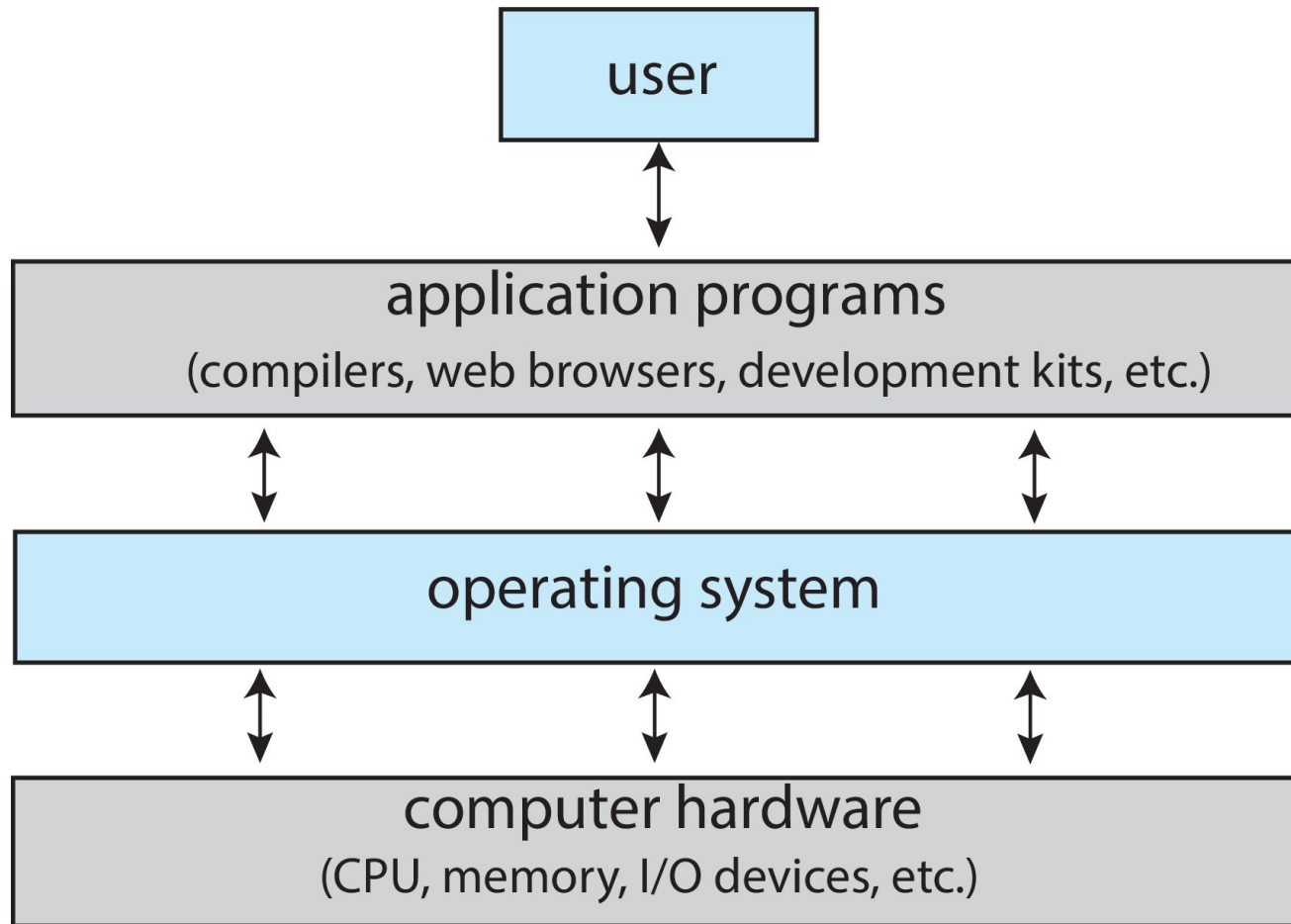
<https://www.geeksforgeeks.org/need-and-functions-of-operating-systems/>

OS: Mandatory or Optional?

- **Can we run a computer without an operating system?**
 - Yes, earliest computers did not have OS.
- **What does a compute without an OS look like?**
 - Machines tasked with one program at a time.
 - ▶ Cannot read a pdf while listening to a music.
 - Each program has a lot of work to do.
 - ▶ Where to load a program
 - ▶ IO access

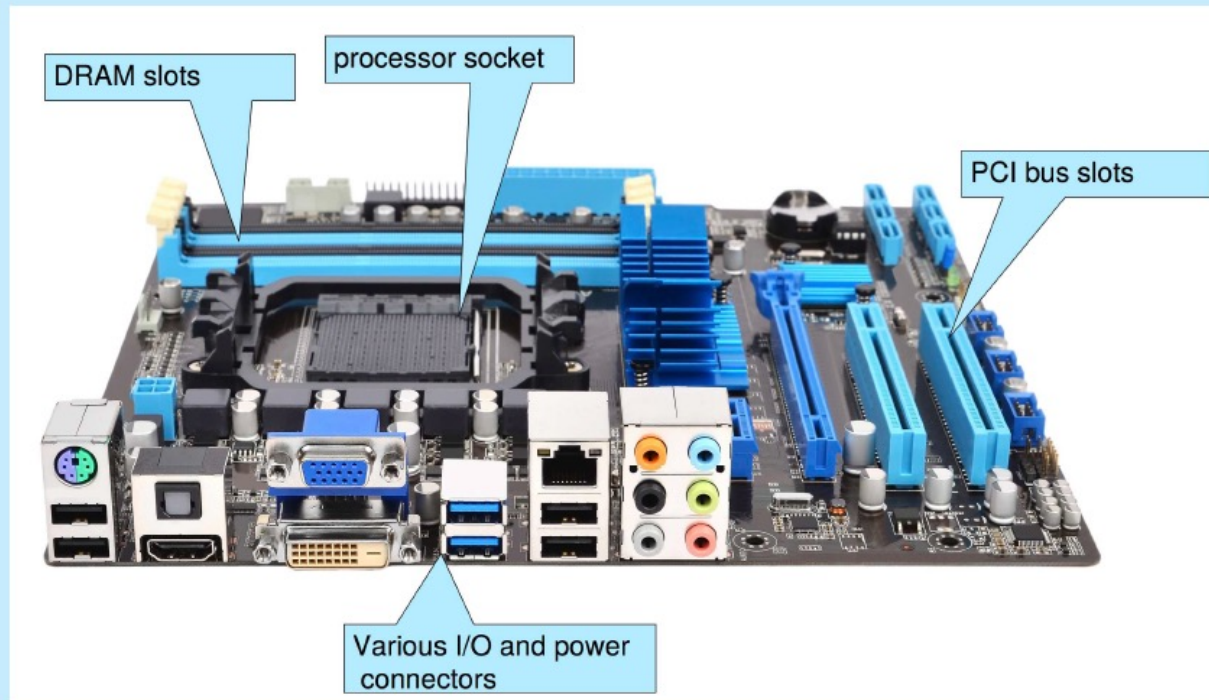


Abstract View of Components of Computer



PC Motherboard

Consider the desktop PC motherboard with a processor socket shown below:



This board is a fully-functioning computer, once its slots are populated. It consists of a processor socket containing a CPU, DRAM sockets, PCIe bus slots, and I/O connectors of various types. Even the lowest-cost general-purpose CPU contains multiple cores. Some motherboards contain multiple processor sockets. More advanced computers allow more than one system board, creating NUMA systems.

Operating System Story

- **Vital goal of a computer system**
 - Execute user program and make solving user problem easier.
- **Shall user program use hardware directly?**
 - Hardware alone is ***not easy to use.***
 - Application programs require certain ***common operations.***
 - ▶ Example: I/O operations

Common functions of controlling and allocating resources brought together into one piece called **OS**

Operating System Definition (cont.)

- No universally accepted definition.
- “The one program running at all times on the computer” is the **kernel**, part of the operating system.
- Everything else is either
 - A **system program** (ships with the operating system, but not part of the kernel) , or
 - An **application program**, all programs not associated with the operating system.

