OPERATING SYSTEM DESIGN

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OS Structures & Kernel Programming

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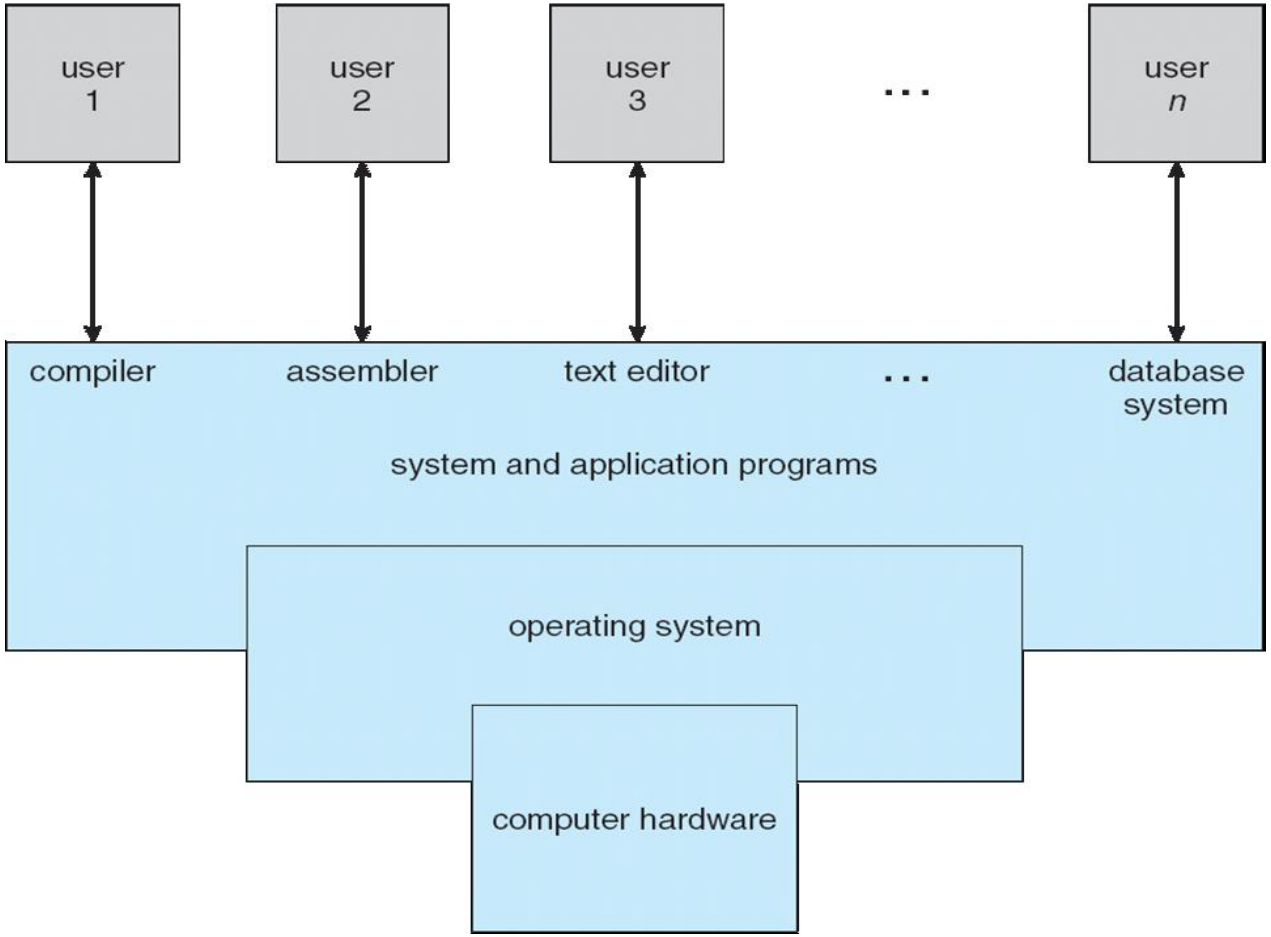
What Operating System does?

- A computer system can be divided roughly into four components: ***the hardware, the operating system, the application programs,*** and the ***users***
- Computer = HW + OS + Apps + Users
- OS serves as interface between HW and Apps & Users
- OS provides services for Apps & Users
- OS manages resources (Government model, it doesn't produce anything.)
- Debates about what is included in the OS - Just the kernel, or everything the vendor ships?

OPERATING SYSTEMS DESIGN

What Operating System does?



What Operating System does?

- **Hardware** – provides basic computing resources such as CPU, Memory, I/O devices
- **Operating system**
  - Controls and coordinates use of hardware among various applications and users

What Operating System does?

- **System & Application programs** – define the ways in which the system resources are used to solve the computing problems of the users

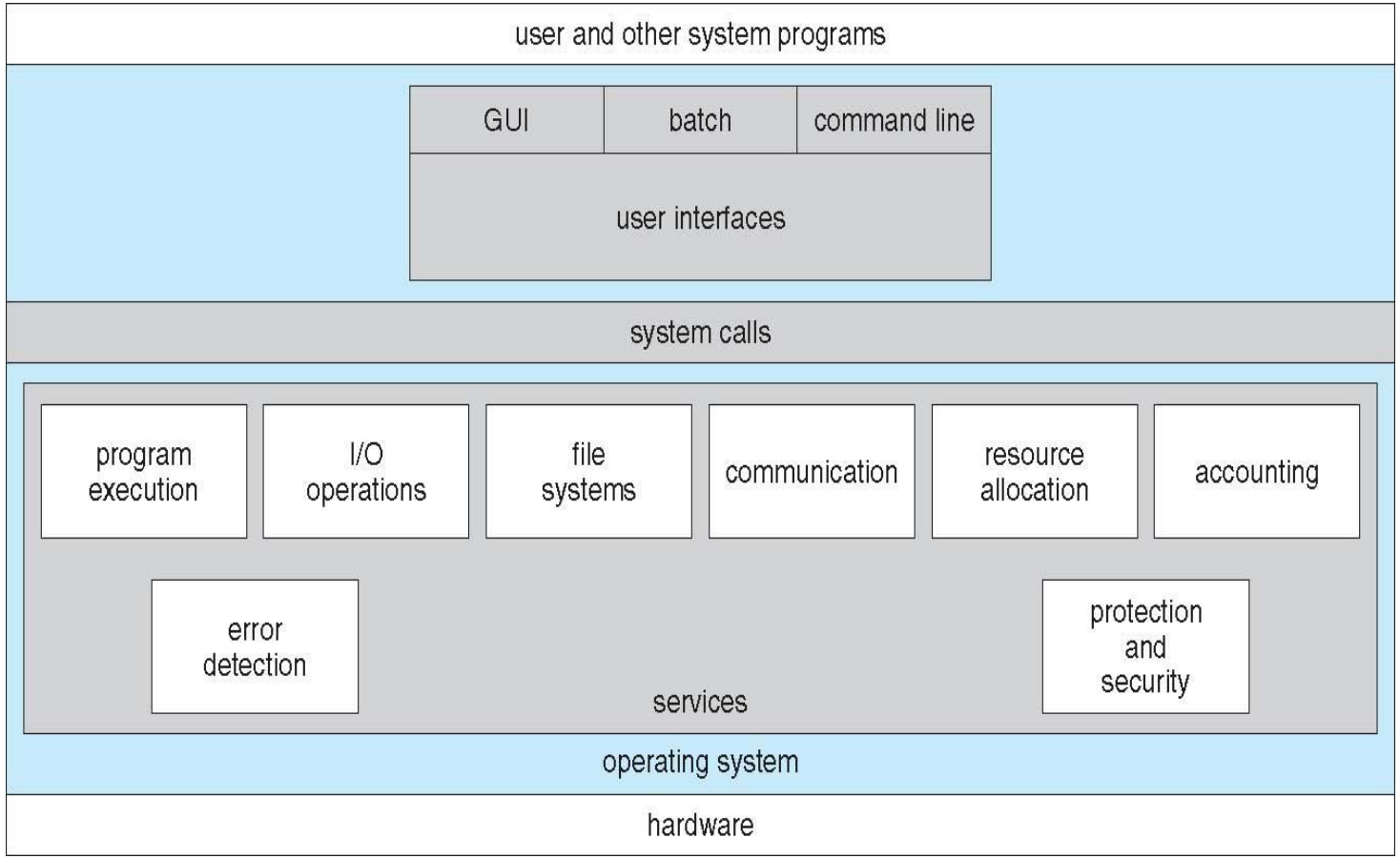
  Ex: Word processors, compilers, web browsers, database systems, video games

- **Users**
  - People, machines, other computers

OPERATING SYSTEMS DESIGN

OS Services

- Services provided by OS can be viewed in 2 perspectives : User Perspective, System Perspective



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OS Services

- **User interface** - Almost all operating systems have a user interface (UI).
- Varies between **Command-Line (CLI)**, Batch Interface, **Graphical User Interface (GUI)**

OS Services

- **Program execution** - The system must be able to load a program into memory and run that program, end execution, either normally or abnormally (indicating error)
- **I/O operations** - A running program may require I/O, which may involve a file or an I/O device
- **File-system manipulation** - Programs need to read and write files and directories, create and delete them, search them, list file Information, permission management.

OS Services

- **Communications** – Processes may exchange information, on the same computer or between computers over a network
- Communications may be via shared memory or through message passing (packets moved by the OS)
- **Error detection** – OS needs to be constantly aware of possible errors
- Errors may occur in the CPU and memory hardware, in I/O devices, in user programs
- For each type of error, OS should take the appropriate action to ensure correct and consistent computing
- Debugging facilities can greatly enhance the user's and programmer's abilities to efficiently use the system

OS Services

- System Perspective: resource allocator, control program
- **Resource allocation -** When multiple users or multiple jobs running concurrently, resources must be allocated to each of them
- Many types of resources - Some (such as CPU cycles, main memory, and file storage) may have special allocation code, others (such as I/O devices) may have general request and release code
- **Accounting -** To keep track of which users use how much and what kinds of computer resources

OS Services

- **Protection and security -** The owners of information stored in a multiuser or networked computer system may want to control use of that information, concurrent processes should not interfere with each other
- **Protection** involves ensuring that all access to system resources is controlled
- **Security** of the system is that outsiders requires user authentication, extends to defending external I/O devices from invalid access attempts
- If a system is to be protected and secure, precautions must be instituted throughout .

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THANK YOU

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