CHANDIGARH UNIVERSITY

Discover. Learn. Empower.

CU CHANDIGARH UNIVERSITY

UNIVERSITY INSTITUTEOF ENGINEERING

Bachelor of Engineering (Computer Science & Engineering)

Operating System (CST-328)

Subject Coordinator: Er. Puneet kaur(E6913)

DISCOVER . **LEARN** . EMPOWER

Lecture 1
Functions of Operating System

1. Process Management
2. Main Memory Management
3. Secondary Storage Management
4. File Management
5. I/O Management
6. Protection & Security
7. Networking
8. Command Interpretation or Shell

Process Management

- A process is a program in execution. It is a unit of work within the system. Program is a *passive entity*, process is an *active entity*.
- Process needs resources to accomplish its task
  - CPU, memory, I/O, files
  - Initialization data
- Process termination requires reclaim of any reusable resources
- Single-threaded process has one **program counter** specifying location of next instruction to execute
  - Process executes instructions sequentially, one at a time, until completion
- Multi-threaded process has one program counter per thread
- Typically system has many processes, some user, some operating system running concurrently on one or more CPUs

Process Management Activities

The operating system is responsible for the following activities in connection with process management:

- Creating and deleting both user and system processes
- Suspending and resuming processes
- Providing mechanisms for process synchronization
- Providing mechanisms for process communication
- Providing mechanisms for deadlock handling

Memory Management

- To execute a program all (or part) of the instructions must be in memory
- All (or part) of the data that is needed by the program must be in memory.
- Memory management determines what is in memory and when
  - Optimizing CPU utilization and computer response to users

- **Memory management activities**
  - Keeping track of which parts of memory are currently being used and by whom
  - Deciding which processes and data to move into and out of memory
  - Allocating and de-allocating memory space as needed.

File-System Management

File-System management
- – Files usually organized into directories
- – Access control on most systems to determine who can access what
- – OS activities include
  - • Creating and deleting files and directories
  - • Primitives to manipulate files and directories
  - • Mapping files onto secondary storage
  - • Backup files onto stable (non-volatile) storage media

I/O Subsystem

- One purpose of OS is to hide peculiarities of hardware devices from the user
- I/O subsystem responsible for
  - Memory management of I/O including buffering (storing data temporarily while it is being transferred), caching (storing parts of data in faster storage for performance), spooling (the overlapping of output of one job with input of other jobs)
  - Handles General device-driver interface
  - Manages Drivers for specific hardware devices

Protection and Security

- **Protection** – any mechanism for controlling access of processes or users to resources defined by the OS
- **Security** – defense of the system against internal and external attacks
  - Huge range, including denial-of-service, worms, viruses, identity theft, theft of service
- Systems generally first distinguish among users, to determine who can do what
  - User identities (**user IDs**, security IDs) include name and associated number, one per user
  - User ID then associated with all files, processes of that user to determine access control
  - Group identifier (**group ID**) allows set of users to be defined and controls managed, then also associated with each process, file
  - **Privilege escalation** allows user to change to effective ID with more rights

OS challenges

- **Reliability**

  Does the system do what it was designed to do?

- **Availability**

  What portion of the time is the system working?

  Mean Time To Failure (MTTF), Mean Time to Repair

- **Security**

  Can the system be compromised by an attacker?

- **Privacy**

  Data is accessible only to authorized users

OS challenges

- **Performance**

  Latency/response time

  > How long does an operation take to complete?

  Throughput

  > How many operations can be done per unit of time?

  Overhead

  > How much extra work is done by the OS?

  Fairness

  > How equal is the performance received by different users?

  Portability

  For programs:

  > Application programming interface (API)

  For the kernel

  > Hardware abstraction layer

Conclusion

This Lecture makes the student to understand various functions and services offered by the operating system. Learning this will make the student understand the requirement of operating system for managing different functions of operating system.

References

https://www.includehelp.com/c-programming-questions/

https://www.studytonight.com/operating-system/

https://computing.llnl.gov/tutorials/

https://www.tutorialspoint.com/operating_system/index.htm#:~:text=An%20operating%20system%20(OS)%20is,software%20in%20a%20computer%20system.

https://www.javatpoint.com/os-tutorial

https://www.guru99.com/operating-system-tutorial.html
https://www.geeksforgeeks.org/operating-systems/