

Distributed Systems

COMP90015 2018 Semester 1
Tutorial 08

Things to cover

1. Operating Systems Support Questions
2. Code Demonstration : Thread Synchronization

Operating Systems Support Questions

1. Discuss the difference between a network operating system and a distributed operating system.
2. What are the core OS components?
3. What is the kernel?
4. What is Supervisor Mode vs User Mode?
5. Discuss the potential advantages and disadvantages of using of multiple threads compared to multiple processes.

1. Discuss the difference between a network operating system and a distributed operating system.

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- A *networked operating system* provides support for networking operations. The users are generally expected to make intelligent use of the network commands and operations that are provided. Each host remains autonomous in the sense that it can continue to operate when disconnected from the networking environment.
- A *distributed operating system* tries to abstract the network from the user and thereby remove the need for the user to specify how the networking commands and operations should be undertaken. This is sometimes referred to as providing a *single system image*. Each host may not have everything that would be required to operate on its own, when disconnected from the network.

1. Discuss the difference between a network operating system and a distributed operating system.

Network operating system

- Users retain autonomy in managing their own processing resources
- It does not manage processes across the nodes
- Provides support for networking operations

1. Discuss the difference between a network operation system and a distributed operating system.

Distributed operating system

- Users are never concerned with where their programs run, or the location of any resources
- Has control over all the nodes in the system, and it transparently locates new processes at whatever node suits its scheduling policies
- Each host may not have everything that would be required to operate on its own
- Single system image
- Not widely adopted

2. What are the core OS components?

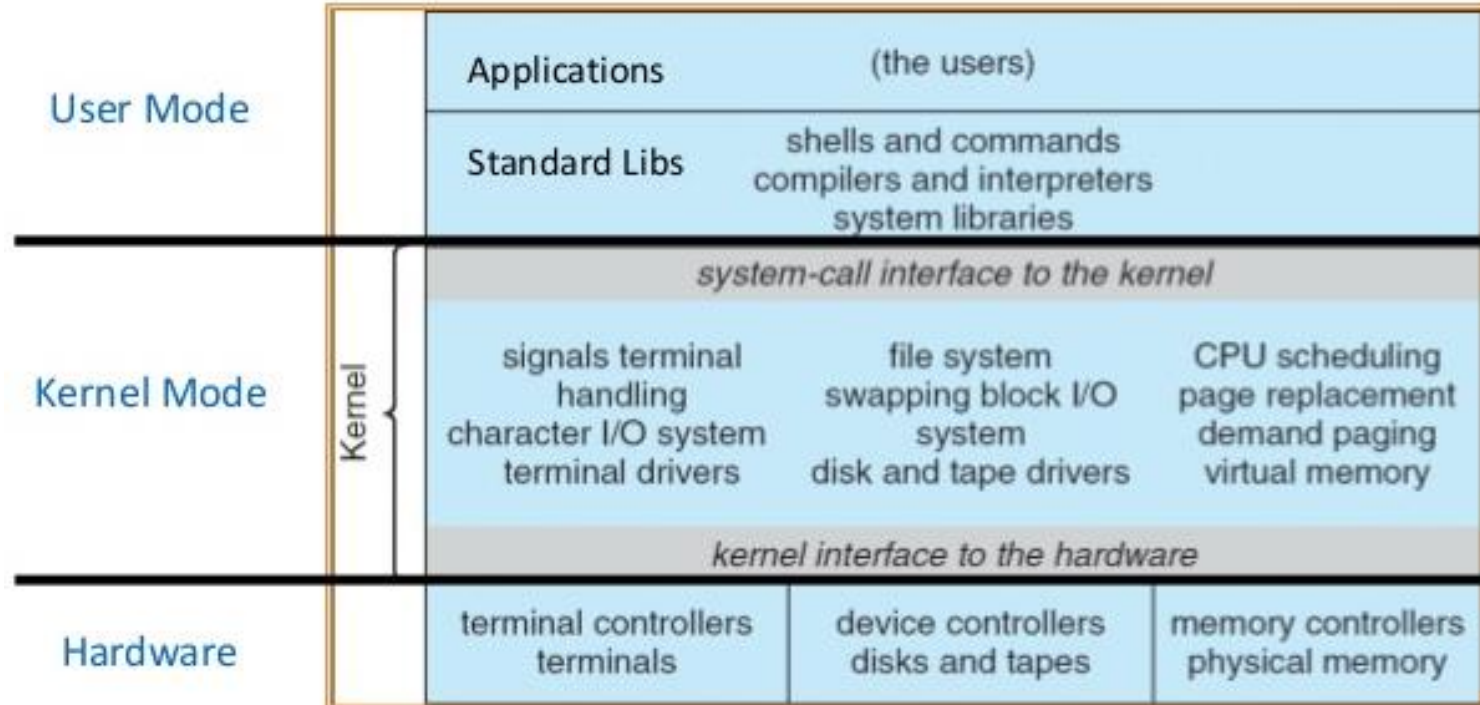
2. What are the core OS components?

- **Process manager** -- Handles the creation of processes, which is a unit of resource management, encapsulating the basic resources of memory (address space) and processor time (threads).
- **Thread manager** -- Handles the creation, synchronization and scheduling of one or more threads for each process. Threads can be scheduled to receive processor time.
- **Communication manager** -- Handles interprocess communication, i.e. between threads from different processes. In some cases this can be across different hosts

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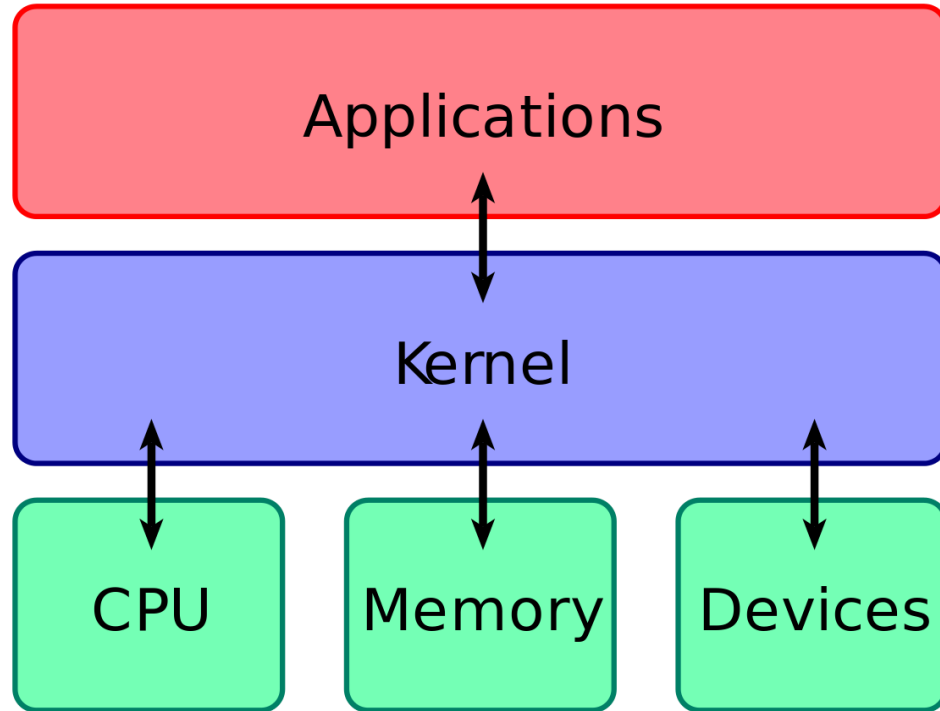
- **Memory manager** -- Handles the allocation and access to physical and virtual memory. Provides translation from virtual to physical memory and handles paging of memory.
- **Supervisor** -- Handles privileged operations, i.e. those that directly affect shared resources on the host, e.g. to and from an I/O device. The supervisor is responsible for ensuring that host continues to provide proper service to each client.

A Real-World Example - UNIX



3. What is the kernel?

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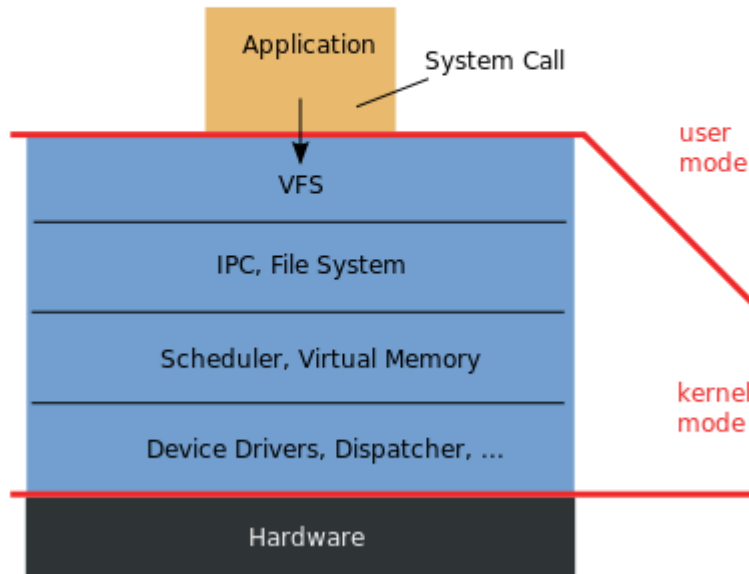


3. What is the kernel?

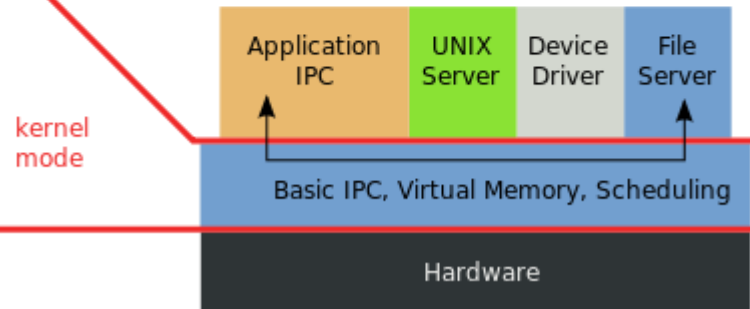
- Part of the Operating System
- Has full access to the host's resources
- Kernel begins execution after the host is powered up and continues to execute while the host is operational
- The kernel has access to all resources and shares access to all other processes that executing on the host

Comparison of Kernel Implementations

Monolithic Kernel
based Operating System



Microkernel
based Operating System



4. What is Supervisor Mode vs User Mode?

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- Operating modes supported by the hardware at the machine instruction level.
- **Supervisor / Kernel mode** -- instructions that execute while the processor is in supervisor (or privileged) mode are capable of accessing and controlling every resource on the host,
- **User mode** -- instructions that execute while the processor is in user (or unprivileged) mode are restricted, by the processor, to only those accesses defined or granted by the kernel.

5. Discuss the potential advantages and disadvantages of using of multiple threads compared to multiple processes.

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Advantages

- Cheaper to allocate/deallocate
- Faster switching
- Easy to share resources via shared memory.

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Disadvantages

- Synchronization overhead of shared data
- Shared process memory space
- Program debugging (synchronization, non-deterministic timing, accidental data corruption)