Assignment 1 - Question 5

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Write a short on monolithic and micro kernel

What is a kernel?
Kernel is the core part of the Operating System. It interacts directly with the hardware and manages the system resources. It provides a set of services that can be used by the programs, isolating these programs from the underlying programs. It can be further classified into two categories: **Monolithic kernel** and **Microkernel**.

What are microkernels?
Microkernel being a kernel manages all the system resources. But in a microkernel, user services and kernel services are implemented in different address spaces. User services are implemented in **user address space** and kernel services are impemented in **kernel address space**.
In addition to the communication between application and hardware of the system, the microkernel provides minimal services of process and memory management. The communication between the client program/application and services running in user address space is established through message passing.

What are Monolithic kernels?
The monolithic kernel manages the system resources between application and hardware of the system. But unlike microkernel, the user services and kernel services are implemented under same address space.
The monolithic kernel provides CPU scheduling, memory management, file management and other operating system functions through system calls. As user services and kernel services both reside in same address space, this results in the fast executing operating system.

Difference between Microkernels and Monolothic kernels:
Monolithic Kernel

- The entire O.S. is placed inside the kernel
- It runs as a single large process
- As all the services are placed inside the kernel, they have a single address space
- It is bigger in size
- It is easy to implement/code
- Performance is high (As kernel can invoke any function directly as everything is placed in the kernel)
- Less Secure (If one service fails, entire system crashes)

Microkernel

- Only bare minimum code is placed inside the kernel (only basic memory management and Inter Process Communication code)
- Here the kernel is broken down into processes called as servers
- As services(Servers provide services) are separated they have different address spaces
- It is smaller in size
- It is tough to implement/code
- Performance is low (As servers are separated, so to invoke services from other servers IPC(Inter Process Communication) is needed which requires kernel's permission and thus increases access time and lowers the performance)
- More Secure (Even if one service crashes, others can function properly because of separation)

Sources/citation and further reading:

1. http://www.geekinterview.com/question_details/25169
2. https://techdifferences.com/difference-between-microkernel-and-monolithic-kernel.html
3. https://www.quora.com/What-is-the-difference-between-a-monolithic-kernel-and-microkernel