1A)An operating system is interrupt driven and the device controller moves data between local buffer and memory, inform CPU via an interrupt when it is done. on a system bus

Each device controller is in charge of operations of a particular device type

SC2005 Operating Systems

TUTORIAL ONE

Review on Computer System Operation

1. Review the following concepts on Computer System Operation, and explain how they are related to Operating Systems.

   a) Computer Organization

   b) Interrupts

   c) I/O Structure: Interrupt-Driven Data Transfer, Direct Memory Access (DMA) Data Transfer

OS Structures and Concepts

2. Indicate whether the following statements are true or false. Justify your answers.

   a) All I/O instructions are privileged instructions.

   b) Given a base register value of 0x1000 and a limit register value of 0x1000, access to memory location 0x1FFF will generate a trap.

   c) Popular operating systems for personal computer use (such as Windows and Linux) are real-time systems.

   d) A system call always generates a trap.

3. Distinguish between multiprogramming and multiprocessing. What were the key motivations for the development of each?

OS saves the state of current execution

1b)Interrupts transfer control to the interrupt service routine through the interrupt vector. Incoming interrupts are disabled while another interrupt is being processed to prevent loss of interrupts. An operating system is interrupt driven.

1c)The operating system preserves the state of CPU by storing registers and program counter. The type of interrupt service routine is determined from the interrupt vector table. For direct memory access, the OS sets up memory blocks with the device controller transferring data blocks from buffer to main memory without CPU intervention. Only one interrupt is generated per block.

Interrupt driven I/O: small size I/O, more interrupts, low speed devices, read data from device buffer
DMA: block based I/O, less interrupts, high speed devices, read data from memory, OS prepares memory blocks

2a) True. A user program may issue illegal I/O operation so I/O needs to be protected. All I/O operations must go through the OS to ensure correctness and legality, with CPU generating a trap for I/O operations that try to bypass the OS

2b) False. With the base register value of 0x1000 and the limit register value of 0x1000, the largest memory location that can be accessed is 0x2000 and 0x1FFF is the register before it. As such, the memory is within the range, is not protected and can be accessed. Thus no trap is generated.

2c) True. They are real time systems as they are used as a control device in a dedicated application and has well defined fixed time constraints

False, those systems are usually time sharing systems

2d) True. A system call causes a switch from user to kernal mode which generates a trap

Appropriate system call function is then identified and executed.

3) Multiprogrammed systems have several jobs in the main memory at the same time with the CPU multiplexed. A job is swapped in and out of memory to the hard disk. The system is highly interactive and supports mulitple online users.
It was developed as Simple batch systems, with only one user job in memory at any point in time, was not efficient since the job waits for the I/O and CPU idles.

improve CPU utilization

Multiprocessing involevs multiple CPUs or CPU with multiple cores. They are tightly coupled systems with communication through shared memory. They were developed to increase system throughput, was economical due to sharing of memory and I/O devices, as well as increased reliability due to redundancy.

with parallel architecture