

QUIZ-3

Q1. In the paper, My recollections of operating system design. Dijkstra says the following:

A: ~~If~~ Command chaining in queuing ~~was~~ had two serious flaws:

1. When a new command had been attached while before the attachment the channel was observed to be active and after the attachment it was passive this information was insufficient to determine whether the last command was executed.

2. While reporting completions, command chaining introduced channels which could report completions through busy interrupt instead of counter. If the signal came before the previous one for the channel, it would get lost.

The trade off ~~for~~ ^{moral urgency for} major one of essential urgency. It had been done.
This was the blunder stated by Dijkstra.

Q2. What are the problems faced by Dijkstra with the probe instructions?

A: Probe instructions execution takes time and thus, probing with high frequency can slow down the computation while probing with low frequency can increase computer's reaction time too much.

Interrupts solves this problem through a dedicated hardware to monitor signals while computing at full speeds. When completed, the program is interrupted and ~~the~~ processor is freed, enabling execution of standard program establishing source of interrupt.

Since the exact moment of interrupts were unpredictable and out of control, it turned the computer into nondeterministic machine with nonreproducible behaviour. This created a problem.

Q.3. There are five levels in THE operating system. Discuss the advantages of hierarchical organization.

A: There are advantages when building a hierarchical system: ^{which} the ~~it~~ allows to 'sequentially execute' the processes. ^{which} is easier to control and monitor.

This is regulated by means of explicit mutual synchronization statements.

At level 0 \rightarrow processor allocation, interrupts ~~are~~ and scheduling are processed to prevent monopolizing processing power.

At level 1 \rightarrow "segment controller" ^{where} is a sequential process ^{on} higher levels are synchronized with drum interrupts. At this level, the details of actual processors involved are no longer relevant and can be abstracted. This also makes process of debugging easier ^{with} testing.

If both levels were together, then the central processor would react directly upon the interrupts which themselves are unpredictable and unpredictable. This would exponentially increase the number of 'relevant states' and exhaustive testing would be impossible.

Q.4. Describe the scheduling algo followed in UNIX:

A: The scheduling algorithm is implemented ~~based~~ on priority of each process.

Each priority is defined based on recent ratio of amount of compute time ~~ratio~~ to ~~the~~ real time consumed by process. A penalty is involved with each consumption of real time. Disk events $>$ teletype events $>$ time of day events $>$ User processes

The algo picks the process with highest priority. The compute to real time ratio is updated every second. After this, looping user processes will be scheduled round robin. A high priority process will preempt a running low priority process. It has a negative feedback character which changes priorities of processes.

Q.5. What are the advantages and problems of deferred block I/O system in UNIX?

A. Block I/O system consists of randomly accessed memory so the access time is fast.

- There are secondary blocks of 512 bytes each which are uniformly addressed. This can emulate the model on a physical device.
- There is buffering involved, so accessing through cache.
- It can navigate between any location on media.
- It allows mounting to be done easily.

Problems:

- It has to be managed through a kernel and provides an entire subsystem for it.
- It is more complex than character I/O.
- The asynchronous nature of algorithm makes error reporting and handling impossible.
- Delayed writes causes errors.
- Associativity of buffers can alter the physical I/O sequence from that of logical I/O sequence.

Q.6. Consider the following lends in a hypothetical OS. Take any two operation and discuss the corresponding

A. Create:

Level 0: Creates new files and returns capability for it.

Level 1: Returns capability for a device of the given type at given address. Access codes 'W' is write, 'R' is read, 'WR' is read-write.

Destroy:

Level 0: Destroys a given file, undoes a create file operation.

Level 1: Detach a given device from system.
(undoes create device operation)