Test 1 Revision

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SOFTENG 370 T4

2011 SE370/CS340 Test

Question

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2011 SE370/CS340 Test

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Very early computers did not provide interrupt handling capabilities. What advantage does an interrupt handling system provide?

SPOOLing: Interrupt driven I/O, removing the need to wait for our computers to wait for I/O. Now we can do other stuff while waiting for our punch card input or printer output.

2011 SE370/CS340 Test

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The first personal computer operating systems (including the Mac) were effectively resident monitors. Describe one way in which early PC operating systems were like resident monitors.

- MS-DOS and Apple-DOS ran one program at a time
- Lack of Virtual Memory
- Maintained a JCL-like user interface

Derived from 2018 SE370 Test

Question

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What is an issue with using "trap and emulate" virtualization on x86 (prior to virtualization extensions such as Intel VT and AMD-V)?

- Instructions exist that can run in both user and kernel mode, give different output (such as `POPF`).
- Instructions also exist to allow a program to determine whether it was in privileged.
- These instructions don't throw an exception (trap), and thus cannot be emulated by the VMM.

Question

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Additional instructions allow the VMM to enter a special privledged mode (some call this "ring -1", although it's not a real protection ring), which allows it to host different guest kernels, all of which believe they have ring 0 (kernel mode) access to the system.

2018 SE370 Test

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- No seperate kernel - instead, Unix syscalls are mapped into NT ones through a kernel module (LXCore)
- Somewhat similar to Application virtualization

Trivia

WSL2 uses a real Linux kernel running under Hyper-V, due to performance and feasibility issues implementing all syscalls in LXCore/on top of NT.

2011 SE370/CS340 Test

Question

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2011 SE370/CS340 Test

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Give reasons why a language such as Java is seldom used to implement operating systems?

- No direct access to memory*
- Insufficient control over memory allocation*
- Not easily mapped to machine code
- more...

Trivia

*One can technically manually allocate off-heap memory or access memory-mapped devices using `sun.misc.unsafe`

2011, 2018 Test

Question

Explain the difference between a thread and a process?

2011, 2018 Test

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Explain the difference between a thread and a process?

Processes have their own memory space and connections to files/devices (file descriptors), whereas threads typically share memory space within a given process (but have their own stack so they can be executing different code).

2018 SE370 Test

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- With user-level threads, the OS only sees one thread per process, whereas with system-level threads the OS is aware of multiple threads per process.
- On a multiprocessor, different system-level threads can be scheduled on different processors, since the OS can schedule them on different processors.

2018 SE370 Test

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- A context switch between two tasks takes a certain amount of time, as registers, stack pointers, etc. need to be switched out.
- As a result, smaller time slices means more context switches and thus lower throughput (but lower latency!).