Lecture 5 - 2nd half
Marc Held

- Address space
- Stack

D-G: demand allocate
B-C: demand allocate
A-B: map file

Program counter
PC = A
Fetch → fault
read file
alloc page
read page
fault
alloc...

Ø if we're under a lot of pressure, move swap
the victim page onto disk (swap or page file)

must remap if swapped (already full)

D-E: CON
B-C: CON
A-B: map file

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Shared memory

IPC and Shared libraries

Interprocess communications DLL

Virtual address deadlocking can't function any more

Not enough memory

Not good. Use bigger and enough pages

OR ELSE!

(thrashing or deadlock will happen)

Virtual address deadlocking

 Spend loads of time moving data from ram to HD and vice versa only with respect to the

Working set = active data ("footprint")

Data, code, regions in use by program since used by a program

Access footprint

Average usage

This is where the algorithms come in close to LRU

 hare

happens at runtime

Saves lots of space

2

Mary Hall

page
Virtual Machines - "You can fake everything by using fault"

Can't run Windows on Linux because of the user/supervisor mode divide. Each OS assumes complete control over supervisor mode, so it assumes it has access to CPU features like virtual memory management, etc.

Slow - [full emulation]

-慢

- Lot

- Emulate CPU

- Int eur, ebx

- While()

- Case mov

- Case jmp

Emulated processes think they have user/supervisor mode, but it's all in user mode.

You could translate to direct instructions like the JVM does to send it up.

You could also try to trick the system to run the userspace normally and emulate supervisor mode.

Called supervisor

- Thru except

- When supervisor mode is requested

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When executing Linux, save registers, then execute instruction, then return back.

It's in user mode, but it still thinks it's in supervisor mode.

Hyervisor could all instructions to instruction set.

"VMware owns everything" (the US), not "we run VMware".

Scheduler:

- VMware
  - Talks to its own drivers

Processor needs to be able to trap when a user program gives in supervisor mode (protected instructions).

Just-in-time virtualizer (e.g., VMware vs. VirtualBox).

4 more held.
Hardware virtualization → Hyper-V (and Xen)

true user and supervisor mode

VM (supervisor mode)

Guest virtualization → Xen

"Let's create a different API for CR3, page tables"

-a different interface for controlling virtual memory and other features

while OS runs in user mode, drop into hypervisor mode

Views on OS architecture

S More Hell