Operating Systems Design (CS 423)

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http://www.cs.illinois.edu/class/cs423/

Based on slides by Roy Campbell, Sam King, and Andrew S Tanenbaum

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I/O Software: Principles

- Device independence
  - Possible to write programs that can access any Io device without having to specify device in advance
  - Read file as input on a floppy, hard disk, or CD-ROM, without modifying program for each device

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I/O Software: Principles

- Uniform naming
  - Name of file or device should simply be a string or an integer and not depend on device in anyway
  - Example: Plan9
    - All drivers are files in file system name space

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I/O Software: Principles

- Buffering
  - Systems are busy, devices have limited storage
  - Keep extra data in software to make device appear to have more space
  - Example: Network packets, audio

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I/O Software: Principles

- Shared vs dedicated devices:
  - Allowing for sharing, considering two user sharing open files
  - Example: Disk, audio devices
  - Often sharing supported in libraries

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Device drivers in VMMs

- Problem: multiple OSes all expecting exclusive access to the underlying hardware
- Solution: another layer of software
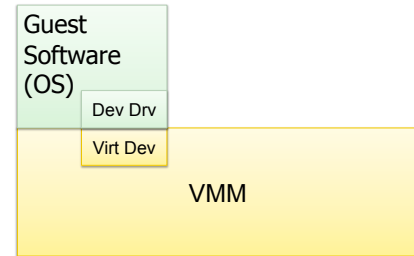
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Devices in VMMs

- Physical reality:
  - Single set of real hardware
  - Shared among multiple OSes, possibly wanting different hardware
- Illusion:
  - Each OS gets sole use of its own specific (virtual) hardware
- Solution:
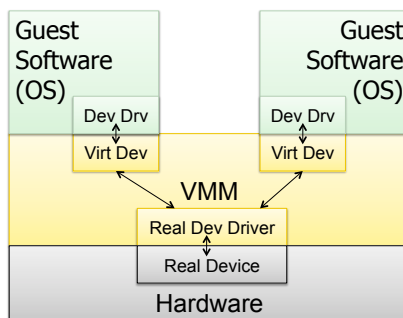 - Software version of real hardware

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Virtual Devices

Guest Software (OS)
Dev Drv
Virt Dev

VMM

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Type I VMM

Guest Software (OS)
Dev Drv
Virt Dev

Guest Software (OS)
Dev Drv
Virt Dev

VMM
Real Dev Driver
Real Device
Hardware

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Type II VMM

Guest Software (OS)
Dev Drv
Virt Dev

Guest Software (OS)
Dev Drv
Virt Dev

VMM
Host OS
Real Dev Driver
Real Device
Hardware

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Type I/II VMM Hybrib

VMM App
Host OS
Real Dev Driver
VMM
VMM

Guest Software (OS)
Dev Drv
Virt Dev
Real Dev Dvr
Real Dev

Real Device
Hardware
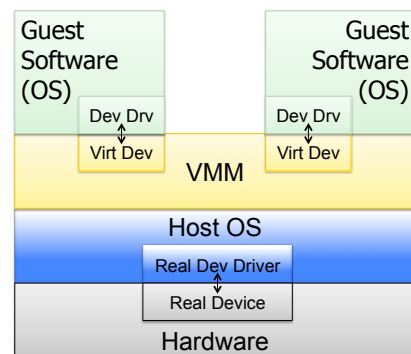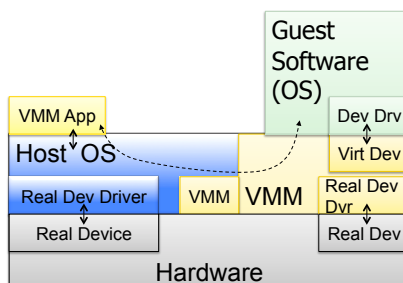
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