第 3 讲：Virtual Machine Monitor

第一节：Overview

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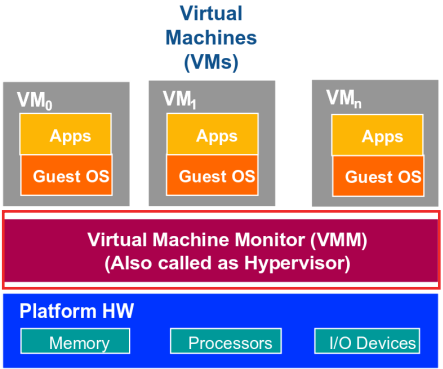
Introduction



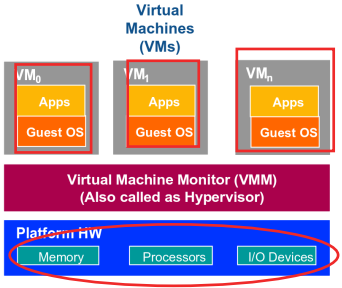
What is Virtualization

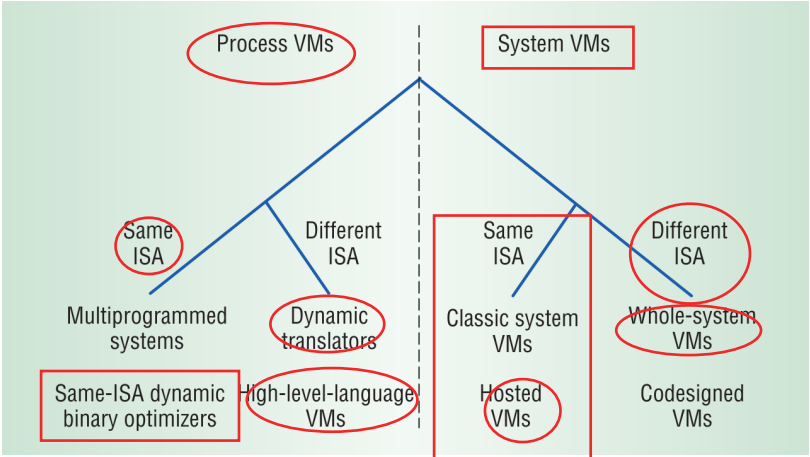
Virtualization is a term that refers to the abstraction of computer resources [wikipedia]

Wisdom

All computer problems can be solved with another layer of redirection [Donald E. Knuth (高德纳), Stanford University]

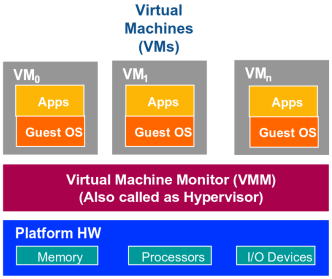
Introduction – taxonomy

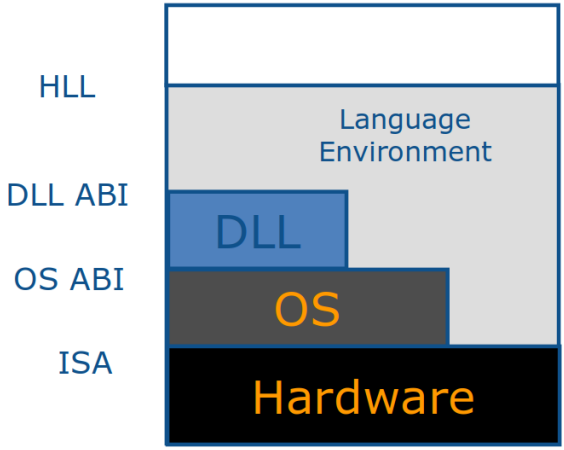




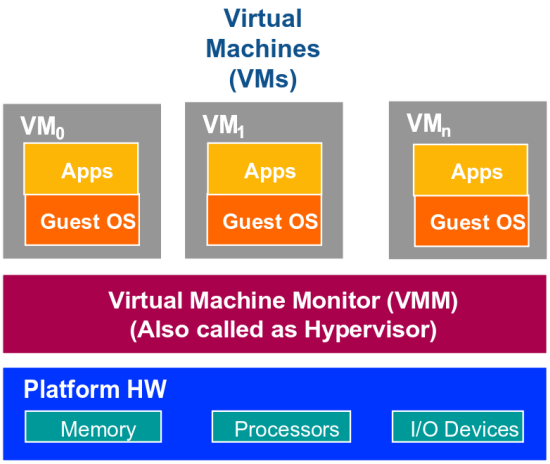
from James E.Smith, IEEE computer Society2005

Introduction – different layer of virtualization





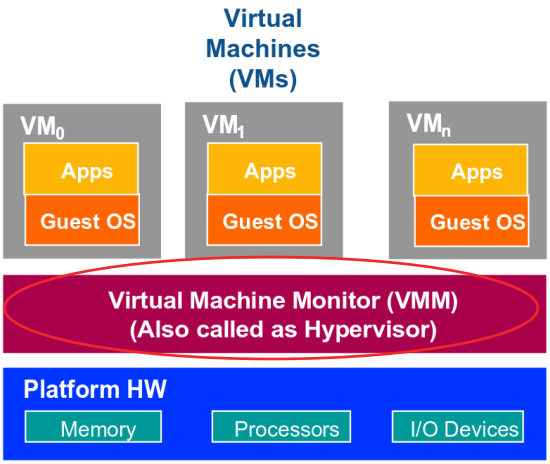
Introduction – VMM



Virtual Machine Monitor, VMM

VMM transforms the single machine interface into the illusion of many. Each of these interfaces (virtual machines) is an efficient replica of the original computer system, complete with all of the processor instructions [Robert P. Goldberg, 1974]

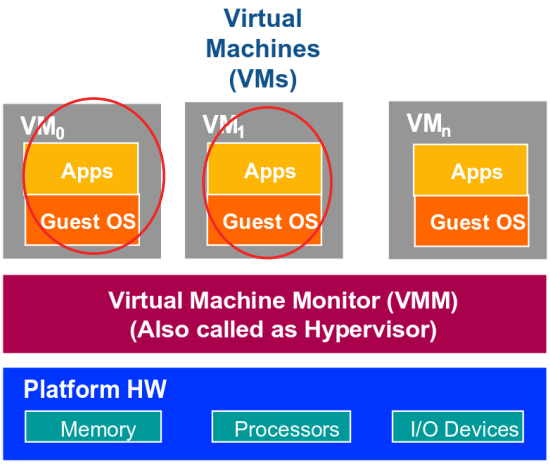
Introduction – VMM



Virtual Machine Monitor, VMM

A virtual machine is implemented by adding software to an execution platform to give it the appearance of a different platform, or for that matter, to give the appearance of multiple platforms. [J.E. Smith, "An Overview of Virtual Machine Architectures"]

Introduction – Why VMM?

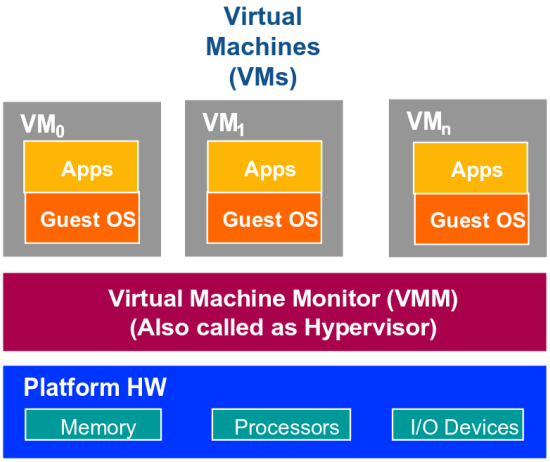


Before there were data centers...

- Many early commercial computers were mainframes
- powerful computation, highly reliable, extensive I/O capabilities
- for computing/data-intensive apps

IBM System/360 hardware and CP/CMS system software: Virtualizable Architecture

Introduction – Why VMM?

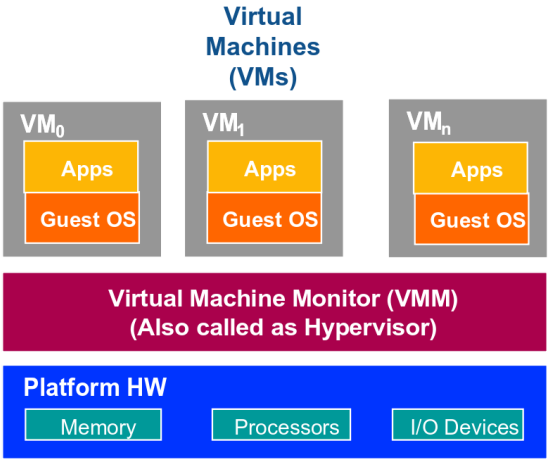


Now there were data centers...

- Many computers were servers connected in the world.
- powerful computation, highly reliable, extensive I/O capabilities
- for computing/data-intensive apps

x86/ARM and Linux/KVM, vmware, xen, etc.
system software: Virtualizable Architecture

Introduction – Essential characteristics of VMM



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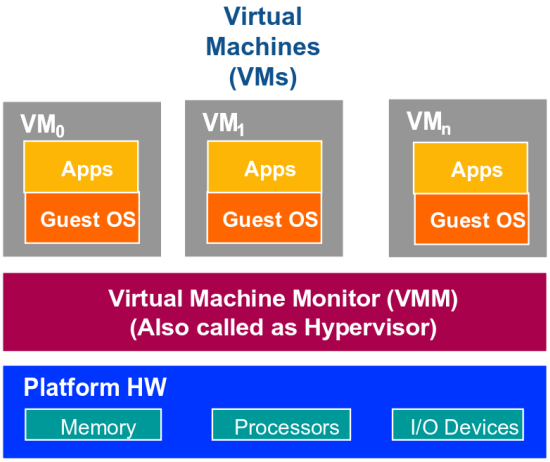
Introduction – Essential characteristics of VMM



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  - VMM is in complete control of system resources

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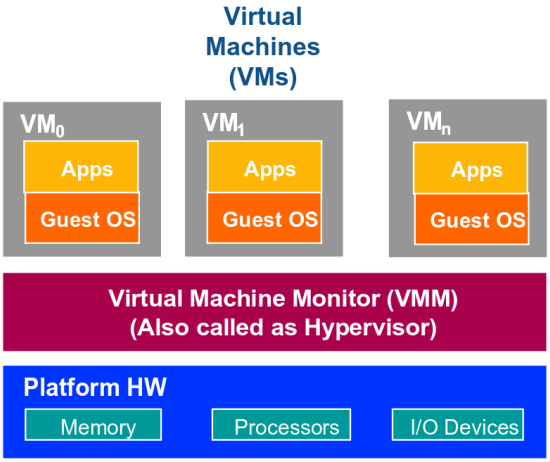

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  - Differences caused by the availability of system resources. e.g. memory size
- Isolation, or resource control
  - VMM is in complete control of system resources
- Efficiency
  - At worst only minor decreases in speed
  - speed $>>$ emulators, software interpreters (simulators)