Operating System Fundamentals

Module 9:
Virtual Machines

Agenda

- Virtual Machines
- Process Virtual Machine
- System Virtual Machine
- Virtual Machine Architecture
- Installation and Configuration

Virtual Machine?

- Abstraction of a computer in software
  - Behaves like a physical machine
  - Generally portable
- Two classifications
  - Process Virtual Machine – JVM or .NET CLR
  - System Virtual Machine – VMWare or Hyper-V

Process Virtual Machine

- Managed Runtime Environment
- Runs in a host to support a single process
- Allows portability of application software, without concern for hardware or the host Operating System
- How it works:
  - VM is host specific
  - Application code is “tokenized” to be platform independent
  - “Tokenized” code is interpreted just-in-time
  - Resulting interpreted code is usually cached for performance

- Software that virtualizes hardware, and allows a full operating system to be installed as a “guest” on a “host”
  - “Guest” OS behaves like a full operating system on its own hardware
- Uses:
  - Multiple OS’s on a single computer to better utilize CPU
  - Testing on multiple platforms without additional hardware costs
  - Easier maintenance of configurations

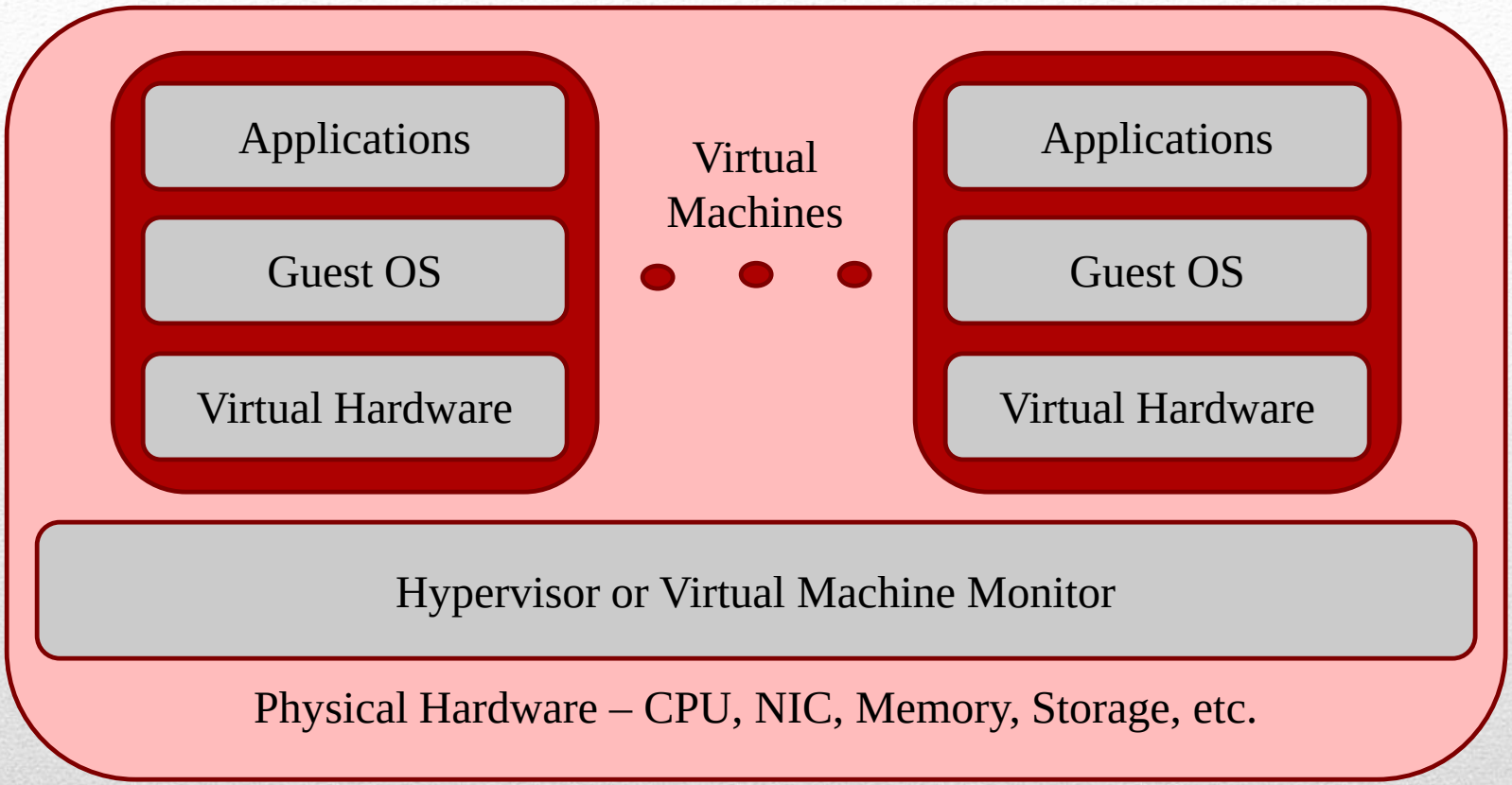
System Virtual Machine

Disadvantages of VM's

- Extra layer of software to virtual hardware
  - Can be less performing than host OS
- Multiple OS's running concurrently
  - Sporadic behavior, especially with user interface
- Hardware optimization
  - VM may not be written to take advantage of hardware features

Popular System VMs

- VMWare (VMWare)
  - Runs on multiple platforms including Linux, Windows and MacOS
- Hyper-V (Microsoft)
  - Runs on Windows Server and Windows 8.x
- VirtualBox (Oracle)
  - Runs on multiple platforms including Linux, Windows and MacOS
- There are dozens more!



Virtual Machine Architecture

General Requirements

- Hardware assisted virtualization
  - Intel VT (Virtualization Technology)
- RAM
  - Need substantial amount to support multiple virtual machines
- Host Operating System
  - Capable of running VM
- Disk space
  - Enough to store all VMs
  - Includes virtual disk space

Configuration

- Basic RAM required
- Hard disk space required
- Network interface
- Number of CPUs
- Sound
- Display
- Printer
- USB

VMWare

- Works on most popular operating systems
  - Linux
  - Windows
  - MacOS
- Well supported
- Free products for consumers
  - VMWare Player

VMWare Resources

- Web site:
  - http://www.vmware.com/
- VMWare Player download
  - https://my.vmware.com/web/vmware/free#desktop_end_user_computing/vmware_player/6_0
- VMWare Player documentation
  - http://www.vmware.com/support/pubs/player_pubs.html

VMWare

- Demonstration
  - Installation of VMWare
  - Installation of a Guest OS