



java.com.sun/javaone

JavaOne™

Virtualizing a Virtual Machine

Azeem Jiva

Shrinivas Joshi

AMD Java Labs

TS-5227

AMD
Smarter Choice



Learn best practices for deploying Java EE applications in virtualized environment



GOAL

Agenda

- What is Virtualization?
- Types of Virtualization
- Why Virtualize?
- Accelerating Virtualization
- Java EE
- Summary
- Q&A

What is Virtualization?

- Platform Virtualization
 - Abstraction of a computer
- Resource Virtualization
 - Abstraction or simplification of a resource
 - Hide physical characteristics of computing resource
- Provides consistent interface, regardless of resource location

Agenda

- What is Virtualization?
- Types of Virtualization
- Why Virtualize?
- Accelerating Virtualization
- Java EE
- Summary
- Q&A

Types of Virtualization

Overview

➤ Native

- VMWare Workstation
- Microsoft® Virtual PC
- QEMU
- Virtual Box
- KVM

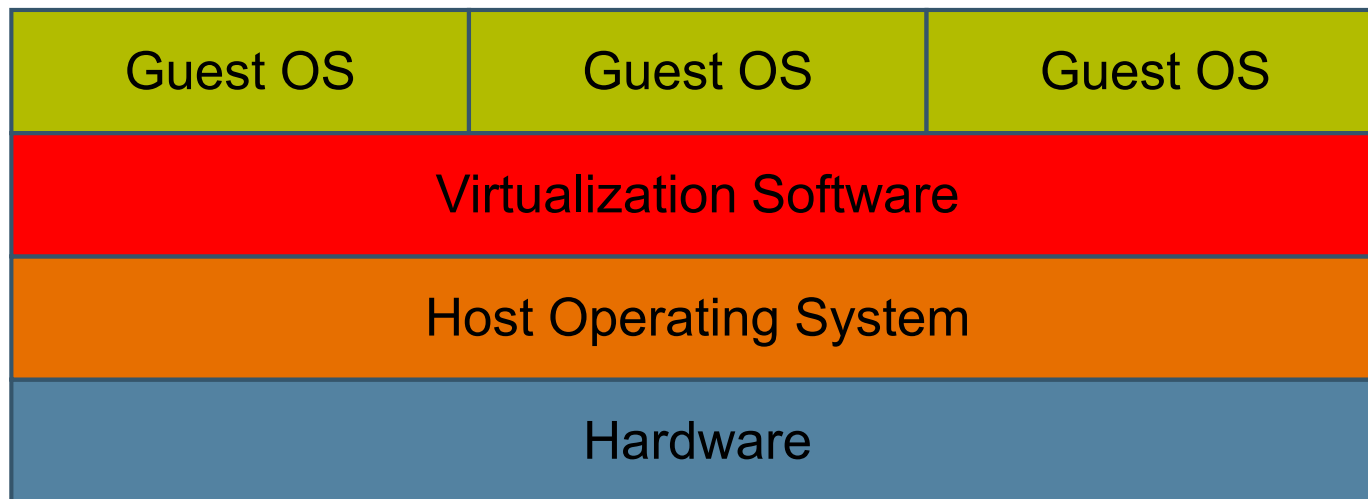
➤ Hypervisor

- VMWare ESX Server
- XEN

Types of Virtualization

Native

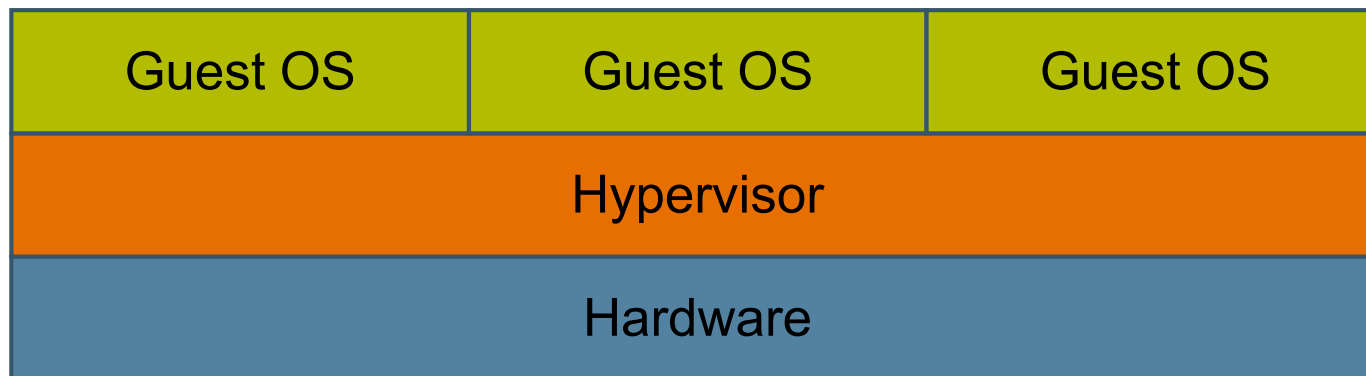
- Virtualize Guest OS on a Host OS
 - Linux[®] running on Windows[®]
 - Windows running on Linux
- Host OS not optimized for virtualization (usually)
- Advanced virtualization features not available



Types of Virtualization

Hypervisor

- Virtualize Guest OS on a thin software layer
 - Linux[®] running on ESX Server
 - Windows[®] running on ESX Server
- Hypervisor is optimized for virtualization
- Advanced virtualization features are available and well tested



Agenda

- What is Virtualization?
- Types of Virtualization
- Why Virtualize?
- Accelerating Virtualization
- Java EE
- Summary
- Q&A

Why Virtualize?

Advantages

- Not every application needs a full system
- Easier to administer
 - Need to do hardware maintenance?
 - Move the virtualized OS disk to another system
- Lower datacenter costs
- Maintain legacy OSs and applications

Why Virtualize?

Disadvantages

- If Hypervisor crashes, all Guest OSes go with it
- Performance
 - With multiple Guest OSes, performance may suffer
 - Usually 10%, can be as high as 20%
- I/O-bound applications suffer
 - Limit the number of I/O-bound applications
 - Disk is the worst offender
- Immature tools
- Specialized skill set required

Agenda

- What is Virtualization?
- Types of Virtualization
- Why Virtualize?
- Accelerating Virtualization
- Java EE
- Summary
- Q&A

Accelerating Virtualization

AMD-V™ Technology

- Nested Page Tables
 - Virtualized CR3 in hardware
- Tagged Transition Look-Aside Buffer (TTLB)
 - Assign ID to TLB entries
 - Hardware knows which TLB entry belongs to which Guest OS
- Device Exclusion Vector (DEV)
 - Excludes devices from accessing memory
 - Bit to include/exclude devices from accessing a page

Agenda

- What is Virtualization?
- Types of Virtualization
- Why Virtualize?
- Accelerating Virtualization
- Java EE
- Summary
- Q&A

Java EE

Virtualizing a complete stack

- Application changes not required
- Most changes are at Hypervisor level
- Java Virtual Machine can be Guest OS
 - JRockit Liquid
- Effects of Virtualization
 - Performance
 - Resource allocation
 - Bottlenecks
 - Consolidation

Java EE

Performance

- SPECjbb2005 performance slows down 10%
- Use as few virtual CPUs as possible
 - If application is single-threaded, use a single VCPU
- Decrease processor-to-processor communication
- If possible use less than 896 MB of physical memory for Linux® Guest OS
 - Different mapping techniques are used over 896 MB
- Be prepared for decrease in performance

Java EE

Resource Allocation

- Three-tier testing on single system
- Page sharing
 - Sharing of guest memory pages
 - Decreases host memory usage
 - Decreases I/O bandwidth
- Run the same Guest OS for increased page sharing
- Move Guest OS from system to system
 - Running application doesn't know (or care!)

Java EE

Bottlenecks

- CPU constraints
 - Guest OS requires all allocated CPUs be available
 - Sum of allocated CPUs == physical CPUs
- Memory constraints
 - Sum of allocated memory == physical memory

Java EE

Bottlenecks

- Disk I/O constraints
 - Apps (dB) that have large number of small read/writes severely affected
 - SAN is common, or at least use a separate disk
- Network constraints
 - Lots of small packets affect latency
 - Dedicated NIC

Java EE

Consolidation

- Move Guest OS to single system when load is low
- Increase CPU core count on the rise
 - Eight cores common now
 - Expect Sixteen cores to be common in two years
- Not all applications can take advantage of that many cores
- Run many Guest OSes on a single system
 - Each application thinks it is on 1-4 processing cores

Summary

- Virtualization helps lower total cost of ownership
- Slight performance hit, improved maintainability
- Bottlenecks on I/O
- Sharing of resources on single Host OS
- Consolidate systems

For More Information

➤ Sites

- <http://www.amd.com/virtualization>
- <http://developer.amd.com/>



Trademark Attribution

AMD, the AMD arrow logo and combinations thereof and AMD-V are trademarks of Advanced Micro Devices, Inc. Microsoft and Windows are registered marks of Microsoft Corporation in U.S. and other jurisdictions. Linux is registered trademark of Linus Torvalds.

©2008 Advanced Micro Devices, Inc. All rights reserved.

THANK YOU

Azeem Jiva
Shrinivas Joshi
AMD Java Labs

TS-5227

