

Clustered Virtualization of SQL

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Agenda

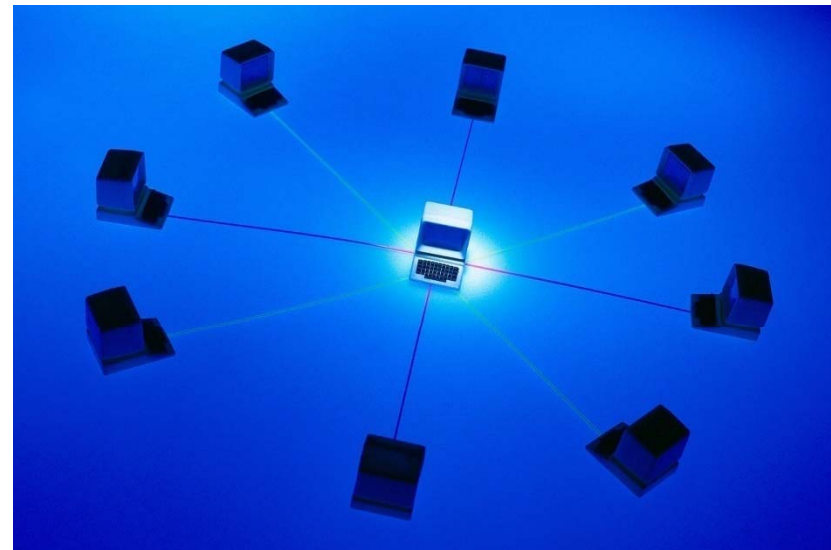
- ▶ **Virtualization Technology**
- ▶ **Advantages and Challenges of Virtualization**
 - ▶ Virtualizing SQL Server
- ▶ **Advanced Virtualization Concepts**
 - ▶ Clustered Virtualization and Managed Infrastructure
- ▶ **Q&A**



Virtualization Technology

Overview of Modern Virtualization

- ▶ **What is Virtualization?**
 - ▶ Abstraction of the operating environment and processes from the physical hardware it resides upon
- ▶ Virtualization enables the sharing of physical system resources between more than one virtual system



Core Components

- ▶ **Physical Server – VM Host**
 - ▶ Shares physical resources with VM Guests
- ▶ **Virtualized System – VM Guest**
 - ▶ Computer within a Computer
- ▶ **Hypervisor**
 - ▶ Manages the interaction between the virtual machines (VMs) and the physical hardware
 - ▶ Controls the available pool of system resources

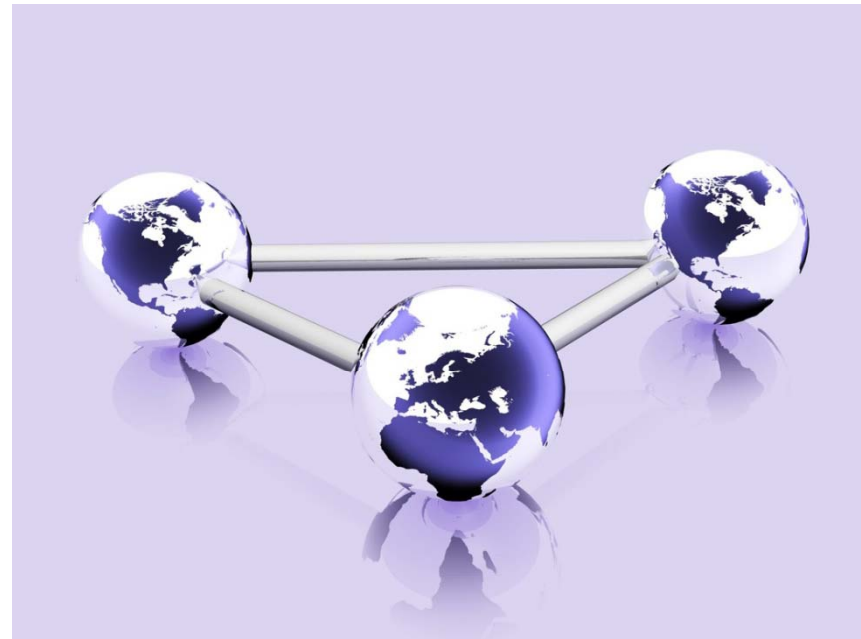


Virtualization Vendors



Hypervisors

- ▶ Citrix XenServer / Open Source Xen
- ▶ VMware Server & VMware ESX
- ▶ Microsoft Hyper-V



Hardware Virtualization

- ▶ Emulates standard physical hardware with virtual devices providing a wide range of functionality
 - ▶ VGA
 - ▶ CD-ROM
 - ▶ Network Adapter
 - ▶ Keyboard and mouse
- ▶ Generally requires no changes or software to be configured on the guest
- ▶ Example
 - ▶ VMware Workstation



HVM – Benefits and Drawbacks

▶ Pro's

- ▶ Easy to install a new guest operating system without ensuring that it has been modified to support virtualization
- ▶ “Look and Feel” of a traditional system

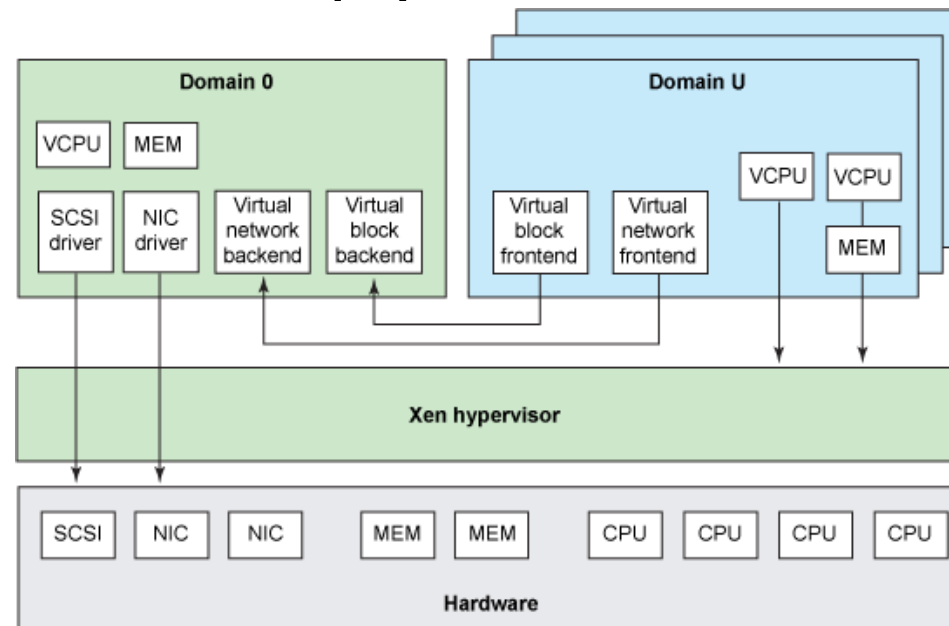
▶ Con's

- ▶ Performance suffers from the emulation of hardware devices
- ▶ Disks are usually provided through software emulation of block devices using file based storage
 - ▶ Filesystem limitations
 - ▶ Severe disk I/O bottleneck



Paravirtualization (PV)

- ▶ Requires modification to the guest operating system to support communicating with the hypervisor
- ▶ Eliminates the need for emulation of hardware devices by providing a native interface for fast I/O to the hypervisor and selective access to physical devices



Why Use Virtualization?

Pro's and Con's of Switching to Virtualization

Benefits of Virtualization

- ▶ Rapid testing and provisioning of new infrastructure reduces lead-time and IT startup costs
- ▶ Significant cost savings can be achieved by virtualizing underutilized systems
- ▶ Development and testing platforms can benefit greatly from the instant provisioning of virtual clones that accurately mirror their production cousins
- ▶ Virtualization can be used to significantly increase efficiency by balancing actual system load to total available resources



Unique Challenges of Virtualization

- ▶ Performance
- ▶ Reliability
- ▶ Data Integrity
- ▶ Security
- ▶ Backups / Fault Tolerance



Best Practices Don't Change!

- ▶ Provisions must be made to properly address the issues of backups, maintenance, monitoring, and security of both the virtualized guests as well as the host systems
- ▶ Virtualization can create a strong temptation to overlook the issues of fault tolerance and single points of failure. Do not ignore the need to practice the same diligence on virtual environments as you would on physical environments.
- ▶ Poorly implemented virtualization can often **increase** complexity and risk

Virtualizing Microsoft SQL Server

Virtualizing SQL

- ▶ **Performance Impact**
 - ▶ Disk I/O
 - ▶ Network Throughput
 - ▶ Competing for resources
 - ▶ CPU / RAM Limitations
- ▶ **Data Integrity**
 - ▶ Timestamps / Clock Drift



Advanced Virtualization Concepts

Ascension from the Physical Server

- ▶ **Snapshots**

- ▶ Not to be confused with backups – these allow for saving both disk and memory state information, enabling the return to a previous condition

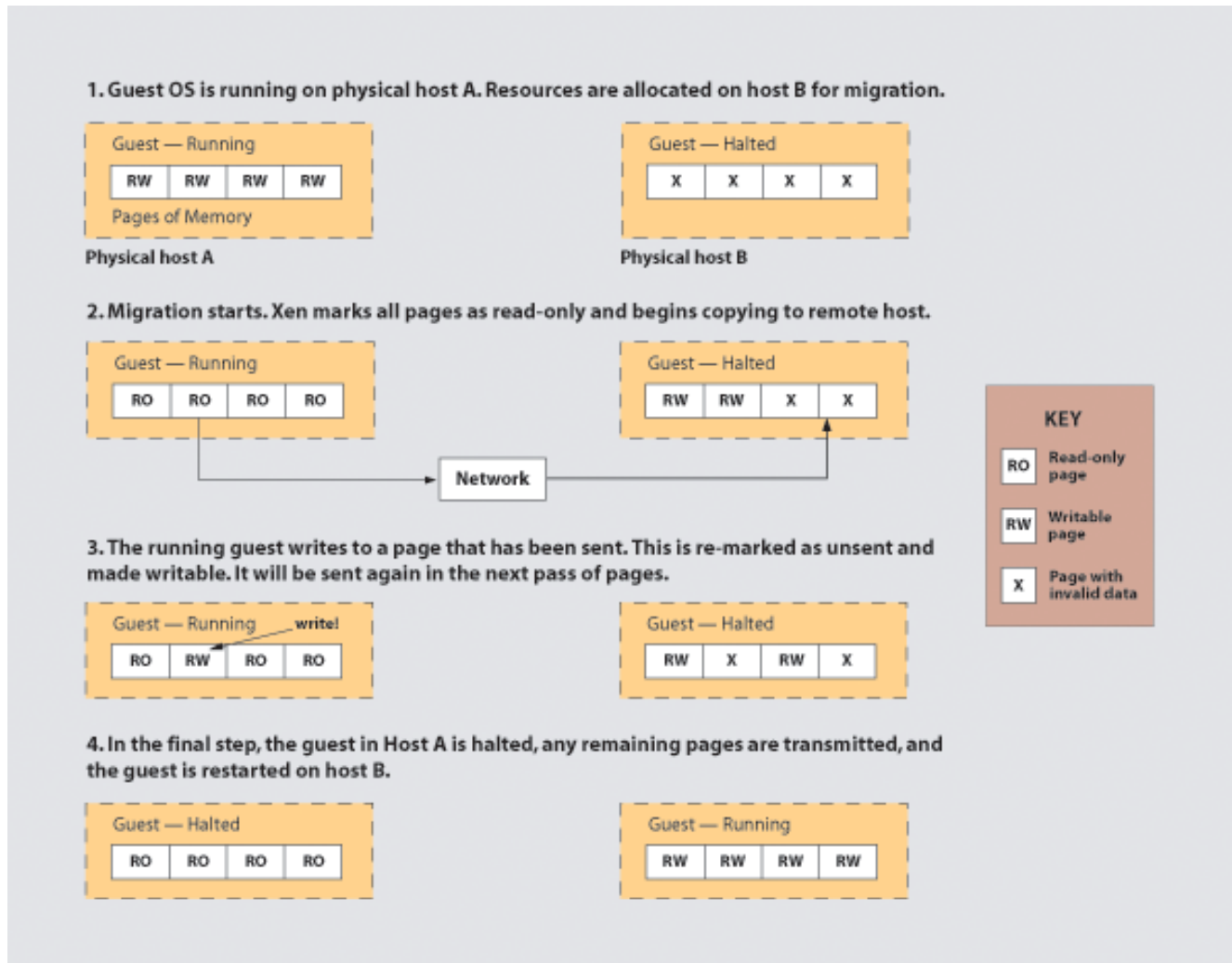
- ▶ **Cloning**

- ▶ Rapid deployment of multiple systems from a single good configuration

- ▶ **Migration / Live Migration**

- ▶ Relocate a server without rebuilding

Live Migration



Clustered Virtualization

Shifting the Paradigm to Virtual Infrastructure Management

Components of a Clustered VM Environment

- ▶ **Physical Server Pool**
 - ▶ Standardized Hypervisor
- ▶ **Shared Network Storage**
 - ▶ Locking Mechanism
 - ▶ Cluster-aware Filesystem / Volume Manager
- ▶ **Heartbeat Monitoring**
 - ▶ STONITH

Shared Network Storage

- ▶ **SAN**
 - ▶ iSCSI
 - ▶ ATA over Ethernet
 - ▶ Proprietary SAN systems
- ▶ **Distributed Locking Mechanisms**
 - ▶ Disk based
 - ▶ Network based
- ▶ **Cluster-aware Filesystems**



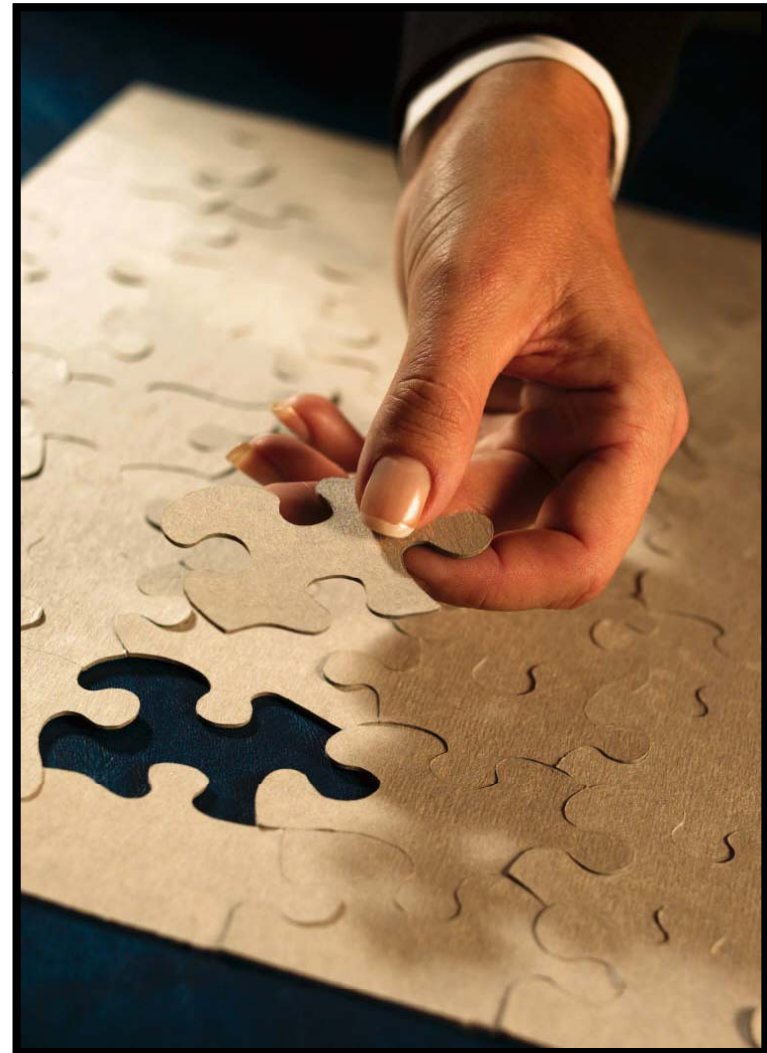
Heartbeat / STONITH

- ▶ Monitor cluster members and proactively lock out failed nodes
- ▶ Quorum / Voting
 - ▶ Prevents split-brain scenarios where more than one node access a locked resource
 - ▶ Necessary to prevent two nodes from writing to the same shared storage
 - ▶ Critical element in delivering clustered services
- ▶ STONITH - Shoot The Other Node In The Head
 - ▶ Physically reboot or disable the offending node



Coming Soon to a VM Near You

- ▶ Unattended migration
- ▶ On-The-Fly Application Clustering
 - ▶ Add application cluster nodes based on demand
- ▶ Live VM Hardware Upgrades
 - ▶ Already available using Xen PV / Linux guests
 - ▶ Adjust vCPU and memory allocation without suspending or rebooting the VM



Questions?

