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[Informix Technical Roadshow](#) is a two-day, deep-dive technical event that gives you hands-on experience with the latest Informix releases and Informix Warehouse technology.

This roadshow is designed to help you gain fresh, innovative ideas for optimizing your business performance and creative competitive advantage - and its absolutely free to attend these events.

The Roadshow topics include:

- Latest features of Informix
- Informix Warehouse
- Deep compression
- Upgrades and migrations

Informix Panther Early Program

- **Want to be on the cutting-edge of Informix technology?**
 - Get early access and exposure to new capabilities
 - Get access to IBM resources through lab advocates
 - Ensure successful deployment
 - Prototype solutions with new capabilities
 - Reduce time to market
 - Gain first mover advantage
- **For more information, contact Madhuri Ahuja (Customer Validation Manager) at: ahujam@us.ibm.com**



Informix[®]
software



Data Management

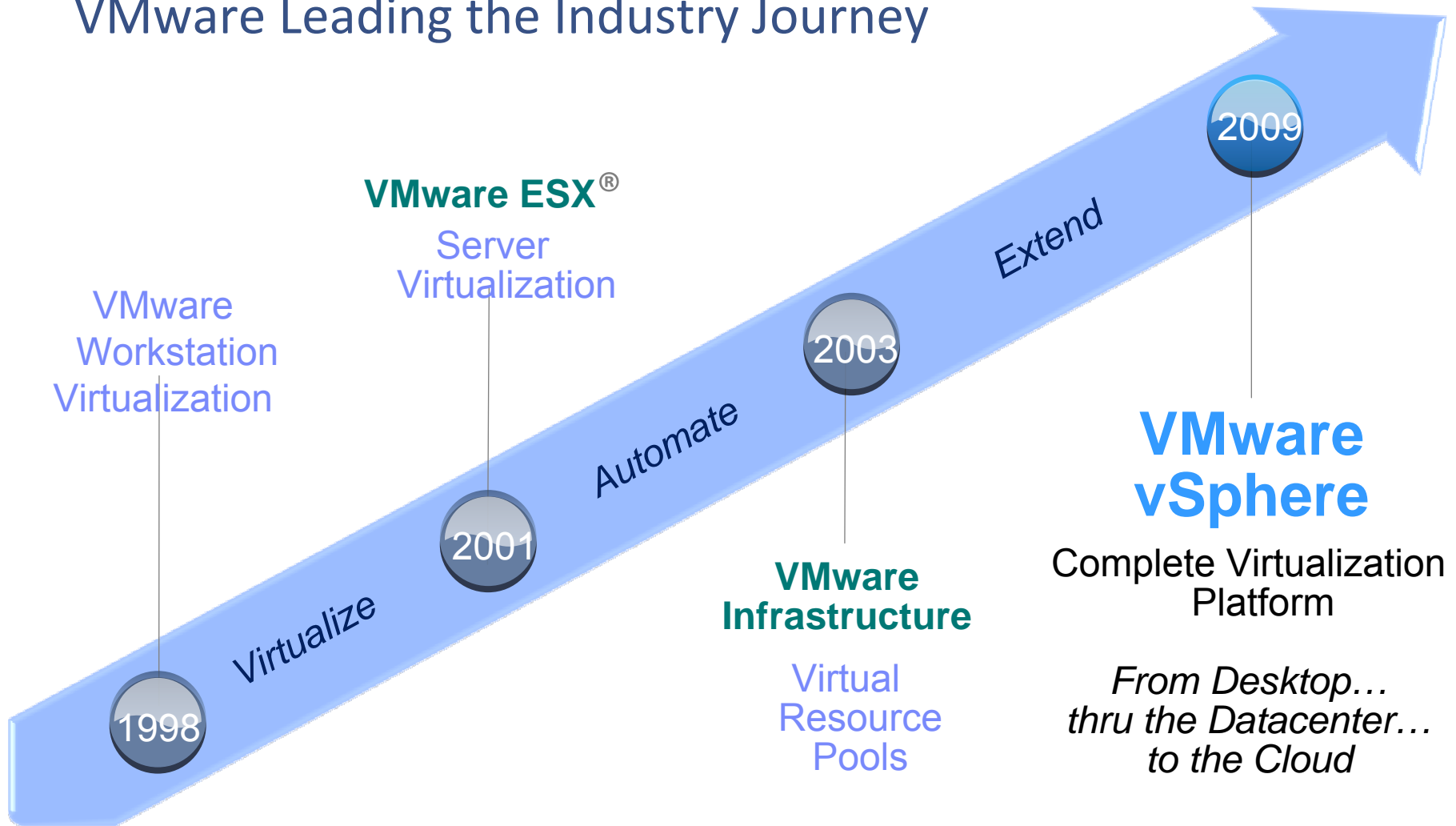
Best Practices for Running Informix Instances in VMWare vSphere Virtual Environments

Sreeni Paidi, Informix Enablement Consultant, spaidi@us.ibm.com

Agenda

- **What is VMware Virtualization?**
- **Evolution of VMWare Virtualization**
- **Why Informix on VMWare**
- **Informix Scalability Tests**
- **Informix Scalability Test Results**
- **Best Practices for running Informix on VMWare**
 - **General Considerations**
 - **BIOS Considerations**
 - **CPU Considerations**
 - **Memory Considerations**
 - **Network Considerations**
 - **Storage Considerations**
- **Resources**

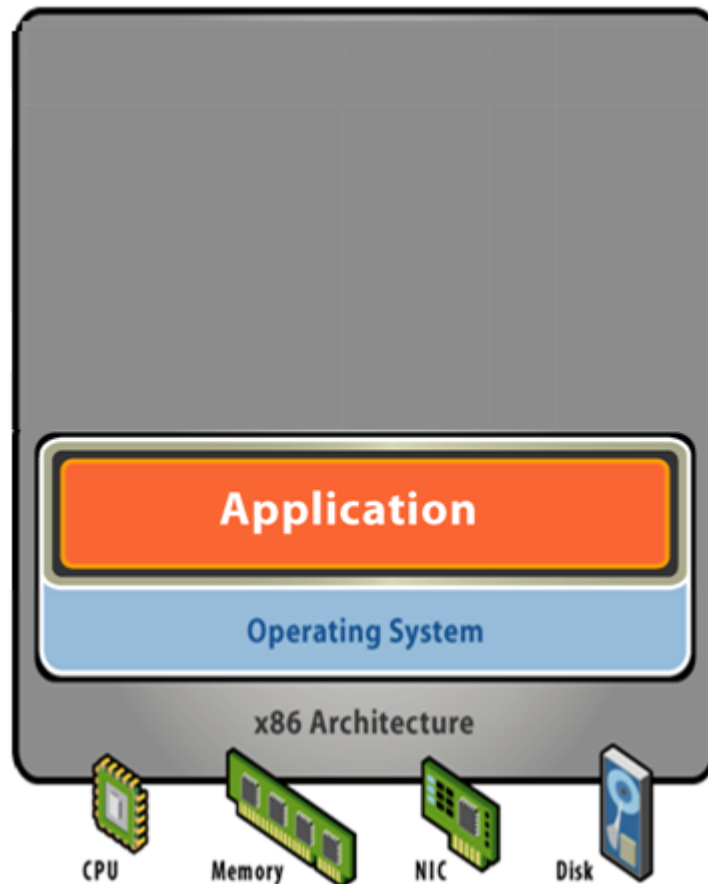
VMware Leading the Industry Journey



What's all this VMware hype about anyway?

- Business Drivers for VMware virtualization
 - ☐ Consolidation
 - ☐ Isolation
 - ☐ Encapsulation

Consolidation



Old Model:

Traditional x86 Architecture

- ❖ Single OS image per machine
- ❖ Software and hardware tightly coupled
- ❖ Multiple applications often conflict
- ❖ Underutilized resources introduce real cost into the infrastructure

Old model just doesn't work anymore!

Consolidation



New x86 Model: VMware Technology

- ❖ Run multiple OS's/APP's and fully utilize physical resources
- ❖ Flexibility to choose the right OS for the right application

**Works with what you
have today...**

Isolation – with-out VMware



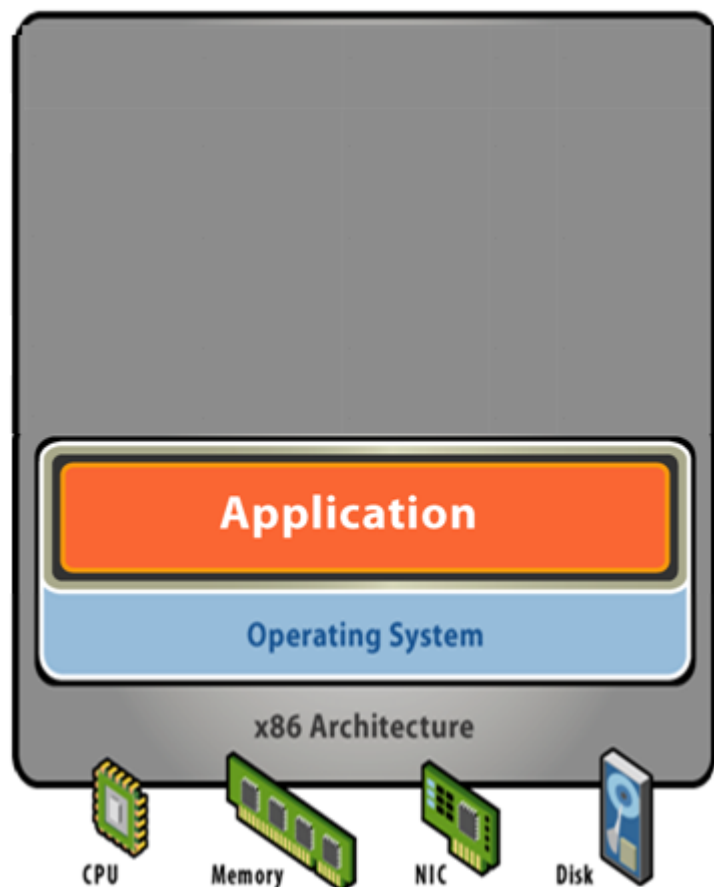
- ❖ OS/APP patching impacts multiple apps.
- ❖ Vulnerable to memory corruption, virus's and host crashing.
- ❖ Security and access problematic for Business Units.
- ❖ Doesn't Scale as well as VMware Virtualization at high end.

Isolation With VMware



- ❖ OS/APP patching impacts only itself.
- ❖ Memory is isolated across VM's. Protected from memory leaks and virus's.
- ❖ Business units assured their workloads are isolated, safe and secure from other workloads running on the same server.
- ❖ Better scalability at the High End

Encapsulation – With Out VMware



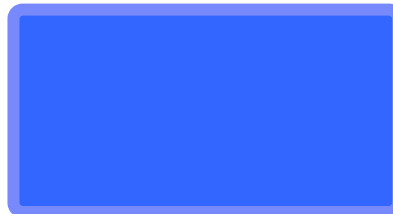
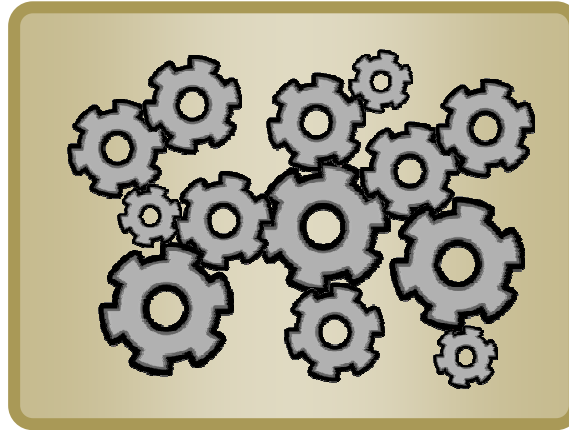
Old Model:

Traditional x86 Architecture

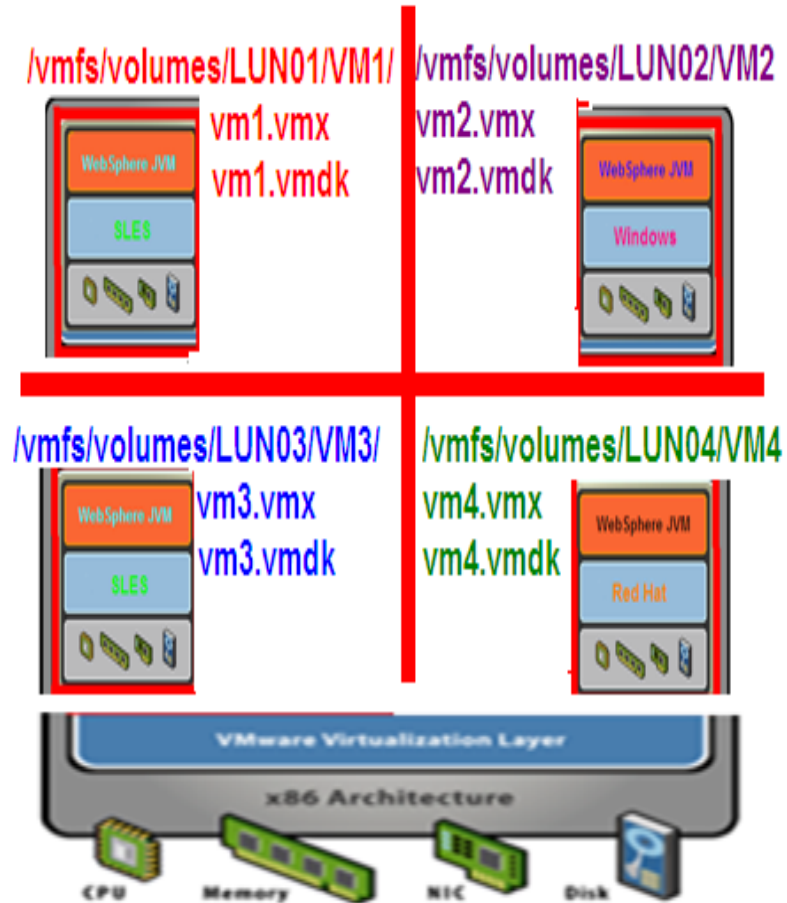
- ❖ Software and hardware tightly coupled
- ❖ Everything encapsulated into the physical hardware
- ❖ Decoupling OS/Hardware from App complex, challenging and expensive to maintain

Backup and recovery require like hardware!

Encapsulation – With Out VMWare

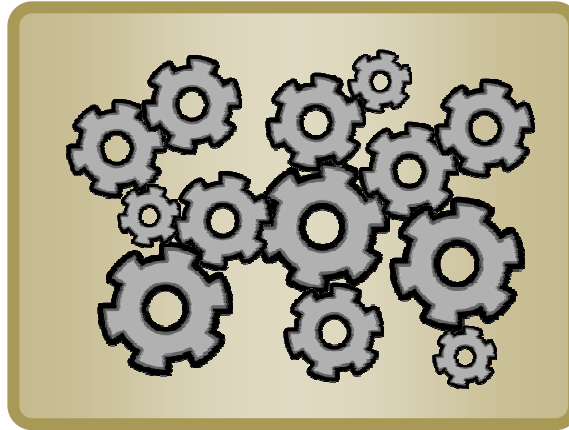


Encapsulation – With VMware



- ❖ OS, Hardware and App are files.
- ❖ What can we do with files?
- ❖ Encapsulation enables better HA, better DR.
- ❖ Enables Rapid Provisioning from VMware templates and clones.

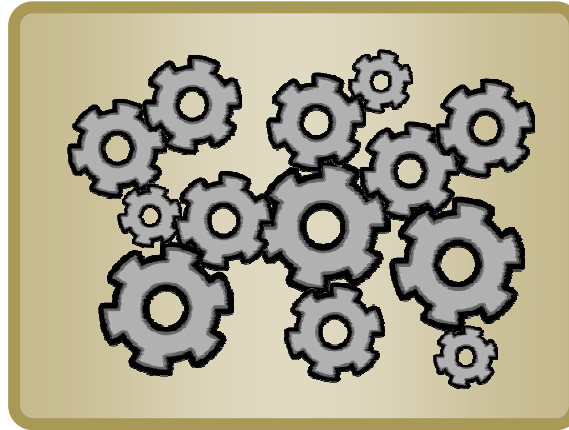
Encapsulation – With VMware



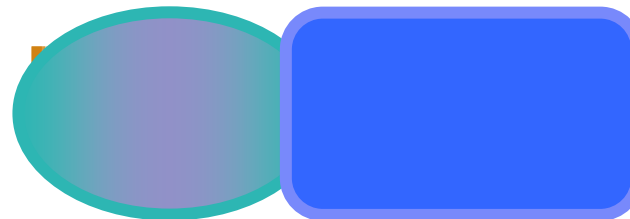
Virtualization Layer



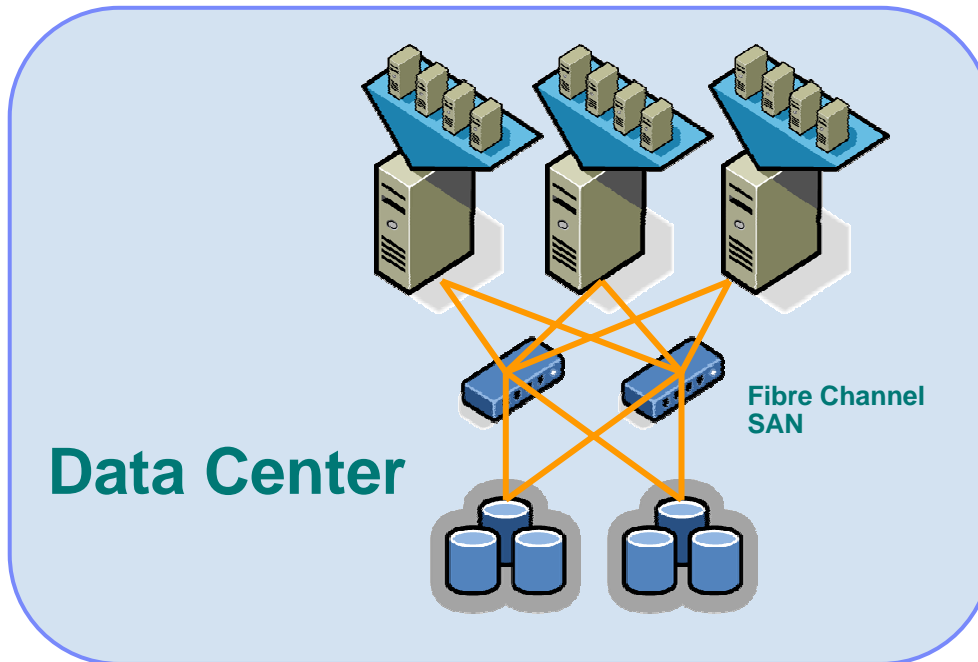
Encapsulation – With VMware



Virtualization Layer



VMware vSphere Clusters



Shared Everything

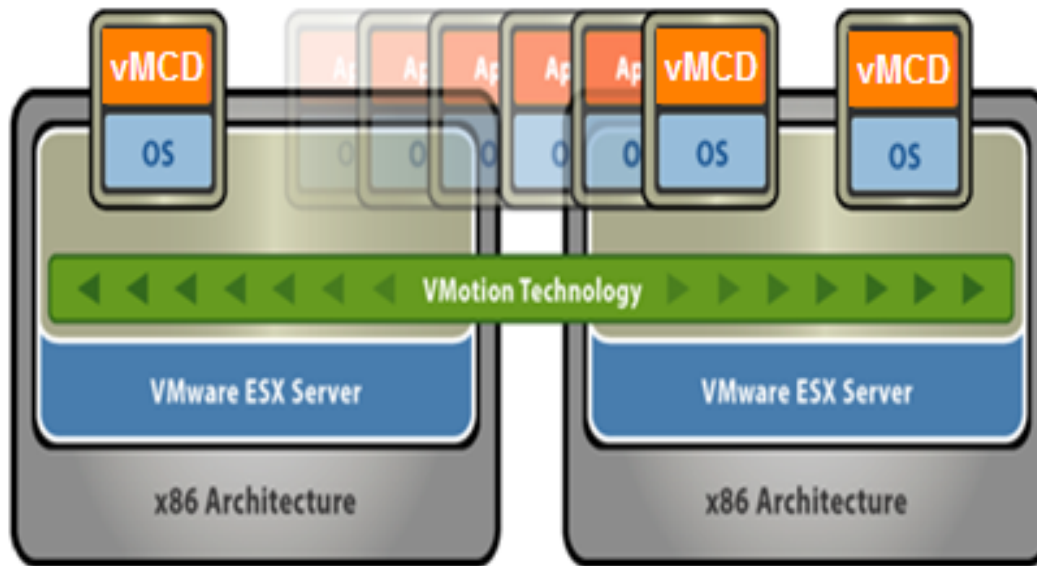
SAN/NAS/iSCSI

VMFS Filesystems

Network Topology

Ability to see and communicate with all aspects of the Infrastructure.
Yet robust enough to keep them isolated.

VMotion™ Technology Changes The Game



Zero-downtime
maintenance

Load Balancing

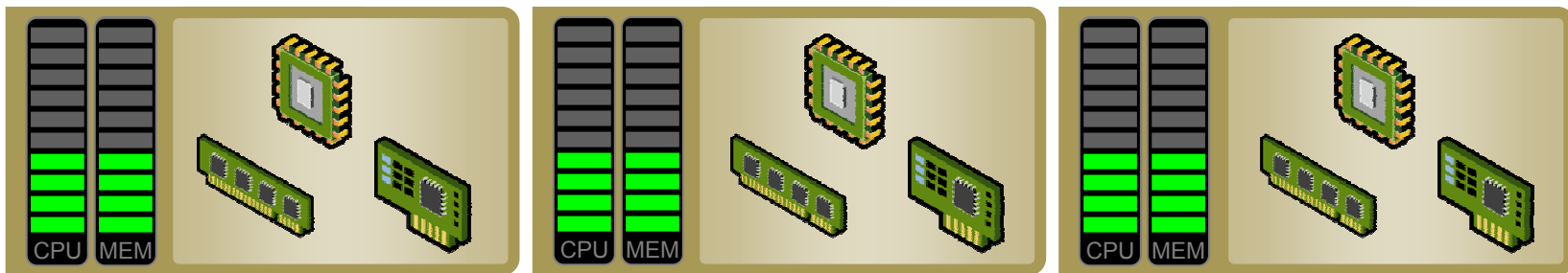
Power Reduction

VMotion technology lets you move live, running virtual machines from one host to another while maintaining continuous service availability.

Distributed Resource Scheduling (DRS)



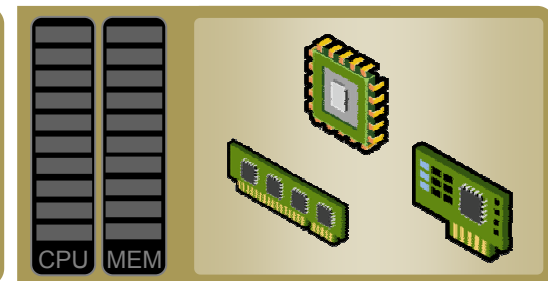
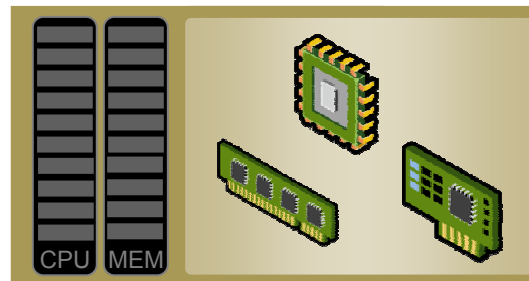
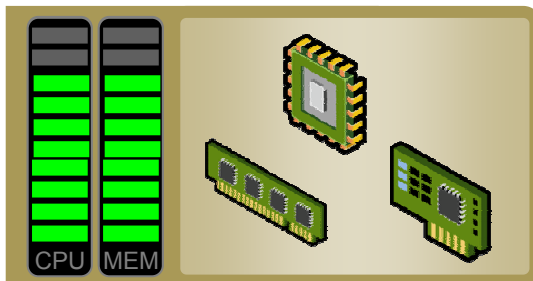
Virtual Infrastructure



Distributed Power Management (DPM)

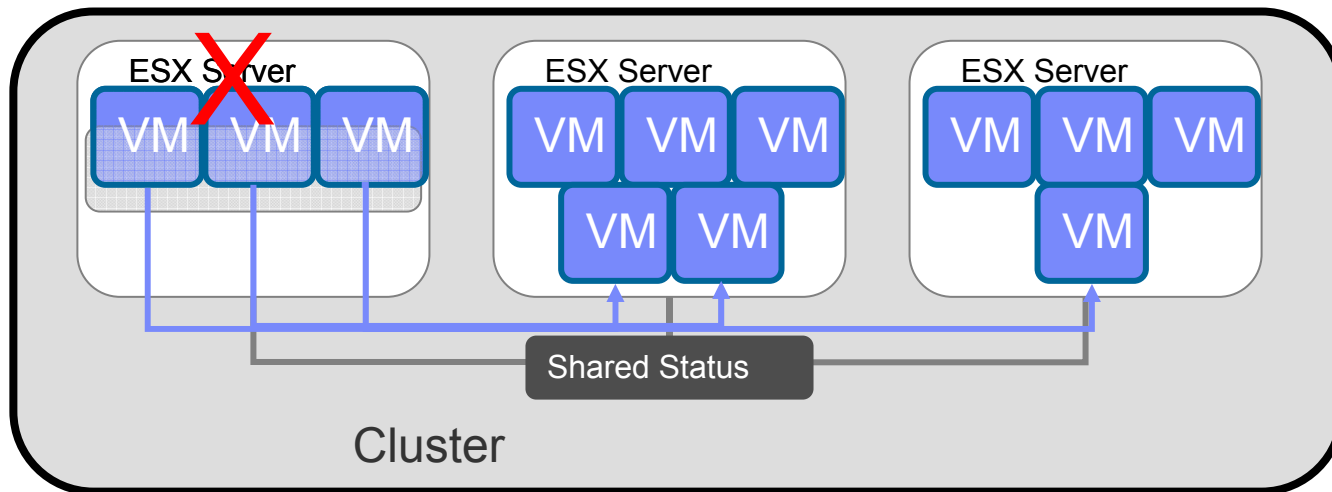


Virtual Infrastructure

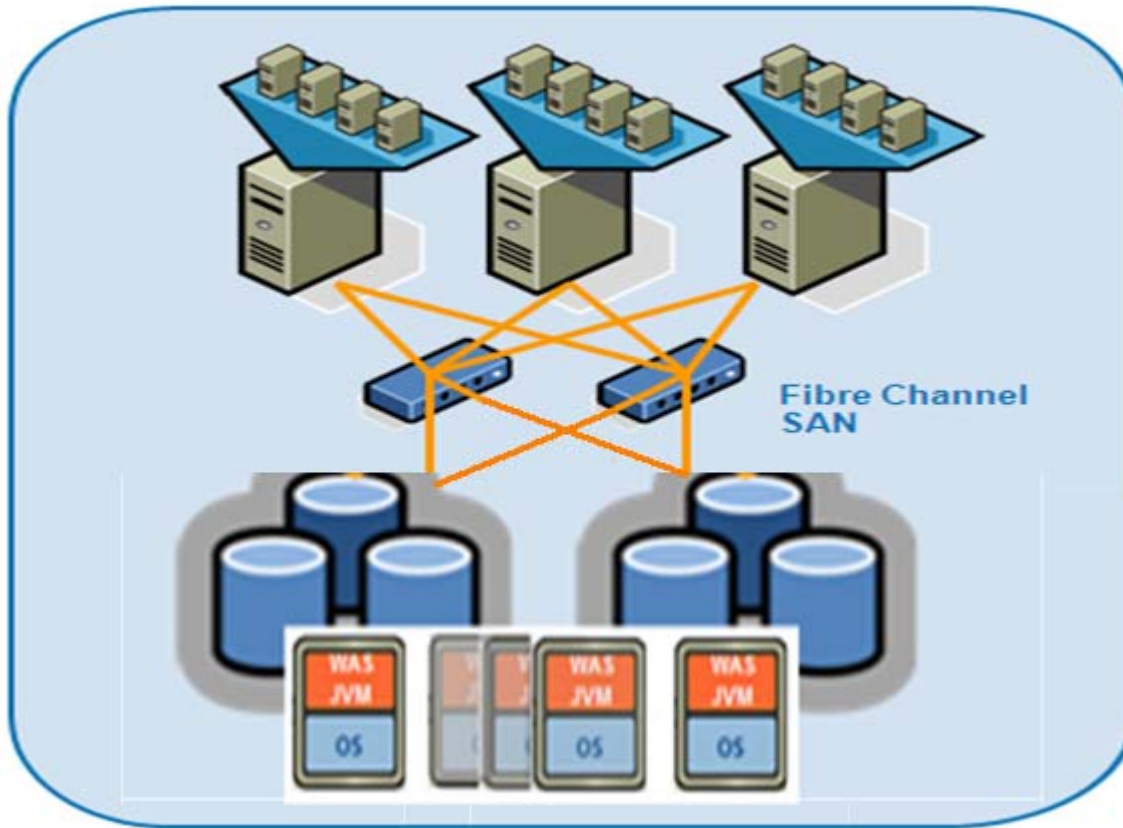


VMware HA – All your eggs in one basket?

- High availability for all your servers
- Losing a host in a cluster means fewer resources, not lost virtual machines
 - Impacted virtual machines are restarted on remaining hosts
 - Placement optimized by global scheduler
 - VirtualCenter handles all setup and configuration automatically
- None of the cost and complexity of clustering



Storage VMotion™

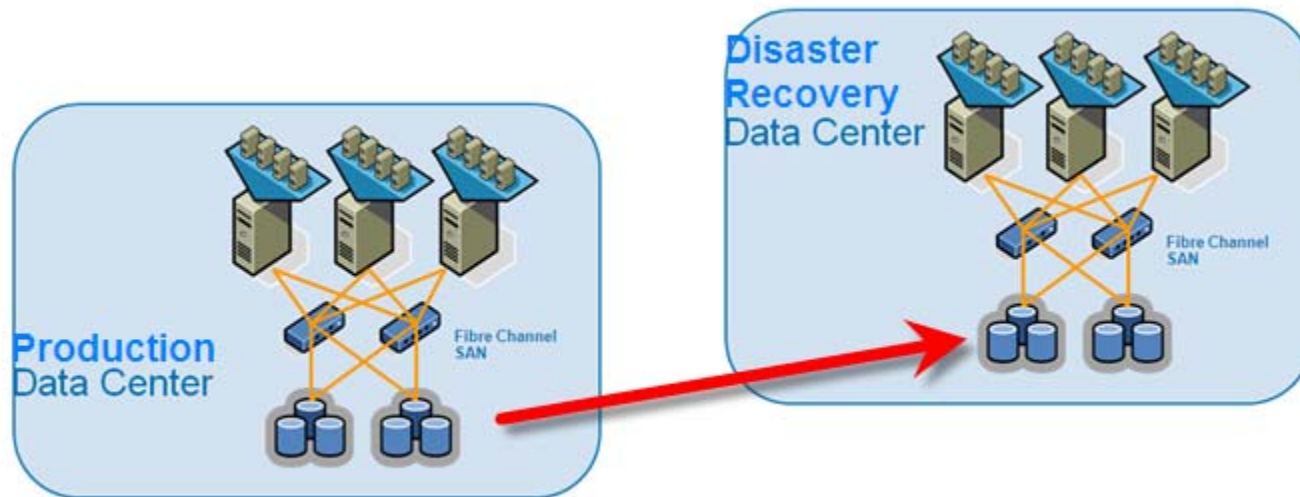


Zero-downtime
maintenance

Load Balancing

Storage VMotion technology lets you move live, running virtual machines from one storage type to another while maintaining continuous service availability.

Site Recovery Manager SRM™



Synchronous or Asynchronous

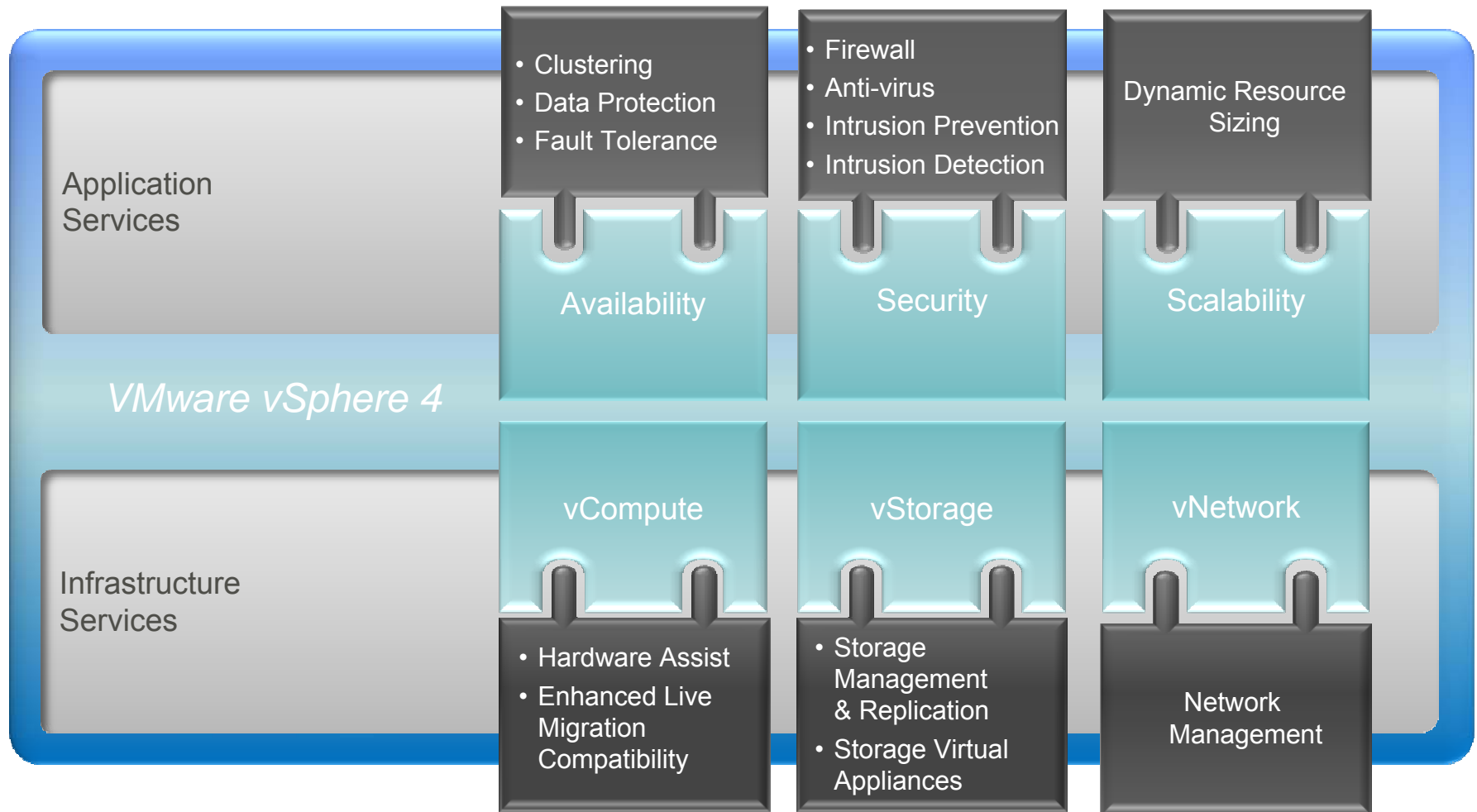
RPO/RTO Based

Fully Automated

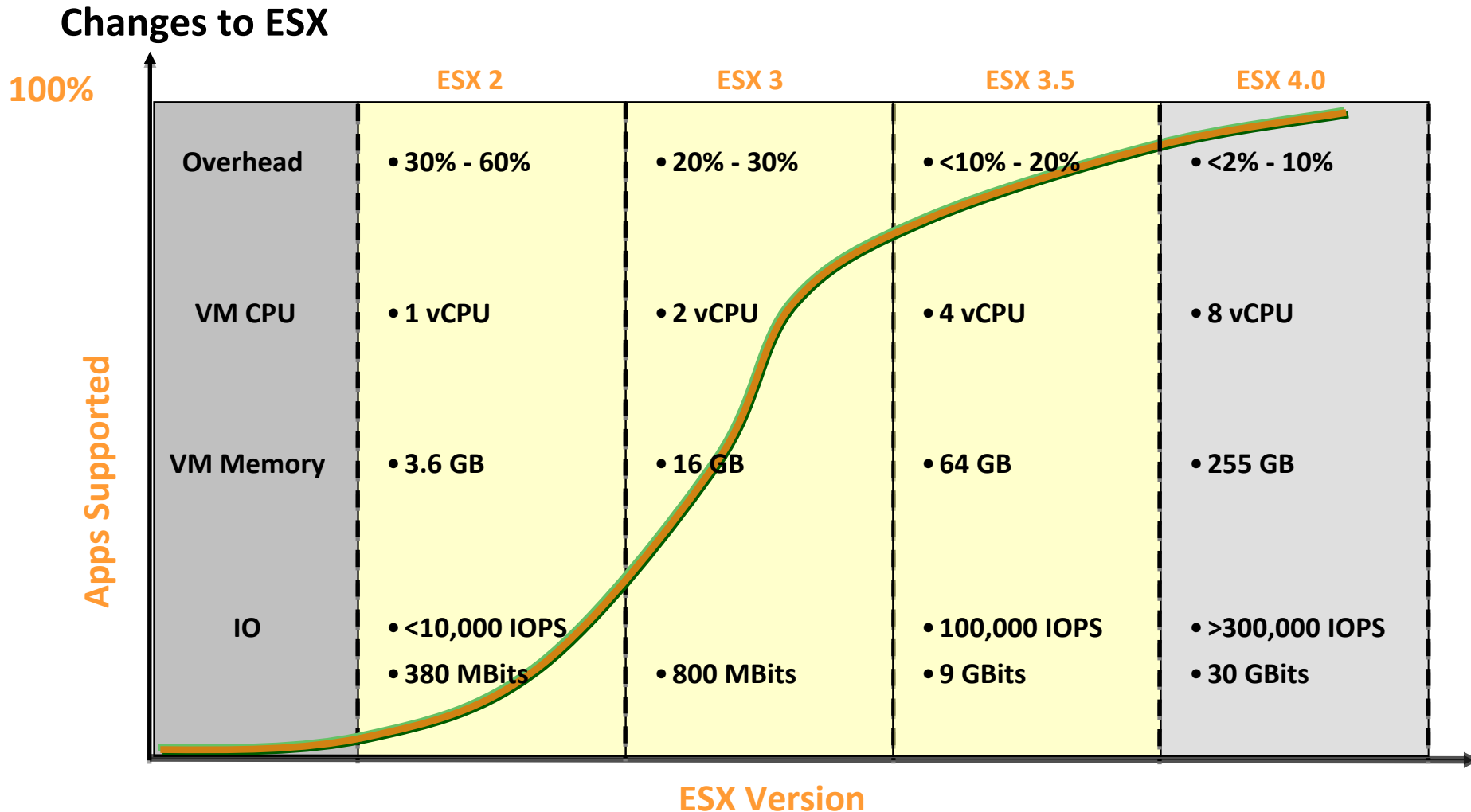
Encapsulation is truly AWESOME!!!

SRM technology lets you reboot your entire datacenter in the event of a disaster.

vSphere 4.0 – *The Most Complete Virtualization Platform*



Virtualization Performance Evolution



Source: VMware Capacity Planner analysis of > 700,000 servers in customer production environments

***The time is ripe for virtualizing databases
and we are doing it with Informix!!!***



Why Informix on VMWare?

- Create optimized, purpose-built computing environments
- VMWare is the industry leader in virtualization with 85% market share
- Informix is best of the breed database technology for virtual environments and virtual appliances with programmable database admin capabilities
- Informix can disappear within the application as an enterprise-class embedded database system with many autonomic features enabled
- Informix storage compression options can provide up to 80% savings on database storage
- Talking Data Warehousing? Have you looked at Informix lately?
- Informix is proven technology to reduce the costs while improving response times with unmatched availability
- Informix is rated #1 in customer satisfaction

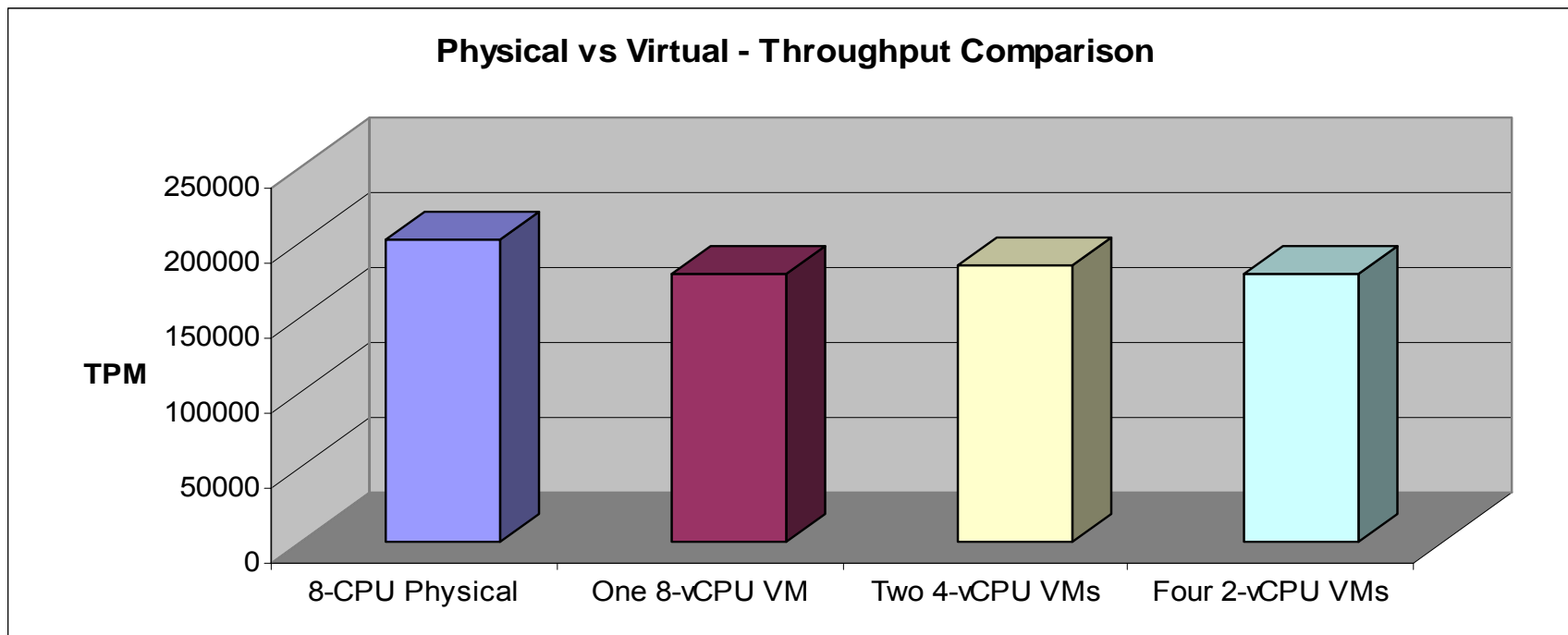
Informix Scalability Tests - Introduction

- Conducted at the IBM Innovation Center @ San Mateo, CA
- Joint project between IBM Informix and VMWare teams
- The experiment test-bed consisted of a server machine (as a physical server as well as a ESX host), a client machine to drive the workload, a storage server, and a vCenter Server
- **Hardware Configuration**
 - 2 IBM x 3650 Systems (One Server and One Client)
 - Intel Nehalem Xeon dual-socket Quad-core 2.93GHz Processors
 - 48 GB memory on the server and 16 GB memory on the client
- **Storage Configuration**
 - IBM DS4800 Storage Server
 - 8 arrays, 6 disks each, RAID 10, 8 LUNs (each with 100 GB capacity)
 - QLogic Fiber Channel HBA QLE2460, 4 GB FC Channels
- **Software Configuration**
 - IBM Informix Dynamic Server 11.50.FC6 for 64-bit SUSE 11
 - VMWare ESX 4.0 Update 1, VMWare vCenter Server 4.0 Update 1

Informix Scalability Tests – Workload

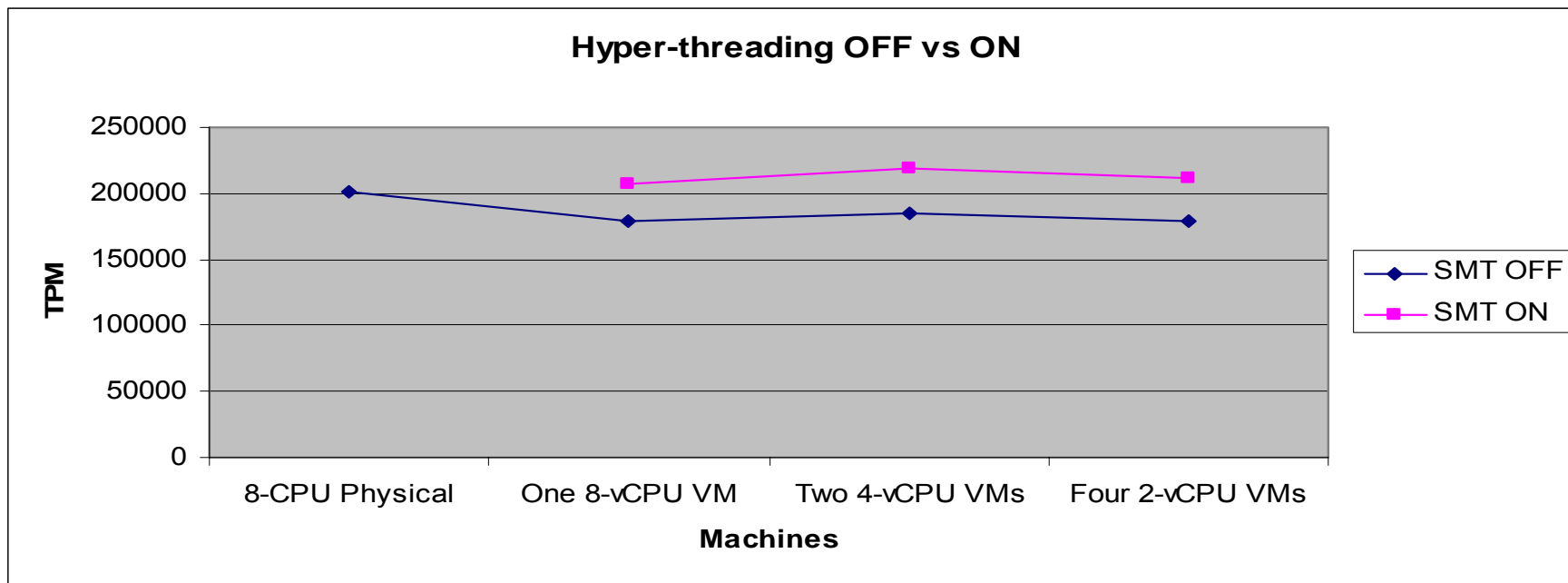
- Workload was generated by an in-house OLTP benchmarking toolkit
- Transactions of an order-entry environment
- The transactions included entering and delivering orders, recording payments, checking the status of the orders, and monitoring the stock level.
- 80% read (select), and 20% write (approximately 6% insert, 13% update, 1% delete) transactions
- No “think” time in order to achieve faster target load with less clients
- Data size wouldn’t exceed IDS buffer cache
- Throughput (tpm) was measured as the number of successful order transactions executed per minute

Informix Scalability Test Results – Physical vs. Virtual



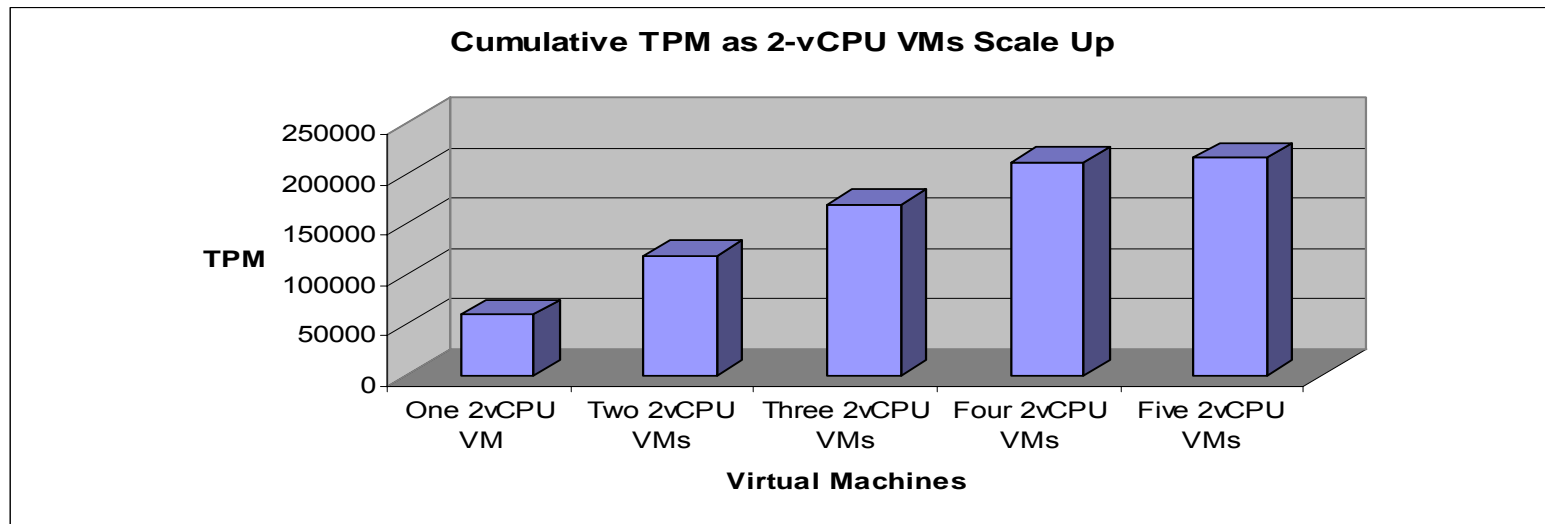
- Throughput on ESX was within 89 ~ 92% of native
- Hyper-threading turned off
- Number of Informix CPU VPs is equal to the number of CPUs
- Approximately 1 GB buffer pool size per CPU VP
- Memory Configurations are:
 - 48 GB memory on native 46 GB memory on 8-vCPU VM
 - 22 GB memory on each 4-vCPU VM 8 GB memory on each 2-vCPU VM

Informix Scalability Test Results – Hyper-threading ON vs. OFF



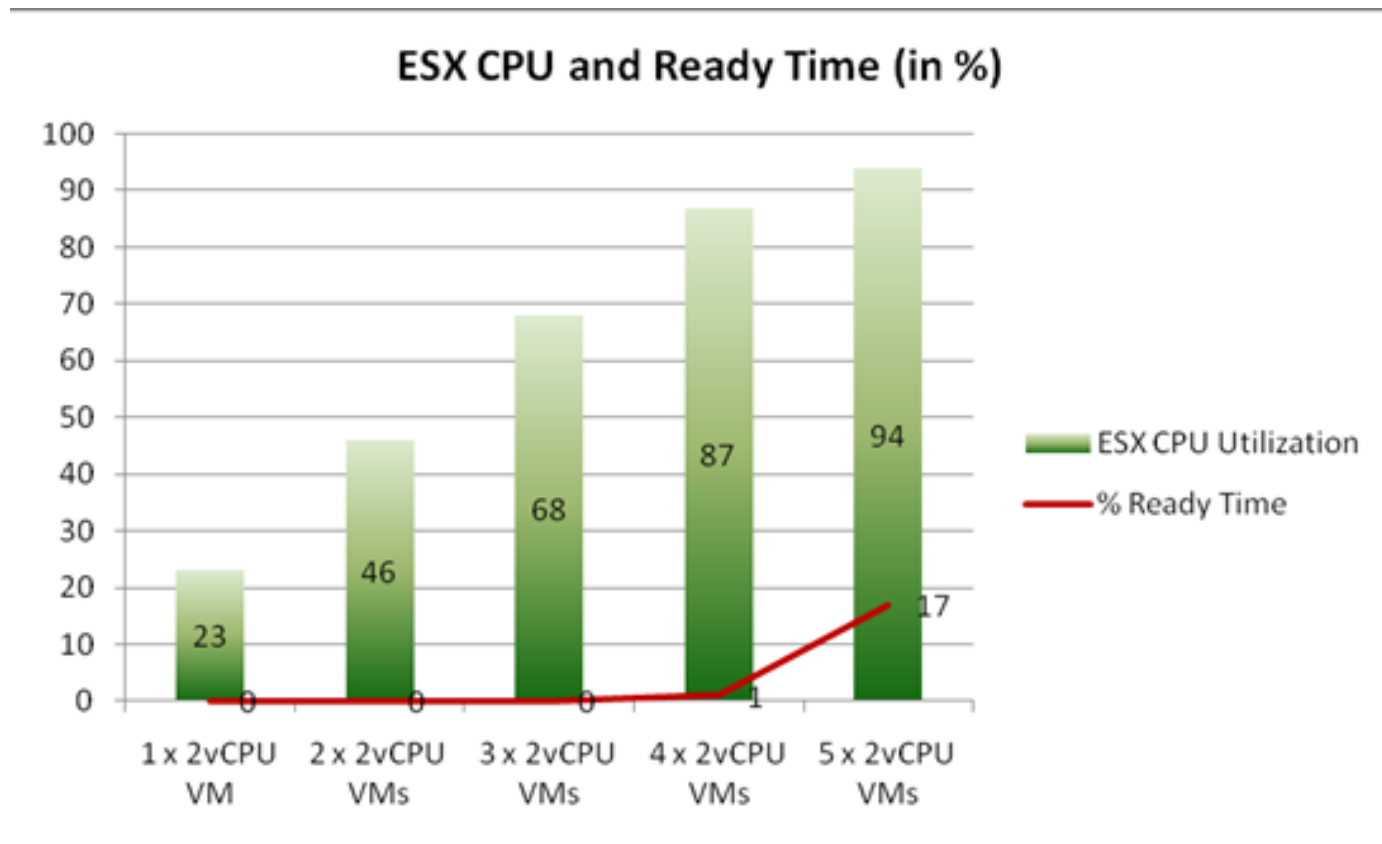
- **12% improvement in the throughput on the Virtual Machines**
- **No changes made to the number of CPU VPs on the Informix side**
- **The only change is, SMT is turned ON at the BIOS level**
- **According to Intel, with SMT turned on you can achieve up to 30 ~ 40% improvement in the throughput on Nehalem processors based on the workloads**

Informix Scalability Test Results – Scaling Up Virtual Machines



- Host is dual-socket quad-core (8 cores total), SMT ON
- Throughput is near-linear up to 4 virtual machines
- Beyond four VM's ESX host ran in an overcommitted CPU scenario
- More information on the next slide

Scaling up Virtual Machines – ESX CPU Utilization



- CPU Ready Time was around 17% after the 5th VM was introduced
- That means 17% of the time Virtual Machines had to wait for CPU cycles, which lead to no improvement in the throughput beyond 4 VMs

Best Practices – General Considerations

- **Allocate enough resources for the service console. Consider reservations if required.**
- **Start with or upgrade to ESX 4.0 Update 1**
- **Use VMWare esxtop to monitor resource utilization on the host**
- **Allocate only required amount of virtual hardware for the virtual machines**
- **Disconnect unused or unnecessary physical hardware devices**
- **Disable unused or unnecessary virtual hardware devices**
- **Create a golden image of the master VM so that it becomes easy to deploy VMs from this image that saves ample amount of productive time.**

Best Practices – BIOS Settings

- **Enable** Virtualization Technology **necessary to run 64-bit guest O/S**
- **Enable** Turbo Mode **for balanced workload over unused cores**
- **VT-x from Intel and AMD-V from AMD for hardware based virtualization support**
- **Enable** High Performance Mode **instead of power saving mode for enhancing performance.**
- **Enable** Hyper Threading. **Some manufacturers label it as logical processor**

Best Practices – CPU Considerations

- **The total CPU resources needed by the virtual machines running on the system should not exceed the CPU capacity of the host. Hypervisor requires CPU too!**
- **Should you over-commit CPU?**
- **Enable Intel VT-x technology that ensures hardware virtualization support instead of software Binary Translation (BT)**
- **Use as few virtual CPUs vCPUs as possible. Creating VMs with excess of vCPUs can impose some small resource requirements on vSphere. Having unused vCPUs can lead to scheduling constraints**
- **Enable Hyper-threading where possible**

Best Practices – Memory Considerations

- For performance critical virtual machines, set memory reservations equal to the size of IDS buffer pool
- Don't over-commit Memory
- Select “automatic” for the CPU / Memory Management Unit (MMU) Virtualization option at the virtual machine level
- Use large memory pages where possible. It is enabled by default starting from ESX 3.5

Best Practices – Network Considerations

- **Used VMXNET 3 Paravirtualized Network Adapters.**
- **Ensured that the Virtual Machines, Service Console and VMkernel are on separate physical adapters to avoid any sort of contentions.**
- **Ensured that all the virtual machines are on the same virtual switch as having virtual machines on separate switch would lead to transmission of traffic over different wires resulting in CPU and network overheads.**

Best Practices – Storage Considerations

- **Separate data-stores for guest O/S and Informix databases on two different sets of disks**
- **Use vSphere Virtual Machine File System (VMFS)**
 - VMFS is a high performance cluster file system
 - Each VM is encapsulated in a small set of files
 - Simplifies VM provisioning
 - Enables distributed infrastructure services like vMotion and VMWare DRS to operate across a cluster of ESX hosts
- **Use hardware RAID like RAID 10 for optimal performance**
- **For active-active storage arrays, the policy for path selection is recommended to be Fixed (Preferred Path) whereas in case of active-passive storage arrays the recommended path is MRU (Most Recently Used)**

Best Practices – Storage Considerations Continued

- **Align VMFS properly**
 - Use vCenter to create VMFS file system as it automatically aligns between SAN LUN and VMFS volume
 - You would have to manually align between VMFS volume and VMDK file - Array specific / VM specific
 - Check your storage vendor's recommendation for partition starting block
 - If partitions aren't aligned, an attempt to read one disk cluster can result in three reads internally
 - If partitions are aligned, attempt to read one disk cluster results in only one read

Resources

- **Performance Best Practices for VMware vSphere 4.0 at**
<http://www.vmware.com/resources/techresources/10041>
- **More VMWare Technical Papers at**
<http://www.vmware.com/resources/techresources/>
- **Information on Informix Virtualization Support at**
<http://www.ibm.com/developerworks/wikis/display/im/IDS+virtualization+support>
- **Get your Informix Virtual Appliance at**
<http://www.ibm.com/developerworks/wikis/display/im/IBM+VirtualAppliances#IBMVirtualAppliances-ids>

Questions