

Advanced DataTools Webcast

Running Informix in a Virtual Machine

***Thursday, August 31, 2017 at
2:00pm EST***

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Lester Knutsen is President of Advanced DataTools Corporation, and has been building large Data Warehouse and Business Systems using Informix Database software since 1983. Lester focuses on large database performance tuning, training and consulting. Lester is a member of the IBM Gold Consultant program and was presented with one of the Inaugural IBM Data Champion awards by IBM. Lester was one of the founders of the International Informix Users Group and the Washington Area Informix User Group.

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Agenda

- What is a VM
- Benefits of running Informix in a VM
- Problems with running Informix in a VM
- Benchmark and Testing
- Recommendations and Best Practices for Informix in a VM
- Poll – How many of you use VM?

What is a VM?

- Virtualization software allows a single host computer to create and run one or more virtual environments
- Virtualization software is most often used to emulate a complete computer system in order to allow a guest operating system to be run. For example, allowing Linux to run as a guest on top of a PC that is natively running a Microsoft Windows operating system (or the inverse, running Windows as a guest on Linux).

What is a VM?

VM – Host Operating System

Guest OS

Guest OS

Guest OS

Guest OS

Guest OS

Guest OS

VM – Everything is Shared

- CPUs are Shared
- Memory is Shared
- Disks are Shared
- Network Cards are Shared
- Everything needs to get along together

Benefits of a VM

- **Partitioning**
 - Run multiple operating systems on one physical machine
 - Divide system resources between virtual machines
- **Isolation**
 - Provide fault and security isolation at the hardware level
 - Preserve performance with advanced resource controls
- **Encapsulation**
 - Save the entire state of a virtual machine to files
 - Move and copy virtual machines as easily as moving and copying files
- **Hardware Independence**
 - Provision or migrate any virtual machine to any physical server

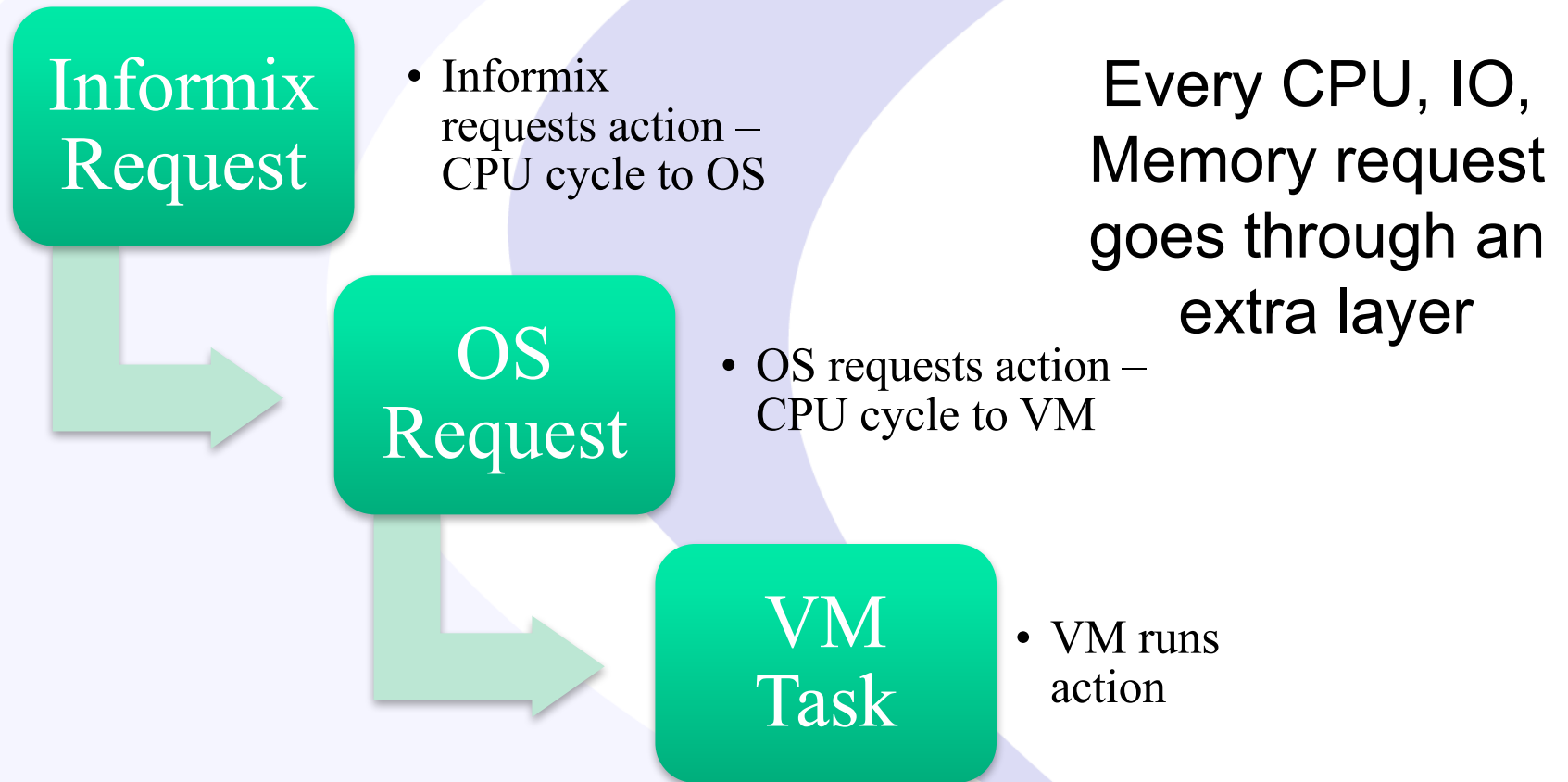
Benefits of running Informix in a VM

- Shared Resources
- Make use of ideal computer power
- Snapshots
- Flexible Management
- Flexible Allocation of Resources

Cost of Running a Database in a VM

- ESXi 6.0 Performance Relative to Native
 - “For example, with a 64-vCPU virtual machine running on a 72-pCPU ESXi host, throughput is 90% of native throughput on the same hardware platform.”
 - Source VMware white paper “Virtualizing Performance - Critical Database Applications in VMware vSphere 6.0”

Costs of Running Informix in VM



Problems of running Informix in a VM

- Overhead Costs - Memory and CPUs
- Disk performance
- Management and Monitoring
- Inconsistent results in benchmarks
- Snapshot corruption

What is a Monster VM?

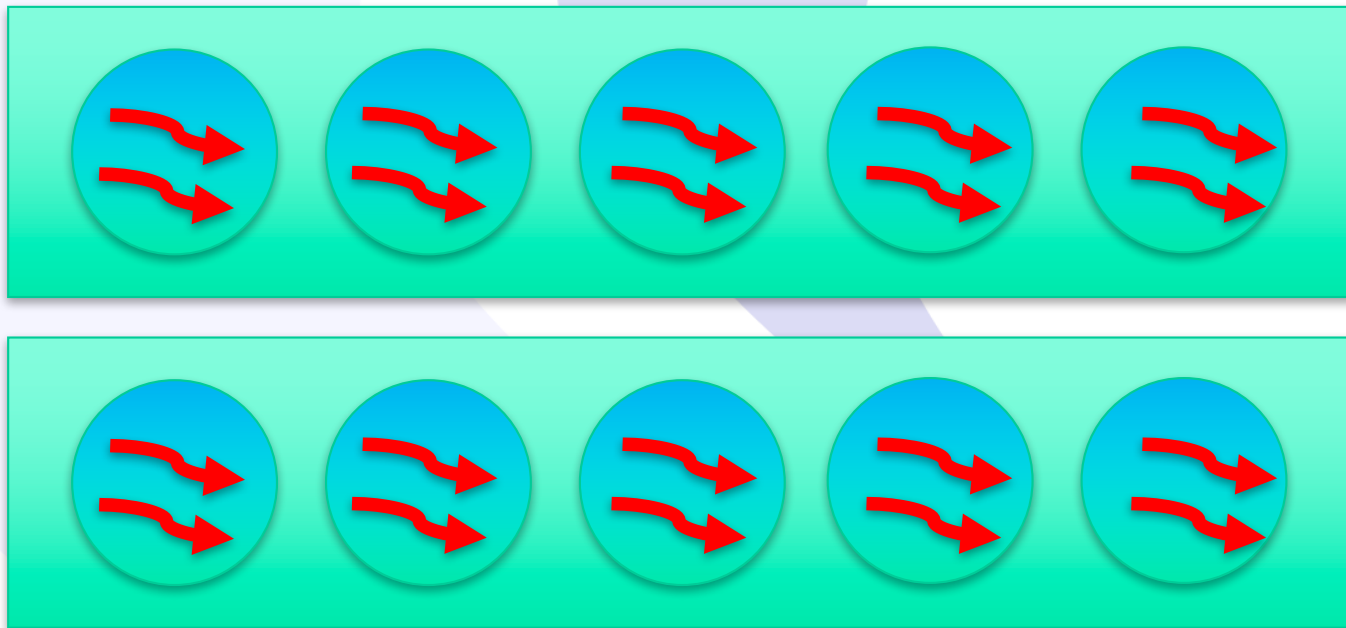
- Monster VM = more than 8 vCPUs and 256 GB RAM
- Focus of this presentation is VMware ESX software for virtualization
- Other virtualization software
- Google – Monster Database VM

CPU Terms

- Socket = One Chip or Processor
- Cores per Socket = How many cores run on a chip. A core only runs one process at a time.
- Hyper-Threads or SMT threads per Core = Many Cores have the ability to run multiple threads. No matter how many threads run on a Core, only one thread can run at a time on a core. Hyper-Threads will appear as additional Virtual Cores.
- Chip speed is measured in gigahertz (GHz); this is the speed of a single core of your processor.
- PVU - IBM Processor Value Unit = A unit of measure used to differentiate licensing of software

CPU Terms

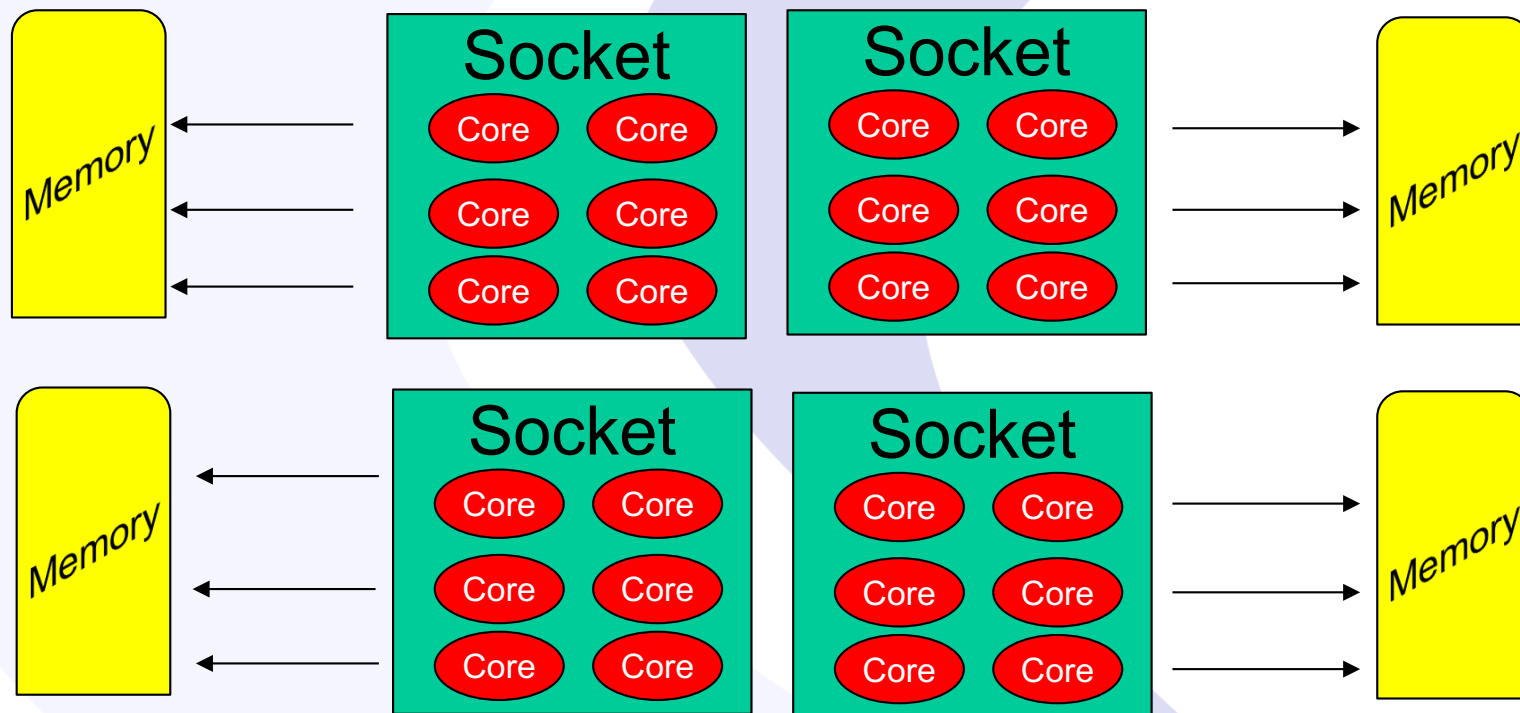
- Example: 2 Sockets with 5 Cores and 2 Hyper-Threads per Core = 10 Cores and 20 Virtual Cores
- Can run 10 processes at the same time



NUMA and VMs

- Non-uniform memory access (NUMA)
- NUMA is a computer memory design used in multiprocessing, where the memory access time depends on the memory location relative to the processor
- The closer the memory bank is to the Core the better the performance

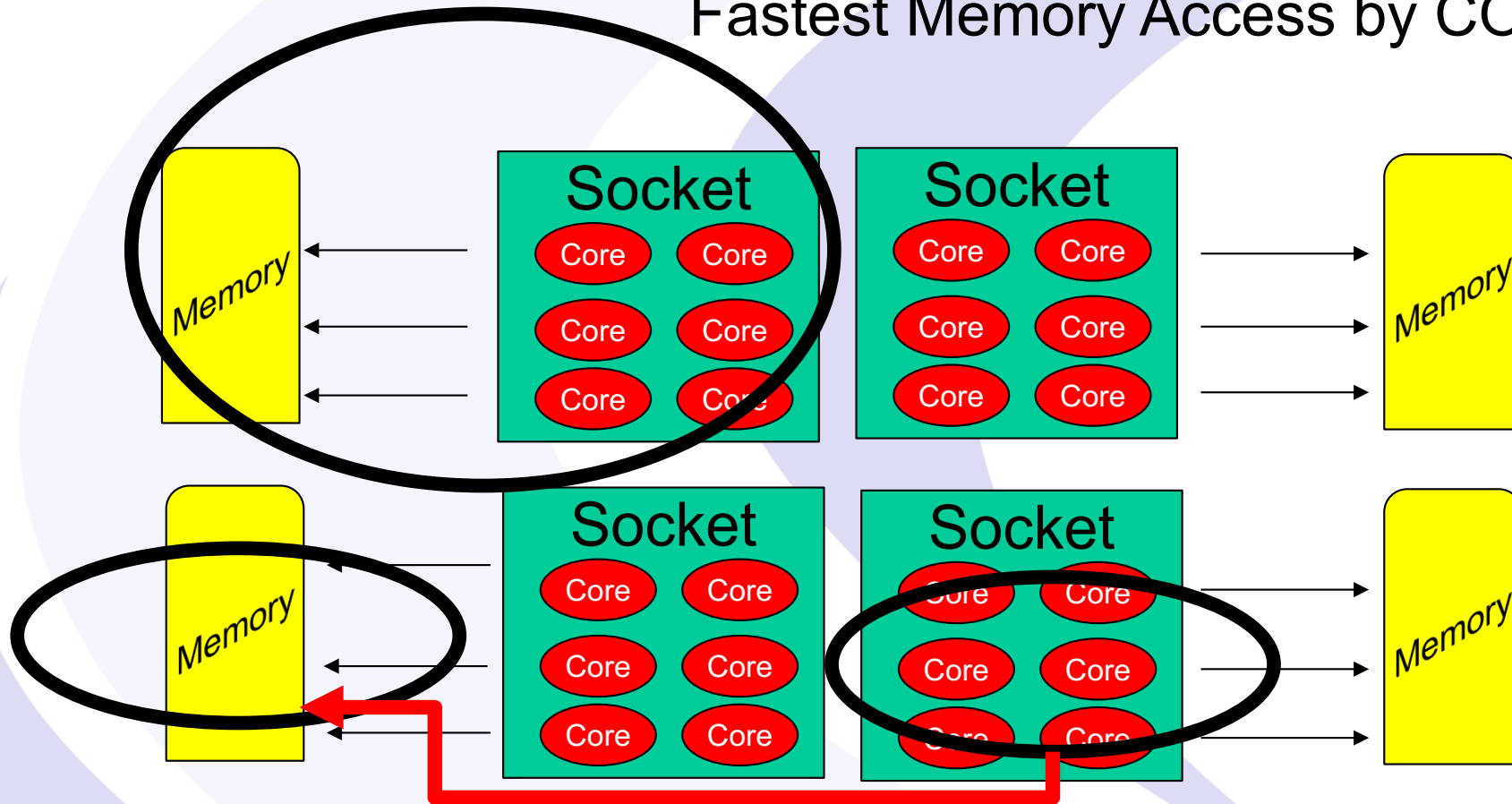
NUMA – Simple Example



Fastest Memory Access by CORE

VM Goal for NUMA

Fastest Memory Access by CORE

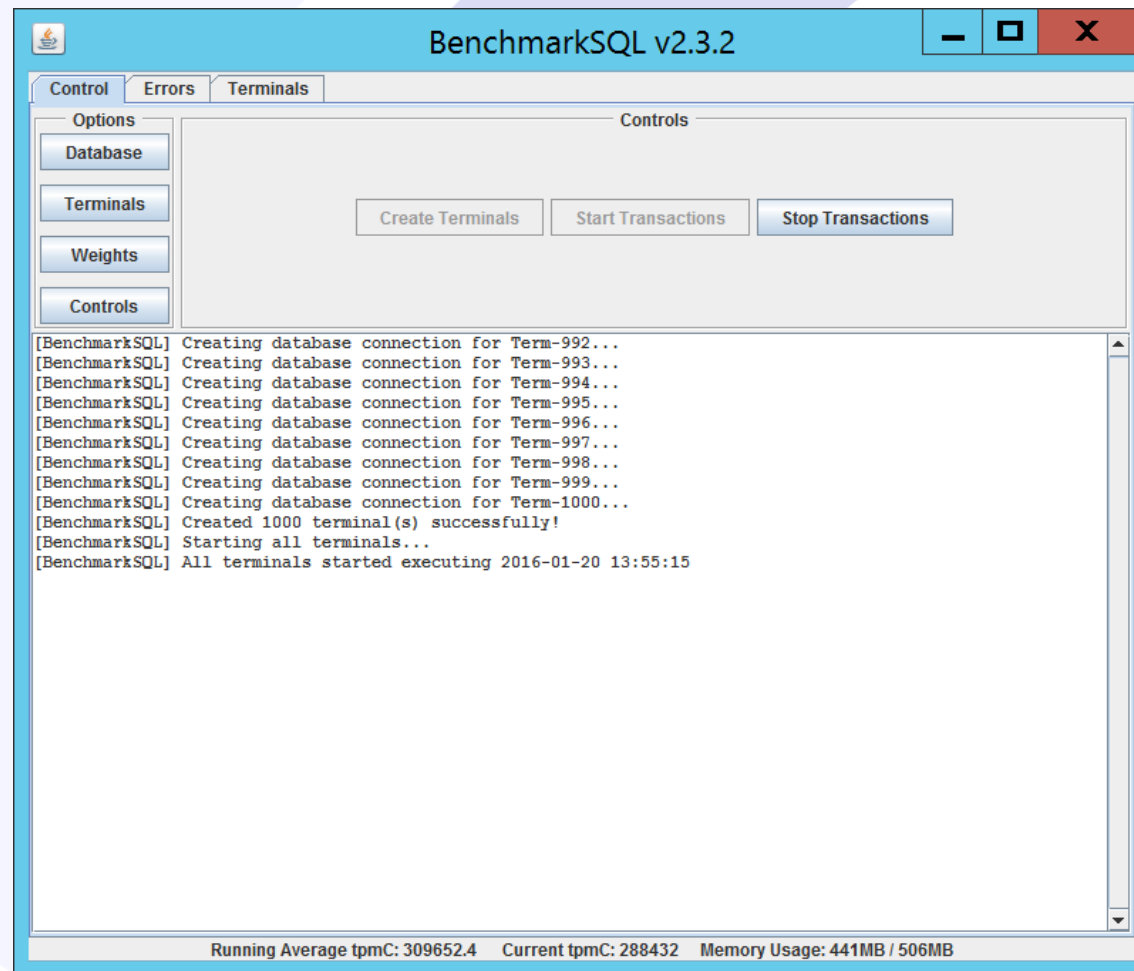


Slow Memory Access by CORE

Benchmark and Testing

- Simple Test – Run the same batch database program 50 times – *One VM only, nothing else was running on the System*
- Fastest Time: 15:18.3 minutes
- Slowest Time: 19:17.4 minutes
- Difference: 03:59.1 minutes
- Percent of variance: 21%

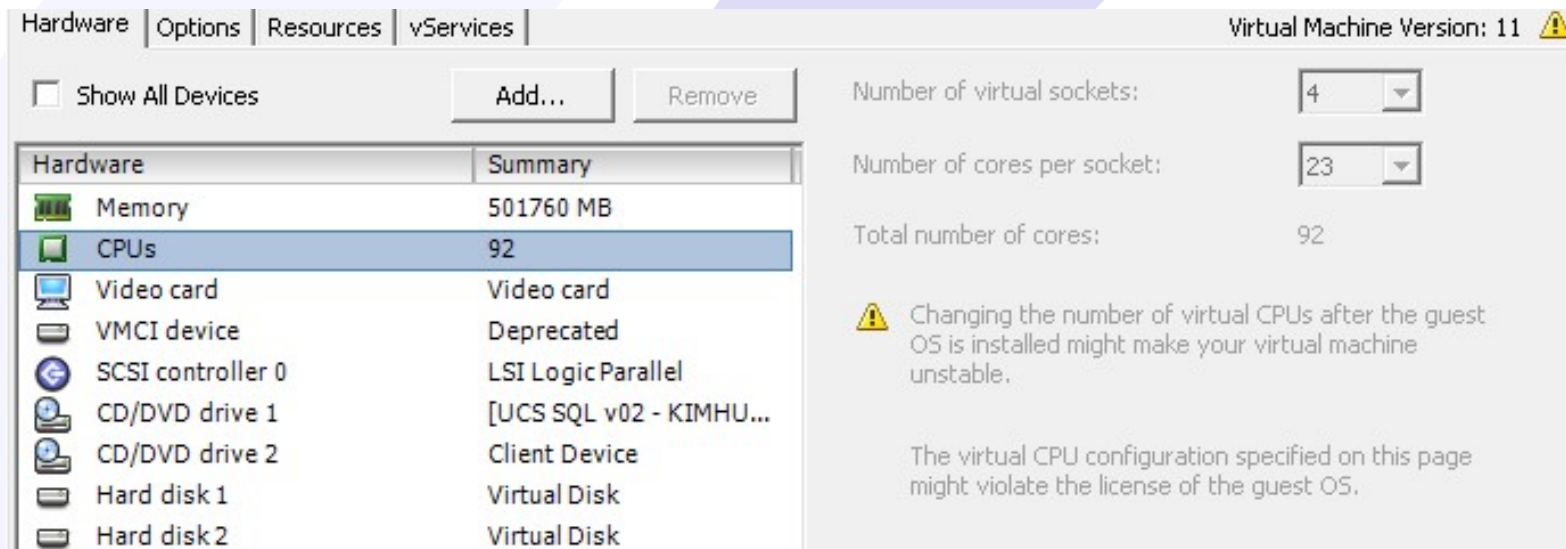
Client Benchmark and Testing



Benchmark and Testing

- OLTP using Benchmark SQL
- Data Warehouse ETL Process
- Data Warehouse Reports
- The following recommendations are based on our testing and benchmarks

Recommendations – Save 1 vCPU per Socket for VM (Used 92 of 96)



Hardware | Options | Resources | vServices | Virtual Machine Version: 11


☐ Show All Devices Add... Remove

Hardware	Summary
Memory	501760 MB
CPUs	92
Video card	Video card
VMCI device	Deprecated
SCSI controller 0	LSI Logic Parallel
CD/DVD drive 1	[UCS SQL v02 - KIMHU...]
CD/DVD drive 2	Client Device
Hard disk 1	Virtual Disk
Hard disk 2	Virtual Disk

Number of virtual sockets: 4

Number of cores per socket: 23

Total number of cores: 92

 Changing the number of virtual CPUs after the guest OS is installed might make your virtual machine unstable.

The virtual CPU configuration specified on this page might violate the license of the guest OS.

Recommendations – Disable Hot Swap Memory/CPU

vApp Options	Disabled
VMware Tools	Shut Down
Power Management	Standby
Advanced	
General	Normal
CPUID Mask	Expose Nx flag to ...
Memory/CPU Hotplug	Disabled/Disabled
Boot Options	Normal Boot
Fibre Channel NPIV	None
CPU/MMU Virtualization	Automatic
Swapfile Location	Use default settings
SDRS Rules	0 rules

The guest OS for which this VM is configured supports adding memory while the VM is powered on.

☒ Disable memory hot add for this virtual machine.

☐ Enable memory hot add for this virtual machine.

CPU Hot Plug

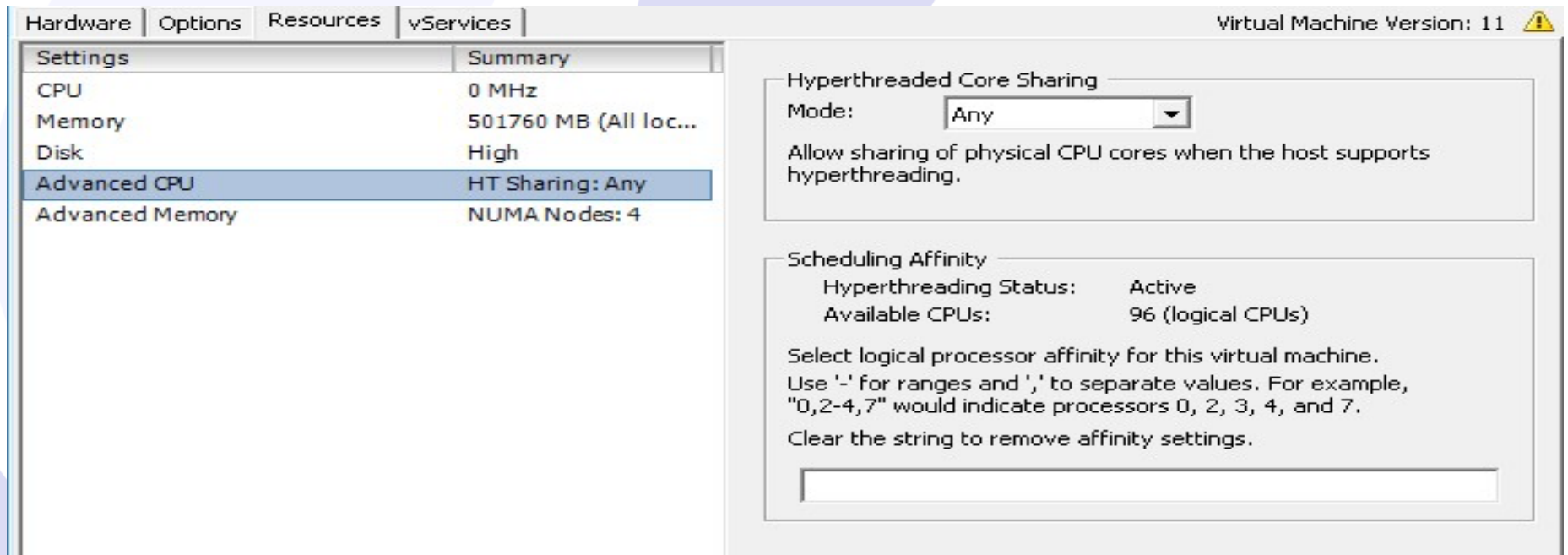
The guest OS for which this VM is configured supports adding virtual CPUs while the VM is powered on.

☒ Disable CPU hot plug for this virtual machine.

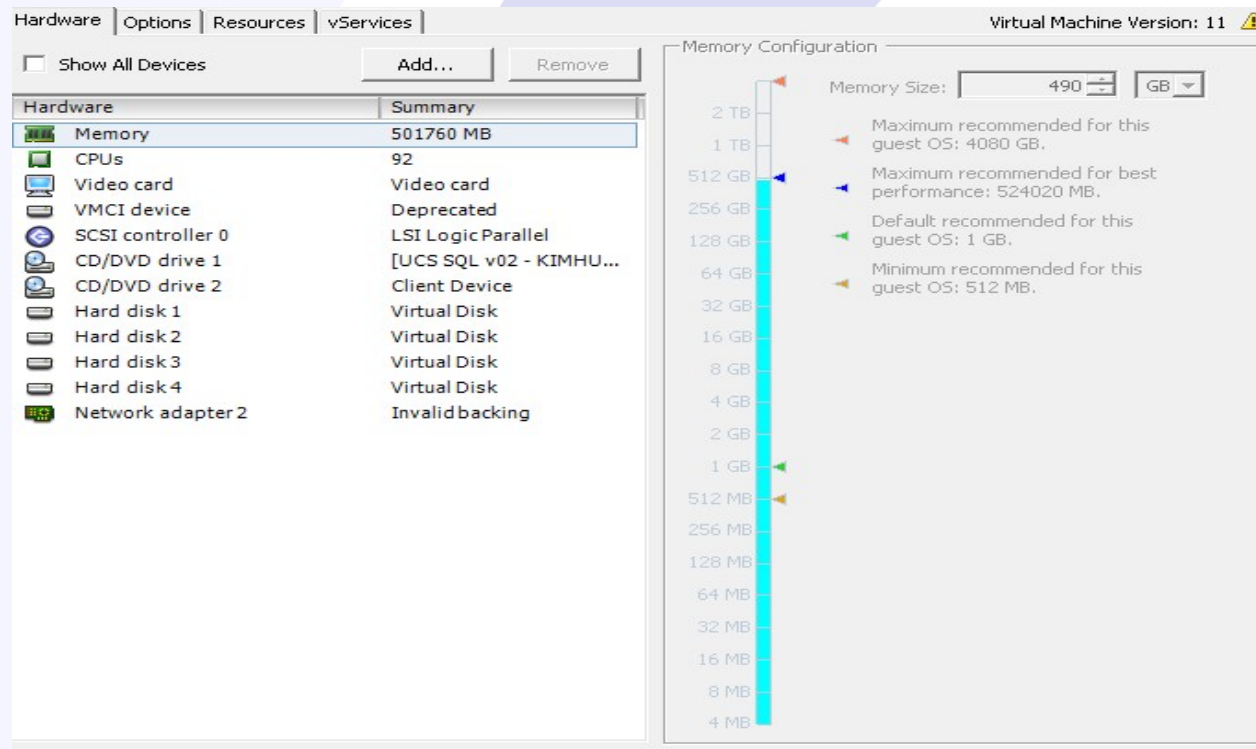
☐ Enable CPU hot add only for this virtual machine.

☐ Enable CPU hot add and remove for this virtual machine.

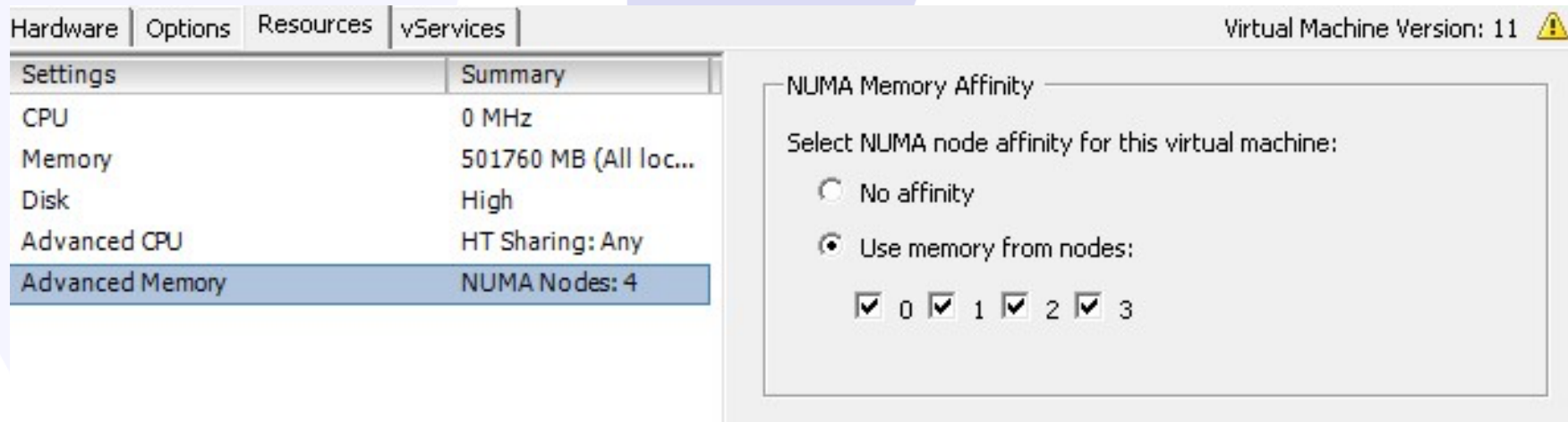
Recommendations – Turn on Hyperthreading?



Recommendations – Save Memory for VM (Used 490 of 512)



Recommendations – Turn NUMA on and align VM to NUMA Nodes



Recommendations and Best Practices

- Determine SLA for your VMs
- Separate Production from QA, Testing, and Development
- Baseline and measure performance and expectations before you virtualize

Recommendations and Best Practices – Non-Critical, Non-Production

- Disk – thin provision (allocate space when the OS requests it)
- Do not Affinity CPUs (Let the VM manage CPUs)
- NUMA is not needed

Recommendations and Best Practices – Critical Production Systems

- Disk – Thick provision (allocate space when VM is created)
- Affinity CPUs (Tie vCores to Physical COREs)
- NUMA is Required

Recommendations and Best Practices

- Setup Direct Disk Access
- Enabled Hyper threading???? (Maybe)
- Enabled NUMA Memory Affinity
- Disabled “Hot Swap” for CPU and RAM

Recommendations and Best Practices

- Do not overschedule Production Systems
- Do not oversubscribe Production Systems
- Map VMs to disks or virtual drives

Recommendations and Best Practices

- Informix External Backup Method for Snapshots
 - onmode -c block
 - Make Snapshot
 - onmode -c unblock

Questions?



Send follow-up questions to
lester@advanceddatatools.com

Next Webcast

Informix Best Practices

- **Using the Sysmaster database to perform an Informix Server Health Check - by Lester Knutsen**
 - Thursday, October 5, 2017 at 2:00pm EST
- **Informix Query Performance Tuning Basics - by Mike Walker**
 - Thursday, October 26, 2017 at 2:00pm EST
- **Schema Design Tips - by Art Kagel**
 - Thursday, November 30, 2017 2:00pm EST

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Thank You

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