Advanced DataTools Webcast

Running Informix in a Virtual Machine

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

Informix Request

• Informix requests action – CPU cycle to OS

OS Request

• OS requests action – CPU cycle to VM

VM Task

• VM runs action

Every CPU, IO, Memory request goes through an extra layer
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)
Recommendations – Disable Hot Swap Memory/CPU

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.

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.

Informix Best Practices
Recommendations – Turn on Hyperthreading?
## Recommendations – Save Memory for VM (Used 490 of 512)

<table>
<thead>
<tr>
<th>Memory Configuration</th>
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<tbody>
<tr>
<td>Memory Size: 490 MB</td>
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- Maximum recommended for this guest: 0.5 GB.
- Maximum recommended for best performance: 512 MB.
- Default recommended for this guest: 0.1 GB.
- Minimum recommended for this guest: 0.512 MB.
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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