Virtualization and Resource Utilization

Saving you effort, time and money by making your infrastructure work harder for you.
Virtualization and Resource Utilization: Saving you effort, time and money

- Schley Andrew Kutz
Sex, Drugs and Rock & Roll

- **Sex** – Virtualization is currently **the** sexy technology!
- **Drugs** – Get hooked on it today!
- **Rock & Roll** – Bring people together to help create new ideas.
Topics to Cover

- Cost of Virtual Infrastructure 3 (VI3)
- Shifting the resource utilization paradigm
  (your required dose of marketing speak to take back to your managers)
- Resource pools
- Resource reservations, limits and shares
- VMware Dynamic Resource Scheduler (DRS)
- VMware High Availability (HA)
Cost

• Unlike previous versions of ESX and VirtualCenter, ESX 3 and VirtualCenter 2 are not sold separately, instead they are sold as a package known as Virtual Infrastructure 3 (VI3).

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<thead>
<tr>
<th></th>
<th>Starter</th>
<th>Standard</th>
<th>Enterprise</th>
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<tbody>
<tr>
<td>ESX Server 3</td>
<td>✓</td>
<td>✓</td>
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</tr>
<tr>
<td>- NAS or local storage only (license restricted)</td>
<td></td>
<td></td>
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<tr>
<td>- Limited to servers with up to 4 physical CPUs and 96GB physical memory (EULA restricted)</td>
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<tr>
<td>VMFS</td>
<td>✓</td>
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<td>✓</td>
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<tr>
<td>- On local storage only</td>
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<td></td>
<td></td>
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<tr>
<td>- No cluster file system</td>
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<td></td>
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<tr>
<td>VirtualCenter Agent</td>
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<td>✓</td>
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<tr>
<td>HA</td>
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<td>✓</td>
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<tr>
<td>DRS</td>
<td></td>
<td>✓</td>
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<tr>
<td>Consolidated Backup</td>
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<tr>
<td>Price per 2 processors</td>
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<td>$3,750</td>
<td>$5,750</td>
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<tr>
<td>SNS Gold/Platinum</td>
<td>$675 / $805</td>
<td>21% / 25%</td>
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Shifting the Resource Utilization Paradigm

• 25%-35% utilization is a typical range, and it is **not** acceptable. What type of utilization do your servers experience?
• The goal should be 85% utilization
• Why was 25%-35% acceptable for so long? The surplus resources were used for:
  - Handling performance spikes
  - Room for growth
• Easily allocate extra resources to VM
• Just add an ESX server when you need to grow
Resource Pools

• What?
  • Resource pools are logical containers with associated policies that allow you to define the minimum and maximum amounts of CPU and memory granted to VMs and/or other resource pools.

• Cost?
  • Resource pools are a free feature of VI3. They are available with stand-a-lone ESX 3 hosts as well as a part of VirtualCenter 2.
Resource Pools (ctd.)

- Implementing
  - Resource Pools are created by simply using the Virtual Interface (VI) client and right-clicking on a folder, and choosing “New Resource Pool.”
Resource Pools (ctd.)

- Policies
  - Define the Resource Pool's minima and maxima.

Virtual Infrastructure 3 (VI3) Client
Resource Pools (ctd.)

- Implementation and policy pitfalls
  - Be careful when configuring the reservation number of a resource pool. If the reservation is fixed too low, any VM that requires a reservation larger than the pool allows will fail to start.
Resource Pools (ctd.)

- Access procedures
- Define permissions on the resource pool in order to restrict who can view and/or modify it.

Virtual Infrastructure 3 (VI3) Client
Resource Pools (ctd.)

- Real-world examples
  - A common practice is to implement resource pools with the same structure as your organization or to divide them by the classification of the VMs they contain, such as development and production.
  - Resource utilization is not just about hardware, but also personnel.
  - Some organizations dedicate separate staff to manage the overall VI3 installation and the resources on the VI3 installation by delegating management of the resource pools.
  - This splits the duties between two groups of people freeing each group up to perform other tasks and at the same time building cross-training experience.
Resource Reservations, Limits & Shares

• What?
  • **Reservations** are the guaranteed amount of some resource for a VM.
  • **Limits** are the upper resource boundary for a VM.
  • **Shares** are used to prioritize resources for VMs when there is resource contention.

• Cost?
  • Free – reservations, limits and shares ship with ever VI3 package.
Resource Reservations, Limits & Shares (ctd.)

• Why?
  • Setting a **reservation** is useful for when a VM requires X amount of resource to function.
  • **Limits** are a useful feature to manage user expectations and to test artificially limiting resources.
  • **Shares** are what allow the overcommitment of resources up to 100% by intelligently handling resource contention when it occurs.
Resource Reservations, Limits & Shares (ctd.)

- Implementation pitfalls
  - A parent resource pool's reservation is not allowed to decrease lower than the sum total of its children's reservations.
  - Overcommitment of resources is extremely tempting, especially so with regards to how well ESX handles resource sharing.
  - Remember: If overcommitment is a goal then particular attention must be paid to the shares settings to ensure proper distribution of resource during times of contention – which will occur if resources are overcommitted and VMs start utilizing all their granted resources.
Resource Reservations, Limits & Shares (ctd.)

• Implementation tips
  • Configure the VirtualCenter to e-mail settings and configure alerts.
  • These alerts can send an e-mail when the infrastructure, a cluster, a host, a resource pool, a VM, or almost any level of the VI3 hierarchy has exceeded warning and critical limits.
  • Being on the ball about the amount of resources a component requires is key to fine-tuning an infrastructure's overall utilization.
  • Re-evaluate your last round of performance metrics in order to properly provision resources for VMs.
Resource Reservations, Limits & Shares (ctd.)

- Implementation tips (ctd.)
  - Create a resource pool for development VMs and do not set a reservation.
  - This will allow almost 100% overcommitment of resources for a development environment.
  - Do not assign these values to individual VMs, instead assign them to resource pools in order to abstract management of resources to a higher level.
Resource Reservations, Limits & Shares (ctd.)

- Real-world examples
  - VM-A and VM-B both run better with 1024 M of RAM while VM-C must have 512 M of RAM to function.
  - Set the VM-C's shares higher than that of VM-A and VM-B so in the event of resource contention even though VM-A and VM-B in general have more RAM than VM-C, VM-C has a higher priority than VM-A or VM-B.
  - A properly configured limit can stop a VM with run-a-way processes from eating up all of the CPU or Memory on a host server.
  - This is true for properly configured shares as well.
VMware Dynamic Resource Scheduler (DRS)

• What?
  • The Dynamic Resource Scheduler allows separate hosts to be members of a shared resource pool.
VMware Dynamic Resource Scheduler (DRS) (ctd.)

• Cost?
  • DRS is available only with the VI3 enterprise package.

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VMware Infrastructure 3 – Pricing, Packaging, and Licensing Overview
VMware Dynamic Resource Scheduler (DRS) (ctd.)

- How?

  - The DRS facilitates resource utilization by intelligently allocating VMs based on their resource needs.
VMware Dynamic Resource Scheduler (DRS) (ctd.)

- Why?
  - DRS facilitates high-level utility or grid computing. When resource utilization in a DRS cluster begins to approach dangerously high levels, simply add another host to the DRS cluster and VMs are migrated to the new host in order to take advantage of its resource capacity.

- Implementation pitfalls
  - VMs participating in a farm can get grouped together on the same host if exclusionary rules are not applied.
VMware Dynamic Resource Scheduler (DRS) (ctd.)

- Real-world examples
  - Rules can be specified to always keep several VMs on the same or separate hosts.
  - This is useful for when there are two or more VMs that are resource hogs and they need to be kept on separate hosts.
  - Conversely, rules can be specified to always keep several VMs on the same host for when a private network has been implemented to test something like Microsoft Active Directory Longhorn Server.
VMware Dynamic Resource Scheduler (DRS) (ctd.)

• Real-world examples (ctd.)
  • Once a DRS cluster reaches 85% utilization simply add another host to the cluster and several VMs from each host will be migrated from to the new host to even distribute resources across the cluster.
VMware High Availability (HA)

- **What?**
  - VMware High Availability (HA) automatically restarts VMs on different ESX hosts if an ESX host fails or is isolated from the other hosts.
VMware High Availability (HA) (ctd.)

- Cost?
  - HA is available only with the VI3 enterprise package

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*VMware Infrastructure 3 – Pricing, Packaging, and Licensing Overview*
VMware High Availability (HA) (ctd.)

• How?
  • Through constant communication between agents, downed and isolated hosts can have their VMs started on hosts that are online.

• Why?
  • HA allows hosts with extra resource capacity to immediately use that capacity to make up for a failure on another host – maximizing resource utilization with manual intervention.
VMware High Availability (HA) (ctd.)

- Implementation pitfalls
  - Split-brain condition:
    This can occur when a VM is configured to stay running even when the host is isolated and the shared storage is NAS or iSCSI.
  - Since both NAS and iSCSI also use TCP/IP, if a host is isolated there’s a good chance that the host cannot communicate with the shared storage either (this is not necessarily the case with fibre-attached storage such as a SAN).
  - In this case, the isolated host will eventually lose its lock on the VM's files and the VM will be started on another host. Except the isolated host still “owns” that VM and when it comes back online confusion ensues.
VMware High Availability (HA) (ctd.)

- Implementation pitfalls (ctd.)
  - Host isolation timing issue – A host with a flaky network connection could result in a VM being powered off.
  - A host in an HA cluster is considered isolated after it is unresponsive for 15 seconds.
  - At the 12 second mark the isolated host shuts down the VM, freeing its lock on the VM's files on the shared storage.
  - However, if the host becomes unisolated (the network connection returns) between 12-14 seconds, the VM will remain off because the other hosts do not consider a host isolated until 15 seconds has elapsed.
In Conclusion

- The Ultimate Goal
  - Maintain 85% utilization
  - Intelligently and automatically manage resource allocation
  - Easily add additional capacity to a resource pool
  - Provide high availability

- All of this is possible today by understanding and properly implementing VMware VI3 reservations, limits, shares, resource pools, DRS and HA.
Questions?

• What say you?
For More Information

- E-mail me at akutz@lostcreations.com
- http://searchservervirtualization.techtarget.com
- I’ll be available at the Ask-the-Expert booth today from 1 PM to 2 PM.
- Download the VM Oglator at http://www.ronoglesby.com/downloads/vmoglator1.1.xls
- Get SAN training through certified vendors such as Dell and HP.