

Enterprise Standards and Best Practices for IT Infrastructure

Lab Report

Lab 08 – VMware vMotion

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vSphere Migration

The process of moving a virtual machine from one host or storage location to another.

vSphere Migration Types

- Cold migration

Moves a powered-off virtual machine to a new host. Optionally, can relocate configuration and disk files to new storage locations. Cold migration can be used to migrate virtual machines from one datacenter to another.

If a virtual machine is shut down, can move it to a different cluster, resource pool, or host by copying all virtual machine files to a different directory.

- Migration of a suspended virtual machine

Moves a suspended virtual machine to a new host. Optionally, can relocate configuration and disk files to new storage location. Can migrate suspended virtual machines from one datacenter to another.

- Migration with VMotion

- Migration with Storage VMotion

Moves the virtual disks or configuration file of a powered-on virtual machine to a new datastore. Migration with Storage VMotion allows to move a virtual machine's storage without interruption in the availability of the virtual machine.

Storage VMotion allows to move a running virtual machine from one VMFS volume to another. Taking the virtual machine or its associated storage offline is not required. All datastore types are supported, including local storage, VMFS, and NAS (network attached storage).

Can place the virtual machine and all its disks in a single location, or select separate locations for the virtual machine configuration file and each virtual disk. The virtual machine remains on the same host during Storage VMotion.

To perform storage VMotion, use the `VirtualMachine.RelocateVM_Task` method. The `RelocateVMSpec` passed in to the method allows to specify the target data store and target host or resource pool.

Migration with VMotion

A vMotion migration moves a powered-on virtual machine from one host to another.

Moves a powered-on virtual machine to a new host. Migration with VMotion allows to move a virtual machine to a new host without interruption in the availability of the virtual machine. Migration with VMotion cannot be used to move virtual machines from one datacenter to another.

VMware VMotion support the live migration of running virtual machines from one physical server to another with no downtime. Can perform this migration only between hosts in the same datacenter that are managed by a vCenter Server system. Must power off a virtual machine to move it to a different datacenter.

When call the VirtualMachine object's MigrateVM_Task method, can specify either a host or resource pool to migrate to. Can optionally specify the task priority and the power state of the virtual machine. The VMotion example performs the following tasks:

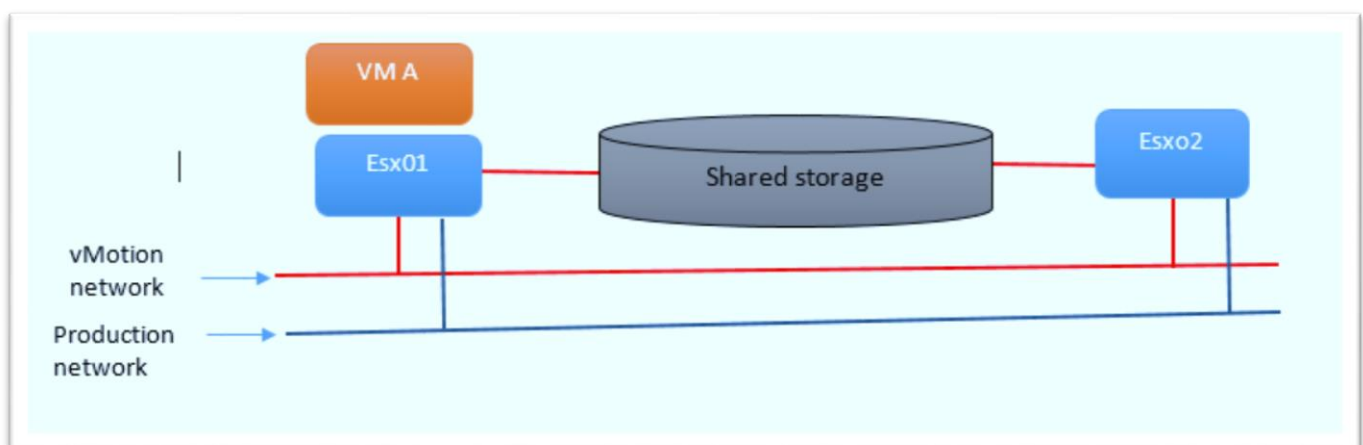
- Uses QueryVMotionCompatibility_Task to check two hosts are compatible.
- Uses CheckMigrate_Task to check whether migration is feasible. For example, if two hosts are not compatible, virtual machines cannot be migrated from one to the other.
- Uses CheckRelocation_Task to check whether relocation is possible.

The sample performs the migration if the hosts are compatible.

vMotion can be used to

- Improve overall hardware utilization
- Allow continued virtual machine operation while accommodating scheduled hardware downtime.
- Allow vSphere Distributed Resource Scheduler (DRS) to balance virtual machines across hosts.

How vMotion Migration Works



If we want to move the Virtual machine from host 1 to host 2 there must be fulfill some requirements.

- A virtual machine must not have a connection to a virtual device (such as a CD-ROM or floppy drive) with a local image mounted.
- A virtual machine must not have a connection to an interval vSwitch (vSwitch with zero up link adapters)
- A virtual machine must not have CPU affinity configured.

Source and destination hosts must have

- Visibility to all storage (Fiber Channel, iSCSI or NAS) used by the virtual machine.
- At least a Gigabit Ethernet network -Four concurrent vMotion migrations on a 1Gbps network - Eight concurrent vMotion migrations on a 10Gbps network
- Access to the same physical networks.
- Compatible CPUs
- The hosts must be licensed for vMotion
- hosts must be running ESXi 5.1 or later
- The hosts must meet the networking requirements for vMotion.

-Migration with vMotion requires correctly configured network interfaces on source and target hosts. Configure each host with at least one network interface for vMotion traffic. To ensure secure data transfer, the vMotion network must be a secure network, accessible only to trusted parties. Additional bandwidth significantly improves vMotion performance. Consider that when you migrate a virtual machine with vMotion without using shared storage, the contents of the virtual disk is transferred over the network as well.

- The virtual machines must be properly configured for vMotion.

-The source and destination management network IP address families must match. You cannot migrate a virtual machine from a host that is registered to vCenter Server with an IPv4 address to a host that is registered with an IPv6 address.

-If virtual CPU performance counters are enabled, you can migrate virtual machines only to hosts that have compatible CPU performance counters.

-Can migrate virtual machines with USB devices that are connected to a physical USB device on the host. Must enable the devices for vMotion.

- Cannot use migration with vMotion to migrate a virtual machine that uses a virtual device backed by a device that is not accessible on the destination host. For example, Cannot migrate a virtual machine with a CD drive backed by the physical CD drive on the source host. Disconnect these devices before migrate the virtual machine.
- Cannot use migration with vMotion to migrate a virtual machine that uses a virtual device backed by a device on the client computer. Disconnect these devices before migrate the virtual machine.
- The destination host must have access to the destination storage.

vMotion is the tool with which active virtual systems can be migrated from one ESX-host to another without any interruption to the virtual machines themselves or to their provided services. With vSphere 5.x previous limits on simultaneous migrations of virtual machines on an ESXi-host- and datastore-basis have been lifted. This procedure was previously only possible as a cold migration process with offline VMs.

The vMotion procedure from the point of view of the virtual machine

1. The first step is to ensure that the source VM can be operated on the chosen destination server.
2. Then a second VM process is started on the target system and the resources are reserved.
3. Next a system memory checkpoint is created. This means all changes to the source VM are written to an extra memory area.
4. The contents of the system memory recorded at the checkpoint are transferred to the target VM.
5. The checkpoint/checkpoint-restore process is repeated until only the smallest changesets remain in the target VM's memory.
6. The CPU of the source VM is stopped.
7. The last modifications to the main memory are transferred to the target VM in milliseconds.
8. The vMotion process is ended and a reverse ARP packet is sent to the physical switch (important: Notify Switches must be activated in the properties of the virtual switch). Hard disk access is taken over by the target ESX.
9. The source VM is shut down. This means the VM process on the source ESX is deleted.

One additional comment about what the vMotion checkpoints record:

- all devices and their status
- CPU registers
- main memory contents
- a serialization of the status for transmission over the network

As you can see vMotion is concerned mostly with the transfer of the main memory contents from one ESX server to another, with a final notification telling the physical network about the new interface over which the VM is reachable sent once the process is finished. The guest system of course does not notice anything.