SRI LANKA INSTITUTE OF INFORMATION TECHNOLOGY

Enterprise Standards and Best Practices for IT Infrastructure

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vMotion

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1. INTRODUCTION

VMware has been the industry leader in virtualization technologies for the past decade and has brought to the data center several new features that enable faster and better provisioning of business-critical applications. One of the features is the VMware vMotion technology.

VMware vMotion enables the live migration of running virtual machines from one physical server to another with zero downtime, continuous service availability, and complete transaction integrity. It is transparent to users. Though vMotion it serve a different purpose, they feature a large amount of overlapping technology. This technology is proactive. It means vMotion is used to migrate virtual machines between running ESX-hosts. The vSphere features are no longer usable when the source or the destination is offline.

A successful application migration through VMware VMotion heavily relies on the underlying network infrastructure. Therefore it is extremely important that IP network be resilient, robust, and highly available.

vMotion happens in three stages. Those are;

- vCenter server verifies that the VM is in a stable state
- VM state is copied over to the destination. State includes the memory, registers and network connections
- VM is resumed in the destination host

vMotion can happen due to any of the following reasons:

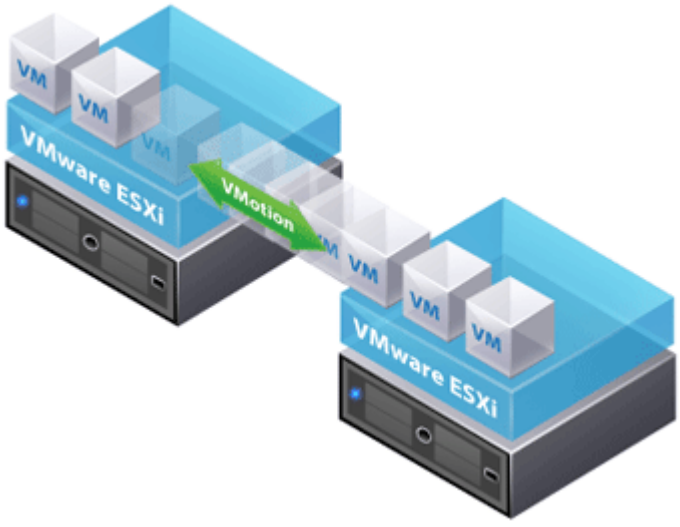
- Balance the load on ESXi hosts using DRS
- When the VMs are being moved off from a host so that the host can be shut down by DPM(distributed power management)
- You need to install patches using update manager or do a hardware maintenance, the VMs are migrated using vMotion and host is put into maintenance mode

2. Need of vMotion

VMware VMotion enables the live migration of running virtual machines from one physical server to another with zero downtime, continuous service availability, and complete transaction integrity. It is transparent to users. VMotion lets:

- Automatically optimize and allocate entire pools of resources for maximum hardware utilization and availability.
- Perform hardware maintenance without any scheduled downtime.
- Proactively migrate virtual machines away from failing or underperforming servers.
- Balance the load on ESX servers (DRS)
- Save power by shutting down ESX using DPM)
- Perform patching and maintenance on ESX server (Update Manager or HW maintenance)

If you need to take a host offline for maintenance, you can move the virtual machine to another host. Migration with vMotion allows virtual machine processes to continue working throughout a migration. With vMotion, you can change the host on which a virtual machine is running, or you can change both the host and the data store of the virtual machine.



3. PRE-Requisites FOR vMotion

a. Resource Requirements

VMware VMotion application mobility is based on certain infrastructure requirements:

- An IP network with a minimum bandwidth of 622 Mbps is required.
- The maximum latency between the two VMware vSphere servers cannot exceed 5 milliseconds.
- The source and destination VMware ESX servers must have a private VMware VMotion network on the same IP subnet and broadcast domain.
- The IP subnet on which the virtual machine resides must be accessible from both the source and destination VMware ESX servers. This requirement is very important because a virtual machine retains its IP address when it moves to the destination VMware ESX server to help ensure that its communication with the outside world (for example, with TCP clients) continues smoothly after the move.
- The data storage location including the boot device used by the virtual machine must be active and accessible by both the source and destination VMware ESX servers at all times.
- Access from VMware vCenter, the VMware Virtual Infrastructure (VI) management GUI, to both the VMware ESX servers must be available to accomplish the migration.
- You will need vSphere Essential plus, Standard, Enterprise or Enterprise plus license
- Shared storage between ESXi servers- iSCSI, FC or NFS.*
- VMkernal interface on both ESXi servers with vMotion enabled
- Same network label in source and destination hosts, either standard or distributed switches can be used
- CPU compatibility between hosts, or they need to be of the same processor family if you are planning to use Enhanced vMotion Compatibility (EVC). That means you cannot migrate VMs from a host with Intel processor to a host with AMD processor.

b. Configuration Requirements

You can use the Migration wizard to migrate a powered-on virtual machine from one host to another using vMotion technology. To relocate the disks of a powered-on virtual machine, migrate the virtual machine using Storage vMotion.

Before migrating a virtual machine with vMotion, ensure that your hosts and virtual machines meet the requirements for migration with vMotion.

- Host Configuration for vMotion
- Virtual Machine Configuration Requirements for vMotion

Host Configuration for vMotion

In order to successfully use vMotion, you must first configure your hosts correctly. Ensure that you have correctly configured your hosts in each of the following areas:

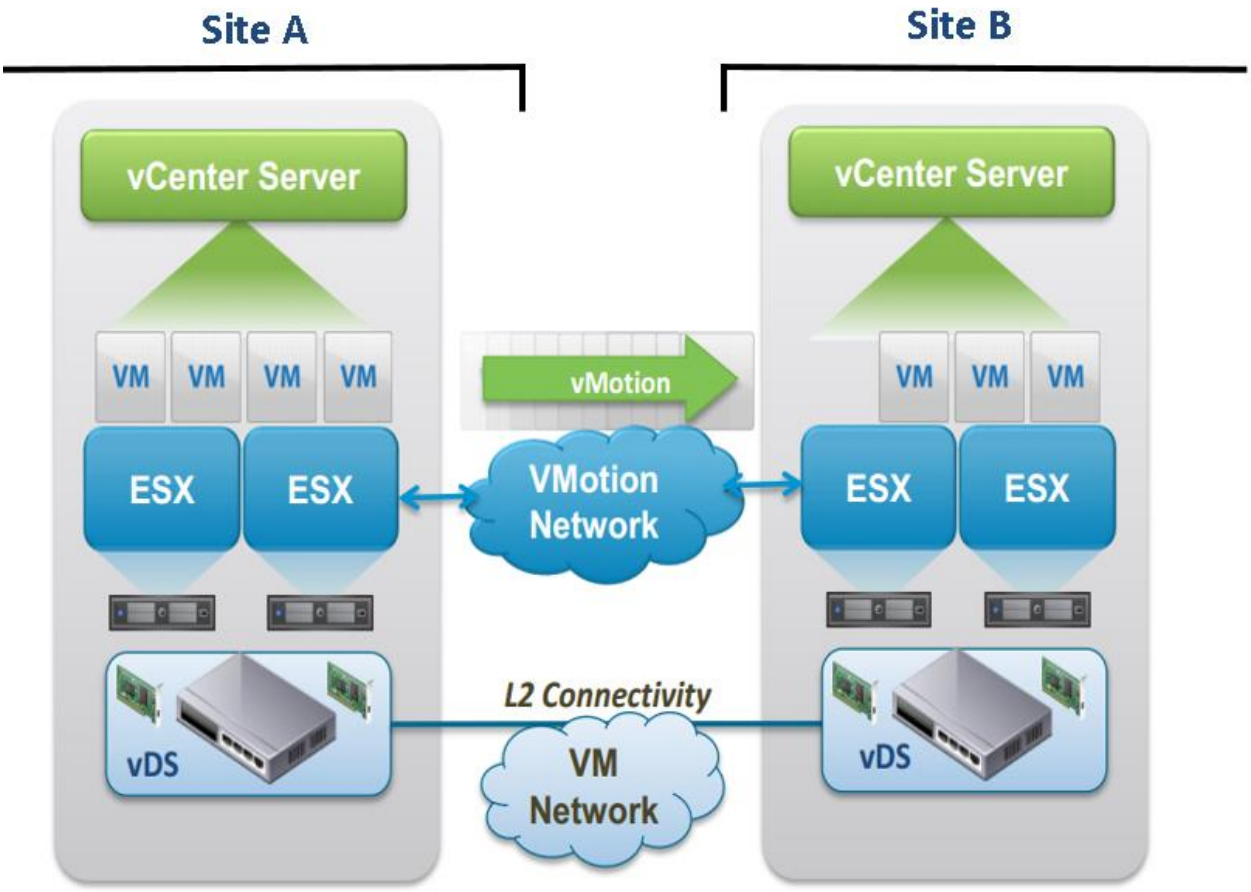
- Each host must be correctly licensed for vMotion.
- Each host must meet shared storage requirements for vMotion.
- Each host must meet the networking requirements for vMotion.

Virtual Machine Configuration

A number of specific virtual machine configurations can prevent migration of a virtual machine with vMotion. The following virtual machine configurations can prevent migration with vMotion:

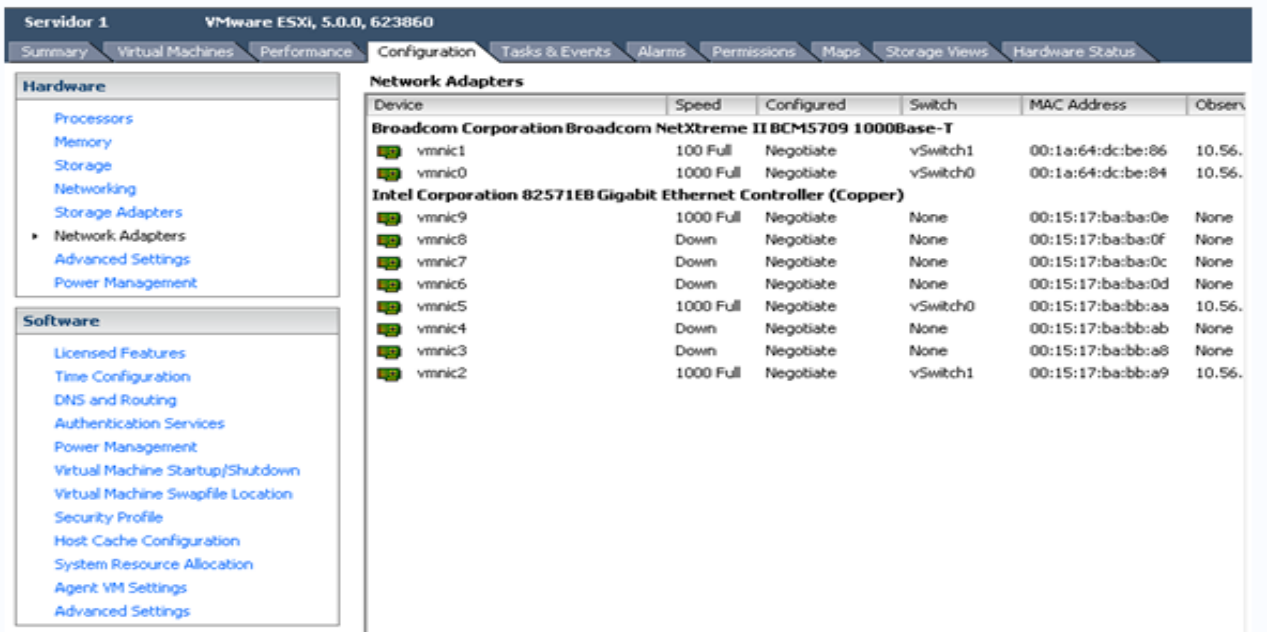
- You cannot use migration with vMotion to migrate virtual machines using raw disks for clustering purposes.
- You cannot use migration with vMotion to migrate a virtual machine that uses a virtual device backed by a device that is not accessible on the destination host. (For example, you cannot migrate a virtual machine with a CD drive backed by the physical CD drive on the source host.) Disconnect these devices before migrating the virtual machine. Virtual machines with USB pass through devices can be migrated with vMotion as long as the devices are enabled for vMotion.

- You 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 migrating the virtual machine.

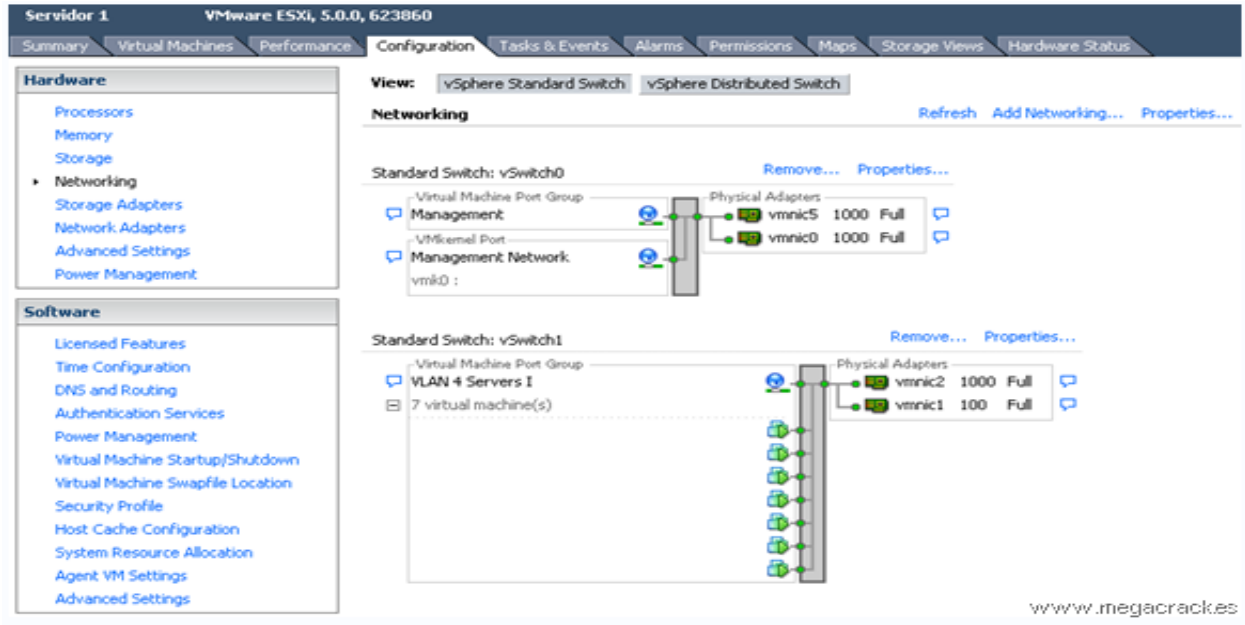


4. HOW TO DO vMotion

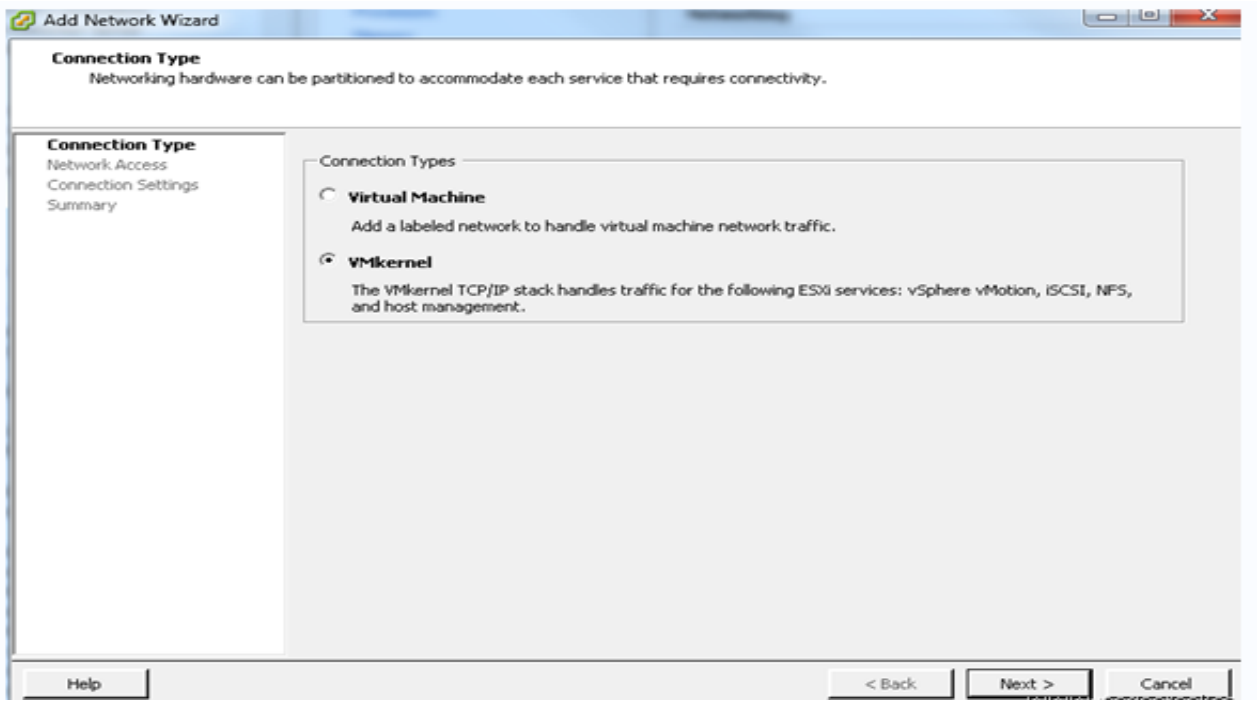
- We connect to Virtual Center and gain access to one of the servers 2. We select the tab Configuration-> Network Adapters and we see that we have visibility of the new connections.



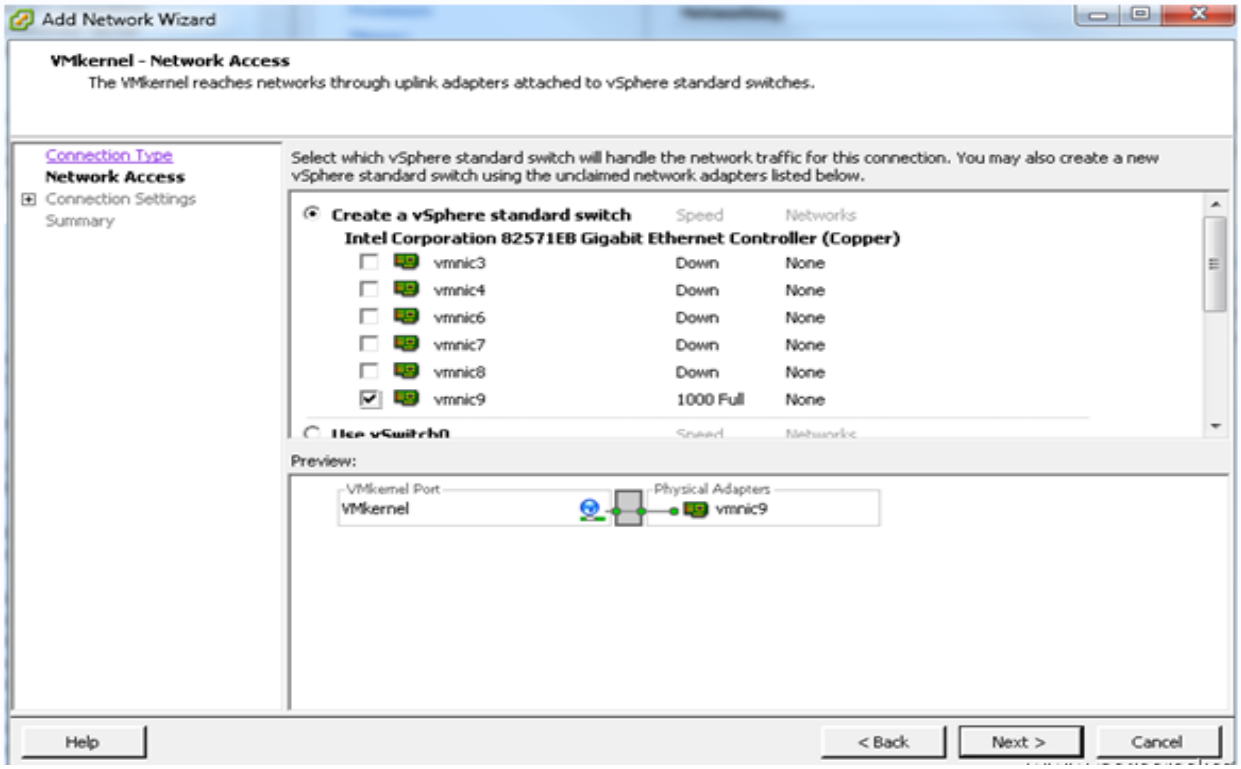
- Now we look at the tab Configuration-> Networking



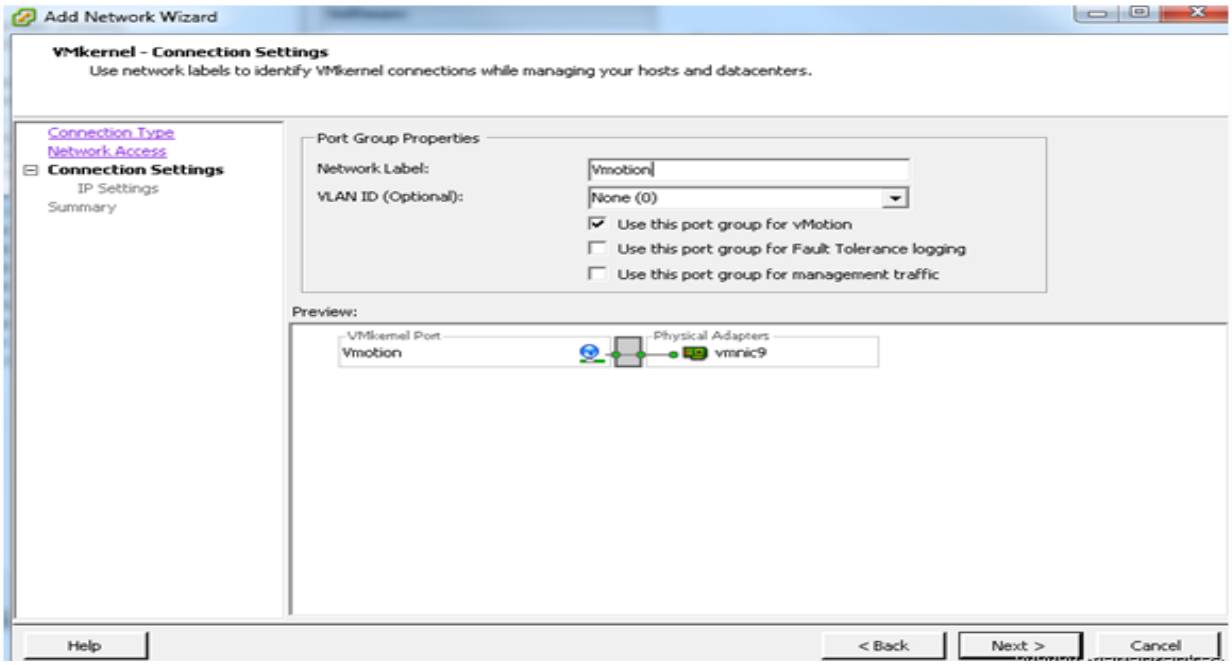
- Click on Add Networking to create the vSwitch.



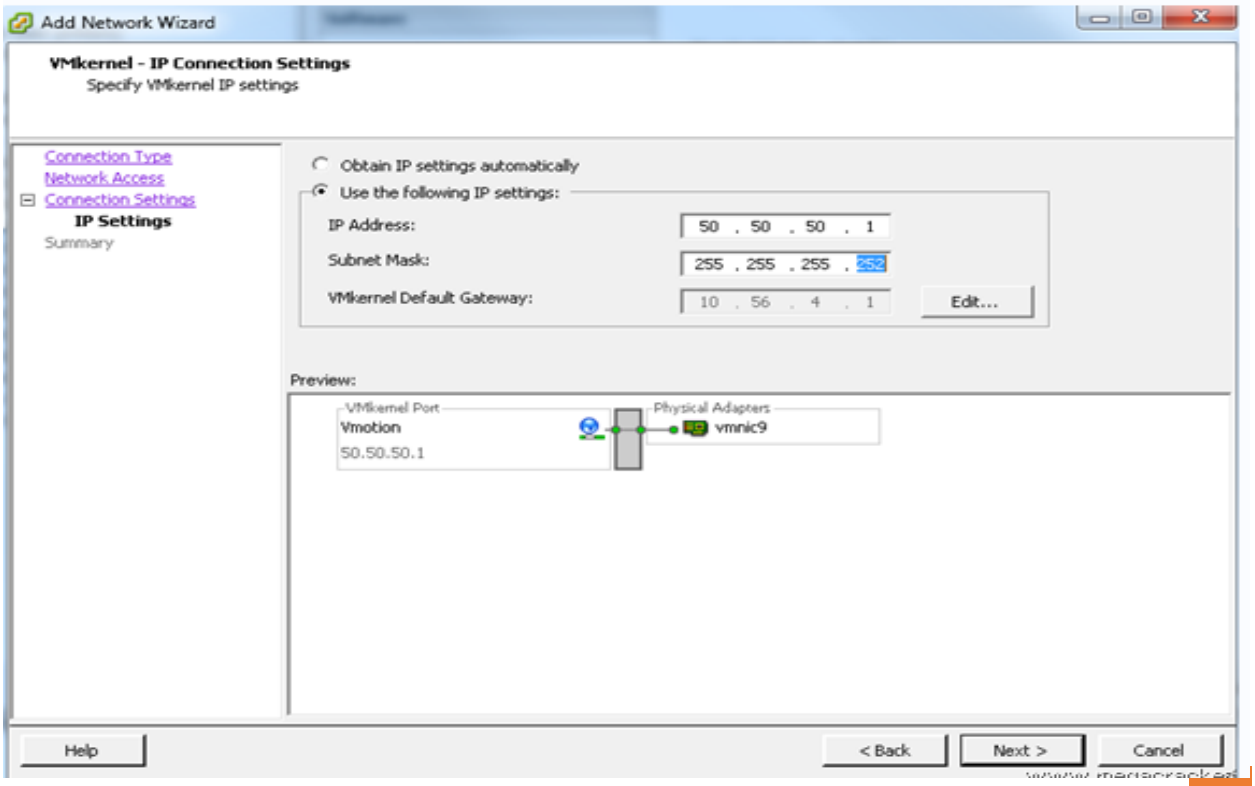
- Select VMkernal and click on Next



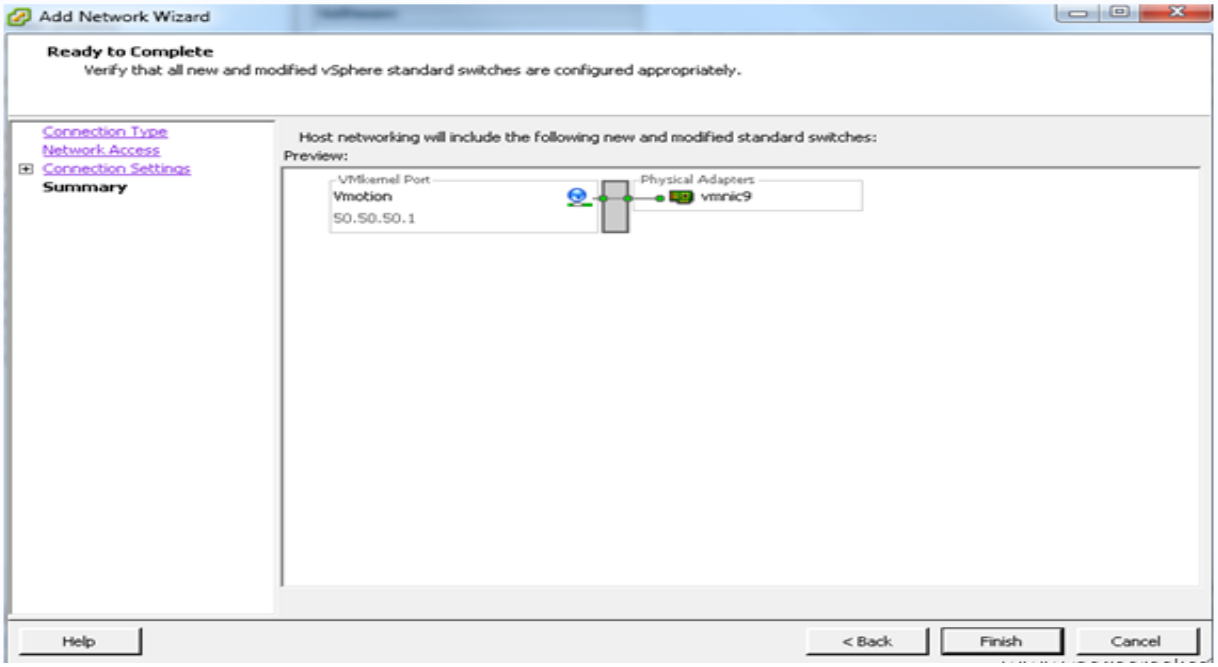
- Making a network card or cards that have connected from one server to another (in our case **vmnic9**). And click on **Next**.



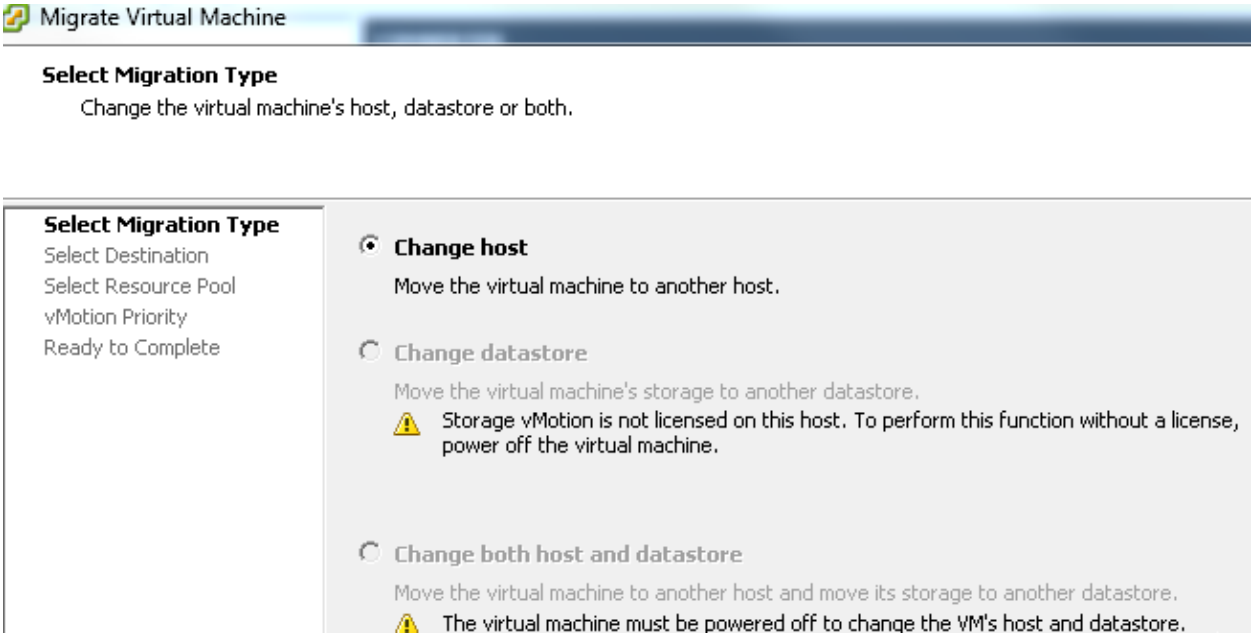
- We set Use this port group for vMotion. We wrote a Label Network different if you want (optional) and click on Next. We for example we put vMotion.



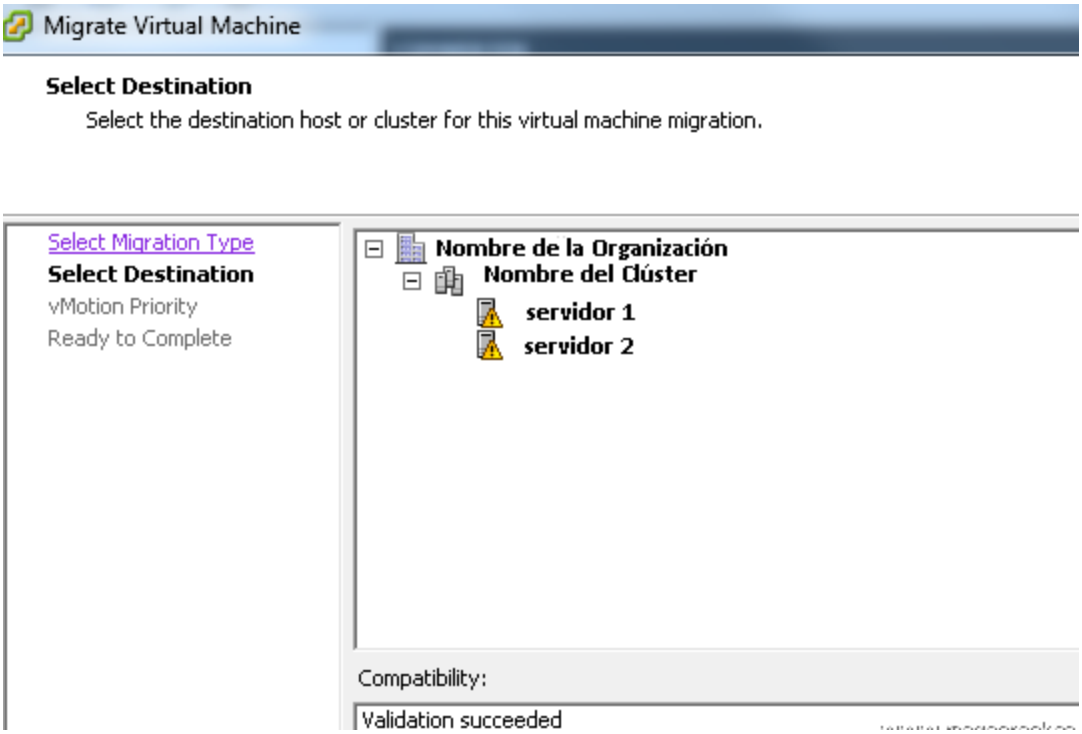
- We set Use the following IP settings. IP Address as 50.50.50.1 and Subnet Mask as 255.255.255.252 (Since we will use only 2 ip's). Click on Next.



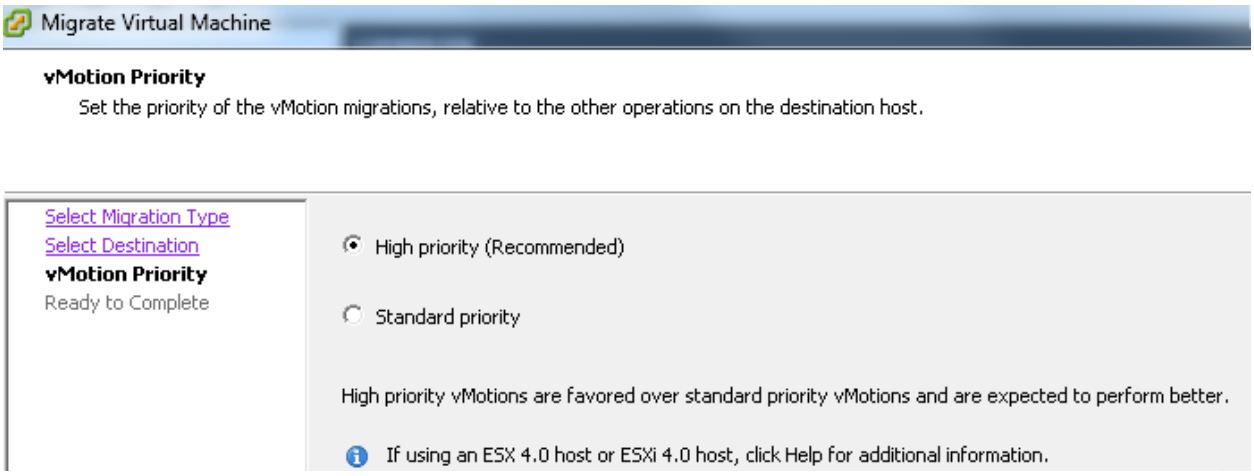
- Click on Finish. And now what we will do to ensure that the entire system is working properly migrate a VM from one ESXi to the other using Vmotion functionality you just configured. We press the right mouse button on a virtual machine. Click on **Migrate.**



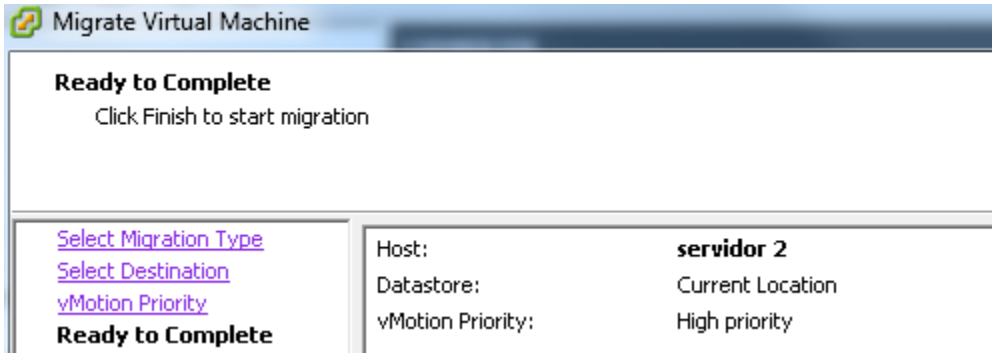
- Click on Next



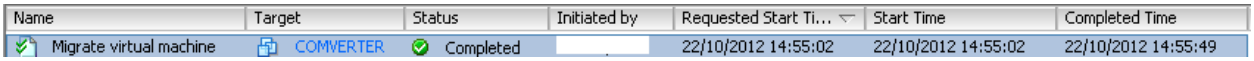
- Select the target server where we will move the virtual machine. Click on Next.



- Click on Next



- Click on Finish to start the migration.



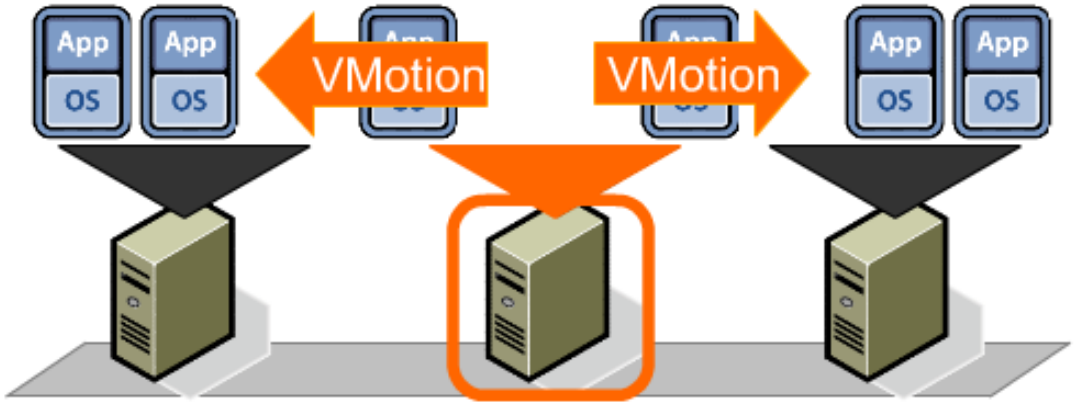
The following metrics were used to understand the performance implications of vMotion:

- Migration Time: Total time taken for migration to complete
- Switch-over Time: Time during which the VM is quested to enable switchover from source to the destination host
- Guest Penalty: Performance impact on the applications running inside the VM during and after the migration

5. BENEFITS OF vMotion

1. **Automatically optimize and allocate entire pools of resources**

   By having all your server and/or desktops virtualized you can move VM's from one physical host to another, which is done rapidly over a high speed network connection, the original host and destination host stay in sync until the transfer it complete leaving the user unaware of the move. This allows network administrators to easily select resource pools to assign to the different VMs.



2. **Move VM's from failing or underperforming priorities**

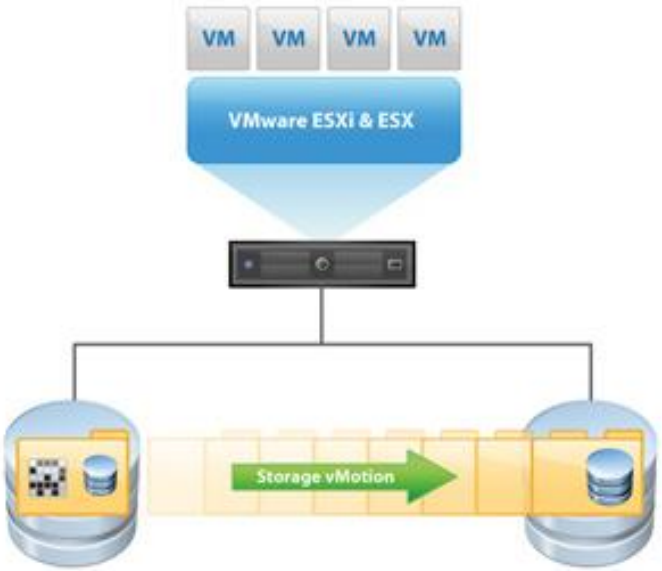
   If there looks like a server is about to fail or is reaching its capacity, administrators can manually move VMs to another physical host, this allows your data center to be more dynamic in nature. Instead of having to upgrade hardware, you can move VM to another host to allow each VM to be more flexible in nature. If 2 VM's are putting a physical host to capacity then you could move one to another server that isn't being used as much.

3. **Storage vMotion**

   While technically its own separate feature, it works similar to vMotion, except it deals completely with data. As a VM starts to reach its data capacity, the LUN can easily be moved to a larger storage center. This is done without disruption to the users or having to manually reassigning more space to the VM.

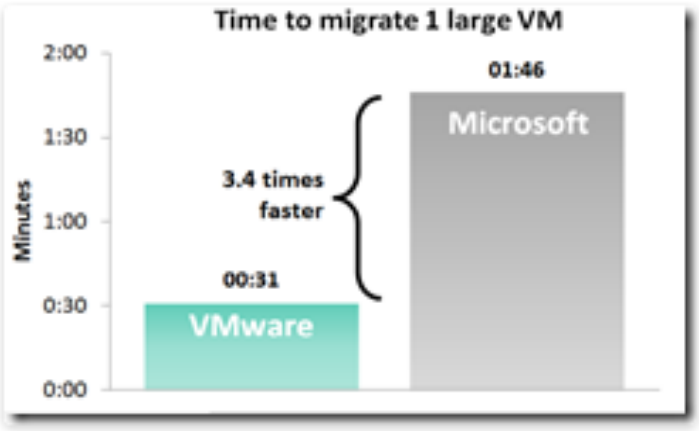
4. **Minimizes scheduled Downtime (Zero Downtime)**

Most of the downtimes are scheduled, before vMotion administrators had to do server maintenance late at night in order to avoid disrupting users. Having all the servers as virtual machines, you only have to move the VM to another physical host, creating zero downtime for the users and allowing administrators to perform maintenance at any time. With DRS (Digital Resource Manager), all you have to do is put a server in maintenance mode and vMotion will automatically move all VM's to another server.



5. **Row speed of vMotion is greater than other migration mechanisms.**

The raw speed of VMware vMotion live migrations for moving single and multiple virtual machines has been a huge timesaver for the customers. Speedy concurrent vMotion let system administrators quickly evacuate the VMs off hosts before a planned server maintenance session so they can get home on time, rather than spending extra hours at work to swap a server power supply or do a firmware upgrade. VMotion also has a minimal impact on VM performance, so mission-critical VMs can be moved during production hours without generating user complaints. The calculations certify that the VMware vMotion Migration produces 3.4 times faster migration than the Microsoft's migration mechanisms.



6. **No dependency on shared storage**
7. **Lower operating cost**
8. **Helps meet service level and performance SLAs**

6. LIMITATIONS OF vMotion

- Virtual machines configured with the Raw Device Mapping(RDM) for clustering features using vMotion
- VM cannot be connected to a CD-ROM or floppy drive that is using an ISO or floppy image stored on a drive that is local to the host server. The device should be disconnected before initiating the vMotion.
- Virtual Machine cannot be migrated with VMotion unless the destination swap file location is the same as the source swap file location. As a best practice, Place the virtual machine swap files with the virtual machine configuration file.
- Virtual Machine affinity must not be set (aka, bound to physical CPUs).