Module – II : Configuration and Change Management

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Virtual CPU Configuration

- ✓Virtual CPU Limitations
- ✓Configuring Multicore Virtual CPUs
- ✓Enable CPU Hot Add
- ✓Change the Number of Virtual CPUs
- ✓Allocate CPU Resources in the VMware Host Client
- ✓Change CPU Identification Mask Settings
- ✓Expose VMware Hardware Assisted Virtualization
- ✓Enable Virtual CPU Performance Counters
- ✓Configure Processor Scheduling Affinity
- ✓Change CPU/MMU Virtualization Settings

Virtual Memory Configuration

Change Memory Configuration

Prerequisites:

✓Verify that you have the **Virtual machine.Configuration.Change Memory privilege on the virtual machine.**

Procedure:

✓Right-click a virtual machine in the inventory and select **Edit Settings.**
✓On the **Virtual Hardware tab, expand Memory and change the memory configuration.**
✓In the **Memory text box, enter the amount of RAM to assign to the virtual machine.**
✓Select whether the memory is specified in MB, GB or TB.
✓Click **OK.**

Allocate Memory Resources

- ✓Limit
- ✓Reservation
- ✓Shares

Prerequisites

- ✓Verify that the virtual machine is turned off.

Procedure

- ✓Right-click a virtual machine in the inventory and select **Edit Settings.**
- ✓On the **Virtual Hardware tab, expand Memory, and allocate the memory capacity for the virtual machine.**
- ✓Click **OK.**

Change Memory Hot Add Settings

Prerequisites

- ✓Power off the virtual machine.
- ✓Verify that the virtual machine has a guest operating system that supports memory hot add functionality.
- ✓Verify that the virtual machine compatibility is ESXi 4.x and later.
- ✓Verify that VMware Tools is installed.

Procedure

- ✓Right-click a virtual machine in the inventory and select **Edit Settings.**
- ✓On the **Virtual Hardware tab, expand Memory, and select Enable to enable adding memory to the virtual machine while it is turned on.**
- ✓Click **OK.**

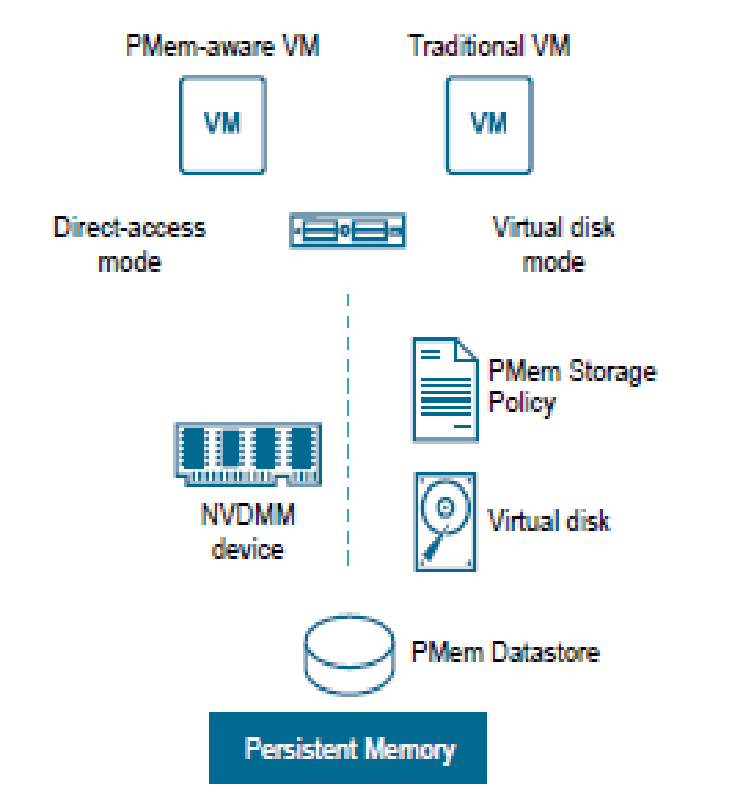
Managing Persistent Memory (NVM/PMem)

Modes of Consumption of the Persistent Memory Resources of the Host

- ✓Virtual PMem (vPMem)
- ✓Virtual PMem Disks (vPMemDisk)

- ✓NVDIMM – Non Volatile Dual In-line Memory Module

- ✓Guest Machine must support PMem-Aware Module



Add an NVDIMM Device to a Virtual Machine

Prerequisites

- ✓Verify that the guest OS of the virtual machine supports PMem.
- ✓Verify that the virtual hardware version is 14 or higher.
- ✓Verify that you have the **Datastore.Allocate space privilege on the virtual machine.**
- ✓Verify that the host or the cluster on which the virtual machine resides has available PMem resources.

Procedure

- ✓Right-click a virtual machine in the inventory and select **Edit Settings.**
- ✓On the **Virtual Hardware tab, click Add a new device and select NVDIMM from the drop-down menu.**
- ✓Click **Add.**
- ✓In the **New NVDIMM text box, enter the size of the NVDIMM device and select the units from the drop-down menu.**

Virtual Disk Configuration

✓You can store virtual machine data in a new virtual disk, an existing virtual disk, or a mapped SAN LUN
✓Raw Device Mapping
✓vSphere Monitoring and Performance

Virtual Disk Provisioning Policies

- Thick Provision Lazy Zeroed
- Thick Provision Eager Zeroed
- Thin Provision

Large Capacity Virtual Disk Conditions and Limitations

- The guest operating system must support large capacity virtual hard disks.
- You can move or clone disks that are greater than 2 TB to ESXi 6.0 or later hosts or to clusters that have such hosts available.
- The datastore format must be one of the following:
  - ✓VMFS5 or later
  - ✓An NFS volume on a Network Attached Storage (NAS) server
  - ✓vSAN
- Fault Tolerance is not supported.
- BusLogic Parallel controllers are not supported.

Change the Virtual Disk Configuration

Prerequisites

✓Power off the virtual machine.
✓Verify that you have the following privileges:

- **Virtual machine.Configuration.Modify device settings on the virtual machine.**
- **Virtual machine.Configuration.Extend virtual disk on the virtual machine.**
- **Datastore.Allocate space on the datastore.**

Procedure

✓Right-click a virtual machine in the inventory and select **Edit Settings.**
✓On the **Virtual Hardware tab, expand Hard disk to view or change the disk settings, and click OK.**

Use Disk Shares to Prioritize Virtual Machines

Procedure

✓Right-click a virtual machine in the inventory and select **Edit Settings.**

✓On the **Virtual Hardware tab, expand Hard disk to view the disk options.**

✓From the **Shares drop-down menu, select a value for the shares to allocate to the virtual machine. Alternatively, you can select Custom and you can enter a number of shares in the text box manually.**

✓In the **Limit - IOPs box, enter the upper limit of storage resources to allocate to the virtual machine, or select Unlimited.**

✓Click **OK.**

Convert a Virtual Disk from the Thin Provision Format to a Thick Provision Format

Procedure

- Verify that the disk format of a virtual hard disk is Thin Provision.
  - ✓Right-click a virtual machine and click **Edit Settings.**
  - ✓On the **Virtual Hardware tab, expand Hard disk and check the Type field.**
  - ✓To exit the wizard, click **Cancel.**
- To open the datastore management panel, click the **Datastores tab, and click a datastore from the list.**
- The datastore that stores the virtual machine files is listed.
- Click the **Files tab, and open the virtual machine folder.**
- Browse to the virtual disk file that you want to convert.
- The file has the .vmdk extension.
- To convert the virtual disk to a thick provision format, click the virtual disk file and click the **Inflate icon.**

Add a Hard Disk to a Virtual Machine

- Add an existing hard disk that is configured as a boot disk during virtual machine creation.
- Keep the default boot disk and add a new disk during virtual machine creation.
- Add multiple hard disks to an existing virtual machine.

Prerequisites

- Ensure that you are familiar with configuration options and caveats for adding virtual hard disks. See Virtual Disk Configuration.
- Before you add disks greater than 2 TB to a virtual machine, see Large Capacity Virtual Disk Conditions and Limitations.
- Verify that you have the **Virtual machine.Configuration.Add new disk privilege on the destination folder or datastore.**

Procedure

- Right-click a virtual machine in the inventory and select **Edit Settings.**
- On the **Virtual Hardware tab, click the Add New Device button.**
- Select **Hard Disk from the drop-down menu.**
- Expand **New hard disk and customize the settings of the new hard disk.**
  - ✓Enter a size for the hard disk and select the unit from the drop-down menu.
  - ✓From the **VM storage policy, select a storage policy or leave the default one.**
  - ✓From the **Location drop-down menu, select the datastore location where you want to store virtual machine files.**
  - ✓From the **Shares drop-down menu, select a value for the shares to allocate to the virtual disk. Alternatively, you can select Custom and enter a value in the text box.**
  - ✓Shares is a value that represents the relative metric for controlling disk bandwidth. The values Low, Normal, High, and Custom are compared to the sum of all shares of all virtual machines on the host.
  - ✓From the **Limit - IOPs drop-down menu, customize the upper limit of storage resources to allocate to the virtual machine, or select Unlimited.**
  - ✓This value is the upper limit of I/O operations per second allocated to the virtual disk.
  - ✓From the **Disk Mode drop-down menu, select a disk mode.**
  - ✓From the **Virtual Device Node, select a virtual device node or leave the default one.**

Add an RDM Disk to a Virtual Machine

Prerequisites

- Ensure that you are familiar with SCSI controller and virtual device node behavior for different virtual hard disk configurations. See Add a Hard Disk to a Virtual Machine.
- Before you add disks greater than 2TB to a virtual machine, see Large Capacity Virtual Disk Conditions and Limitations.
- Required privilege: **Virtual machine.Configuration.Configure Raw device**

Procedure

- Right-click a virtual machine in the inventory and select **Edit Settings.**
- On the **Virtual Hardware tab, click the Add New Device button and select RDM Disk from the drop-down menu.**
- The **Select Target LUN dialog box opens.**
- In the **Select Target LUN dialog box, select the target LUN for the raw device mapping and click OK.**

- The disk appears in the virtual device list.
- Select the location for the mapping file.
  - ✓To store the mapping file with the virtual machine configuration file, select **Store with the virtual machine.**
  - ✓To select a location for the mapping file, select **Browse and select the datastore location for the disk.**
- Select a compatibility mode.
- Accept the default or select a different virtual device node.
- If you selected virtual compatibility mode, select a disk mode to change the way that disks are affected by snapshots.
- Click **OK.**

SCSI, SATA, and NVMe Storage Controller Conditions, Limitations, and Compatibility

Storage controllers

- ✓BusLogic Parallel
- ✓LSI Logic Parallel
- ✓LSI Logic SAS
- ✓VMware Paravirtual SCSI
- ✓AHCI
- ✓SATA
- ✓NVM Express (NVMe) controllers

- SCSI – 0:15
- SATA – 0:29
- NVMe – 0:14

Storage Controller Limitations

- LSI Logic SAS and VMware Paravirtual SCSI are available for virtual machines with ESXi 4.x and later compatibility.
- AHCI SATA is available only for virtual machines with ESXi 5.5 and later compatibility.
- NVMe is available only for virtual machines with ESXi 6.5 and later compatibility.
- BusLogic Parallel controllers do not support virtual machines with disks larger than 2TB.
- Disks on VMware Paravirtual SCSI controllers might not experience optimal performance gains if they have snapshots or if the host's memory is overcommitted.

Virtual Machine Network Configuration

Network Adapter Types

- E1000E
- E1000
- Flexible
- Vlance
- VMXNET
- PVRDMA

Legacy Network Adapters and ESXi Virtual Hardware Versions

Network Adapters and Legacy Virtual Machines

Change the Virtual Machine Network Adapter Configuration

Prerequisites

- Required privilege: **Network.Assign network on a network if you are changing the network the virtual machine connects to.**

Procedure

- Right-click a virtual machine in the inventory and select **Edit Settings.**
- On the **Virtual Hardware tab, expand Network adapter, and select the port group to connect to from the drop-down menu.**
- Change the **Status settings.**
  - ✓**Connected**
  - ✓**Connected at Power on**
- Select the network adapter type to use from the **Adapter Type drop-down menu.**
- Select how to assign the **MAC address from the drop-down menu.**
  - ✓Select **Automatic to assign a MAC address automatically.**
  - ✓Select **Manual to enter manually the MAC address that you want.**
- Allocate bandwidth to the adapter. (Share, Reserve and Limit)

Add a Network Adapter to a Virtual Machine

Prerequisites

- Required privilege: **Network.Assign network on a network.**
- To add an SR-IOV Passthrough adapter, ensure that the virtual machine is of hardware version 10 and later.
- To add an SR-IOV Passthrough adapter, power off the virtual machine.

Procedure

- Right-click a virtual machine in the inventory and select **Edit Settings.**
- On the **Virtual Hardware tab, click the Add New Device button and select Network Adapter from the drop-down menu.**
- The new network adapter appears at the bottom of the device list.
- Expand **New Network and select the standard or distributed port group to connect to.**
- Select the network adapter type to use from the **Adapter Type drop-down menu.**
- Disable DirectPath I/O if that seems appropriate in your environment.
- Allocate bandwidth to the adapter. (Share, Reserve and Limit)
- Assign the **MAC address from the drop-down menu.**
  - ✓Select **Automatic to assign a MAC address automatically.**
  - ✓Select **Manual to enter manually the MAC address that you want.**
- Click **OK.**

Parallel and Serial Port Configuration

- Physical serial port on the host
- Output to file
- Connect to a named pipe
- Connect over the network

Adding a Firewall Rule Set for Serial Port Network Connections

- VM serial port connected to vSPC
- VM serial port connected over network

ConfigureVirtual Machine Communication Interface Firewall

To restrict virtual machines accessing the hypervisor-based services and VMCI-based services.

A virtual machine can communicate with VMCI services through the following means:

- ESXi hypervisor
- Services installed on the host operating system in the form of a vmkernel module
- Applications installed by a verified vSphere Installation Bundle

Establishing Serial Port Network Connections to a Client or Server

- Simple Server Connection
- Secure Server Connection
- Simple Client Connection
- Secure Client Connection

Tools and Technologies in Virtualized Environments

VM Monitor :

Continuously monitors your virtual machine infrastructure, which includes VMWare vSphere and Microsoft Hyper-V compatibility

Key features of this application include:

- Low system utilization for components such as CPU and memory, network interfaces and VMWare resource usage
- Built in thresholds ensure that your environment runs at industry best practice levels
- Ensures that performance levels never degrade below acceptable levels
- VM details are all easy to access and view, including VM state, name and what the guest OS is that is running on each VM

Solarwinds Virtualization Manager:

Designed to optimize performance and reliability in your virtual environment, and allows all v-Sphere and Hyper-V issues to be resolved quickly and easily.

Key features of this application include:

- ✓Performance recommendations and monitoring
- ✓Reduce downtime
- ✓Save time by fixing issues more quickly
- ✓Reduce resource utilization

Other features include capacity planning, active virtualization alerts, management dashboards, management actions, VM sprawl control, VM right-sizing, application stack integration, cloud infrastructure monitoring, dashboards, high availability and an enterprise command center

ManageEngine OpManager:

Manage Engine has created an application that is capable of monitoring VMWare ESX/ESXi Servers and it ensures up-time and peak performance of guest virtual machines.

Key features of this application include:

- ✓Generate VM insights and troubleshoot and resolve problems before users are affected
- ✓Capacity Planning allows decision makers to plan and allocate resources correctly
- ✓Manage VMs and physical servers
- ✓Agentless monitoring
- ✓Easy setup

Paessler Router Traffic Grapher (PRTG):

PRTG is a professional and comprehensive VMWare monitoring solution which is developed by it's own and it is pre-configured for monitoring all aspects of your VMWare installation.

Key features of this application include:

- ✓VMWare Virtual Machine Sensor with Simple Object Access Protocol (SOAP)
- ✓VMWare Host Hardware Sensor (WBEM)
- ✓VMWare Host Hardware Status Sensor
- ✓VMWare Data Store Sensor
- ✓VMWare Host Performance Sensor

Simple Object Access Protocol (SOAP) Features :

- ✓CPU usage in percent
- ✓CPU ready in percent
- ✓Active memory in bytes
- ✓Consumed memory in bytes and percent
- ✓Disk read and write speed
- ✓Read and write latency
- ✓Network usage (total, received, and transmitted bytes per second)

Basic Sensor Settings

- ✓Sensor Name
- ✓Parent Tags
- ✓Tags
- ✓Priority

VMware Virtual Machine Settings

- ✓MoID
- ✓Handling of Virtual Machines when it is “Powered off”

Debug Options

- ✓Discard sensor result: Do not store the sensor result.
- ✓Write sensor result to disk (Filename: "Result of Sensor [ID].txt"):

Sensor Display

- ✓Primary Channel
- ✓Chart Type
- ✓Stack Type

Scanning Interval

Schedules, Dependencies, and Maintenance Window

- ✓Schedule
- ✓Maintenance Window
- ✓Maintenance Begins At
- ✓Maintenance End At
- ✓Dependency Type (Parent, Select Object and Master Object)
- ✓Dependency
- ✓Delay

Access Rights

- ✓Inherited
- ✓None
- ✓Read
- ✓Write
- ✓Full

Web-Based Enterprise Management (WBEM):

The VMware Host Hardware sensor monitors hardware information of a ESX/ESXi server.

Depends on selected server it shows the following:

- ✓Health status
- ✓Temperature
- ✓Power
- ✓Fan rotations per minute (RPM)
- ✓Battery voltage

Remarks:

The parent device must be a VMware ESXi server version 5.0, 5.1, 5.5, or 6.0.

Windows 2012 R2 on the probe system for best performance of this sensor.

Zabbix:

The great thing about Zabbix is that all of the data that you could possibly need to monitor is available in a light weight, easy to use web browser interface, which makes it really easy to navigate and view.

Some other great VM related features include:

- Ready to use templates
- Extended logging
- VM host monitoring
- VM resource monitoring

VEEAM:

Veam ONE is able to assist with performance and optimization, as well as reporting. Veeam also has excellent visibility features like dashboards, 200 preset alarms, 100 predefined reports, infrastructure assessment tools for backups, backup and replication reports, and much more.

Other features include:

- 24×7 real time monitoring, alerting and managing for VM and physical servers
- Resource management and configuration tracking
- Capacity planning and forecasting functionality
- Chargeback and billing capabilities

ApexSQL:

- You can view the top 5 loaded virtual machines for specific hosts.
- You can monitor performance of host devices and calculate baselines and thresholds, while creating and exporting comprehensive performance reports.

EG Innovations:

- They provide a monitoring platform that allows for real time analysis of application performance issues, as well as root cause investigation.
- They are able to guide for the application performance issues towards investigating network, application, virtualization platform and storage states within the environment.

Nagios:

- Nagios has all of the capabilities that make monitoring your VMs and keeping track of the multitude of metrics and data really easy to do.
- Nagios also offers multi-vendor support for their product, which includes VMWare, Microsoft Virtual PC, Xen, Application EC2 and more.

Key benefits include:

- Increased server, services and application availability
- Fast detection of server and OS failures
- Fast detection of service and application failures
- Reduced deployment time
- Reduced administrative overheads
- Centralized configuration

iPSwitch:

"WhatsUp Gold" is well known in IT administrative circles, and is an excellent connectivity tool. It now also offers virtualization monitoring features that allow you to map out your entire virtual environment.

It is able to automatically generate dynamic maps of your virtual environment and is compatible with VMWare and Hyper-V. It is able to display hosts and guests as well as the relationships and clusters of VMs within your environment.

Proactive alerting and virtual performance are also monitored, and everything from performance and resource monitoring, to host and guest states can be checked. CPU, memory and disk space of each VM guest is also easy to check.

This is a great tool that will help you to visualize your virtual environment from a single location, with an accurate map that will give you deeper insights into your operating environment.