

AMD EPYC[™] 9005, 9004, 8004 7003, 7002, 7001

Virtual Machine Migration Guide

AMD together we advance_data center computing

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Oct, 2023	1.1	Added VAMT information
Oct, 2024	2.0	Extensive global updates, added 5th Gen AMD EPYC processor information

Audience

The virtualization environment can make the VM migration process anywhere from straightforward to very complex and involved. This document provides preliminary guidelines on major hypervisor-vendor support for migrating existing VMs to new on-premises AMD EPYC 9000, 8000, or 7000 series-based environments. To do this, you must:

- Be familiar with the hypervisor you are using and have admin access to the hypervisor.
- Have admin OS access and familiarity with OS-specific configuration, monitoring, and troubleshooting tools.



VIRTUAL MACHINE MIGRATION GUIDE CONTENTS

CHAPTER 1 - INTRODUCTION	1
1.1 - Advantages of Migrating to AMD EPYC Processors	1
1.2 - Types of VM Migration	
1.2.1 - Powered-On Migration	2
1.2.2 - Powered-Off Migration	2
1.2.3 - Migrating from Intel Xeon to AMD EPYC	3
	_
CHAPTER 2 - DEFURE YOU DEGIN	5
2.1 - Processor Compatibility	
2.2 - Planning VM Migration	
2 3 - Other Software Considerations	6
	0
CHAPTER 3 - MIGRATING VMS ON KVM Hypervisor	7
3.1 - Prerequisites	7
3.1.1 - Virtualization Support	
3.1.2 - KVM Packages	8
3.1.3 - KVM Drivers	8
3.2 - Powered-On Migration	
3.2.1 - KVM Shared Storage	9
3.2.2 - Performing the Powered-On KVM Migration	9
3.2.3 - Example	10
3.3 - Powered-Off Migration	
3.3.1 - Example	

CHAPTER 4 - MIGRATING VMS ON MICROSOFT HYPER-V	13
4.1 - Move Prerequisites	
4.1.1 - Minimum Hyper-V Version Support	14
4.1.2 - Enabling VM Migration with Hyper-V Manager	
4.1.5 - Ellabiling VM Migration Will Powershell	
4.2 - Powereu-Un Migration (Hyper-V Manager)	ID
4.3 - Powered-Un Migration (Windows PowerSheil)	
4.4 - Powered-Uff Migration (Hyper-V Manager)	
4.5 - Powered-Utt Migration (Windows PowerShell)	
4.6 - Importing and Exporting VMs (Hyper-V Manager)	
4.7 - Importing and Exporting VMs (Windows PowerShell)	
4.8 - Troubleshooting Hyper-V VM Migrations	
4.9 - Resources	
CHAPTER 5 - MIGRATING VMS ON vSPHERE	
5.1 - Powered-On Migration (vMotion)	
5.1.1 - EVC Modes	
5.1.2 - Software Version Lompatibility	29 ەد
5.1.5 - rowered off Migration (Using VMuses vCenter™)	
5.2 - Powereu-off Migration (osing vMware vcenter)	
5.3 - VM Migration (vCenter UI)	
CHAPTER 6 - USING THE VMWARE ARCHITECTURE MIGRATION TOOL	
6.1 - Step 1: Prerequisites	
6.2 - Step 2: Before Migrating the VMs	
6.3 - Step 3: Configure the Migration	
6.4 - Step 4: Migrate the VMs	
6.5 - Rollback	
6.6 - Cleanup	
Гилатер 7 - Блассару	
CHAPTER 7 - GLOSSARY	45

V



CHAPTER 1: INTRODUCTION

Today's virtualization technology supports multiple isolated execution environments (guest VMs) that are all running on the same physical server. Guest VMs run on a software called the hypervisor, which in turn runs on a physical server. The hypervisor helps orchestrate guest VM creation, execution, and sharing the server's physical resources among the guest VMs running on that server.

VM migration is the process of moving a virtualized compute environment and its associated infrastructure resources (such as its storage) from one physical host system to another. This helps environments evolve to keep pace with technology innovations and ever-increasing computational demands. Today's technological improvements in areas such as networking and security allow IT departments to more easily move or migrate their infrastructure. VM migration falls into one of two categories based on the migration destination:

- On-premise migration: Destination hardware is housed in locations that are under the physical control of the organization using them.
- **Cloud migration:** Destination hardware is housed in locations that are not under the physical control of the organization using them. Accessing this hardware and the services it provides typically occurs via the Internet.

This guide includes VM migration guidance for the following hypervisors:

- Kernel-based Virtual Machine (KVM)
- Microsoft Hyper-V
- VMware vSphere[®]

1.1 - Advantages of Migrating to AMD EPYC Processors

The AMD EPYC[™] SoC brings together critical compute, memory, I/O, and security resources with the right ratios to deliver industry-leading performance while lowering TCO. Servers powered by AMD EPYC processors enable virtualized datacenters to further increase consolidation ratios while offering higher-performance virtual machines that deliver:

- **Performance:** The AMD EPYC SoC provides high-frequency parts and a massive number of cores that are a perfect fit for your virtualization needs.
- I/O: 5th Gen AMD EPYC 9005 Series Processors support up to 192 cores, 12 memory channels, and 128 PCle[®] Gen 5 lanes per socket. 4th Gen AMD EPYC 9004 Series Processors support up to 96 cores, 12 memory channels, and 128 PCle[®] Gen 5 lanes per socket. 3rd Gen AMD EPYC 7003 Series Processors and 2nd Gen AMD EPYC 7002 Series Processors support up to 64 cores, 8 memory channels, and 128 PCle[®] Gen 4 lanes per socket.
- Memory: Each 5th Gen AMD EPYC processor supports up to 6TB of DDR5 memory running at speeds up to 6000MHz. Each 4th Gen AMD EPYC processor supports up to 6TB of DDR5 memory running at speeds up to 4800MHz. 3rd and 2nd Gen AMD EPYC processors support up to 4TB of DDR4 memory running at speeds up to 3200MHz.

 Security: AMD EPYC processors include security features such as Secure Boot, Secure Memory Encryption (SME), Secure Encrypted Virtualization (SEV), Secure Nested Paging (SNP), and AMD Trusted I/O (SEV-TIO).

Note: You can migrate VMs from the AMD Opteron line of x86-64 server processors to AMD EPYC processors on supported operating systems.

1.2 - Types of VM Migration

Different hypervisors use different terms to describe VM migration when the VM is powered on and when the VM is powered off. This guide therefore uses the following generic terms throughout:

- Powered-On: The source VM remains powered on during migration. See <u>"Powered-On Migration" on page 2</u>.
- Powered-Off: The source VM is powered off during migration. See <u>"Powered-Off Migration" on page 2</u>.

1.2.1 - Powered-On Migration

Powered-On migration moves a running VM environment to a new host system without any perceived downtime in an active environment and without disrupting any work happening in the virtual environment during the migration.

Powered-On Migration From	To Opteron	Το ΕΡΥϹ
Opteron	Yes	Yes
EPYC	Yes	Yes

Table 1-1: Powered-On migration options between AMD server processors

Note: Powered-On migration requires the original and destination hosts to use processors from the same manufacturer. Major hypervisor vendors do not officially support cross-vendor Powered-On migration.

1.2.2 - Powered-Off Migration

Powered-Off migration temporarily disrupts active operation while moving guest VMs to their new environment. In the virtualization context, this means that guest VMs may be temporarily powered off for the duration of the migration.

Powered-Off Migration From	To Opteron	To EPYC
Opteron	Yes	Yes
EPYC	Yes	Yes

Table 2: Powered-Off migration options between AMD server processors

1.2.3 - Migrating from Intel Xeon to AMD EPYC

Powered-Off migration is supported when migrating from Intel Xeon-based hosts to AMD EPYC-based hosts. Please see the following hypervisor-specific instructions in this guide for detailed instructions:

- KVM hypervisor: <u>"Powered-Off Migration" on page 10</u>.
- Microsoft Hyper-V: "Powered-Off Migration (Hyper-V Manager)" on page 20 and "Powered-Off Migration (Windows PowerShell)" on page 20.
- vSphere: <u>"Powered-Off Migration (Using VMware vCenter")</u>" on page 30.

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CHAPTER 2: BEFORE YOU BEGIN

You need to understand your existing VM environments and dependencies such as (but not necessarily limited to) VM configurations, hardware resources, device assignments, software, and applications before migrating the VMs. Ensuring compatibility between the source and destination VMs helps ensure a smooth migration process.

2.1 - PROCESSOR COMPATIBILITY

Most modern-day processors are x86-64 based, but there are differences. A processor is defined by its microarchitecture and ISA.

- Architecture: AMD EPYC is built on a Multi-Chip Module (MCM) chiplet design that interconnects multiple Core Chiplet Dies (CCDs) to memory and I/O through an I/O Die. Multiple Zen cores provide central processing within the CCD. Please see the appropriate guide for your generation of AMD EPYC processor (available from the <u>AMD Documentation Hub</u>):
 - Overview of AMD EPYC[™] 7003 Series Processors Microarchitecture
 - AMD EPYC™ 8004 Processor Architecture Overview
 - AMD EPYC™ 9004 Series Architecture Overview
 - AMD EPYC™ 9005 Series Architecture Overview
- **ISA:** This is the software abstraction of the Zen processor, which determines how software interacts with the processor. ISA defines everything from what operations the processor supports to how to access the software-visible features of the underlying processor.

Note: The hypervisor generally provides compatibility support for a common minimum feature set across all vendor's models during a VM migration.

2.2 - PLANNING VM MIGRATION

The destination server (host) provides resources to the VM during a migration. The basic items to consider when determining an ideal destination host include:

- Number of processors: Does the VM consume more virtual processors than the destination host can provide?
- Memory: Does the destination host have enough physical memory to run the VM? If not, then the VM migration may not start.
- Network infrastructure and interconnect: Consider the following:
 - Are VM network configurations compatible?
 - Does the VM migration need its own separate private subnet?

- What are the host server physical network adapter capabilities? Does the network hardware have TCP/IP offload capabilities?
- Are network infrastructure speeds and throughput sufficient?

Server storage subsystem:

- Is the drive technology adequate?
- Is there sufficient available drive space?

2.3 - OTHER SOFTWARE CONSIDERATIONS

VM migration must also consider the software being used. Always use the most current releases and apply all applicable patches and updates.

- **Application software:** Most software is hardware agnostic; however, some software may require specific hardware or contain certain architecture-specific instructions. Code can often be rewritten to support portability
- Guest VM versions: Different hypervisor versions may offer different levels of migration support.
- **Hypervisors:** Be sure to comply with the minimum version requirement for your selected hypervisor. You can find this information in the chapter in this guide that corresponds to your selected hypervisor.
- I/O Drivers: Your environments may have specific I/O configuration requirements such as specific network addresses, SR-IOV support, and/or where a device is assigned to a specific VM.
- Virtualization: Verify that virtualization is enabled in the destination host BIOS.



CHAPTER 3: MIGRATING VMs on KVM Hypervisor

KVM hypervisor requires the destination host to have the following minimum OS versions or newer:

OS	Minimum Release
Ded Hat	RHEL 7.5
Reutiat	RHEL 6.8
CHICE	SLES-11-SP4
JOJE	SLES-12 SP2
Canonical	Ubuntu 16.04.2

Table 3-1: Minimum KVM hypervisor OS requirements

These requirements may be different from the processor OS requirements. Please see <u>AMD EPYC[™] Processors Minimum Operating System (OS)</u> <u>Versions</u> for information about your AMD EPYC processor family.

3.1 - PREREQUISITES

The following prerequisites must be met before starting VM migration in a KVM hypervisor environment:

- Virtualization support: See "Virtualization Support" on page 7.
- KVM packages: See <u>"KVM Packages" on page 8</u>.
- KVM drivers: See <u>"KVM Drivers" on page 8</u>.

3.1.1 - Virtualization Support

Execute the following command on the destination host to verify virtualization support for AMD processors:

lscpu | grep -i virt
Virtualization: AMD-V

3.1.2 - KVM Packages

Execute the following command to verify that the correct KVM packages are installed on the destination host:

SUSE:

#yast \rightarrow Virtualization \rightarrow Install Hypervisor and Tools \rightarrow KVM server & KVM tools

• Ubuntu:

#apt-get install qemu-kvm libvirt-daemon-system libvirt-clients bridge-utils virt- viewer virt-manager

3.1.3 - KVM Drivers

Execute the following command to verify that the correct KVM drivers are installed on the destination host:

# lsmod gre	ep -i kvm			
kvm amd		110592	0	
kvm_		786432	1	kvm amd
irqbypass		16384	1	kvm_
сср		102400	1	kvm amd

3.2 - POWERED-ON MIGRATION

Powered-On migration allows you to migrate VMs without any interruption in their availability. A successful migration requires the VM to not use instructions specific to the source processor that are not available on the destination processor. You can execute the lscpu command to display supported CPU instructions in the Flags: section of the output. If you are migrating from an older to newer version, then the source processor instructions should be a subset of the destination processor instructions. The migration may fail if the source and destination processors have different supported instructions; however, you can mitigate that failure by disabling the CPU policy feature(s) that are missing from the destination processor. You can perform this mitigation on the source by modifying libvirt.xml. For example:

lscpu | grep Flags Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr_opt pdpelgb rdtscp lm constant_tsc rep_good nopl nonstop_tsc cpuid extd_apicid aperfmperf rapl pni pclmulqdq monitor ssse3 fma cx16 pcid sse4_1 sse4_2 x2apic movbe popcnt aes xsave avx fl6c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misalignsse 3dnowprefetch osvw ibs skinit wdt tce topoext perfctr_core perfctr_nb bpext perfctr_llc mwaitx cpb cat_13 cdp_13 invpcid_single hw_pstate ssbd mba ibrs ibpb stibp vmmcall fsgsbase bmi1 avx2 smep bmi2 erms invpcid cqm rdt_a avx512f avx512dq rdseed adx smap avx512ifma clflushopt clwb avx512cd sha_ni avx512bw avx512vl xsaveopt xsavec xgetbvl xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local avx512_bfl6 clzero irperf xsaveerptr rdpru wbnoinvd amd_ppin cppc arat npt lbrv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassists pausefilter pfthreshold avic v_vmsave_vmload vgif v_spec_ctrl avx512vbmi umip pku ospke avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni avx512_bitalg avx512_vpopcntdq la57 rdpid overflow_recov succor smca fsrm flush_l1d

3.2.1 - KVM Shared Storage

Shared storage is required in order to perform a Powered-On migration. Shared storage can be made available to the source and destination system using the NFS, iSCSI, FCoE, SCSI, or RDMA protocol. This guide uses NFS.

KVM Shared Storage



Figure 3-1: KVM shared storage

Figure 3-1 shows the following components:

- Source System: Where the VM is currently running.
- Destination System: Where the running VM will move to.
- Shared Storage: System that holds the VM data.

3.2.2 - Performing the Powered-On KVM Migration

To perform a Powered-On VM migration on KVM hypervisor:

- 1. Enable NFS on the shared storage system.
- 2. Use NFS to mount shared storage on the source system.
- 3. Find the exact directory name on the destination server.
- 4. On the destination system, mount the shared storage to the exact same directory as on the source system.
- 5. Verify that the VM you are migrating is running.
- 6. Execute the command virsh on the source system to initiate the migration.

The Linux prompt appears when the migration is complete. This can take anywhere from a few seconds to a few minutes to complete, depending on the size of the migrating VM.

7. On the destination system, verify that the VM was moved and that the workload is still running.

3.2.3 - Example

Here is an example of a Powered-On migration between hosts powered by AMD EPYC processors:

On the shared storage system, add /var/lib/libvirt/images X.X.X.0/24(rw,no_root_squash) to /etc/exports, where X.X.X.0/24 represents a range of your IP addresses.

#exportfs -a

2. Mount the shared storage on the source and destination hosts.

mount SharedStorage:/var/lib/libvirt/images /var/lib/libvirt/images

3. On the source host, verify that the shared storage is mounted, and then verify that the VM is running:

#vir	sh list	
Id	Name	State
7	VM1	running

4. Migrate the running VM to the DestinationSystem.

#virsh migrate --live VM1 qemu+ssh://DestinationSystem/system

5. On the destination system, verify that you can see VM1.iso and VM1.qcow2 in /var/lib/libvirt/images.

#virt-viewer -c qemu:///system VM1

3.3 - Powered-Off Migration

A successful migration requires the VM to not use instructions specific to the source processor that are not available on the destination processor. This example migrates both compute and storage. To perform a Powered-Off VM migration on KVM hypervisor:

- 1. Shut down the VM on the source host.
- 2. Copy the .gcow2 VM image file from the source host to the destination host.
- 3. Execute the command virsh list ← Use the OS name from the output in Step 4, below.
- 4. Execute the command virsh dumpxml os-name > os-name.xml.
- 5. Copy os-name.xml to the destination host.
- 6. On the destination system, execute the command virsh define os-name.xml.
- 7. Execute either the virt-viewer or virt-manager command to start the VM.

3.3.1 - Example

This example performs a Powered-Off migration from CentOS 8 to Ubuntu 20.04 7002.

- 1. Download CentOS-8-GenericCloud-8.2.2004-20200611.2.x86_64.qcow2* from the Debian source to the Ubuntu destination.
- 2. On the source system:

3. On the destination host:

3.4 - RESOURCES

Please visit the following links for additional OS-specific information on performing VM migrations on KVM hypervisors:

- Red Hat:
 - Configuring and managing virtualization, Red Hat Enterprise Linux 8*
 - <u>Configuring and managing virtualization, Migrating Virtual Machines*</u>
- SUSE:
 - <u>SUSE Linux Enterprise Server 15 GA Release Notes</u>*
 - <u>SLES Virtualization Guide</u>*
- Ubuntu: <u>QemuKVMMigration</u>*

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CHAPTER 4: MIGRATING VMS ON MICROSOFT HYPER-V

Microsoft Hyper-V supports VM migration using either of the following methods:

- Microsoft Hyper-V Manager (GUI)
- Windows PowerShell (CLI)

This guide includes the following mechanisms for migrating VMs:

- Move: Moves VMs between Hyper-V hosts. See the following, as appropriate:
 - "Powered-On Migration (Hyper-V Manager)" on page 16
 - "Powered-On Migration (Windows PowerShell)" on page 18
 - <u>"Powered-Off Migration (Hyper-V Manager)" on page 20</u>
 - <u>"Powered-Off Migration (Windows PowerShell)" on page 20</u>
- **Export/Import:** Exports the source VM on a Hyper-V host to a folder and then imports that folder into the destination server during Powered-Off migration. See the following, as appropriate:
 - <u>"Importing and Exporting VMs (Hyper-V Manager)" on page 22</u>
 - <u>"Importing and Exporting VMs (Windows PowerShell)" on page 24</u>.

4.1 - MOVE PREREQUISITES

The Microsoft Hyper-V Live Migration feature performs both Powered-On and Powered-Off VM migrations. If you want to use the Move method to migrate a VM, then verify the following before migrating the VM:

- Both the source and destination host servers must be running Hyper-V and must either be in the same domain or belong to domains that trust each other. The source and destination servers should ideally be running identical versions of Hyper-V.
- Enable VM migration using either the Hyper-V Manager GUI or PowerShell CLI.

4.1.1 - Minimum Hyper-V Version Support

Table 4-1 shows the minimum Hyper-V version required for migration based on the destination AMD EPYC processor version:

	AMD EPYC 7001	AMD EPYC 7002	AMD EPYC 7003	AMD EPYC 9004	AMD EPYC 9005
Minimum Hyper-V ver-	Windows Server				
sion	2012 R2 based	2016 based	2016 based	2019 based	2019 based

Table 4-1: Hyper-V versions by AMD EPYC processor series

4.1.2 - Enabling VM Migration with Hyper-V Manager

To enable VM Live Migration on Hyper-V Manager:

- 1. Open Hyper-V Manager and either:
 - Right-click Hyper-V Manager in the left-hand navigation, and then select Connect to Server...
 - Click Connect to Server... in the Actions pane on the right-hand side.

A list of available Hyper-V servers appears.

- 2. Right-click the Hyper-V host server on which you want to enable VM Live Migration, and then select Hyper-V Settings.
- 3. The Hyper-V Settings window appears.

R Server	Uve Migrations
Virtual Hard Disks C: Users Public Documents Hyper Virtual Machines C: ProgramData Microsoft Windo NUMA Spanning Allow NUMA Spanning Allow NUMA Spanning Virtual Machines Storage Migratons 2.Simultaneous Migrations 2.Simultaneous Migrations Einhanced Session Mode Policy Na Enhanced Session Mode Policy N	Enable incoming and outgoing live migrations Simultaneous live migrations Specify how many simultaneous live migrations are allowed. Simultaneous live migrations: Incoming live migrations O Use any available network for live migration Use any available network for live migration Use any available network for live migration
Replication Configuration Not enabled as a Replica server	Add
Keyboard Use on the virtual machine Mouse Release Key CTRL+ALT+LEFT ARROW	Edit Move Up Move Down
 Enhanced Session Mode Use if available Reset Check Boxes Reset check boxes 	Remove

Figure 4-1: Hyper-V Settings window with Live Migrations selected

4. Check the **Enable incoming and outgoing live migrations** checkbox.

The following additional options appear:

- **Simultaneous live migrations:** Specifies the maximum number of simultaneous live migrations that can be performed on the selected host.
- Incoming live migrations: Specifies how networks are selected for incoming live migration traffic. You can select either the Use any available network... or the Use these IP addresses... radio button and then specify the IP address(es) to use for live VM migrations.
- 5. Make the appropriate selections, then click **OK**.
- 6. Expand the Live Migrations option to expose the Advanced Features options:
 - **Authentication protocol:** Specifies the type of login authentication you want to use to initiate and set up the live migration from the source server to the destination server.
 - Performance options: Specifies how the VM memory will migrate from the source server to the destination server.

Note: Windows Server 2025 enables Credential Guard default. Microsoft therefore recommends Kerberos Constrained Delegation and Resource-Based Kerberos Constrained Delegation when moving VMs across Windows Server 2025 servers.

Server	Advanced Features
Server Virbal Hard Disks C: Users (Public (Documents \Hypers Virbal Machines C: \ProgramData \Microsoft (Windo NUMA Spanning Allow NUMA Spanning Allow NUMA Spanning Uve Migrations 2 Simultaneous Migrations Advanced Features Storage Migrations 2 Simultaneous Migrations Enhanced Session Mode Policy No Enhanced Session Mode Replication Configuration Not enabled as a Replica server User Muse Release Key CTRL+ALT+LEFT ARROW Enhanced Session Mode Use if available Replication Mode Use if available Replice Check Boxes Reset Check Boxes Reset Check boxes	Advanced Features Authentication protocol Select how you want to authenticate live migrations. Use Credential Security Support Provider (CredSSP) You must log on to the server to perform a live migration. Use Kerberos This is more secure but requires constrained delegation for live migration. Performance options Select performance configuration options. CTCP/IP The memory of the virtual machine being migrated is copied over the network to the destination server over a TCP/IP connection. Compression The memory of the virtual machine being migrated is compressed and then copied over the network to the destination server over a TCP/IP connection. SMB The memory of the virtual machine being migrated is copied over the network to the destination server over a SMB connection. SMB Direct will be used if the network adapters of both the source and destination server have Remote Direct Memory Access (RDMA) capabilities enabled.

Figure 4-2: Hyper-V Settings window with Live Migration Advanced Features selected

- 7. Select the appropriate values, and then click OK.
- 8. Review the VM Live Migration settings, and then click **OK** to save your selections.

4.1.3 - Enabling VM Migration with PowerShell

Execute the following commands in the Windows PowerShell CLI to enable VM migration. See the Microsoft Documentation* for additional details.

- 1. Enable-VMMigration: Enables VM migration on a Hyper-V server.
- Set-VMMigrationNetwork: Sets the subnet, subnet mask, and/or priority of a migration network. 2.
- Set-VMHost: Configure Hyper-V settings on a Hyper-V server. З.

4.2 - Powered-On Migration (Hyper-V Manager)

To perform a Powered-On VM migration from a Hyper-V server to a new AMD-based destination server without any interruption of service using Hyper-V Manager:

Open Hyper-V Manager. 1.

11

4

- In the navigation pane, click the name of the source Hyper-V server where the VM is currently running. 2.
- З. From the Virtual Machines pane, right-click the VM you want to migrate, and then select Move.

Hyper-V Manager							-	Ø	Х
File Action View Hel	P								
🗢 🏟 🖄 📷 📓 💷									
Hyper-V Manager	Virtual Ma	achines							
	Name	^	State	CPU Usage	Assigned Memory	Uptime	Status		
	VM4	Connect	Running	0%	16384 MB	00:03:37			
		Settings							
		Turn Off							
		Shut Down							
		Save							
	<	Pause							>
	Checkp	Reset							۲
		Checkpoint	The selected	virtual machine has r	o checkpoints.				
		Move							
		Export							
File Action View Help									
		Enable Replication							
		Help							
									- 1

Figure 4-3: Moving a VM using Hyper-V Live Migration

Move "VM-	" Wizard X
Before You	u Begin
Before You Begin Choose Move Type Specify Destination Choose Move Options Summary	This wizard helps you move a virtual machine to a different computer, or move virtual machine storage from one location to another location.
	Do not show this page again
	Previous Next > Finish Cancel

Figure 4-4: The Hyper-V Move VM wizard

- 4. Proceed through the **Move VM** wizard pages to select the move type, new destination host server, and other options.
- 5. Select the type of VM to move. If you are not using shared storage between the source and destination hosts, then you will need to move the VM and all its resources (virtual hard drives, checkpoints, etc.) to the destination host.
- 6. Specify the destination host server to which to move the VM. Select the local path on the destination host to store the VM's virtual hard drive(s), check points, configuration data, memory states, etc. The wizard defaults to **Best Practice**, which moves the VM's data to a single location. Use this default unless you use a specific file directory structure for storing VMs and their associated resources. In this case, you may either manually enter the complete file path including drive letter or use the **Browse** button to navigate to a specific folder on the destination host.

7. In the Summary tab, review your selected VM migration options, and then click Finish to perform the migration.

Move "VM-	" Wizard	>	<
Completing) Move Wizard		
Before You Begin	You are about to perform the following operation	tion.	
Specify Destination Choose Move Options Virtual Machine Summary	Virtual machine: Move type: Destination computer: Item to move: Attached virtual hard disk SCSI Controller Current configuration Checkpoints Smart Paging Move method: To complete the move and close this wizard, of	VM- Virtual Machine And Storage AMD- Destination Location C:\Wigrated_VMS\\ C:\Wigrated_VMS\ C:\Wigrated_VMS\ C:\Wigrated_VMS\ Compression dick Finish.	
	< Pret	vious Next > Finish Cancel	

Figure 4-5: The Hyper-V Move VM summary window

4.3 - Powered-On Migration (Windows PowerShell)

To perform a Powered-On VM migration using the Windows PowerShell CLI:

1. Execute the Get-Wmiobject -class Win32_Processor PowerShell cmdlet on both the source and destination Hyper-V host servers to show the installed processor manufacturer on those hosts.

On the source Hyper-V server:

```
PS C:\> get-wmiobject -Class win32_processor | Fl Name*
Name: AMD EPYC 7543 32-Core Processor
```

On the destination Hyper-V server:

```
PS C:\> Get-Wmiobject -class Win32 Processor | Fl
Name* Name: AMD EPYC 9354 32-Core Processor
```

Execute the Get-VM PowerShell cmdlet on the source Hyper-V server to list the VMs and their state. In this example, the VM-VM-xxxx-Win_1 VM is currently in the Running state.

```
PS C:\> Get-VM
Name State CPUUsage(%) MemoryAssigned(M) Uptime Status Version
---- ---- ----- ------
VM-xxxx-Win10-20H1_1 Running 0 65536 00:10:32.0060000 Operating normally 9.0
```

3. Execute the Get-Date PowerShell cmdlet just prior to and after performing the migration.

4. Use the Move-VM PowerShell cmdlet to live migrate the running VM (such as VM-xxxx-Win_1) to a different Hyper-V server named AMD-9xx4, being sure to include the -IncludeStorage option to also migrate the VM storage. In this example, the AMD-9xx4 host server is powered by 4th Gen AMD EPYC Series Processors.

```
PS C:\> Get-Date
Tuesday, June 18, 2024 11:12:58 AM
PS C:\> Move-VM -Name VM-xxxx-Win1 -DestinationHost AMD-9xx4 -IncludeStorage -DestinationStoragePath
C:\Migrated_VMs
PS C:\> Get-Date
Tuesday, June 18, 2024 11:16:21 AM
```

5. The Get-VM PowerShell cmdlet lists the VMs on the source Hyper-V server. In this example, the Move-VM PowerShell cmdlet succeeded and the source Hyper-V server no longer has the VM.

PS C:\> Get-VM

6. Executing the Get-VM PowerShell cmdlet with the -ComputerName parameter lists the VMs on the destination Hyper-V server, AMD-9xx4. In this example, the AMD-9xx4 host now has the VM-xxxx-Win_1 VM, which is still in the **Running** state.

4.4 - POWERED-OFF MIGRATION (Hyper-V MANAGER)

To migrate a VM in a Powered-Off state from a Hyper-V host server to a new AMD-based destination server using Hyper-V Manager:

- 1. Open the Hyper-V Manager, then find and click the name of the source Hyper-V server where the VM you are migrating is currently hosted.
- 2. Verify that the VM is in the Off state. If not, then turn the VM off.
- 3. From the Virtual Machines page, right-click the VM to be migrated, and then select Move.

Hyper-V Manager							-	-		×
File Action View Help										
 > ><										
Hyper-V Manager	Virtual Machines	i					^ A	ctic	ons	
	Name	State	CP	PU Usage	Assigned Memory	Uptime	V	WIN	-XEON	•
	Guest VM	Off					0	Sues	st VM	•
	<			Conne	ct	>	•		Connect	
	Checkpoints			Setting	JS		E	M	Settings	
	checkpoints			Start				5	Start	
		The selected virtual m		Check	point		6	2	Checkpoint	
				Move.				*	Move	
	Guest VM			Export			Export		Export	
				Renam	ie			7	Rename	
		Created:	8/18/	Delete		0	Ē	×	Delete	
		Configuration Version: Generation:	9.0 1	Enable	Replication				Enable Rep	li
	1	Notes:	None	Help			111	£	Help	
	Summary Memor	y Networking Replication					~			
Move a virtual machine or its s	storage.									

Figure 4-6: Moving a selected Hyper-V VM

Note: The Move VM wizard is shown in Figure 4-5.

4. Perform Steps 3-6 in "Powered-On Migration (Hyper-V Manager)" on page 16 to migrate the VM to the destination server.

4.5 - Powered-Off Migration (Windows PowerShell)

To perform a Powered-Off VM migration using the Windows PowerShell CLI:

1. Execute the Get-Wmiobject -class Win32_Processor PowerShell cmdlet on both the source and destination Hyper-V servers to show the installed processor manufacturer on those hosts.

Source Hyper-V server:

```
PS C:\> Get-Wmiobject -class Win32_processor | Fl Name*
Name: AMD EPYC 7543 32-Core Processor
```

Destination Hyper-V server:

```
PS C:\> Get-Wmiobject -class Win32_Processor | Fl Name*
Name: AMD EPYC 9354 32-Core Processor
```

Execute the Get-VM PowerShell cmdlet on the source Hyper-V server to list the VMs and their state. In this example, the VM-xxxx-Win_1 VM is currently in the Off state. If the VM is not in the Off state, then use the Stop-VM PowerShell cmdlet to turn off the VM.

PS C:\> get-vm
Name State CPUUsage(%) MemoryAssigned(M) Uptime Status Version
---- ---- ----- ----- ------ -----VM-xxxx-Win10-20H1 1 Off 0 0 00:00:00 Operating normally 12.0

- 3. Execute the Get-Date PowerShell cmdlet both prior to and after performing the migration.
- 4. Execute the Move-VM PowerShell cmdlet to migrate the VM-xxxx-Win10-20H1 1 VM to the AMD-9xx4 server while in the Off state.

```
PS C:\> Get-Date
Tuesday, June 18, 2024 12:06:29 PM
PS C:\> Move-VM -Name VM-xxxx-Win10-20H1_1 -DestinationHost AMD-9xx4 -IncludeStorage -
DestinationStoragePath C:\Migrated_VMs
PS C:\> Get-Date
Tuesday, June 18, 2024 12:10:01 PM
```

5. Executing the Get-VM PowerShell cmdlet with the -ComputerName parameter lists the VMs on the destination Hyper-V server, AMD-9xx4. The AMD-9xx4 server now has the VM-xxxx-W_1 VM, which is still in the **Off** state.

4.6 - IMPORTING AND EXPORTING VMs (Hyper-V MANAGER)

If the source and destination servers are not on a shared domain, then you can use the **Export/Import** option in Microsoft Hyper-V Manager to perform Powered-Off VM migration. To do this:

- 1. On the source server, launch Hyper-V Manager and verify that the VM you are exporting is in the **Off** state. If the VM is not in the **Off** state, then turn off the VM.
- 2. Right click the VM, and then select **Export** to export the VM and corresponding data to a folder.

Hyper-V Manager	Virtual Machine	s					Actions	
I MINTODINIQUUM	Name	State	CPU Usage	Assigned Memory	Uptime	Status	WIN-FGBTNKQP6J4	•
	VM-2025-Win	1 Off Connect					New	ici
		Settings					Hyper-V Settings.	 sn
		Upgrade Configura	tion Version				🤬 Virtual SAN Mana	ıg
		Start					🤞 Edit Disk	
	Checkpoints	Checkpoint				۲	inspect Disk	
		Move		dischief.			stop service	
		Explore		checkpoints.			X Remove Server	
		Rename					C Refresh	
		Delete					View	,
		Enable Replication.					Help	
		Help					VM-2025-Win_1	*
		Thep					Connect	
	101 2025 105						Settings	
	VM-2025-Win_	1					🔓 Upgrade Configu	ra
		Created:	6/16/2024 7:29:50	PM Cluste	red: No		💿 Start	
		Configuration Version:	: 10.0				By Checkpoint	
		Generation:	2				Move	
		Notes:	None				Export	
							🗐 Rename	
						Activate	Deletes.	
	Summary Mem	ory Networking Replicatio	n			Go to Settin	Enable Peolication	OWS.

Figure 4-7: Exporting a VM in Hyper-V

- 3. Launch Hyper-V Manager on the destination server.
- Right click the destination server, and then select **Import Virtual Machine**.
 The **Before You Begin** step of the **Import Virtual Machine** wizard appears.
- 5. Click **Next** to open the **Locate Folder** step.

- Hyper-V Manage File Action View Help 💠 🌩 i 🙇 📷 i 🖬 📷 Hyper-V Manager WIN-ITAG3NF97M8 Action Virtual Machines WIN-ITAG3NF97M8 Import Virtual Machine × ort Virtual Machin er-V Settings . Choose Import Type al Switch Manage. ial SAN Manager... Before You Begin Choose the type of import to perform: Disk Locate Folder O Register the virtual machine in-place (use the existing unique ID) ect Disk ... Select Virtual Ma Restore the virtual machine (use the existing unique ID) Service Copy the virtual machine (create a new unique ID) ove Serve Summary sh < Previous Next > Finish Cancel
- 6. Select the folder containing the VM you want to import, and then click Next to open the Choose Import Type step.

Figure 4-8: The Choose Import Type window

- 7. Select the appropriate import type of import, based on your requirements:
 - a. **Register:** Select this option if all of the virtual machine files are where you want them and you just want Hyper-V to start using the VM right where it is.
 - b. **Restore:** Select this option if your virtual machine files are stored on a file share, removable drive, etc. and you want Hyper-V to move the files to the appropriate location for you.
 - c. **Copy:** Select this option If you have a set of virtual machine files that you want to import multiple times, such as if you are using them as a template for new VMs. This copies the files to an appropriate location, gives the VM a new unique ID, and then registers that VM.

8. When the import completes, you will see the VM on the destination server and can then turn it on.

Hyper-V Manager		- 🗆 X
File Action View Help		
🗢 🏟 🙋 📷 🔛		
Hyper-V Manager	Vietual Machiner	Actions
WIN-ITAG3NF97M8	New Automatics	WIN-ITAG3NF97M8
	VM-2025-Win_1 Off	New Import Virtual Machin Hyper-V Settings Virtual Switch Manage Virtual SAN Manager
	Checkpoints	🔏 Edit Disk
	No vitual machine selected.	Stop Service Remove Server Refresh
		View 🕨
		👔 Help
	Details	
	No item selected.	
	L.	la la

Figure 4-9: Hyper-V VM import process completed

4.7 - IMPORTING AND EXPORTING VMs (WINDOWS POWERSHELL)

Please see the Microsoft documentation on Export and Import Virtual Machines* for instructions on importing and exporting VMs using the PowerShell CLI.

4.8 - TROUBLESHOOTING HYPER-V VM MIGRATIONS

A VM migration can fail for numerous reasons such as (but not limited to) access permissions, host servers with different processor manufactures, or insufficient resources. A failed migration leaves the VM on its current (source) host. Hyper-V will specify the reason why the migration failed via either an error popup or Windows Event Log messages. The Microsoft <u>Troubleshooting Live Migration Issues</u> *article lists common errors or failures that can occur during a VM migration.

4.9 - RESOURCES

Please visit the following links for additional information on performing VM migration on Microsoft Hyper-V:

- Hyper-V-specific PowerShell cmdlets*
- <u>Configure Live Migration and Migrating Virtual Machines without Failover Clustering*</u>
- Set up hosts for live migration without Failover Clustering*
- Delegation Considerations*
- Failover Clustering in Windows Server*

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CHAPTER 5: MIGRATING VMs on vSphere

vSphere runs VMs on the VMware ESXi® hypervisor and manages them using the vCenter management GUI. vCenter also provides a workflow for migrating VMs to other ESXi hosts that are being managed by the same vCenter.

Both the source and destination hosts must be:

- Powered on.
- Managed within the same vSphere cluster.
- Configured with the appropriate EVC settings. See <u>"EVC Modes" on page 28</u>.
- Configured with compatible versions of vSphere. See <u>"Software Version Compatibility" on page 29</u>.

5.1 - POWERED-ON MIGRATION (VMOTION)

Powered-On migration (called vMotion) moves a powered-on VM to a new host without interrupting its availability. vMotion requires the source host and destination host to provide the same CPU functions (called CPU flags), which means that vMotion requires the source and destination hosts to have CPUs from the same manufacturer.

5.1.1 - EVC Modes

If the CPUs on the source and destination hosts are from the same manufacturer but not from the same family or generation, then you can perform Powered-On migrations using VMware Enhanced vMotion Compatibility (EVC) modes, as shown in Table 5-1. Adding a host to an EVC mode limits the CPU functions available to VMs to those applicable to that EVC mode. Please see the VMware KB article <u>"The target host does not support the</u> <u>virtual machine's current hardware requirements" error vMotioning a VM</u>* for additional information about EVC modes and the <u>VMware</u> <u>Compatibility Guide</u>* for information about the specific EVC modes supported by your server model.

From			٦	Го		
	AMD Opteron	AMD EPYC 7001 Series	AMD EPYC 7002 Series	AMD EPYC 7003 Series	AMD EPYC 9004 Series	AMD EPYC 9005 Series
AMD Opteron Series	EVC Modes for AMD Opteron	EVC Mode AMD Opteron Genera- tion 3 w/0 3DNow!	EVC Mode AMD Opteron Genera- tion 3 w/0 3DNow!	EVC Mode AMD Opteron Genera- tion 3 w/o 3DNow!	EVC Mode AMD Opteron Genera- tion 3 w/o 3DNow!	Path not sup- ported (see below)
AMD EPYC 7001 Series	EVC Mode AMD Opteron Genera- tion 3 w/0 3DNow!	No EVC mode required	EVC Mode AMD Zen Generation or prior	EVC Mode AMD Zen Generation or prior	EVC Mode AMD Zen Generation or prior	EVC Mode AMD Zen Generation or prior
AMD EPYC 7002 Series	EVC Mode AMD Opteron Genera- tion 3 without 3DNow!	EVC Mode AMD Zen Generation or prior	No EVC mode required	EVC Mode AMD Zen 2 Generation or prior	EVC Mode AMD Zen 2 Generation or prior	EVC Mode AMD Zen 2 Generation or prior
AMD EPYC 7003 Series	EVC Mode AMD Opteron Genera- tion 3 w/0 3DNow!	EVC Mode AMD Zen Generation or prior	EVC Mode AMD Zen 2 Generation or prior	No EVC mode required	EVC Mode AMD Zen 3 Generation or prior	EVC Mode AMD Zen 3 Generation or prior
AMD EPYC 9004 Series	EVC Mode AMD Opteron Genera- tion 3 w/0 3DNow!	EVC Mode AMD Zen Generation or prior	EVC Mode AMD Zen 2 Generation or prior	EVC Mode AMD Zen 3 Generation or prior	No EVC mode required	EVC Mode AMD Zen 4 Generation or prior
AMD EPYC 9005 Series	Path not sup- ported (see below)	EVC Mode AMD Zen Generation or prior	EVC Mode AMD Zen 2 Generation or prior	EVC Mode AMD Zen 3 Generation or prior	EVC Mode AMD Zen 4 Generation or prior	No EVC mode required

Table 5-1: AMD server processor EVC modes

From Table 5-1: AMD Opteron support is deprecated starting with vSphere 8. AMD EPYC 9005 Series Processors require a future version of ESXi, meaning that there is no overlap in compatible software to allow migrating VMs from AMD Opteron to AMD EPYC 9005 Series Processors. You can, however, migrate your VMs running on Opteron as follows:

- 1. Migrate the VMs to an intermediate server running a prior generation of AMD EPYC processor(s) and an older compatible version of ESXi.
- 2. Upgrade ESXi on the intermediate server to a future version.
- 3. When appropriate, reboot the VMs and update the EVC mode on the VM to a version compatible with EPYC 9005 as described in this table.
- 4. Migrate the VMs from the intermediate server to the server running the AMD EPYC 9005 Series Processor(s).

5.1.2 - Software Version Compatibility

VMware strongly recommends having identical ESXi versions on the source and destination hosts to allow Powered-On VM migration. Table 5-2 shows the minimum software versions required on the source and destination hosts to allow for the Powered-On migration of VMs.

			То		
From	AMD EPYC 7001 Series	AMD EPYC 7002 Series	AMD EPYC 7003 Series	AMD EPYC 9004 Series	AMD EPYC 9005 Series
AMD Opteron Series	vSphere 6.5 U1	vSphere 6.5 EP15 or 6.7 U3	vSphere 6.5 EP15 or 6.7 U3	vSphere 7.0U3 and vSphere 8.0	Path not supported*
AMD EPYC 7001 Series	vSphere 6.5 U1	vSphere 6.5 EP15 or 6.7 U3	vSphere 6.5 EP15 or 6.7 U3	vSphere 7.0U3 and vSphere 8.0	future version of vSphere
AMD EPYC 7002 Series	vSphere 6.5 EP15 or 6.7 U3	vSphere 6.5 EP15 or 6.7 U3	vSphere 6.5 EP15 or 6.7 U3	vSphere 7.0U3 and vSphere 8.0	future version of vSphere
AMD EPYC 7003 Series	vSphere 6.7 U3 P03 and 7.0 U1	vSphere 6.7 U3 P03 and 7.0 U1	vSphere 6.7 U3 P03 and 7.0 U1	vSphere 7.0U3 and vSphere 8.0	future version of vSphere
AMD EPYC 9004 Series	vSphere 7.0U3 and vSphere 8.0	vSphere 7.0U3 and vSphere 8.0	vSphere 7.0U3 and vSphere 8.0	vSphere 7.0U3 and vSphere 8.0	future version of vSphere
AMD EPYC 9005 Series	future version of vSphere	future version of vSphere	future version of vSphere	future version of vSphere	future version of vSphere
*Coo the notes at the t	on of this nage for evela	nation and instructions			

*See the notes at the top of this page for explanation and instructions.

Table 5-2: vSphere software compatibility matrix

5.1.3 - Powered-On Migration Example

This section describes how to perform a Powered-On VM migration using the example of an AMD EPYC 7001 series source host and an AMD EPYC 9005 series destination host.

- 1. Ensure that both the source and destination hosts are powered on.
- 2. Ensure that the vSphere cluster EVC setting is EVC Mode AMD Zen Generation or prior.
- 3. Select the VM on the source host that you intend to migrate, then select Actions, and then click Migrate.
- 4. Proceed through the wizard and start the migration.
- 5. When the migration is complete, verify that the VM is running appropriately on the destination host.

Please see Migrating Virtual Machines* for detailed instructions on performing a Powered-On migration using the vSphere UI.

5.2 - Powered-Off Migration (Using VMware vCenter[™])

Powered-Off migration moves a powered-off or suspended VM to a new host. vSphere supports Powered-Off migration of VMs in most cases, including between hosts with different CPU vendors, if all of the following prerequisites are met:

- The destination host must support the guest OS in the VMs.
- All VMs must meet the guidelines specified in <u>Migration to a different processor</u>*.
- The source and destination hosts must be powered on and reachable via applicable network and storage.
- The same vCenter must manage the source and destination hosts.
- Applications that use processor-specific instructions without looking at the instructions offered at the guest OS level may fail after migration. Modify these applications to use features offered by the OS.
- If you are migrating VMs to a host with a different processor family or manufacturer, then the VM must not be installed or compiled so as to be locked to a specific processor type. See <u>"Powered-Off Migration Example" on page 30</u>.
- If you are migrating VMs between hosts with different processor vendors, then the VMs must be powered off.
- If you are migrating VMs between hosts with different processor vendors (e.g., from Intel to AMD), then the VMs must use powered-off migration.

5.2.1 - Powered-Off Migration Example

This section describes how to perform a Powered-Off VM migration using the example of migrating from Intel Xeon-based hosts to AMD EPYC 7003 processor-based hosts:

- Verify that the VM being migrated is not installed of compiled so as to be locked to an Intel processor. See <u>Migration to a different processor</u>* for more information.
- 2. Verify that the source and destination hosts are powered on and reachable via applicable network and storage.
- 3. Verify that the same vCenter is managing both the source and destination hosts.
- 4. Shutdown the migrating VM that is on the source host.
- 5. Select the VM, then select the **Migrate** action, and then proceed through the wizard.
- 6. When the migration is complete, power on the VM, and then verify that the VM is running appropriately on the destination host.

Please see Migrating Virtual Machines* for detailed instructions on migrating a VM using the vCenter UI.

5.3 - VM MIGRATION (VCENTER UI)

You can use the vCenter UI to perform either Powered-On or Powered-Off VM migrations:

1. If you are performing a Powered-On migration, then confirm that both the source host and destination host are in the same cluster and that the cluster EVC mode is compatible with both hosts. This step is optional for Powered-Off migrations.

entange Er er ne	ac point and			
O Disable EVC	C Enable I	IVC for AMD Hosts	C Enable EVC for Intel® Hosts	i
CPU Mode		AMD Zen 4 Generation	U.S.	
Graphics Mode (v\$GA) Description		AMD Opteron ¹⁹⁴ Generation 1 AMD Opteron ¹⁹⁴ Generation 2 AMD Opteron ¹⁹⁴ Gen. 3 (no 3DNowt ¹⁹⁴)		
CPU Mode Applies the baseline feat following processor type Compared to the AMD Fast Short CMPSB and S AVX512DQ, AVX512F, A AVX512VPOPCNTDQ, G 1003212.	ture set of AMD "Zer is will be permitted t Zen 3" Generation E TOSB, Automatic IBF VXS12IFMA, AVX512 FNI, IBPS, and Upper	AMD Opteron ¹⁴ Generation 3 AMD Opteron ¹⁴ Generation 4 AMD Opteron ¹⁴ "Steamoler" Generation AMD Opteron ¹⁴ "Steamoler" Generation AMD Zen Generation AMD Zen 2 Generation AMD Zen 4 Generation	e cluster, Hosts with the Future AMD processors i CPU features including W, AVXSI2CD, NNI, Knowledge Base article	
and the second sec				

Figure 5-1: Changing the EVC mode

- 2. Select the VM to migrate, and then select **Actions > Migrate** to start the migration wizard.
 - If the VM is powered on, then a Powered-On migration will be performed.
 - If the VM is powered off or suspended, then a Powered-Off migration will be performed.



Figure 5-2: Starting the migration

3. Select the migration type, which will be either **Change compute resource only** or **Change both compute resource and storage** based on your migration requirements.



Figure 5-3: Selecting the migration type

4. Select the destination host for your VM.

If you are performing a Powered-On migration, then vSphere will perform a compatibility check.

- 10 904-Cluster	1 Select a regration type	Select a com Select a cluster, hos	Resource Pools	oi to run the virtue vilaps	al machines.	VM	origin C 15	
The second second	2 Select a compute resource 3 Select networks	New		State	Status	Fitser Overbar	Cornu	168
	4. Select vMotion promy 5. Ready to complete	Image: 192.168.1 Image: 192.168.1 Image: 192.168.1 Image: 192.168.1 Image: 192.168.1 Image: 192.168.1	0.102 0.103 0.104	Connected Connected Connected	V Normal V Normal	9xx4-Ouster 9xx4-Ouster 9xx4-Ouster 9xx4-Ouster		res fest
							- 1	
							. 1	

Figure 5-4: Compatibility check for a Powered-On VM migration

5. Select the appropriate options for **Network** and **vMotion Priority**, and then complete the wizard by reviewing the migration plan and clicking **Finish**.



Figure 5-5: Completing the VM migration

- 6. Monitor the progress of VM migration and confirm successful completion.
- 7. If necessary, power on the VM.
- 8. Verify that the VM is fully functional after migration.

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CHAPTER 6:

CHAPTER 6: USING THE VMWARE ARCHITECTURE MIGRATION TOOL

The VMware Architecture Migration Tool (VAMT) is a Windows PowerShell script that uses VMware PowerCLI to allow moving a VM from one hardware architecture to another, such as migrating from Intel to AMD. This chapter provides a "cheat sheet" example of using VAMT that was captured during initial testing. Please see the complete <u>Getting Started Guide</u>* for detailed coverage about the functional details of using this script at runtime, along with important constraints and other guidelines for moving VMs using VAMT.

6.1 - STEP 1: PREREQUISITES

There are several prerequisites that need to be completed before the VAMT script can executed. Some of these prerequisites are in the vCenter settings while others are environmental ecosystem items. The basic prerequisites are:

- The host system must have all of the following:
 - Ability to execute Windows PowerShell scripts as an administrator.
 - VMware PowerCLI installed in PowerShell, as described in either Installing VMware PowerCLI* or PowerCLI Installation Guide*.
 - Access to the source vCenter instance that contains the migrating VMs.
 - Administrator credentials on the destination vCenter instance that will contain the clusters with the migrated VMs.
- Access to the <u>VAMT source repo</u>*.
- If Distributed Resource Scheduler (DRS) is part of your vCenter, then it must be enabled on the source and destination clusters, as described in <u>Enable vSphere HA and vSphere DRS in a Cluster (MSCS)</u>*.

6.2 - STEP 2: BEFORE MIGRATING THE VMs

Users familiar with environment can automate much of this setup. The <u>vamt_dir</u>* repo contains sample PowerShell/PowerCLI scripts that you can use to set up automation. You may see PowerShell warnings the first you run this script. These warnings come from PowerCLI and can be safely ignored. For example:

WARNING: The 'Version' property of VirtualMachine type is deprecated. Use the 'HardwareVersion' property instead.

WARNING: The 'DrsMode' property of Cluster type is deprecated. Use the 'DrsAutomationLevel' property instead. WARNING: The 'Accessible' property of Datastore type is deprecated. Use the 'State' property instead. WARNING: The 'State' property of VMHost type is deprecated. Use the 'ConnectionState' property instead. WARNING: PowerCLI scripts should not use the 'DatastoreIdList' property of VMHost type. The property will be removed in a future release. WARNING: The 'IsChildTypeVm' property of the Folder type is deprecated. Use the Type property instead. WARNING: The 'IsChildTypeComputeResource' property of the Folder type is deprecated. Use the Type property instead. WARNING: The 'IsChildTypeDatacenter' property of the Folder type is deprecated. Use the Type property instead. WARNING: The 'IsChildTypeDatastore' property of the Folder type is deprecated. Use the Type property instead. WARNING: The 'IsChildTypeDatastore' property of the Folder type is deprecated. Use the Type property instead. WARNING: The 'IsChildTypeDatastore' property of the Folder type is deprecated. Use the Type property instead. WARNING: The 'IsChildTypeDatastore' property of the Folder type is deprecated. Use the Type property instead. WARNING: The 'Quiesced' property of Snapshot type is deprecated and will be removed in a future release. WARNING: The 'Parent' property of Snapshot type is deprecated. Use the 'ParentSnapshot' property instead.

6.3 - STEP 3: CONFIGURE THE MIGRATION

To migrate VMs using VAMT:

1. Pull the <u>vamt_dir</u>* git repository down to the execution host. For example:

user@MYSYSTEM:/vmtest\$ git clone git@github.com:vmware-samples/vmware-architecture-migration-tool.git Cloning into 'vmware-architecture-migration-tool'... remote: Enumerating objects: 260, done. remote: Counting objects: 100% (89/89), done. remote: Compressing objects: 100% (68/68), done. remote: Total 260 (delta 45), reused 50 (delta 21), pack-reused 171 Receiving objects: 100% (260/260), 2.74 MiB | 8.14 MiB/s, done. Resolving deltas: 100% (128/128), done.

2. Use PowerCLI to set up your desired one-time session settings for migration and interaction.

```
Set-PowerCLIConfiguration -Scope User -ParticipateInCeip $true -InvalidCertificateAction Ignore Set-PowerCLIConfiguration -DisplayDeprecationWarnings:$false -Scope User
```

Add the required single cardinality VM tags in the VAMT vSphere category. These tags drive the migration and/or rollback process.

Note: NOTE: You can also use PowerCLI to programmatically set up the VAMT category and required tags.

 Get the most recent list of the required tags for the migration process from the script source. Please see the <u>list of available migration</u> tags*.

```
tagCatName = "VAMT"
readyTagName = "readyToMigrate"
inProgressTagName = "inProgress"
completeTagName = "complete"
completeWithErrorsTagName = "completeWithErrors"
failedTagName = "failed"
readyToRollbackTagName = "readyToRollback"
rollbackTagName = "rolledBack"
```

b. Select Menu>Tags & Custom Attributes.

The Tags & Custom Attributes window appears.

c. Select the Tags tab, then select Categories, and then select VAMT.

The Edit Category window appears.

- d. Check the **One tag** radio button, which applies only one tag of that category to any given VM. All of the **Associate Object** checkboxes are checked by default; however, you can probably select either **All Objects** or just **Virtual Machine**.
- e. Click Save to save your changes and close the Edit Category window.
- f. Create the tags shown in Step 3a, above, in the VAMT tag category VAMT tag category Create Tag.
- 4. Create a comma delimited (.csv) list of VMs to migrate. Click <u>here</u>* for an example.

The example described in this chapter used the following values in a file called toMigrate.csv:

```
vmname,target_hostpoolcluster,target_portgroup,target_datastore
Win2012r2-1,green,VLAN819-Green,Green
Win2012r2-2,green,VLAN819-Green,Green
Win2012r2-3,green,VLAN819-Green,Green
Win2012r2-4,green,VLAN819-Green,Green
Win2012r2-5,green,VLAN819-Green,Green
```

5. Set up the helper for script execution.

The following TestMigrate.ps1 PowerShell script example shows one way to customize and use the options hash table to invoke the migration script. You can also embed the hash table setup inside other scripts or calls from your own tooling, set these variables up as part of a separate script, or pass the various options in as list of command line arguments to the migration script itself.

```
[string]$userName = 'username@email.domain'
[string]$userPassword = 'password'
[securestring]$secStringPassword = ConvertTo-SecureString $userPassword -AsPlainText -Force
[pscredential]$credObject = New-Object System.Management.Automation.PSCredential($userName,
$secStringPassword)
options = 0
     action = "migrate"
     vcenters = "a.b.c.d"
     inputFilePath = ".\example\toMigrate.csv"
changeWindowStart = "7/11/2022 13:16:58"
     changeWindowDuration = 0
     parallelTaskCount = 5
     syslogHost = "a.b.c.d:port"
toEmail = "tousername@email.domain"
     fromEmail = "fromusername@email.domain"
     smtpServer = "a.b.c.d:port"
     secureMailCred = $credObject
     smtpUseSs1 = $true
     Debug = $false
     debugLogging = $true
.\VMwareArchitectureMigrationTool.ps1 @options
```

You can run this helper script from any location where <u>VMwareArchitectureMigrationTool.ps1</u>*, <u>VAMT.psm1</u>*, and the migration targets .csv file described in Step 4, above (see the <u>Example CSV file</u>*) exist. You may find it convenient to execute the script from the repo root after cloning it down from git. For example:

```
PS C:\Users\admin\Test\vamt dir> dir
 Directory: C:\Users\admin\Test\vamt dir
LastWriteTime
                 Length Name
7/14/2022 11:03 AM .
                        example
7/17/2022
          6:22 PM
                        vamt_runlogs
                   •
7/14/2022 2:53 PM
                        wiki
7/6/2022 4:10 PM 15
                        .gitignore
7/11/2022 12:41 PM 528
                         README.md
7/17/2022 7:03 PM 260
                        VAMT.psml
7/15/2022 3:23 PM 103801 VMwareArchitectureMigrationTool.ps1
```

- 6. Clean up any existing VAMT tags and add the readyToMigrate VAMT tag to all VMs to be migrated. This sets the tags up to be ready for migration in vCenter. You can also automate this step using the approach outlined in the previous sample script, but this example shows you how to do this using the vSphere UI.
 - a. Navigate to the list of VMs you want to migrate. You may want to group these VMs into folders for easy selection.

vm vSphere Client Menu ∨ Q			0) - Administrator@	VSPHERE.LOCAL	~ ©
(.) þ 🖹 👰	🗈 KevinsTest 🛛 астіоня 🗸					
✓	Summary Monitor Configure Permissions VMs U	pdates				
✓						
> 🗅 chuck_maas	Virtual Machines VM Templates vApps VM Folders					
> 🗋 Discovered virtual machine					Filter	
✓ ☐ KevinsTest	Num t	0	04-04-0	Devisioned Courses	Hand Course and	
🔂 Win2012r2-1	Name T	state	Status	Provisioned Space ~	Used Space ~	HOST GPU
🔂 Win2012r2-2	🔂 Win2012r2-1	Powered On	Vormal	49.38 GB	9.56 GB	0 Hz
🔂 Win2012r2-3	🔂 Win2012r2-2	Powered On	Vormal	49.38 GB	9.56 GB	0 Hz
🔂 Win2012r2-4	🔂 Win2012r2-3	Powered On	🗸 Normal	49.43 GB	9.62 GB	0 Hz
🔂 Win2012r2-5	🔂 Win2012r2-4	Powered On	🗸 Normal	49.41 GB	9.59 GB	0 Hz
✓ ➡ Templates	🔂 Win2012r2-5	Powered On	V Normal	49.38 GB	9.56 GB	0 Hz
win2012r2_template_vmtools						
B windows2019_template_no_vmtools						
By windows2019_template_vmtools					🕒 Expor	t 5 items
> 🗅 ubuntutest						

- Remove any existing VAMT tags from the VMs you are migrating. This is important because the VAMT tag category was set up with single cardinality, meaning that only one tag can exist per VM. To this, select the VMs, right click to open the context menu, and then select Tags **6 Custom Attributes>Remove Tag**.
- c. Select the VMs, right click to open the context menu, and then select Tags & Custom Attributes>Assign Tag.

The Objects - Assign Tag window appears.

- d. Check the readyToMigrate checkbox, and then click Assign.
- e. Verify that the tag is properly assigned by looking at the **Tags** section of the VM summaries for the VMs you are migrating.

6.4 - Step 4: Migrate the VMs

This example migrates the five VMs shown above from the blue cluster to the green cluster. In this example, the blue cluster uses Intel hosts and the green cluster uses AMD hosts.

vm vSphere Client Menu ∨ C	Search in all environments		0	✓ Administrator@\	
() B = Q	[]] blue Actions ∨				
✓ 🕝 vsphere.maas	Summary Monitor Configure Permissions Hosts V	Ms	Datastores Network	s Updates	
In archstratwwt In blue	Total Processors: 108			CPU	Free: 280.18 GHz
of tresh-lbex.maas				Used: 616 M	Hz Capacity: 280.8 GHz
👺 game-troll.maas				Memory	Free: 1.1 TB
proper-ocelot.maas				Used: 25.73	GB Capacity: 1.12 TB
> 🕢 blue-pool				Storage	Free: 5.64 TB
🔂 Win2012r2-1				Used: 2.09 T	B Capacity: 7.73 TB
🔂 Win2012r2-2					
🔂 Win2012r2-3	Related Objects	~	vSphere DRS		\checkmark
🔂 Win2012r2-4					
🔂 Win2012r2-5	Datacenter 🗄 archstratwwt		Churter Comment		
Win2012r2_kevins_migration_test			Cluster Consumers		~
🔂 windows_test_blue					
S windows_test_shared	vSphere HA	\sim	Tags		^
 ([]) green 			Assigned Ten	Catagony	Description
🚰 bright-cattle.maas			Assigned lag	Category	Description

To migrate the VMs:

- 1. Verify that all prerequisites have been met, as described in "Step 1: Prerequisites" on page 35.
- 2. Open a PowerShell window on the execution host.
- 3. Execute the migration using the helper script. If all is properly set up, then the script will shut down the VMs and begin migrating them to the other cluster architecture.



4. Use the vCenter **Task Console** window to verify that the migration is in progress.

vm vSphere Client Menu ∽ C	${f \lambda}$ Search in all environments				? ∽ Administrator@VSPH	ERE.LOCAL V
⊖ Home ♦ Shortcuts	Task Console					
[]] Hosts and Clusters	PREVIOUS NEXT					
By VMs and Templates	Task Name 🛛 🝸	Target	▼ Status ▼	Details T	Initiator T	Queued For
Storage	> Relocate virtual mac	🔂 Win2012r2-1	39 % 🛞	Copying V	VSPHERE.LOCAL\Administ	2 ms
	> Create virtual machi	🔂 Win2012r2-1	Completed		administrator@vsphere.local	2 ms
Workload Management	> Relocate virtual mac	🔂 Win2012r2-2	41 % 🛞	Copying V	VSPHERE.LOCAL\Administ	2 ms
Global Inventory Lists	> Create virtual machi	🔂 Win2012r2-2	Ocompleted		administrator@vsphere.local	4 ms
	> Relocate virtual mac	🔂 Win2012r2-3	40 % 🛞	Copying V	VSPHERE.LOCAL\Administ	2 ms
Policies and Profiles	> Create virtual machi	🔂 Win2012r2-3	⊘ Completed		administrator@vsphere.local	3 ms
지 Auto Deploy	> Initiate guest OS sh	🔂 Win2012r2-1	Ocompleted		administrator@vsphere.local	2 ms
log Hybrid Cloud Services	> Initiate guest OS sh	🔂 Win2012r2-2	O Completed		administrator@vsphere.local	3 ms
V Developer Center	> Relocate virtual mac	🔂 Win2012r2-5	40 % 🛞	Copying V	VSPHERE.LOCAL\Administ	4 ms
Administration	> Relocate virtual mac	🔂 Win2012r2-4	46 % 🛞	Copying V	VSPHERE.LOCAL\Administ	3 ms
(■) Tasks	Create virtual machi	🔂 Win2012r2-4	O Completed		administrator@vsphere.local	1 ms
deth Events	> Initiate guest OS sh	Win2012r2-3	O Completed		administrator@vsphere.local	6 ms
					testor@venhere logel	

5. Verify that the migration completed successfully by reviewing the status summary that appears. The system will also log any errors encountered during migration.

<pre>[Info] 07/18/2022 10:51:45 - There are currently 5 moves in progress and 0 moves waiting to start. [Info] 07/18/2022 10:52:00 - VM move job for 'Win2012r2-4' is complete. [Info] 07/18/2022 10:52:00 - There are currently 4 moves in progress and 0 moves waiting to start. [Info] 07/18/2022 10:52:15 - There are currently 4 moves in progress and 0 moves waiting to start. [Info] 07/18/2022 10:52:30 - VM move job for 'Win2012r2-2' is complete. [Info] 07/18/2022 10:52:30 - VM move job for 'Win2012r2-5' is complete. [Info] 07/18/2022 10:52:30 - There are currently 2 moves in progress and 0 moves waiting to start. [Info] 07/18/2022 10:52:30 - There are currently 2 moves in progress and 0 moves waiting to start. [Info] 07/18/2022 10:52:45 - VM move job for 'Win2012r2-1' is complete. [Info] 07/18/2022 10:52:45 - VM move job for 'Win2012r2-3' is complete. [Info] 07/18/2022 10:52:45 - VM move job for 'Win2012r2-3' is complete.</pre>
tgt_vm tgt_compute tgt_network tgt_storage tag_state job_state job attempts
Win2012r2-1 green VLAN819-Green Green complete Completed System.Management.Automation.PSRemotingJob
Win2012r2-2 green VLAN819-Green Green complete Completed System.Management.Automation.PSRemotingJob
Win2012r2-3 green VLAN819-Green Green complete Completed System.Management.Automation.PSRemotingJob
Win2012r2-4 green VLAN819-Green Green complete Completed System.Management.Automation.PSRemotingJob
Win2012r2-5 green VLAN819-Green Green complete Completed System.Management.Automation.PSRemotingJob
<pre>[Info] 07/18/2022 10:52:46 - Script run summary: Script start: '07/18/2022 10:44:22' Script runtime: 8 minutes Script completion: '07/18/2022 10:52:46' [Info] 07/18/2022 10:52:46 - Final report:</pre>
tgt_compute tgt_network job_result tgt_storage tag_state job_state attempts tgt_vm
green VLAN819-Green Successfully moved VM 'Win2012r2-1'. Green complete Completed 1 Win2012r2-2' green VLAN819-Green Successfully moved VM 'Win2012r2-2'. Green complete Completed 1 Win2012r2-2' green VLAN819-Green Successfully moved VM 'Win2012r2-3'. Green complete Completed 1 Win2012r2-2' green VLAN819-Green Successfully moved VM 'Win2012r2-4'. Green complete Completed 1 Win2012r2-4' green VLAN819-Green Successfully moved VM 'Win2012r2-5'. Green complete Completed 1 Win2012r2-4' [Info] 07/18/2022 10:52:46 - Preparing to send final status email.

Transcript stopped, output file is C:\Users\admin\Test\vamt_dir\vamt_runlogs\20220718-104422\transcript-20220718T1044221610.log PS C:\Users\admin\Test\vamt_dir>

- 6. You can use vCenter to double-check that the VMs migrated from and to the correct clusters.
- 7. You can further validate the migration by examining the final state of each VM to verify that:
 - The VAMT tag is showing complete.
 - The VM now resides in the correct cluster.
 - The VM is powered back up on the correct network with the correct datastore.

6.5 - ROLLBACK

You can roll VMs back to the original cluster at any point after completing a migration operation. This is essentially a reverse migration from the destination cluster back to the source cluster. vSphere stores migration information as custom attributes for each VM along with a rollback snapshot. These attributes drive the rollback.



To rollback one or more VM(s):

1. Change operation action in options from migrate to rollback:

\$options = @{
 action = "rollback"
.
.

2. Verify the VMs you want to rollback in the input .csv file. This .csv file contains the list of VMs to roll back in the same way as with migration, but the script only uses the VM name itself from the migration .csv file during the rollback. All of the other information needed for the rollback comes from the custom attributes and snapshot data shown above. You can leave the other fields as is because they will not be used during the rollback. This information was stored as custom attributes during the migration, and the rollback will use those custom attributes.

```
vmname,target_hostpoolcluster,target_portgroup,target_datastore
Win2012r2-1,blue,VLAN819-Blue,Blue
Win2012r2-2,blue,VLAN819-Blue,Blue
Win2012r2-3,blue,VLAN819-Blue,Blue
Win2012r2-4,blue,VLAN819-Blue,Blue
Win2012r2-5,blue,VLAN819-Blue,Blue
```

3. Configure the VAMT tags for rollback. Any former VAMT tags (e.g., complete, completeWithErrors, etc.) must be removed and replaced by the VAMT tag set indicating that the VMs are ready to rollback:

හි පෙය () මූ පෙය (ව මූ පෙය (ව) මූ පෙය (4) මූ පෙය (ව)	5 Objects - Assign Tag Some of the displayed tags might be alre have these tags already assigned to them.	eady assigned to some of the target obj	ects. If selected, the tags are assigned only to the target	\times objects that do not
값 vCLS (6) () collier_test01	ADD TAG			
合 testblue 合 testareen	Tag Name	T Category	T Description	
🔠 win2012r2_green	🗌 readyToMigrate	VAMT		
# win2012r2_kevins_migration_test	rolled Back	VAMT		
🖨 windows_test_blue	C complete	VAMT		
A windows_test_shared	🗋 failed	VA.MT		
	inProgress	VAMT		
	CompleteWithErrors	VAMT		
	<table-cell> readyToRollback</table-cell>	VAMT		
	1			1-7017
				CANCEL ASSIGN

4. Execute the rollback. This example shows the target (blue) cluster, network, and datastore but the stored custom attributes will migrate these VMs back to the green network.

```
PS C:\Users\admin\Test\vamt_dir> .\TestMigrate.ps1
Transcript started, output file is C:\Users\admin\Test\vamt dir\vamt runlogs\20220719-103518/transcript-
20220719T1035181154.log
[Info] 07/19/2022 10:35:18 - Beginning inputs file validation.
[Info] 07/19/2022 10:35:18 - Inputs CSV file successfully validated for completeness.
[Info] 07/19/2022 10:35:18 - Change window start time: 07/11/2022 13:16:58
[Info] 07/19/2022 10:35:18 - Change window does not have an end time.
[Info] 07/19/2022 10:35:18 -
                               Current time (07/19/2022 10:35:18) is within the specified change window.
Proceeding with script now.
[Debug] 07/19/2022 10:35:18 - No credential for vCenter 10.254.251.40 was passed in via input parameter.
Starting stored credential retrieval.
[Debug] 07/19/2022 10:35:18 - Found credential for vCenter 10.254.251.40. User:
administrator@vsphere.local
[Info] 07/19/2022 10:35:18 - Logging in to vCenter 10.254.251.40 with User: administrator@vsphere.local
[Info] 07/19/2022 10:35:20 - All tags and categories have been validated.
[Info] 07/19/2022 10:35:20 - Found vm attribute 'vamtSourcevCenterName' in vCenter '10.254.251.40'. No
action required.
[Info] 07/19/2022 10:35:20 - Found vm attribute 'vamtSourceESXiHostId' in vCenter '10.254.251.40'. No
action required.
```

[Info] 07/19/2022 10:35:20 - Found vm attribute 'vamtSourceResourcePoolId' in vCenter '10.254.251.40'. No action required. [Info] 07/19/2022 10:35:20 - Found vm attribute 'vamtSourceFolderId' in vCenter '10.254.251.40'. No action required. [Info] 07/19/2022 10:35:20 - Found vm attribute 'vamtSourceDatastoreId' in vCenter '10.254.251.40'. No action required. [Info] 07/19/2022 10:35:20 - Found vm attribute 'vamtSourcePortgroupId' in vCenter '10.254.251.40'. No action required. [Info] 07/19/2022 10:35:20 - Found vm attribute 'vamtLastMigrationTime' in vCenter '10.254.251.40'. No action required. [Info] 07/19/2022 10:35:20 - Found vm attribute 'vamtSnapshotName' in vCenter '10.254.251.40'. No action required. [Info] 07/19/2022 10:35:22 - Pre-rollback target states: tgt respool tgt_folder tgt_network tgt_datastore tgt_snapshot tgt host tat vm tgt_vc tag state job state _____ ____ Win2012r2-1 10.254.251.40 exotic-dory.maas Resources test net 1 VLAN819-Green Green VAMT Migration 7 18 2022 1:34:26 PM readyToRollback readyToRollback Win2012r2-2 10.254.251.40 exotic-dory.maas Resources test_net_1 VLAN819-Green Green VAMT Migration 7 18 2022 1:34:26 PM readyToRollback readyToRollback Win2012r2-3 10.254.251.40 fleet-Ilama.maas Resources test net 1 VLAN819-Green Green VAMT Migration 7 18 2022 1:34:26 PM readyToRollback readyToRollback Win2012r2-4 10.254.251.40 fleet-Ilama.maas Resources test_net_1 VLAN819-Green Green VAMT Migration 7 18 2022 1:34:26 PM readyToRollback readyToRollback Win2012r2-5 10.254.251.40 bright-cattle.maas Resources test net 1 VLAN819-Green Green VAMT Migration 7 18 2022 1:34:26 PM readyToRollback readyToRollback [Info] 07/19/2022 10:35:22 - There are currently 0 moves in progress and 5 moves waiting to start. [Info] 07/19/2022 10:35:22 - New batch of moves: Win2012r2-4, Win2012r2-5, Win2012r2-3, Win2012r2-1, Win2012r2-2 [Info] 07/19/2022 10:35:58 - There are currently 5 moves in progress and 0 moves waiting to start.

At this point, vCenter should show the rollback in progress in a manner similar to that shown during the migration.

5. Verify the rollback once completed. You should receive the same type of operation status summary as received during the migration:

[Info] 07/19/2022 10:43:00 - Preparing to set 'complete' tag on 'Win2012r2-1'						
[Info] 07/19/2022 10:43:00 - Successfully to set 'complete' tag on 'Win2012r2-1'						
[Info] 07/19/2022 10:43:00 - Preparing to set 'complete' tag on 'Win2012r2-2'						
[Info] 07/19/2022 10:43:00 - Successfully to set 'complete' tag on 'Win2012r2-2'						
[Info] 07/19/2022 10:43:00 - Preparing to set 'complete' tag on 'Win2012r2-3'						
[Info] 07/19/2022 10:43:00 - Successfully to set 'failed' tag on 'Win2012r2-3'						
[Info] 07/19/2022 10:43:00 - Preparing to set 'complete' tag on 'Win2012r2-4'						
[Info] 07/19/2022 10:43:00 - Successfully to set 'complete' tag on 'Win2012r2-4'						
[Info] 07/19/2022 10:43:00 - Preparing to set 'complete' tag on 'Win2012r2-5'						
[Info] 07/19/2022 10:43:00 - Successfully to set 'complete' tag on 'Win2012r2-5'						
[Info] 07/19/2022 10:43:00 - There are currently 1 moves in progress and 0 moves waiting to start.						
[Info] 07/19/2022 10:43:15 - There are currently 1 moves in progress and 0 moves waiting to start.						
[Info] 07/19/2022 10:43:30 - VM move job for 'Win2012r2-1' is complete.						
[Info] 07/19/2022 10:43:30 - rollback target states:						
tgt_vm tgt_vc tgt_host tgt_respool tgt_folder tgt_network tgt_datastore tgt_snapshot tag_state job_state						
VIANT Migration 7, 18, 2022, 1:34:26 PM rolledBack Completed						
Win2012r2-2 10 254 251 40 exotic=dory maas Resources test net 1 VLAN819-Green Green						
VAMT Migration 7 18 2022 1:34:26 PM rolledBack Completed						
Min2012r2-3 10 254 251 40 fleet-llama maas Resources test net 1 VLAN819-Green Green						
VAMT Migration 7 18 2022 1:34:26 PM rolledBack Completed						
Win2012r2-4 10.254.251.40 fleet-llama.maas Resources test net 1 VLAN819-Green Green						
VAMT Migration 7 18 2022 1:34:26 PM rolledBack Completed						
Win2012r2-5 10.254.251.40 bright-cattle.maas Resources test net 1 VLAN819-Green Green						
VAMT Migration 7 18 2022 1:34:26 PM rolledBack Completed						

```
[Info] 07/19/2022 10:43:30 - Script run summary:
    Script start: '07/19/2022 10:35:18'
    Script runtime: 8 minutes
    Script completion: '07/19/2022 10:43:30'
[Info] 07/19/2022 10:43:30 - Final report:
    test_net_1 VLAN819-Green Successfully rolled back VM 'Win2012r2-1'.
    test_net_1 VLAN819-Green Successfully rolled back VM 'Win2012r2-2'.
    test_net_1 VLAN819-Green Successfully rolled back VM 'Win2012r2-2'.
    test_net_1 VLAN819-Green Successfully rolled back VM 'Win2012r2-3'.
    test_net_1 VLAN819-Green Successfully rolled back VM 'Win2012r2-3'.
    test_net_1 VLAN819-Green Successfully rolled back VM 'Win2012r2-3'.
    test_net_1 VLAN819-Green Successfully rolled back VM 'Win2012r2-5'.
    [Info] 07/19/2022 10:43:30 - Preparing to send final status email.
```

As with the migration example, you can also validate the rollback via vcenter or via PowerCLI script calls to read the VM state.

6.6 - CLEANUP

Once migration and/or rollback operations are completed,

You can perform a cleanup operation to remove the snapshots and custom attributes that were stored during migration and/or rollback. This can be helpful because snapshots can accrue over time and represent wasted space on large deployments. Rollback and cleanup are virtually identical to migration. The simplest cleanup approach is to replace the operation action in the input <code>@options</code> with the <code>cleanup</code> action and use the same input.csv file.

```
$options = @{
    action = "cleanup"
.
}
```

Here again, the cleanup operation only uses the VM names in the input.csv file; the cluster/host, network, and datastore are ignored, and the required cleanup information comes from the snapshot and custom attributes.



CHAPTER 7: GLOSSARY

- DDR4: Double Data Rate 4 Synchronous Dynamic Random-Access Memory
- DDR5: Double Data Rate 5 Synchronous Dynamic Random-Access Memory
- EVC: VMware's Enhanced vMotion Compatibility mode
- FCoE: Fiber Channel over Ethernet
- I/O: Input/Output
- ISA: Instruction Set Architecture
- **iSCSI:** Internet Small Computer Systems Interface
- KVM: Kernel Virtual Machine
- MHz: Megahertz
- NFS: Network File System
- **OS:** Operating System
- PCle Gen 4: Peripheral Component Interconnect Express Generation 4
- PCIe Gen 5: Peripheral Component Interconnect Express Generation 5
- PS: PowerShell
- **QEMU:** Quick Emulator, a hosted virtual machine monitor.
- **RDMA:** Remote Direct Memory Access
- SCSI: Small Computer Systems Interface
- SEV: Secure Encrypted Virtualization
- SME: Secure Memory Encryption
- SoC: System on a Chip
- SRIOV: Single Root Input/Output Virtualization
- **TB:** Terabyte
- TCO: Total Cost of Ownership

Virtual Machine (VM) Migration Guide for AMD EPYC[™] 9000, 8000, & 7000 Series Processors

PID: 58206

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