

VMware to KVM Migration Tooling in CloudStack

Nicolas Vazquez

nvazquez@apache.org / nicolas.vazquez@shapeblue.com

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Agenda

- Introduction
- VMware to KVM Migration process recap
- Improvements and use cases
- Latest improvements on 4.22
- Demo
- Future ideas
- Conclusions

About me

Nicolas Vazquez

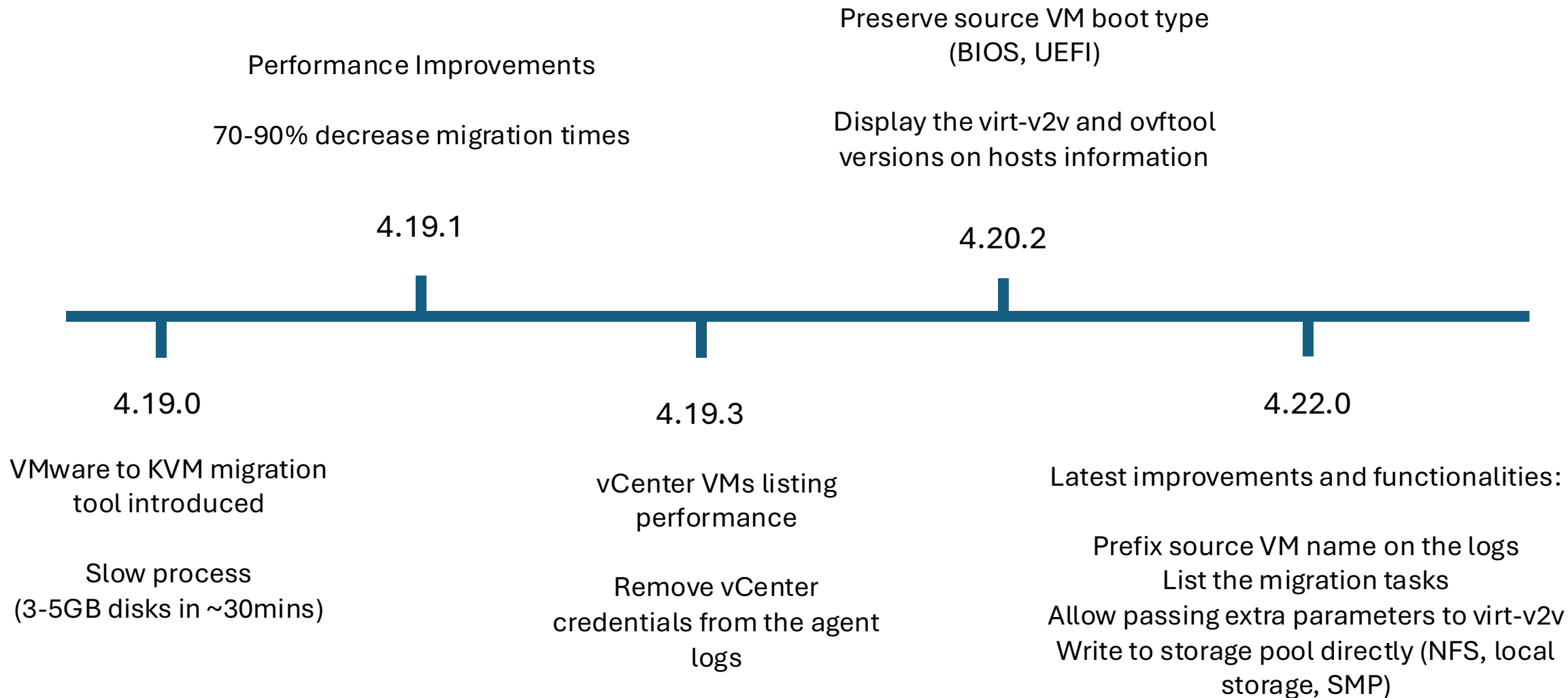
- Lead Software Engineer at Shapeblue
- Current VP Apache CloudStack (since 03/2025)
- Committer (2016) and PMC Member (2021)
- +10 years contributing to the CloudStack project
- 1x father
- Hobbies: tennis, football



Introduction

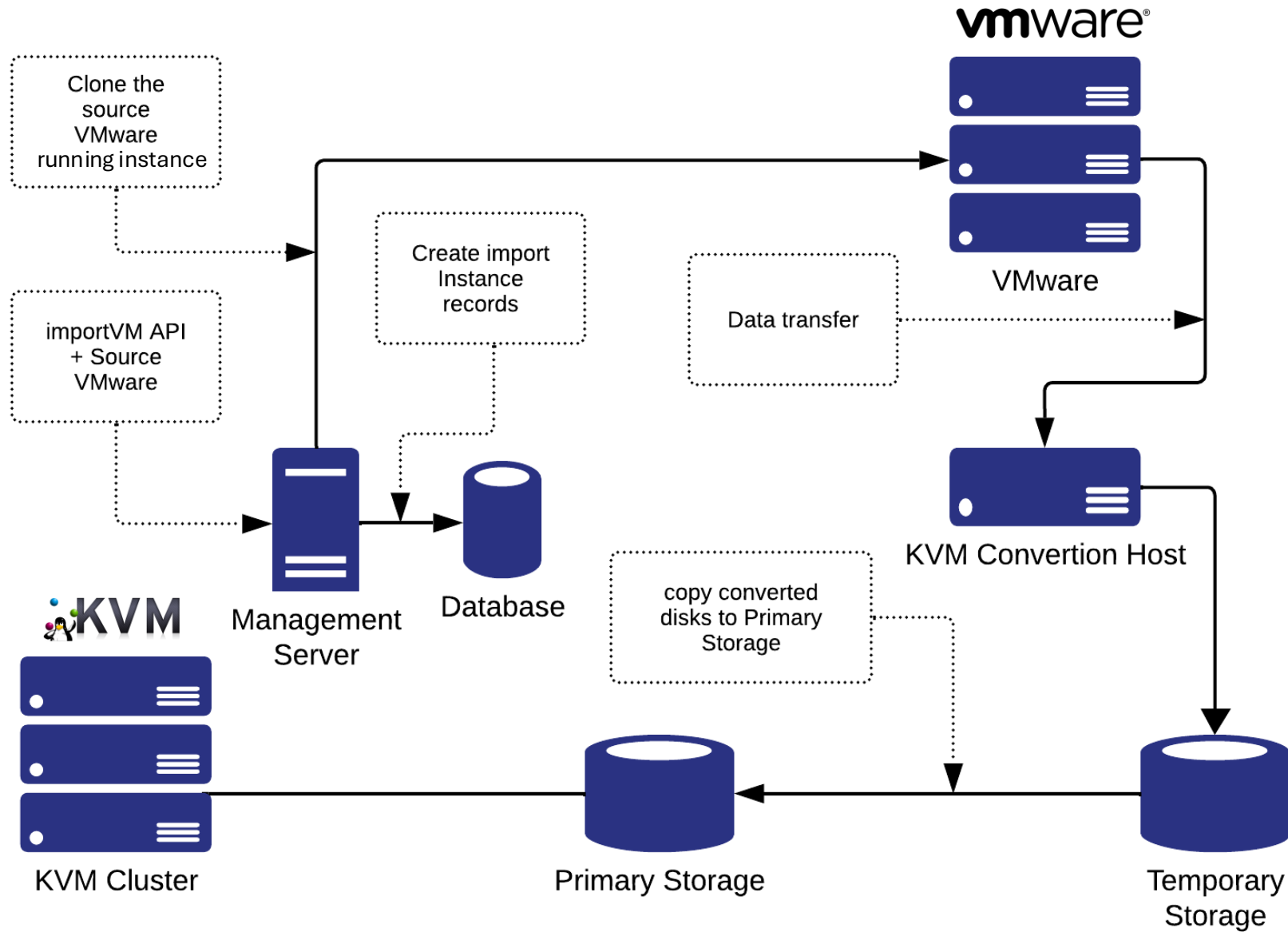
- VMware to KVM migration tool
 - Convert Vmware instance to KVM using virt-v2v
 - Import converted instance into CloudStack
 - First introduced on 4.19.0:
<https://github.com/apache/cloudstack/pull/7881>
- Initial stage:
 - Migrations taking long time
 - Restrictions on storage type to NFS
 - Restrictions on using temporary/staging storage
 - Limited feedback on the on-going migrations

Timeline



Recap

- KVM conversion host:
 - Must be installed: virt-v2v
 - Recommended: ovftool (download from Broadcom website and install)
 - Tasks:
 - Invoke ovftool (if installed) to export the VM files to temporary storage (or destination if writing directly to the pool)
 - Invoke virt-v2v to convert the OVF exported VM into the temporary storage (or destination if writing directly to the pool)
- KVM importing host:
 - Must have access to the temporary storage (or destination if writing directly to the pool)
 - Moves the converted disks to destination storage (if not writing directly)
 - Imports the VM into the host



Import Instance

Unmanaged Instance



i-2-3-VM

Status

● PowerOff

CPU

1 CPU x 0.00 GHz

Memory

512 MB memory

Network

1 NIC(s)

eth0

Boot type

BIOS

Boot mode

LEGACY

* Display name ⓘ

the display name of the instance

Host name ⓘ

the host name of the instance

Domain ⓘ

Project ⓘ

import instance for the project

Force converting to storage pool directly (not using temporary storage for conversion) ⓘ



☐ (Optional) Select a KVM host in the Zone to perform the instance conversion through virt-v2v

☐ (Optional) Select a KVM host in the Cluster to perform the importing of the converted instance

☐ (Optional) Select a staging storage for the converted disks

Enable to force OVF Download via Management Server. Disable to use KVM Host ovftool (if installed) ⓘ



Compute Offering ⓘ

Default: Use
temporary storage

KVM host
ovftool by
default

Search



Improvements in 4.19.3

- Gathered from migration experiences
- Observed errors / improvements:
 - Timeout on UI listing vCenter VMs for migration when +1000s VMs:
 - The vCenter VMs listing was slow, causing timeout on the UI
 - Introduced thin listing for the vCenter VMs, full details on single VM listing
 - Agent logs sanitization for ovftool and virt-v2v operations
 - Hide vCenter credentials, improve logs

Improvements in 4.20.2

- Conversion process does not preserve the boot type setting (BIOS, UEFI)
 - CloudStack was setting the migrated VM to BIOS by default
- Improve usability – display virt-v2v and ovftool versions on host details
 - KVM Host reports ‘Instance conversion supported’
 - Extended details to display the virt-v2v version and ovftool versions when present

Pod

Pod1

Zone

ref-trl-9798-k-Mr8-nicolas-vazquez

Management Servers

511d81c1-c7d3-4af9-8bb8-db9c29d7f048

Created

20 Oct 2025 15:52:16

View Instances

Hypervisor version

KVM Rocky Linux 8.4

Secured

true

Volume Encryption Supported

true

Instance Conversion Supported

true

Virt-v2v Version

1.42.0rhel=8

OVFTool Version

5.0.0

Force converting to storage pool directly (not using temporary storage for conversion)

(Optional) Select a KVM host in the Zone to perform the instance conversion through virt-v2v

ref-trl-9798-k-Mr8-nicolas-vazquez-kvm1 [Pod=Pod1] [Cluster=p1-c1] (Supported) (virt-v2v=1.42.0rhel=8) (ovftool=5.0.0)

ref-trl-9798-k-Mr8-nicolas-vazquez-kvm1 [Pod=Pod1] [Cluster=p1-c1] (Supported) (virt-v2v=1.42.0rhel=8) (ovftool=5.0.0)

ref-trl-9798-k-Mr8-nicolas-vazquez-kvm2 [Pod=Pod1] [Cluster=p1-c1] (Not supported)

Improvements in 4.22

- Prefix agent logs with the source VMware VM name for better traceability

2025-09-30 01:22:13,892 INFO [resource.wrapper.LibvirtConvertInstanceCommandWrapper] (Script-5:[]) (logid:) ((i-2-6407-VM) virt-v2v ovf source: /mnt/cc4eeede-1379-307c-b7e2-c7046c72667c/cc8022e7-3769-4b9f-b0e7-4382a81503b4/i-2-6407-VM/ progress) guestfsd: <= is_file (0x25) request length 64 bytes

2025-09-30 01:22:13,893 INFO [resource.wrapper.LibvirtConvertInstanceCommandWrapper] (Script-5:[]) (logid:) ((i-2-6407-VM) virt-v2v ovf source: /mnt/cc4eeede-1379-307c-b7e2-c7046c72667c/cc8022e7-3769-4b9f-b0e7-4382a81503b4/i-2-6407-VM/ progress) chroot: /sysroot: running 'is_file: ///qxldod/w10'

2025-09-30 01:22:13,895 INFO [resource.wrapper.LibvirtConvertInstanceCommandWrapper] (Script-5:[]) (logid:) ((i-2-6407-VM) virt-v2v ovf source: /mnt/cc4eeede-1379-307c-b7e2-c7046c72667c/cc8022e7-3769-4b9f-b0e7-4382a81503b4/i-2-6407-VM/ progress) guestfsd: => is_file (0x25) took 0.00 secs

Improvements in 4.22

- Optimize the process bypassing temporary/staging location and write directly to storage pool when possible
- Support SharedMountPoint and Local Storage
 - Solution: Introduce option to Force writing directly to storage pool
 - Conversion process on virt-v2v writes directly to the selected storage pool
 - For Local Storage:
 - Select Force conversion to pool = true
 - Select importing and converting host as the same host for the local storage pool
 - For Shared Mountpoint and NFS:
 - Select Force conversion to pool = true
 - Select import and converting hosts to hosts that have access the shared mount point pool / NFS pool

Import Instance

Unmanaged Instance



i-2-3-VM

Status

● PowerOff

CPU

1 CPU x 0.00 GHz

Memory

512 MB memory

Network

1 NIC(s)

eth0

Boot type

BIOS

Boot mode

LEGACY

* Display name ⓘ

the display name of the instance

Host name ⓘ

the host name of the instance

Domain ⓘ

Project ⓘ

import instance for the project

Force converting to storage pool directly (not using temporary storage for conversion) ⓘ



☐ (Optional) Select a KVM host in the Zone to perform the instance conversion through virt-v2v

☐ (Optional) Select a KVM host in the Cluster to perform the importing of the converted instance

☒ (Optional) Select a Primary Storage destination for the converted disks

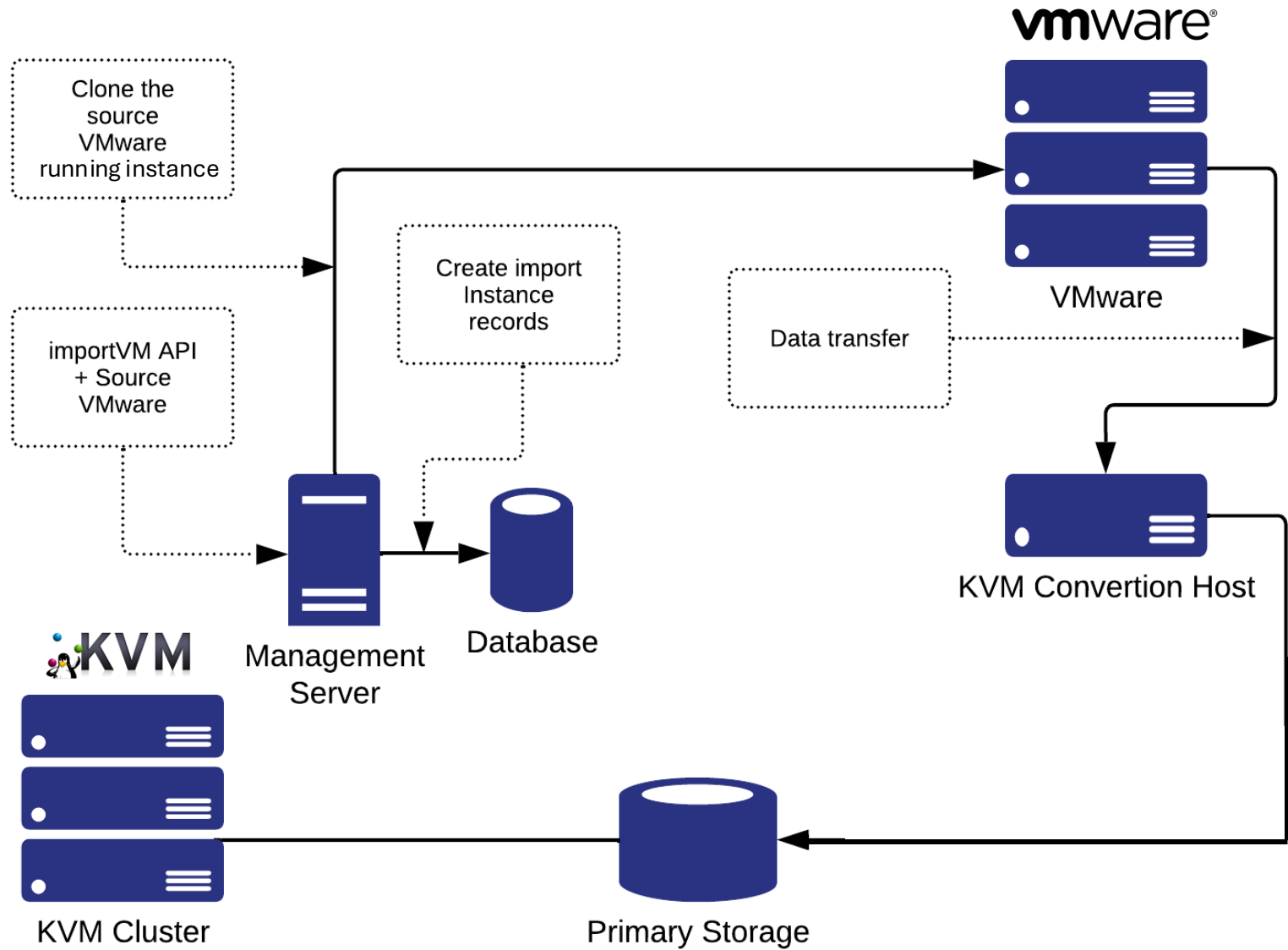
Primary Storage

Storage pool

|

ref-trl-9798-k-Mr8-nicolas-vazquez-kvm-pri1

ref-trl-9798-k-Mr8-nicolas-vazquez-kvm-pri2



Improvements in 4.22

- Windows VM Migrations were not preserving static IP address
 - By default virt-v2v resets Windows NIC to DHCP
 - Workaround: pass --mac to virt-v2v

```
# virt-v2v --help | grep "\-mac"
```

--mac <mac:network|bridge|ip:out> Map NIC to network or bridge or assign static IP

- Solution: Allow passing extra parameters to the virt-v2v conversion
 - Extra parameters disabled by default
 - Controlled by the administrator, enable/disable and list of allowed parameters

Migrating 1000's of VMs from VMware to CloudStack



Lucian Burlacu

CLOUD ARCHITECT, SHAPEBLUE

All Settings

Access

Compute

Storage

Convert vmware instance to kvm extra params allowed

(convert.vmware.instance.to.kvm.extra.params.allowed)

Disabled by default. If enabled, allows extra parameters to be passed to the virt-v2v binary on KVM conversion hosts

**Convert vmware instance to kvm extra params allowed list**

(convert.vmware.instance.to.kvm.extra.params.allowed.list)

Comma separated list of allowed extra parameters to be passed to the virt-v2v binary on KVM conversion hosts

Please add additional values by typing them in

mac x



Force converting to storage pool directly (not using temporary storage for conversion) ⓘ

☐ (Optional) Select a KVM host in the Zone to perform the instance conversion through virt-v2v☐ (Optional) Select a KVM host in the Cluster to perform the importing of the converted instance☐ (Optional) Select a staging storage for the converted disks☒ (Optional) Pass extra parameters to the virt-v2v command on the conversion host`--mac 00:0c:29:e6:3d:9d:ip:192.168.0.89,192.168.0.1,24,192.168.0.254`

Enable to force OVF Download via Management Server. Disable to use KVM Host ovftool (if installed) ⓘ



Use case – Extra parameters

2025-10-07 14:55:09,585 INFO [resource.wrapper.LibvirtConvertInstanceCommandWrapper] (Script-1:[]) (logid:) ((i-2-5-VM) export ovf) Transfer Completed

2025-10-07 14:55:09,661 INFO [resource.wrapper.LibvirtConvertInstanceCommandWrapper] (Script-1:[]) (logid:) ((i-2-5-VM) export ovf) Completed successfully

2025-10-07 14:55:09,665 DEBUG [resource.wrapper.LibvirtConvertInstanceCommandWrapper] (AgentRequest-Handler-5:[]) (logid:80269e32) Successfully executed process [2376185] for command [ovftool --noSSLVerify vi://*****@10.0.34.203/Trillian/vm/i-2-5-VM /mnt/f6be0d5c-afab-35b7-b12f-7f4d88d0038b/c2b942f0-b766-4bec-8e73-04920efd25e9/].

2025-10-07 14:55:09,666 INFO [resource.wrapper.LibvirtConvertInstanceCommandWrapper] (AgentRequest-Handler-5:[]) (logid:80269e32) Attempting to convert the OVF c2b942f0-b766-4bec-8e73-04920efd25e9 of the instance i-2-5-VM from VMware to KVM

2025-10-07 14:55:09,666 DEBUG [resource.wrapper.LibvirtConvertInstanceCommandWrapper] (AgentRequest-Handler-5:[]) (logid:80269e32) Executing command [virt-v2v --root first -i ova /mnt/f6be0d5c-afab-35b7-b12f-7f4d88d0038b/c2b942f0-b766-4bec-8e73-04920efd25e9/i-2-5-VM/ -o local -os /mnt/f6be0d5c-afab-35b7-b12f-7f4d88d0038b -of qcow2 -on 37620458-b078-41cf-b740-dd6ad7fc1b40 --mac 00:0c:29:e6:3d:9d:ip:192.168.0.89,192.168.0.1,24,192.168.0.254].

2025-10-07 14:55:09,699 INFO [resource.wrapper.LibvirtConvertInstanceCommandWrapper] (Script-7:[]) (logid:) ((i-2-5-VM) virt-v2v ovf source: /mnt/f6be0d5c-afab-35b7-b12f-7f4d88d0038b/c2b942f0-b766-4bec-8e73-04920efd25e9/i-2-5-VM/ progress) [0.0] Opening the source -i ova /mnt/f6be0d5c-afab-35b7-b12f-7f4d88d0038b/c2b942f0-b766-4bec-8e73-04920efd25e9/i-2-5-VM/

2025-10-07 14:55:09,700 INFO [resource.wrapper.LibvirtConvertInstanceCommandWrapper] (Script-7:[]) (logid:) ((i-2-5-VM) virt-v2v ovf source: /mnt/f6be0d5c-afab-35b7-b12f-7f4d88d0038b/c2b942f0-b766-4bec-8e73-04920efd25e9/i-2-5-VM/ progress) virt-v2v: warning: making OVA directory public readable to work around

Improvements in 4.22

- The tool does not give much feedback to the user on UI or API
 - Solution: List VMware to KVM migration tasks
 - Filter by status: Running, Completed, Failed, or All
 - Display migration steps, current duration and total duration
 - New API: listImportVmTasks
 - UI: New tab on the VMware to KVM migration section for Import VM Tasks

Latest improvements on 4.22

Instances Listing [Import VM Tasks](#)

Import VM Tasks ⓘ ↻

Completed ⚠

AllRunningCompletedFailed

Created	Display name	Conversion Host	Current step	Current step duration	Description	Total duration	Source VM Name	VMware datacenter vCenter	vCenter datacenter	State
26 Oct 2025 21:51:33	Test-New-Check	ref-trl-9798-k-Mr8-nicolas-vazquez-kvm1	[5/5] Completed		Completed at 2025-10-26 21:55:22	3 min 49 secs	i-2-3-VM	10.0.34.58	Trillian	Completed
26 Oct 2025 21:39:30	Test-Checks-2	ref-trl-9798-k-Mr8-nicolas-vazquez-kvm1	[5/5] Completed		Completed at 2025-10-26 21:44:04	4 min 34 secs	i-2-8-VM	10.0.34.58	Trillian	Completed
26 Oct 2025 21:37:32	Migrate-Test-Checks-1	ref-trl-9798-k-Mr8-nicolas-vazquez-kvm1	[5/5] Completed		Completed at 2025-10-26 21:42:17	4 min 45 secs	i-2-3-VM	10.0.34.58	Trillian	Completed
22 Oct 2025 14:24:38	VM-Migrated-CentOS	ref-trl-9798-k-Mr8-nicolas-vazquez-kvm1	[5/5] Completed		Completed at 2025-10-22 14:27:29	2 min 51 secs	i-2-3-VM	10.0.34.58	Trillian	Completed
22 Oct 2025 14:17:08	VM-Direct-Migration-PS2	ref-trl-9798-k-Mr8-nicolas-vazquez-kvm1	[5/5] Completed		Completed at 2025-10-22 14:20:01	2 min 53 secs	i-2-3-VM	10.0.34.58	Trillian	Completed

Showing 1-5 of 5 items < 1 >

Demo

Future ideas

- Keep extending the VMware to KVM migration tool
- Extend support to more storage types and providers
- CloudStack native support for block storage on KVM
- Any suggestions? Please submit idea on the Github repository, mailing lists
 - <https://github.com/apache/cloudstack/discussions>
 - users@cloudstack.apache.org

Conclusions

- VMware to KVM migration tool keeps evolving
 - Faster!
 - More flexibility
 - More user friendly
- Improvements on 4.19, 4.20 and 4.22



Q/A

Thanks!