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Technical Research Report

Can You Easily Migrate VMs from Intel® Hardware to AMD Hardware?

How do virtual machines (VMs) running on legacy Intel architecture fare when migrating to new AMD architecture? Prowess Labs tested a tool developed by AMD and VMware to find out.

Executive Summary

Companies considering virtual machine (VM) migration across platforms might hesitate because their CPU architectures are not the same across the enterprise. Technologists know that migrating across different CPU generations and/or CPU vendors can be challenging, and if such a migration is not executed smoothly, it could impede the business. Additionally, Enhanced vMotion Compatibility (EVC) does not allow AMD and Intel® CPUs in the same cluster, making it impossible to use VMware vSphere® vMotion® to migrate running VMs between Intel and AMD hardware. These top-of-mind considerations shape the need for an easier path to transition across architectures.

AMD and VMware teamed to develop a tool that automates migration of VMs from Intel architecture to AMD architecture, with the goal of delivering a better user experience (UX) and better business value. Prowess Labs evaluated the tool to determine whether the VM-migration process from Intel environments to AMD EPYC™ processors is simple, as AMD claims.

This report demonstrates that, with the proper steps, IT professionals can migrate VMs without issue or interruption to business operations. The report also validates the claim that VM migration across platforms is frictionless, with the tool performing as claimed.

The analysis in this document was done by Prowess Consulting and commissioned by AMD.

Introduction

IT departments feel increasing pressure to quickly address administrative tasks and move on to the next ones. However, getting the job done involves more than keeping existing workloads running smoothly to support business operations. Many factors are at play:

- New technologies becoming available over the next several quarters
- Acquisition activity among major industry players
- Aging infrastructures that cost more to maintain than to upgrade
- Increasing security threats
- Ever-mounting demands on IT to do more with the mountains of data collected daily

Why Migrate to Newer Processors?

Servers running on legacy processors can be less efficient and consume more energy than servers based on newer processors.

Modern workloads, such as advanced analytics and artificial intelligence (AI)/machine learning (ML), might require new hardware with updated capabilities.

Modern processors feature more cores, which could mean fewer servers, lower energy costs, and lower operating expenses (OpEx).

It's no wonder that IT departments are frequently overwhelmed. IT professionals want to be able to easily move to new technologies, solutions, and architectures that lower total cost of ownership (TCO) without being subject to vendor lock-in. To successfully navigate evolving business conditions, IT professionals must contend with the obstacles of limited time, fixed budgets, and constrained staff and space. These simultaneous challenges can hinder operational tempo and leave IT operations unable to cope with increasing business demands.

To meet these marketplace needs, AMD and VMware teamed to develop a cold-migration tool, known as the VMware Architecture Migration Tool (VAMT), to help streamline the process to save server administrators valuable time. VAMT automates cold migration to newer hardware architectures when live migration is not supported.

VMware supports EVC for live migration between generations of CPUs from a single vendor, but it does not support live migration from across vendors (for instance, from Intel to AMD). EVC works by using the "lowest common denominator" feature set of the CPUs in the cluster. For example, if there are 1st generation and 2nd generation processors in a cluster and you want to live migrate these to a new 3rd generation cluster using EVC, the new clusters will operate with 1st generation features. This means that the newer features available in the 3rd generation CPUs will not be available. It should also be noted that EVC does not provide backward compatibility indefinitely. For this reason, at some point, IT managers will have to perform a cold migration. Cold migrations can be complex and challenging, and they can require some downtime during the migration process. VMware and AMD have jointly developed the VAMT tool to help address these challenges and automate the cold-migration process.

Prowess Puts Cold Migration to the Test

Prowess Labs set out to discover whether IT staff can cleanly migrate VMs between Intel and AMD hardware architectures using VAMT.

Table 1 | Cluster environments used in migration testing

	Dell™ PowerEdge™ R7525	3 x Dell™ PowerEdge™ R320
Processor	AMD EPYC™ 75F3 processor	Intel® Xeon® processor E5-2640 v3
Number of CPUs	1	1
Cores per CPU	32	8
Cores/threads per server	64/128	8/16
Installed memory	1 TB	128 GB
Test server quantity	1	3
Shared storage	Synology® network-attached storage (NAS)	
VMware vSphere® 7.0.3*		

*VMware NSX-T Data Center™ and VMware HCX™ were not used for the purposes of this test.

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Prowess engineers used the hardware shown in Table 1 and VAMT, which is a Microsoft® PowerShell® script written for migration. We chose this tool because it is open-source and extensible, so it can be tailored for specific customer needs, such as this use case. We tested migration of VMs from legacy Intel hardware to more modern AMD hardware with both environments connected to shared storage.

Our engineers stood up two separate clusters—one AMD processor–based cluster and one Intel processor–based cluster—and then migrated VMs between the two environments while documenting the experience. For this testing, we used an on-premises shared-storage model. Although a VMware vSAN™–to–VMware vSAN migration is possible if the clusters are connected to the same VMware vCenter Server®, this report does not address that scenario. We also documented any impediments that arose during the migration process.

Note: There are VMware vCenter® limits for tasks running at the same time. Limits that apply to an entire vCenter server are as follows:

- vCenter can execute approximately 640 concurrent operations before incoming requests are queued.
- vCenter can support up to 2,000 concurrent sessions (authenticated logins via user interface [UI] or API, also including remote consoles) before it rejects them.

To learn more, visit https://blogs.vmware.com/performance/2021/02/vcenter-limits-for-tasks-running-at-the-same-time.html.

Test Steps[1]

For this testing, we completed the following processes:

1. Using VMware vCenter Server, create 40 VMs named "workload" hosted on the legacy Intel compute cluster. Configure each VM with:
   - vCPU: 2
   - RAM: 4 GB
   - Storage: 48 GB
   - Operating system: Windows® 10
   - VMware Tools™ v.2147483647

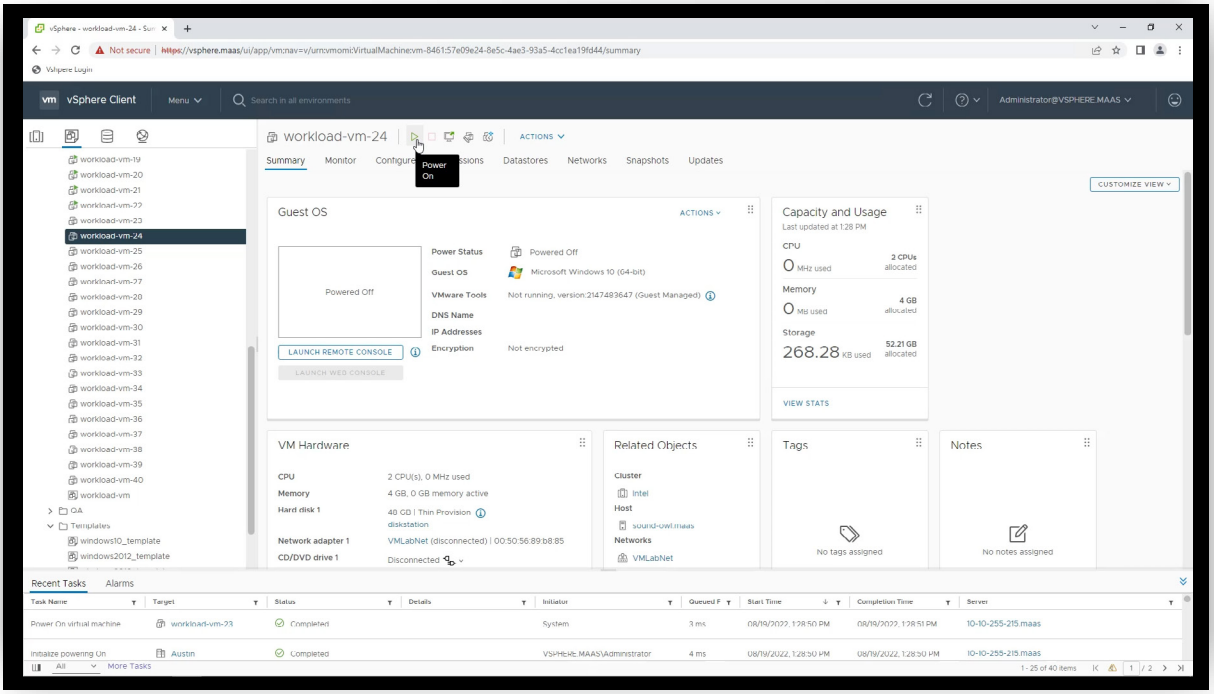

Figure 1 | One of the VMs created for migration testing

2. Install VMware PowerCLI™ on the administrator machine.
3. Attempt live migration. The native VMware vCenter migration tool warns that the source (Intel) and target (AMD) compute nodes are not compatible.

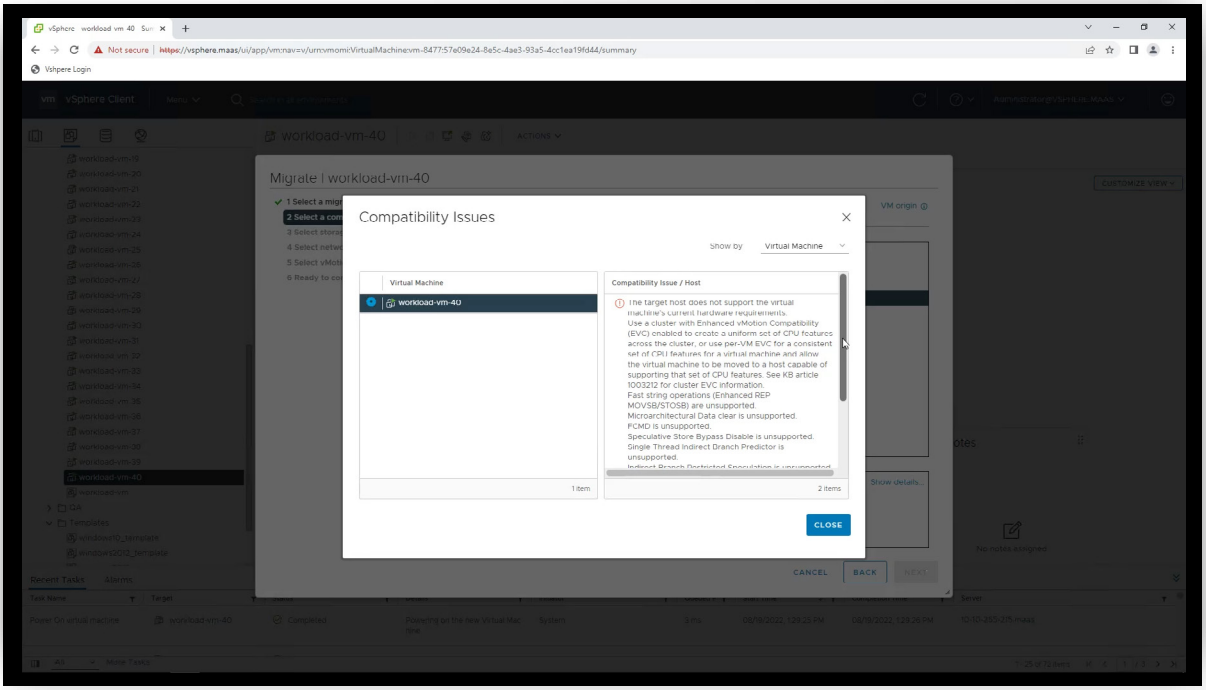

Figure 2 | VMware vCenter® generates a warning that source and target clusters are incompatible

4. Add the required single-cardinality VAMT tags manually to the vCenter **Tags & Custom Attributes** page.[2]
5. Create a CSV file containing all "workload" VMs with the following formatting:
   vmname,target_hostpoolcluster,target_portgroup,target_datastore
   vmname: VM name to migrate
   target_hostpoolcluster: Target host pool cluster to migrate the VMs to
   target_portgroup: Target VM port group network to connect VMs to
   target_datastore: Target host pool cluster datastore to migrate the VM files to

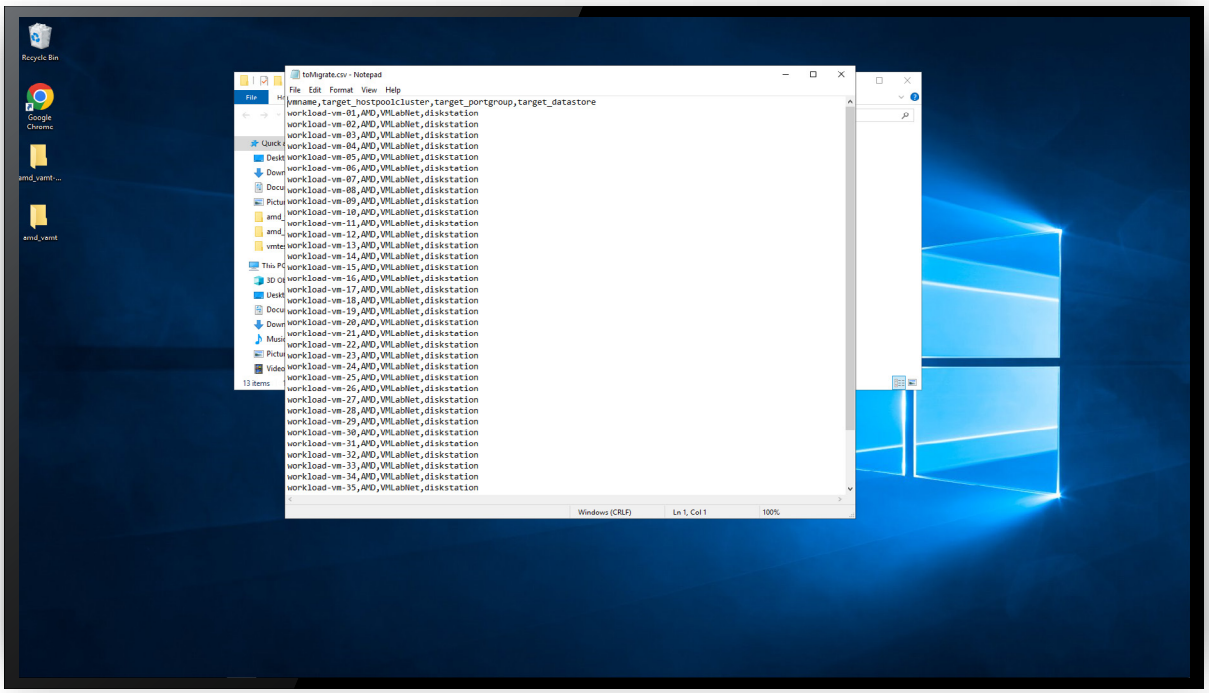

Figure 3 | A CSV file containing VM attributes read by the migration tool

6. Prior to applying any tags to the VMs, run the VAMT tool in vSphere PowerCLI to confirm authentication with vCenter.
7. Apply the **readyToMigrate** tag to the workload VMs.

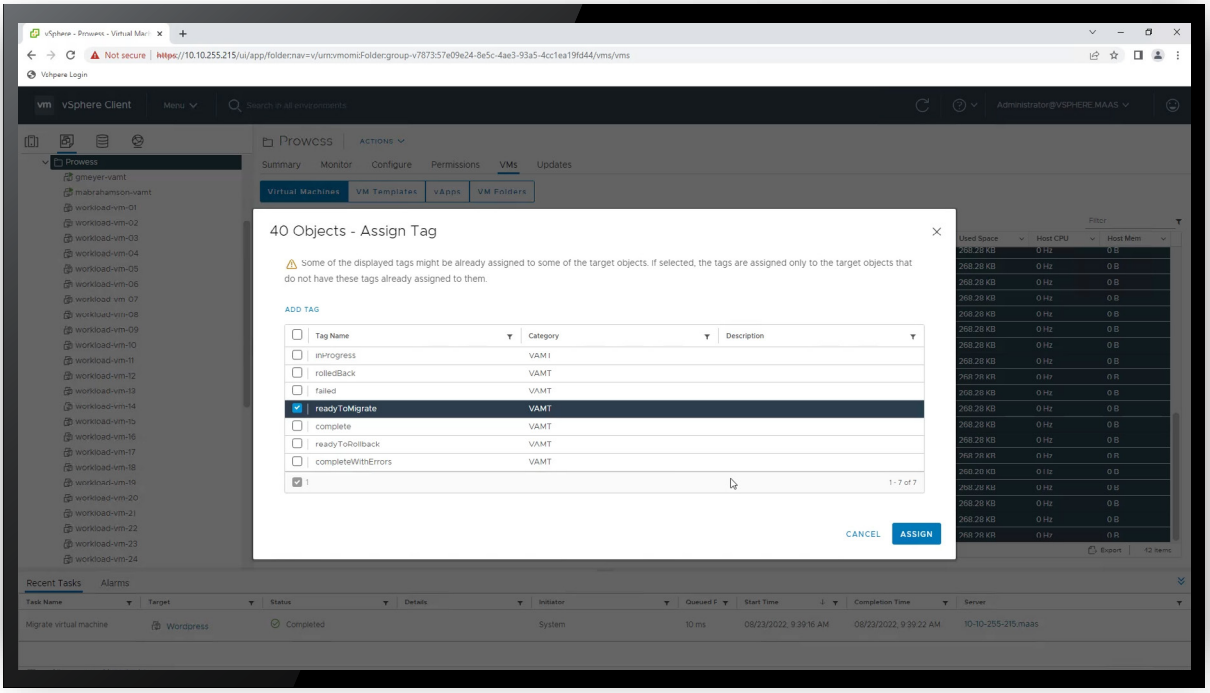

Figure 4 | readyToMigrate tag applied to objects

8. Run the migration command in VAMT. Certain warning messages might appear as a result of which vSphere version you are running. These are only warning messages and will not affect the migration.
9. Once finished, the tool displays a summary output.

Results and Analysis

Because vSphere vMotion clusters cannot use both Intel and AMD processors in the same cluster, we investigated an alternate means of moving VMs between the two principal x86 architectures. Our testing found that VAMT offers an easy cold-migration process. Key features of the tool include VM success validation, process throttling, change window support, email and syslog support, audit trails, and rollback. Our engineers successfully cold-migrated 40 VMs from Intel to AMD hardware in less than 30 minutes. Additionally, our engineers consolidated three legacy servers based on Intel processors to one modern server based on AMD processors.

According to AMD testing, AMD processors lead in performance/watt and require lower total power consumption at the solution level. This helps lower power and cooling costs and helps reduce greenhouse-gas emissions:

- AMD EPYC™ processors power the most energy-efficient x86 servers in the industry, delivering exceptional performance and low energy consumption.[3]
- Running 1,200 VMs on dual AMD EPYC 7713 processor–powered servers requires an estimated 33 percent fewer servers and consumes 32 percent less energy, compared to using Intel® Xeon® Platinum 8380 processor–based servers.[4]

Conclusion

Our test results prove that in a real-world migration scenario, cold migration was easy, seamless, and cost-effective. The AMD solution is agile, and it supports fundamental business needs for progress and growth.

To stay competitive, organizations must look beyond simply keeping their businesses up and running. Normal operational patterns routinely require rebooting, so it is optimal to pivot while migrating to a new platform. Doing so can widen an IT department's ability to make use of database analytics, use AI, apply ML, and make the most of containers and cloud-native usage models to deliver next-generation architecture.

Learn More

- **AMD EPYC server processors**
- **VAMT**
- **How to use the tool**
- **Jason Collier, AMD | VMware Explore 2022 video**

[1] Several prerequisites need to be completed before the VAMT script can executed. For an overview of these prerequisites, see the methodology report associated with this paper.
[2] Prowess engineers added these tags manually before running VAMT, as specified in the methodology report associated with this paper.
[3] EPYC-028B: As of 2/2/22, out of SPECpower_ssj® 2008 results published on SPEC's website, the 55 publications with the highest overall efficiency results were all powered by AMD EPYC™ processors. More information about SPEC® is available at http://www.spec.org. SPEC and SPECpower are registered trademarks of the Standard Performance Evaluation Corporation.
[4] MLNTCO-021: This scenario contains many assumptions and estimates and, while based on AMD internal research and best approximations, should be considered an example for information purposes only, and not used as a basis for decision making over actual testing. The AMD EPYC™ SERVER VIRTUALIZATION and GREENHOUSE GAS EMISSIONS TCO ESTIMATION TOOL compares the 2P AMD EPYC processor–based server solutions and the 2P Intel® Xeon® processor–based server solutions required to deliver 1,200 total virtual machines (VMs), requiring 1 core and 8 GB of memory per VM. The analysis includes both hardware and virtualization software components.

The analysis in this document was done by Prowess Consulting and commissioned by AMD.

Results have been simulated and are provided for informational purposes only. Any difference in system hardware or software design or configuration may affect actual performance.

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