



High performance computing on Azure

Migration guide for A8 to A11 virtual machines

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Introduction

As more powerful high performance computing (HPC) clusters become available in Microsoft Azure datacenters, we recommend assessing your workloads and migrating the virtual machines (VMs) in the A8 to A11 sizes. These legacy HPC clusters can be migrated into new VM series such as H, D, E, and F for better performance with reduced cost. Newer datacenters include the next generation of Azure HPC VMs known as the H series, which are intended for high-end computational needs such as molecular modeling and computational fluid dynamics. The main difference between the A series and H series is improved cluster performance. The H series clusters have more modern cores and greater capacity.

Migration to newer HPC clusters is not a requirement but can offer benefits. By reassessing your infrastructure requirements, you may be able to reduce costs and improve performance using a more appropriate type of VM hosted on different or newer hardware clusters. Customers we have worked with usually take one of the following approaches to an HPC migration:

- Move the existing VMs in the A8 to A11 series to the new H series in the same or in another datacenter.
- Reassess the computing requirements and move to a more cost-effective, non-HPC cluster.

The scope of this guide is to provide recommendations and tools for migration to the appropriate VM series. To help reduce downtime for your workloads, we have shared tools to help you automate the migration process. This guide includes the scripts we used.

Get started: Review the current VM size

To determine the best migration approach, start by reviewing the CPU, memory, disk, and network specifications for your existing VMs in the A8 to A11 series. Based on this information, you can determine the appropriate target VM series.

In the A series, only the VM sizes from A8 to A11 are the scope for this migration. To help you compare compute (CPU) performance across Azure SKUs, Microsoft uses the [Azure Compute Unit \(ACU\)](#), a metric that uses a small Standard_A1 VM as the standard (100 ACUs). These A-series SKUs rate 225 ACUs per vCPU.

For help assessing your current requirements, see [High performance compute VM sizes](#).

Choose a series and size for migration

After assessing your current HPC usage, decide what type of HPC cluster you need. Your organization may benefit from the performance and cost advantages of a more traditional VM SKU. Here's how to choose:

- If you currently use the A8 to A11 sizes to run HPC workloads, we highly recommend migrating to the next-generation H series.
- If you run non-HPC workloads using the A8-A11 sizes, we recommend migrating to either the compute-optimized Fv2 series, the memory-optimized Ev3 series, or the general-purpose Dv3 series. The F or Dv2 series are good choices if the new VM series is not available in your preferred region.
- If you prefer to run non-HPC workloads on HPC clusters, you have the option to use the next-generation HPC VMs such as the H series, although this choice incurs higher costs.

The sections below can help you map your current scenario to the recommended VM SKUs.

NOTE: A best practice is to select a VM size based on both cost and performance. The recommendations in this guide are based on a one-to-one comparison of performance metrics for the A8 to A11 sizes and the nearest match in another VM series. Before deciding on the right size, get a cost comparison using the [Azure Pricing Calculator](#).

H series: HPC VM sizes

The H series is targeted for HPC workloads on Azure. These 8 vCPU and 16 vCPU VMs are built on the Intel Haswell E5-2667 V3 processor technology featuring DDR4 memory and solid state drive (SSD) temporary storage. In addition to the substantial CPU power, the H series offers diverse options for low-latency RDMA networking using FDR InfiniBand and provides several memory configurations to support memory-intensive computational requirements. For the most up-to-date specifications, see [High performance compute VM sizes: H-series](#).

The following table lists the recommended VM mapping for A series (A8 to A11) into H series.

Table 1. Map for A-series to H-series migration (290 to 300 ACU per vCPU)

Current VM size	Target VM size	Difference in specification
Standard_A8 (RDMA Capable)	Standard_H16r	vCPU: 16 (+8) Memory: GiB: 112 (+56) Temp storage (SSD) GiB: 2000 (+SSD, +1618) Max data disks: 64 (+32) Max disk throughput: IOPS: 64 x 500 (+ 32 * 500) Max NICs: 4 (+2)

Standard_A9 (RDMA Capable)	Standard_H16r	vCPU: 16 (same) Memory: GiB: 112 (same) Temp storage (SSD) GiB: 2000 (+SSD, +1618) Max data disks: 64 (same) Max disk throughput: IOPS: 64 x 500 (same) Max NICs: 4 (same)
Standard_A10	Standard_H8	vCPU: 8 (same) Memory: GiB: 56 (same) Temp storage (SSD) GiB: 1000 (+SSD, +618) Max data disks: 32 (same) Max disk throughput: IOPS: 32 x 500 (same) Max NICs: 2 (same)
Standard_A11	Standard_H16	vCPU: 16 (same) Memory: GiB: 112 (same) Temp storage (SSD) GiB: 2000 (+SSD, +618) Max data disks: 64 (same) Max disk throughput: IOPS: 64 x 500 (same) Max NICs: 4 (same)

Fv2 series: Compute-optimized VM sizes

The compute-optimized sizes in the Fv2 series offer the fastest CPU-powered calculations based on the Intel Xeon Scalable processor. These VM sizes are hyper-threaded and run on the Intel Xeon Platinum 8168 processor, featuring a base core frequency of 2.7 GHz and a maximum single-core turbo frequency of 3.7 GHz. Intel AVX-512 instructions, which are new on Intel Scalable Processors, boost performance to vector processing workloads up to two times on both single and double precision floating point operations. These sizes support Azure Premium Storage disks by default and support accelerated networking capabilities for extremely high throughput and ultra-low VM-to-VM latencies. Fv2 VMs are a perfect fit for compute-intensive workloads.

Two Fv2-series VMs are appropriate for migrating workloads hosted on A8-A11 VMs:

- Standard_F8s_v2
- Standard_F16s_v2

For the most up-to-date specifications for these sizes, see [Compute optimized virtual machine sizes: Fsv2-series](#). Fv2 series VMs are not available for Azure Service Management (classic model) deployments.

The following table lists the recommended VM mapping for A series (A8 to A11) into Fv2 series.

Table 2. A series to Fv2 series mapping table (195 to 210 ACU per vCPU)

Current VM size	Target VM size	Difference in specification
Standard_A8 ¹	Nil	No RDMA capable size available. For RDMA capable size, choose H series. For non-RDMA capable size, choose Fv2, Dv3, or Ev3.
Standard_A9 ¹	Nil	No RDMA capable size For RDMA capable size, choose H series. For non-RDMA capable size, choose Fv2, Dv3, or Ev3.
Standard_A10	Standard_F8s_v2	vCPU: 8 (same) Memory: GiB: 16 (-40) Temp storage (SSD) GiB: 64 (+SSD, -254) Max data disks: 16 (-16) Disk throughput: IOPS: Varies based on storage size & type Max NICs: 4 (+2)
Standard_A11	Standard_F16s_v2	vCPU: 16 (same) Memory: GiB: 32 (-80) Temp storage (SSD) GiB: 128 (+SSD, -254) Max data disks: 32 (-32) Disk throughput: IOPS: Varies based on storage size and type Max NICs: 4 (same)

Dv3 series: General purpose VM sizes

The D-series VMs are designed to run applications that demand higher compute power and temporary disk performance. D-series VMs provide faster processors, a higher memory-to-vCPU ratio, and a solid-state drive (SSD) for the temporary disk.

As a follow-on to the original D series, the Dv2-series VMs feature a more powerful CPU. This series is based on the latest generation Intel Xeon E5-2673 v3 2.4 GHz (Haswell) or E5-2673 v4 2.3 GHz (Broadwell) processors, and with the Intel Turbo Boost Technology 2.0 can go up to 3.1 GHz.

The Dv3-series VMs have the same processors as the Dv2 series but feature Intel hyper-threading technology, so the ACU per vCPU is less than the Dv2 series. The hyper-threaded configuration provides a better value for most general-purpose workloads, since the cost per hour for Dv2-series is higher. In the Dv3-series, memory has been expanded (from approximately 3.5 GiB/vCPU to 4 GiB/vCPU), while disk and network limits have been adjusted on a per-core basis to align with the move to hyperthreading.

If your workload is not suitable for a hyper-threaded configuration and needs more ACU per vCPU, it is recommended to choose the Dv2-series. Two sizes are recommended:

- Standard_D13_v2
- Standard_D14_v2

Otherwise, two sizes in the Dv3 series are recommended:

- Standard_D8_v3
- Standard_D16_v3

For the most up-to-date specifications for these sizes, see [General purpose virtual machine sizes: Dv3-series](#). The following summarizes the Dv3-series VMs to consider when migrating from the A8 to A11 sizes.

Table 3. A series to Dv3 series mapping table (160 to 190 ACU per vCPU)

Current VM size	Target VM size	Difference in specification
Standard_A8	Nil	No RDMA capable size For RDMA capable size, choose H series For non-RDMA capable size, choose Fv2, Dv3, or Ev3
Standard_A9	Nil	No RDMA capable size For RDMA capable size, choose H series For non-RDMA capable size, choose Fv2, Dv3, or Ev3
Standard_A10	Standard_D8_v3	vCPU: 8 (same) Memory: GiB: 32 (-24) Temp storage (SSD) GiB: 200 (+SSD, -182) Max data disks: 16 (-16) Max disk throughput: IOPS: 16 x 500 (-16 x 500) Max NICs: 4 (+2)
	Standard_D16_v3	vCPU: 8 (same) Memory: GiB: 64 (-48) Temp storage (SSD) GiB: 400 (+SSD, -18) Max data disks: 32 (-32) Max disk throughput: IOPS: 32 x 500 (-32 x 500) Max NICs: 4 (same)

Ev3 series: Memory optimized VM sizes

The Ev3 series feature the E5-2673 v4 2.3 GHz (Broadwell) processor in a hyperthreaded configuration and provide a better value for most general-purpose workloads. Memory has been expanded (from 7 GiB/vCPU to 8 GiB/vCPU), while disk and network limits have been adjusted on a per-core basis to align with the move to hyperthreading. The Ev3 is the follow up to the high memory VM sizes of the D and Dv2 series. Ev3-series instances are based on the 2.3 GHz Intel Xeon E5-2673 v4 (Broadwell) processor and can achieve 3.5 GHz with Intel Turbo Boost Technology 2.0. Ev3-series instances are ideal for memory-intensive enterprise applications.

Two sizes in the Ev3 series are recommended:

- Standard_E8_v3
- Standard_E16_v3

For the most up-to-date specifications for these sizes, see [Memory optimized virtual machine sizes: Ev3-series](#).

The following table summarizes the Ev3-series VMs to consider when migrating from the A8 to A11 sizes.

Table 4. A series to Ev3 series mapping table (160 to 190 ACU per vCPU)

Current VM size	Target VM size	Difference in specification
Standard_A8	Nil	No RDMA capable size For RDMA capable size, choose H series For non-RDMA capable size, choose Fv2, Dv3, or Ev3
Standard_A9	Nil	No RDMA capable size For RDMA capable size, choose H series For non-RDMA capable size, choose Fv2, Dv3, or Ev3
Standard_A10	Standard_E8_v3	vCPU: 8 (same) Memory: GiB: 64 (-8) Temp storage (SSD) GiB: 200 (+SSD, -182) Max data disks: 16 (-16) Max disk throughput: IOPS: 16 x 500 (-16 x 500) Max NICs: 4 (+2)
Standard_A11	Standard_E16_v3	vCPU: 16 (same) Memory: GiB: 128 (+16) Temp storage (SSD) GiB: 400 (+SSD, +18) Max data disks: 32 (-32) Max disk throughput: IOPS: 32 x 500 (-32 x 500) Max NICs: 8 (+4)

Selecting other VM sizes

The VM sizes recommended above are a near match to the CPU, memory, disk, and network characteristics of the A8 to A11 sizes. However, other sizes may be more suitable in certain situations—for example, when the recommended VM sizes:

- Are not available in the preferred Azure region.
- Are not supported in chosen deployment model (Azure Resource Manager or classic).
- Do not meet the cost and performance requirements for the workload.

In these types of cases, you can select other VM sizes as the following table shows.

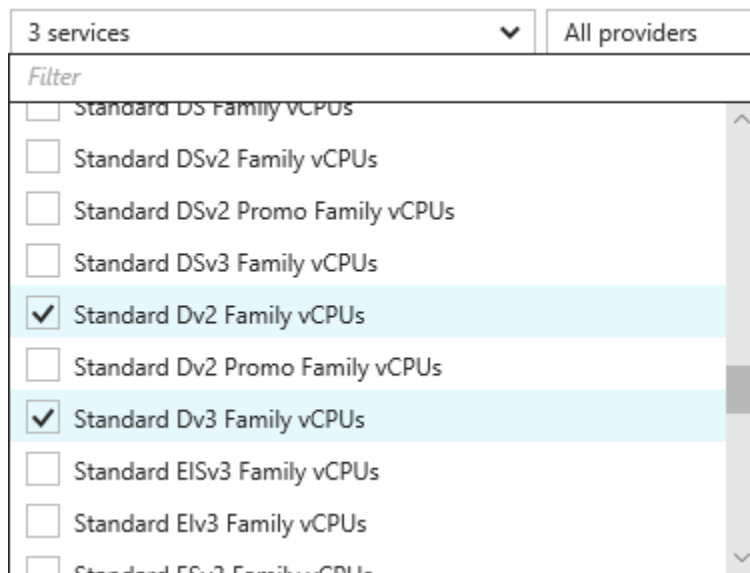
Table 5. Other VMs for HPC migration

Type	Size	Description
General purpose	Standard_D4_v2 Standard_D5 Standard_D14_v2_v2 Standard_D13_v2	Balanced CPU-to-memory ratio. Ideal for testing and development, small to medium databases, and low to medium traffic web servers.
Compute optimized	Standard_F8 Standard_F16	High CPU-to-memory ratio. Good for medium traffic web servers, network appliances, batch processes, and application servers.
Memory optimized	Ev3	High memory-to-CPU ratio. Great for relational database servers, medium to large caches, and in-memory analytics.








Verify Azure subscription quota limits

Before any migration, make sure to check whether the quota limits for your Azure subscription accommodate the target VM sizes you choose. Do the following:

1. In Azure portal, select **Subscriptions**, then select the subscription for migration.
2. In the **Subscription** blade, click **Usage + Quotas**, and check the services for which the usage and quota limits need to be verified.



- In the output list, refer to the **Usage** column and verify that the quota is sufficient to accommodate the VM cores for the selected VM series.

QUOTA	↑ ↓ PROVIDER	↑ ↓ LOCATION	↑ ↓ USAGE
Standard H Family vCPUs	Microsoft.Compute	West Europe	 5 % 48 of 1000
Standard H Family vCPUs	Microsoft.Compute	North Central US	 3 % 208 of 6000
Standard H Family vCPUs	Microsoft.Compute	South Central US	 3 % 48 of 1600
Standard H Family vCPUs	Microsoft.Compute	West US	 1 % 64 of 6400
Standard Dv2 Family vCPUs	Microsoft.Compute	West Europe	 1 % 8 of 1600
Standard Dv2 Family vCPUs	Microsoft.Compute	North Central US	 0 % 4 of 1000
Standard Dv2 Family vCPUs	Microsoft.Compute	West US	 0 % 4 of 1600

If necessary, you can raise the quota limits by opening a support ticket. For details, see [Azure subscription and service limits, quotas, and constraints](#).

Identify the deployment model

After selecting the right type of VM for your workload, the next step is to identify the deployment model used for your VMs and use the same model for migration. The goal is to automate deployment as much as possible, and Azure provides two models: Azure Resource Manager or Azure Service Manager, also known as classic deployment. We recommend using the newer Resource Manager model, which supports ease-of-use features not available in the classic deployment model. However, this guide provides instructions for migrating VMs in both models.

The existing A8 to A11 VMs are hosted on dedicated, physical servers. They are not shared with other VM series and do not support the newer VM SKUs. Therefore, migrating to a different size affects your deployment in the following ways:

- Extra steps are needed to migrate your VMs to a different size, and these steps vary depending on the deployment model you use.
- If you use Azure Resource Manager for migration, all VMs in an availability set must be hosted in the same hardware cluster. In some cases, multiple VMs must be resized together. VMs in an availability set must be stopped (deallocated) before migration.
- If you use the classic model for migration, all VMs in a cloud service must be hosted in the same hardware cluster. In some cases, multiple VMs must be resized together. The cloud service deployment must be removed and redeployed to change the VMs to a size in another size family.

You can use Azure portal, Azure CLI, or Azure PowerShell to list the VMs running in each of the deployment models.

Use Azure portal

If you are using Azure portal do the following to identify the deployment model:

- In Azure portal, select **Virtual machines**.
- On the **Virtual machines** blade, click **Edit columns**.

- Under **Available columns**, move **Size**, **Type**, and **Resource Type** to **Selected columns** and click the **Apply** button.
- Notice the list of VMs running in the A8 to A11 sizes. The **Resource Type** column shows the deployment model the VMs are running in. For example, the first item below is for Azure Resource Manager, and the second item is for Azure Service Manager (classic).

TYPE ↑↓	RESOURCE TYPE ↑↓
Virtual machine	Microsoft.Compute/virtualMachines
Virtual machine (classic)	Microsoft.ClassicCompute/virtualMachines

Use a script

You can use Azure CLI or Azure PowerShell to identify the deployment model. Use the following scripts to identify the deployment model used for your VMs:

- ListVM_ARMHPC.sh** and **ListVM_ARMHPC.ps1** list all VMs deployed in the A8 to A11 sizes in a particular Azure subscription and datacenter or location in the Azure Resource Manager model.
- ListVM_CSHPC.ps1** lists all VMs deployed in the A8 to A11 sizes in a particular Azure subscription and datacenter or location in Azure Service Manager (classic) model

The following sections describe how to work with these scripts.

Use Azure Resource Manager for migration

If you deployed your VMs using the Azure Resource Manager deployment model, migration to a new VM size is straightforward. Scripts are provided to automate the process to stop (deallocate) the VMs, select the target VM size, and then restart the VMs. If a VM is part of an availability set, all VMs in the set must be stopped before migrating any VM in the set to a new size. This is because all running VMs in an availability set must use the same physical hardware cluster.

The following Azure CLI or Azure PowerShell scripts are used:

- ListVM_ARMHPC.sh** and **ListVM_ARMHPC.ps1** list all VMs deployed in the A8 to A11 sizes in a particular Azure subscription and datacenter or location.
- ResizeVM_ARMHPC_NONASVM.sh** and **ResizeVM_ARMHPC_NONASVM.ps1** resize the A8 to A11 VMs into the selected target VM size, after stopping and deallocating the VM.
- ResizeVM_ARMHPC_ASVM.sh** and **ResizeVM_ARMHPC_ASVM.ps1** identify all VMs in an availability set deployed in the A8 to A11 sizes, stop and deallocate all VMs, and then resize them into the selected size.

! IMPORTANT: Before running the scripts, ensure that the VMs you are migrating (A8 to A11) are backed up using Azure Backup or other backup tools.


Prerequisites

- Access to the Azure account and subscription where A8 to A11 VMs are deployed.
- Azure PowerShell Resource Manager module. For details, see [Install and configure Azure PowerShell](#).
- If you are using Azure CLI on Linux, before running the scripts, log on to your Azure account (Azure Resource Manager) using the following command:

```
# Log on to your Azure account
az login
```

- If you are using Azure PowerShell on Windows, before running the scripts, log on to your Azure account (Azure Resource Manager) using the following PowerShell cmdlet:

```
# Log on to your Azure account
Connect-AzureRMAccount
```

- If you prefer to use Azure Cloud Shell to run the scripts, open Azure portal. At the top of the screen, click **Cloud Shell** (), then choose Bash or PowerShell to initialize the Cloud Shell environment.

List Resource Manager VMs deployed in A8 to A11 VM sizes

If you are using Azure CLI on Linux or Azure Cloud Shell (Bash), use the following script to list VMs deployed in A8 to A11 VM size in a subscription.

ListVM_ARMHPC.sh

```
#!/bin/bash

# Subscription name or id
subscriptionName="mySubscription"

# Set Azure subscription context
az account set --subscription $subscriptionName

# declare an array for HPC VM sizes
hpcvmsize=( 'Standard_A8' 'Standard_A9' 'Standard_A10' 'Standard_A11' )

# for loop that iterates over each element in array for hpcvmsize
for i in "${hpcvmsize[@]}"
do
    echo $i
    az vm list --query [].[resourceGroup,name,hardwareProfile.vmSize] --out
    tsv | grep "$i"
done
```

If you are using Azure PowerShell on Windows or Azure Cloud Shell, use the following script to list VMs deployed in the A8 to A11 VM size in a subscription.

ListVM_ARMHPC.ps1

```
# Azure datacenter location where HPC VM is deployed
$SourceLocation = '<azure dc>' # 'southeastasia', 'uswest'

# Subscription name or id
$SubscriptionName = "mySubscription"

# Set Azure subscription context
Set-AzureRmContext -Subscription $SubscriptionName

# Create legacy HPC VM sizes array list
$HPCVMSize = @( 'Standard_A8', 'Standard_A9', 'Standard_A10',
'Standard_A11' )

# Get all VMs deployed in legacy HPC VM size
Get-AzureRmVM | where { $_.Location -eq $SourceLocation -and $HPCVMSize -
contains $_.HardwareProfile.VmSize }
```

Resize Resource Manager VMs not in an availability set

If you are using Azure CLI on Linux or Azure Cloud Shell (Bash), use the following script to migrate a VM that is not part of an availability set.

ReSizeVM_ARMHPC_NONASVM.sh

```
#!/bin/bash

# Subscription name or id
subscriptionName="mySubscription"

# Resource group name
resourceGroupName="myResourceGroup"

# Source HPC VM name to be resized
vmName="sourceHPCVM"

# Set target HPC VM size to be resized
newVMSize="targetHPCVMSize"

# Set Azure subscription context
az account set --subscription $subscriptionName

# Deallocate source HPC VM before resizing
az vm deallocate --resource-group $resourceGroupName --name $vmName

# Resize HPC VM properties
az vm resize --resource-group $resourceGroupName --name $vmName --size
$newVMSize

# Start source HPC VM with the new VM size
az vm start --resource-group $resourceGroupName --name $vmName
```

If you are using Azure PowerShell on Windows or Azure Cloud Shell, use the following script to migrate a VM that is not part of an availability set.

ReSizeVM_ARMHPC_NONASVM.ps1

```
# Subscription name or id
$subscriptionName = "mySubscription"

# Resource group name
$resourceGroupName = "myResourceGroup"

# Source HPC VM name to be resized
$vmName = "sourceHPCVM"

# Set target HPC VM size to be resized
$newVMSize = "targetHPCVMSize"

# Set Azure subscription context
Set-AzureRmContext -Subscription $subscriptionName

# Stop source HPC VM before resizing
Stop-AzureRmVM -ResourceGroupName $resourceGroupName -VMName $vmName -Force

# Get source HPC VM properties
$vm = Get-AzureRmVM -ResourceGroupName $resourceGroupName -VMName $vmName

# Set source HPC VM size to new VM size
$vm.HardwareProfile.VmSize = $newVMSize

# Update source HPC VM with new VM size setting
Update-AzureRmVM -VM $vm -ResourceGroupName $resourceGroupName

# Start source HPC VM after resizing
Start-AzureRmVM -ResourceGroupName $resourceGroupName -Name $vmName
```

NOTE: Deallocating a VM releases any dynamic IP addresses assigned to it. The OS and data disks are not affected.

Resize Resource Manager VMs deployed in an availability set

All VMs in an availability set must be hosted in the same hardware cluster. However, the new size for a VM in an availability set is not available on the hardware cluster currently hosting the VM, so all VMs in the availability set must be deallocated before any VM can be migrated to a new size.

If you are using Azure CLI on Linux or Azure Cloud Shell (Bash), use the following script to migrate all VMs deployed in an availability set.

ReSizeVM_ARMHPC_ASVM.sh

```
# Subscription name or id
subscriptionName="mySubscription"
```

```

# Resource group name
resourceGroupName="myResourceGroup"

# Source HPC VM name to be resized
availabilitySetName="availabilitySetForHPCVM"

# Set target HPC VM size to be resized
newVMSize="targetHPCVMSize"

# Set Azure subscription context
az account set --subscription $subscriptionName

# Get availability set name and vm instances
vmIDs=$(az vm availability-set show -n $availabilitySetName -g
$resourceGroupName | grep "Microsoft.Compute/virtualMachines")

# Deallocate/resize and start all VMs running in availability set
for vmID in "${vmIDs[@]}"
do
    echo $vmID
    string1=`echo $vmID | cut -d'/' -f 9`
    vmName=`echo $string1 | cut -d'"' -f 1`
    echo $vmName

    # Deallocate source HPC VM before resizing
    az vm deallocate --resource-group $resourceGroupName --name $vmName

    # Resize HPC VM properties
    az vm resize --resource-group $resourceGroupName --name $vmName --size
$newVMSize

    # Start source HPC VM with the new VM size
    az vm start --resource-group $resourceGroupName --name $vmName
done

```

if you are using Azure PowerShell on Windows or Azure Cloud Shell, use the following script to migrate all VMs deployed in an availability set.

ReSizeVM_ARMHPC_ASVM.ps1

```

# Subscription name or id
$subscriptionName = "mySubscription"

# Resource group name
$resourceGroupName = "myResourceGroup"

# Source HPC VM name to be resized

```

```

$availabilitySetName = "availabilitySetForHPCVM"

# Set target HPC VM size to be resized
$newVMSize = "targetHPCVMSize"

# Set Azure subscription context
Set-AzureRmContext -Subscription $subscriptionName

# Get availability set name object
$availabilitySetName = Get-AzureRmAvailabilitySet -ResourceGroupName
$resourceGroupName

# Get VM references in availability set
$vmIDs = $availabilitySetName.VirtualMachinesReferences

# Stop all VMs running in availability set
foreach ($vmId in $vmIDs){
    $string = $vmId.Id.Split("/")
    $vmName = $string[8]
    Stop-AzureRmVM -ResourceGroupName $resourceGroupName -Name $vmName -Force
}

# Get availability set name object
$availabilitySetName = Get-AzureRmAvailabilitySet -ResourceGroupName
$resourceGroupName

# Get VM references in availability set
$vmIDs = $availabilitySetName.VirtualMachinesReferences

# Update all VMs in availability set to new size, update, restart VMs
foreach ($vmId in $vmIDs){
    $string = $vmId.Id.Split("/")
    $vmName = $string[8]
    $vm = Get-AzureRmVM -ResourceGroupName $resourceGroupName -Name $vmName
    $vm.HardwareProfile.VmSize = $newVMSize
    Update-AzureRmVM -ResourceGroupName $resourceGroupName -VM $vm
    Start-AzureRmVM -ResourceGroupName $resourceGroupName -Name $vmName
}

```

NOTE: Deallocating a VM releases any dynamic IP addresses assigned to it. The OS and data disks are not affected.

Use Azure Service Manager (classic) for migration

You can use the classic Azure Service Manager deployment model to migrate VMs and cloud services to a different size in another hardware cluster. The new size needs to be supported by the hardware cluster where the VMs currently reside. With the classic model, it is not possible to resize a VM while it is in a stopped state as you can with Resource Manager deployments. The VMs must be deleted and then recreated using the same operating system and data disks.

The following PowerShell scripts are used:

- **ListVM_CSHPC.ps1** lists all virtual machines deployed in the A8 to A11 sizes in a particular Azure subscription and datacenter or location.
- **ResizeCS.ps1** resizes the A8 to A11 VMs into the selected target size, after stopping and deallocating the VM. Also identifies all VMs in an availability set deployed using the A8 to A11 sizes, stops and deallocates all VMs, and then resizes them into the selected size.

! **IMPORTANT:** Before running the scripts, ensure that the VMs you are migrating (A8 to A11) are backed up using Azure Backup or other backup tools.

Prerequisites

- Azure PowerShell Service Management module. For details, see [Installing the Azure PowerShell Service Management module](#)
- Access to the Azure account and subscription that have deployments with A8 to A11 VMs.
- Before running the scripts, log on to your Azure account (Cloud Services) using the following PowerShell cmdlet"

```
# Log on to your Azure account (Cloud Services)
Add-AzureAccount
```

List Cloud Services VMs deployed in the A8 to A11 VM sizes

Run the following script to list VMs deployed in the A8 to A11 sizes in a subscription.

ListVM_CSHPC.ps1

```
# Azure datacenter location where HPC VM is deployed
$SourceLocation = '<azure region>'

# Subscription name
$SubscriptionName = "mySubscription"

# Set Azure subscription context
Select-AzureSubscription -Default -SubscriptionName $SubscriptionName

# Create legacy HPC VM sizes array list
```

```
$HPCVMSize = @( 'Standard_A8', 'Standard_A9', 'Standard_A10',
'Standard_A11' )

# Get all VMs deployed in legacy HPC VM size in Cloud Services
Get-AzureVM | where { $_.Location -eq $SourceLocation -and $HPCVMSize -
contains $_.HardwareProfile.VmSize }
```

Resize the deployed Cloud Services VMs (ResizeCS.ps1)

With Cloud Services, whether VMs are deployed in an availability set or not, the high-level migration steps are similar. First, all VM instances running under the production slot are deleted but the storage disks are retained. Then the new VM instances are created using the specified size and the retained disks.

To simplify the migration process, a PowerShell script, `ResizeCS.ps1`, is available in [GitHub \(ResizeCS.ps1\)](#). You can use this script to resize VMs across hardware clusters. The script performs the following actions:

- Evaluates the current deployment to ensure the requested resize operation cannot be done through a simple resize using the existing hardware cluster where the VM is deployed.
- Ensures VMs using Premium Storage are resized to another VM size that also supports Premium Storage.
- Warns if any IP addresses will be changed as part of the delete and redeployment operations.
- Ensures that only features supported by the script are in use: The script does not currently support VMs with multiple NICs, or deployments with reverse FQDN, or custom DNS configurations.
- Stores all current configuration in a file that is used to rebuild the VM if anything fails during the redeployment process.
- Deletes the existing deployment after saving all VM configuration settings.
- Redeploys the VMs using the newly selected VM size.

Run the `ResizeCS.ps1` script

1. Copy the `ResizeCS.ps1` script to a local computer where the Azure PowerShell module is installed.
2. Open the PowerShell prompt or PowerShell ISE with `ResizeCS.ps1`.
3. Execute the following PowerShell cmdlets to set the environment to run `ResizeCS.ps1` script

```
# SubscriptionName
$subscriptionName = "mySubscription"
# Log on to Azure
Add-AzureAccount
# Select the subscription that has the source VMs
Select-AzureSubscription -Default -SubscriptionName $subscriptionName
# Verify the default subscription is selected
Get-AzureSubscription
```

4. Open `ResizeCS.ps1` and set the input parameters to match your VM deployments for the A8

to A11 sizes. In particular, set the following three parameters to *true* if needed.

AllowServiceVipChange: Allow the VIP (Internet IP address for the cloud service) to change through the resize operation. To maintain the VIP, the cloud service must be using a reserved IP address.

AllowVMPublicIPChange: Allow the public IP address of a VM to change. Public IP addresses cannot use a static IP address for Azure classic VMs, so you must set this switch if the deployment contains any VMs on which a public IP address is configured.

AllowVNetIPChange: Allow the virtual network IP address of the VMs to change. You must set this switch if any VM does not have a static virtual network IP address configured on it.

For example, to allow the script to change the VIP, set the **AllowServiceVipChange** parameter value to *true* as shown in the highlighted line:

```
[CmdletBinding()]
Param(
    [string]$CloudService = $(Read-Host -prompt "Specify the cloud service
that contains VMs to be resized"),
    [string]$NewSize = $(Read-Host -prompt "Specify the size to make all VMs
in the cloud service"),
    [string]$OutputFile = $(Read-Host -prompt "Specify a file to store the
output of the operations"),
    [switch]$AllowServiceVipChange-$true,
    [switch]$AllowVMPublicIPChange,
    [switch]$AllowVNetIPChange,
    [switch]$AllowRemovalOfAffinityGroup
)
```

5. Run **ResizeCS.ps1**, and enter values for the input parameters:
 - Specify the cloud service that contains the VMs to be resized (for example, **jpncatdcvm03** in the following sample script output).
 - Specify the new size to resize VMs in the cloud service, such as **Standard_D13_v2**.
 - Specify a file to store the output of the operations (for example, **jpncatdcvm03.json** in the following sample script output).

! IMPORTANT: Before running the PowerShell scripts, ensure that the VMs you are migrating (A8 to A11) are backed up using Azure Backup or other backup methods.

6. Once the script execution is complete, in Azure portal, verify the VM is resized to new VM size.

Sample ResizeCS.ps1 script output

```

PS E:\scripts> E:\Scripts\ResizeCS.ps1
Specify the cloud service that contains VMs to be resized: testdcvm03
Specify the size to make all VMs in the cloud service: Standard_D13_v2
Specify a file to store the output of the operations: testdcvm03.json
INFO:    Reading Cloud Service Details
INFO:    Checking for reserved IP address on VIP
WARNING: Continuing with unreserved VIP. IP address of VIP will change
after resize.
INFO:    Reading VM details
INFO:    Getting Details for VM: testdcvm03
Please review details. Click Enter to continue or CTRL+C to exit script
Press Enter to continue...:
Deleting the deployment

Check disks are present after removing VM
Press Enter to continue...:
Building VM Config: testdcvm03
OperationDescription  OperationId                               OperationStatus
-----
Remove-AzureDeployment 53b69919-1d22-7a59-9eaf-c275b480cd0b Succeeded

WARNING: No deployment found in service: 'testdcvm03'.
New-AzureVM          4e28d850-b78c-7f9c-b044-f66a76b281f0 Succeeded

```

Resize web and worker roles deployed in Cloud Services

Like VMs deployed in cloud services, web role and worker role instances cannot be migrated to a new VM size that is not available in the current hardware cluster. It is possible to use in-place or VIP swap methods to move the VM size within the same hardware cluster, such as A8 to A9 or A9 to A10 or A10 to A11. However, if you are moving HPC VMs deployed in A8 to A11 VMs to a new VM size in another hardware cluster such as the F series, D series, or E series, you must delete all the instances (web and worker role), and then redeploy them using the new VM size.

There are two methods for doing this depending on how much application downtime is acceptable during the migration.

⚠ WARNING: In both methods, the local data in the VMs, including C:, D:, and E: drives, is destroyed. The VMs are deleted and recreated either using the same cloud services or new cloud services. **Please make sure to back up the local data before deleting the VM instances and restore them after recreating the VM instances.**

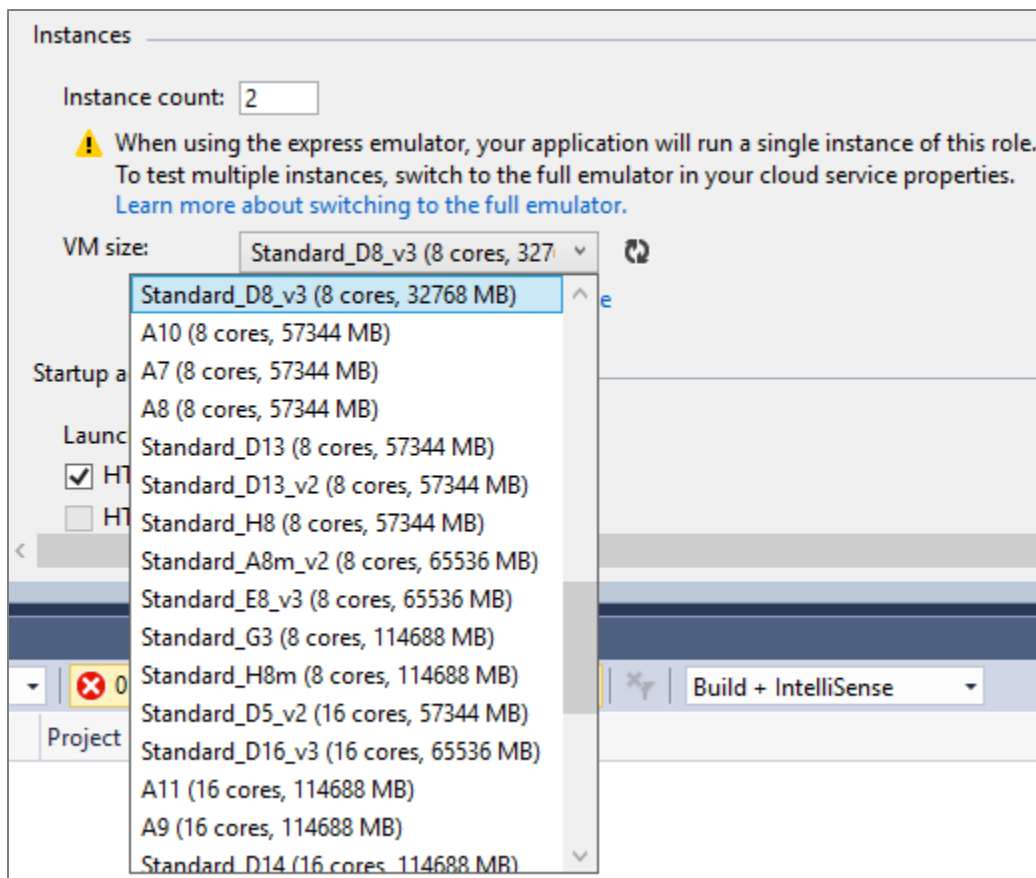
Method to use when application downtime is OK

To resize web and worker role deployed in cloud service, follow these high-level steps:

1. Delete all instances running under staging and production slots of the cloud services. If any of the instances are running in any of the slots, the deployment to the new VM size will fail.
2. In the cloud service package for the web and worker role, modify **vmsize** in the ServiceDefinition.csdef file to a new VM size in the H series, D series, or E series. For example:

```
<ServiceDefinition name="AzureCloudService1"
xmlns="http://schemas.microsoft.com/ServiceHosting/2008/10/ServiceDefinition" schemaVersion="2015-04.2.6">
  <WebRole name="WebRole1" vmsize="Standard_D8_v3">
    <Sites>
      <Site name="Web">
        <Bindings>
          <Binding name="Endpoint1" endpointName="Endpoint1" />
        </Bindings>
      </Site>
    </Sites>
  </WebRole>
</ServiceDefinition>
```

Cloud Services Package sample configuration in Visual Studio:



3. Build and publish the package to the same cloud services with the newly configured VM size to the staging and production slots.

In this method, there is no change in the VIP (Internet IP address for cloud service) assigned

originally to the cloud services. Client applications can communicate with the cloud services using the same public IP address.

Method to use when reduced application downtime is needed

The previous method deletes and recreates the VM instances in a new VM size, causing application downtime. To reduce application downtime, use the following alternative method:

1. Continue running existing or current cloud services installed on the VMs you want to migrate (A8 to A11) for both the staging and production slots.
2. In the cloud service package for the web and worker role, modify **vmsize** in the ServiceDefinition.csdef file to a new VM size in the H series, D series, or E series. (See step 2 of the previous method for an example.)
3. Build and publish the package to a new cloud services with the newly configured VM size to the staging and production slots.
4. Ensure the newly deployed cloud services are running and functional.
5. Wait for the new cloud services to become operational, then stop the old cloud services running in the A8 to A11 VMs, delete them, and make them decommissioned.

This method causes the VIP (Virtual IP) to change because the cloud services are newly created. Client applications need to be changed to communicate with the cloud services using the newly assigned public IP address.

Learn more

- [Solution architecture: HPC cluster deployed in the cloud](#), an Azure solution architecture
- [High performance compute VM sizes: H-series](#), documentation for HPC VM Sizes
- [Azure compute unit](#), a comparison of HPC specifications.
- [Cloud Services Documentation](#), documentation for Cloud Services.
- [Sizes for cloud services](#), an article about the available sizes and options for Cloud Service role instances.
- [Resize Virtual Machines](#), a blog about changing the size of your VM.
- [Azure Resize Cloud Service](#), a script for resizing VMs that cannot be resized through standard commands.