

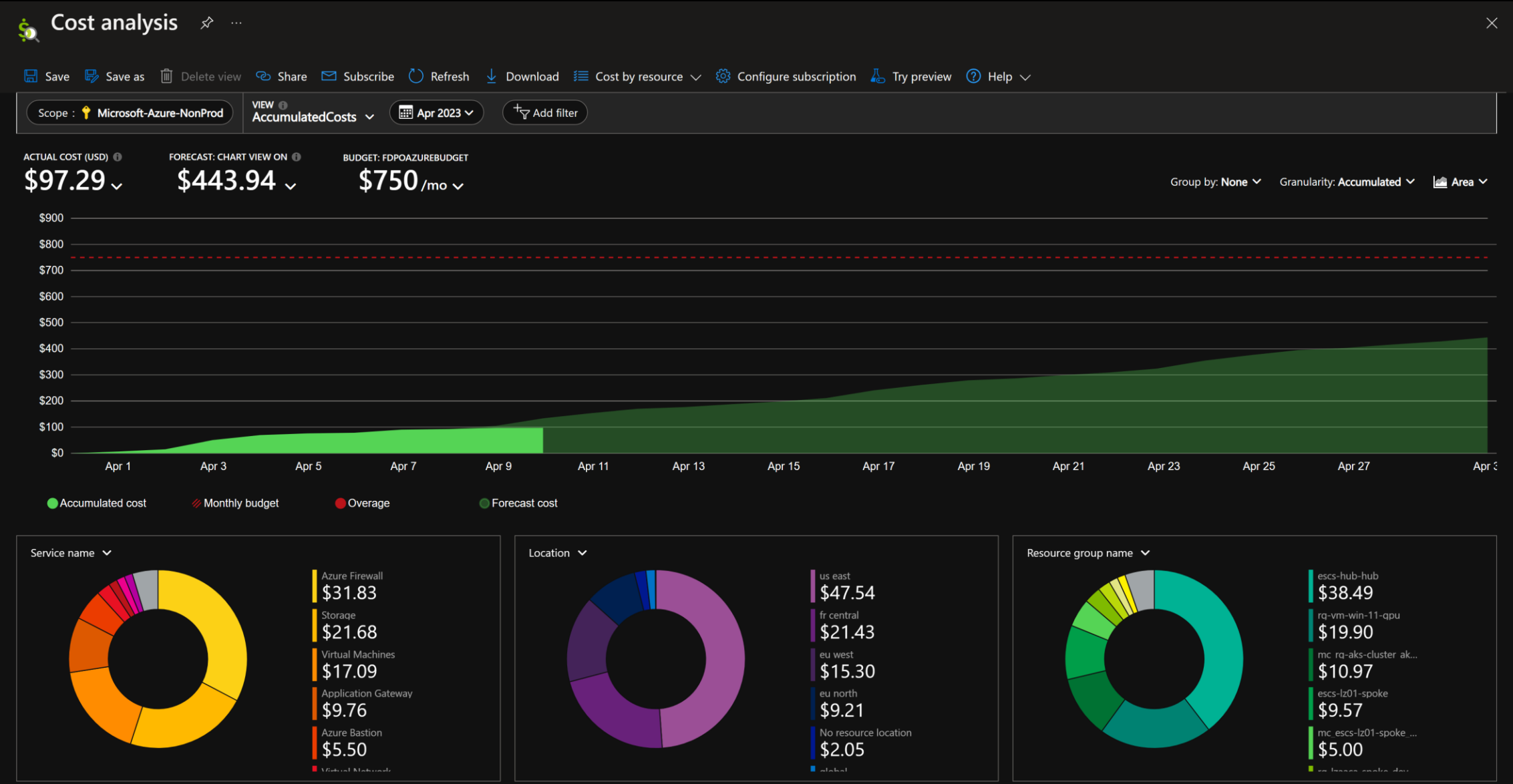
AKS Cost Optimisation



Houssem Dellai



View the cost of resources in Azure portal



Reduce cost of AKS cluster

In Kubernetes:

- Optimize docker images (size & perf)
- Pod auto scalability (HPA)
- Nodes auto scalability (cluster autoscaler)

In AKS:

- Choose the right VM size (SKU)
- Stop & Start cluster or nodepools
- Free & Standard SKU for control plane

In Azure:

- Arm (cheaper) vs Intel based processors
- Azure Spot VMs (up to 80% cost reduction)
- Azure Reservations (1 or 3 years reservation)
- Azure Saving Plan (up to 65% off PAYG)
- Azure Hybrid Benefits (for Windows Server)
- Azure Dev/Test subscriptions (no SLA)


How much does AKS cost ?














AKS cost includes:

- VMSS (system & user)
- Load Balancer & IP addresses
- Network traffic between Availability Zones
- Standard/Premium SKU for the control plane
- Private Endpoint traffic if using private cluster

What is free in AKS ?

- The control plane
- Managed Identity
- AKS extensions (OSM, CSI Drivers...)

<input type="checkbox"/> Name ↑↓	Type ↑↓
<input type="checkbox"/>  aks-cluster	Kubernetes service

<input type="checkbox"/> Name ↑↓	Type ↑↓
<input type="checkbox"/>  3d5de69b-1c80-47fe-8860-209f23c24d2a	Public IP address
<input type="checkbox"/>  aks-agentpool-42354260-nsg	Network security group
<input type="checkbox"/>  aks-agentpool-42354260-routetable	Route table
<input type="checkbox"/>  aks-appspool-75868440-vmss	Virtual machine scale set
<input type="checkbox"/>  aks-cluster-agentpool	Managed Identity
<input type="checkbox"/>  aks-nodepool1-14384788-vmss	Virtual machine scale set
<input type="checkbox"/>  aks-vnet-42354260	Virtual network
<input type="checkbox"/>  azurekeyvaultsecretsprovider-aks-cluster	Managed Identity
<input type="checkbox"/>  ingress-appgateway	Application gateway
<input type="checkbox"/>  ingress-appgateway-appgwpip	Public IP address
<input type="checkbox"/>  ingressapplicationgateway-aks-cluster	Managed Identity
<input type="checkbox"/>  kubernetes	Load balancer
<input type="checkbox"/>  pvc-2c365e2a-349f-49b0-a0aa-b03409b23974	Disk

How much does AKS cost ?

AKS cost includes:

- VMSS (system & user)
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Other cost:

- VNET peering with Hub network
- Application Gateway as Ingress Controller (AGIC)
- Azure Key vault for storing secrets & certificates
- Logs & metrics: Log Analytics, Prometheus & Grafana
- Persistent Volumes using Azure Disk, Blob or File
- Cost of cluster backup

What is free in AKS ?

- The control plane
- Managed Identity
- AKS extensions (OSM, CSI Drivers...)

Stop & start cluster (control plane + all worker nodes)

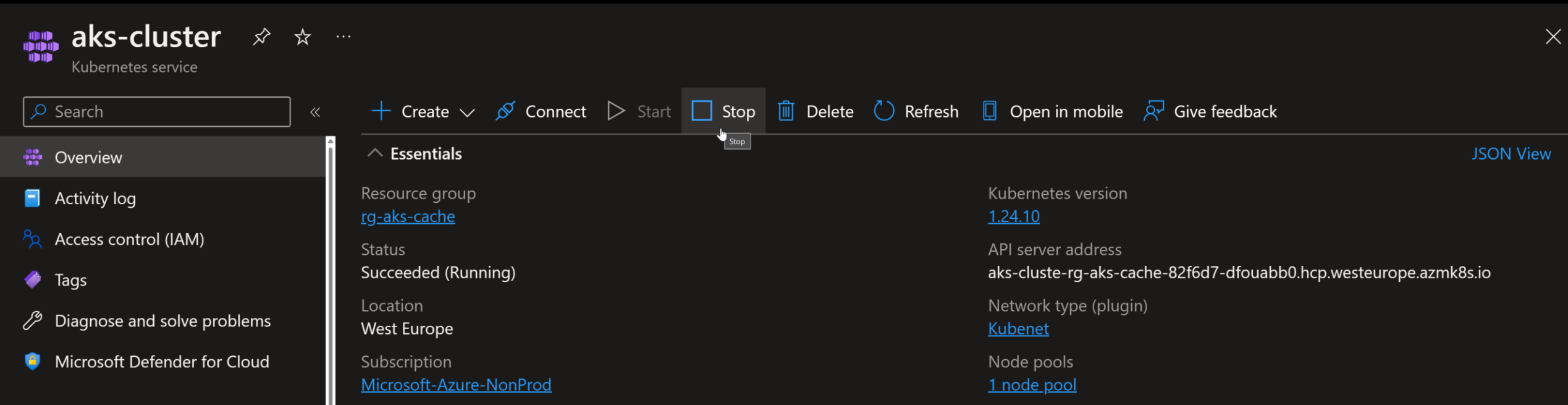
```
$ az aks start -n $AKS_NAME -g $AKS_RG
```




Could run as part of a DevOps pipeline

Stop all the cluster nodes during non-working hours (weekend, night)

Suites more the Dev/Test clusters, not recommended for Production clusters









Save the cost of Nodepools only, not the other resources like Load Balancer, Public IP...





aks-cluster   


Kubernetes service


Search


«  Create  Connect  Start  Stop  Delete  Refresh  Open in mobile  Give feedback


 Overview

 Activity log

 Access control (IAM)

 Tags

 Diagnose and solve problems


 Microsoft Defender for Cloud

Essentials [JSON View](#)

Resource group	Kubernetes version
rg-aks-cache	1.24.10
Status	API server address
Succeeded (Running)	aks-cluste-rg-aks-cache-82f6d7-dfouabb0.hcp.westeurope.azmk8s.io
Location	Network type (plugin)
West Europe	Kubenet
Subscription	Node pools
Microsoft-Azure-NonProd	1 node pool

Stop & start user nodepools

```
az aks nodepool start --cluster-name $AKS_NAME -g $AKS_RG -n $POOL_NAME
```

 **aks-cluster | Node pools** ☆ ⋮

Kubernetes service

+ Add node pool

↻ Refresh

▶ Start

□ Stop

⬆ Upgrade Kubernetes

⬆ Update image

⋮

Stop user node pools to save compute time.

Node pools

Nodes

Node pools provide space for applications to run. Node pools of different types can be added to the cluster to handle a variety of workloads, existing node pools can be scaled and upgraded, or node pools that are no longer needed can be deleted. Each node pool will contain nodes backed by virtual machines. [Learn more about node pools](#)

Choose the right VM SKU/family

Select a VM size ...



Search by VM size...

vCPUs : All

RAM (GiB) : All

Display cost : Monthly

Add filter

Showing 721 VM sizes. | Subscription: Microsoft-Azure-NonProd | Region: West Europe | Current size: Standard_D2ads_v5 | [Learn more about VM sizes](#)

Group by series

VM Size	Type	vCPUs	RAM (GiB)	Data disks	Max IOPS	Temp storage (GiB)	Premium disk	Cost/month
Most used by Azure users The most used sizes by users in Azure								
D-Series v5 The latest generation D family sizes recommended for your general purpose needs								
D2ads_v5	General purpose	2	8	4	3750	75	Supported	\$91.25
D2as_v5	General purpose	2	8	4	3750	0	Supported	\$75.92
D2ds_v5	General purpose	2	8	4	3750	75	Supported	\$99.28
D2lds_v5	General purpose	2	4	4	3750	75	Supported	\$81.03
D2ls_v5	General purpose	2	4	4	3750	0	Supported	\$70.81
D2pds_v5	General purpose	2	8	4	3750	75	Supported	\$79.57
D2plds_v5	General purpose	2	4	4	3750	75	Supported	\$64.97
D2pls_v5	General purpose	2	4	4	3750	0	Supported	\$56.65
D2ps_v5	General purpose	2	8	4	3750	0	Supported	\$67.16
D2s_v5	General purpose	2	8	4	3750	0	Supported	\$83.95
D4ads_v5	General purpose	4	16	8	6400	150	Supported	\$182.50
D4as_v5	General purpose	4	16	8	6400	0	Supported	\$151.84

Autoscale Nodepools

Dashboard > Resource groups > rg-aks-cache > aks-cluster

aks-cluster | Node pools

Kubernetes service

Search

<< + Add node pool ↻ Refresh ▶ Start □ Stop ↑ Upgrade Kubernetes ↑ Upd.

Overview

Activity log

Access control (IAM)

Tags

Diagnose and solve problems

Microsoft Defender for Cloud

Kubernetes resources

Namespaces

Workloads

Services and ingresses

Storage

Configuration

Settings

Node pools

Cluster configuration

Networking

Extensions + applications (preview)

Backup (preview)

Open Service Mesh

Node pools

Nodes

Node pools provide space for applications to run. Node pools of different types can be added to workloads, existing node pools can be scaled and upgraded, or node pools that are no longer ne will contain nodes backed by virtual machines. [Learn more about node pools](#)

Node pool	Provisioning state ⓘ	Power state ⓘ	Node count
appspool	Succeeded	Running	✓ 2/2 ready
nodepool1	Succeeded	Running	✓ 3/3 ready

Scale node pool

nodepool1

You can scale the number of nodes in your cluster to increase the total amount of cores and memory available for your container applications. [Learn more](#)

Scale method ⓘ

Manual

Autoscale - Recommended

This option is recommended so that the cluster is automatically sized correctly for the current running workloads.

Node count range ⓘ

3

Min: 1

Max: 1000

Node pool capacity

Virtual machine sizeStandard DS2 v2 (2 vcpus, 7 GiB memory)

Maximum cores100 vCPUs

Maximum memory350 GiB

Usage

i

The metrics included here are intended to provide context regarding scaling. To view all cluster metrics, including node pool metrics, go to the cluster [metrics view](#).

Show data for last:

30 days

Apply

Cancel

Free vs Standard control plane SKU

Free SKU for Dev/Test clusters

Standard SKU for Production clusters, costs about 70\$ per cluster (fixed)

aks-cluster | Cluster configuration ☆ ...

Kubernetes service

Search

Settings

- Node pools
- Cluster configuration**
- Networking
- Extensions + applications (preview)
- Backup (preview)
- Open Service Mesh
- GitOps
- Deployment center (deprecated)
- Automated deployments

Troubleshoot

Upgrade

You can upgrade your cluster to a newer version. If you upgrade your cluster, you can choose whether to upgrade the entire cluster or individual node pools, go to the 'Node pools' section.

[Learn more about upgrading your AKS cluster](#)
[View the Kubernetes changelog](#)

Kubernetes version

AKS pricing tier ⓘ

Free

Standard

The cluster management is free, but you'll be charged for VM, storage, and networking usage. Best for experimenting, learning, simple testing, or workloads with fewer than 10 nodes.

Recommended for mission-critical and production workloads. Includes Kubernetes control plane autoscaling, workload-intensive testing, and up to 5,000 nodes per cluster. Uptime SLA is 99.95% for clusters using Availability Zones and 99.9% for clusters not using Availability Zones.

Free

Enable secret store CSI driver ⓘ ☐

Spot Nodepools

Could be used in Dev/Test and Production clusters

Suited for running batches and stateless apps

Add a node pool

aks-cluster

Basics Optional settings Tags Review + Create

Node pool name * ⓘ

Mode * ⓘ
☒ User
☐ System

OS type ⓘ
☒ Linux
☐ Windows
Windows node pools are not supported on kubenet clusters

Kubernetes version * ⓘ
1.24.10

Availability zones ⓘ
None

Enable Azure Spot instances ⓘ
☒

Azure Spot configuration * ⓘ
No size configured
Eviction type: -
Eviction policy: -
[Configure](#)

Scale method ⓘ
☐ Manual
☒ Autoscale - **Recommended**
This option is recommended so that the cluster is automatically sized correctly for the current running workloads.

Node count range ⓘ
1 20
Min: 0 Max: 1000

Azure Spot configuration

Azure Spot offers unused Azure capacity at a discounted rate versus pay as you go prices. Workloads should be tolerant to infrastructure loss as Azure may recall capacity for pay as you go workloads. [Learn more about Azure Spot instances.](#)

Spot options

Eviction type ⓘ

- ☐ Capacity only: Your virtual machine will be evicted when Azure's excess capacity disappears.
- ☒ Price or capacity: Your virtual machine will be evicted when Azure's excess capacity disappears, or costs exceed your specified max price.

Eviction policy ⓘ

- ☒ Stop / Deallocate
- ☐ Delete

Size and pricing

Node size * ⓘ

Standard D8ads v5
8 vCPUs, 32 GiB memory
[View pricing history](#)
[Choose a size](#)

Maximum price you want to pay per hour (USD) ⓘ

0.07 ✓
Enter a price greater than or equal to the hardware costs (\$0.05000)

More resources


Azure FinOps guide:

<https://techcommunity.microsoft.com/t5/fasttrack-for-azure/the-azure-finops-guide/ba-p/3704132>

How to reduce the total cost of ownership (TCO) of your AKS cluster:

<https://techcommunity.microsoft.com/t5/fasttrack-for-azure/how-to-reduce-the-total-cost-of-ownership-tco-of-your-azure/ba-p/3706895>

How to reduce the total cost of ownership (TCO) of your Azure Kubernetes Service (AKS) cluster


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By  Paolo Salvatori

Published Jan 02 2023 06:26 AM

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This article contains a few recommendations for reducing the [total cost of ownership \(TCO\)](#) of your [Azure Kubernetes Service \(AKS\)](#) cluster.

Recommendations

If you want to minimize the number of unused cores, you can use the following general guidelines to improve the density of your workloads and reduce the number of VMs to the bare minimum.

- Use the [cluster autoscaler](#), [Kubernetes Event-Driven Autoscaler \(KEDA\)](#), and [Horizontal Pod Autoscaler](#) to scale in and scale out the number of pods and the number of nodes based on the traffic conditions.
- Make sure to properly set [requests and limits](#) for pods to avoid assigning too many resources in terms of CPU and memory to the user-defined workloads and improve application density. You can observe the average and maximum consumption of CPU and memory using Prometheus or Container Insights and properly configure limits and quotas for your pods in the YAML manifests, [Helm](#) charts, [Kustomize](#) manifests for your deployments. For more information, see [Best practices for application developers to manage resources in Azure Kubernetes Service \(AKS\)](#). There are 3rd party tools like [Densify](#) that, by gathering granular container data from frameworks like Prometheus, learning the patterns of activity, and applying policies, can suggest requests and limits for each pod container, optimizing the overall density.
- Use [ResourceQuota](#) objects to set quotas for the total amount of memory and CPU that can be used by all Pods running in a given [namespace](#) to prevent or reduce the likelihood of the noisy neighbor's issue, improve the application density, and reduce the number of agent nodes and hence the total cost of ownership. Likewise, Use [LimitRange](#) objects to configure the default requests in terms of [CPU](#) and [memory](#) for pods running in a namespace. Azure Policy integrates with AKS through built-in policies to apply at-scale enforcements and safeguards on your cluster in a centralized, consistent manner. Follow the documentation to enable the [Azure Policy add-on on your cluster](#) and apply the [Ensure CPU and memory resource limits](#) policy, ensuring CPU and memory resource limits are defined on containers in an Azure Kubernetes Service cluster.
- Use the [Vertical Pod Autoscaler \(VPA\)](#), based on the open-source [Kubernetes](#) version, to analyze and set CPU and memory resources required by your pods. Instead of running tests to calculate the optimal CPU and memory requests and limits for the containers in your pods, you can configure vertical Pod autoscaling to provide recommended values for CPU and memory requests and limits that you can use to update your pods manually, or you can configure vertical Pod autoscaling to update the values automatically. When configured, the [Vertical Pod Autoscaler \(VPA\)](#) automatically sets resource requests and limits on containers per workload based on past usage. This ensures pods are scheduled onto nodes with the required CPU and memory