What is Kubernetes?

According to Wikipedia, "*It is an open-source container orchestration system for automating computer application deployment, scaling, and management*".

Kubernetes is commonly called K8s. It was originally designed by Google and is now maintained by Cloud Native Computing Foundation. It works with a range of container tools and runs containers on clusters, often with images built using Docker. It was founded by Joe Beda, Brendan Burns, and Craig McLuckie. It was first announced in mid-2014. K8s v1.0 was released on July 21, 2015.

Kubernetes is employed because it makes the work of organizing and scheduling applications across multiple machines much easier. It can automatically install a storage system. It carries out automated rollouts and rollbacks. It possesses the characteristics of self healing. It supports clouds with three different types of privacy. They are public, private and hybrid.

What is Azure Kubernetes Service (AKS)?

It is a fully managed service that allows you to run Kubernetes in Azure without having to manage your own Kubernetes clusters.

The basic features of Azure Kubernetes Services are:

- In the case of VMs, we need to pay only for the nodes.

- It works with various Azure and OSS tools and services.

- As a hosted Kubernetes service, Azure handles critical tasks, like health monitoring and maintenance.

- Kubernetes can scale nodes using cluster autoscaler.

- AKS automatically configures all of the Kubernetes nodes that control and manage the worker nodes during the deployment process.

- Users can monitor a cluster directly or view all clusters with [Azure Monitor](#).

Users can access AKS in three different ways:

- Through the AKS management portal

- Through AKS CLI

- By using templates through

Azure Kubernetes Service features and benefits

As a managed service provided by Microsoft, AKS automatically configures all [Kubernetes nodes](#) that control and manage the worker nodes during deployment. It also handles other tasks, including [governance](#), cluster [scalability](#), connections to monitoring services and configuration of [advanced networking features](#). Users can monitor a cluster directly or view all clusters with Azure Monitor. The primary benefits of AKS are flexibility, [automation](#) and reduced management overhead.

AKS also helps to speed up the development and deployment of cloud-native apps. It provides prebuilt cluster configurations for Kubernetes, built-in code-to-cloud pipelines and guardrails that make it easy to do the following:

- Spin up managed Kubernetes clusters.

- Develop and debug [microservices applications](#).

- Simplify [runtime](#) and portability.

- Set up a test deployment strategy.

- Detect failures.

AKS node configurations can be customized to adjust operating system (OS) settings or [kubelet](#) parameters, depending on the workload. Also, nodes can be scaled up or down to accommodate fluctuations in resource demands. For additional processing power -- say, to run resource-intensive workloads -- AKS supports graphics processing unit ([GPU](#))-enabled node pools. In addition, users can define user node pools to support applications with different compute or storage requirements and create custom tags to modify resources.

AKS integrates with [Azure Container Registry](#) to create and manage [container images](#) and related artifacts -- an [authentication](#) mechanism must be established first. Also, since AKS

supports [Azure Disks](), users can dynamically create persistent [volumes]() in AKS for use with Kubernetes pods.
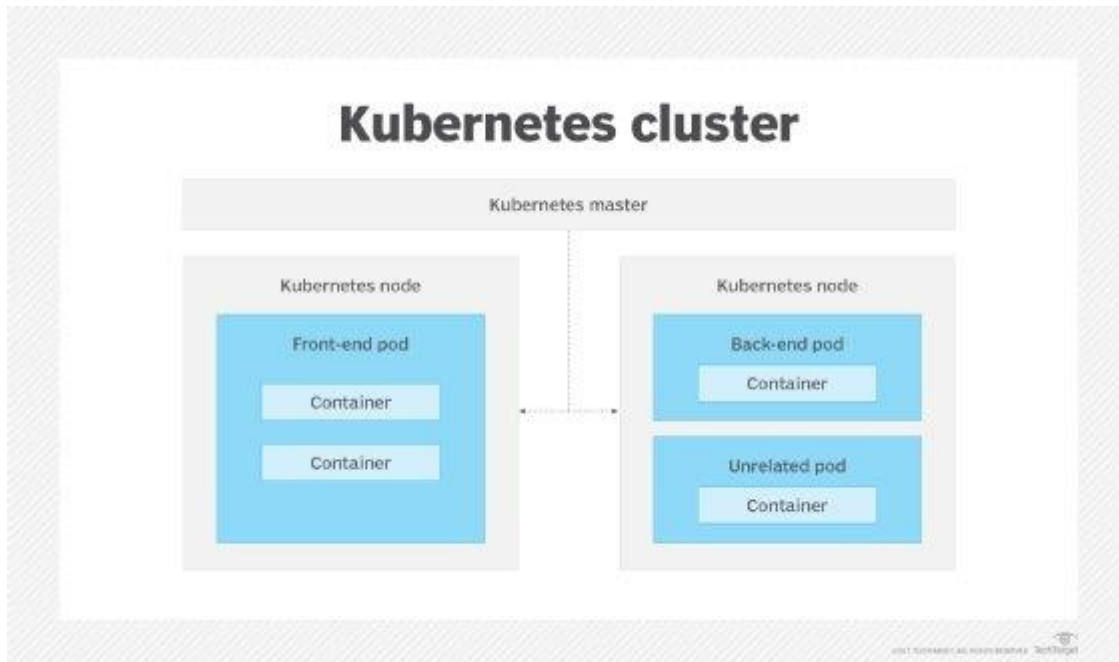
Azure Kubernetes Service architecture

With AKS, users can create Kubernetes clusters from the Azure portal, Azure [PowerShell](), [Azure Command-Line Interface]() (CLI) or Azure Resource Manager templates. An AKS cluster has at least one node. However, the clusters can run multiple node pools to support mixed OSes and [Windows Server]() containers, and they can be upgraded with the Azure portal, Azure CLI or Azure PowerShell.

Regardless of the creation method used, when an AKS cluster is created, a [control plane]() is also automatically created and configured. The control plane is a managed Azure resource that the user cannot directly access. In addition to the control plane, AKS also configures Kubernetes nodes once the user deploys the cluster and specifies the node number and size.

All AKS nodes run on Azure VMs. Both single and multiple GPU-enabled VMs are available. AKS provides an Azure Linux container host, a lightweight and hardened OS image for running container workloads on AKS.

All Kubernetes development and management tools work with AKS. Azure also provides multiple tools to streamline Kubernetes.

Kubernetes cluster

This image shows a representation of a Kubernetes pod encapsulating a container and how the pods are gathered into nodes.

Azure Kubernetes Service use cases

Organizations can use AKS to automate and streamline the migration of applications into containers. AKS is also useful to deploy, scale and manage diverse groups of containers, which helps with the launch and operation of microservices-based applications.

AKS usage can complement Agile software development paradigms, such as continuous integration/continuous delivery (CI/CD) and DevOps. Thus, developers could place a new container build into a repository like GitHub, move those builds into ACR and then use AKS to launch the workload into operational containers.

Data streaming can be made easier with AKS as well. It can be used to process real-time data streams to perform quick analyses and enable fast decision-making.

AKS can also be used for internet of things (IoT) applications. It can ensure that adequate compute resources are available to process data from large numbers of discrete IoT devices. Similarly, AKS can help ensure adequate

compute resources for [big data](#) tasks or compute-intensive workloads, such as [machine learning](#) model training, [visualization](#) and so on.

Pros and Cons of Azure Kubernetes Service (AKS)

- **Pros / Strengths:**

-> AKS has a very good support system for windows.
-> Configuring the virtual network and subnet is very simple.
-> Vigorous support to the command line.
-> Azure Active Directory integration for cluster authentication.

- **Cons / Weaknesses:**

-> Being a relatively new technology, many features of AKS are still in the testing levels.
-> The Virtual Machines do not support customization directly and there is no ability to provide a cloud init or user data script.
-> The server type cannot be changed, once it has been deployed.
-> Node updates are not automatically done.
Nodes do not recover automatically after failure.