

# Create and Configure Azure Kubernetes Service

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# Course Coverage of Certification Objectives



## Create and Configure Azure Kubernetes Service

- Configure storage for AKS
- Configure scaling for AKS
- Configure network connections for AKS
- Upgrade an AKS cluster



# Create and Configure Azure Kubernetes Service

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# What is Azure Kubernetes Service



Open-source system for automating deployment, scaling and management of containerized apps



It's a management platform using declarative configuration to orchestrate containers in different compute environments



A Kubernetes deployment is configured as a cluster consisting of at least one master machine and one or more workers machines



Azure Kubernetes Service (AKS) manages hosted Kubernetes clusters



AKS cluster master is managed by Azure and is free



# Create Azure Kubernetes Cluster



Nodes of the same configuration are grouped into node pools



When you create your cluster, you create a system node pool



The AKS cluster must use virtual machine scale sets for the nodes for autoscaling and multiple node pools



All node pools must reside in the same virtual network



AKS cluster must use the *Standard SKU* load balancer to use multiple node pools



# Create an Azure Kubernetes Cluster

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# Create an Azure Kubernetes Cluster

[Home](#) > [Kubernetes services](#) >

## Create Kubernetes cluster

[Basics](#) [Node pools](#) [Authentication](#) [Networking](#) [Integrations](#) [Tags](#) [Review + create](#)

Azure Kubernetes Service (AKS) manages your hosted Kubernetes environment, making it quick and easy to deploy and manage containerized applications without container orchestration expertise. It also eliminates the burden of ongoing operations and maintenance by provisioning, upgrading, and scaling resources on demand, without taking your applications offline. [Learn more about Azure Kubernetes Service](#)

### Project details

Select a subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription \* ⓘ

ps-course-development

Resource group \* ⓘ

[Create new](#)

### Cluster details

Kubernetes cluster name \* ⓘ

PSAKSCluster1

Region \* ⓘ

(US) Central US

Availability zones ⓘ

None

Kubernetes version \* ⓘ

1.17.11 (default)

### Primary node pool

The number and size of nodes in the primary node pool in your cluster. For production workloads, at least 3 nodes are recommended for resiliency. For development or test workloads, only one node is required. If you would like to add additional node pools or to see additional configuration options for this node pool, go to the 'Node pools' tab above. You will be able to add additional node pools after creating your cluster. [Learn more about node pools in Azure Kubernetes Service](#)

Node size \* ⓘ

Standard B2s

2 vcpus, 4 GiB memory

[Change size](#)

[Review + create](#)

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# Create an Azure Kubernetes Cluster

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## Create Kubernetes cluster

Basics

Node pools

Authentication

Networking

Integrations

Tags

Review + create

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Select a subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

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Node size \* ⓘ

Standard DS2 v2

[Change size](#)

Node count \* ⓘ

3

Node size \* ⓘ

Standard B2s

2 vcpus, 4 GiB memory

[Change size](#)

Review + create

< Previous

Next : Node pools >





# Create an Azure Kubernetes Cluster

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## Create Kubernetes cluster

Basics **Node pools** Authentication Networking Integrations Tags Review + create

### Node pools

In addition to the required primary node pool configured on the Basics tab, you can also add optional node pools to handle a variety of workloads. [Learn more about multiple node pools](#)

[+ Add node pool](#) [Delete](#)

	Name	OS type	Node count	Node size	Availability zones
<input type="checkbox"/>	agentpool (primary)	Linux	3	Standard_B2s	None

### Enable virtual nodes

Virtual nodes allow burstable scaling backed by serverless Azure Container Instances. [Learn more about virtual nodes](#)

Enable virtual nodes ☐

### Enable virtual machine scale sets

Enabling virtual machine scale sets will create a cluster that uses virtual machine scale sets instead of individual virtual machines for the cluster nodes. Virtual machine scale sets are required for scenarios including autoscaling, multiple node pools, and Windows support. [Learn more about virtual machine scale sets in AKS](#)

Enable virtual machine scale sets ☒

[Review + create](#) [< Previous](#) [Next : Authentication >](#)



# Create an Azure Kubernetes Cluster

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## Create Kubernetes cluster

Basics Node pools **Authentication** Networking Integrations Tags Review + create

**Cluster infrastructure**

The cluster infrastructure authentication specified is used by Azure Kubernetes Service to manage cloud resources attached to the cluster. This can be either a [service principal](#) or a [system-assigned managed identity](#).

Authentication method ☒ Service principal ☐ System-assigned managed identity

Service principal \* ⓘ   
[Configure service principal](#)

**Kubernetes authentication and authorization**

Authentication and authorization are used by the Kubernetes cluster to control user access to the cluster as well as what the user may do once authenticated. [Learn more about Kubernetes authentication](#)

Role-based access control (RBAC) ⓘ ☒ Enabled ☐ Disabled

AKS-managed Azure Active Directory ⓘ ☐ Enabled ☒ Disabled

**Node pool OS disk encryption**

By default, all disks in AKS are encrypted at rest with Microsoft-managed keys. For additional control over encryption, you can supply your own keys using a disk encryption set backed by an Azure Key Vault. The disk encryption set will be used to encrypt the OS disks for all node pools in the cluster. [Learn more](#)

Encryption type

[Review + create](#) [< Previous](#) [Next : Networking >](#)



# Create an Azure Kubernetes Cluster

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## Create Kubernetes cluster

Basics Node pools Authentication **Networking** Integrations Tags Review + create

You can change networking settings for your cluster, including enabling HTTP application routing and configuring your network using either the 'Kubenet' or 'Azure CNI' options:

- The **kubenet** networking plug-in creates a new VNet for your cluster using default values.
- The **Azure CNI** networking plug-in allows clusters to use a new or existing VNet with customizable addresses. Application pods are connected directly to the VNet, which allows for native integration with VNet features.

[Learn more about networking in Azure Kubernetes Service](#)

Network configuration ⓘ ☒ Kubenet ☐ Azure CNI

DNS name prefix \* ⓘ  ✓

**Traffic routing**

Load balancer ⓘ Standard

Enable HTTP application routing ⓘ ☐

**Security**

Enable private cluster ⓘ ☐

Set authorized IP ranges ⓘ ☐

Network policy ⓘ ☒ None ☐ Calico ☐ Azure

**i** The Azure network policy is not compatible with kubenet networking.

[Review + create](#) [< Previous](#) [Next : Integrations >](#)



# Create an Azure Kubernetes Cluster

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## Create Kubernetes cluster

Basics Node pools Authentication Networking Integrations Tags Review + create

Connect your AKS cluster with additional services.

**Azure Container Registry**  
Connect your cluster to an Azure Container Registry to enable seamless deployments from a private image registry. You can create a new registry or choose one you already have. [Learn more about Azure Container Registry](#)

Container registry None

**i** The system-assigned managed identity authentication method must be used in order to associate an Azure Container Registry.

**Azure Monitor**  
In addition to the CPU and memory metrics included in AKS by default, you can enable Container Insights for more comprehensive data on the overall performance and health of your cluster. Billing is based on data ingestion and retention settings.  
[Learn more about container performance and health monitoring](#)  
[Learn more about pricing](#)

Container monitoring ☒ Enabled ☐ Disabled

Log Analytics workspace ? DefaultWorkspace-8bc4fbf0-6ad5-4922-aaaa-226b44e5db84-CUS  
[Create new](#)

**Azure Policy**  
Apply at-scale enforcements and safeguards for AKS clusters in a centralized, consistent manner through Azure Policy.  
[Learn more about Azure Policy for AKS](#)

Azure Policy ☐ Enabled ☒ Disabled

Review + create < Previous Next : Tags >



# Create an Azure Kubernetes Cluster

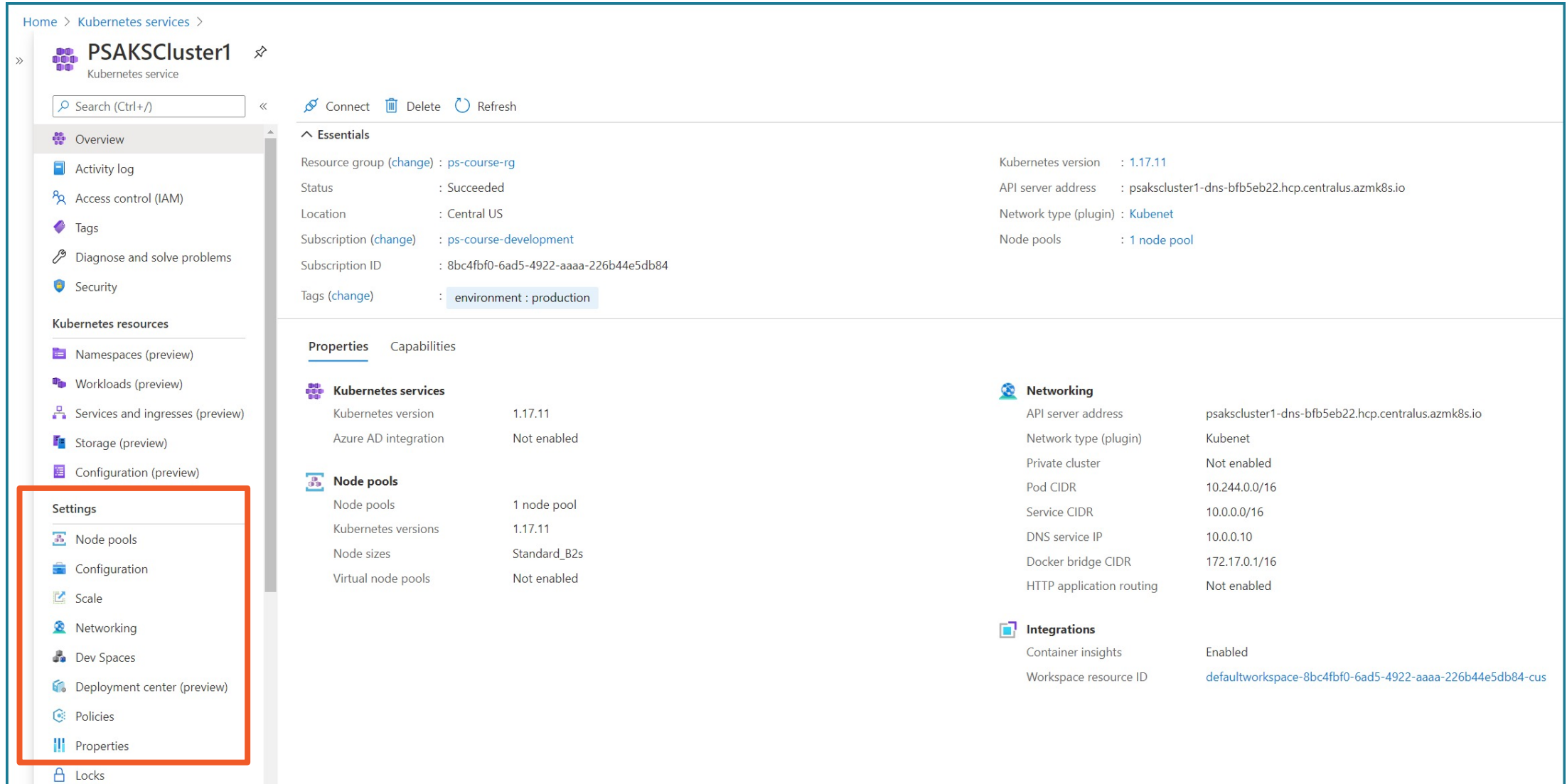
The screenshot displays the Azure portal interface for a Kubernetes service named **PSAKSCluster1**. The left-hand navigation pane is expanded, showing the **Kubernetes resources** section, which is highlighted with a red rectangle. This section includes links to **Namespaces (preview)**, **Workloads (preview)**, **Services and ingresses (preview)**, **Storage (preview)**, and **Configuration (preview)**. Below this, the **Settings** section lists **Node pools**, **Configuration**, **Scale**, **Networking**, **Dev Spaces**, **Deployment center (preview)**, **Policies**, **Properties**, and **Locks**.

The main content area is divided into several sections:

- Essentials**: Provides a quick overview of the cluster's configuration.
  - Resource group (change): [ps-course-rg](#)
  - Status: Succeeded
  - Location: Central US
  - Subscription (change): [ps-course-development](#)
  - Subscription ID: 8bc4fbf0-6ad5-4922-aaaa-226b44e5db84
  - Tags (change): environment : production
  - Kubernetes version: 1.17.11
  - API server address: psakscluster1-dns-bfb5eb22.hcp.centralus.azurek8s.io
  - Network type (plugin): [Kubenet](#)
  - Node pools: 1 node pool
- Properties**: A tabbed view showing detailed configuration.
  - Kubernetes services**:
    - Kubernetes version: 1.17.11
    - Azure AD integration: Not enabled
  - Node pools**:
    - Node pools: 1 node pool
    - Kubernetes versions: 1.17.11
    - Node sizes: Standard\_B2s
    - Virtual node pools: Not enabled
  - Networking**:
    - API server address: psakscluster1-dns-bfb5eb22.hcp.centralus.azurek8s.io
    - Network type (plugin): Kubenet
    - Private cluster: Not enabled
    - Pod CIDR: 10.244.0.0/16
    - Service CIDR: 10.0.0.0/16
    - DNS service IP: 10.0.0.10
    - Docker bridge CIDR: 172.17.0.1/16
    - HTTP application routing: Not enabled
  - Integrations**:
    - Container insights: Enabled
    - Workspace resource ID: defaultworkspace-8bc4fbf0-6ad5-4922-aaaa-226b44e5db84-cus



# Create an Azure Kubernetes Cluster



Home > Kubernetes services >

PSAKSCluster1  
Kubernetes service

Search (Ctrl+ /)

Connect Delete Refresh

Overview

- Activity log
- Access control (IAM)
- Tags
- Diagnose and solve problems
- Security

Kubernetes resources

- Namespaces (preview)
- Workloads (preview)
- Services and ingresses (preview)
- Storage (preview)
- Configuration (preview)

Settings

- Node pools
- Configuration
- Scale
- Networking
- Dev Spaces
- Deployment center (preview)
- Policies
- Properties

Locks

Essentials

Resource group (change) : ps-course-rg

Status : Succeeded

Location : Central US

Subscription (change) : ps-course-development

Subscription ID : 8bc4fbf0-6ad5-4922-aaaa-226b44e5db84

Tags (change) : environment : production

Kubernetes version : 1.17.11

API server address : psakscluster1-dns-bfb5eb22.hcp.centralus.azmk8s.io

Network type (plugin) : Kubenet

Node pools : 1 node pool

Properties Capabilities

Kubernetes services

Kubernetes version : 1.17.11

Azure AD integration : Not enabled

Node pools

Node pools : 1 node pool

Kubernetes versions : 1.17.11

Node sizes : Standard\_B2s

Virtual node pools : Not enabled

Networking

API server address : psakscluster1-dns-bfb5eb22.hcp.centralus.azmk8s.io

Network type (plugin) : Kubenet

Private cluster : Not enabled

Pod CIDR : 10.244.0.0/16

Service CIDR : 10.0.0.0/16

DNS service IP : 10.0.0.10

Docker bridge CIDR : 172.17.0.1/16

HTTP application routing : Not enabled

Integrations

Container insights : Enabled

Workspace resource ID : defaultworkspace-8bc4fbf0-6ad5-4922-aaaa-226b44e5db84-cus



# Create an Azure Kubernetes Cluster

The screenshot displays the Azure portal interface for a Kubernetes service named 'PSAKSCluster1'. The left-hand navigation pane includes sections for 'Overview' (Activity log, Access control, Tags, Diagnose and solve problems, Security), 'Kubernetes resources' (Namespaces, Workloads, Services and ingresses, Storage, Configuration), and 'Settings' (Node pools, Configuration, Scale, Networking, Dev Spaces, Deployment center, Policies, Properties, Locks). The main content area is divided into 'Essentials', 'Properties', and 'Capabilities' tabs. The 'Essentials' tab shows cluster details: Resource group (ps-course-rg), Status (Succeeded), Location (Central US), Subscription (ps-course-development), Subscription ID (8bc4fbf0-6ad5-4922-aaaa-226b44e5db84), and Tags (environment: production). The 'Properties' tab is further divided into 'Kubernetes services' (Kubernetes version: 1.17.11, Azure AD integration: Not enabled) and 'Node pools' (1 node pool, Kubernetes versions: 1.17.11, Node sizes: Standard\_B2s, Virtual node pools: Not enabled). A red-bordered box highlights the 'Networking' section, which lists: API server address (psakscluster1-dns-bfb5eb22.hcp.centralus.azmk8s.io), Network type (Kubenet), Private cluster (Not enabled), Pod CIDR (10.244.0.0/16), Service CIDR (10.0.0.0/16), DNS service IP (10.0.0.10), Docker bridge CIDR (172.17.0.1/16), and HTTP application routing (Not enabled). Below this, the 'Integrations' section shows Container insights (Enabled) and Workspace resource ID (defaultworkspace-8bc4fbf0-6ad5-4922-aaaa-226b44e5db84-cus).

Home > Kubernetes services >

» **PSAKSCluster1**   
Kubernetes service

Search (Ctrl+/) << Connect Delete Refresh

**Overview**

- Activity log
- Access control (IAM)
- Tags
- Diagnose and solve problems
- Security

**Kubernetes resources**

- Namespaces (preview)
- Workloads (preview)
- Services and ingresses (preview)
- Storage (preview)
- Configuration (preview)

**Settings**

- Node pools
- Configuration
- Scale
- Networking
- Dev Spaces
- Deployment center (preview)
- Policies
- Properties
- Locks

**Essentials**

Resource group (change) : [ps-course-rg](#)

Status : Succeeded

Location : Central US

Subscription (change) : [ps-course-development](#)

Subscription ID : 8bc4fbf0-6ad5-4922-aaaa-226b44e5db84

Tags (change) : [environment : production](#)

Kubernetes version : 1.17.11

API server address : [psakscluster1-dns-bfb5eb22.hcp.centralus.azmk8s.io](#)

Network type (plugin) : [Kubenet](#)

Node pools : 1 node pool

**Properties** Capabilities

**Kubernetes services**

Kubernetes version : 1.17.11

Azure AD integration : Not enabled

**Node pools**

Node pools : 1 node pool

Kubernetes versions : 1.17.11

Node sizes : Standard\_B2s

Virtual node pools : Not enabled

**Networking**

API server address : [psakscluster1-dns-bfb5eb22.hcp.centralus.azmk8s.io](#)

Network type (plugin) : Kubenet

Private cluster : Not enabled

Pod CIDR : 10.244.0.0/16

Service CIDR : 10.0.0.0/16

DNS service IP : 10.0.0.10

Docker bridge CIDR : 172.17.0.1/16

HTTP application routing : Not enabled

**Integrations**

Container insights : Enabled

Workspace resource ID : [defaultworkspace-8bc4fbf0-6ad5-4922-aaaa-226b44e5db84-cus](#)



# Create a AKS Single Node Cluster

*# Create a basic single-node AKS cluster*

```
az aks create \  
  --resource-group ps-course-rg \  
  --name PSAKSCluster \  
  --vm-set-type VirtualMachineScaleSets \  
  --node-count 2 \  
  --generate-ssh-keys \  
  --load-balancer-sku standard
```





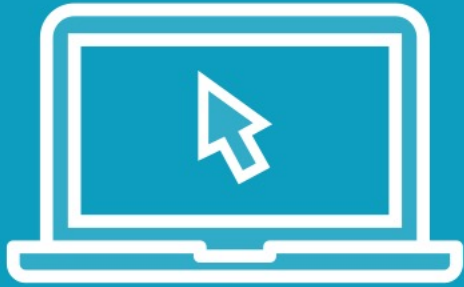
# Add an AKS Node Pool

*# Add and AKS Node Pool*

```
az aks nodepool add \  
    --resource-group ps-course-rg \  
    --cluster-name PSAKSCluster \  
    --name mynodepool \  
    --node-count 3
```



# Demo



## Create an AKS Cluster and Node Pool



# Configure Storage for Azure Kubernetes Service

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# Storage Concepts for AKS

**Volumes**

**Persistent Volumes**

**Storage classes**

**Persistent volume claims**



# Storage Types and Capabilities

Use case	Volume plugin	Read/write once	Read-only many	Read/write many	Windows Server container support
Shared configuration	Azure Files	Yes	Yes	Yes	Yes
Structured app data	Azure Disks	Yes	No	Yes	Yes
unstructured data, file system operations	BlobFuse	Yes	Yes	Yes	No



# Configure Scaling for Azure Kubernetes Service

---



# Scaling Options

**Manual scale pods  
or nodes**

**Horizontal pod  
auto-scaler**


**Cluster  
auto-scaler**



# Scaling

# Manual scale pods

```
kubectl scale --replicas=5 deployment/azure-vote-front
```



# Manual scale nodes

```
az aks scale --resource-group ps-course-rg --name myAKSCluster --node-count 3
```

# Autoscale

```
kubectl autoscale deployment azure-vote-front --cpu-percent=50 --min=3 --max=10
```






# Scaling

# Manual scale pods

```
kubectl scale --replicas=5 deployment/azure-vote-front
```

# Manual scale nodes

```
az aks scale --resource-group ps-course-rg --name myAKSCluster --node-count 3
```



# Autoscale

```
kubectl autoscale deployment azure-vote-front --cpu-percent=50 --min=3 --max=10
```



# Scaling

# Manual scale pods


```
kubectl scale --replicas=5 deployment/azure-vote-front
```

# Manual scale nodes

```
az aks scale --resource-group ps-course-rg --name myAKSCluster --node-count 3
```

# Autoscale

```
kubectl autoscale deployment azure-vote-front --cpu-percent=50 --min=3 --max=10
```



# Configure Networking for Azure Kubernetes Service

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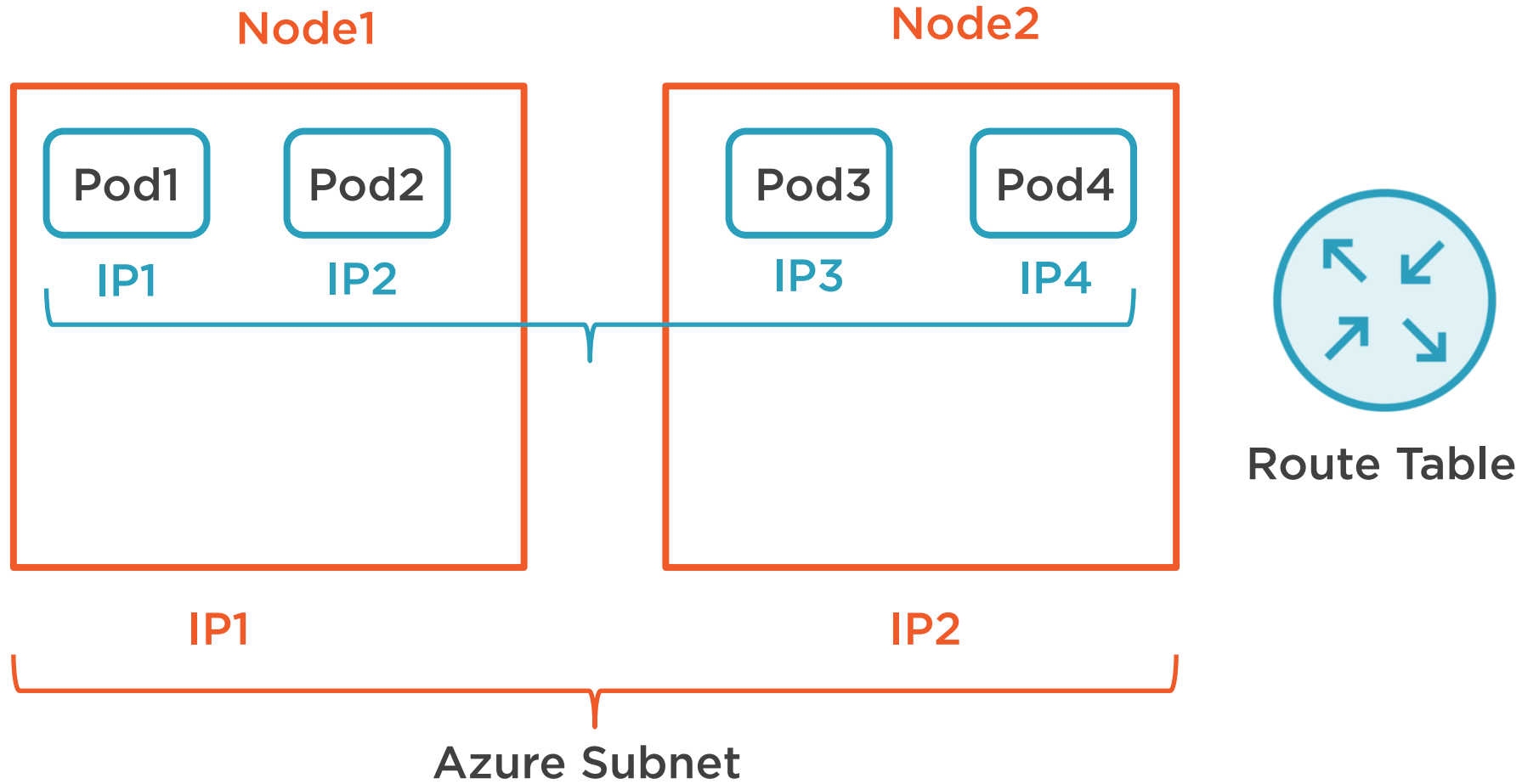
# Kubernetes and Azure CLI

Capabilities	Kubernetes	Azure CNI
Deploy cluster in existing or new VNet	Supported-UDRs manually applied	Supported
Pod->Pod connectivity	Supported	Supported
Pod->VM, VM in same vNet	Works when initiated by pod	Works both ways
Pod->VM, VM in peered vNet	Works when initiated by pod	Works both ways
On-prem access using VPN	Works when initiated by pod	Works both ways
Access to resources secured by service endpoints	Supported	Supported
Expose Kubernetes service using a load balancer, App Gateway, or ingress controller	Supported	Supported




Link: <https://bit.ly/2QZvpHz>







# Kubernetes



# Kubernetes

 **aks-agentpool-19694923-routetable**  

Route table

 Move   Delete  Refresh

Overview

Activity log

Access control (IAM)

Tags

Diagnose and solve problems

Settings

Configuration

Routes

Subnets

Properties

Locks

Monitoring

Alerts

Automation

Tasks (preview)

^ Essentials

JSON View

Resource group (change) : mc\_ps-course-rg\_myakscluster\_eastus

Associations : 1 subnet associations

Location : East US

Subscription (change) : ps-course-development

Subscription ID : 8bc4fbf0-6ad5-4922-aaaa-226b44e5db84

Tags (change) : [Click here to add tags](#)

Routes

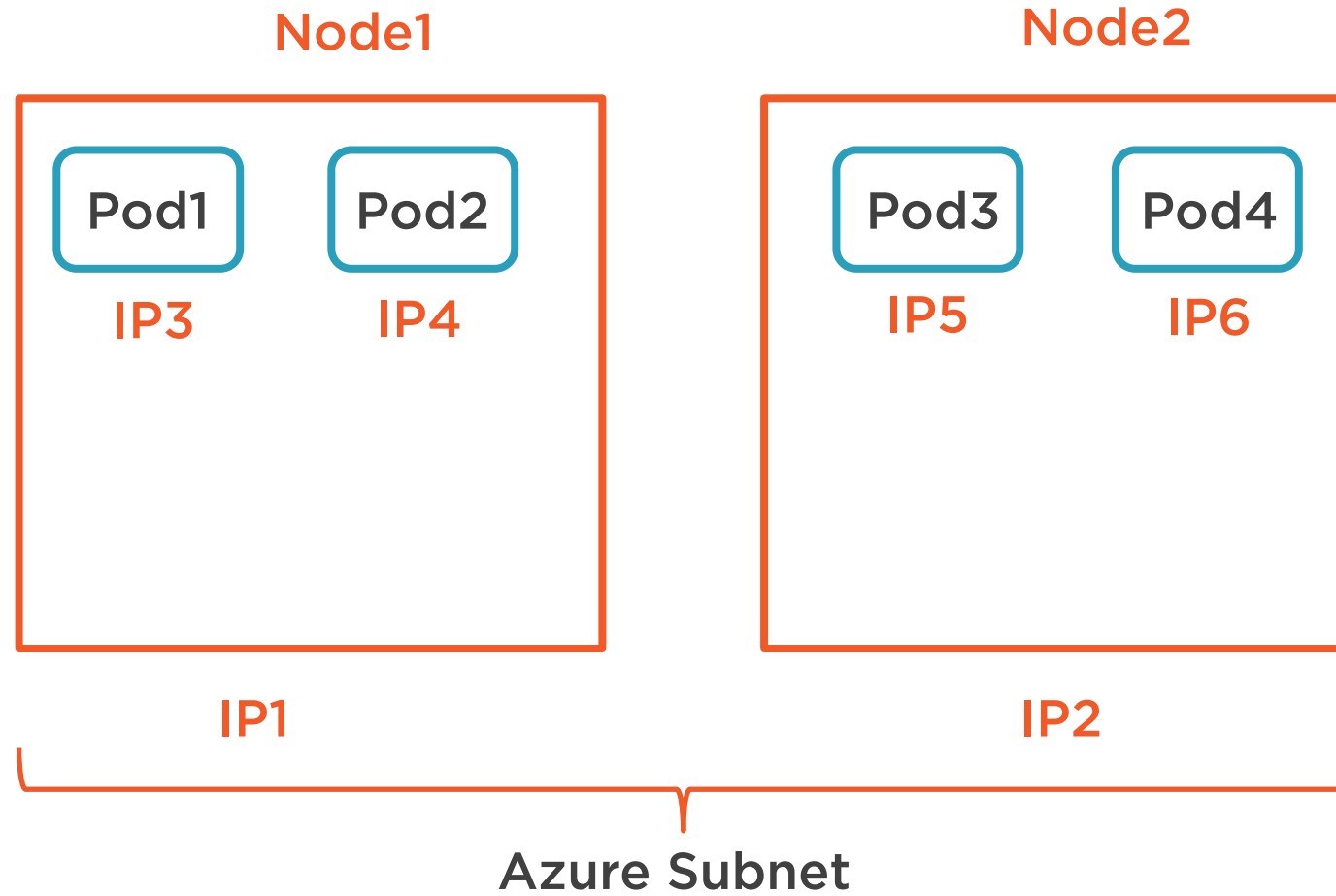
Name	↑↓ Address prefix	↑↓ Next hop type	↑↓ Next hop IP address	↑↓
aks-agentpool-19694923-vmss000000	10.244.2.0/24	Virtual appliance	10.240.0.4	...
aks-agentpool-19694923-vmss000001	10.244.1.0/24	Virtual appliance	10.240.0.5	...
aks-agentpool-19694923-vmss000002	10.244.0.0/24	Virtual appliance	10.240.0.6	...

Subnets

Name	↑↓ Address range	↑↓ Virtual network	↑↓ Security group	↑↓
aks-subnet	10.240.0.0/16	aks-vnet-19694923	aks-agentpool-19694923-nsg	...



# Azure CNI



# Upgrade an Azure Kubernetes Cluster

---





```
# Show current version of AKS
```

```
az aks show --resource-group ps-course-rg --name myAKSCluster --output table
```

```
# Get available upgrades for the cluster
```

```
az aks get-upgrades --resource-group ps-course-rg --name myAKSCluster
```

```
# Upgrade cluster
```

```
az aks upgrade --resource-group ps-course-rg --name myAKSCluster --kubernetes-version KUBERNETES_VERSION
```

## Upgrading a cluster

**You can only upgrade one minor version at a time.**

- You can upgrade from 1.14.x to 1.15.x
- You cannot upgrade from 1.14.x to 1.16.x



```
# Show current version of AKS
```

```
az aks show --resource-group ps-course-rg --name myAKSCluster --output table
```

```
# Get available upgrades for the cluster
```

```
az aks get-upgrades --resource-group ps-course-rg --name myAKSCluster
```

```
# Upgrade cluster
```

```
az aks upgrade --resource-group ps-course-rg --name myAKSCluster --kubernetes-version KUBERNETES_VERSION
```

## Upgrading a cluster

**You can only upgrade one minor version at a time.**

- You can upgrade from 1.14.x to 1.15.x
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```
# Show current version of AKS
```

```
az aks show --resource-group ps-course-rg --name myAKSCluster --output table
```

```
# Get available upgrades for the cluster
```

```
az aks get-upgrades --resource-group ps-course-rg --name myAKSCluster
```

```
# Upgrade cluster
```

```
az aks upgrade --resource-group ps-course-rg --name myAKSCluster --kubernetes-version KUBERNETES_VERSION
```

## Upgrading a cluster

**You can only upgrade one minor version at a time.**

- You can upgrade from 1.14.x to 1.15.x
- You cannot upgrade from 1.14.x to 1.16.x



# Overview



## Create and Configure Azure Container

- Registries are the locations of our images
- Image source is the image pulled from the registry
- Restart policies include:
  - Always
  - On failure
  - Never
- Container groups are co-located containers on the same host



# Overview



## Create and Configure Azure Kubernetes Service

- Kubernetes is a container management platform
- A Kubernetes deployment is configured as a cluster consisting of at least one master machine and one or more worker machines
- Standard Load balancer is required for additional features such as autoscaling
- Clusters can be configured using VM scale sets
- Node pools reside in the same Vnet



# Overview



## Create and Configure Azure Kubernetes Service

- Scaling can include the number of nodes and or the number of pods
- Kubenet uses a routing table for inter-pod comms
- Kubnet assigns a CIDR block of unique, reusable IPs
- Azure CNI assigns IPs from the subnet to the worker nodes and pods
- You cannot skip minor versions when you're upgrading a cluster



# For Further Learning

## Remember the course exercise files

- Links to the Azure Docs sites for additional studying and deeper dives
- Any code used in the demos.
- PowerPoint slides for review purposes

## Questions?

- Join the conversation in the discussion tab in the Pluralsight player
- Hit me up on LinkedIn

