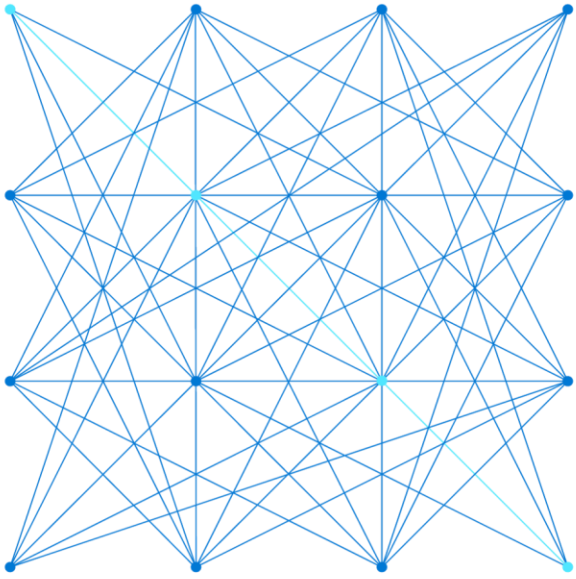
Microsoft Azure

6. Administer Azure PaaS Compute



Administer PaaS Compute Options Introduction

Configure Azure App Service Plans

Configure Azure App Services

Configure Azure Container Instances

Configure Azure Kubernetes Service

These Learn modules are part of the AZ-104: Deploy and manage Azure compute resources (https://docs.microsoft.com/learn/paths/az-104-manage-compute-resources/) learning path.

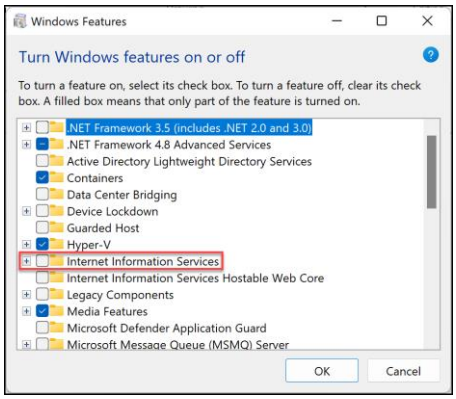
Configure Azure App Service Plans

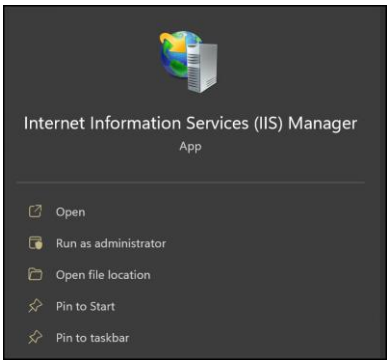
Before Getting into App Service Plans (ASPs) ..

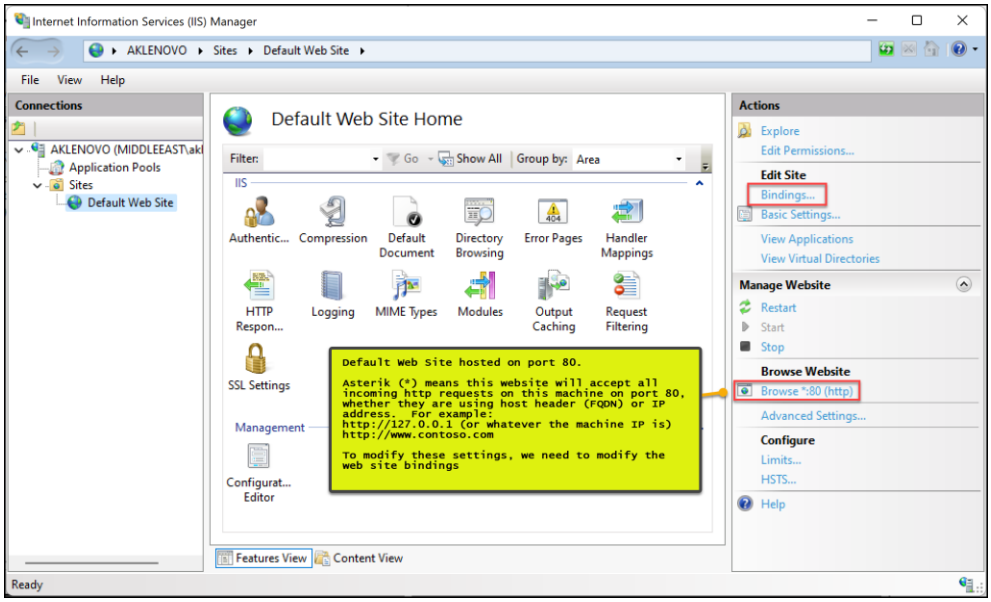
- Web Applications need Web Servers before they can be accessed.
  - Linux/Windows OpenSource Web Servers: Apache Tomcat, Nginx, etc.
    - Nginx is beta version on Windows
  - Native Windows Web Server: Internet Information Services (IIS)
- Multiple Web Applications can be hosted on a single webserver
- There are two ways a web servers can send the request to a specific web application:
  - Each web application is hosted on a different port, OR
  - Each web application has a different host address (host header)

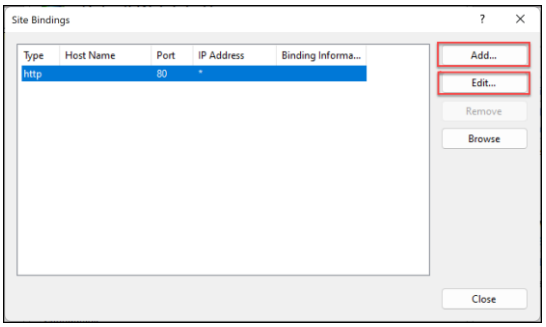
App Service pricing - https://azure.microsoft.com/pricing/details/app-service/windows/

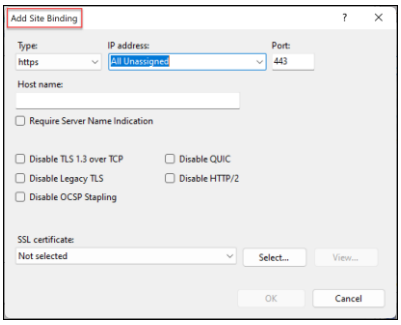
Installing IIS on Windows

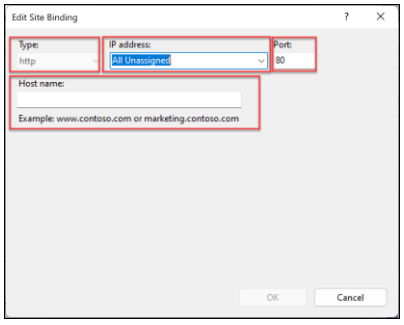












Once website is setup, add the required entries in windows hosts file (*c:\windows\system32\drivers\etc\hosts*) for local testing, or add a public DNS A record.

This process allows mapping of custom domain name to your website.

[How to Set Up SSL on IIS 7 or later | Microsoft Learn]

[How to Create and Bind a Self Signed Certificate in IIS 10 (msftwebcast.com)]

What's the Hosts file

The Hosts file is used by the operating system to map human-friendly hostnames to numerical Internet Protocol (IP) addresses which identify and locate a host in an IP network. The hosts file is one of several system resources that address network nodes in a computer network and is a common part of an operating system's IP implementation.

The Hosts file contains lines of text consisting of an IP address in the first text field followed by one or more host names. Each field is separated by white space (Tabs are often preferred for historical reasons, but spaces are also used). Comment lines may be included, and they are indicated by a hash character (#) in the first position of such lines. Entirely blank lines in the file are ignored.

[How to reset the Hosts file back to the default - Microsoft Support]

Configure Azure App Service Plans Introduction

- Implement Azure App Service Plans
- Determine App Service Plan Pricing
- Scale Up and Scale Out the App Service Plan
- Configure App Service Plan Scaling
- Demonstration – Create an App Service Plan
- Summary and Resources

Deploy and manage Azure

compute resources (20-25%)
Create and confi

gure Azure App Service

* Create an App Service.

* Secure an App Service.
* Configure custom domai

n names.

* Configure backup for an App Service.

* Configure networking settings.
* Configure depl

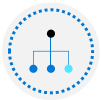
oyment s
ettings.

Implement Azure App Service Plans

Define a set of compute resources for a web app to run

Determines performance, price, and features

One or more apps can be configured to run in the same App Service plan



Operating System (Windows, Linux)
Region where compute resources will be created
Number of virtual machine instances
Size of virtual machine instances
Pricing tier (next slide)

Azure App Service plan overview - https://docs.microsoft.com/azure/app-service/overview-hosting-plans

Determine App Service Plan Pricing

Selected Features	Free	Shared (dev/test)	Basic (dedicated dev/test)	Standard (production workloads)	Premium (enhanced scale and performance)	Isolated (high-performance, security and isolation)
Web, mobile, or API apps	10	100	Unlimited	Unlimited	Unlimited	Unlimited
Disk space	1 GB	1 GB	10 GB	50 GB	250 GB	1 TB
Auto Scale	–	–	–	Supported	Supported	Supported
Deployment Slots	0	0	0	5	20	20
Max Instances	–	–	Up to 3	Up to 10	Up to 30	Up to 100

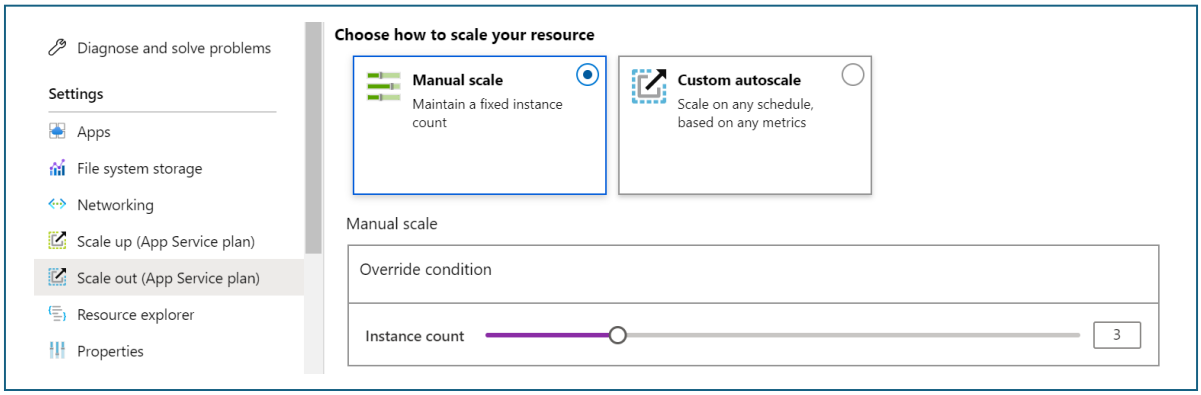
Shared compute (Free and Shared). Run apps on the same Azure VM as other App Service apps, and the resources cannot scale out

Dedicated compute (Basic, Standard, Premium). Run apps in the same plan in dedicated Azure VMs

Isolated. Runs apps on dedicated Azure VMs in dedicated Azure virtual networks

App Service pricing - https://azure.microsoft.com/pricing/details/app-service/windows/

Scale Up and Scale Out the App Service Plan



Scale up (change the App Service plan):

More hardware (CPU, memory, disk)

More features (dedicated virtual machines, staging slots, autoscaling)

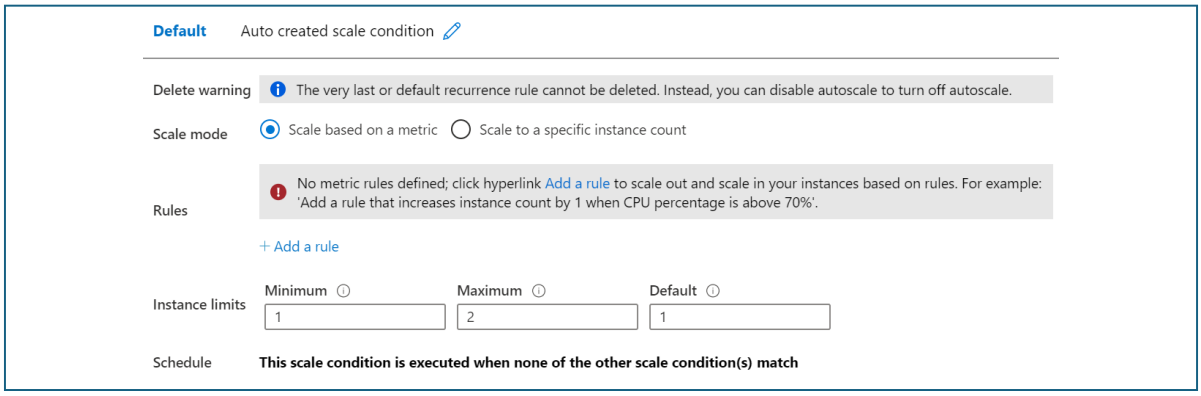
Scale out (increase the number of VM instances):

Manual (fixed number of instances)

Auto scale (based on predefined rules and schedules)

Scale up an app in Azure App Service - https://docs.microsoft.com/azure/app-service/manage-scale-up

Configure App Service Plan Scaling



Adjust available resources based on the current demand	Improves availability and fault tolerance	Scale based on a metric (CPU percentage, memory percentage, HTTP requests)	Scale according to a schedule (weekdays, weekends, times, holidays)	Can implement multiple rules – combine metrics and schedules	Don't forget to scale in

Get started with Autoscale in Azure - https://docs.microsoft.com/azure/app-service/manage-scale-up?toc=/azure/app-service/toc.json

Configure Azure App Services

Configure Azure App Services Introduction


Implement Azure App Service


Create an App Service


Create Deployment Slots


Add Deployment Slots


Secure an App Service


Create Custom Domain Names


Backup an App Service


Demonstration – Create an App Service


Summary and Resources

Deploy and manage Azure compute resources (25-30%)

Create and configure Web Apps

- Create and configure App Service
- Create and configure App Service Plans

Implement Azure App Service

Includes Web Apps, API Apps, Mobile Apps, and Function Apps

Fully managed environment enabling high productivity development

Platform-as-a-service (PaaS) offering for building and deploying highly available cloud apps for web and mobile

Platform handles infrastructure so developers focus on core web apps and services

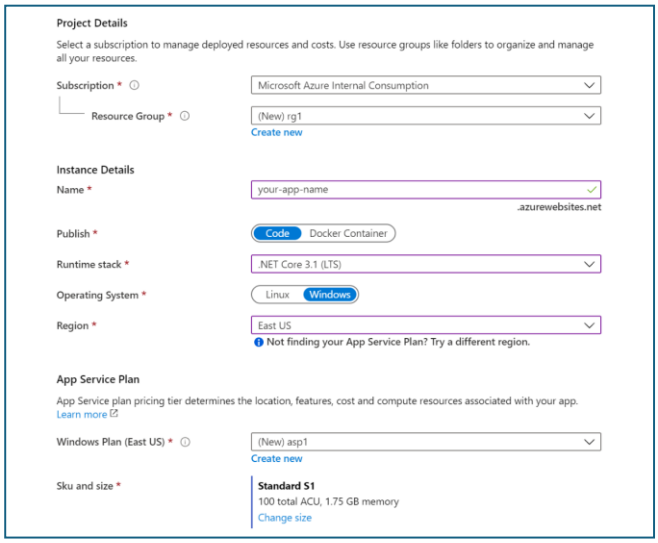
Developer productivity using .NET, .NET Core, Java, Python and a host of others

Provides enterprise-grade security and compliance

App Service - https://azure.microsoft.com/services/app-service/

Create an App Service

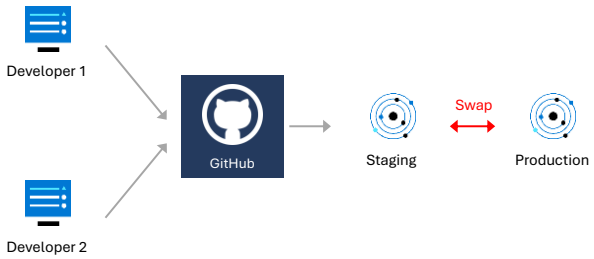
- Name must be unique
- Access using *azurewebsites.net* – can map to a custom domain
- Publish Code (Runtime Stack)
- Publish Docker Container
- Linux or Windows
- Region closest to your users
- App Service Plan



Manage an App Service plan in Azure - https://docs.microsoft.com/azure/app-service/app-service-plan-manage

Create Deployment Slots

Continuous Deployment with Stage Slot



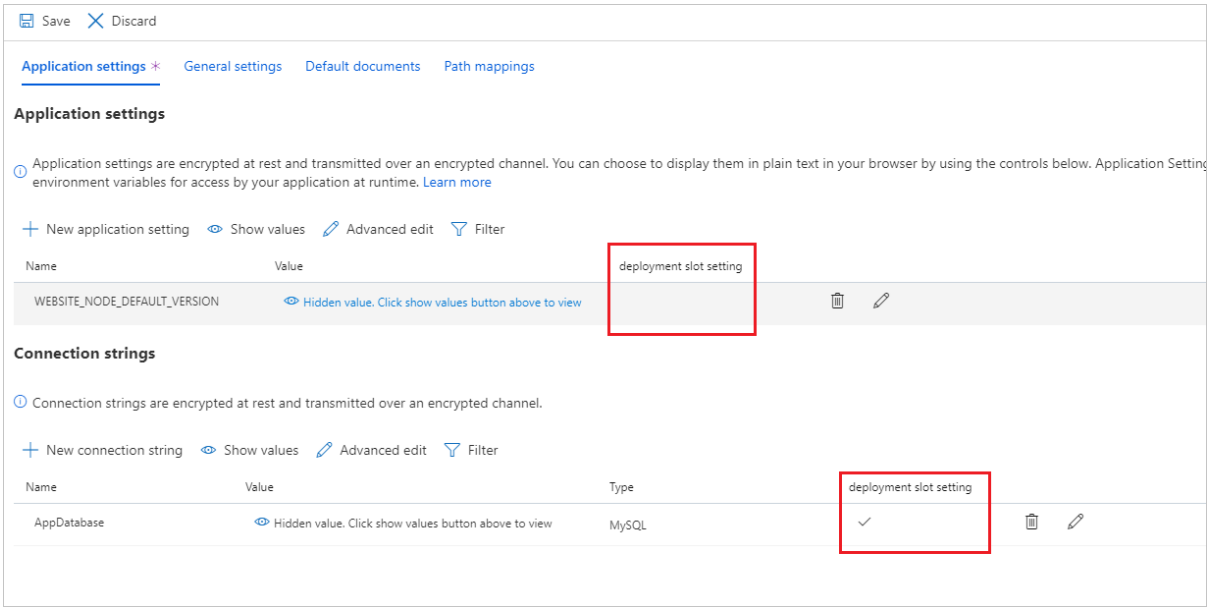
Service Plan	Slots
Free, Shared, Basic	0
Standard	Up to 5
Premium	Up to 20
Isolated	Up to 20

Deploy to a different deployment slots (depends on service plan)	Validate changes before sending to production	Deployment slots are live apps with their own hostnames	Avoids a cold start – eliminates downtime	Fallback to a last known good site	Auto Swap when pre-swap validation is not needed

Set up staging environments - https://docs.microsoft.com/azure/?toapp-service/web-sites-staged-publishingc=%2Fazure%2Fapp-service%2Ftoc.json#add-a-deployment-slot

App Service Web App – block web access to non-production deployment slots - http://ruslany.net/2014/04/azure-web-sites-block-web-access-to-non-production-deployment-slots/

✓ Each App Service plan mode supports a different number of deployment slots. To find out the number of slots your app's mode supports, see App Service Limits.



✓ You can configure app settings and connections to stick to a slot and not be swapped. This done in the App Settings blade. A developer can create new settings for the web app.

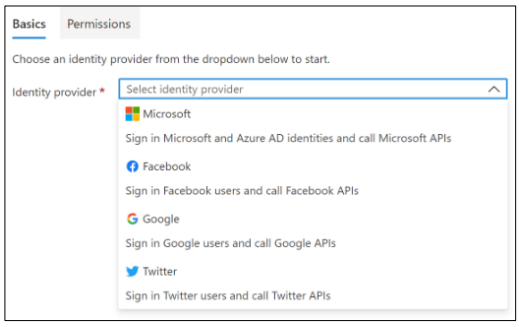
Secure an App Service

Authentication:

- Enable authentication – default anonymous
- Log in with a third-party identity provider

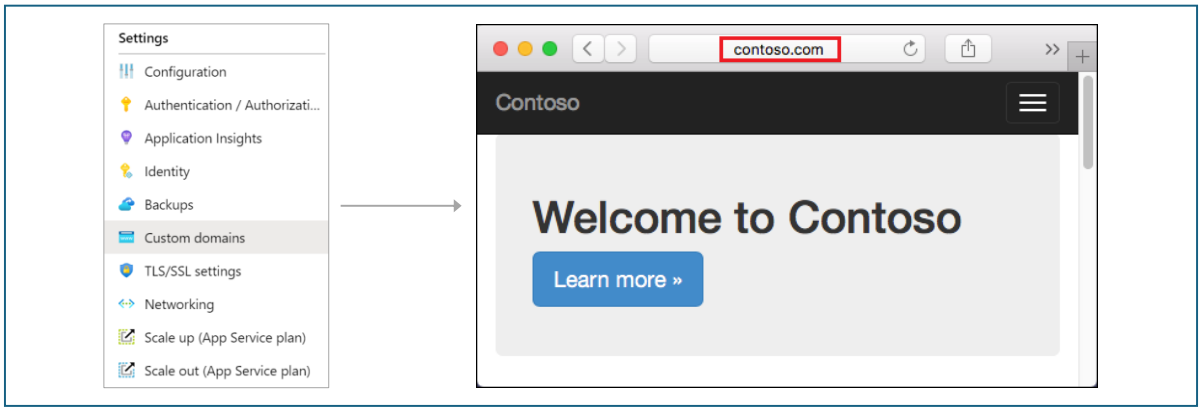
Security:

- Troubleshoot with Diagnostic Logs – failed requests, app logging
- Add an SSL certificate – HTTPS
- Define a priority ordered allow/deny list to control network access to the app
- Store secrets in the Azure Key Vault



https://learn.microsoft.com/en-us/azure/app-service/overview-security#client-authentication-and-authorization

Create Custom Domain Names

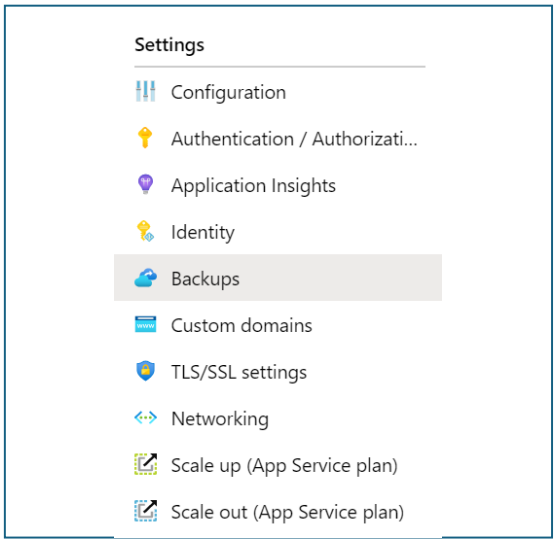


Redirect the default web app URL	Validate the custom domain in Azure	Use the DNS registry for your domain provider – create a CNAME or A record with the mapping	Ensure App Service plan supports custom domains

https://learn.microsoft.com/en-us/azure/app-service/app-service-web-tutorial-custom-domain?tabs=root%2Cazurecli#configure-a-custom-domain

Backup an App Service

- Create app backups manually or on a schedule
- Backup the configuration, file content, and database connected to the app
- Requires Standard or Premium plan
- Backups can be up to 10 GB of app and database content
- Configure partial backups and exclude items from the backup
- Restore your app on-demand to a previous state, or create a new app



Back up your App in Azure - https://docs.microsoft.com/azure/app-service/web-sites-backup

Configure partial backups - https://docs.microsoft.com/azure/app-service/web-sites-backup
https://learn.microsoft.com/en-us/azure/app-service/manage-backup?tabs=portal

Summary and Resources – Configure Azure App Services

Knowledge Check Questions	Microsoft Learn Modules (docs.microsoft.com/Learn)
	Host a web application with Azure App Service (Sandbox) Stage a web app deployment for testing and rollback by using App Service deployment slots Dynamically meet changing web app performance requirements with autoscale rules

A *sandbox* indicates a hands-on exercise.

List at least three administrator tasks for an organization's web app.

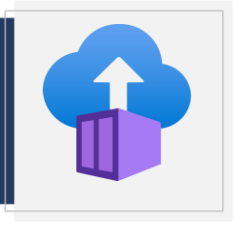
If you are administering an Azure web app you will need to monitor, secure, and backup the app.

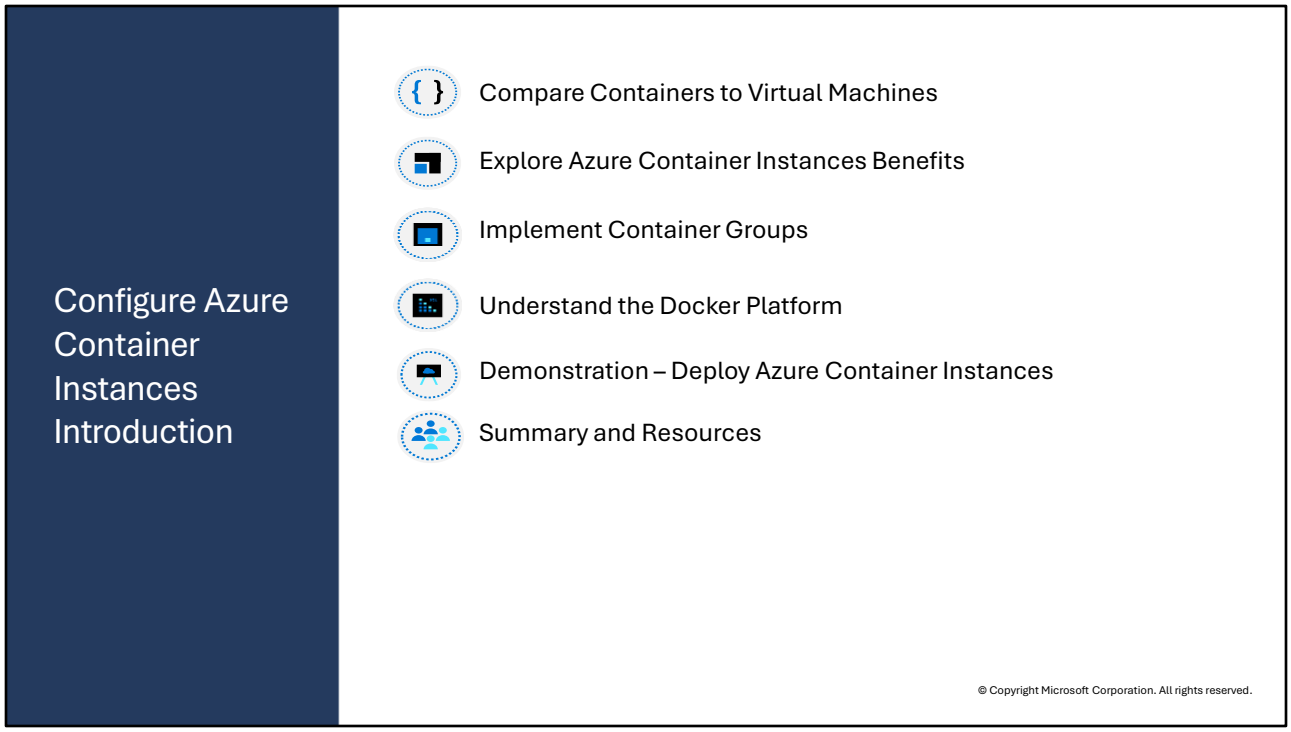
- Monitoring includes usage stats, outages, page views, user sessions, performance, and troubleshooting.
- Securing tasks include access, authentication, certificates, and identity.
- Backup decisions make sure all parts of the app

can be restored, as well as frequency of the backups.

- Creating a custom domain name is another important task; there are certainly other important tasks.

Configure Azure Container Instances

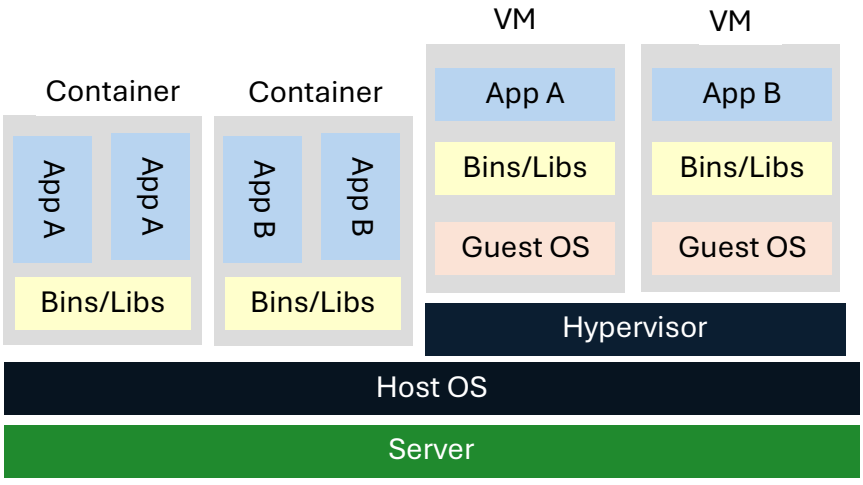





```
Deploy and manage Azure compute resources (20–25%)
Create and configure containers
* Configure sizing and scaling for Azure Container Instances.
* Configure container groups for Azure Container Instances.
```

Compare Containers to Virtual Machines

- Isolation
- Operating System
- Deployment
- Persistent storage
- Fault tolerance



Containers vs. virtual machines - https://docs.microsoft.com/virtualization/windowscontainers/about/containers-vs-

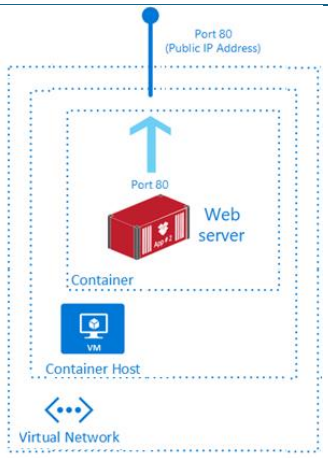
Compare Containers to Virtual Machines

Feature	Containers	Virtual Machines
Isolation	Typically provides lightweight isolation from the host and other containers but doesn't provide as strong a security boundary as a virtual machine	Provides complete isolation from the host operating system and other VMs. This is useful when a strong security boundary is critical, such as hosting apps from competing companies on the same server or cluster
Operating system	Runs the user mode portion of an operating system and can be tailored to contain just the needed services for your app, using fewer system resources.	Runs a complete operating system including the kernel, thus requiring more system resources (CPU, memory, and storage)
Deployment	Deploy individual containers by using Docker via command line; deploy multiple containers by using an orchestrator such as Azure Kubernetes Service	Deploy individual VMs by using Windows Admin Center or Hyper-V Manager; deploy multiple VMs by using PowerShell or System Center Virtual Machine Manager
Persistent storage	Use Azure Disks for local storage for a single node, or Azure Files (SMB shares) for storage shared by multiple nodes or servers	Use a virtual hard disk (VHD) for local storage for a single VM, or an SMB file share for storage shared by multiple servers
Fault tolerance	If a cluster node fails, any containers running on it are rapidly recreated by the orchestrator on another cluster node	VMs can fail over to another server in a cluster, with the VM's operating system restarting on the new server

Containers vs. virtual machines - https://docs.microsoft.com/virtualization/windowscontainers/about/containers-vs-

Explore Azure Container Instances Benefits

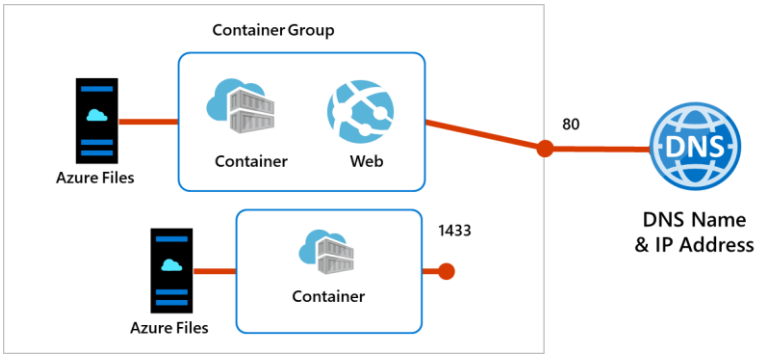
- PaaS Service
- Fast startup times
- Public IP connectivity and DNS name
- Isolation features
- Custom sizes
- Persistent storage
- Linux and Windows Containers
- Co-scheduled Groups
- Virtual network Deployment



Fastest way to run a container in Azure without provisioning a VM

What is Azure Container Instances? - https://docs.microsoft.com/azure/container-instances/container-instances-overview

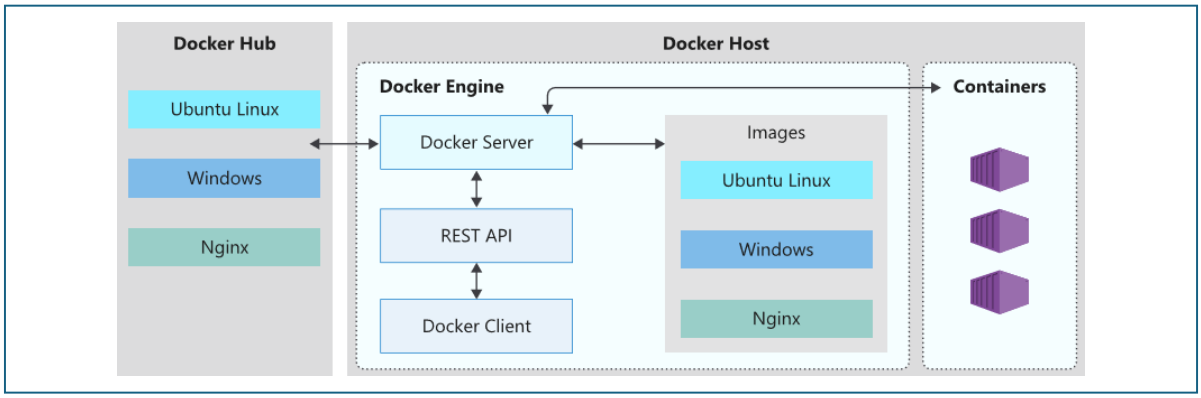
Implement Container Groups



Top-level resource in Azure Container Instances	A collection of containers that get scheduled on the same host	The containers in the group share a lifecycle, resources, local network, and storage volumes

Quickstart: Deploy a container instance in Azure using the Azure portal - https://docs.microsoft.com/azure/container-instances/container-instances-quickstart-portal

Understand the Docker Platform



Enables developers to host applications within a container

A container is a standardized "unit of software" that contains everything required for an application to run

Available on both Linux and Windows and can be hosted on Azure

Docker on Azure - https://azure.microsoft.com/services/kubernetes-service/docker/

Summary and Resources – Configure Azure Container Instances

Knowledge Check Questions	Microsoft Learn Modules (docs.microsoft.com/Learn)
	Run Docker containers with Azure Container Instances Build a containerized web application with Docker

Describe at least two differences between containers and virtual machines.

Answer: Containers provide only lightweight isolation, whereas VMs provide complete isolation. VMs run the entire operating systems, but containers only run the OS services that are needed. Containers are deployed with Docker and orchestrated with Azure Kubernetes service. VMs are deployed and managed different tools with Azure. Containers can use local disk storage or file shares. VMs use a virtual hard disk and file shares.

Configure Azure Kubernetes Service

Configure Azure Kubernetes Service Introduction

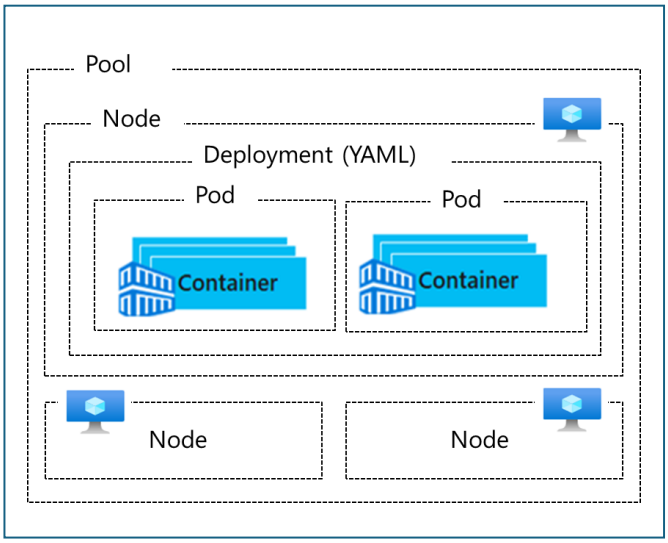
- Understand AKS Terminology
- Understand AKS Clusters and Nodes
- Configure AKS Networking
- Configure AKS Storage
- Configure AKS Scaling
- Configure AKS Scaling to ACI (optional)
- Demonstration – Deploy Azure Kubernetes Service (optional)
- Summary and Resources

Instructor – optional slides at the end of the presentation.

Deploy and manage Azure compute resources (20–25%)
Create and configure containers
* Configure storage for Azure Kubernetes Service (AKS).
* Configure scaling for AKS.
* Configure network connections for AKS.
* Upgrade an AKS cluster.

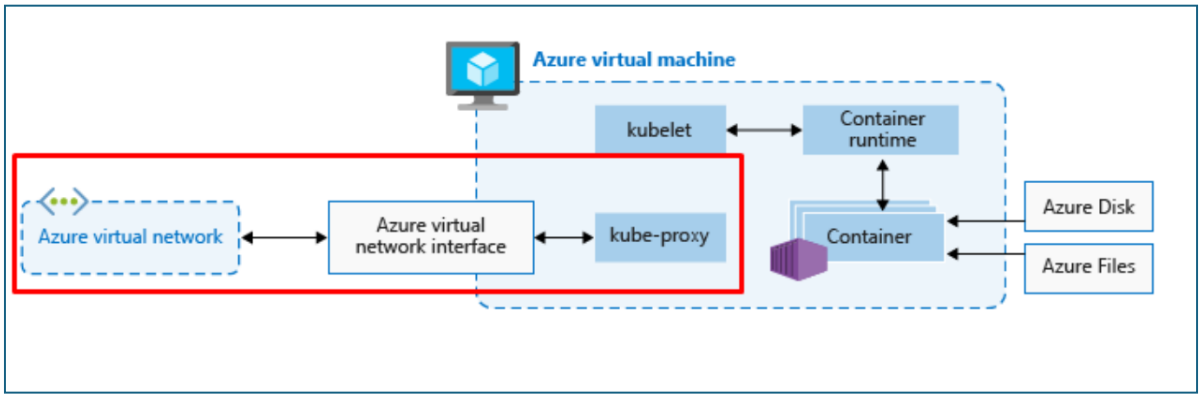
Understand AKS Terminology

Term	Description
Pools	Groups of nodes with identical configurations
Nodes	Individual VMs running containerized applications
Pods	Single instance of an application. A pod can contain multiple containers
Deployment	One or more identical pods managed by Kubernetes
Manifest	YAML file describing a deployment



Kubernetes core concepts for Azure Kubernetes Service (AKS) - https://docs.microsoft.com/azure/aks/concepts-clusters-workloads

Understand AKS Clusters and Nodes



Azure-managed node provides core Kubernetes services and orchestration

Customer-managed nodes run applications and supporting services

Each individual node is an Azure virtual machine

https://kodekloud.com/blog/kube-proxy/
https://kubernetes.io/docs/concepts/architecture/#kubelet

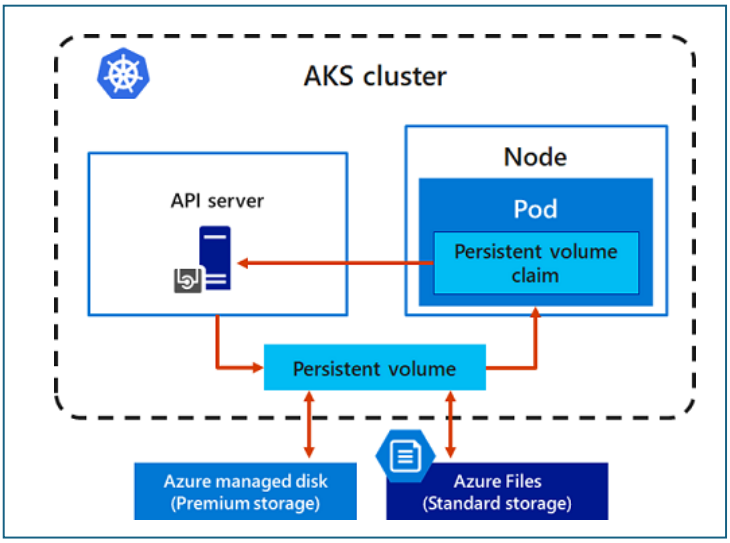
Configure AKS Storage

Local storage on the node is fast and simple to use

Local storage might not be available after the pod is deleted

Multiple pods may share data volumes

Storage could potentially be reattached to another pod



Storage options for applications in Azure Kubernetes Service (AKS) - https://docs.microsoft.com/azure/aks/concepts-storage

Persistent Volume (PV) is a storage resource created and managed by the Kubernetes API that can exist beyond the lifetime of an individual pod.

A persistent volume claim (PVC) requests storage of a particular storage class, access mode, and size.

Persistent volume claim that uses the *managed-premium* storage class and requests an Azure Disk that is *5Gi* in size:

YAML

```yaml
apiVersion: v1
kind: PersistentVolumeClaim
metadata:
  name: azure-managed-disk
spec:
  accessModes:
  - ReadWriteOnce
  storageClassName: managed-premium-retain
  resources:
    requests:
      storage: 5Gi
```

Previously created persistent volume claim being used to mount a volume in a pod definition:

YAML

```yaml
kind: Pod
apiVersion: v1
metadata:
  name: nginx
spec:
  containers:
    - name: myfrontend
      image: mcr.microsoft.com/oss/nginx/nginx:1.15.5-alpine
      volumeMounts:
      - mountPath: "/mnt/azure"
        name: volume
  volumes:
    - name: volume
      persistentVolumeClaim:
        claimName: azure-managed-disk
```

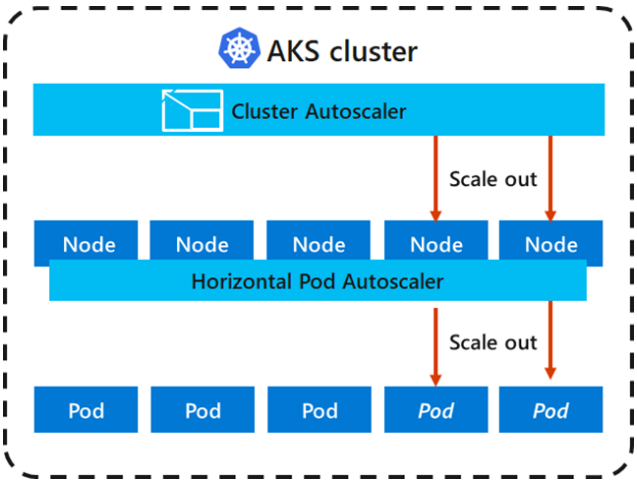
Configure AKS Scaling

Applications might grow beyond the capacity of a single pod

Kubernetes has built-in autoscalers

Cluster autoscaler scales based on compute resources

Horizontal pod autoscaler scales based on metrics



Scaling options for applications in Azure Kubernetes Service (AKS) - https://docs.microsoft.com/azure/aks/concepts-scale

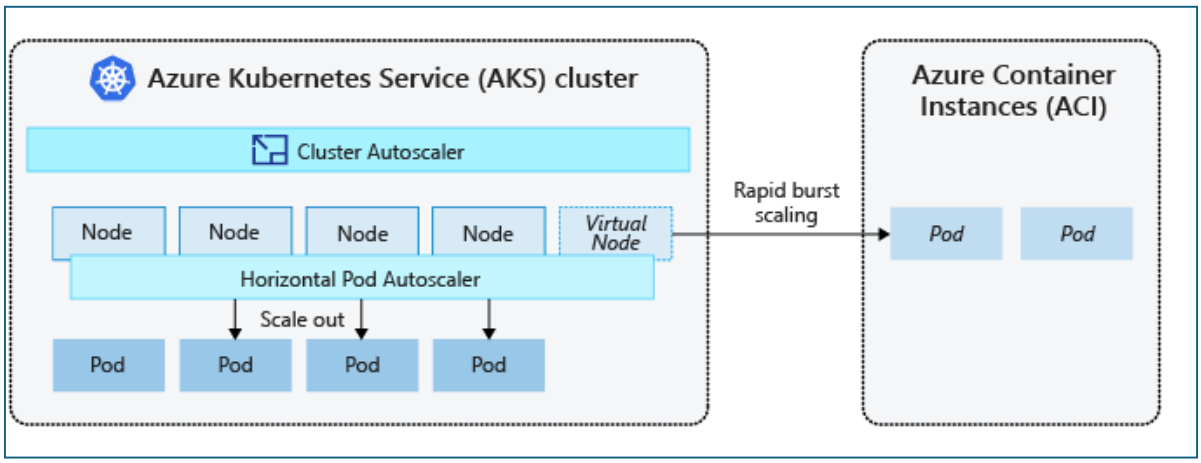
Kubernetes uses the horizontal pod autoscaler (HPA) to monitor the resource demand and automatically scale the number of pods. By default, the HPA checks the Metrics API every 15 seconds for any required changes in replica count, and the Metrics API retrieves data from the Kubelet every 60 seconds. So, the HPA is updated every 60 seconds. When changes are required, the number of replicas is increased or decreased accordingly. HPA works with AKS clusters that deployed the Metrics Server for Kubernetes version 1.8 and higher.

Cluster autoscaler

To respond to changing pod demands, the Kubernetes cluster autoscaler adjusts the number of nodes based on the requested compute resources in the node pool. By default, the cluster autoscaler checks the Metrics API server every 10 seconds for any required changes in node count. If the cluster autoscaler determines that a change is required, the number of nodes in your AKS cluster is increased or decreased accordingly.

Configure AKS Scaling to ACI (optional)

If you need to rapidly grow your AKS cluster, you can create new pods in Azure Container Instances



https://learn.microsoft.com/en-us/azure/aks/concepts-scale

Burst to Azure Container Instances (ACI)

To rapidly scale your AKS cluster, you can integrate with Azure Container Instances (ACI). Kubernetes has built-in components to scale the replica and node count.

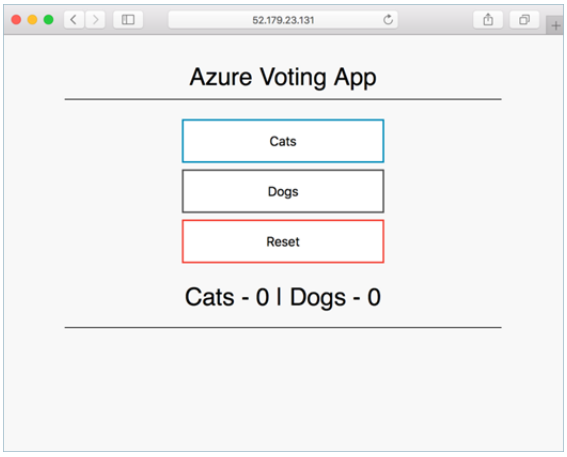
ACI lets you quickly deploy container instances without extra infrastructure overhead. When you connect with AKS, ACI becomes a secured, logical extension of your AKS cluster. The virtual nodes component, which is based on virtual Kubelet, is installed in your AKS cluster that presents ACI as a virtual Kubernetes node. Kubernetes can then schedule pods that run as ACI instances through virtual nodes, not as pods on VM nodes directly in your AKS cluster.

Demonstration – Deploy Azure Kubernetes Service (optional)

Create a Kubernetes service

Connect to the cluster

Test the applications



QuickStart: Deploy an Azure Kubernetes Service (AKS) cluster using the Azure portal –

https://docs.microsoft.com/azure/aks/kubernetes-walkthrough-portal
https://learn.microsoft.com/en-us/azure/aks/tutorial-kubernetes-prepare-app?tabs=azure-cli

Summary and Resources – Configure Azure Kubernetes Service

Knowledge Check Questions	Microsoft Learn Modules (docs.microsoft.com/Learn)
	Introduction to Azure Kubernetes Service Implement Azure Kubernetes Service (AKS)

Describe how Azure Kubernetes service pools, nodes, and pods work together.

Answer: Kubernetes is an open-source system for automating deployment, scaling, and management of containerized applications. Azure Kubernetes Service (AKS) makes it simple to deploy a managed Kubernetes cluster in Azure. Nodes are the individual VMs running the containerized applications. Pods are a single instance of an application. The application can contain multiple containers. Pools are groups of nodes with identical configurations. Both pools and

nodes can be scaled.