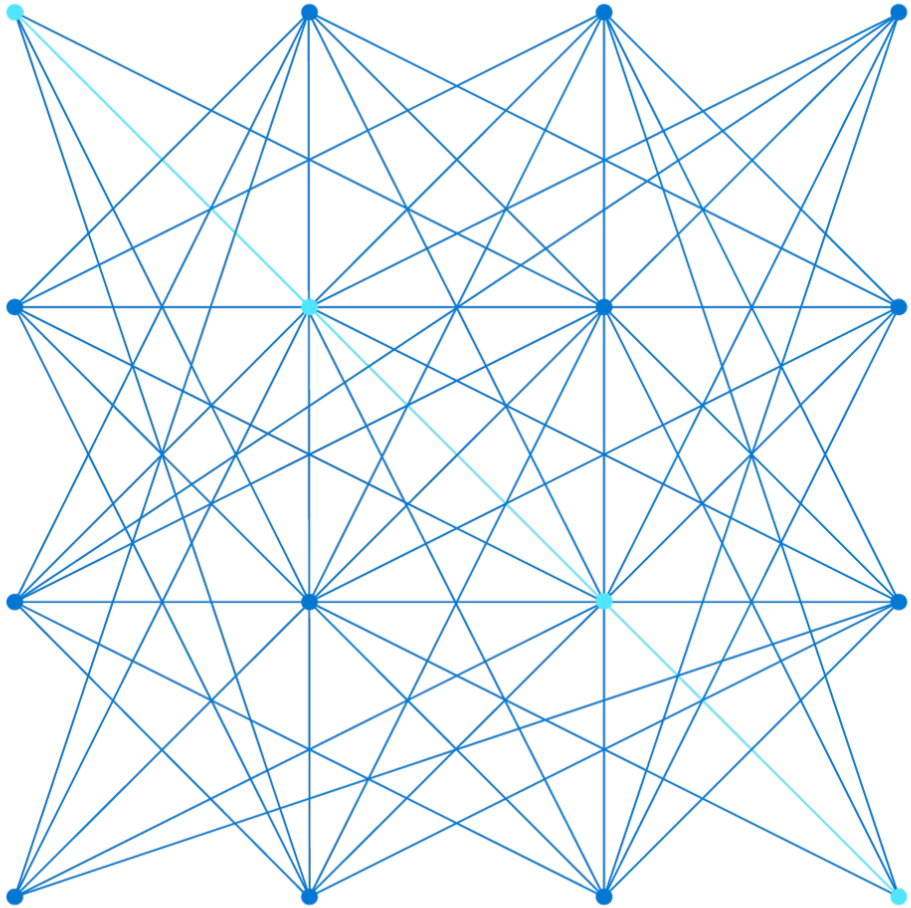
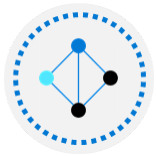
Microsoft Azure

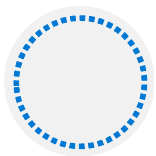
AZ-104T00A
Module 09:
Serverless Computing



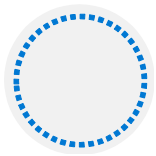
Module Overview



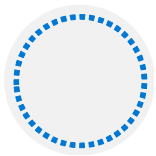
Lesson 01: Azure App Service Plans



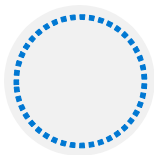
Lesson 02: Azure App Services



Lesson 03: Container Services

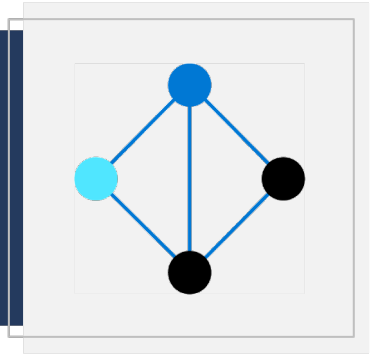


Lesson 04: Azure Kubernetes Service

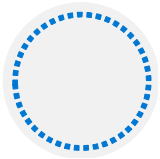


Lesson 05: Module 09 lab and review

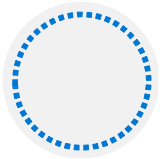
Lesson 01: Azure App Service Plans



Azure App Service Overview

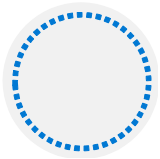


Azure App Service Plans

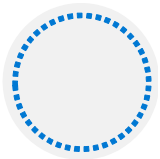


App Service Plan Pricing Tiers

App Service Plan Scaling

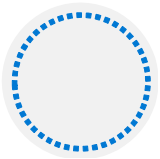


App Service Plan Scale Out

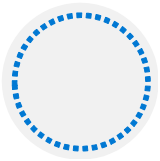


Demonstration – Create an App Service Plan

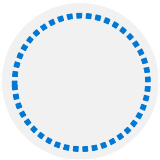
Azure App Service Plans



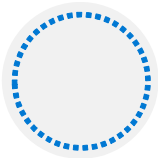
Define a set of compute resources for a web app to run



Determines performance, price, and features



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



Region where compute resources will be created

Number of virtual machine instances

Size of virtual machine instances

Pricing tier (next slide)

App Service Plan Pricing Tiers

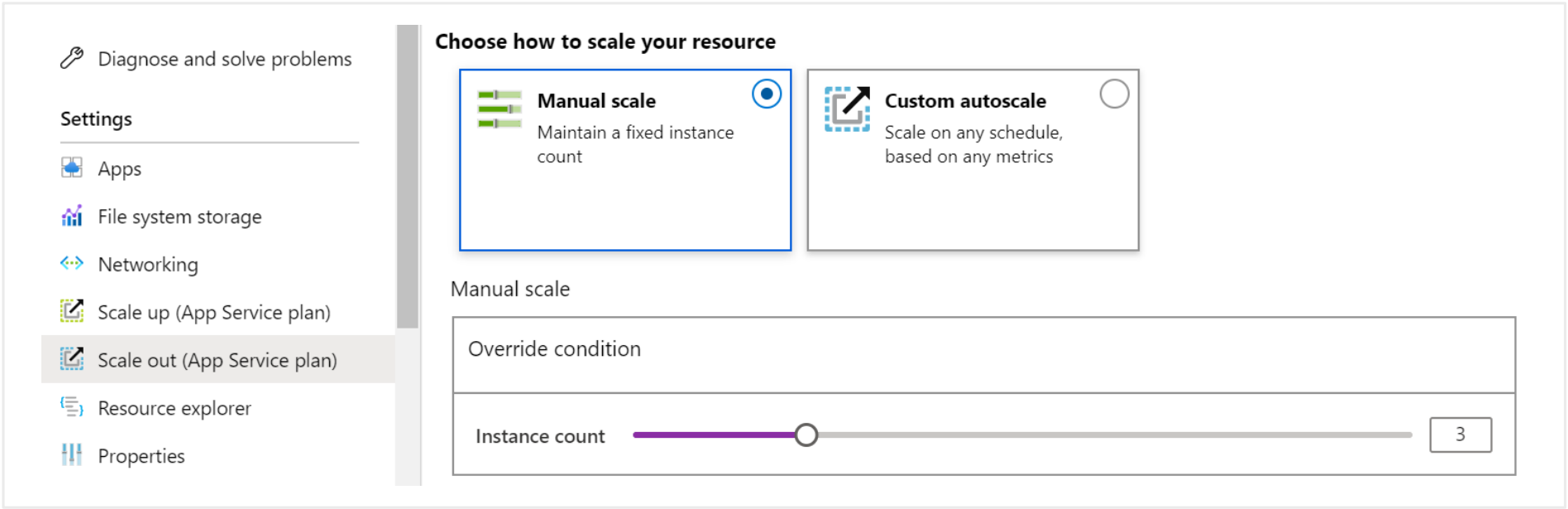
Selected Features	Free	Shared (dev/test)	Basic (dedicated dev/test)	Standard (production workloads)	Premium (enhanced scale and performance)	Isolated (high-performance, security and isolation)
Web, mobile, or API apps	10	100	Unlimited	Unlimited	Unlimited	Unlimited
Disk space	1 GB	1 GB	10 GB	50 GB	250 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 Plan Scaling



Scale up (change the App Service plan):

More hardware (CPU, memory, disk)

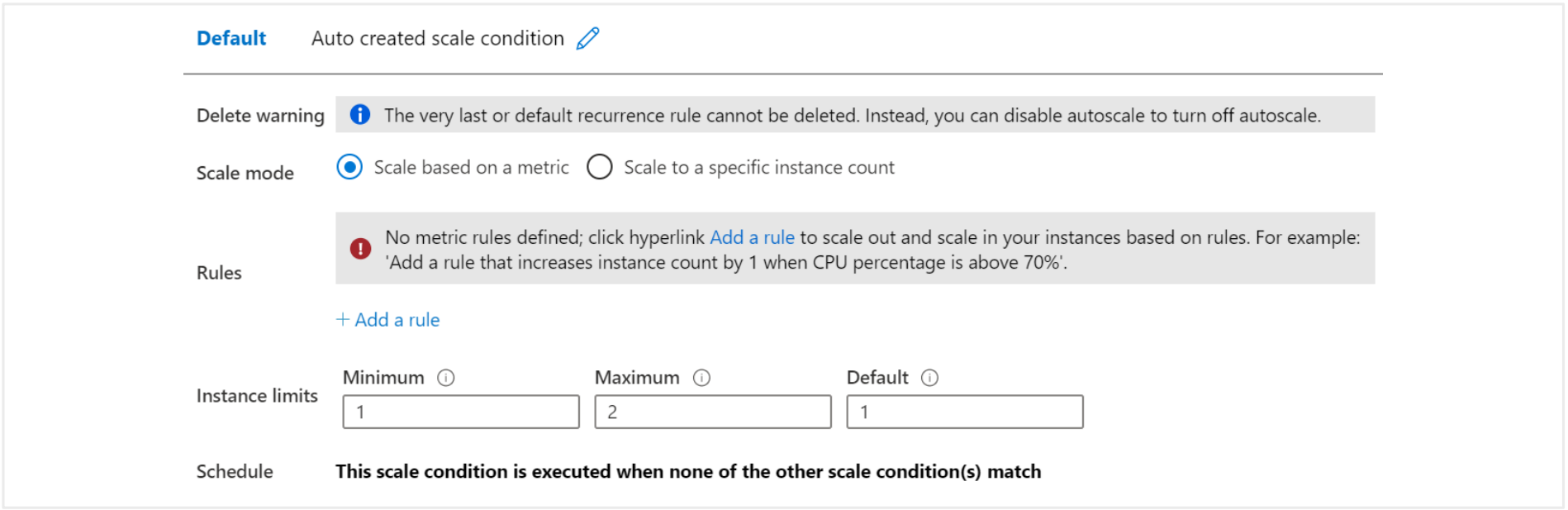
More features (dedicated virtual machines, staging slots, autoscaling)

Scale out (increase the number of VM instances):

Manual (fixed number of instances)

Auto scale (based on predefined rules and schedules)

App Service Plan Scale Out



Adjust available resources based on the current demand

Improves availability and fault tolerance

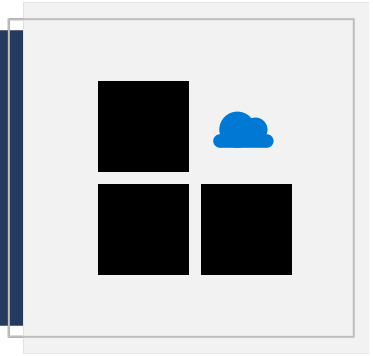
Scale based on a metric (CPU percentage, memory percentage, HTTP requests)

Scale according to a schedule (weekdays, weekends, times, holidays)

Can implement multiple rules – combine metrics and schedules

Don't forget to scale in

Lesson 02: Azure App Services



Managing App Services Overview

- Azure App Service
- Creating an App Service
- Continuous Deployment
- Deployment Slots
- Creating Deployment Slots
- Securing an App Service
- Custom Domain Names
- Backup an App Service
- Application Insights
- Demonstration – Create an App Service

Azure App Service

.NET

Node.js

PHP


Java


Python (on Linux)


HTML


Custom Windows container (Preview)

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

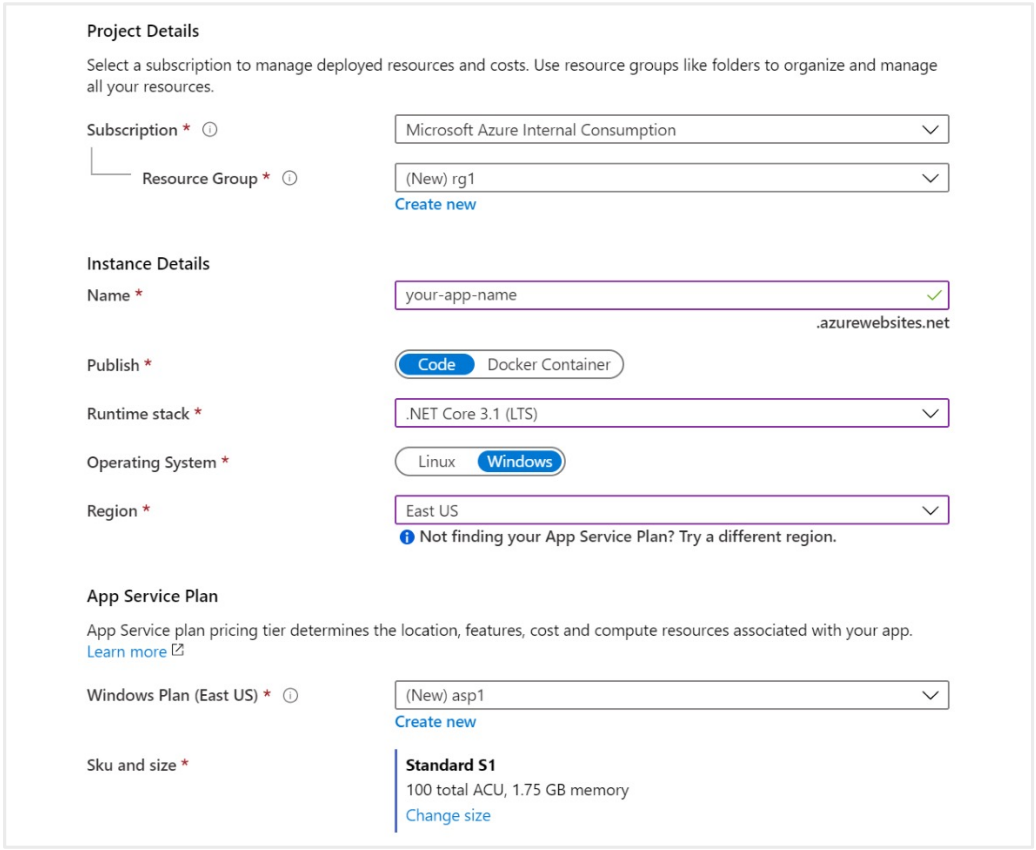
Platform handles infrastructure so developers focus on core web apps and services

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

Provides enterprise-grade security and compliance

Creating 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



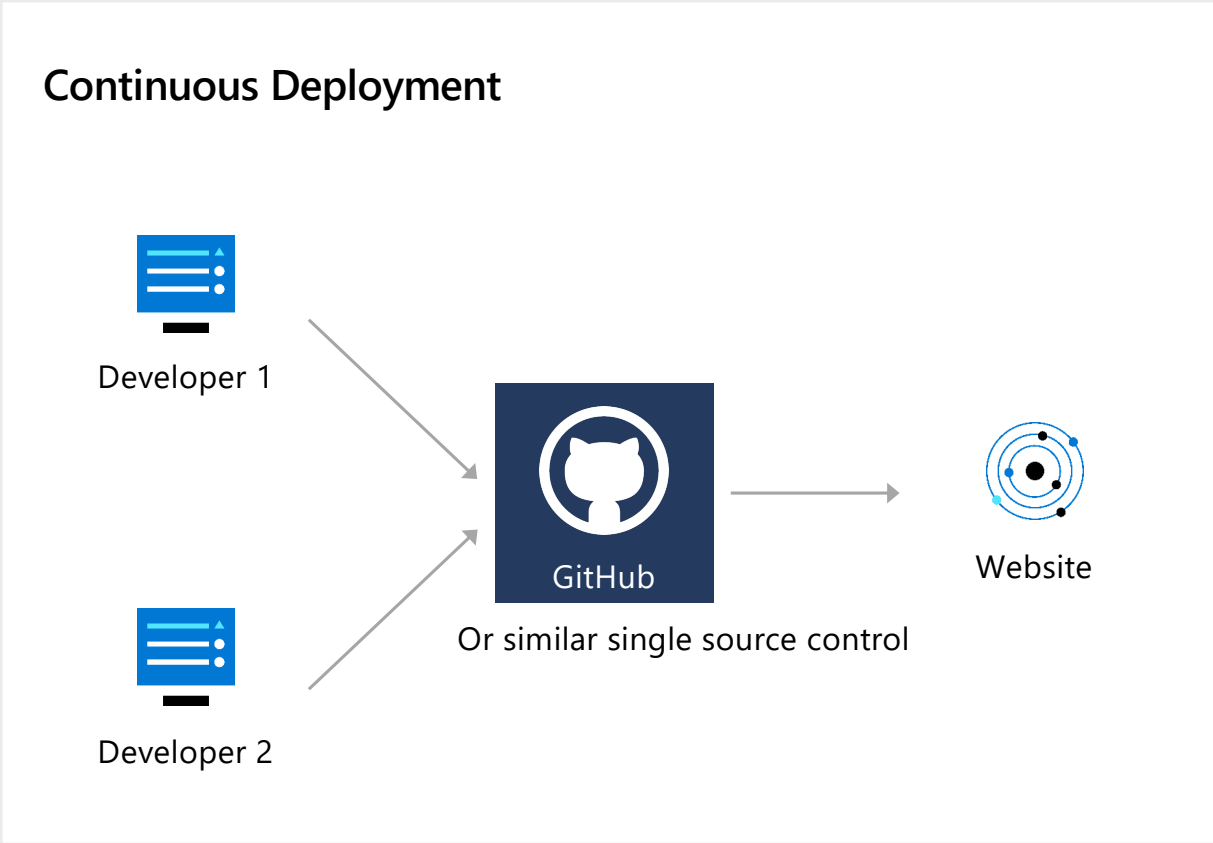
Continuous Deployment

Work in a single source control

Whenever code updates are pushed to the source control, then the website or web app will automatically pick up the updates

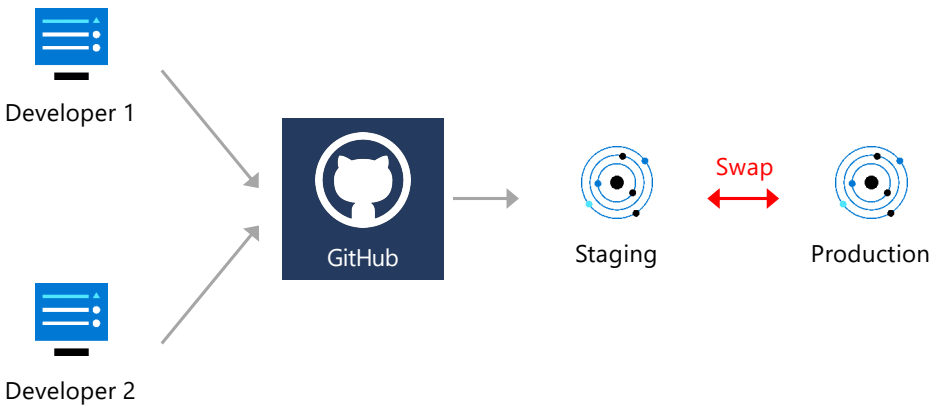
A continuous deployment workflow publishes the most recent updates from a project

Use the portal for continuous deployments from GitHub, Bitbucket, or Azure DevOps



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

Creating Deployment Slots

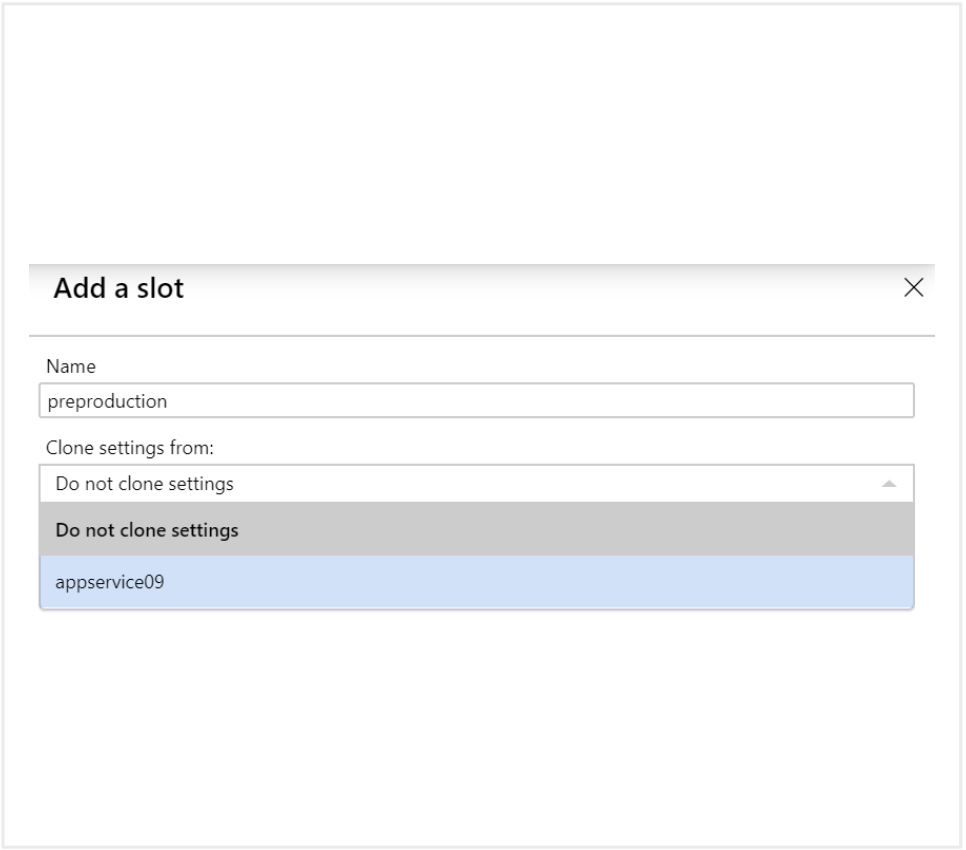
A new slot can be empty or cloned

When you clone, pay attention to the settings:

- Slot-specific app settings and connection strings
- Continuous deployment settings
- App Service authentication settings

Not all settings are sticky (endpoints, custom domain names, SSL certificates, scaling)

Review and edit your settings before swapping



Securing an App Service

Authentication:

Enable authentication – default anonymous

Log in with a third-party identity provider

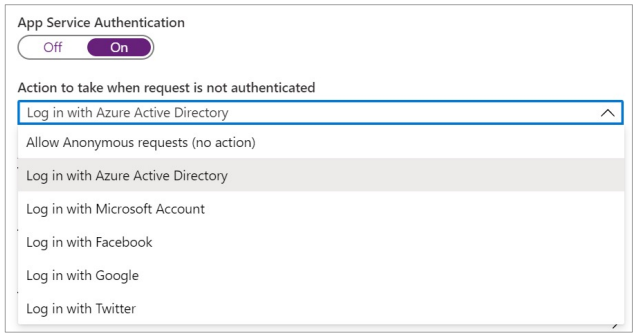
Security:

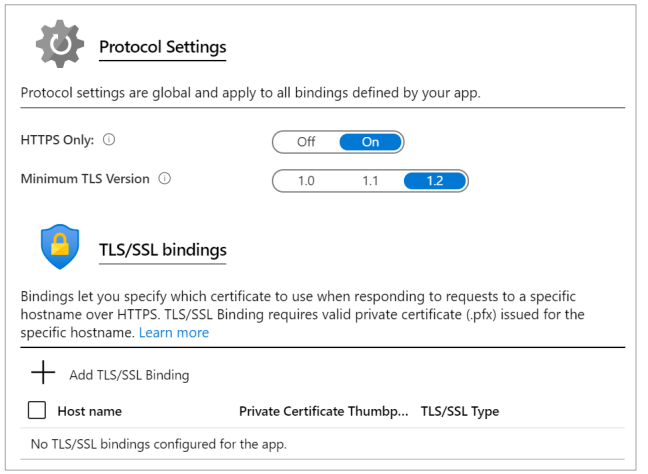
Troubleshoot with Diagnostic Logs – failed requests, app logging

Add an SSL certificate – HTTPS

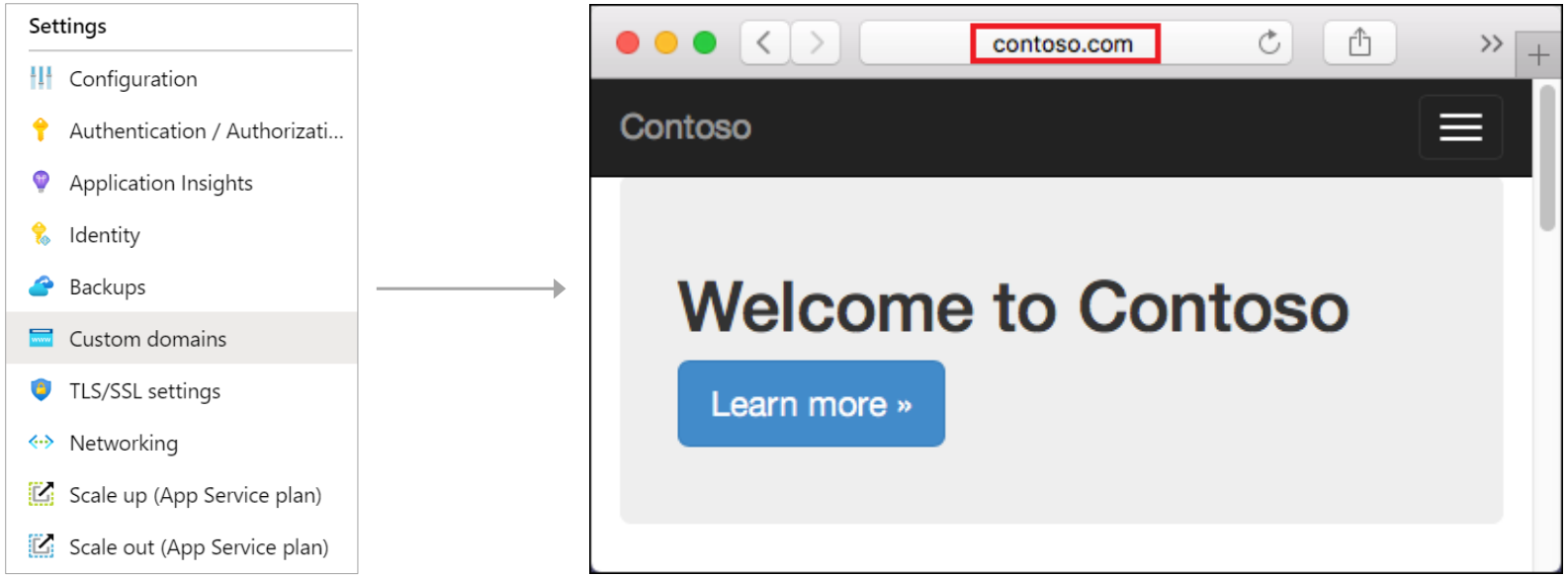
Define a priority ordered allow/deny list to control network access
to the app

Store secrets in the Azure Key Vault





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

Backup an App Service

Create app backups manually or on a schedule

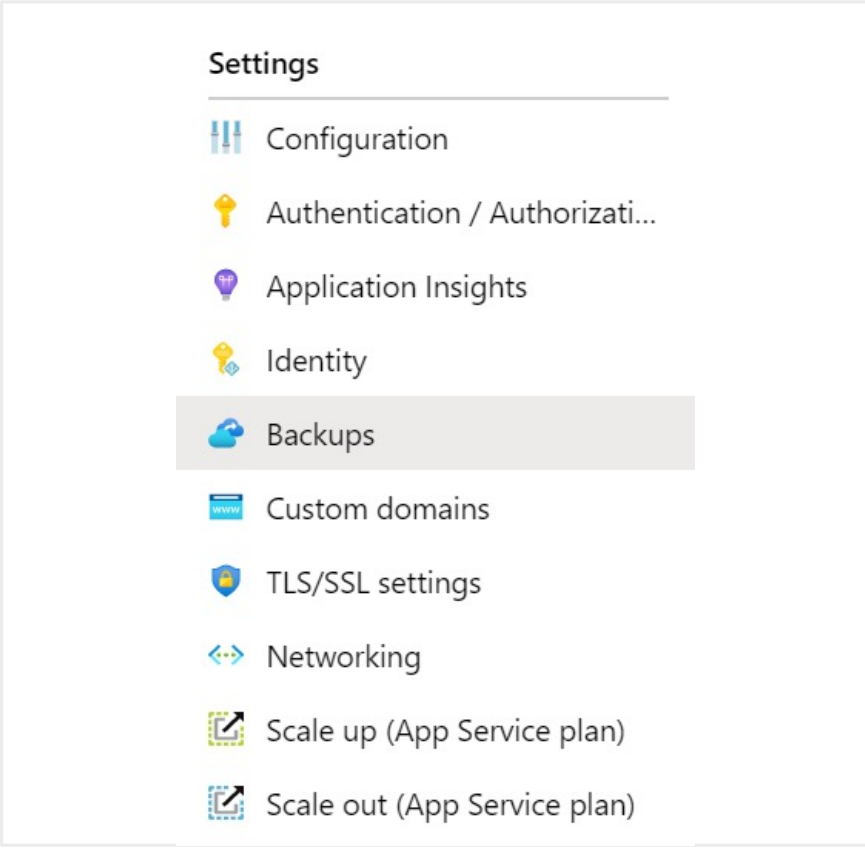
Backup the configuration, file content, and database connected to the app

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



Application Insights

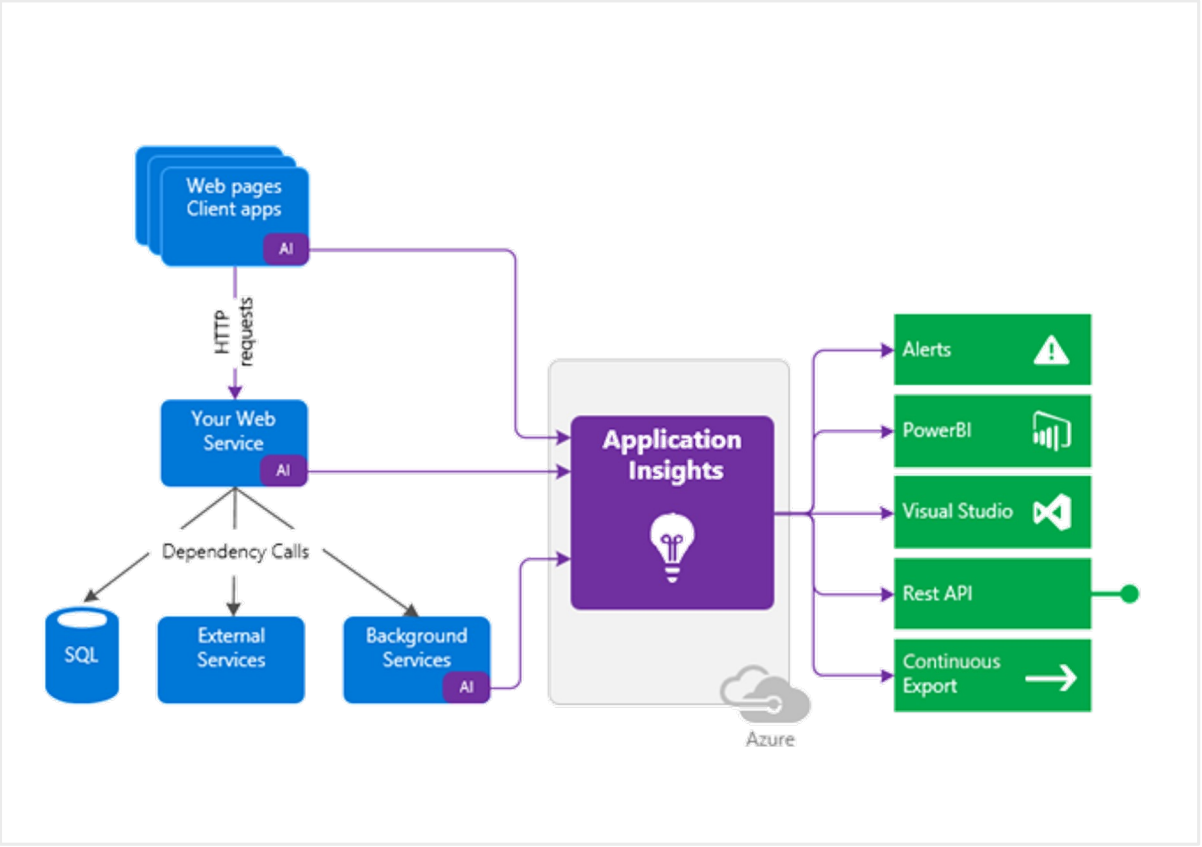
Request rates, deny rates, response time and failure rates

Page views and load performance

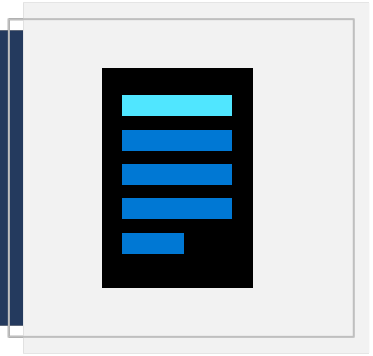
User and session counts

Performance counters

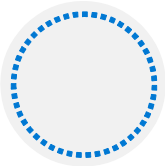
Diagnostics and Exceptions



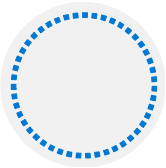
Lesson 03: Container Services



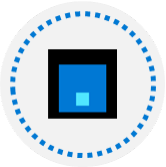
Container Services Overview



Containers vs. Virtual Machines



Azure Container Instances



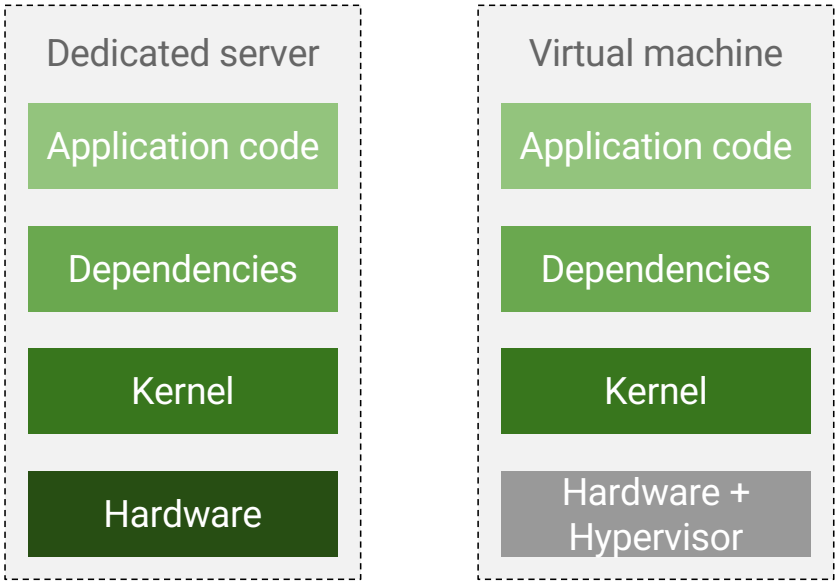
Container Groups

Docker

Containers vs 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

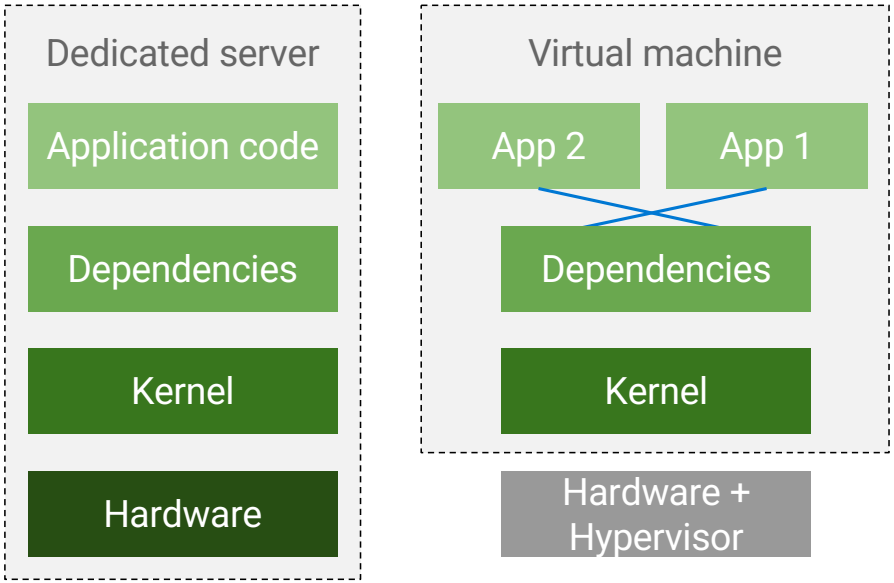
Hypervisors create and manage virtual machines



Deployment ~months
Low utilization
Not portable

Deployment ~days (mins)
Hypervisor-specific
Low isolation; tied to OS

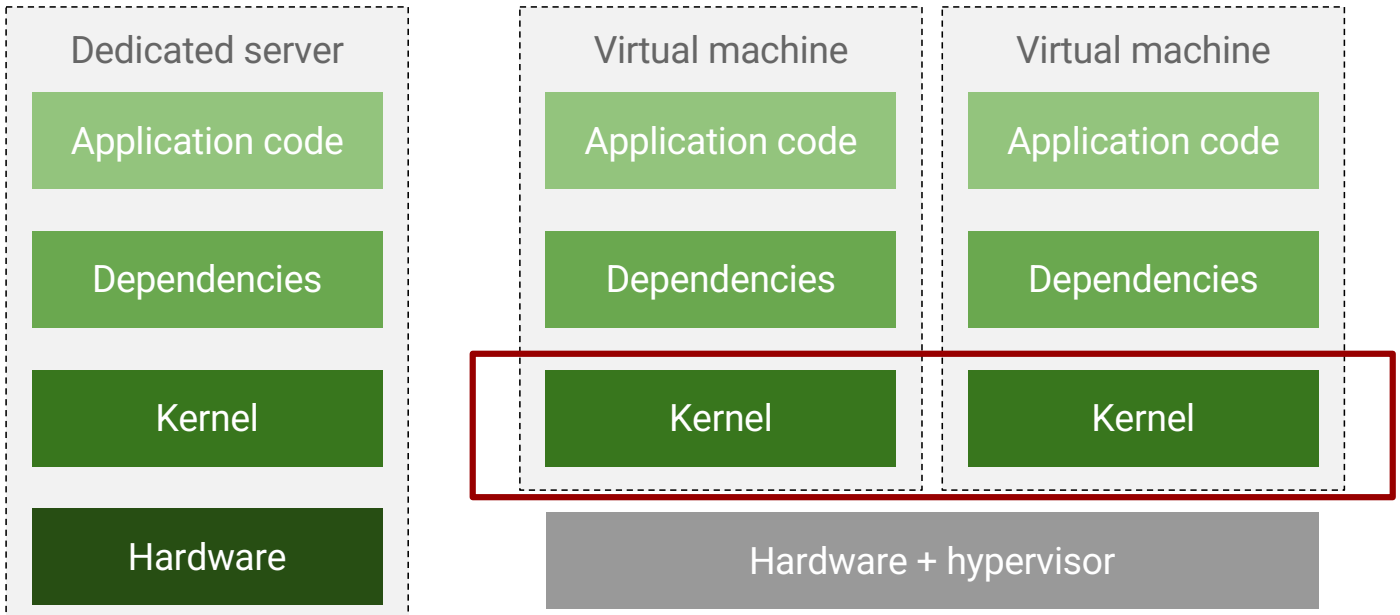
Running multiple apps on a single VM



Deployment ~months
Low utilization
Not portable

Deployment ~days (mins)
Hypervisor-specific
Low isolation; tied to OS

The VM-centric way to solve this problem

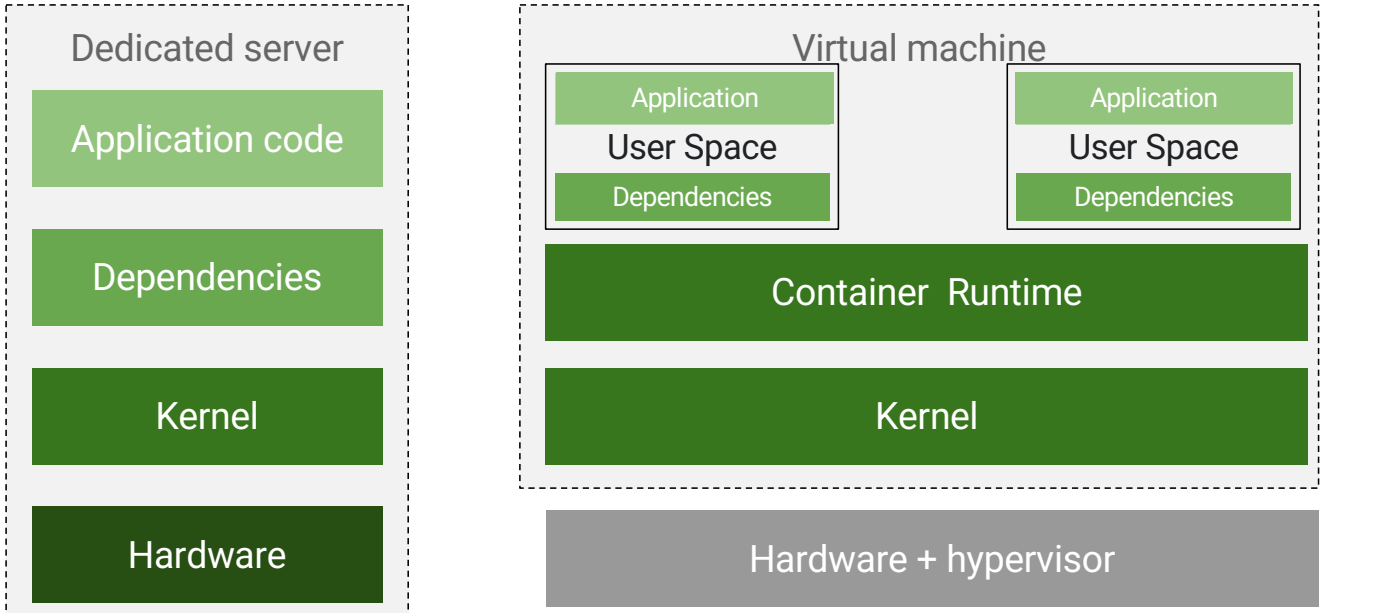


Deployment ~months
Not portable
Low utilization

Deployment ~days (mins)
Hypervisor-specific
Low isolation; tied to OS

Deployment ~days (mins)
Hypervisor-specific
Redundant OS

User space abstraction and containers

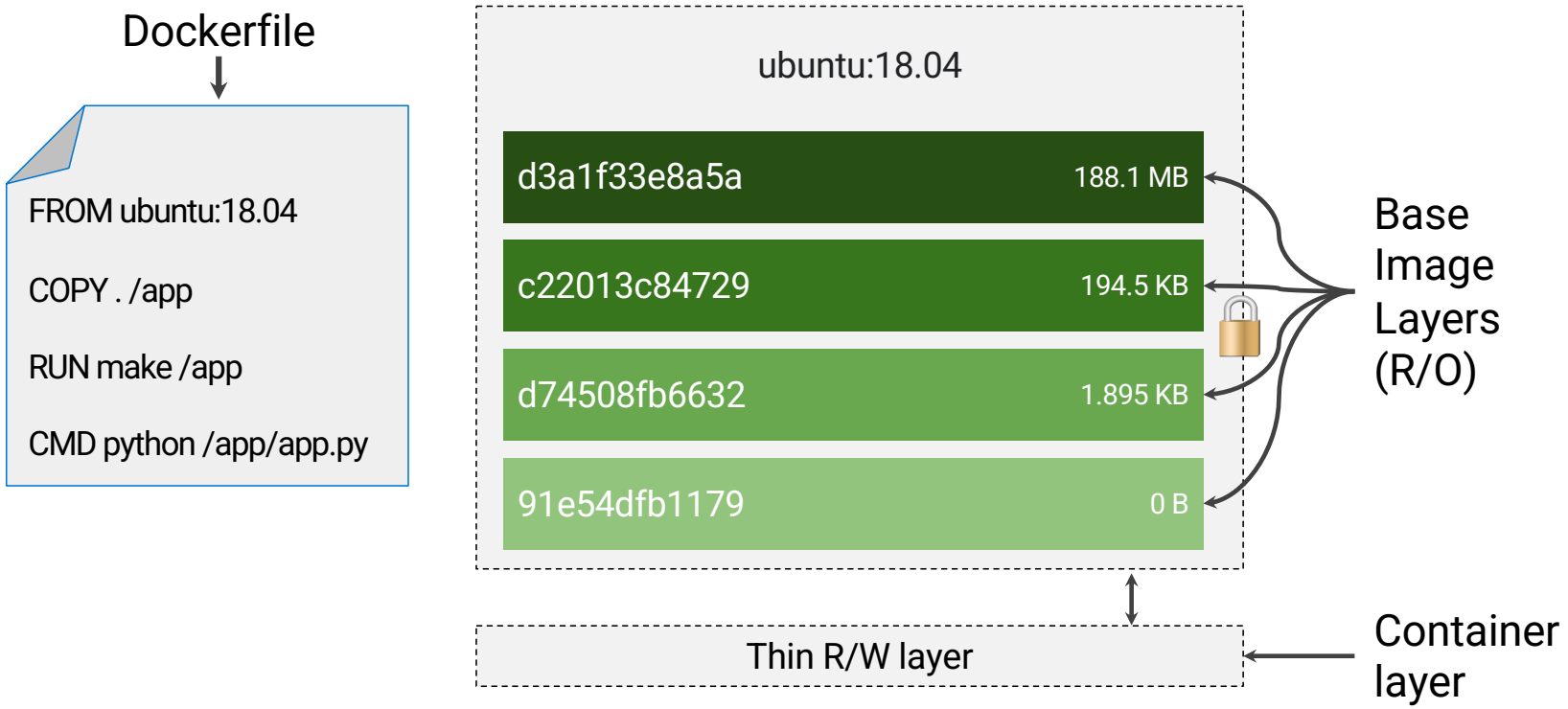


Deployment ~months
Not portable
Low utilization

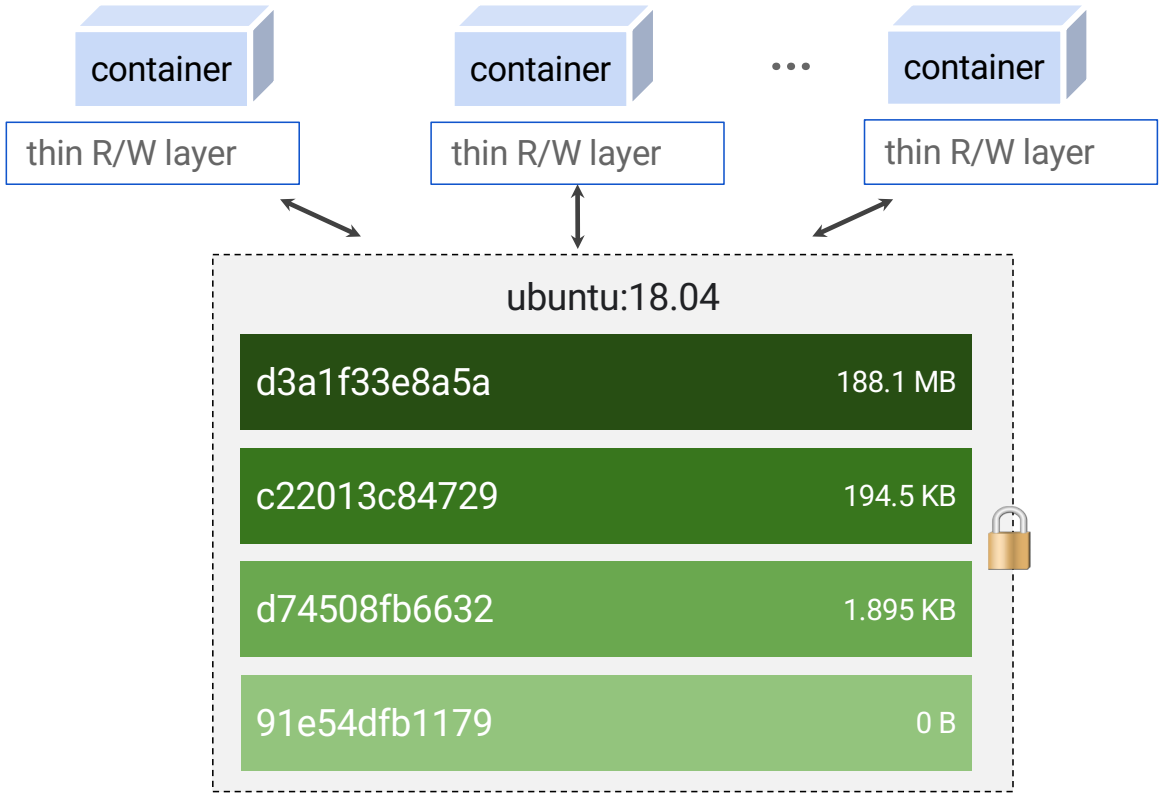
Deployment ~days (mins)
Hypervisor-specific
Low isolation; tied to OS

Deployment ~days (mins)
Hypervisor-specific
Redundant OS

Containers are structured in layers

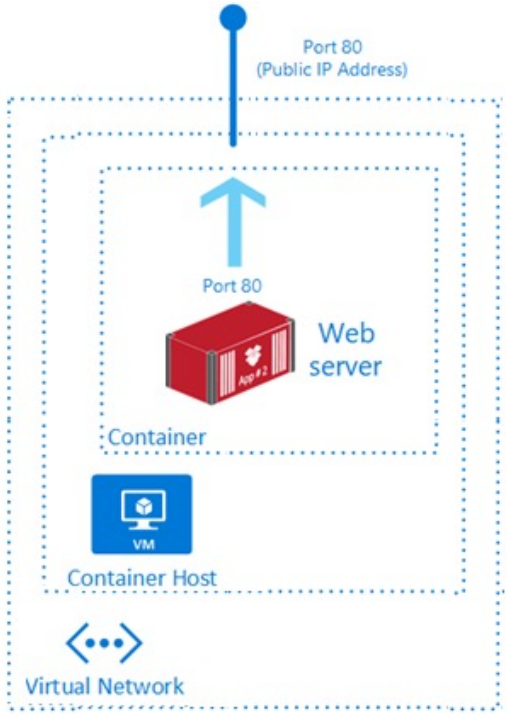


Containers promote smaller shared images



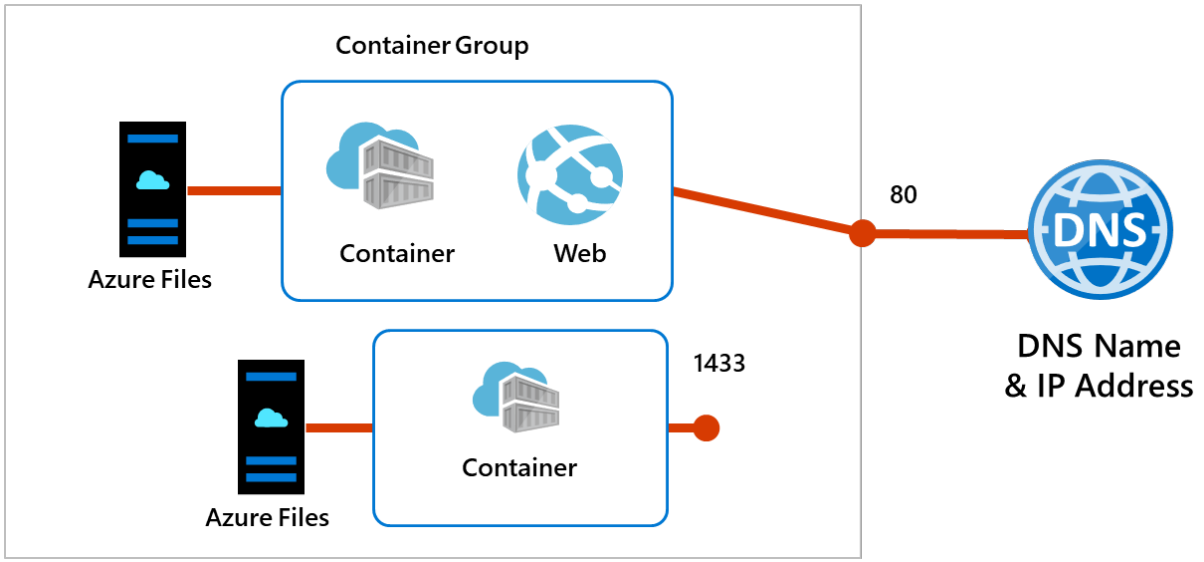
Azure Container Instances

- 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

Container Groups

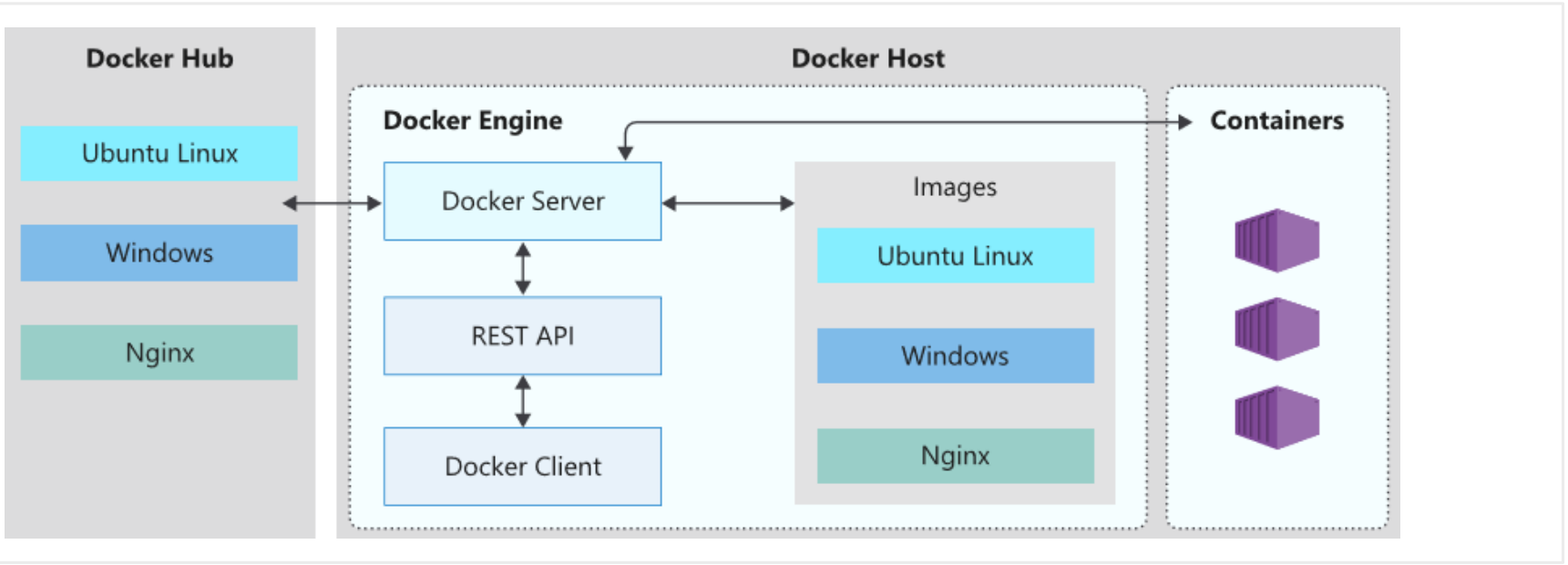


Top-level resource in Azure Container Instances

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

Docker

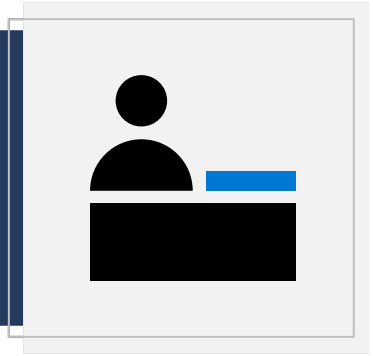


Enables developers to host applications within a container

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

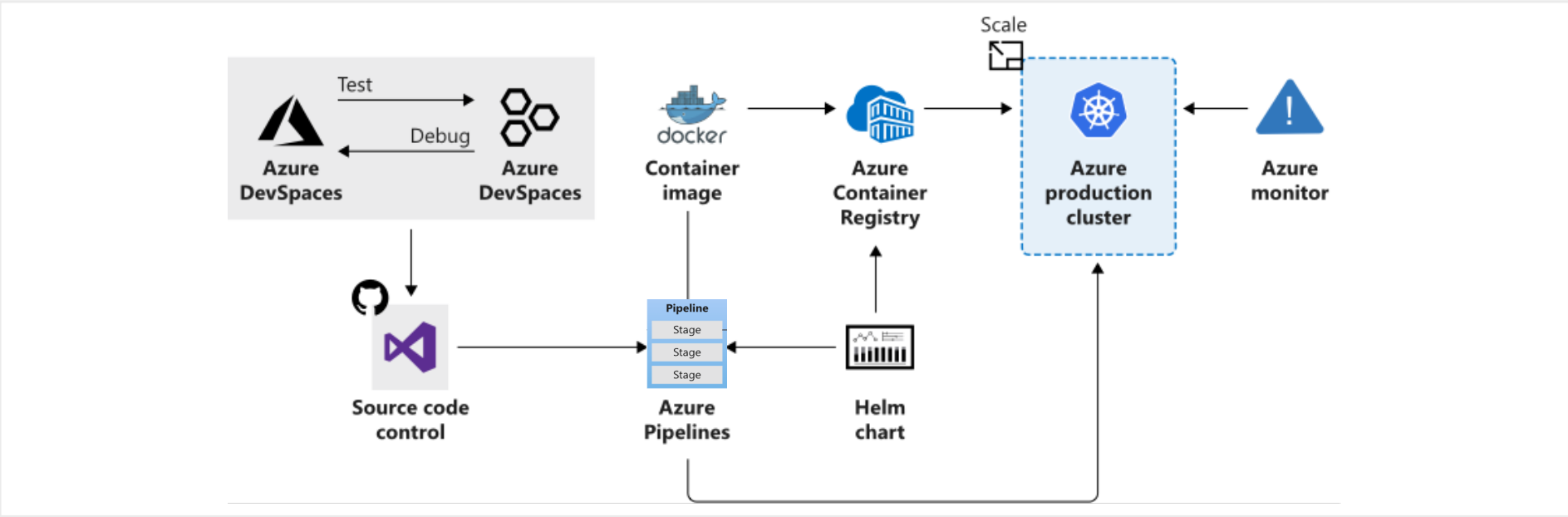
Lesson 04: Azure Kubernetes Service



Azure Kubernetes Services Overview

- Azure Kubernetes Services (AKS)
- AKS Terminology
- AKS Clusters and Nodes
- AKS Networking
- AKS Storage
- AKS Security
- AKS and Azure Active Directory
- AKS Scaling
- AKS Scaling to ACI
- Virtual Kubelet
- Demonstration – Deploy Azure Kubernetes Service

Azure Kubernetes Service



Manages health monitoring and maintenance

Performs simple cluster scaling

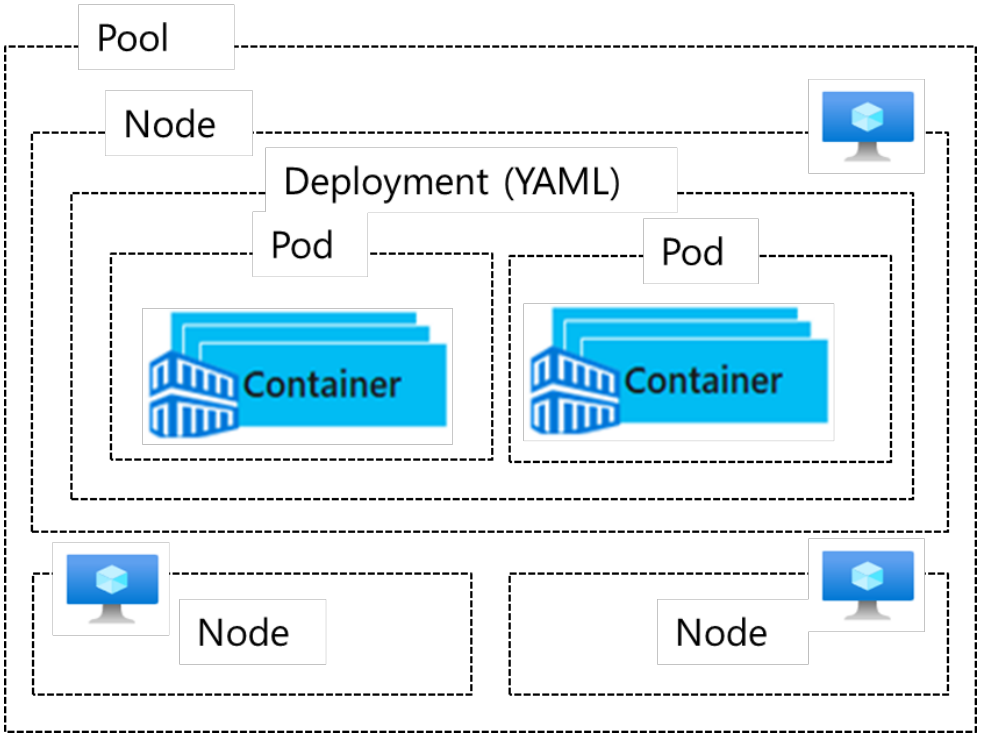
Enables nodes to be fully managed by Microsoft

You're responsible only for managing the agent nodes

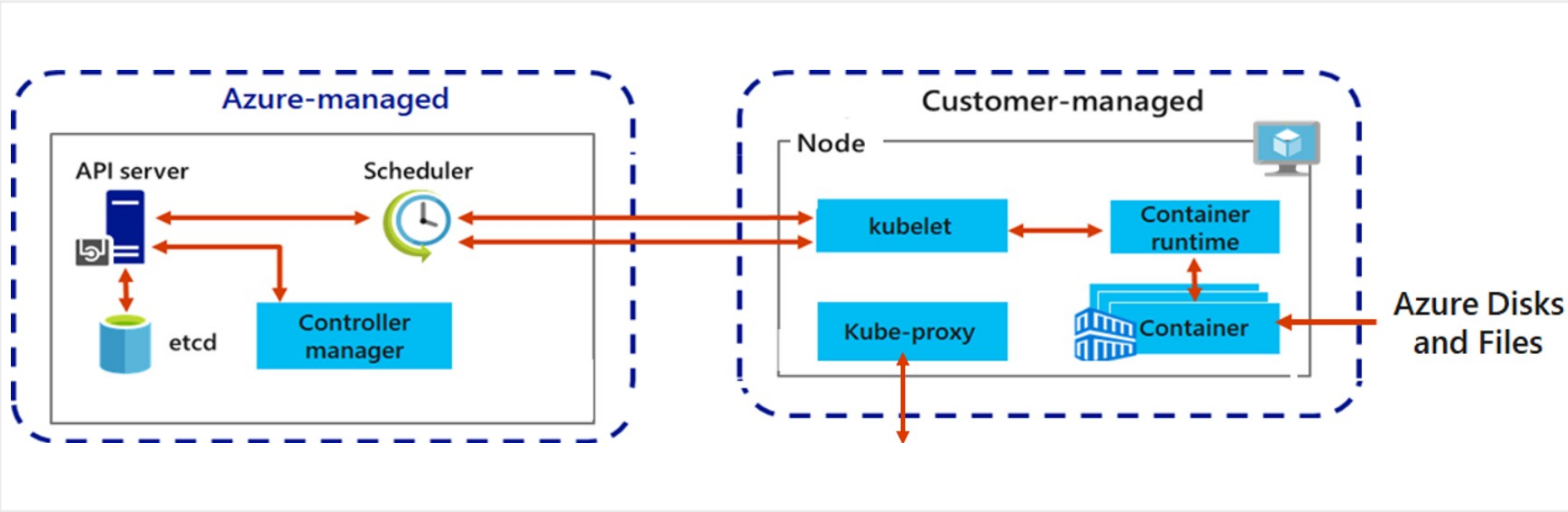
You pay only for the agent nodes

AKS Terminology

Term	Description
Pools	Groups of nodes with identical configurations
Nodes	Individual VM 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



AKS Clusters and Nodes

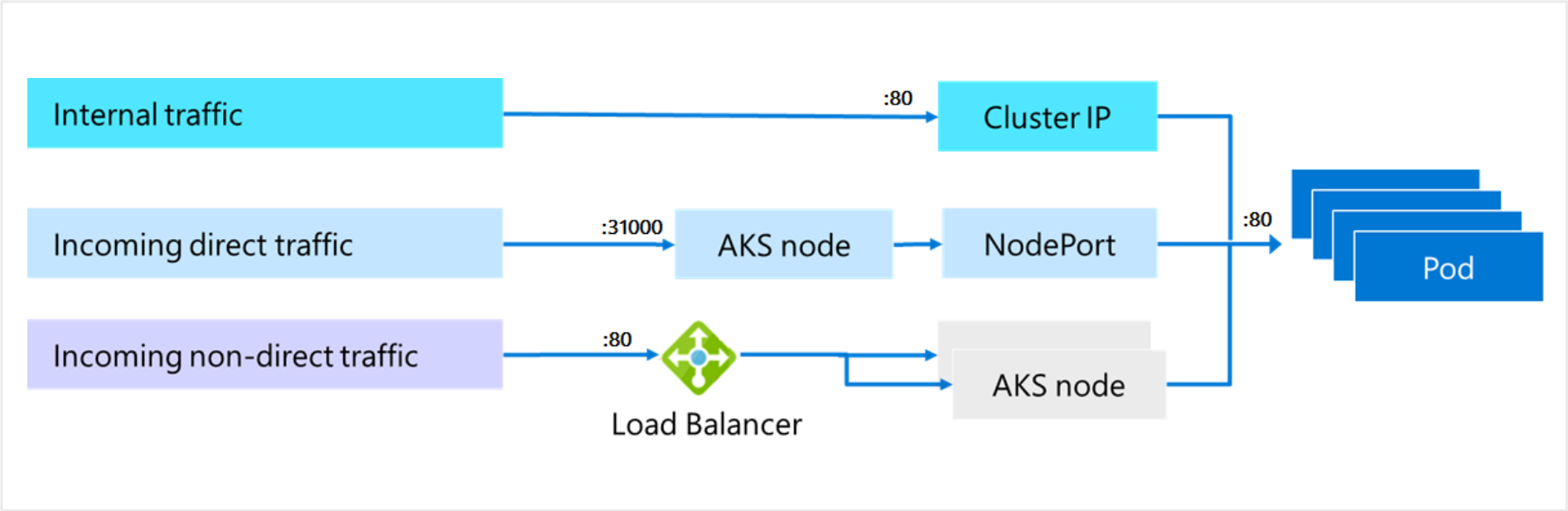


Azure-managed node provides core Kubernetes services and orchestration

Customer-managed nodes run applications and supporting services

Each individual node is an Azure virtual machine

AKS Networking



Pods run an instance of your application

Services group pods together to provide network connectivity

Cluster IP provides internal traffic access

NodePort provides mapping for incoming direct traffic

Load balancer has external IP address for incoming non-direct traffic

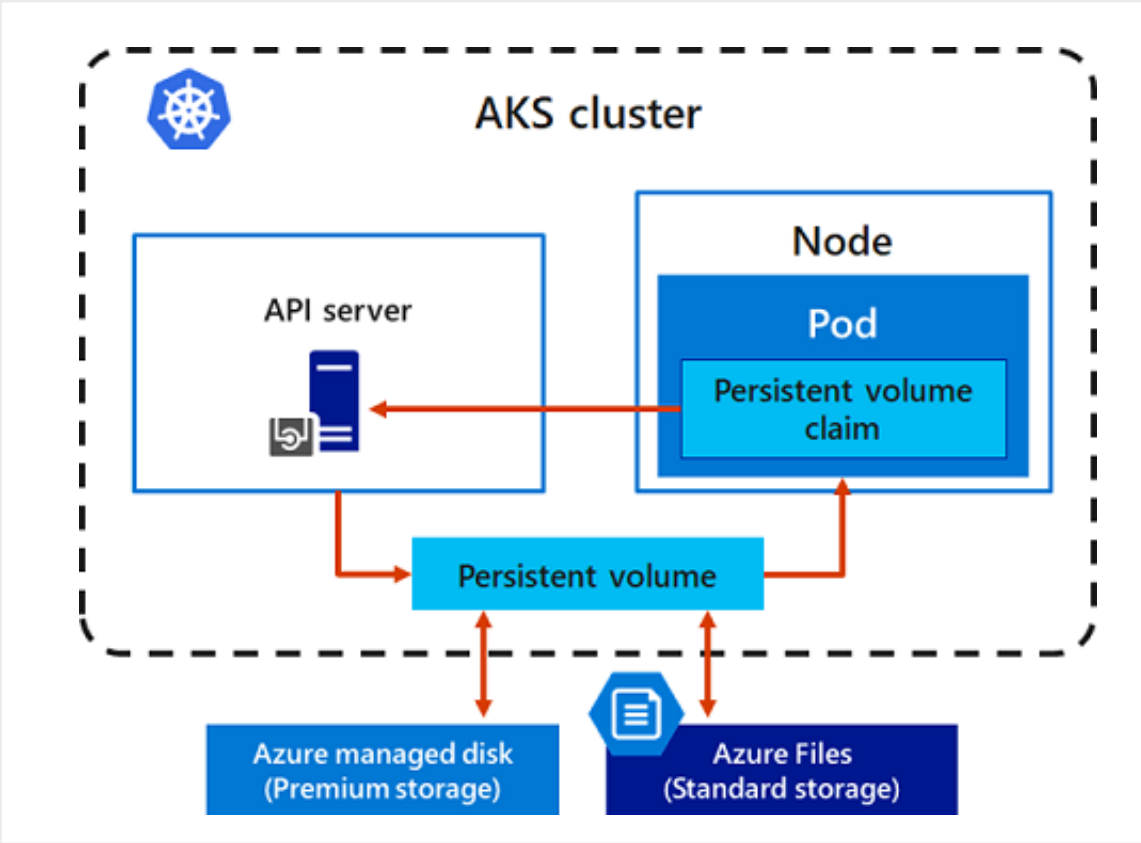
AKS Storage

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



AKS Security

Implement security across the entire AKS infrastructure

Managed service – Limit access with authorized IP ranges, create a private cluster, use RBAC and Azure AD access

Cluster upgrades – Upgrade the AKS cluster with cordon and drain

Node – Automatic OS security patches, Azure managed disks, pod security policies

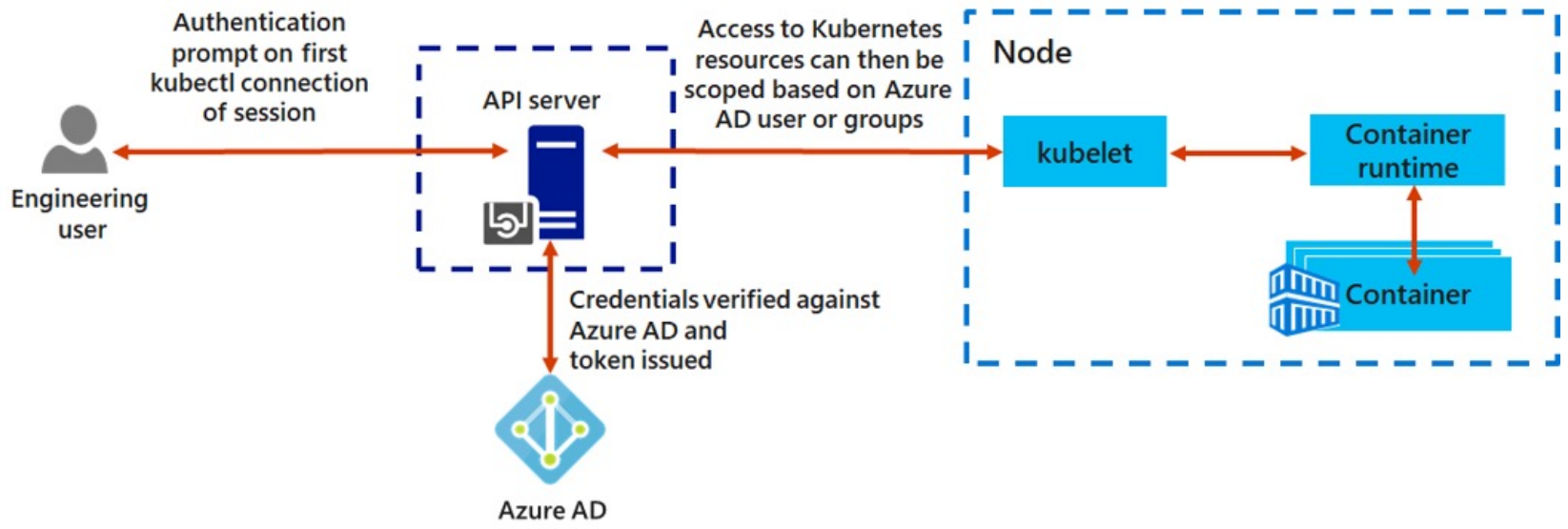
Networks – Define ingress controllers with private internal IP addresses, filter the flow of traffic with network security groups

Data – Kubernetes secrets for credentials and keys

AKS and Azure Active Directory

Use Azure AD as an integrated identity solution

Use service accounts, user accounts, and role-based access control



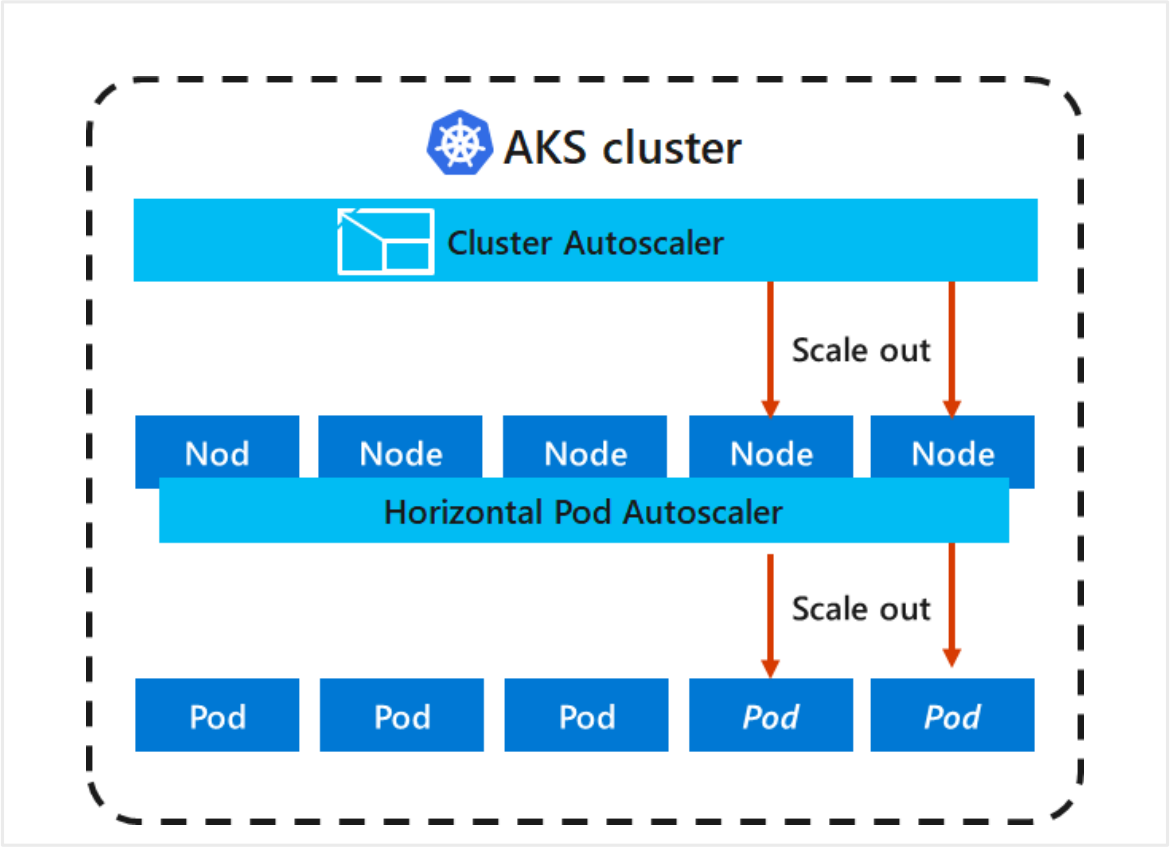
AKS Scaling

Applications might grow beyond the capacity of a single pod

Kubernetes has built-in autoscalers

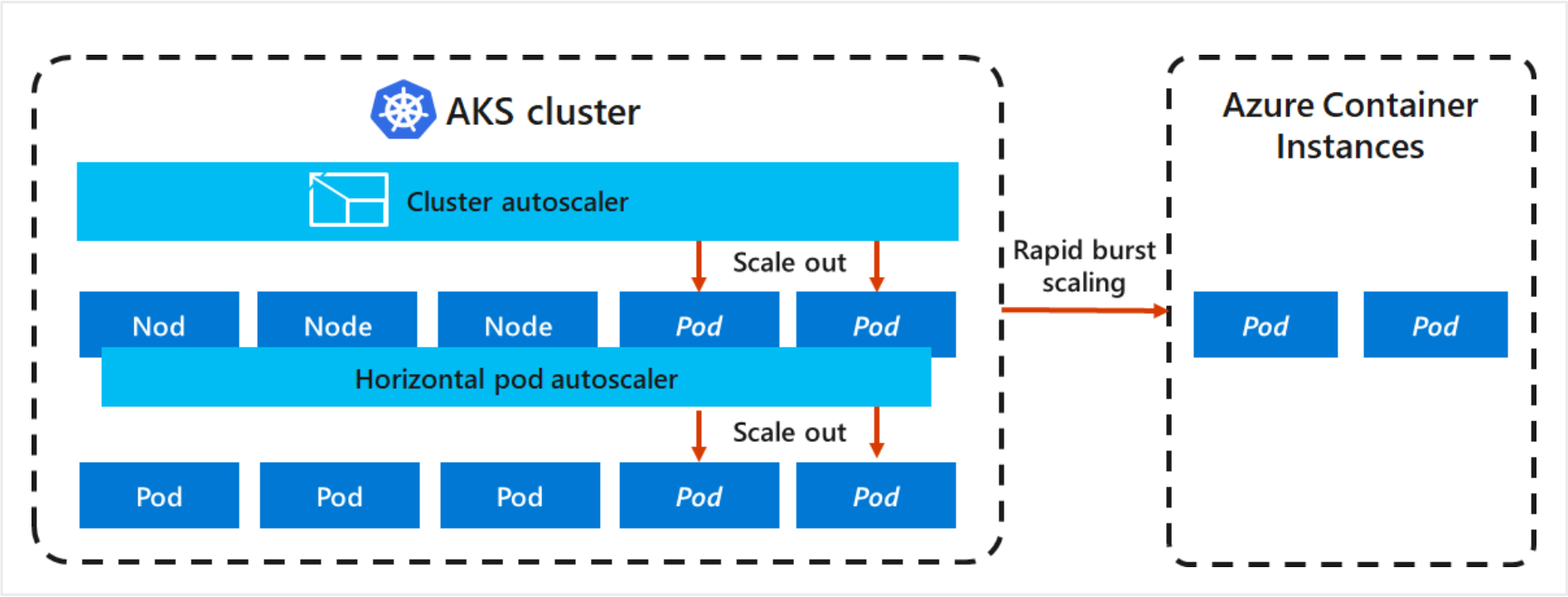
Cluster autoscaler scales based on compute resources

Horizontal pod autoscaler scales based on metrics

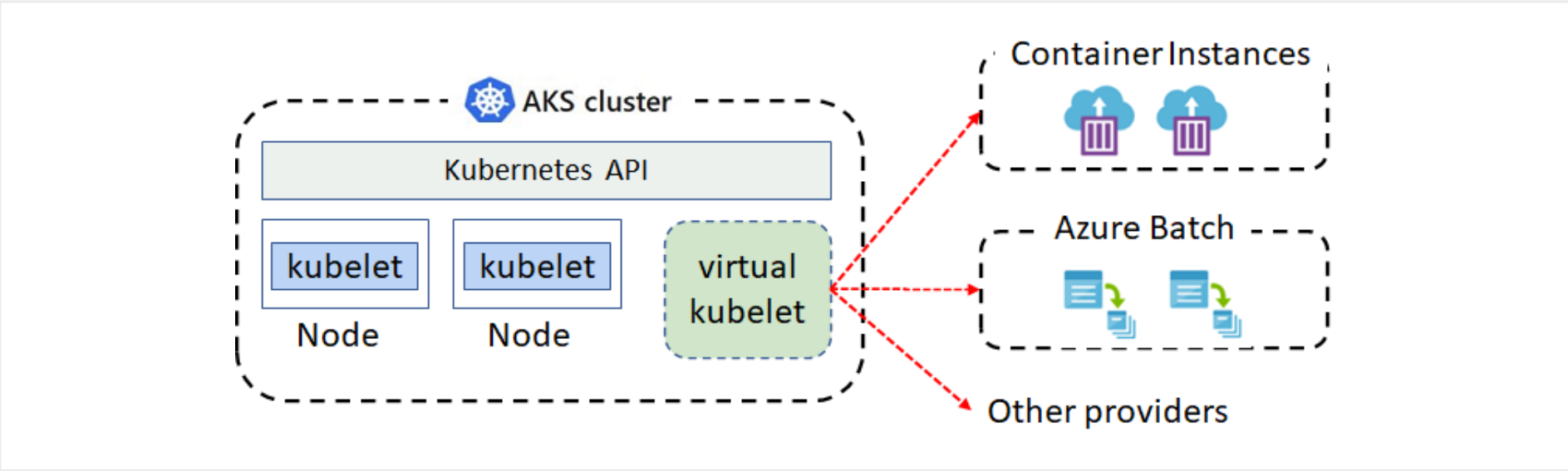


AKS Scaling to ACI

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



Virtual Kubelet

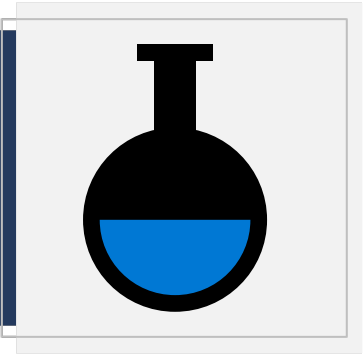


Virtual kubelet is an open-source Kubernetes kubelet implementation

The virtual kubelet registers itself as a node and allows developers to deploy pods and containers with their own APIs

Supported by an ecosystem of providers

Lesson 06: Module Labs and Review



Lab 09a – Implement web apps

Lab scenario

You need to evaluate the use of Azure Web apps for hosting Contoso's web sites, hosted currently in the company's on-premises data centers. The web sites are running on Windows servers using PHP runtime stack. You also need to determine how you can implement DevOps practices by leveraging Azure web apps deployment slots

Objectives

Task 1:
Create an Azure web app

Task 2:
Create a staging deployment slot

Task 3:
Configure web app deployment settings

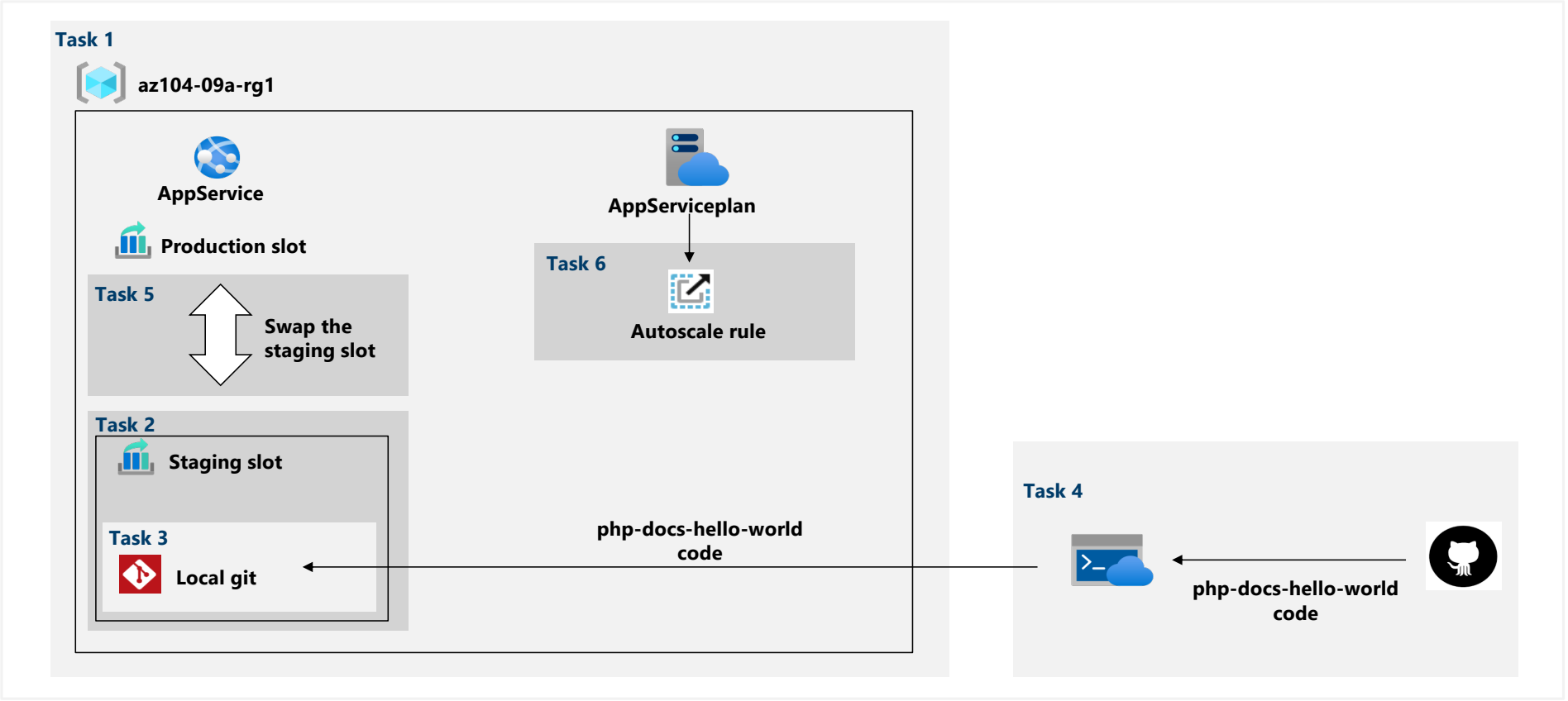
Task 4:
Deploy code to the staging deployment slot

Task 5:
Swap the staging slots

Task 6:
Configure and test autoscaling of the Azure web app

Next slide for an architecture diagram

Lab 09a – Architecture diagram



Lab 09b – Implement Azure Container Instances

Lab scenario

Contoso wants to find a new platform for its virtualized workloads. You identified several container images that can be leveraged to accomplish this objective. Since you want to minimize container management, you plan to evaluate the use of Azure Container Instances for deployment of Docker images

Objectives

Task 1:

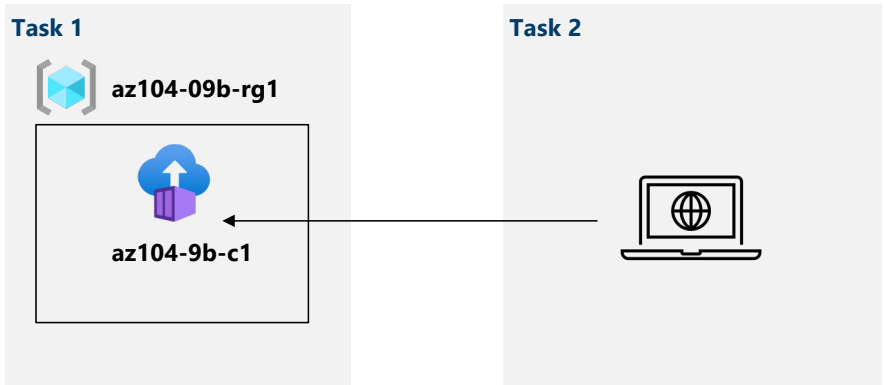
Deploy a Docker image by using the Azure Container Instance

Task 2:

Review the functionality of the Azure Container Instance

Next slide for an architecture diagram

Lab 09b – Architecture diagram



Lab 09c – Implement Azure Kubernetes service

Lab scenario

Contoso has several multi-tier applications that are not suitable to run by using Azure Container Instances. To determine whether they can be run as containerized workloads, you want to evaluate using Kubernetes as the container orchestrator. To minimize management overhead, you want to test Azure Kubernetes Service, including its simplified deployment experience and scaling

Objectives

Task 1:

Deploy an Azure Kubernetes Service cluster

Task 2:

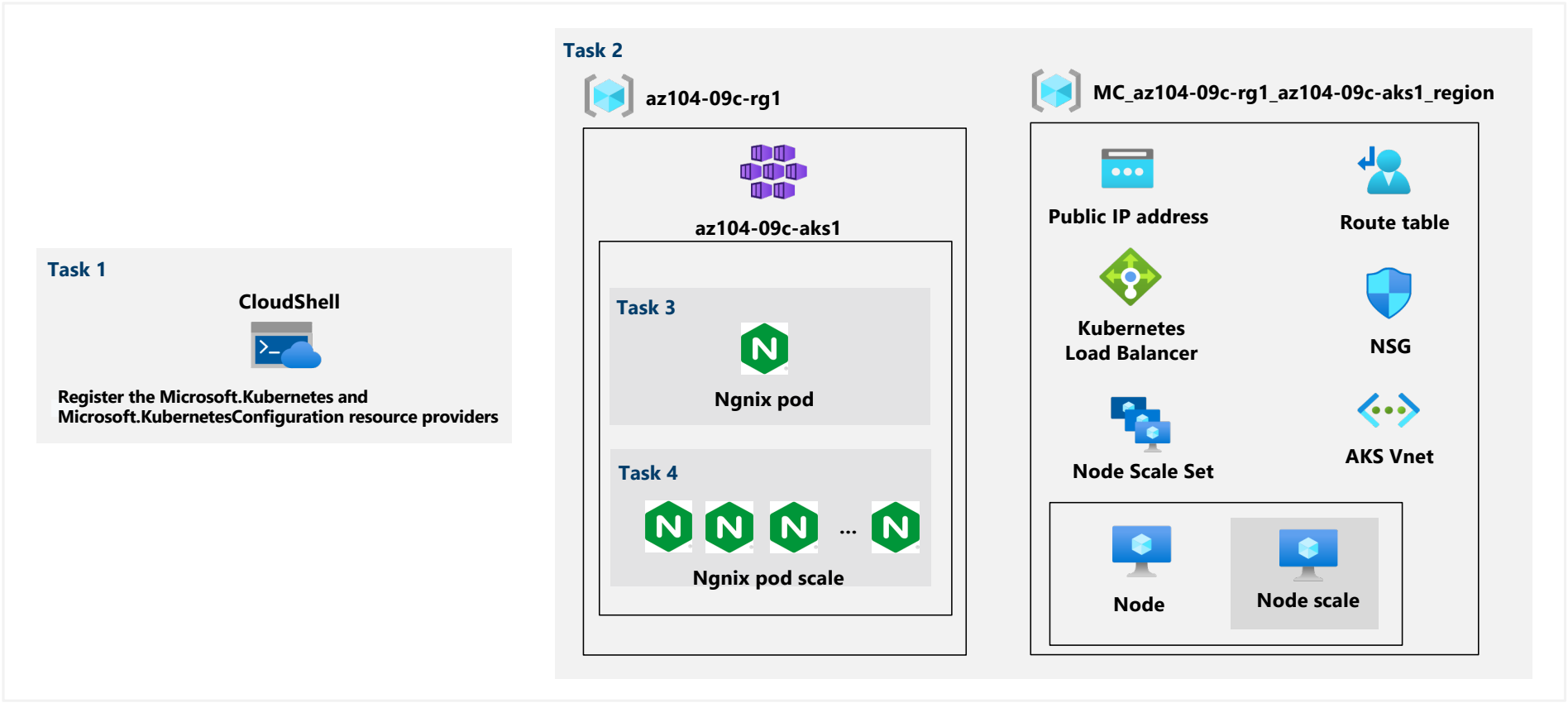
Deploy pods into the Azure Kubernetes Service cluster

Task 3:

Scale containerized workloads in the Azure Kubernetes service cluster

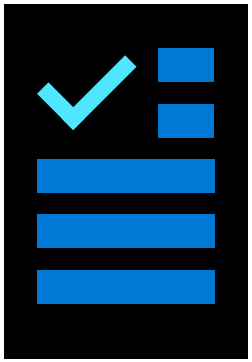
Next slide for an architecture diagram

Lab 09c – Architecture diagram



Module Review

Module Review Questions



Microsoft Learn Modules (docs.microsoft.com/Learn)

Host a web application with Azure App service

Stage a web app deployment for testing and rollback by using App Service deployment slots

Scale an App Service web app to efficiently meet demand with App Service scale up and scale out

Dynamically meet changing web app performance requirements with autoscale rules

Capture and view page load times in your Azure web app with Application Insights

Build a containerized web application with Docker

Run Docker containers with Azure Container Instances

Introduction to the Azure Kubernetes Service

End of presentation