

# Q3: Azure Blob Storage + AKS Persistent Volume Integration + CI/CD Deployment

## Screenshots

### 1. Azure Storage Accounts

staks5q074gff

Storage account

Search

UploadOpen in ExplorerDeleteMoveRefreshOpen in mobileCLI / PSFeedback

Overview

Activity log

Tags

Diagnose and solve problems

Access Control (IAM)

Data migration

Events

Storage browser

Storage Mover

Partner solutions

Resource visualizer

Data storage

Security + networking

Data management

Settings

Monitoring

Monitoring (classic)

Automation

Help

Essentials

Resource group (move) : rg-aks-5q074gff

Location : westus2

Subscription (move) : Azure for Students

Subscription ID : 69a0ceb2-4ba6-4cd4-bbf7-a35a58b1be1e

Disk state : Available

Tags (edit) : Environment : DevelopmentProject : AKS-TerraformPurpose : AKS-Persistent-Storage

Performance : Standard

Replication : Locally-redundant storage (LRS)

Account kind : StorageV2 (general purpose v2)

Provisioning state : Succeeded

Created : 7/18/2025, 10:04:28 PM

JSON View

Properties

Monitoring

Capabilities (7)

Recommendations (0)

Tutorials

Tools + SDKs

Blob service

Hierarchical namespace : Disabled

Default access tier : Hot

Blob anonymous access : Enabled

Blob soft delete : Disabled

Container soft delete : Disabled

Versioning : Enabled

Change feed : Disabled

NFS v3 : Disabled

Allow cross-tenant replication : Enabled

Storage tasks assignments : None

File service

Large file share : Enabled

Identity-based access : Not configured

Default share-level permissions : Disabled

Soft delete : Enabled (7 days)

Queue service

Security

Require secure transfer for REST API operations : Enabled

Storage account key access : Enabled

Minimum TLS version : Version 1.2

Infrastructure encryption : Disabled

Networking

Allow access from : All networks

Private endpoint connections : 0

Network routing : Microsoft network routing

Access for trusted Microsoft services : Yes

Endpoint type : Standard

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## 2. AKS Storage Status

```
Finalizers:      [kubernetes.io/pv-protection]
StorageClass:    azure-blob-storage
Status:          Bound
Claim:           default/aks-blob-pvc
Reclaim Policy:  Retain
Access Modes:    RWX
VolumeMode:      Filesystem
Capacity:        10Gi
Node Affinity:   <none>
Message:
Source:
  Type:          CSI (a Container Storage Interface (CSI) volume so
  Driver:         blob.csi.azure.com
  FSType:
  VolumeHandle:   staks5q074gff-aks-persistent-storage
  ReadOnly:       false
  VolumeAttributes: containerName=aks-persistent-storage
                    protocol=fuse
Events:          <none>
○ munachiernest-eze@Munachis-MacBook-Pro BCDV4034-FinalExam %
```

## 3. Persistent Container

<

# 4. CI/CD Pipeline Success

Deploy AKS Store Demo - Self-Hosted Runner

Fix deployment to apply YAML to correct namespace #13

Re-run all jobs

Summary

Jobs

Run details

Usage

Workflow file

deploy

succeeded now in 59s

Search logs

Set up job1s

Checkout code1s

Azure CLI Login with Managed Identity1s

Create AKS Cluster1s

Get AKS Credentials1s

Deploy AKS Store Demo52s

1 ▶ Run # Create namespace first

41 namespace/aks-store-demo configured

42 statefulset.apps/rabbitmq created

43 configmap/rabbitmq-enabled-plugins created

44 service/rabbitmq created

45 deployment.apps/order-service created

46 service/order-service created

47 deployment.apps/product-service created

48 service/product-service created

49 deployment.apps/store-front created

50 service/store-front created

51 === Checking deployed resources ===

52

53 NAME READY STATUS RESTARTS AGE

54 pod/order-service-5c85f45984-8pvp4 0/1 Init:0/1 0 31s

55 pod/product-service-5b8794b597-96vhd 1/1 Running 0 31s

56 pod/rabbitmq-0 1/1 Running 0 31s

57 pod/store-front-6ff78d4f79-cqwhn 1/1 Running 0 30s

58 NAME TYPE CLUSTER-IP EXTERNAL-IP PORT(S) AGE

59 service/order-service ClusterIP 10.0.114.176 <none> 3000/TCP 31s

60 service/product-service ClusterIP 10.0.71.1 <none> 3002/TCP 31s

61 service/rabbitmq ClusterIP 10.0.253.144 <none> 5672/TCP,15672/TCP 31s

62 service/store-front LoadBalancer 10.0.220.145 <pending> 80:31088/TCP 30s

63 NAME READY IP-TO-BE-IP AVAILABLE AGE

# 5. AKS Store Demo Deployment

Microsoft Azure

Search resources, services, and docs (G+)

Copilot

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GEORGE BROWN COLLEGE

Home > All resources >

All resources

George Brown College

Create Manage view

You are viewing a new version of Browse experience. Click here to access the old experience.

Name ↑

kubernetes

kubernetes

kubernetes-a0a198bbff0242c1a0a

kubernetes-a43137dfd540c4c0911

kubernetes-a85fe6cb84f6941f1a01

kubernetes-ac263d121efab49ec89

KubernetesRecordingRulesRuleGro

MSProm-westus2-aks-cluster-5q07

MSProm-westus2-aks-cluster-5q07

NetworkWatcher\_eastus

NetworkWatcher\_westus2

NodeAndKubernetesRecordingRule

NodeRecordingRulesRuleGroup - i

NodeRecordingRulesRuleGroup-W

staks5q074gff

UXRecordingRulesRuleGroup - aks

UXRecordingRulesRuleGroup-Win

Showing 18 - 34 of 34. auto

Display count:

kubernetes-a0a198bbff0242c1a0d2dd542d8a2ec

Public IP address

Search

Associate Dissociate Delete Move Refresh Open in mobile Give feedback

Overview

Activity log

Access control (IAM)

Tags

Resource visualizer

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Help

Essentials

Resource group (move) : mc\_rg-aks-store-demo-aks-store-cluster-eastus

Location (move) : East US

Subscription (move) : Azure for Students

Subscription ID : 69a0ceb2-4ba6-4cd4-bbf7-a35a58b1be1e

Tags (edit) : aks-managed-cluster-name : aks-store-cluster aks-managed-cluster-rg : rg-aks-store-demo k8s-azure-cluster-name : kubernetes k8s-azure-service : aks-store-staging/store-front

Get Started Properties Tutorials

JSON View

SKU : Standard

Tier : Regional

IP address : 52.147.208.33

DNS name : -

Domain name label scope : -

Associated to : kubernetes

Virtual machine : -

Routing preference : Microsoft network

Use public IP addresses for public connections to Azure resources

Associate and configure public IP addresses to various Azure resources Learn more.

Associate to a resource

Associate your public IP address to an Azure resource such as an Azure Load Balancer or a network interface.

Associate IP

Configure a public IP address

Configure a DNS idle time, name, and alias record for your public IP address.

Configure

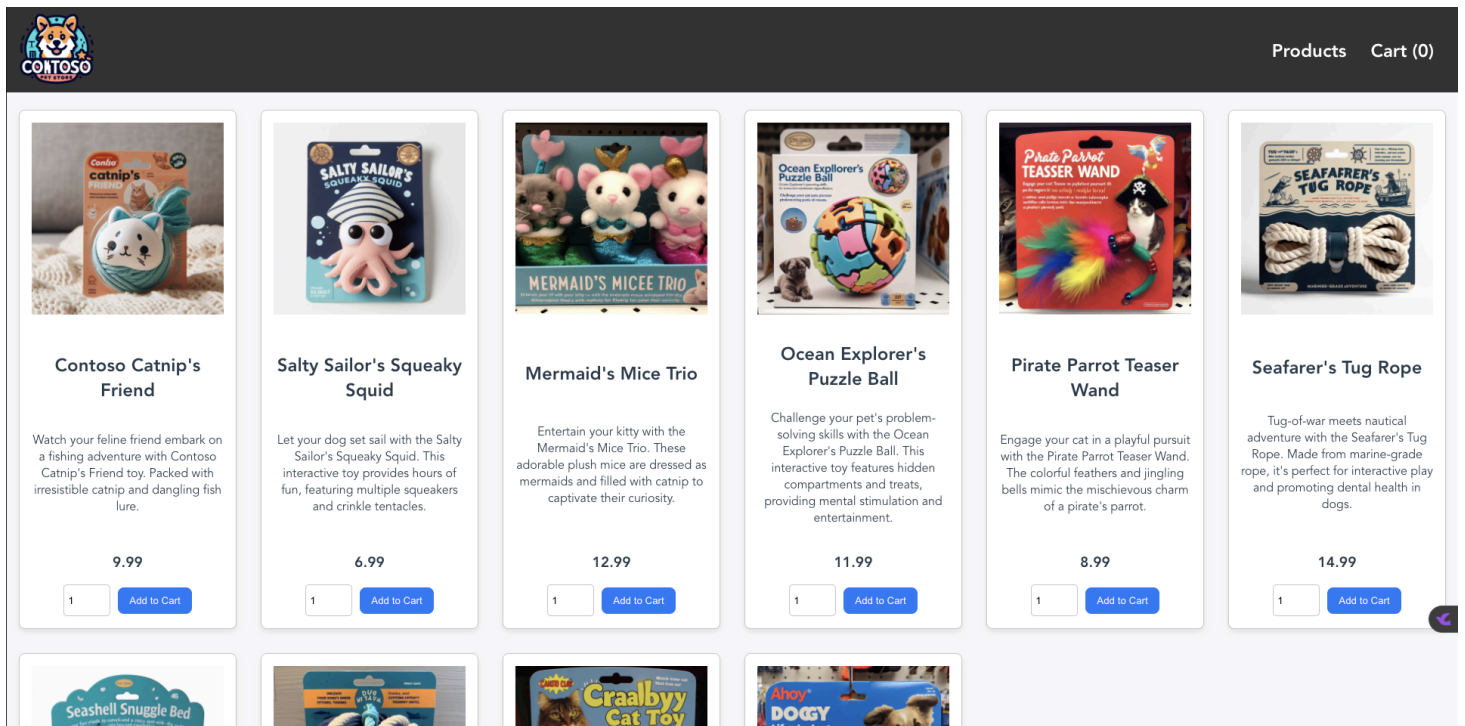
Protect IP address

Choose the right DDoS protection level for your IP address.

Protect

Add or remove favorites by pressing Cmd+Shift+F or ⌘+⇧+F

## 6. AKS Store Application Running



## 7. AKS Store with Security Context

```
munach:~$ kubectl get pod product-service-5db5645fb7-lpgbz -n aks-store-demo -o yaml | grep -A 20 securityContext
securityContext:
  allowPrivilegeEscalation: false
  capabilities:
    drop:
      - ALL
  readOnlyRootFilesystem: false
  runAsNonRoot: true
  runAsUser: 1000
  terminationMessagePath: /dev/termination-log
  terminationMessagePolicy: File
  volumeMounts:
  - mountPath: /var/run/secrets/kubernetes.io/serviceaccount
    name: kube-api-access-zvdzp
    readOnly: true
dnsPolicy: ClusterFirst
enableServiceLinks: true
nodeName: aks-default-39692054-vmss000002
nodeSelector:
  kubernetes.io/os: linux
preemptionPolicy: PreemptLowerPriority
priority: 0

securityContext:
  fsGroup: 1000
  runAsGroup: 1000
  runAsNonRoot: true
  runAsUser: 1000
serviceAccount: default
serviceAccountName: default
terminationGracePeriodSeconds: 30
tolerations:
- effect: NoExecute
  key: node.kubernetes.io/not-ready
  operator: Exists
  tolerationSeconds: 300
- effect: NoExecute
  key: node.kubernetes.io/unreachable
  operator: Exists
  tolerationSeconds: 300
- effect: NoSchedule
  key: node.kubernetes.io/memory-pressure
  operator: Exists
volumes:
```

## 8. AKS Store with Security

```
munachiernest-eze@Munachis-MacBook-Pro BCDV4034-FinalExam % kubectl get po
&& kubectl get services -n aks-store-demo && echo "----" && kubectl get po
&& kubectl get services -n aks-store-demo && echo "----" && kubectl get de
NAME                                READY    STATUS    RESTARTS   AGE
order-service-5c85f45984-956bv      1/1     Running   0          10m
product-service-5db5645fb7-lpgbz    1/1     Running   0          2m39s
rabbitmq-0                          1/1     Running   0          10m
store-front-6fff78d4f79-6nj4w      1/1     Running   0          2m38s
----
NAME                                TYPE                CLUSTER-IP    EXTERNAL-IP    PORT(S)
order-service                       ClusterIP           10.0.196.199  <none>         3000/TCP
product-service                    ClusterIP           10.0.111.1    <none>         3002/TCP
rabbitmq                           ClusterIP           10.0.123.245  <none>         5672/TCP,156
store-front                        LoadBalancer       10.0.15.153   <pending>      80:30520/TCP
----
NAME                                READY    UP-TO-DATE    AVAILABLE    AGE
order-service                       1/1     1             1            10m
product-service                    1/1     1             1            10m
store-front                        1/1     1             1            10m
munachiernest-eze@Munachis-MacBook-Pro BCDV4034-FinalExam %
```

## 9. AKS Store Cluster with Dependencies

Microsoft Azure

Search resources, services, and docs (G+ /)

Copilot

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Home > Resource groups > rg-aks-store-demo >

aks-store-cluster  
Kubernetes Service

Search

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Microsoft Defender for Cloud (preview)

Cost analysis

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Services and ingresses

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Events

Run command

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Node pools

Upgrades

Security configuration

Application scaling

Networking

Essentials

Resource group: rg-aks-store-demo

Power state: Running

Cluster operation status: Succeeded

Subscription: Azure for Students

Location: East US

Subscription ID: 69a0ceb2-4ba6-4cd4-bbf7-a35a58b1be1e

Fleet Manager: Click here to assign

Tags (edit): Add tags

Kubernetes version: 1.30.12

API server address: aks-store-rg-aks-store-dem-69a0ce-ns1v3yp7.hcp.eastus.azmk8s.io

Network configuration: Azure CNI Overlay

Node pools: 1 node pool

Container registries: Attach a registry

Get started

Properties

Monitoring

Recommendations

Kubernetes services

Encryption type: Encryption at-rest with a platform-managed key

Virtual node pools: Not enabled

Node pools

Node pools: 1 node pool

Kubernetes versions: 1.30.12

Node sizes: Standard\_B2s

Upgrades

Kubernetes version: 1.30.12

Auto Upgrade Type: -

Automatic upgrade scheduler: -

Node upgrade channel type: Node Image

Node upgrade channel scheduler: -

Security configuration

Networking

API server address: aks-store-rg-aks-store-dem-69a0ce-ns1v3yp7.hcp.eastus.azmk8s.io

Network configuration: Azure CNI Overlay

Pod CIDR: 10.244.0.0/16

Service CIDR: 10.0.0.0/16

DNS service IP: 10.0.0.10

Cilium dataplane: Not enabled

Network Policy: None

Load balancer: standard

Private cluster: Not enabled

Authorized IP ranges: Not enabled

Application Gateway ingress controller: Not enabled

Integrations

Container insights: Not enabled

Workspace resource ID: -

Service Mesh - Istio: Not enabled

Add or remove favorites by pressing Cmd+Shift+F

# Overview

This document demonstrates the integration of Azure Blob Storage with Azure Kubernetes Service (AKS) through persistent volumes, along with a complete CI/CD pipeline for automated deployment of the AKS store demo application.

## Files Submitted

### 1. Terraform Configuration

`storage-account.tf` - Creates Azure Storage Account and Blob Container

### 2. Kubernetes Storage Resources

`k8s-storage-class.yaml` - StorageClass for Azure Blob CSI driver

`k8s-persistent-volume.yaml` - PersistentVolume for blob storage

`k8s-persistent-volume-claim.yaml` - PVC for requesting storage

`k8s-storage-secret.yaml` - Secret for storage credentials

### 3. Application Deployment

`store-front-with-storage.yaml` - Deployment with volume mount

### 4. CI/CD Pipeline

`.github/workflows/deploy-aks-store-runner.yaml` - GitHub Actions workflow for automated deployment

## CI/CD Pipeline Details





### Architecture

- **Self-hosted GitHub Runner:** Running on Azure VM for secure access to Azure resources
- **Managed Identity Authentication:** Using user-assigned managed identity for secure Azure authentication
- **Automated Deployment:** Triggers on push to main branch or manual dispatch









## Pipeline Steps

1. **Checkout Code:** Retrieves the latest code from the repository
2. **Azure CLI Login:** Authenticates using managed identity
3. **AKS Cluster Management:** Creates AKS cluster if it doesn't exist
4. **Get Credentials:** Retrieves kubectl credentials for the cluster
5. **Deploy Application:** Applies the AKS store demo to the cluster
6. **Verify Deployment:** Checks deployment status and service URLs

## Security Features

-  **Managed Identity:** No secrets stored in workflow
-  **Self-hosted Runner:** Secure execution environment
-  **Namespace Isolation:** Deploys to dedicated namespace
-  **Error Handling:** Robust error handling and retry logic

## Current Status

-  **Azure Storage Account:** staks5q074gff - Created
-  **Blob Container:** aks-persistent-storage - Created
-  **Persistent Volume:** aks-blob-pv - Bound
-  **Storage Class:** azure-blob-storage - Active
-  **Deployment:** store-front-with-storage - Deployed
-  **CI/CD Pipeline:** Automated deployment workflow - Active
-  **AKS Store Demo:** Successfully deployed via CI/CD
-  **LoadBalancer Service:** store-front service with external access
-  **All Services:** product-service , order-service , rabbitmq - Running

## Deployment Results





### Services Deployed

- **store-front:** LoadBalancer service (external access)
- **product-service:** ClusterIP service
- **order-service:** ClusterIP service
- **rabbitmq:** StatefulSet with ClusterIP service

## Pod Status

- All pods running successfully
- Services properly configured
- LoadBalancer pending external IP assignment

## CI/CD Success Metrics

-  Workflow completes successfully
-  All deployment steps pass
-  Services accessible within cluster
-  External access via LoadBalancer