

Kubernetes Storage

Practice 1: Direct provisioning of Azure File storage.

```
PS /home/stanislav> az account set --subscription c983dec5-cde0-4991-9469-c26f8cf60056
PS /home/stanislav> az aks get-credentials --resource-group cluster --name ExerciseCluster
Merged "ExerciseCluster" as current context in /home/stanislav/.kube/config$true
```

- Setting subscription.

```
PS /home/stanislav> kubectl get deployments --all-namespaces
NAMESPACE      NAME                READY    UP-TO-DATE    AVAILABLE    AGE
kube-system    ama-logs-rs        1/1      1              1            7m54s
kube-system    coredns            2/2      2              2            7m53s
kube-system    coredns-autoscaler 1/1      1              1            7m53s
kube-system    konnectivity-agent 2/2      2              2            7m53s
kube-system    metrics-server     2/2      2              2            7m52s
PS /home/stanislav>
```

- Checking for running pods.

```
PS /home/stanislav> $AKS_PERS_STORAGE_ACCOUNT_NAME="kubernetesaccounthomework"
PS /home/stanislav> $AKS_PERS_RESOURCE_GROUP="kuberneteshomeworkgroup"
PS /home/stanislav> $AKS_PERS_LOCATION="eastus"
PS /home/stanislav> $AKS_PERS_SHARE_NAME="aksharename"
PS /home/stanislav> az group create --name $AKS_PERS_RESOURCE_GROUP -- $AKS_PERS_LOCATION
```

- Setting variables.

```
PS /home/stanislav> az group create --name $AKS_PERS_RESOURCE_GROUP --location $AKS_PERS_LOCATION
{
  "id": "/subscriptions/c983dec5-cde0-4991-9469-c26f8cf60056/resourceGroups/kuberneteshomeworkgroup",
  "location": "eastus",
  "managedBy": null,
  "name": "kuberneteshomeworkgroup",
  "properties": {
    "provisioningState": "Succeeded"
  },
  "tags": null,
  "type": "Microsoft.Resources/resourceGroups"
}
PS /home/stanislav>
```

- Creating resource group.

```

PS /home/stanislaw> az storage account create -n $AKS_PERS_STORAGE_ACCOUNT_NAME -g $AKS_PERS_RESOURCE_GROUP -l $AKS_PERS_LOCATION
--sku Standard_LRS
The public access to all blobs or containers in the storage account will be disallowed by default in the future, which means default value for --allow-blob-public-access is still null but will be equivalent to false.
{
  "accessTier": "Hot",
  "allowBlobPublicAccess": true,
  "allowCrossTenantReplication": null,
  "allowSharedKeyAccess": null,
  "allowedCopyScope": null,
  "azureFilesIdentityBasedAuthentication": null,
  "blobRestoreStatus": null,
  "creationTime": "2023-04-09T11:28:27.100929+00:00",
  "customDomain": null,
  "defaultToOAuthAuthentication": null,
  "dnsEndpointType": null,
  "enableHttpsTrafficOnly": true,
  "enableNfsV3": null,
  "encryption": {
    "encryptionIdentity": null,
    "keySource": "Microsoft.Storage",
    "keyVaultProperties": null,
    "requireInfrastructureEncryption": null,
    "services": {
      "blob": {
        "enabled": true,
        "keyType": "Account",
        "lastEnabledTime": "2023-04-09T11:28:27.272784+00:00"
      },
      "file": {
        "enabled": true,
        "keyType": "Account",
        "lastEnabledTime": "2023-04-09T11:28:27.272784+00:00"
      },
      "queue": null,
      "table": null
    }
  },
  "extendedLocation": null,
  "failoverInProgress": null,
  "geoReplicationStats": null,
  "id": "/subscriptions/c983dec5-cde0-4991-9469-c26f8cf60056/resourceGroups/kuberneteshomeworkgroup/providers/Microsoft.Storage/storageAccounts/kubernetesaccount15321",
  "identity": null,
  "immutableStorageWithVersioning": null,
  "isHnsEnabled": null,
  "isLocalUserEnabled": null,
  "isSftpEnabled": null,

```

- Creating storage account.

```

Here we save the command az storage account show-connection-string to a variable.
PS /home/stanislaw> $AZURE_STORAGE_CONNECTION_STRING=$(az storage account show-connection-string -n $AKS_PERS_STORAGE_ACCOUNT_NAME -g $AKS_PERS_RESOURCE_GROUP -o tsv)
PS /home/stanislaw>

```

- Exporting the connection string as a variable.

```

PS /home/stanislaw> az storage share create -n $AKS_PERS_SHARE_NAME --connection-string $AZURE_STORAGE_CONNECTION_STRING
{
  "created": true
}

```

- File share created.

```

PS /home/stanislaw> $STORAGE_KEY=$(az storage account keys list --resource-group $AKS_PERS_RESOURCE_GROUP --account-name $AKS_PERS_STORAGE_ACCOUNT_NAME --query "[0].value" -o tsv)
PS /home/stanislaw>

```

- Getting storage account key.

```
PS /home/stanislav> echo Storage account name: $AKS_PERS_STORAGE_ACCOUNT_NAME
Storage
account
name:
kubernetesaccount15321
PS /home/stanislav> echo Storage account key: $STORAGE_KEY
Storage
account
key:
pwBgeJBhWZZU9bEYAi9pK/fGnBkXH7NZsZ+dRp++ooTIqz+NsubNs8N1QvhGQ1Ka7PXOnuc/1w++Ast5FGXQA==
PS /home/stanislav>
```

- Storage account name and key.

```
PS /home/stanislav> kubectl create secret generic azure-secret --from-literal=azurestorageaccountname=$AKS_PERS_STORAGE_ACCOUNT_NAME --from-literal=azurestorageaccountkey=$STORAGE_KEY
secret/azure-secret created
PS /home/stanislav> kubectl get secret -A
```

	NAME	TYPE	DATA	AGE
default	azure-secret	Opaque	2	14s
kube-system	ama-logs-secret	Opaque	2	52m
kube-system	bootstrap-token-xvrtsr	bootstrap.kubernetes.io/token	4	52m
kube-system	connectivity-certs	Opaque	3	52m

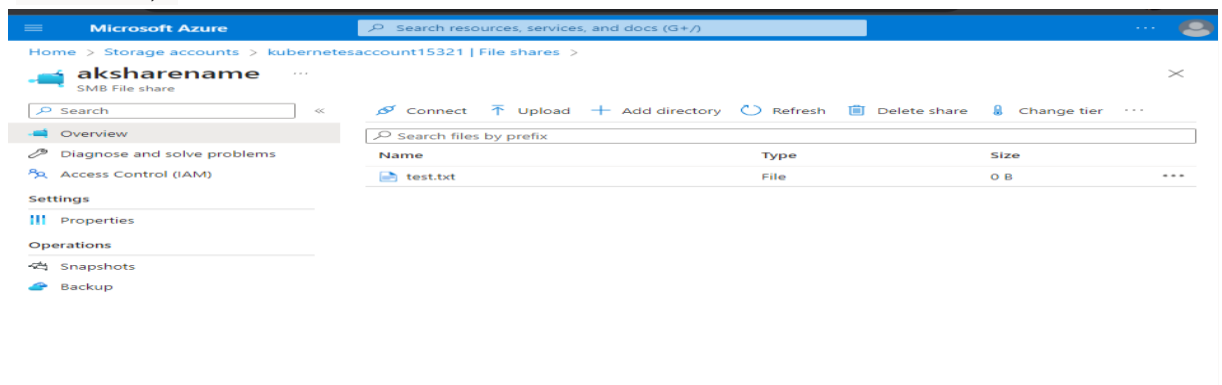
```
PS /home/stanislav>
```

- Creating a secret.

```
PS /home/stanislav> kubectl apply -f azure-file-pod.yaml
pod/mypod created
PS /home/stanislav> kubectl describe pod mypod
```

```
Name:          mypod
Namespace:     default
Priority:       0
Service Account: default
Node:          aks-agentpool-86139379-vmss000000/10.224.0.5
Start Time:    Sun, 09 Apr 2023 12:16:02 +0000
Labels:        <none>
Annotations:   <none>
Status:        Pending
IP:            <none>
IPs:           <none>
Containers:
  mypod:
    Container ID:  mcr.microsoft.com/oss/nginx/nginx:1.15.5-alpine
    Image:         mcr.microsoft.com/oss/nginx/nginx:1.15.5-alpine
    Image ID:      <none>
    Port:          <none>
    Host Port:     <none>
    State:         Waiting
      Reason:      ContainerCreating
    Ready:         False
    Restart Count: 0
    Limits:
      cpu:         250m
      memory:      256Mi
    Requests:
      cpu:         100m
      memory:      128Mi
```

- Creating a pod from a yaml file(every yaml is in my Github).



- Checking if the test file is there.

Practice 2: Provisioning Azure File storage using PVs and PVCs.

```
PS /home/stanislav> kubectl delete pod mypod
pod "mypod" deleted
```

- Deleting the pod, that we created last task.

```
PS /home/stanislav> kubectl apply -f azurefile-mount-options-pv.yaml
persistentvolume/azurefile created
PS /home/stanislav> ls
az104-02a-customRoleDefinition.json  az104-06-vms-loop-template.json  clouddrive
az104-05-vnetvm-loop-parameters.json  azurefile-mount-options-pvc.yaml  Microsoft
az104-05-vnetvm-loop-template.json    azurefile-mount-options-pv.yaml   php-docs-hello-world
az104-06-vms-loop-parameters.json     azure-file-pod.yaml
PS /home/stanislav> kubectl apply -f azurefile-mount-options-pvc.yaml
persistentvolumeclaim/azurefile created
PS /home/stanislav> kubectl get pvc azurefile
NAME          STATUS    VOLUME   CAPACITY   ACCESS MODES   STORAGECLASS   AGE
azurefile     Bound    azurefile  5Gi        RWX             Microsoft      21s
PS /home/stanislav>
```

- Executing the two yaml files and verifying the azure file is there.

```
PS /home/stanislav> kubectl apply -f azure-files-pod.yaml
pod/mypod created
PS /home/stanislav>
```

- Executing the azure-files-pod.

```
Microsoft Azure
PS /home/stanislav> kubectl describe pod mypod
Name: mypod
Namespace: default
Priority: 0
Service Account: default
Node: aks-agentpool-86139179-vmss000000/10.224.0.5
Start Time: Sun, 02 Apr 2023 13:56:21 +0000
Labels: <none>
Annotations: <none>
Status: Pending
IP: <none>
IPs: <none>
Containers:
  mypod:
    Container ID: mcr.microsoft.com/oss/nginx/nginx:1.15.5-alpine
    Image ID: <none>
    Ports: <none>
    Host Port: <none>
    State: Waiting
    Reason: ContainerCreating
    Ready: False
    Restart Count: 0
    Limits:
      cpu: 250m
      memory: 256Mi
    Requests:
      cpu: 100m
      memory: 128Mi
    Environment: <none>
    Mounts:
      /mnt/azure from azure (rw)
      /var/run/secrets/kubernetes.io/serviceaccount from kube-api-access-xtsk (ro)
Conditions:
  Type             Status
  Initialized       True
  Ready             False
  ContainersReady   False
  PodScheduled      True
Volumes:
  azure:
    Type: PersistentVolumeClaim (a reference to a PersistentVolumeClaim in the same namespace)
    ClaimName: azurefile
    ReadOnly: false
  kube-api-access-xtsk:
    Type: Projected (a volume that contains injected data from multiple sources)
    TokenExpirationSeconds: 3607
    ConfigMapName: kube-root-ca.crt
```

- Output from the kubectl describe

Microsoft Azure | Search resources, services, and docs (G+)

Home > Storage accounts > kubernetesaccount15321 | File shares >

aksharename ...
SMB File share

Search

Connect Upload Add directory Refresh Delete share Change tier Edit quota

Overview

Search files by prefix

Name	Type	Size
test.txt	File	0 B

Diagnose and solve problems

Access Control (IAM)

Settings

Properties

Operations

Snapshots

Backup

```
PowerShell
status 32
Mounting command: mount
Mounting arguments: -t cifs -o dir_mode=0777,file_mode=0777,uid=1000,gid=1000,mfsymlinks,nobrl,actimeo=30,<masked> //kubernetesaccount15321.file.core.windows.net/aksshare /var/lib/kubelet/plugins/kubernetes.io/csi/file.csi.azure.com/538c1d1afed7f0963849b065d9c21b427f80dedf8744027378c5e17352004397/globalmount
Output: mount error(2): No such file or directory
Refer to the mount.cifs(8) manual page (e.g. man mount.cifs) and kernel log messages (dmesg)
PS /home/stanislav> kubectl exec -it mypod -- sh
```

- Checking the files.

```
error: unable to upgrade connection: container not found (mypod)
PS /home/stanislaw> kubectl delete pvc azurefile
persistentvolumeclaim "azurefile" deleted
```

- Deleting the azure file.

Practice 3: Provisioning Azure file storage using Storage Classes.

```
PS /home/stanislaw> kubectl apply -f azure-file-sc.yaml
storageclass.storage.k8s.io/my-azurefile created
PS /home/stanislaw>
```

- Creating storage class.

```
PS /home/stanislaw> kubectl apply -f azurefile-pvc.yaml
persistentvolumeclaim/my-azurefile created
PS /home/stanislaw>
```

- Creating persistent volume.

```
PS /home/stanislaw> kubectl get pvc my-azurefile
```

NAME	STATUS	VOLUME	CAPACITY	ACCESS MODES	STORAGECLASS	AGE
my-azurefile	Bound	pvc-ab7a45b9-35fd-4379-81a3-c65e3133bd9b	5Gi	RWX	my-azurefile	52s

```
PS /home/stanislaw>
```

- Information and credentials.

```
PS /home/stanislaw> kubectl apply -f azure-pvc-files.yaml
pod/mypod created
PS /home/stanislaw> kubectl describe pod mypod
```

Name: mypod
Namespace: default
Priority: 0
Service Account: default
Node: aks-agentpool-86139379-vmss000000/10.224.0.5
Start Time: Sun, 09 Apr 2023 14:40:06 +0000
Labels: <none>
Annotations: <none>
Status: Running
IP: 10.244.1.17
IPs: IP: 10.244.1.17
Containers:
 mypod:
 Container ID: containerd://62d1ef70ebc73f5c2f2f16fb7d1c34c9aec005ed3cbff4a7a86b80c5816d352
 Image: mcr.microsoft.com/oss/nginx/nginx:1.15.5-alpine
 Image ID: mcr.microsoft.com/oss/nginx/nginx@sha256:f84780a5ad654515bcd9ba2f35e20935e1246799f198683dd2c4f74d19ae9e

- Creating the pod and some description.

```
PS /home/stanislaw> kubectl delete pvc my-azurefile
persistentvolumeclaim "my-azurefile" deleted
PS /home/stanislaw> kubectl get pvc my-azurefile
Error from server (NotFound): persistentvolumeclaims "my-azurefile" not found
PS /home/stanislaw> kubectl get pod
No resources found in default namespace.
PS /home/stanislaw> kubectl get pod mypod
Error from server (NotFound): pods "mypod" not found
PS /home/stanislaw>
```

- Deleting the azure-file and the pod.

Practice 4: Direct provisioning of Azure Disk storage.

```
PS /home/stanislaw> az aks show --resource-group MC_cluster_ExerciseCluster_westeurope --name ExerciseCluster --query nodeResourceGroup -o tsv
MC_cluster_ExerciseCluster_westeurope
PS /home/stanislaw>
```

- Creating a disk in the node resource group.

```
PS /home/stanislaw> az disk create --resource-group MC_cluster_ExerciseCluster_westeurope --name myAKSDisk --size-gb 20 --query id --output tsv
/subscriptions/c983dec5-cde0-4991-9469-c26f8cf60056/resourceGroups/MC_cluster_ExerciseCluster_westeurope/providers/Microsoft.Compute/disks/myAKSDisk
PS /home/stanislaw>
```

- /subscriptions/c983dec5-cde0-4991-9469-c26f8cf60056/resourceGroups/MC_cluster_ExerciseCluster_westeurope/providers/Microsoft.Compute/disks/myAKSDisk

- Creating the disk resource group.

```
PS /home/stanislaw> kubectl apply -f azure-disk-pod.yaml
pod/mypod created
PS /home/stanislaw>
```

- Creating the disk pod.

```
PS /home/stanislav> kubectl describe pod mypod
Name: mypod
Namespace: default
Priority: 0
Service Account: default
Node: aks-agentpool-86139379-vmss000000/10.224.0.5
Start Time: Sun, 09 Apr 2023 14:55:51 +0000
Labels: <none>
Annotations: <none>
Status: Pending
IP: <none>
IPs: <none>
Containers:
  mypod:
    Container ID:
    Image: mcr.microsoft.com/oss/nginx/nginx:1.15.5-alpine
    Image ID:
    Port: <none>
    Host Port: <none>
    State: Waiting
    Reason: ContainerCreating
    Ready: False
    Restart Count: 0
    Limits:
      cpu: 250m
      memory: 250Mi
    Requests:
      cpu: 100m
      memory: 128Mi
    Environment: <none>
    Mounts:
      /mnt/azure from azure (rw)
      /var/run/secrets/kubernetes.io/serviceaccount from kube-api-access-46gvv (ro)
Conditions:
  Type             Status
  Initialized       True
  Ready             False
  ContainersReady   False
  PodScheduled      True
Volumes:
  azure:
```

- Description for the pod.

```
PS /home/stanislav> kubectl delete pod mypod
pod "mypod" deleted
```

- Deleting mypod.

Practice 5: Provisioning Azure Disk storage using Storage Classes.

```
PS /home/stanislav> kubectl get sc
NAME                PROVISIONER             RECLAIMPOLICY   VOLUMEBINDINGMODE   ALLOWVOLUMEEXPANSION   AGE
azurefile           file.csi.azure.com       Delete          Immediate           true                   3h51m
azurefile-csi       file.csi.azure.com       Delete          Immediate           true                   3h51m
azurefile-csi-premium file.csi.azure.com       Delete          Immediate           true                   3h51m
azurefile-premium   file.csi.azure.com       Delete          Immediate           true                   3h51m
default (default)   disk.csi.azure.com       Delete          WaitForFirstConsumer true                   3h51m
managed             disk.csi.azure.com       Delete          WaitForFirstConsumer true                   3h51m
managed-csi         disk.csi.azure.com       Delete          WaitForFirstConsumer true                   3h51m
managed-csi-premium disk.csi.azure.com       Delete          WaitForFirstConsumer true                   3h51m
managed-premium     disk.csi.azure.com       Delete          WaitForFirstConsumer true                   3h51m
my-azurefile        kubernetes.io/azure-file Delete          Immediate           false                  34m
PS /home/stanislav> |
```

- AKS clusters.


```
PS /home/stanislaw> kubectl apply -f azurepremium.yaml
persistentvolumeclaim/azure-managed-disk created
PS /home/stanislaw> 
```

- Persistent volume claim creation.

```
PS /home/stanislaw> kubectl apply -f azure-pvc-disk.yaml
pod/mypod created
```

- Creating the pod.

```
PS /home/stanislaw> kubectl describe pod mypod
Name: mypod
Namespace: default
Priority: 0
Service Account: default
Node: aks-agentpool-86139379-vmss000000/10.224.0.5
Start Time: Sun, 09 Apr 2023 15:07:11 +0000
Labels: <none>
Annotations: <none>
Status: Running
IP: 10.244.1.18
IPs:
  IP: 10.244.1.18
Containers:
  mypod:
    Container ID: containerd://299527c1e448eb51dd0947cab355d17a7ce38e51a88ef6f5d76e672f44b84c27
    Image: mcr.microsoft.com/oss/nginx/nginx:1.15.5-alpine
    Image ID: mcr.microsoft.com/oss/nginx/nginx@sha256:f84780a5ad654515bcd9ba2f35e20935e1246799f198683dd2c4f74d19ae9e5e
    Port: <none>
    Host Port: <none>
    State: Running
      Started: Sun, 09 Apr 2023 15:07:25 +0000
    Ready: True
    Restart Count: 0
    Limits:
      cpu: 250m
      memory: 256Mi
    Requests:
      cpu: 100m
      memory: 128Mi
    Environment: <none>
    Mounts:
      /mnt/azure from volume (rw)
      /var/run/secrets/kubernetes.io/serviceaccount from kube-api-access-czvqs (ro)
Conditions:
  Type             Status
  Initialized       True
  Ready             True
  ContainersReady   True
  PodScheduled      True
Volumes:
```

- Describing the created pod.

```
PS /home/stanislav> kubectl delete pod mypod  
pod "mypod" deleted  
PS /home/stanislav> 
```

- Deleting the pod.