

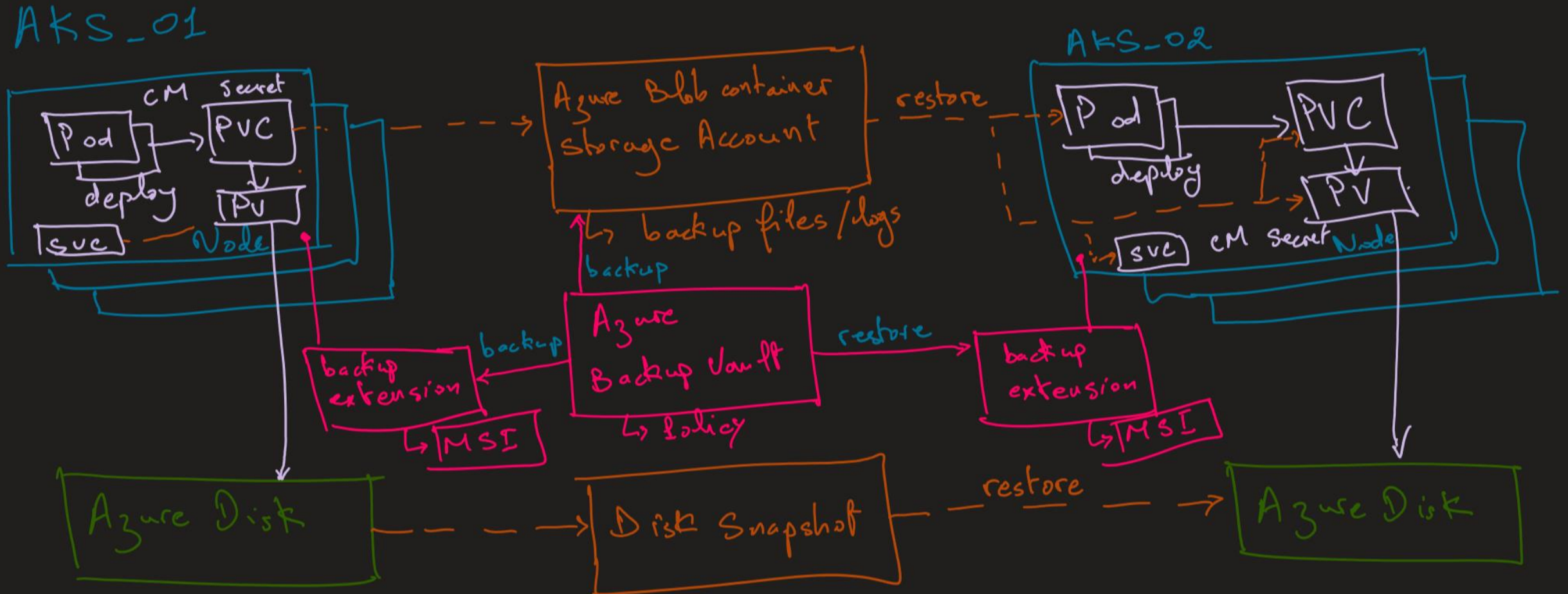
AKS Backup Using Azure Backup Vault



Houssem Dellai



AKS Backup architecture



AKS Backup – Limitations

Supports Kubernetes version 1.21.1 or later.

Supports only CSI driver. In tree not supported.

Supports only Persistent Volumes (PV) using Azure Disk.

Azure Blob Containers and Azure File Shares are not supported.
They could be backed up using Azure Backup.

Supports only AKS with Managed Identity (MI).
AKS with Service Principal (SPN) is not supported. AKS can migrate from SPN to MI.

The backup for Kubernetes objects will be saved into a Blob container.
This Blob should be in the same region and subscription as the AKS cluster.

Both the Backup vault and AKS cluster should be in the same subscription and region.

AKS Backup – Limitations

Setting	Maximum limit
Number of backup policies per Backup vault	5000
Number of backup instances per Backup vault	5000
Number of on-demand backups allowed in a day per backup instance	10
Number of allowed restores per backup instance in a day	10

Currently, AKS backup supports once-a-day backup. It also supports more frequent backups (in every 4, 6, 8, and 12 hours intervals) per day. This solution allows you to retain your data for restore for up to 360 days.

Deploy sample apps: Pods+PV/Azure Disk

```
$ az aks get-credentials -n aks-01 -g rg-aks-01 --overwrite-existing
Merged "aks-01" as current context in C:\Users\hodellai\.kube\config
$
$ kubectl get nodes
```

NAME	STATUS	ROLES	AGE	VERSION
aks-systempool-20780455-vmss000000	Ready	agent	28m	v1.25.5
aks-systempool-20780455-vmss000001	Ready	agent	28m	v1.25.5
aks-systempool-20780455-vmss000002	Ready	agent	28m	v1.25.5

```
$
$ kubectl apply -f deploy_disk_lrs.yaml
deployment.apps/nginx-lrs created
persistentvolumeclaim/azure-managed-disk-lrs created
$
$ kubectl apply -f deploy_disk_zrs_sc.yaml
deployment.apps/nginx-zrs created
storageclass.storage.k8s.io/managed-csi-zrs created
persistentvolumeclaim/azure-managed-disk-zrs created
```

Data is saved into the Azure Disk

```
kubectl exec nginx-lrs-7db4886f8c-x4hzz -it -- cat /mnt/azuredisk/outfile
```

```
Tue Mar 21 15:00:14 UTC 2023
```

```
Tue Mar 21 15:01:14 UTC 2023
```

```
Tue Mar 21 15:02:14 UTC 2023
```

```
kubectl exec nginx-zrs-5567fd9ddc-hbtfs -it -- cat /mnt/azuredisk/outfile
```

```
Tue Mar 21 15:00:48 UTC 2023
```

```
Tue Mar 21 15:01:48 UTC 2023
```

```
Tue Mar 21 15:02:48 UTC 2023
```

We will try to backup (Snapshot) the Disk and then restore it into another AKS cluster.

Install AKS Backup extension

Microsoft Azure (Preview)

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

hodemai@microsoft.com

MICROSOFT NON-PRODUCTION

Home > aks-02

aks-02 | Backup (preview)

Kubernetes service

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Extensions (preview)

Backup (preview)

Open Service Mesh

GitOps

Deployment center (deprecated)

Automated deployments (preview)

Policies

Properties

+ Backup

Restore

Install AKS Backup extension

Microsoft

✓ Basics

✓ Review + create

AKS Backup Extension is mandatory to be installed to enable backup and restore capabilities for your AKS clusters. The extension requires a blob container as input and uses it to store backup data in it. The extension will update automatically when a new version is released. [Learn more](#)

Cluster Details

Subscription

Resource group

Cluster

Microsoft-Azure-NonProd

rg-aks-02

aks-02

Extension Details

Subscription

Resource group *

Storage Account *

Blob Container Name *

Microsoft-Azure-NonProd

rg-backup-storage

storage4aks1backup135

aks-backup

Use Azure

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Feedback

AKS Backup extension installed

Microsoft Azure (Preview)

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

[Home](#) > [aks-01 | Backup \(preview\)](#) >

aks-01\backup-aks-01

Backup instance

Backup Now

Restore

Change policy

Stop Backup

Resume Backup

Delete

Refresh

^ Essentials

Datasource	: aks-01\backup-aks-01	Status	: Protection configured
Datasource type	: Kubernetes Services (Preview)	Backup Vault	: backup-vault-aks
Snapshot resource group	: rg-backup-storage	Backup Policy	: policy-aks
Subscription (move)	: Microsoft-Azure-NonProd	Backup storage redunda...	: Locally-redundant
Subscription ID	: 82f6d75e-85f4-434a-ab74-5dddd9fa8910	Backup instance configur...	: view
Resource group (move)	: rg-backup-vault	Storage account	: storage4aks1backup135
Location	: West Europe	Blob container	: aks-backup

Jobs (last 7 days) [View all](#)

Operation	Failed	In progress	Completed
Scheduled backup	0	0	0
On-demand backup	0	0	0
Restore	0	0	0

AKS Backup extension resources

```
$  
$ kubectl get all -n dataprotection-microsoft
```

NAME	READY	STATUS	RESTARTS	AGE
pod/dataprotection-microsoft-controller-7b8977698c-2hcxn	2/2	Running	0	5m16s
pod/dataprotection-microsoft-geneva-service-6c8457bbd-h6phd	2/2	Running	0	5m16s
pod/dataprotection-microsoft-kubernetes-agent-5558dbbf8f-shl4s	2/2	Running	3 (4m26s ago)	5m16s









NAME	TYPE	CLUSTER-IP	EXTERNAL-IP	PORT(S)	AGE
service/dataprotection-microsoft-geneva-service	ClusterIP	10.0.151.200	<none>	8125/UDP,8130/TCP	5m16s
service/dataprotection-microsoft-kubernetes-agent	ClusterIP	10.0.127.139	<none>	8085/TCP	5m16s

NAME	READY	UP-TO-DATE	AVAILABLE	AGE
deployment.apps/dataprotection-microsoft-controller	1/1	1	1	5m16s
deployment.apps/dataprotection-microsoft-geneva-service	1/1	1	1	5m16s
deployment.apps/dataprotection-microsoft-kubernetes-agent	1/1	1	1	5m16s

NAME	DESIRED	CURRENT	READY	AGE
replicaset.apps/dataprotection-microsoft-controller-7b8977698c	1	1	1	5m16s
replicaset.apps/dataprotection-microsoft-geneva-service-6c8457bbd	1	1	1	5m16s
replicaset.apps/dataprotection-microsoft-kubernetes-agent-5558dbbf8f	1	1	1	5m16s

```
$
```


AKS Backup Managed Identity

<input type="checkbox"/>	Name ↑↓	Type ↑↓
<input type="checkbox"/>	 1e13dad0-3000-472f-9bbf-df8ee52ef43d	Public IP address
<input type="checkbox"/>	 aks-01-agentpool	Managed Identity
<input type="checkbox"/>	 aks-agentpool-10802013-nsg	Network security group
<input type="checkbox"/>	 aks-agentpool-10802013-routetable	Route table
<input type="checkbox"/>	 aks-systempool-20780455-vmss	Virtual machine scale set
<input type="checkbox"/>	 aks-vnet-10802013	Virtual network
<input checked="" type="checkbox"/>	 ext-21a39791cf3f1594075f3e9868e7b273-aks-01	Managed Identity
<input checked="" type="checkbox"/>	 extensionmanager-aks-01	Managed Identity
<input type="checkbox"/>	 kubernetes	Load balancer

Microsoft Azure (Preview)

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

Home > MC_rg-aks-01_aks-01_westeurope > ext-21a39791cf3f1594075f3e9868e7b273-aks-01

 **ext-21a39791cf3f1594075f3e9868e7b273-aks-01** | Azure role assignments

Managed Identity

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Overview

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Access control (IAM)

Tags

Azure role assignments

Associated resources (preview)


+ Add role assignment (Preview)

Refresh

If this identity has role assignments that you don't have permission to read, they won't be shown in the list. [Learn more](#)

Subscription *

Microsoft-Azure-NonProd

Role	Resource Name	Resource Type	Assigned To
Storage Account Contributor	 storage4aks1backup135	Storage account	ext-21a39791cf3f1594075f3...

Configure Backup

Microsoft Azure (Preview)

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

Home > Resource groups > rg-aks-1 > aks-1 | Backup (preview) >

Configure Backup ...

1 Basics

2 Backup policy

3 Datasources

4 Review + configure

Datasource type ⓘ

Kubernetes Services (Preview) ▼

Use Azure Backup to protect Kubernetes workloads and application data by configuring backup and restore of your AKS Clusters [Learn more](#)

Vault *

Select a Vault

[Select vault](#) [Create vault](#)

ⓘ The Backup Vault and AKS Cluster to be backed up should be within same region. [Learn more](#)

Additional datasource scope

Kubernetes services * ⓘ

aks-1

[Select Kubernetes cluster](#)

Selected kubernetes service details

Subscription

Microsoft-Azure-NonProd

Resource group

rg-aks-1

Location

West Europe

Storage account

storage4aks1backup1357

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Create a Backup Policy for AKS

Create Backup Policy

✓ Basics

2 Schedule + retention

3 Review + create

Backup schedule

Specify time when the backup will happen

Backup Frequency

Hourly

Daily

Time

Every 4 hours

Every 4 hours

Every 6 hours

Every 8 hours

Every 12 hours

Backups will occur every 4 hours. [Learn more](#)

Retention settings (in the order of priority)


Specify how long the backups are retained in

Retention rules	Operational data store	
Default	7 Days	View details

[Add retention rule](#)

Backup configured

Home > Resource groups > rg-aks-1 > aks-1

 **aks-1 | Backup (preview)** ☆ ...

Kubernetes service

<< + Backup ↶ Restore ↷ Refresh | 🗨 Feedback | + Install Extension 🗑 Delete Extension

- Settings
- 👤 Node pools

📁 Cluster configuration

🌐 Networking

📦 Extensions (preview)

☁ Backup (preview)

🕸 Open Service Mesh

🔗 GitOps

🏠 Deployment center (deprecated)

Protection status == All Tags == All

1-1 of 1 items

Backup/Protected Instan...↑↓	Vault	Vault subscription	Vault resource group	Vault location	Protection status
aks-1\backup-instance-aks	backup-vault	Microsoft-Azure-NonProd	rg-backup-vault	West Europe	✔ Protection configured ...

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Backup Center

Backup center

Microsoft

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Azure policies for backup

Protectable datasources

Support + troubleshooting

New support request

Backup

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Help

Find out about exciting new features and capabilities offered by Azure Backup. Click here to learn more

Datasource subscription == Microsoft-Azure-NonProd

Datasource resource group == All

Datasource location == All

Datasource type == Kubernetes Services (Preview)

Vault == All

Datasource type: Kubernetes Services (Preview)

Overview of Jobs and Backup instances

Jobs (last 24 Hours)

View all

Operation	Failed	In progress	Completed
Scheduled backup	0	0	0
On-demand backup	2	0	2
Restore	0	0	2

Click here to view ASR jobs across all vaults and subscriptions.

Backup instances

Kubernetes Services (Preview)

1

Protection configured

1

0

Protection error

0

0

Soft deleted

0

0 out of 1

Backup instances with the underlying datasource not found

Click here to view ASR replicated items across all vaults and subscriptions.

Active Alerts (last 24 Hours)

View all

Kubernetes Services (Preview)

0 Security alerts

0 Configured alerts

Sev0 0/0

Sev1 0/0

Sev2 0/0

Click here to learn more about the alerts displayed in Backup center

Global alerts

0 Security alerts

0 Configured alerts

Sev0 0/0

Sev1 0/0

Sev2 0/0

Trigger backup from Backup center

Microsoft Azure (Preview)

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

Home > Backup center > Start: Configure Backup >

Configure Backup

BasicsBackup policyDatasourcesReview + configure

Please ensure the pre-requisites are met before proceeding - [Learn more](#)

Azure Backup provides fine grained controls to protect your AKS clusters by backing up Kubernetes workloads and Azure Disk based Persistent Volumes. To select cluster resources you want to protect, click on Add and define required configurations. [Learn more](#)

Kubernetes serviceaks-2

Storage account ⓘstorage4aks1backup1357

+ Add/Edit | ✓ Assign missing roles | ↓ Download role assignment template | ✕ Remove

<input type="checkbox"/> Datasource name	Subscription	Resource group	Snapshot resource group	Backup readiness	
<input type="checkbox"/> aks-2\backup-instance	Microsoft-Azure-NonProd	rg-aks-2	rg-backup-storage	✓ Success	✕

✓ Backup readiness check completed.

Snapshot resource group

Select the resource group where your snapshots are stored. We recommend that you assign a dedicated resource group to store the snapshots in the operational data store. [Learn more about permissions for snapshot resource groups](#)

SubscriptionMicrosoft-Azure-NonProd

Snapshot resource group *rg-backup-storage


Validate

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Backup created for Persistent Volumes (Azure Disk)

 rg-backup-storage

Resource group

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  ...




 Create

 Manage view

 Delete resource group

 Refresh

 Export to CSV

...

Essentials

View Cost

JSON View

Resources

Recommendations

Type equals all

Add filter




More (1)

Showing 1 to 3 of 3 records.

☐ Show hidden types

No grouping

List view

<input type="checkbox"/> Name	Type	Location
<input type="checkbox"/>  snapshot-301e413d-fbd8-46ec-9322-21d9a355f674	Snapshot	West Europe
<input type="checkbox"/>  snapshot-c440ef8f-e112-433d-b6df-05f553194329	Snapshot	West Europe
<input type="checkbox"/>  storage4aks1backup135	Storage account	West Europe

Backup created for Kubernetes objects

Home > Resource groups > rg-backup-storage > storage4aks1backup135 | Containers >

aks-backup

Container

Search

<<

Upload

Change access level

Refresh

Delete

Change tier

Acquire lease

Break lease

View snapshots

...

Overview

Diagnose and solve problems

Access Control (IAM)

Settings

Shared access tokens

Access policy

Properties

Metadata

Authentication method: Access key (Switch to Azure AD User Account)

Location: aks-backup / backups / clusterbackup-dataprotection-microsoft-backup-24225682-8c48-455e-8990-71d83910187b

Search blobs by prefix (case-sensitive)

Show deleted blobs

Add filter


Name	Modified	A
<input type="checkbox"/> [.]		
<input type="checkbox"/> clusterbackup-dataprotection-microsoft-backup-24225682-8c48-455e-8990-71d83910187b-csi-volumesnapshotclasses.json.gz	3/21/2023, 7:38:18 PM	H
<input type="checkbox"/> clusterbackup-dataprotection-microsoft-backup-24225682-8c48-455e-8990-71d83910187b-csi-volumesnapshotcontents.json.gz	3/21/2023, 7:38:18 PM	H
<input type="checkbox"/> clusterbackup-dataprotection-microsoft-backup-24225682-8c48-455e-8990-71d83910187b-csi-volumesnapshots.json.gz	3/21/2023, 7:38:17 PM	H
<input type="checkbox"/> clusterbackup-dataprotection-microsoft-backup-24225682-8c48-455e-8990-71d83910187b-logs.gz	3/21/2023, 7:38:17 PM	H
<input type="checkbox"/> clusterbackup-dataprotection-microsoft-backup-24225682-8c48-455e-8990-71d83910187b-podvolumebackups.json.gz	3/21/2023, 7:38:18 PM	H
<input type="checkbox"/> clusterbackup-dataprotection-microsoft-backup-24225682-8c48-455e-8990-71d83910187b-resource-list.json.gz	3/21/2023, 7:38:17 PM	H
<input type="checkbox"/> clusterbackup-dataprotection-microsoft-backup-24225682-8c48-455e-8990-71d83910187b-volumesnapshots.json.gz	3/21/2023, 7:38:17 PM	H
<input type="checkbox"/> clusterbackup-dataprotection-microsoft-backup-24225682-8c48-455e-8990-71d83910187b.tar.gz	3/21/2023, 7:38:17 PM	H
<input type="checkbox"/> velero-backup.json	3/21/2023, 7:38:17 PM	H


Restore a cluster from backup center

[Home](#) > [Backup center](#) > [Start: Restore](#) >

Restore ...

① Basics  Restore point  Restore parameters ④ Review + restore

 Using Azure Backup you can restore you Kubernetes workloads and application data to the Original or Alternate AKS cluster as target. You also have the ability to restore your entire backup or specific items in the target cluster. [Learn more](#)

 The target AKS cluster should have Backup Extension installed to perform the restore operation. [Learn more](#)

Select Target cluster ⓘ

aks-1

[Change Kubernetes service](#)

Restore configuration * ⓘ

All selected


[Select resources](#)

Snapshot resource group ⓘ

rg-backup-storage

Storage account ⓘ

storage4aks1backup1357

 Validation completed successfully.

Validate

Grant Permissions

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[Next: Review + restore >](#)

Backup restored on the second cluster

```
$
$ az aks get-credentials -n aks-2 -g rg-aks-2 --overwrite-existing
The behavior of this command has been altered by the following extension: aks-preview
Merged "aks-2" as current context in C:\Users\hodellai\.kube\config
$
$ kubectl get pods,svc,pv,pvc
NAME                                READY   STATUS    RESTARTS   AGE
pod/nginx-lrs-7db4886f8c-2c7mz      1/1     Running   0           97m
pod/nginx-zrs-5567fd9ddc-9h4qz      0/1     Pending   0           97m

NAME              TYPE           CLUSTER-IP   EXTERNAL-IP   PORT(S)    AGE
service/kubernetes ClusterIP      10.0.0.1     <none>        443/TCP    3h54m

NAME                                CAPACITY   ACCESS MODES   RECLAIM POLICY   STATUS   CLAIM
persistentvolume/pvc-a2cd5abb-744d-45f0-9ece-e0da8b3ff504 5Gi        RWO            Delete           Bound    default/azure-managed-disk-l
rs managed-csi                               97m

NAME                                STATUS    VOLUME                                     CAPACITY   ACCESS MODES   STORAGECLASS
AGE
persistentvolumeclaim/azure-managed-disk-lrs Bound     pvc-a2cd5abb-744d-45f0-9ece-e0da8b3ff504 5Gi        RWO            managed-csi
97m
persistentvolumeclaim/azure-managed-disk-zrs Pending                                     managed-csi-zr
s 97m
$
$ kubectl exec nginx-lrs-7db4886f8c-2c7mz -it -- cat /mnt/azuredisk/outfile
Wed Mar 22 06:47:12 UTC 2023
Wed Mar 22 06:48:12 UTC 2023
Wed Mar 22 06:49:12 UTC 2023
Wed Mar 22 06:50:12 UTC 2023
```