



# Bring DevOps to the Swiss Alps with Azure Arc

Wolfgang Ofner



# Wolfgang Ofner

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Focus on Azure, Kubernetes, DevOps and .NET

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# Agenda



Project "Autonomous Ropeway System"



Challenges in the project



Azure Arc integration



Further Azure Arc features



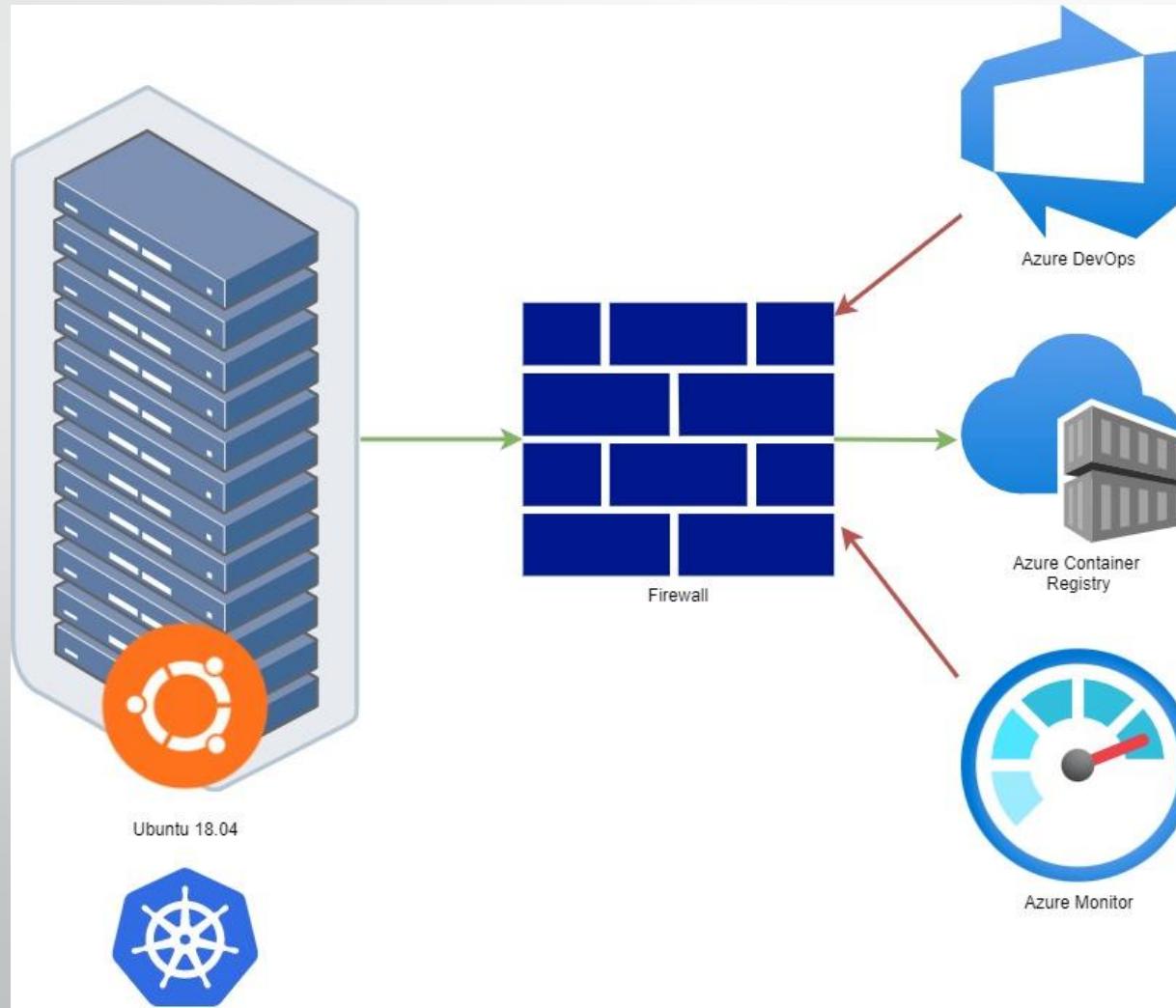
# Project “Autonomous Ropeway System”

- Ropeway vehicle comes out of the garage automatically
- Routing possible → ropeway vehicle can find its way
- Saves costs due to better usage of resources and less wear and tear
- Running 24/7 with minimum human interaction

# Challenges

- Use existing hardware
- No inbound traffic allowed
  - No connection from Azure DevOps
  - No possibility to use cloud services like Azure Monitor
  - How to collect logs from the Kubernetes cluster?
  - No VPN or ExpressRoute allowed

# Network Overview







# Azure Arc Overview

- Project infrastructure running outside of Azure into Azure
  - Linux and Windows VMs and bare metal servers
  - Any CNCF certified Kubernetes distribution
  - SQL Server

Search[Get started](#)[Infrastructure](#)[Services](#)[Learn more](#)

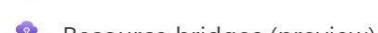
Overview

**Management**

Custom locations



Data controllers



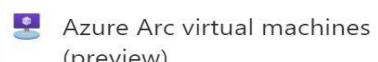
Resource bridges (preview)



Service principals



Private link scopes

**Infrastructure**

Azure Arc virtual machines (preview)



Azure Stack HCI



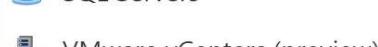
Kubernetes clusters



Servers



SQL Servers



VMware vCenters (preview)



SCVMM management servers (preview)

**Data services**

PostgreSQL Hyperscale (preview)

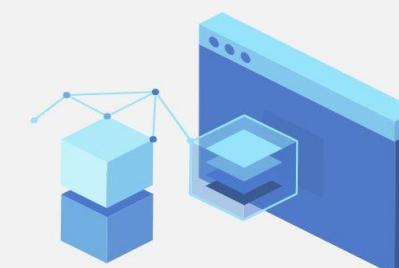


SQL managed instances

[Get started](#)[Infrastructure](#)[Services](#)[Learn more](#)

## See and manage all your on-prem infrastructure, anywhere. It's free to get started.

With Azure Arc, you can manage your infrastructure in all your environments, including on-premises, other public clouds, and edge devices. There's no charge to start, just add your infrastructure and enjoy the views. [Learn more](#)



### Get hands-on with ArcBox (preview)

Use ArcBox to deploy an Azure Arc sandbox in less than an hour. [Learn more](#)

[Try ArcBox](#)

### Add your infrastructure for free

See all your infrastructure in Azure. There's no charge to add and view your existing resources. [Learn more](#)

[Add](#)

### Deploy Azure services

Use Azure Arc to deploy Azure services on your infrastructure. [Learn more](#)

[Deploy](#)

# Azure Arc Overview

- Project infrastructure running outside of Azure into Azure
  - Linux and Windows VMs and bare metal servers
  - Any CNCF certified Kubernetes distribution
  - SQL Server
- Manage infrastructure as it was running in Azure
  - Update Management
  - Configuration Management
  - Microsoft Cloud Defender

# Azure Arc-enabled Kubernetes

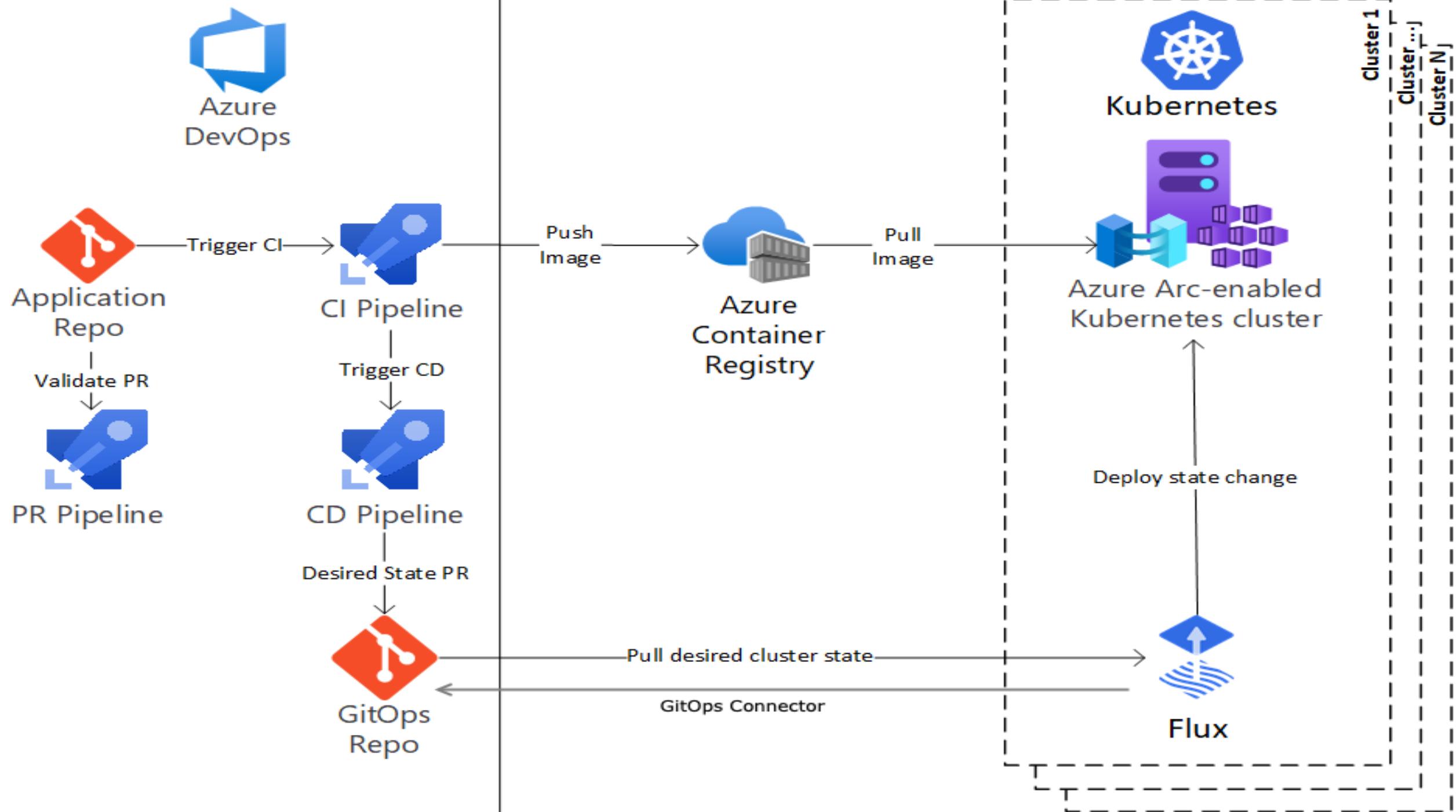
- Install Azure Arc extensions to manage the cluster
  - Azure Monitor
  - GitOps with Flux
  - Azure Policy
  - Azure Key Vault as Secret Store
- Securely access cluster without opening inbound ports

# Azure Arc-enabled Kubernetes GitOps

- GitOps Agent runs inside the cluster
- Agent pulls changes from a configured repository and applies them
  - YAML files
  - Helm charts
- Securely access private Git repositories via SSH
- No inbound connection needed

# Azure Arc-enabled Kubernetes GitOps

- 2 Git repositories
  - Application code
  - Configuration
- Dependencies can be configured
  - Create namespace
  - Deploy application



# Proof of Concept

- K3s
- Lightweight, open-source CNCF certified Kubernetes
- Developed and maintained by Rancher
- `curl -sfL https://get.k3s.io | sh -`

# Azure Arc Installation Prerequisites

- Azure CLI
- Azure CLI Arc extension

```
root@Office:/home/wolfgang ~ +   
root@Office:/home/wolfgang# az extension add --name connectedk8s
```

# Azure Arc Installation Prerequisites

- Azure CLI
- Azure CLI Arc extension
- Register Azure Provider

```
root@Office:/home/wolfgang# az provider register --namespace Microsoft.Kubernetes
root@Office:/home/wolfgang# az provider register --namespace Microsoft.KubernetesConfiguration
root@Office:/home/wolfgang# az provider register --namespace Microsoft.ExtendedLocation
```

# Azure Arc Installation Prerequisites

- Register Azure Provider

```
root@Office:/home/wolfgang# az provider show -n Microsoft.Kubernetes -o table
Namespace          RegistrationPolicy    RegistrationState
-----            -----                -----
Microsoft.Kubernetes  RegistrationRequired  Registered

root@Office:/home/wolfgang# az provider show -n Microsoft.KubernetesConfiguration -o table
Namespace          RegistrationPolicy    RegistrationState
-----            -----                -----
Microsoft.KubernetesConfiguration  RegistrationRequired  Registered

root@Office:/home/wolfgang# az provider show -n Microsoft.ExtendedLocation -o table
Namespace          RegistrationPolicy    RegistrationState
-----            -----                -----
Microsoft.ExtendedLocation  RegistrationRequired  Registered
```

# Azure Arc Installation

- Install with Azure CLI on Master node of k3s cluster

```
root@Office:/home/wolfgang# az connectedk8s connect --name k3s-arc --resource-group ArcDemo  
This operation might take a while...
```

# Azure Arc Installation

- Install with Azure CLI on Master node of k3s cluster

```
root@Office:/home/wolfgang# az connectedk8s list --resource-group ArcDemo --output table
Name      Location     ResourceGroup
-----  -----
k3s-arc    westeurope   ArcDemo
```

# Azure Arc Installation

- Install with Azure CLI on Master node of k3s cluster
- Applications are installed in the azure-arc namespace

# Azure Arc Applications

NAME	READY	STATUS	RESTARTS	AGE
clusterconnect-agent-897468586-zgxj9	3/3	Running	0	44m
flux-logs-agent-86cf4f7b7d-55fld	1/1	Running	0	44m
config-agent-69dcdb554d-7swhm	2/2	Running	0	44m
controller-manager-5494575977-rfc6g	2/2	Running	0	44m
extension-manager-7dc84fb6d7-sfznl	2/2	Running	0	44m
resource-sync-agent-56f777f6b6-7zj9n	2/2	Running	0	44m
clusteridentityoperator-77f6bf4f89-trs59	2/2	Running	0	44m
metrics-agent-84ccd8598f-6h885	2/2	Running	0	44m
cluster-metadata-operator-9945b897c-nxcwr	2/2	Running	0	44m
kube-aad-proxy-8564d4dd5d-qqccbq	2/2	Running	0	44m

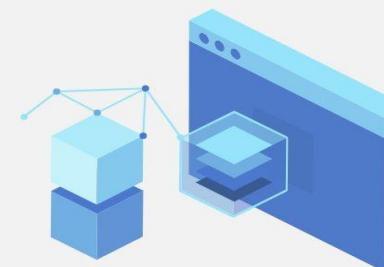
# Azure Arc in the Azure Portal

- “Single pane of glass”
- Manage outside infrastructure within Azure

(1 result)[Get started](#)[Infrastructure](#)[Services](#)[Learn more](#)[All Azure Arc resources](#)**Management**[Custom locations](#)[Data controllers](#)[Resource bridges \(preview\)](#)[Service principals](#)[Private link scopes](#)**Infrastructure**[Azure Arc virtual machines \(preview\)](#)[Azure Stack HCI](#)[Kubernetes clusters](#)[Servers](#)[SQL Servers](#)[VMware vCenters \(preview\)](#)[SCVMM management servers \(preview\)](#)**Data services**[PostgreSQL Hyperscale \(preview\)](#)[SQL managed instances](#)[Get started](#)[Infrastructure](#)[Services](#)[Learn more](#)

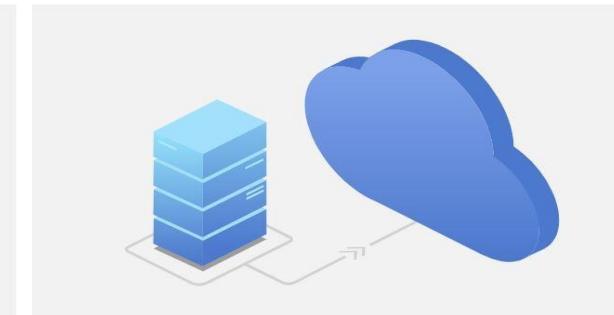
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[Add](#)

### Deploy Azure services

Use Azure Arc to deploy Azure services on your infrastructure. [Learn more](#)

[Deploy](#)



# Azure Arc | Kubernetes clusters

Microsoft

 Search[+ Add a Kubernetes cluster with Azure Arc](#)

Manage view



Refresh



Export to CSV



Open query

## Infrastructure

Azure Arc virtual machines (preview)

Azure Stack HCI

Kubernetes clusters

Servers

SQL Servers

VMware vCenters (preview)

SCVMM management servers (preview)

## Data services

PostgreSQL Hyperscale (preview)

SQL managed instances

 Filter for any field...Subscription equals **all**Resource group equals **all**

Add filter

No grouping



List view

<input type="checkbox"/> Name ↑↓	Type ↑↓	Resource group ↑↓	Kubernetes... ↑↓	Location ↑↓
AzureServices-Arc	Kubernetes - Azure Arc	ArcDemo	1.23.12	West Europe
k3s-arc	Kubernetes - Azure Arc	ArcDemo	1.23.12	West Europe

# k3s-arc | Namespaces

Kubernetes - Azure Arc

Search

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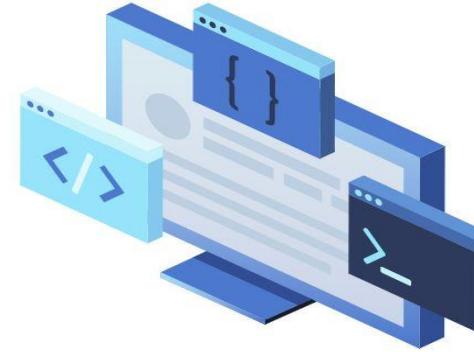
- Overview
- Activity log
- Access control (IAM)
- Tags
- Diagnose and solve problems
- Security (preview)

## Kubernetes resources (preview)

- Namespaces
- Workloads
- Services and ingresses
- Storage
- Configuration

## Settings

- Extensions
- Open Service Mesh
- GitOps
- Policies
- Properties
- Locks



Sign in to view your Kubernetes resources.

A service account bearer token is required to view the Kubernetes resources on this cluster. This can be created using `kubectl` while connected to your cluster via CLI. [Learn how to create a service account bearer token](#) ↗

Service account bearer token \* ⓘ

Sign in

# Securely Access Cluster through Azure Arc

- Use K8s RBAC or Azure RBAC
- Generate access token
- Use token in Azure Portal
- Create proxy with token on developers machine

# Access Cluster using K8s RBAC

- Create a new service account

```
root@Office:/home/wolfgang × + ▾  
root@Office:/home/wolfgang# kubectl create serviceaccount admin-user  
serviceaccount/admin-user created
```

# Access Cluster using K8s RBAC

- Create a new service account
- Add desired role for the user

```
root@Office:/home/wolfgang ~ + \ 
root@Office:/home/wolfgang# kubectl create clusterrolebinding admin-user-binding \
>   --clusterrole cluster-admin \
>   --serviceaccount default:admin-user
clusterrolebinding.rbac.authorization.k8s.io/admin-user-binding created
```

# Access Cluster using K8s RBAC

- Create a new service account
- Add desired role for the user
- Create access token

# Access Cluster using K8s RBAC

```
root@Office:/home/wolfgang ~ + -> root@Office:/home/wolfgang# kubectl create token admin-user  
eyJhbGciOiJSUzI1NiIsImtpZCI6Ik0YTZlaVETQjZOZlhjc0hNV1hxdF8xZG  
aHR0cHM6Ly9taWNyb3NlcnZpY2UtYWtzLWRucy1mMzViYzVmZi5oY3Aud2VzdG  
jZS1ha3MtZG5zLWYzNWJjNWZmLmhjcC53ZXN0ZXVyb3BLmF6bWs4cy5pb1wiI  
E3Njc0LCJpc3MiOiJodHRwczovL21pY3Jvc2VydmljZS1ha3MtZG5zLWYzNWJj  
mt1YmVybmV0ZXMuaw8iOnsibmFtZXNwYWNLlIjoizGVmYXVsdcIsInNlcnZpY2V  
dwlkIjoiMTNlMjZmNjUtMmI3My00Y2JjLTliYmMtZDZjOTYyNzI3NWUwIn19LQ  
zZXJ2aNlYWNjb3VudDpkZWZhdx00mFkbWluLXVzZXIfQ.AsCbdMl0yFtPtQ  
zAu_xjxowyqzEZ_BdWQBZSoIT9liiG39i6mq1nAzc4Re42iwDlJh3X0sHbabud  
xHrwL2p-aGS06-jCphhgGKa1-nyvkp0JtnSJ6edq08Fxg-Aa92tKUgpYOSiLXo  
bEv2IrYAF_fPT3eCMNAH5Joh0qDjC_Pka4X4GV0gUUvXQUWxcAFcjU7LvLLYNQ  
mGzWzYTIYcDwiOBpGcNHTbGHhlQLsfDGUMR-nuQce6V04ibfEz_My6zdyX7ToB  
T7hjIvLe2wuwBM3A7inUPFvy00DCTdwMZvApFBKItcpt_6MWhzmypshN0hrP0  
M076cPmUYgZijWPLEB3Lgwg9hojDTA39gbyYkg3pIOSLY4oWdbv7NvWuAe8cgm  
sf9RIssCwYw
```

Search



- Overview
- Activity log
- Access control (IAM)
- Tags
- Diagnose and solve problems
- Security (preview)

## Kubernetes resources (preview)

- Namespaces
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Service account bearer token \* i

```
kiOdK/RA-w-xqoNuMDA2tWHMzB1KDt8W-  
Z6D7M4k5yknroHRuMN7MLCr66on9pO6Xul19MlbZDo8KskUD4  
GCWOriMTAnMbq5rfpr9Pv1g_tvHocHrmUwH-  
m3K4Pes4M_DRQFCOYhURRULsdEeHsJz9KSv7MucEhWAV31L3S  
cfxzNpmzvmGS0tana-  
rTGWFIr3mC2KamA2gELhcWyoayKJdfr4TG264Wx1Ce50pyO-  
t0xuQU1hoBYB0RoiqXWsEZidFgWvoWVue5qpUKpy5DRImcDCG  
YpqvKK7qTCE6m_I9SGnxxNF9mVRIebuFumfTHmeVlf940TInJ5i6  
BNq_yj1kprraL3zpa9MuT6F9Ccg7IInq9JdZEIbafJBbo-  
vh56sifkq2YOygiSjDBDcumDBOpYIQI9ZG96pdQK5bEMrGCs2E  
e9b9zIBb0rTXrxil2piA9LpaVBMpsJjkKWTfi1l5Pfy92262alOwo  
ZVJvreM5cU6hPedvSffHfq-TK4JCSaq3ZEzo8
```

Sign in

# DemoArc | Workloads

Kubernetes - Azure Arc

 Add
 Delete
 Refresh
 Show labels
 Give feedback

Overview

Activity log

Access control (IAM)

Tags

Diagnose and solve problems

Security (preview)

Kubernetes resources (preview)

Namespaces

Workloads

Services and ingresses

Storage

Configuration

Settings

Extensions

GitOps (preview)

Policies

Properties

Locks

Monitoring

Insights

Alerts

Metrics

Logs

Workbooks

Automation

Tasks (preview)

[Deployments](#)
[Pods](#)
[Replica sets](#)
[Stateful sets](#)
[Daemon sets](#)
[Jobs](#)
[Cron jobs](#)

Filter by deployment name

Enter the full deployment name

Filter by label selector ⓘ

foo=bar,key!=value

Filter by namespace

All namespaces

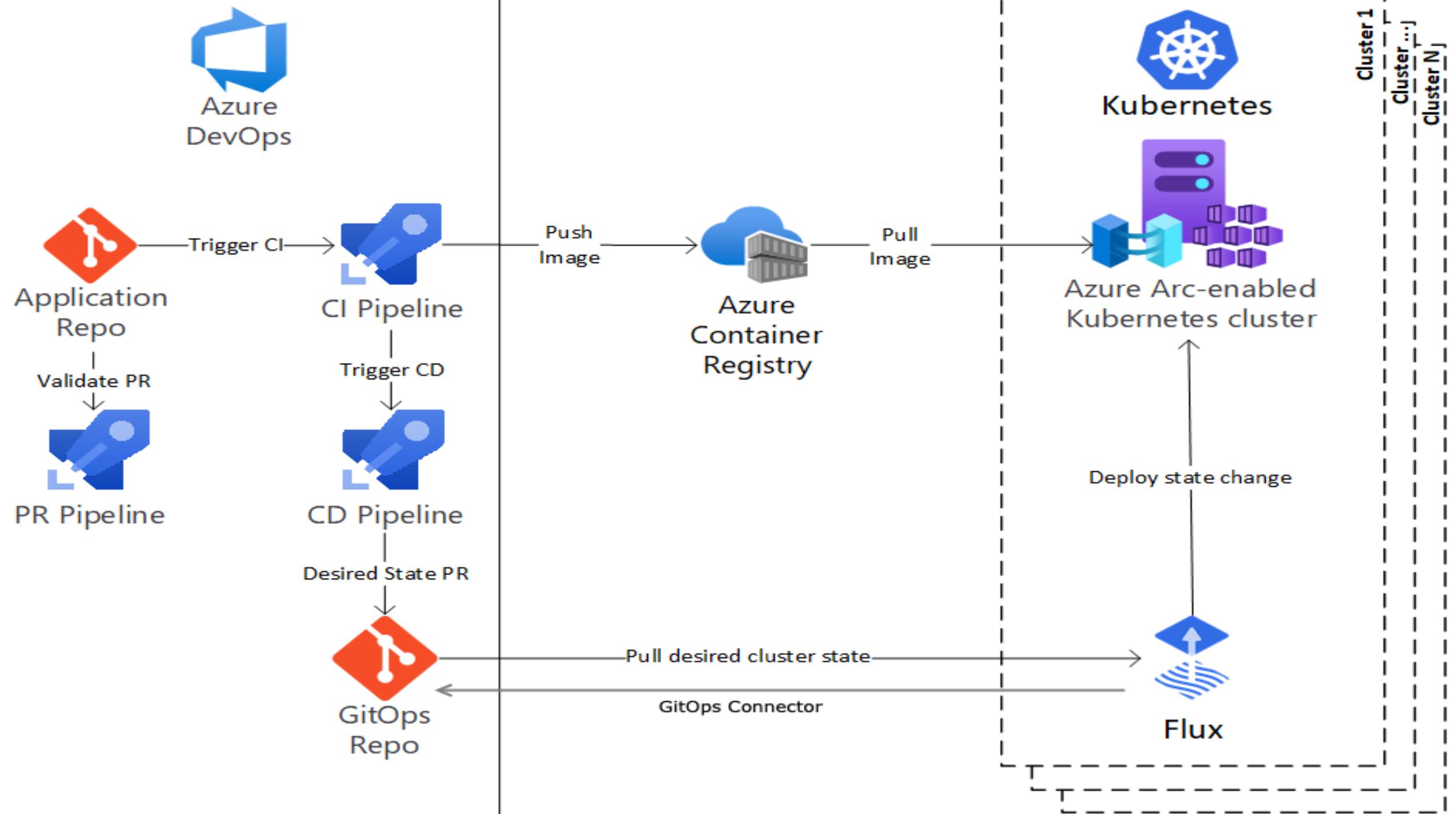
	Name	Namespace	Ready	Up-to-date	Available	Age ↓
<input type="checkbox"/>	coredns	kube-system	1/1	1	1	54 minutes
<input type="checkbox"/>	local-path-provisioner	kube-system	1/1	1	1	54 minutes
<input type="checkbox"/>	metrics-server	kube-system	1/1	1	1	54 minutes
<input type="checkbox"/>	traefik	kube-system	1/1	1	1	54 minutes
<input type="checkbox"/>	clusterconnect-agent	azure-arc	1/1	1	1	46 minutes
<input type="checkbox"/>	flux-logs-agent	azure-arc	1/1	1	1	46 minutes
<input type="checkbox"/>	config-agent	azure-arc	1/1	1	1	46 minutes
<input type="checkbox"/>	controller-manager	azure-arc	1/1	1	1	46 minutes
<input type="checkbox"/>	extension-manager	azure-arc	1/1	1	1	46 minutes
<input type="checkbox"/>	resource-sync-agent	azure-arc	1/1	1	1	46 minutes
<input type="checkbox"/>	clusteridentityoperator	azure-arc	1/1	1	1	46 minutes
<input type="checkbox"/>	metrics-agent	azure-arc	1/1	1	1	46 minutes
<input type="checkbox"/>	cluster-metadata-operator	azure-arc	1/1	1	1	46 minutes
<input type="checkbox"/>	kube-aad-proxy	azure-arc	1/1	1	1	46 minutes
<input type="checkbox"/>	omsagent-rs	kube-system	1/1	1	1	20 minutes
<input type="checkbox"/>	mqtt	myapps	1/1	1	1	15 minutes
<input type="checkbox"/>	kedademoapi	myapps	1/1	1	1	12 minutes
<input type="checkbox"/>	customerapi	myapps	1/1	1	1	12 minutes
<input type="checkbox"/>	orderapi	myapps	1/1	1	1	12 minutes
<input type="checkbox"/>	kubernetesdeploymentdemo	myapps	1/1	1	1	10 minutes

# Azure Arc extensions

- Bring Azure Services to your Kubernetes cluster
  - GitOps for deployments
  - Azure Monitor
  - Azure Key Vault as Secret Store Provider

# Git Ops Extension

- Uses Flux as GitOps agent
- Can be installed via Azure CLI or Azure Portal
- V1 and V2 available
  - Demo uses V1
  - V2 allows for dependencies between resources
  - V2 Helm deployment lacks features
  - V2 documentation needs improvement



# Git Ops Extension Installation

- Single Azure CLI command to configure and install GitOps operator

# Git Ops Extension Installation

```
root@Office:/home/wolfgang# az k8s-configuration create \
>   --name gitops-arcdemo \
>   --cluster-name k3s-Arc \
>   --resource-group ArcDemo \
>   --operator-instance-name gitops-arcdemo \
>   --operator-namespace gitops-arcdemo \
>   --repository-url git@ssh.dev.azure.com:v3/programmingwithwolfgang/AzureArcDemo/AzureArcDemoGitOps \
>   --scope Cluster \
>   --cluster-type connectedClusters \
>   --operator-params "--git-poll-interval 1m --git-branch=master --git-path=./AzureArcDemo" \
>   --enable-helm-operator \
>   --helm-operator-params "--set helm.versions=v3"
This command has been deprecated and will be removed in a future release. Use 'k8s-configuration flux create' instead.
{
  "complianceStatus": {
    "complianceState": "Pending",
    "lastConfigApplied": "0001-01-01T00:00:00+00:00",
    "message": "{\"OperatorMessage\":null,\"ClusterState\":null}",
    "messageLevel": "Information"
  }
}
```

# Git Ops Extension Installation

```
root@Office:/home/wolfgang# az k8s-configuration show --cluster-name k3s-Arc \
>   --cluster-type connectedClusters \
>   --name gitops-arcdemo \
>   --resource-group ArcDemo
This command has been deprecated and will be removed in a future release. Use 'k8s-configuration flux show' instead.
{
  "complianceStatus": {
    "complianceState": "Installed",
    "lastConfigApplied": "2022-10-07T08:25:05.600000+00:00",
    "message": "{\"OperatorMessage\":\"ts=2022-10-07T08:25:02.84302456Z caller=main.go:259 version=1.21.2\\nts=2022-10-07T08:25:02.843079062Z caller=main.go:284 warning=\"--git-readonly prevents use of --sync-state=git. Forcing to --sync-state=secret\"\\nts=2022-10-07T08:25:02.843106662Z caller=main.go:303 warning=\"configuring any of {git-user} has no effect when --git-readonly is set\"\\nts=2022-10-07T08:25:02.843147763Z caller=main.go:412 msg=\"using kube config: \\\\\\\"/root/.kube/config\\\\\\\" to connect to the cluster\"\\nts=2022-10-07T08:25:02.88071805Z caller=main.go:276 type=\"internal kubernetes error\"\\\" kubernetes_caller=k8s.io/client-go@v0.17.11/tools/cache/reflector.go:153 err=\"pkg/mod/k8s.io/client-go@v0.17.11/tools/cache/reflector.go:105: Failed to list *v1beta1.CustomResourceDefinition: the server could not find the requeste"
  }
}
```

# Git Ops Extension Installation

Dashboard > Azure Arc | Kubernetes clusters > k3s-arc

 **k3s-arc | GitOps** ...  
Kubernetes - Azure Arc

Search

 Create  Delete  Refresh

<input type="checkbox"/>	Name	Operator instance	Operator namespace	Operator scope	Operator state
<input type="checkbox"/>	gitops-arcdemo	gitops-arcdemo	gitops-arcdemo	namespace	 Succeeded

 Storage  
 Configuration  
 Settings  
 Extensions  
 Open Service Mesh  
 GitOps  
 Policies

# gitops-arcdemo

Kubernetes cluster configuration



+ Create Delete Refresh

<input checked="" type="checkbox"/>	Name	Operator instance	Operator name
<input checked="" type="checkbox"/>	gitops-arcdemo	gitops-arcdemo	gitops-arcdemo

## Operator details

Operator state

Succeeded

Instance name

gitops-arcdemo

Message

{ "OperatorMessage": "ts=2022-10-07T08..."

[View full message](#)

Operator last updated

10/7/2022, 04:25 PM GMT+8

Namespace

gitops-arcdemo

Operator scope

cluster

Operator type

Flux

Operator parameters

--git-readonly --git-poll-interval 1m --git-branch...

Enable helm



Helm operator parameters

--set helm.versions=v3

## Repository details

Repository URL

git@ssh.dev.azure.com:v3/programmingwithwolf...

Repository public key

ssh-rsa

AAAAAB3NzaC1yc2EAAAQABAAABgQDQ

# gitops-arcdemo

Kubernetes cluster configuration



[← Back to configuration details](#)

## Message

```
{  
    "OperatorMessage": "ts=2022-10-07T08:25:02.84302456Z  
    caller=main.go:259 version=1.21.2  
    ts=2022-10-07T08:25:02.843079062Z caller=main.go:284  
    warning=\"--git-readonly prevents use of --sync-state=git.  
    Forcing to --sync-state=secret\"  
    ts=2022-10-07T08:25:02.843106662Z caller=main.go:303  
    warning=\"configuring any of {git-user} has no effect when  
    --git-readonly is set\"  
    ts=2022-10-07T08:25:02.843147763Z caller=main.go:412 msg=\"using  
    kube config: \\"/root/.kube/config\\\" to connect to the  
    cluster\"  
    ts=2022-10-07T08:25:02.88071805Z caller=main.go:276  
    type=\"internal kubernetes error\" kubernetes_caller=k8s.io/  
    client-go@v0.17.11/tools/cache/reflector.go:153 err=\"pkg/mod/  
    k8s.io/client-go@v0.17.11/tools/cache/reflector.go:105: Failed  
    to list *v1beta1.CustomResourceDefinition: the server could not  
    find the requested resource\"  
    ts=2022-10-07T08:25:03.067998673Z caller=main.go:492  
    component=cluster identity=/var/fluxd/keygen/identity  
    ts=2022-10-07T08:25:03.068044074Z caller=main.go:493  
    component=cluster identity.pub=\"ssh-rsa  
    AAAAB3NzaC1yc2EAAAQABAAgQDQbjuiGDjSUIjteUiH2ZsvKHzY+7Uxa/AB1  
    +tVmyIXE/GK+Ibc3z1ksA/7QsZ2iDA5BQmwV8LOJ9qWcaCRI7gjukPpFam5r5395/  
    wrlpu15QQFkt9BG11xWq/JQtPFb3QJ+MiKi4FS/  
    S5hT01pMmgdpWomSYOJbnYnwAUH+wsoIMb16I4yarv8F5XAXZ1zpt3GI  
    +xaFGSYT3hy24zxCQgcQdRHT0uSqFMAAnrsie2c4tAhfuE2PJEpIWjwxkJxut06QL7  
    y2jSS7Kd8eZ/RqJKs/xtMkZNr/tluceIngSwphIci508IhQ  
    +nz0SyxhATZ8oDn9m1rCZJtTJegHeCoATDYB/qvdSz/i2A/  
    1xL9QpE0MEa7kRvRaNX2vE51qQJhWDBIqjRQij4Ldg5t+g02/  
    hinwmEUalWSsm3bj7zwUXkHbz1PeAwza8Vw8TZTV8/pYariCjW0Sc54B1qQlt1xZz  
    +j1GHQCU2wDD0h7QtagXjBqx84VTg9UDsH1QIFAEfevOU=  
    root@gitops-arcdemo-9bb7b79c5-vmwlt\"
```



## User settings

Wolfgang Ofner

### Account

Profile

Time and Locale

Permissions

### Preferences

Notifications

Theme

Usage

### Security

Personal access tokens

SSH public keys

Authorizations

## Add an SSH public key

Description

BastaArcDemo

Key Data

ssh-rsa

```
AAAAB3NzaC1yc2EAAAQABAAQgQDQbjuiGDjSUIjteUih2ZsvKHzY+7Uxa/AB1+tVmyIX  
E/GK+lbc3zlksA/7QsZ2iDA5BQmwV8LOJ9qWcaCRI7gjukPpFam5r5395/wrlpu15QQFkt9BG1  
1xWq/JQtPFb3QJ+MiKi4FS/S5hTO1pMmgdpWomSYOJbnYnwAUH+wsoIMb16I4yarv8F5XA  
XZlzpt3GI+xaFGSYT3hy24zxCQgcQdRHT0uSqFMAAnrsie2c4tAhfuE2PJEplWjwxkJxutO6QL7y2  
jSS7Kd8eZ/RqJKs/xtMkZNr/tlucelngSwphlc5O8lhQ+nz0SyxhATZ8oDn9mlrCZJtTJegHeCoA  
TDYB/gvdsz/i2A/1xL9QpE0MEa7kRvRaNX2vESIqQJhWDBIqjRQij4Ldg5t+g02/hinwmEUalW
```

Save

Cancel

+ Create Delete Refresh

Name	Operator instance	Operator name
gitops-arcdemo	gitops-arcdemo	gitops-arcdemo

# gitops-arcdemo

Kubernetes cluster configuration

[← Back to configuration details](#)

## Message

```
the operator\" , \"helm-operator\" : \"Successfully installed the
operator\" }",
| "LastGitCommitInformation": [
  {\"revision\": \"636160d880016fb9dfd12544ce0151f567795514\",
  \"message\": \"fixed repo and probes\"},
  {\"revision\": \"8ac3d8c09cc968dffed26efc41d9766a9e3def05\",
  \"message\": \"moved files and added helm configuration\"},
  {\"revision\": \"614fcf0ba04ca3e016603438363c7585d7f17ef9\",
  \"message\": \"renamed folder\"}],
| "MostRecentEventsFromFlux": [
  {\"id\": 0, \"serviceIDs\": [\"basta:helmrelease/
azurearcdemo\"], \"type\": \"sync\",
\"startedAt\": \"2022-10-07T08:28:06.77500166Z\",
\"endedAt\": \"2022-10-07T08:28:06.77500166Z\",
\"logLevel\": \"info\", \"metadata\": {\"commits\": [
  {\"revision\": \"636160d880016fb9dfd12544ce0151f567795514\",
  \"message\": \"fixed repo and probes\"},
  {\"revision\": \"8ac3d8c09cc968dffed26efc41d9766a9e3def05\",
  \"message\": \"moved files and added helm configuration\"},
  {\"revision\": \"614fcf0ba04ca3e016603438363c7585d7f17ef9\",
  \"message\": \"renamed folder\"}], \"includes\": {\"other\": true},
  \"errors\": [{\"ID\": \"basta:helmrelease/azurearcdemo\",
  \"Path\": \"AzureArcDemo/AzureArcDemo.yaml\", \"Error\": \"running
kubectl: exit status 1. stderr: Error from server (NotFound):
error when creating \\\\\\"STDIN\\\\\\\": namespaces \\\\\\"basta\\\\\\\" not
found\\\"}], \"initialSync\": true}}}
],
| "ErrorsInTheLastSynced": [
  {\"ID\": \"basta:helmrelease/azurearcdemo\",
  \"Path\": \"AzureArcDemo/AzureArcDemo.yaml\",
  \"Error\": \"running kubectl: exit status 1, stderr: Error from
server (NotFound): error when creating \\\\\\"STDIN\\\\\\\": namespaces
\\\\\\\"basta\\\\\\\" not found\\\"}]]}
```

```
root@Office:/home/wolfgang × + | ▾
root@Office:/home/wolfgang# kubectl get pods -n basta
NAME                      READY   STATUS    RESTARTS   AGE
azurearcdemo-8dcdbdb9b-6kwdr   1/1     Running   0          3m18s
root@Office:/home/wolfgang#
root@Office:/home/wolfgang# kubectl get service -n basta
NAME            TYPE           CLUSTER-IP      EXTERNAL-IP      PORT(S)        AGE
azurearcdemo   LoadBalancer   10.0.33.76    20.103.208.162   80:30181/TCP   4m32s
```



Swagger

Supported by SMARTBEAR

Select a definition

AzureArcDemo v1



# AzureArcDemo 1.0 OAS3

<http://20.103.208.162/swagger/v1/swagger.json>

## Basta



GET /Basta



### Parameters

Try it out

No parameters

### Responses

Code	Description	Links
200	Success	<i>No links</i>

Media type

text/plain



Controls Accept header.

[Example Value](#) | Schema

string

# GitOps Repository

- YAML file containing information about the Helm chart
  - Git repository
  - Branch
  - Path to Helm chart

# GitOps Repository

- YAML file containing information about the Helm chart

```
apiVersion: helm.fluxcd.io/v1
kind: HelmRelease
metadata:
  name: azurearcdemo
  namespace: basta
spec:
  releaseName: azurearcdemo
  chart:
    git: git@ssh.dev.azure.com:v3/programmingwithwolfgang/AzureArcDemo/AzureArcDemoGitOps
    ref: master
    path: AzureArcDemo/AzureArcDemo
```

# GitOps Repository

- YAML file containing information about the Helm chart
  - Git repository
  - Branch
  - Path to Helm chart
- Helm chart

# GitOps Pipeline

- CD Pipeline reads newest tag from Azure Container Registry
- Replace tag in values.yaml file
- Commit changes to master branch
- GitOps Agent sees changes and applies them to the k3s cluster
- Tag can be set manually when starting the pipeline

# GitOps Flux V1 vs V2

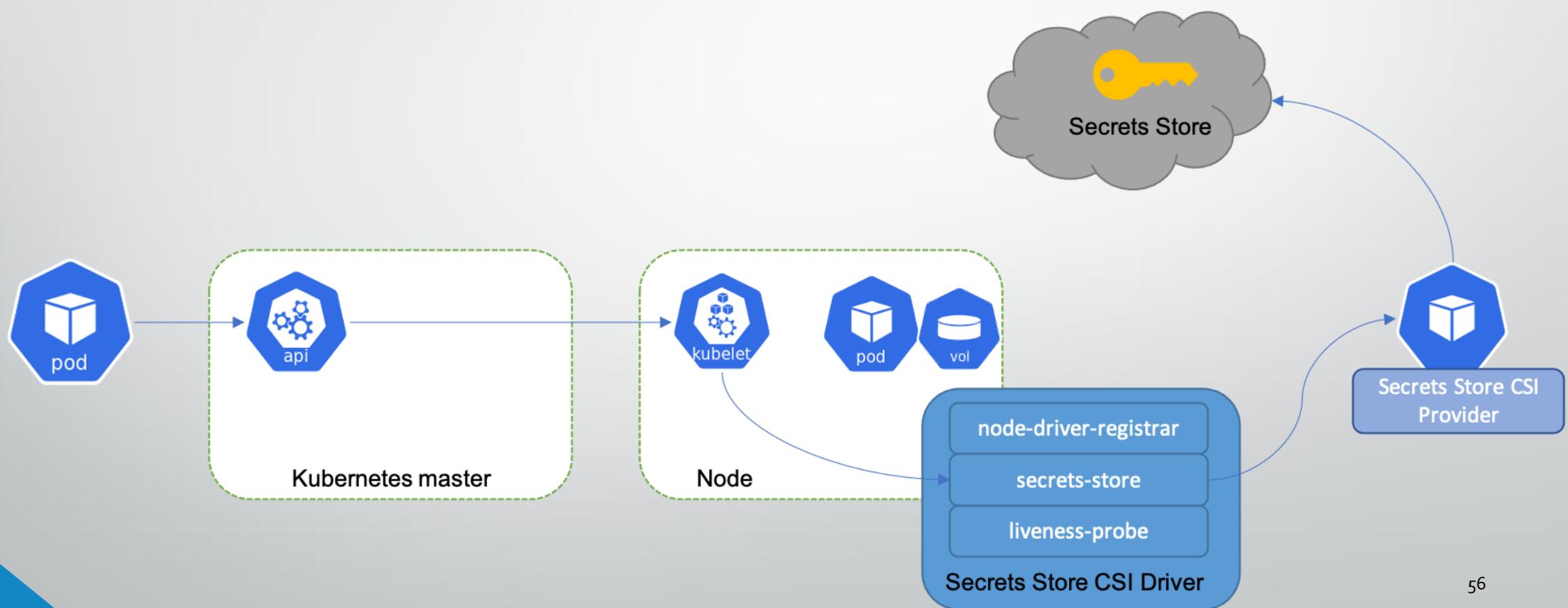
- V1:
  - Is deprecated and will be removed in the future
  - Easy to use
  - Can deploy YAML files and Helm charts
- V2:
  - Configure dependencies between resources
  - Deploying Helm charts from Git repository does not work
  - Horrendous documentation

# Deployment Demo

# Key Vault Extension

- Mount secrets from Azure Key Vault into Kubernetes
- Secrets are retrieved using gRPC
- Get all advantages from Azure Key Vault
- Use pipeline to write/rotate secrets in Key Vault

# Key Vault Extension



# Azure Monitor Extension

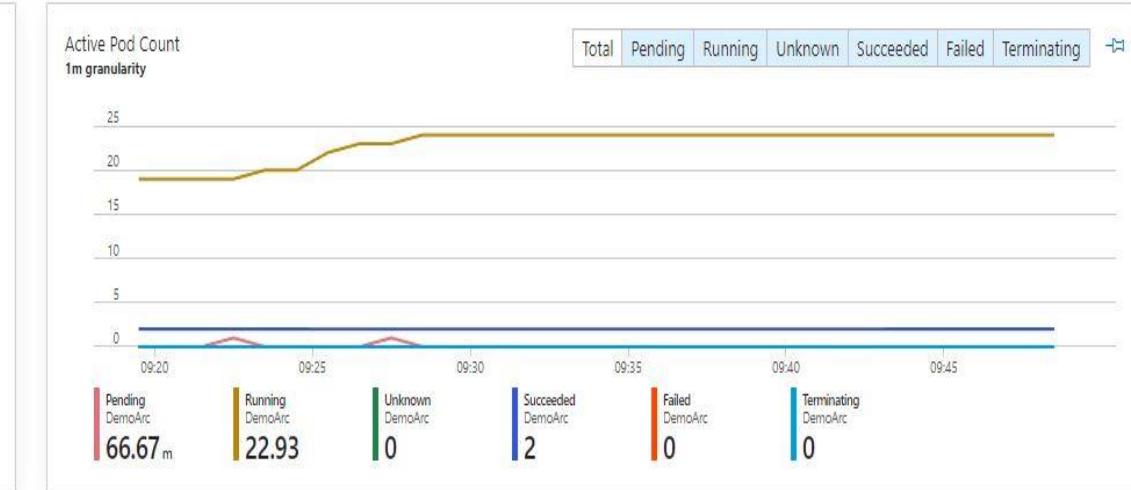
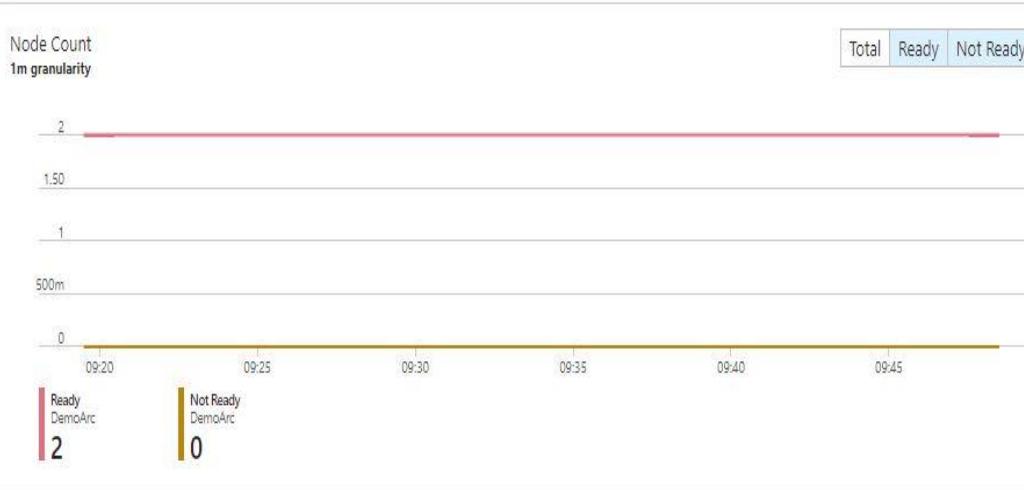
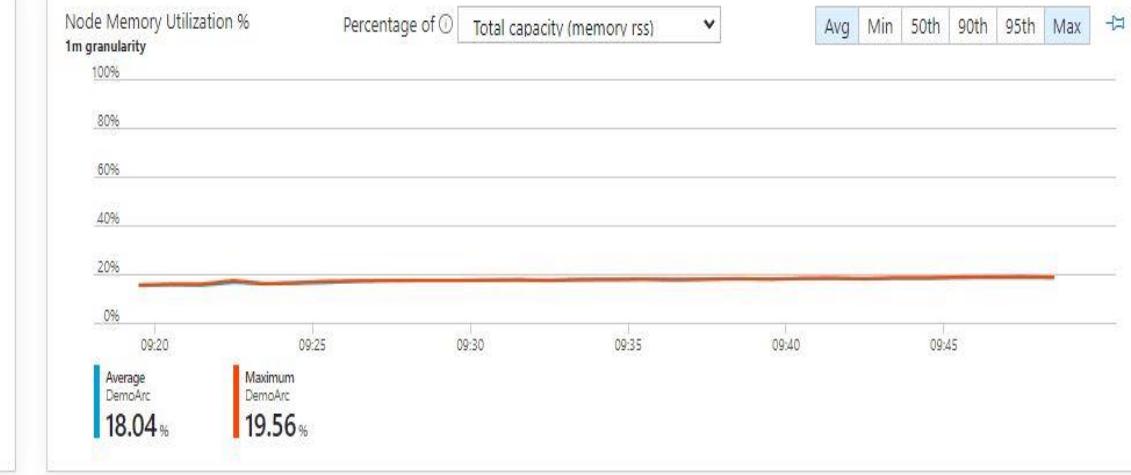
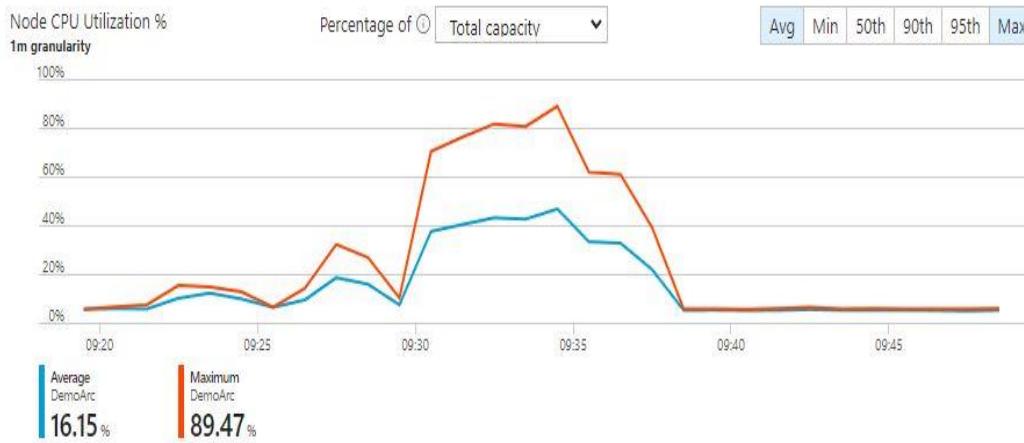
- Azure Monitor agent is installed in its own namespace
- Agent sends information to Log Analytics Workspace
- Azure Monitor:
  - Dashboards
  - Alerting
  - Container Insights

# DemoArc | Insights

Kubernetes - Azure Arc

Search (Ctrl+ /)
Refresh
View All Clusters
Recommended alerts (Preview)
View Workbooks
Help
Feedback
Overview

Time range = Last 30 minutes

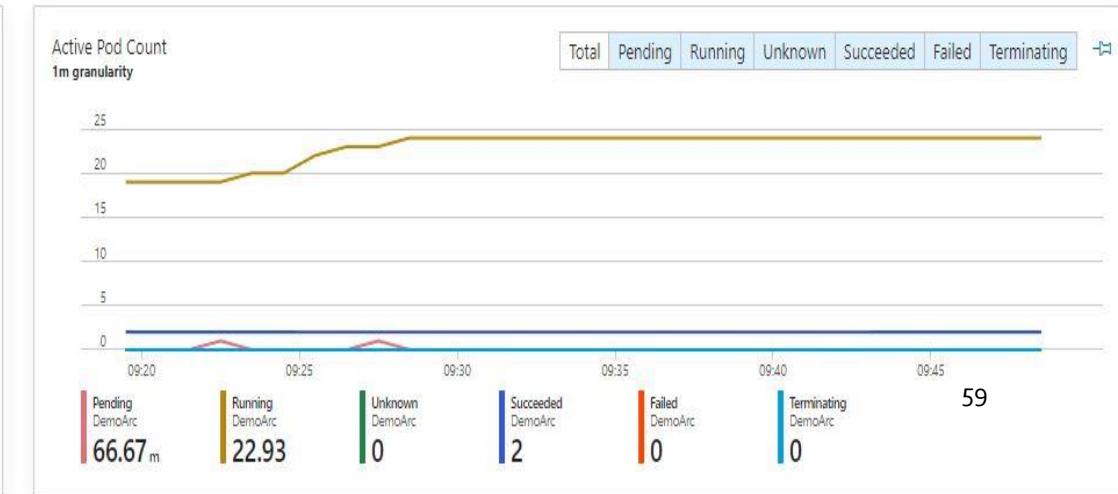
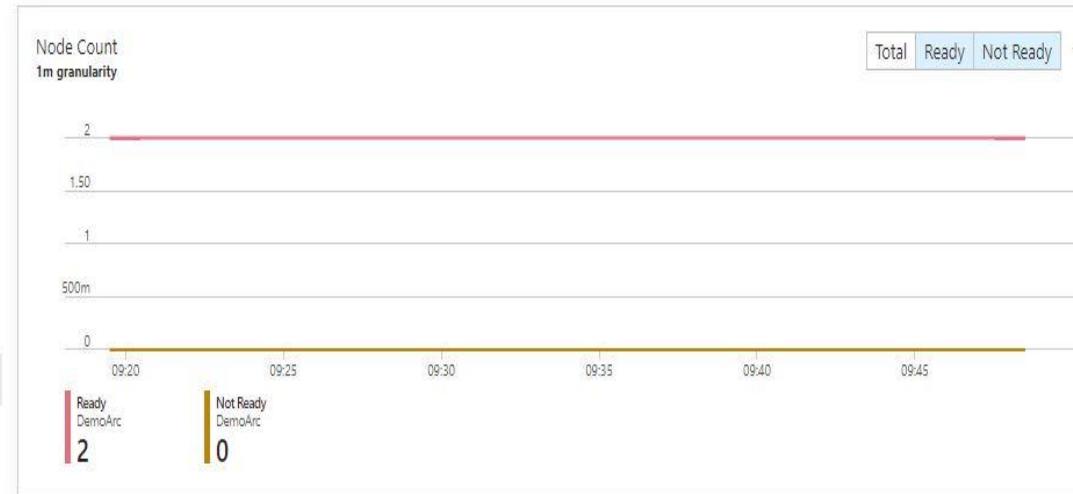
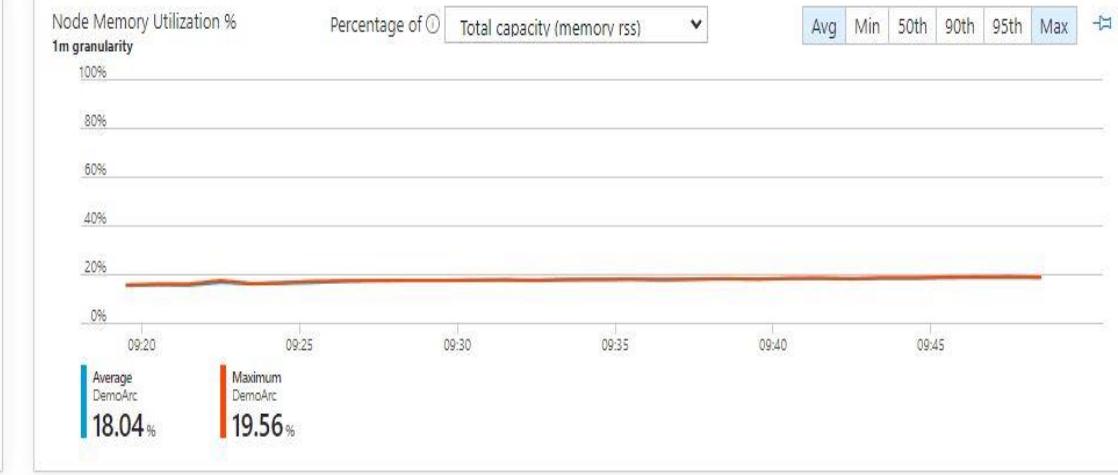
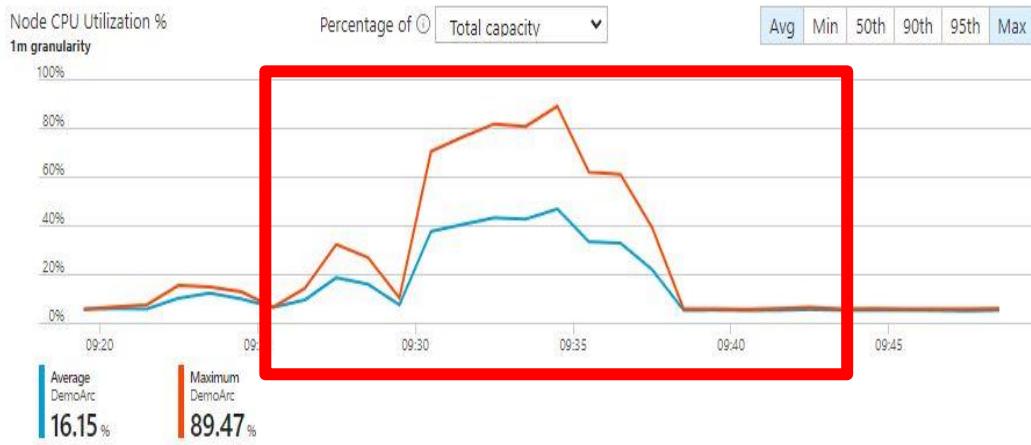
Add Filter
[What's new](#)
[Cluster](#)
[Reports](#)
[Nodes](#)
[Controllers](#)
[Containers](#)
SettingsExtensionsGitOps (preview)PoliciesPropertiesLocksMonitoringInsightsAlertsMetricsLogs

# DemoArc | Insights

Kubernetes - Azure Arc

Search (Ctrl+ /)
Refresh
View All Clusters
Recommended alerts (Preview)
View Workbooks
Help
Feedback
Overview

Time range = Last 30 minutes

Add Filter
[What's new](#)
[Cluster](#)
[Reports](#)
[Nodes](#)
[Controllers](#)
[Containers](#)
Logs

# DemoArc | Insights

Kubernetes - Azure Arc

Search (Ctrl+/) Refresh View All Clusters Recommended alerts (Preview) View Workbooks Help Feedback

Overview Time range = Last 30 minutes Add Filter

Activity log

Access control (IAM)

Tags

Diagnose and solve problems

Security (preview)

Kubernetes resources (preview)

Namespaces

Workloads

Services and ingresses

Storage

Configuration

Settings

Extensions

GitOps (preview)

Policies

Properties

Locks

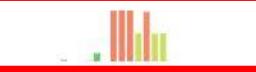
Monitoring

Insights

Alerts

What's new Cluster Reports Nodes Controllers Containers

Search by name... Metric: CPU Usage (millicores) Min Avg 50th 90th 95th Max

Name	Status	95th %	95th	Pod	Node	Restarts	UpTime	Trend 95th % (1 bar = 1m)
customerapi	Ok	91%	1810 mc	customerapi-5d5f8d96c5-v8nt7	master	0	25 mins	
mqtt	Ok	64%	322 mc	mqtt-58b75468c-zcnzx	master	0	27 mins	
kube-aad-proxy	Ok	17%	17 mc	kube-aad-proxy-8564d4dd5d-qqcqb	worker1	0	54 mins	
omsagent	Ok	7%	10 mc	omsagent-727fd	worker1	0	31 mins	
omsagent	Ok	4%	6 mc	omsagent-4pfjt	master	0	32 mins	
fluent-bit	Ok	4%	0.8 mc	config-agent-69dcdb554d-7whm	worker1	0	57 mins	
fluent-bit	Ok	4%	0.8 mc	cluster-metadata-operator-9945b897c-nxcwr	worker1	0	57 mins	
cluster-metadata-operator	Ok	4%	2 mc	cluster-metadata-operator-9945b897c-nxcwr	worker1	0	58 mins	
fluent-bit	Ok	3%	0.7 mc	controller-manager-5494575977-rfc6g	worker1	0	57 mins	
flux-logs-agent	Ok	3%	1 mc	flux-logs-agent-86cf4f7b7d-55fld	worker1	0	58 mins	
fluent-bit	Ok	3%	0.6 mc	extension-manager-7dc84fb6d7-sfnl	worker1	0	57 mins	
resource-sync-agent	Ok	3%	1 mc	resource-sync-agent-56f777f6b6-7zj9n	worker1	0	58 mins	



# Azure Arc Services

# Azure Arc Services

- Azure Arc-enabled infrastructure
  - Azure Arc-enabled servers
  - Azure Arc-enabled Kubernetes
  - Azure Stack HCI

# Azure Arc Services

- Azure Arc-enabled services
  - Azure App Service
  - Azure Logic Apps
  - Azure Event Grid
  - Azure Functions
  - Azure API Management

# Azure Arc Services

- Azure Arc-enabled services
  - Azure SQL Managed Instance
  - PostgreSQL Hyperscale
  - Azure Machine Learning

# Azure Arc Services

- Azure Arc-enabled services run inside a Kubernetes cluster
- Bring Azure services to your on-prem datacenter
- Developers can continue using their tools



Unified operations, management,  
compliance, security and governance



Azure resources



Azure Arc-enabled infrastructure resources  
(Servers, SQL servers, Kubernetes)



Azure Arc-enabled services resources  
(Data services, App services, Machine Learning services)



Azure Resource Manager

Azure Arc

Azure Arc-enabled  
infrastructure onboarding

Azure Arc-enabled  
services deployment

Azure Arc-enabled  
infrastructure onboarding

On-premises IT  
infrastructure resources



On-premises Arc-enabled services  
(Data services, App services, Machine Learning services)



Multicloud Arc-enabled services  
(Data services, App services, Machine Learning services)



Multicloud IT  
infrastructure resources



Azure Stack HCI

VMware®

Amazon Web Services

Google Cloud Platform

# Azure Managed SQL Instance

- Run Azure Managed SQL Instance in your datacenter:
  - Always up-to-date
  - Automated backups
  - Elastic scale
  - Kibana and Grafana

Discover

New Save Open Share Inspect

custom\_resource\_name:arc-database KQL Last 15 minutes

+ Add filter

logstash-\* ▾

Search field names

Filter by type 0

Selected fields

- \_source

Available fields

- \_id
- \_index
- \_score
- \_type
- @timestamp
- custom\_resource\_name
- file\_path
- kubernetes\_container\_name
- kubernetes\_namespace
- kubernetes\_node\_name
- kubernetes\_pod\_name
- message
- service\_name
- time

2,834 hits Oct 7, 2022 @ 19:00:30.040 - Oct 7, 2022 @ 19:15:30.040 Auto

Count @timestamp per 30 seconds

Time ▾ \_source

> Oct 7, 2022 @ 19:15:28.299 custom\_resource\_name: arc-database @timestamp: Oct 7, 2022 @ 19:15:28.299 message: [heartbeat-arc-database-0] 2022/10/07 11:15:28 Heartbeat received. orchestrator service\_name: ha-supervisor file\_path: /var/log/arc-ha-orchestrator/ha-supervisor-stdout.log kubernetes\_namespace: wolfgang-attic kubernetes\_vmss000003 kubernetes\_pod\_name: arc-database-ha-0 \_id: yJoosoMB\_YIqz-hETCea \_type: \_doc \_index: logstash-2022.10.07 \_score: -

> Oct 7, 2022 @ 19:15:28.299 custom\_resource\_name: arc-database @timestamp: Oct 7, 2022 @ 19:15:28.299 message: [INFO] 2022/10/07 11:15:28 Handling heartbeat for replica "arc-database". kubernetes\_container\_name: arc-ha-orchestrator service\_name: ha-supervisor file\_path: /var/log/arc-ha-orchestrator/ha-supervisor-stdout.log kubernetes\_node\_name: aks-agentpool-77043942-vmss000003 kubernetes\_pod\_name: arc-database-ha-0 \_id: yZoosoMB\_YIqz-hETCea \_type: \_doc \_index: logstash-2022.10.07 \_score: -

> Oct 7, 2022 @ 19:15:28.299 custom\_resource\_name: arc-database @timestamp: Oct 7, 2022 @ 19:15:28.299 message: [INFO] 2022/10/07 11:15:28 healthyTransitioner: verifyPrimary: <nil> kubernetes\_container\_name: arc-ha-orchestrator service\_name: ha-supervisor file\_path: /var/log/arc-ha-orchestrator/ha-supervisor-stdout.log kubernetes\_node\_name: aks-agentpool-77043942-vmss000003 kubernetes\_pod\_name: arc-database-ha-0 \_id: ypoosoMB\_YIqz-hETCea \_type: \_doc \_index: logstash-2022.10.07 \_score: -

> Oct 7, 2022 @ 19:15:28.299 custom\_resource\_name: arc-database @timestamp: Oct 7, 2022 @ 19:15:28.299 message: [orchestrator] 2022/10/07 11:15:28 State transition succeeded, new kubernetes\_container\_name: arc-ha-orchestrator service\_name: ha-supervisor file\_path: /var/log/arc-ha-orchestrator/ha-supervisor-stdout.log kubernetes\_node\_name: aks-agentpool-77043942-vmss000003 kubernetes\_pod\_name: arc-database-ha-0 \_id: y5oosoMB\_YIqz-hETCea \_type: \_doc \_index: logstash-2022.10.07 \_score: -

> Oct 7, 2022 @ 19:15:28.299 custom\_resource\_name: arc-database @timestamp: Oct 7, 2022 @ 19:15:28.299 message: [orchestrator] 2022/10/07 11:15:28 Starting state tranistion in state kubernetes\_container\_name: arc-ha-orchestrator service\_name: ha-supervisor file\_path: /var/log/arc-ha-orchestrator/ha-supervisor-stdout.log kubernetes\_node\_name: aks-agentpool-77043942-vmss000003 kubernetes\_pod\_name: arc-database-ha-0 \_id: zJoosoMB\_YIqz-hETCea \_type: \_doc \_index: logstash-2022.10.07 \_score: -



# Azure Managed SQL Instance

- Works on any hardware and Kubernetes distribution
- Service runs in its own namespace
- Install via Azure CLI or Azure Portal

```
root@Office:/home/wolfgang# az sql mi-arc create --name arc-database --dev --k8s-namespace wolfgang-attic --use-k8s
Arc SQL managed instance username:wolfgang
Arc SQL managed instance password:
Confirm Arc SQL managed instance password:
arc-database is Ready
```

# Azure Managed SQL Instance

- Works on any hardware and Kubernetes distribution
- Service runs in its own namespace
- Install via Azure CLI or Azure Portal
- Keep your data on-premises
- Only metadata for billing purposes is sent to Azure

# Azure App Service

- Use Azure App Service as it was running in the cloud
  - Auto-scaling
  - Load Balancing
  - DNS und SSL Management
  - Deployment

# Azure App Service

- App Service runs in its own namespace
- Currently free
  
- Deployed to a “custom location”
- Create service via Azure Portal or CLI



# Azure App Service Demo

# Create Web App

[Basics](#)[Docker](#)[Networking](#)[More](#)

App Service Web Apps lets you quickly build any platform. Meet rigorous performance, scalability, and security standards so you can focus your platform to perform infrastructure maintenance.

## Project Details

Select a subscription to manage deployed resources and costs across all your resources.

Subscription \* ⓘ



Resource Group \* ⓘ

## Instance Details

Need a database? [Try the new Web + Database service](#)

Name \*

Publish \*

Operating System \*

Region \*

### Custom Locations (Preview)

wolfgang-basement

### Regions

Australia Central

Australia East

Australia Southeast

Brazil South

Canada Central

Canada East

Central India

Central US

East Asia

East US

East US 2

France Central

Germany West Central

wolfgang-basement

Not finding your App Service Plan? Try a different region or select your own location.

[Review + create](#)[< Previous](#)[Next : Docker >](#)

# Create Web App

[Create new](#)

## Instance Details

Need a database? [Try the new Web + Database experience.](#) ↗

Name \*

 ✓

.appservice-envir-7bkpp2s.westeurope.k4apps.io

Publish \*

Code  Docker Container  Static Web App

Operating System \*

Linux  Windows

Region \*

 ✓

i Not finding your App Service Plan? Try a different region or select your App Service Environment.

## Zone redundancy

An App Service plan can be deployed as a zone redundant service in the regions that support it. This is a deployment time only decision. You can't make an App Service plan zone redundant after it has been deployed [Learn more](#) ↗

Zone redundancy

- Enabled:** Your App Service plan and the apps in it will be zone redundant. The minimum App Service plan instance count will be three.
- Disabled:** Your App Service Plan and the apps in it will not be zone redundant. The minimum App Service plan instance count will be one.

[Review + create](#)< PreviousNext : Docker >

 **basta-azure-arc-demo** ⚡ ☆ ...  
App Service << [Browse](#)  [Stop](#)  [Swap](#)  [Restart](#)  [Delete](#) |  [Refresh](#)  [Get publish profile](#) ...

JSON View

## Configuration

Authentication

Application Insights

Identity

Backups

Custom domains

Custom domains (preview)

TLS/SSL settings

Certificates (preview)

Networking

Scale out

WebJobs

Push

MySQL In App

Service Connector

Locks

## ^ Essentials

Resource group ([move](#))[ArcDemo](#)

Status

Running

Location

West Europe

Subscription ([move](#))[Visual Studio Enterprise Subscription](#)

Subscription ID

Tags ([edit](#))[Click here to add tags](#)

URL

<https://basta-azure-arc-demo.appservice-envir-7bkpp2s.w...>

Custom location

[wolfgang-baseinent](#)

App Service Plan

[ASP-ArcDemo-ade2 \(K1\)](#)



# Hey, App Service developers!

Your app service is up and running.

Time to take the next step and deploy your code.

Have your code ready?  
Use deployment center to get code published from your client or setup continuous deployment.

[Deployment Center](#)

Don't have your code yet?  
Follow our quickstart guide and you'll have a full app ready in 5 minutes or less.

[Quickstart](#)



# Azure Arc Conclusion

- Proof of concept was successful
- Powerful service
- Major focus from Microsoft
  
- Deep knowledge required
- Buggy
- Documentation needs improvement

# Resources

- [Slides](#)
- [Azure Arc Series](#)
- [Azure Arc Youtube Playlist](#)
- [Azure Arc Documentation](#)
- <https://docs.k3s.io>
- <https://fluxcd.io>

