



# Optimizing On-Premises Kubernetes: Scaling in the Swiss Alps with Azure

Wolfgang Ofner



# Wolfgang Ofner

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Focus on Azure, Kubernetes, DevOps and .NET

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[https://twitter.com/wolfgang\\_ofner](https://twitter.com/wolfgang_ofner)



# Agenda



Introduction to Hybrid Cloud



Azure Arc and Kubernetes



Integrating On-Premises with Cloud



Real-World Examples



Conclusion and Q&A



# Hybrid Cloud

# Hybrid Cloud Definition

Hybrid Cloud is a combination of public and private cloud services, along with on-premises infrastructure, creating a unified computing environment that offers greater flexibility, scalability, and cost-effectiveness.

# Types of Hybrid Cloud

- Split cloud and on-premise usage
- Extend on-premise usage with simple cloud services
  - Storage or database services
  - VPN or ExpressRoute into the cloud
- Unify on-premises and cloud environment
  - Run cloud services in your datacenter

# Benefits of Hybrid Cloud

- Data Sovereignty
- Security
- Latency
- Cost
- Resiliency

# Challenges of Hybrid Cloud

- Complex infrastructure
- Security and compliance
- Data integration
- Skill set

# Run Azure Services On-Premises

- Azure Stack Edge
- Azure Stack Hub
- Azure Stack HCI
- Azure Arc

# Azure Stack Edge

- Edge Computing
- Cloud-managed
- Transfer data to Azure
- Preprocess data
- Inference with Azure Machine Learning

# Azure Stack Hub

- Azure Stack Hub is a hybrid cloud platform for using Azure services from your own datacenter or service provider
- Delivers a subset of the services and features that are available in Azure
- Developers can build apps on Azure Stack Hub and deploy them to Azure Stack Hub, Azure, or create truly hybrid apps

# Azure Stack HCI

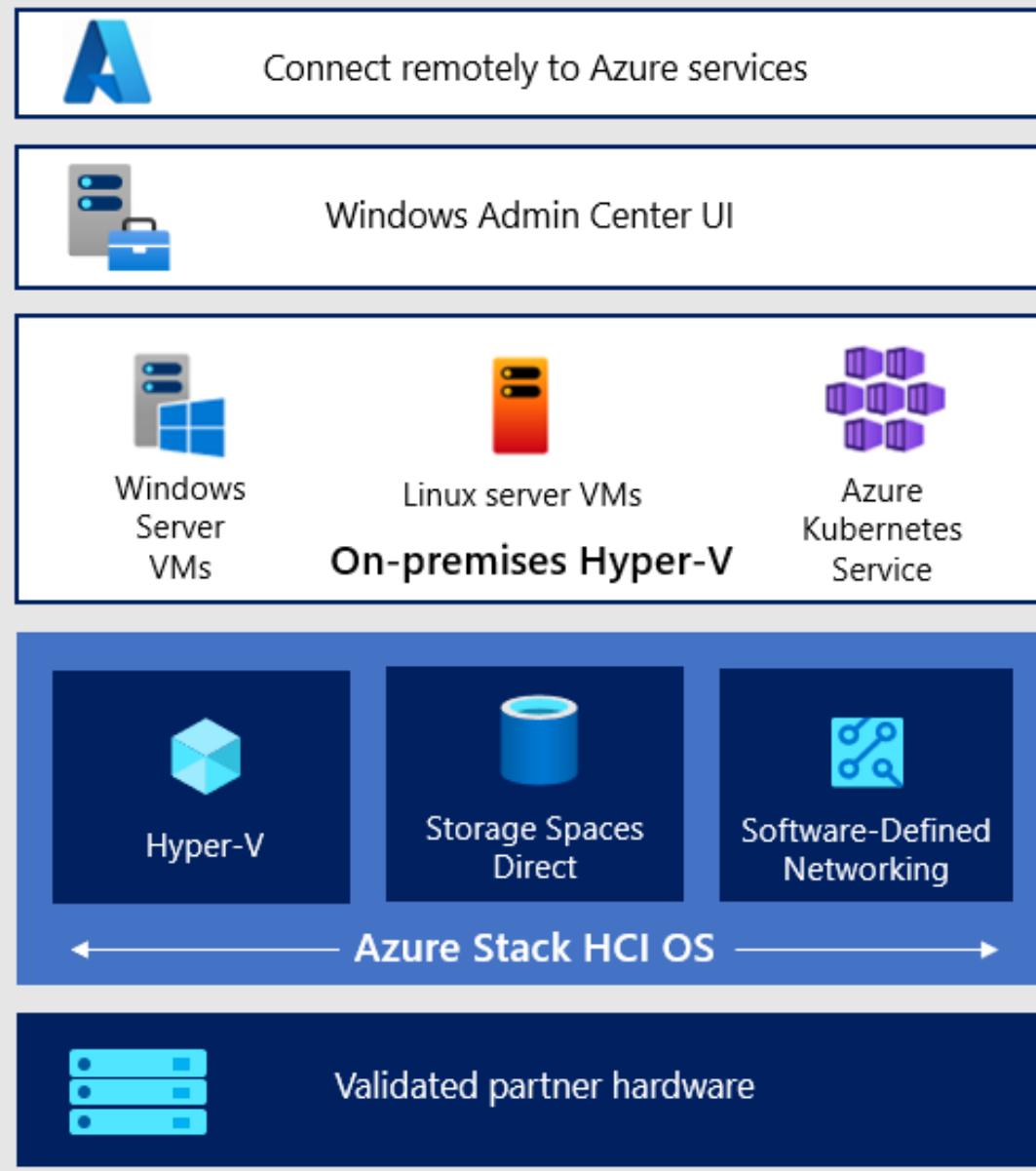
- Azure Stack HCI is a hyperconverged infrastructure (HCI) cluster solution for hosting virtualized workloads in a hybrid environment
- Delivered as an Azure service and billed to an Azure subscription, with access to cloud-based monitoring, Site Recovery, VM backups, and central view of Azure Stack HCI deployments

# Azure Stack HCI

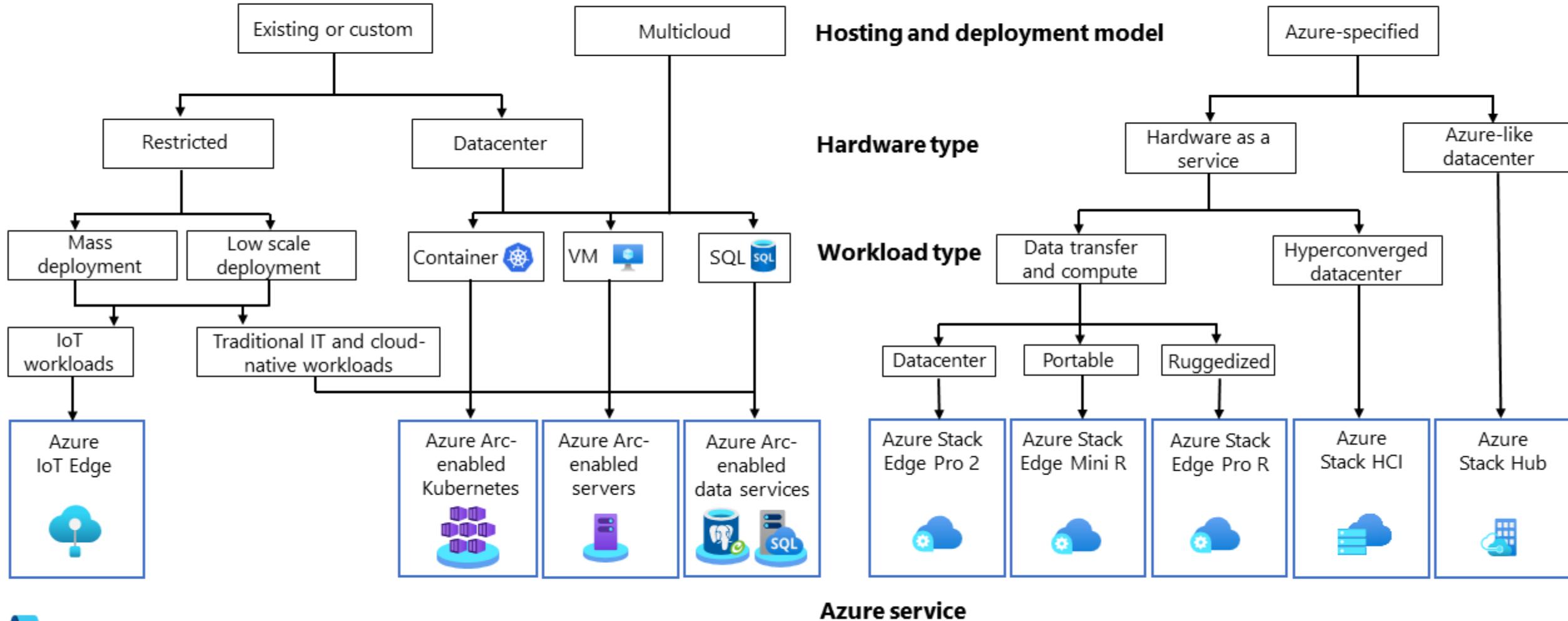
- Built on proven technologies such as Hyper-V, Storage Spaces Direct, and Azure-inspired SDN
- Each cluster consists of 1 to 16 physical servers
- Often used in disconnected scenarios



## Azure Stack HCI solution



## Azure cloud





Azure Arc

# 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](#)

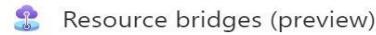
Overview

**Management**

Custom locations



Data controllers



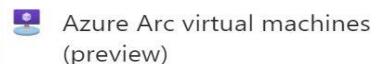
Resource bridges (preview)



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)

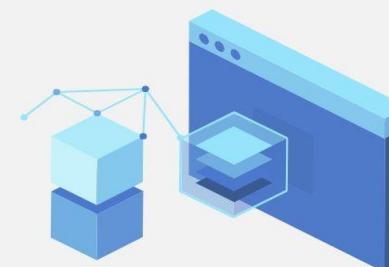


SQL managed instances

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

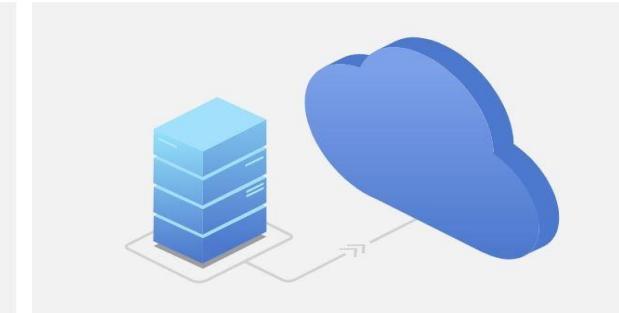
## See and manage all your on-prem infrastructure, anywhere. It's free to get started.

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 Secrets Provider
- Securely access cluster without opening inbound ports

# Azure Arc Installation Prerequisites

- Azure CLI
- Azure CLI Arc extension

```
curl -sL https://aka.ms/InstallAzureCLIDeb | sudo bash
```

```
az extension add --name connectedk8s
```

# Azure Arc Installation Prerequisites

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

```
root@Office:/home/wolfgang ~ + ^  
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

```
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
- 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

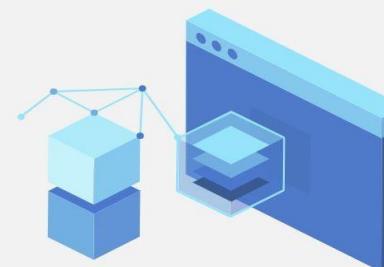
[Azure Arc virtual machines \(preview\)](#)[Azure Stack HCI](#)[Kubernetes clusters](#)[Servers](#)[SQL Servers](#)[VMware vCenters \(preview\)](#)[SCVMM management servers \(preview\)](#)

#### Data services

[PostgreSQL Hyperscale \(preview\)](#)[SQL managed instances](#)[Get started](#)[Infrastructure](#)[Services](#)[Learn more](#)

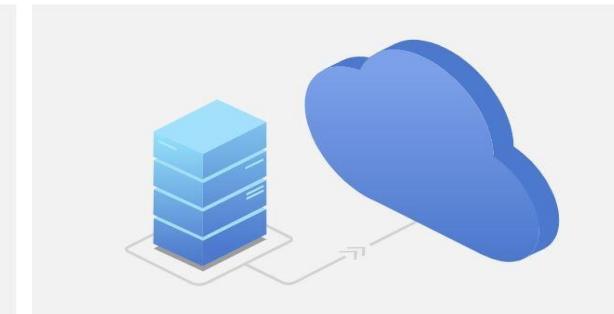
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[Add](#)

### 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

&lt;&lt;

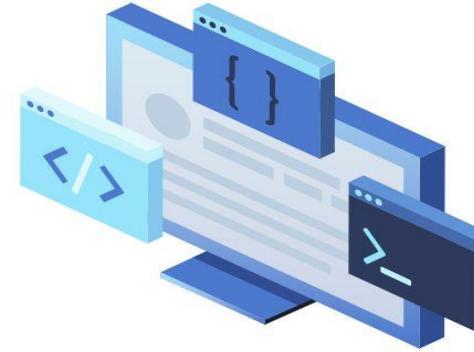
- Overview
- Activity log
- Access control (IAM)
- Tags
- Diagnose and solve problems
- Security (preview)

## 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 \* (i)

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# 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  
dwlkIjoimTNlMjZmNjUtMmI3My00Y2JjLTliYmMtZDZjOTYyNzI3NWUwIn19L  
zZXJ2aNlYWNjb3VudDpkZWZhdx0OmFkbWluLXVzZXIfQ.AsCbdMl0yFtPtQ  
zAu_xjxowyqzEZ_BdWQBZSoIT9liiG39i6mq1nAzc4Re42iwDlJh3X0sHbabud  
xHrwL2p-aGS06-jCphhgGKa1-nyvkp0JtnSJ6edq08Fwg-Aa92tKUgpYOSiLXg  
bEv2IrYAF_fPT3eCMNAH5Joh0qDjC_Pka4X4GV0gUUvXQUWxcAFcjU7LvLLYNQ  
mGzWzYTIYcDwiOBpGcNHTbGHhlQLsfDGUMR-nuQce6V04ibfEz_My6zdyX7ToB  
T7hjIvLe2wuwBM3A7inUPFvy00DCTdwMZvApFBKItcpt_6MWhzmypshN0hrP  
M076cPmUYgZijWPLEB3Lgwg9hojDTA39gbyYkg3pIOSLY4oWdbv7NvWuAe8cg  
sf9RIssCwYw
```

Search



- Overview
- Activity log
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## Kubernetes resources (preview)

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Service account bearer token \* i

```
kiOdK/RA-w-xqoNuMDA2tWHMzB1KDt8W-
Z6D7M4k5yknroHRuMN7MLCr66on9pO6Xul19MlbZDo8KskUD4
GCWOriMTAnMbq5rfpr9Pv1g_tvHocHrmUwH-
m3K4Pes4M_DRQFCOYhURRULsdEeHsJz9KSv7MucEhWAV31L3S
cfxzNpmzvmGS0tana-
rTGWFIIr3mC2KamA2gELHcWyoayKJdfr4TG264Wx1Ce50pyO-
t0xuQU1hoBYB0RoiqXWsEZidFgWvoWVue5qpUKpy5DRImcDCG
YpqvKK7qTCE6m_I9SGnxxNF9mVRIebuFumfTHmeVilf940TInJ5i6
BNq_yj1kprraL3zpa9MuT6F9Ccg7IInq9JdZEIbafJBbo-
vvh56sifkq2YOygiSjDBDcumDBOpYIQI9ZG96pdQK5bEMrGCs2E
e9b9zIBb0rTXrxil2piA9LpaVBMpsJjkKWTfi1l5Pfy92262alOwo
ZVJvreM5cU6hPedvSffHfq-TK4JCSaq3ZEzo8
```

Sign in

# DemoArc | Workloads

Kubernetes - Azure Arc

Add Delete Refresh Show labels Give feedback

## 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

<input type="checkbox"/>	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



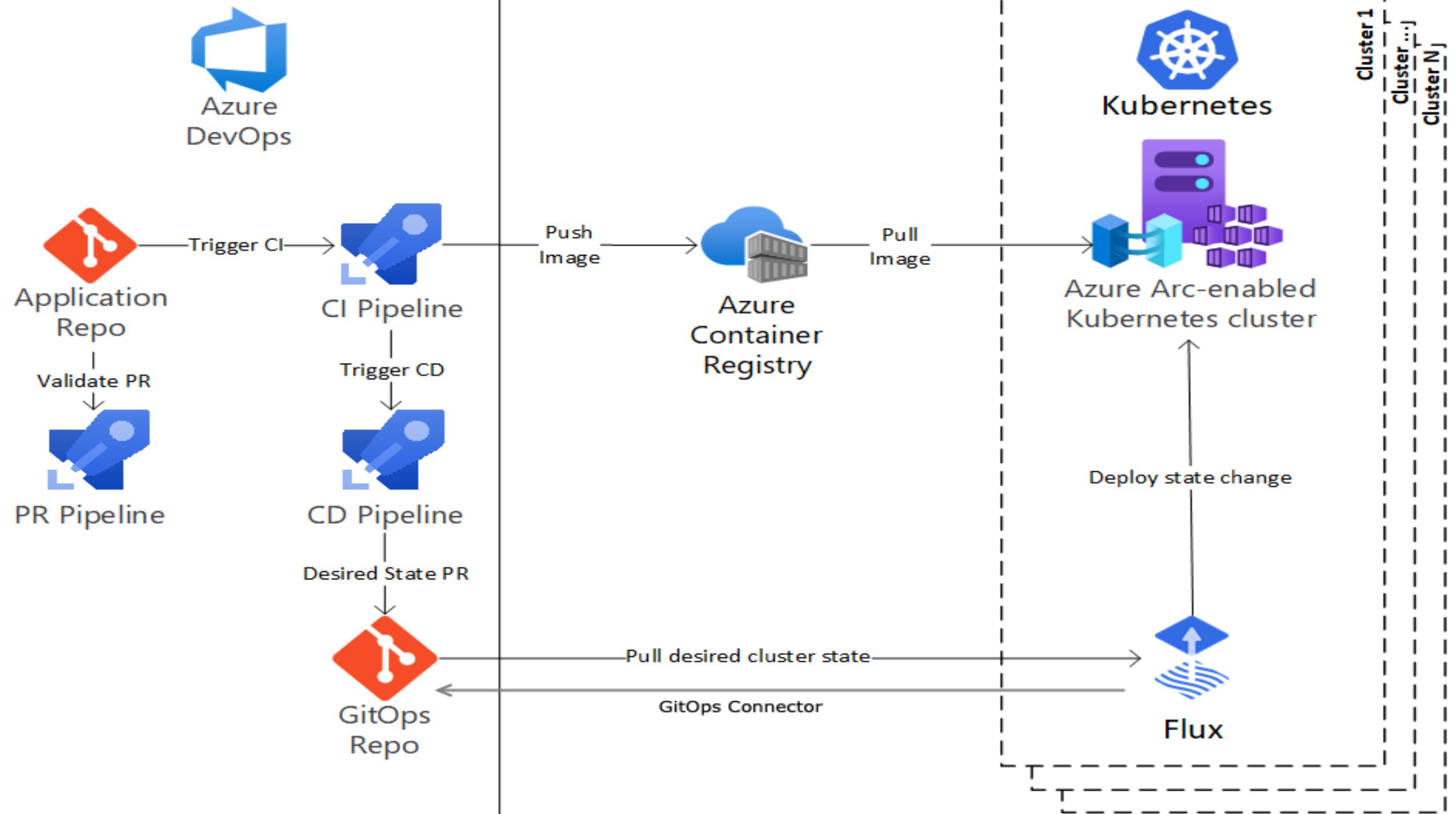
# Azure Arc Extensions

# Azure Arc extensions

- Bring Azure Services to your Kubernetes cluster
  - GitOps for deployments
  - Azure Monitor
  - Azure Key Vault Secrets Provider

# Git Ops Extension

- Uses Flux as GitOps agent
- Can be installed via Azure CLI or Azure Portal
- 2 repositories
  - Application repository
  - Configuration repository



# 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

Dashboard > Azure Arc | Kubernetes clusters > k3s-arc

## k3s-arc | GitOps

Kubernetes - Azure Arc

Search

Storage Configuration Settings Extensions Open Service Mesh GitOps Policies

Create Delete Refresh

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

# 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

```
root@Wolfgang-PC:/home/wolfgang# kubectl get pods -n demo
NAME                      READY   STATUS    RESTARTS   AGE
azurearcdemo-bb66f7b4f-zh2kz   1/1     Running   0          5m48s
root@Wolfgang-PC:/home/wolfgang# kubectl get service -n demo
NAME            TYPE      CLUSTER-IP      EXTERNAL-IP      PORT(S)        AGE
azurearcdemo   LoadBalancer   10.0.192.106   51.105.204.160   80:32544/TCP   5m53s
```

# AzureArcDemo 1.0 OAS3

<http://51.105.204.160/swagger/v1/swagger.json>

## Hello

GET /Hello ^

### Parameters

Try it out

No parameters

### Responses

Code	Description	Links
200	Success	No links

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: demo
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

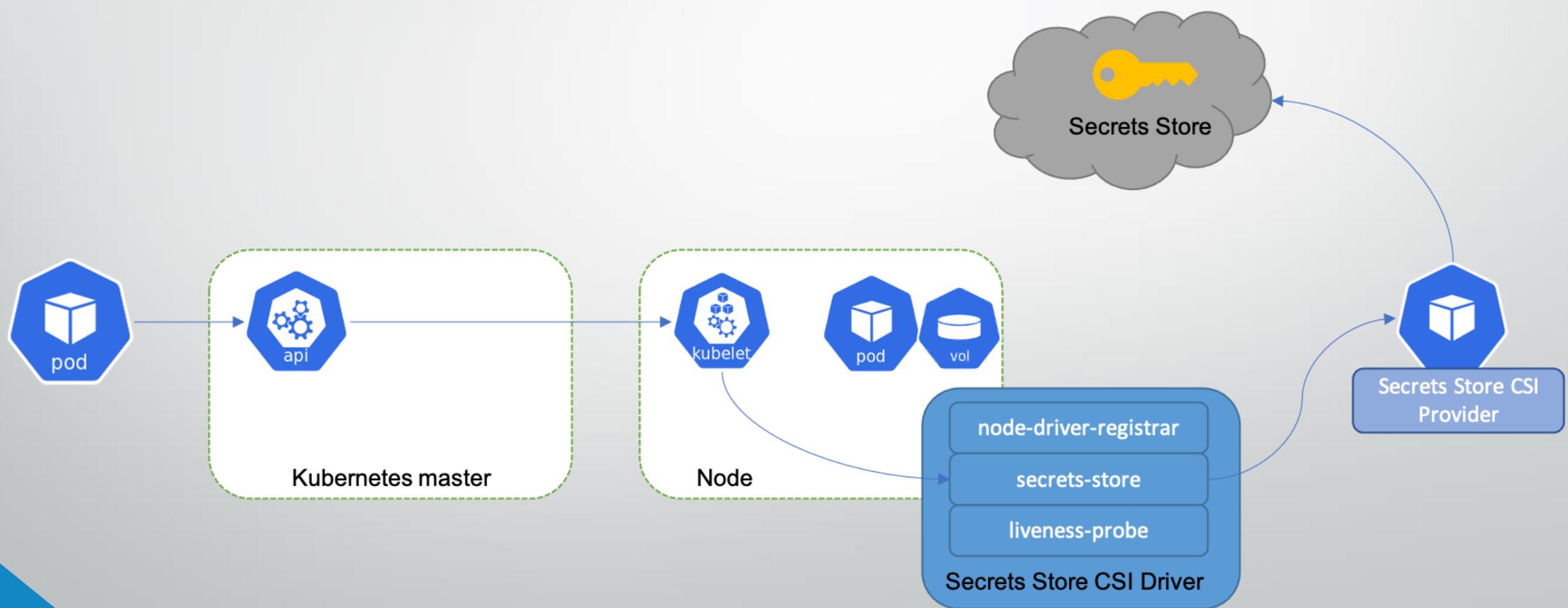
# GitOps Pipeline

- 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 K8s cluster
- Tag can be set manually when starting the pipeline

# 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

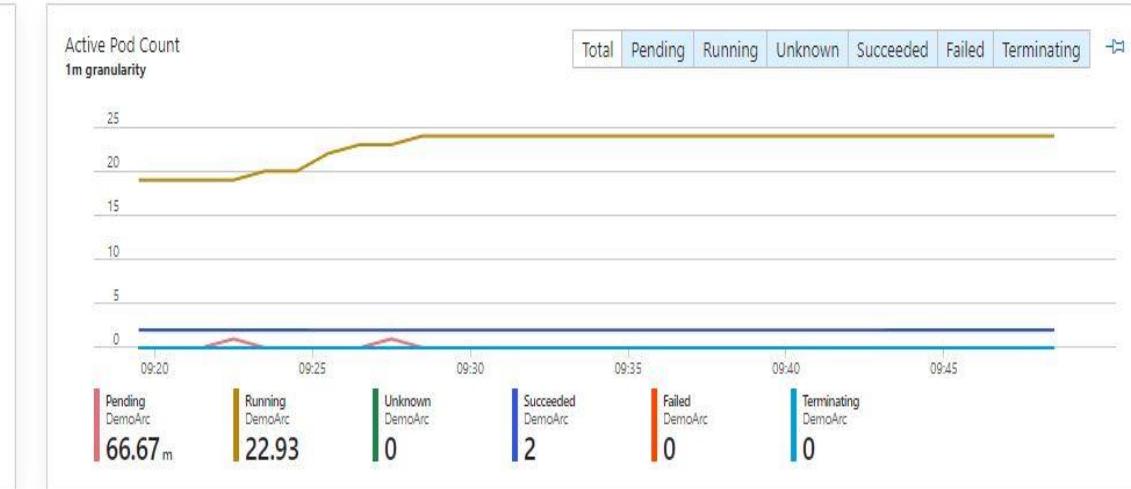
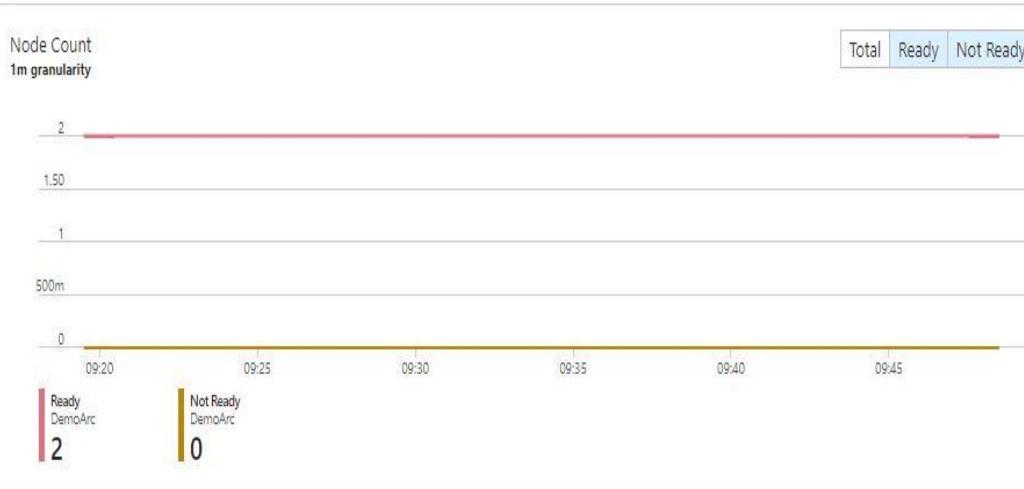
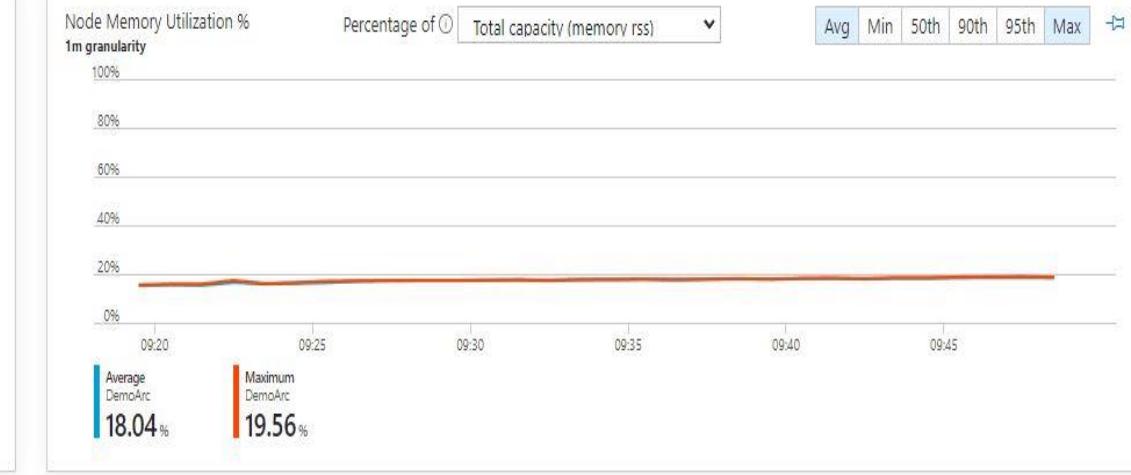
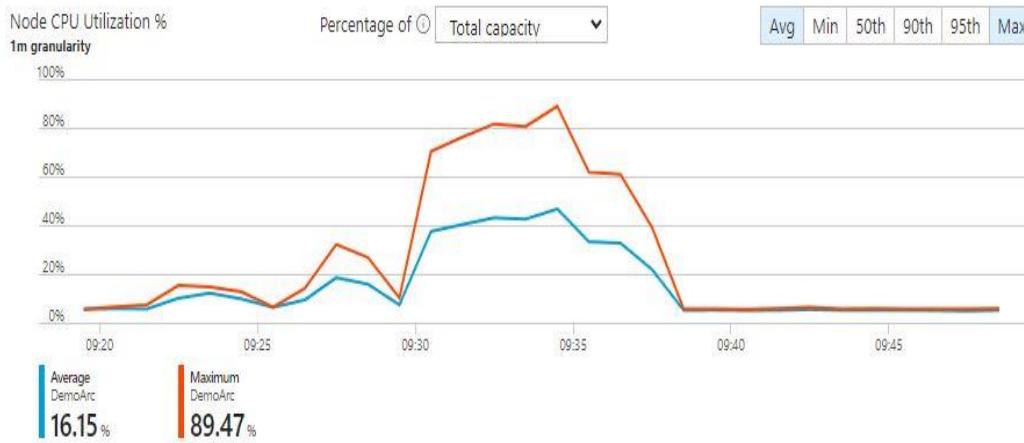
- Azure Monitor agent is installed in its own namespace
- Agent sends information to Log Analytics Workspace
- Azure Monitor:
  - Dashboards
  - Alerting
  - Container Insights

# DemoArc | Insights

Kubernetes - Azure Arc

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

Time range = Last 30 minutes

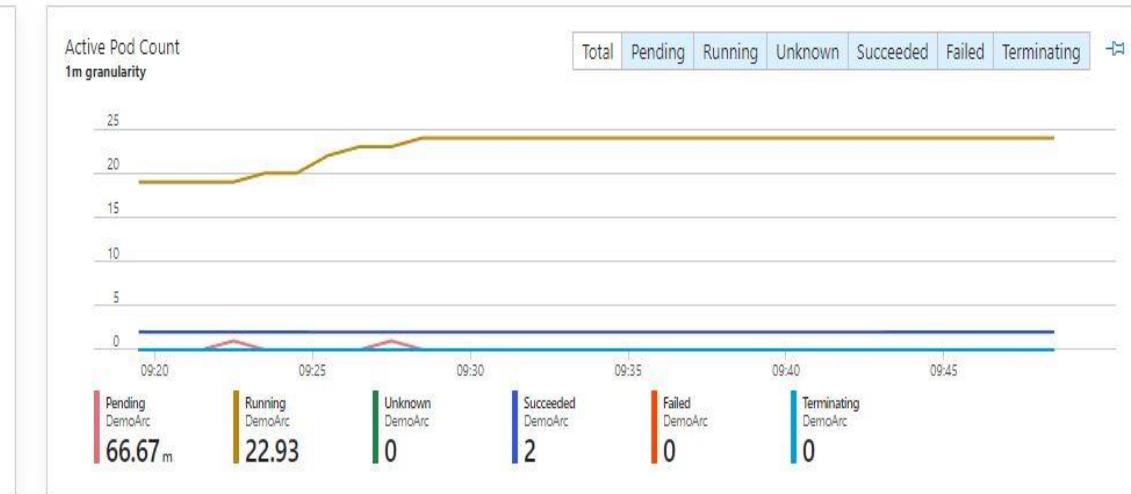
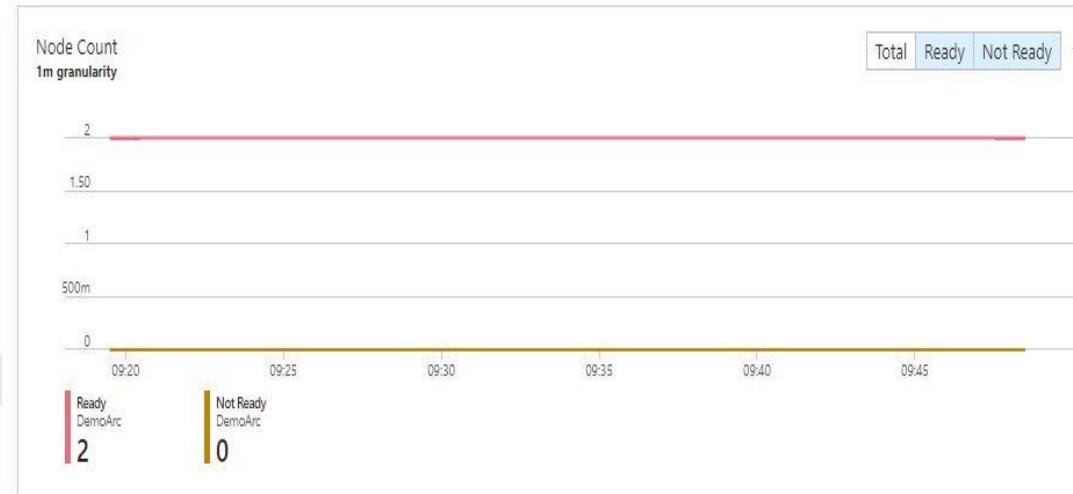
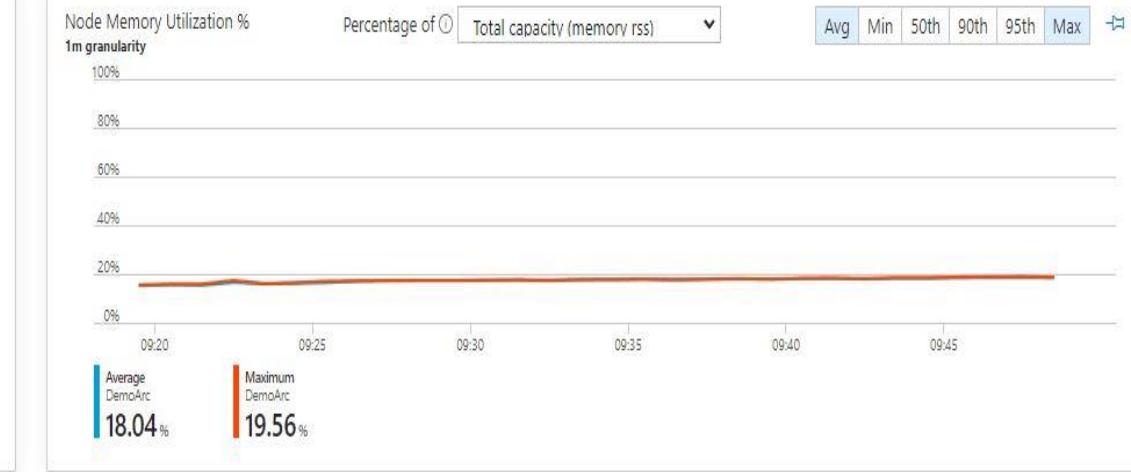
Add Filter
[What's new](#)
[Cluster](#)
[Reports](#)
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# DemoArc | Insights

Kubernetes - Azure Arc

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Time range = Last 30 minutes

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# DemoArc | Insights

Kubernetes - Azure Arc


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

# Real-World Examples

- Project “Autonomous Ropeway System”
- Project Smart Machine Factory



# 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



# Smart Machine Factory

- Run Azure Stack HCI AKS in factories around the globe
- Use Azure Arc to manage AKS cluster
  - Azure Monitor for monitoring and alerting
  - GitOps for deployments without access to the factory
- Run additional service in AKS such as managed PostgreSQL

# Hybrid Cloud Conclusion

# Hybrid Cloud Conclusion

- Powerful tool to combine on-premises requirements with cloud services
- Manage on-premises infrastructure from the cloud
  - Data never leaves your datacenter
  - Combine cloud services with low latency
- Deep technical knowledge necessary
- Too many applications to talk about them in just one hour

# Azure Arc Conclusion

- Possibly the most powerful Azure service
- Major focus from Microsoft
- Deep technical knowledge required
- Can be buggy
- Documentation needs improvement

