



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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https://twitter.com/wolfgang_ofner



Agenda



Project "Autonomous Ropeway System"



Challenges in the project



Azure Arc integration



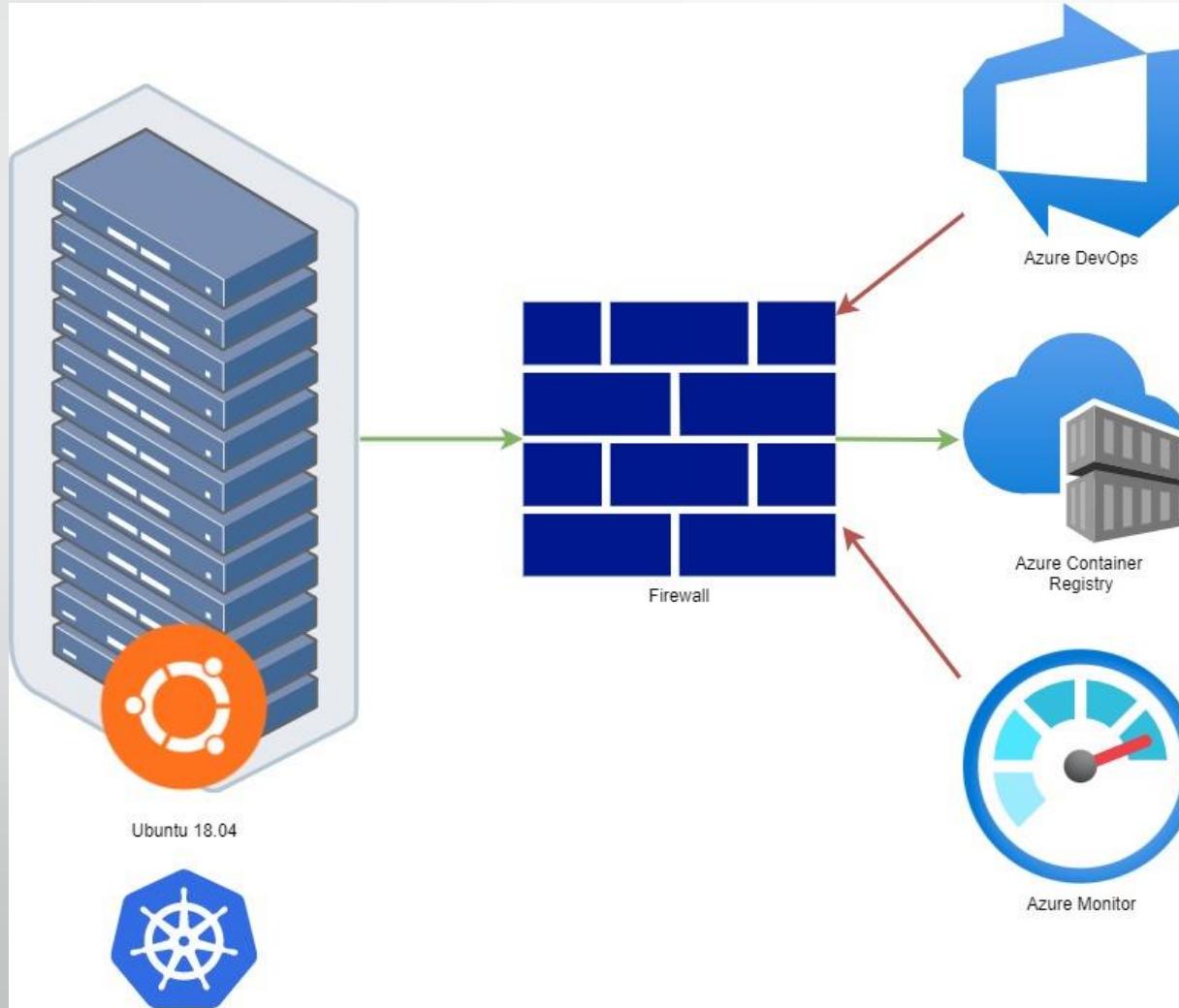
Project “Autonomous Ropeway System”

- 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



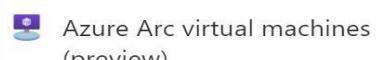
Resource bridges (preview)



Service principals



Private link scopes

Infrastructure

Azure Arc virtual machines (preview)



Azure Stack HCI



Kubernetes clusters



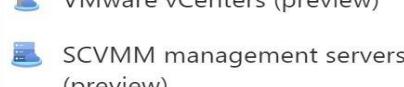
Servers



SQL Servers



VMware vCenters (preview)



SCVMM management servers (preview)

Data services

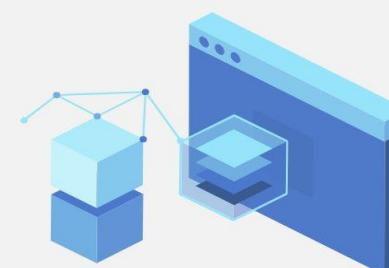
PostgreSQL Hyperscale (preview)



SQL managed instances

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
- Register Azure Provider

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

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

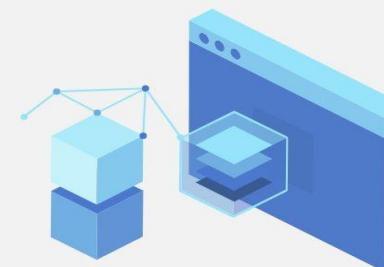
[Azure Arc virtual machines \(preview\)](#)[Azure Stack HCI](#)[Kubernetes clusters](#)[Servers](#)[SQL Servers](#)[VMware vCenters \(preview\)](#)[SCVMM management servers \(preview\)](#)

Data services

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

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)

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[Try ArcBox](#)

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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

...



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

More

No grouping

List view

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

k3s-arc | Namespaces

Kubernetes - Azure Arc



Search

<<

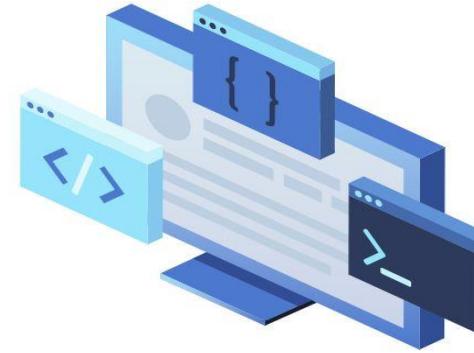
- Overview
- Activity log
- Access control (IAM)
- Tags
- Diagnose and solve problems
- Security (preview)

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

Search



- Overview
- Activity log
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Service account bearer token * i

```
kiOdK/RA-w-xqoNuMDA2tWHMzB1KDt8W-
Z6D7M4k5yknroHRuMN7MLCr66on9pO6Xul19MlbZDo8KskUD4
GCWOriMTAnMbq5rfpr9Pv1g_tvHocHrmUwH-
m3K4Pes4M_DRQFCOYhURRULsdEeHsJz9KSv7MucEhWAV31L3S
cfxzNpmzvmGS0tana-
rTGWFIIr3mC2KamA2gELhcWyoayKJdfr4TG264Wx1Ce50pyO-
t0xuQU1hoBYB0RoiqXWsEZidFgWvoWVue5qpUKpy5DRImcDCG
YpqvKK7qTCE6m_I9SGnxxNF9mVRIebuFumfTHmeVlf940TInJ5i6
BNq_yj1kprraL3zpa9MuT6F9Ccg7IInq9JdZEIbafJBbo-
vvh56sifkq2YOygiSjDBDcumDBOpYIQI9ZG96pdQK5bEMrGCs2E
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

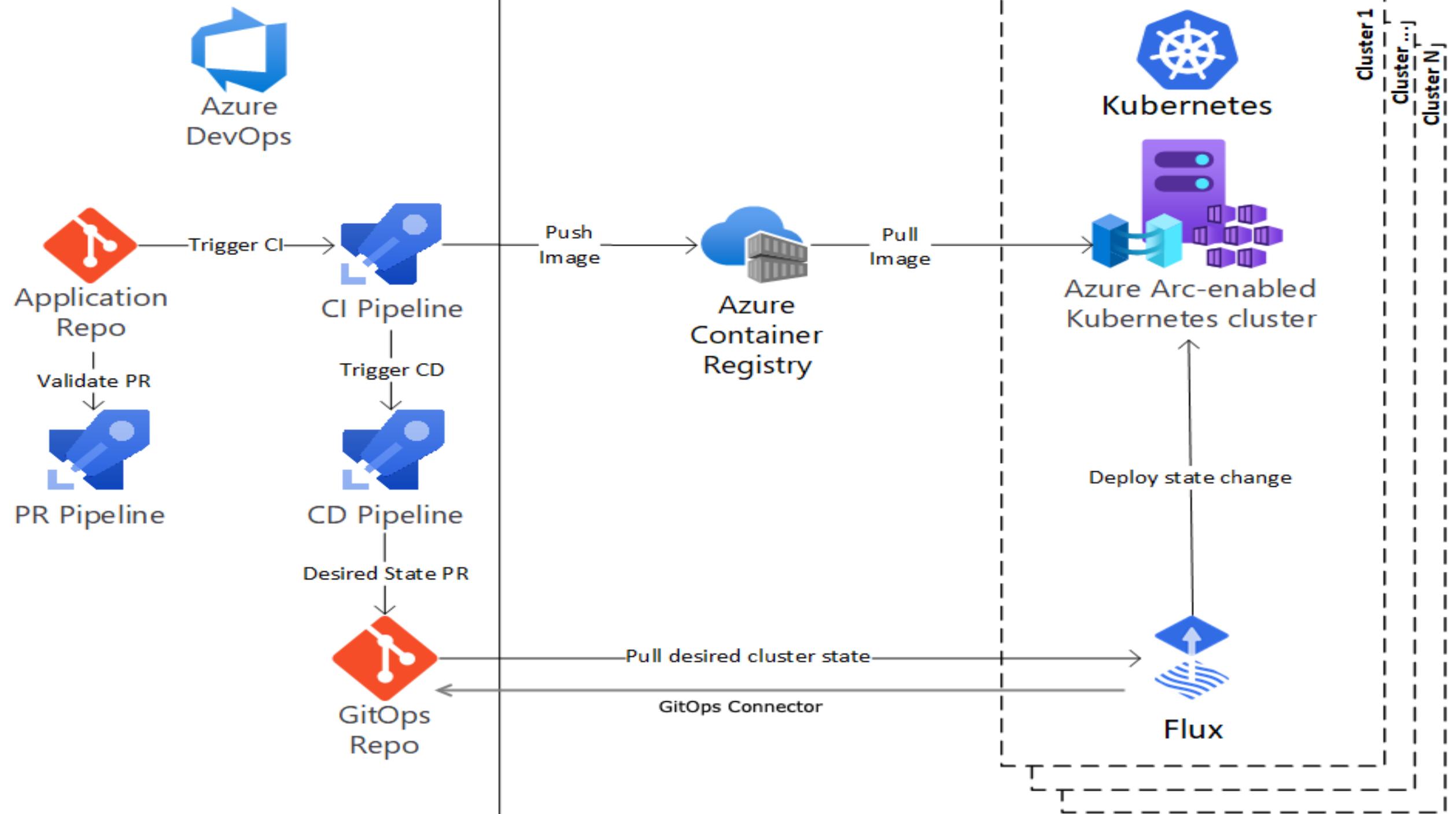
Filter by namespace

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

Git Ops Extension

- Uses Flux as GitOps agent
- Agent runs inside the Kubernetes cluster
- 2 Git repositories
 - Application code
 - Configuration



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

  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/  
1xL9QpE0MEa7kRvRaNX2vE5lqQJhWDBIqjRQij4Ldg5t+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

Add an SSH public key

Description

ArcDemo

Key Data

```
DRSrJFFyJkCql8Xg3aj0xUrTlxOmXvkiE7tuKKauc/gS7u42KYYE5q/ZdgcJ08abPujVYFgvVpu943
bpNwBes1xGRcuR/mGHDypCA4LiyP/92+hEhy1iIN33QOb93QkTfH1pE2vR3WjMwaObanysn
eqm9EtpQkcz4YjpZHoFg4eJaN2A/JvhT91R8yKJG9k/LxM220TAPvSiGh/+KZdq10IL6eM1LyeZ
9nFS0ZgSYUu9Tgpc21IT6etfr6WuKZjnpfq5L4INkkFDHVMGxggZT0wcqWIer+YMNamTFLg/
MIU752oUKoj7VrkhVmX3V00qW4u/zNdsV3Hf/BqJS6NxyUrCmoZ+mRDuoKrwCWpllwqtEEZ
0hrS3GSgiTAO5Tw6G0hri7It8NH6d/KMIK7u2zIRAyxbZrDIElrl/Ci3QPxYSQGCIKpYqkqeoueo6
gWQXmm6OUbdGKKC/PLvzg6JUVCk= root@gitops-arcdemo-785cc757dd-dp8gs
```

Save

Cancel

```
{"revision\":\"8854ab7242897587e01adb14d399a5ffefc0b087\",  
\"message\":\"Prepared azurearcdemo for deployment\"},  
{\"revision\":\"f3e2a01d3409b041fa39ea3801bcea60cae4d462\",  
\"message\":\"Prepared azurearcdemo for deployment\"},  
{\"revision\":\"554481bc16f2f07fd8c40634cedbcb878eddd4c3\",  
\"message\":\"Prepared azurearcdemo for deployment\"},  
{\"revision\":\"af72d9b9b877d38d688fad46856adb040f74cd44\",  
\"message\":\"Prepared azurearcdemo for deployment\"},  
{\"revision\":\"f51f52246c99db9583367154962f86c311c37715\",  
\"message\":\"Prepared azurearcdemo for deployment\"},  
{\"revision\":\"8f9fb1fdb08007c2634a5c7c3a631ef569c1ab50\",  
\"message\":\"Prepared azurearcdemo for deployment\"},  
{\"revision\":\"9e2949ba020ead8278a688bb3f0624cf53cf5d8\",  
\"message\":\"Prepared azurearcdemo for deployment\"},  
{\"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\\\":\\\"demo:helmrelease/azurearcdemo\\\",  
\"Path\\\":\\\"AzureArcDemo/AzureArcDemo.yaml\\\",  
\"Error\\\":\\\"running kubectl: exit status 1, stderr: Error from  
server (NotFound): error when creating \\\\\\"STDIN\\\\\\\":  
namespaces \\\\\\"demo\\\\\\\" not found\\\"}],\"initialSync\":true}}}  
],
```

```
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
```

Swagger UI

Not secure | 51.105.204.160/swagger/index.html

Hello

GET /Hello

Parameters

No parameters

Execute

Responses

Curl

```
curl -X 'GET' \
'http://51.105.204.160/Hello' \
-H 'accept: text/plain'
```

Request URL

```
http://51.105.204.160/Hello
```

Server response

Code	Details
200	<p>Response body</p> <p>Hello BASTA! Fall in Mainz!</p>

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 k3s cluster
- Tag can be set manually when starting the pipeline



Azure DevOps

programmingwithwolfgang

/ AzureArcDemo

/ Pipelines

A AzureArcDemo +

Overview

Boards

Repos

Pipelines

Pipelines

Environments

Releases

Pipelines

[Recent](#) All Runs

Recently run pipelines

Pipeline

Last run



AzureArcDemo-CD

#20221110.4 • Prepared azurearcdemo for deployment

Manually triggered for master



AzureArcDemo-CI

#0.1.37 • Updated HelloController.cs

Individual CI for master

A AzureArcDemo +

Overview

Boards

Repos

Files

Commits

Pushes

Branches

Tags

Pull requests

Pipelines

Prepared azurearcdemo for deployment

41b7ee75 📁 Pipeline committed 4m ago ↗ master

Files Details

Parent 1 → This commit

Filter

1 changed file

◆ AzureArcDemoGitOps

✓ AzureArcDemo/AzureArcDemo

values.yaml

values.yaml -1+1

/AzureArcDemo/AzureArcDemo/values.yaml

```
8   8      repository: wolfgangspeakingdemo.azurecr.io/azurearcdemo
9   9      pullPolicy: Always
10 10     # Overrides the image tag whose default is the chart appVersion.
11 11     - tag: 0.1.35
12 12     + tag: 0.1.37
13 13       imagePullSecrets:
14 14         - name: acr-secret
```

Swagger UI

Not secure | 51.105.204.160/swagger/index.html

Hello

GET /Hello

Parameters

No parameters

Execute

Responses

Curl

```
curl -X 'GET' \
'http://51.105.204.160/Hello' \
-H 'accept: text/plain'
```

Request URL

```
http://51.105.204.160/Hello
```

Server response

Code	Details
200	<p>Response body</p> <p>Hello ADD 2022!</p>

Azure Arc Pricing

- Azure control plane: free
- Azure Arc-enabled Kubernetes:
 - \$2 / vCPU / month, first 6 vCPUs free
- Azure Services, e.g. Azure Monitor: normal Azure pricing

Azure Arc Conclusion

- Proof of concept was successful
- Powerful service
- Major focus from Microsoft

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](#)
- [Demo Code and Pipelines](#)
- [Azure Arc Documentation](#)
- <https://docs.k3s.io>
- <https://fluxcd.io>

