Bring DevOps to the Swiss Alps with Azure Arc

Wolfgang Ofner

Wolfgang Ofner

Freelance Software Architect, Perth, Australia

Focus on Azure, Kubernetes, DevOps and .NET

https://programmingwithwolfgang.com

https://www.linkedin.com/in/wolfgangofner

https://twitter.com/wolfgang_ofner

Agenda

Project “Autonomous Ropeway System”

Challenges in the project

Azure Arc integration

Further Azure Arc features

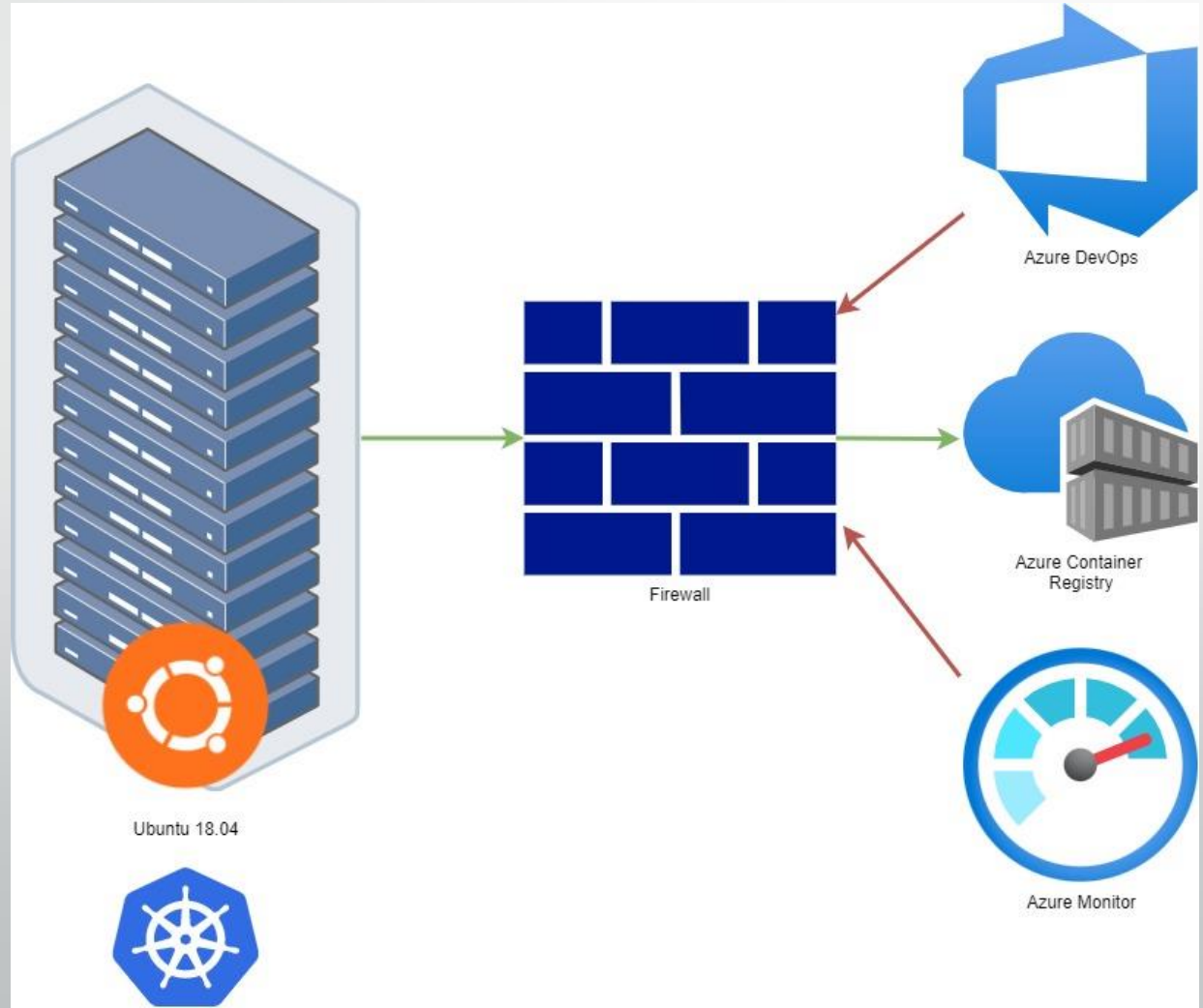
Project “Autonomous Ropeway System”

- 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

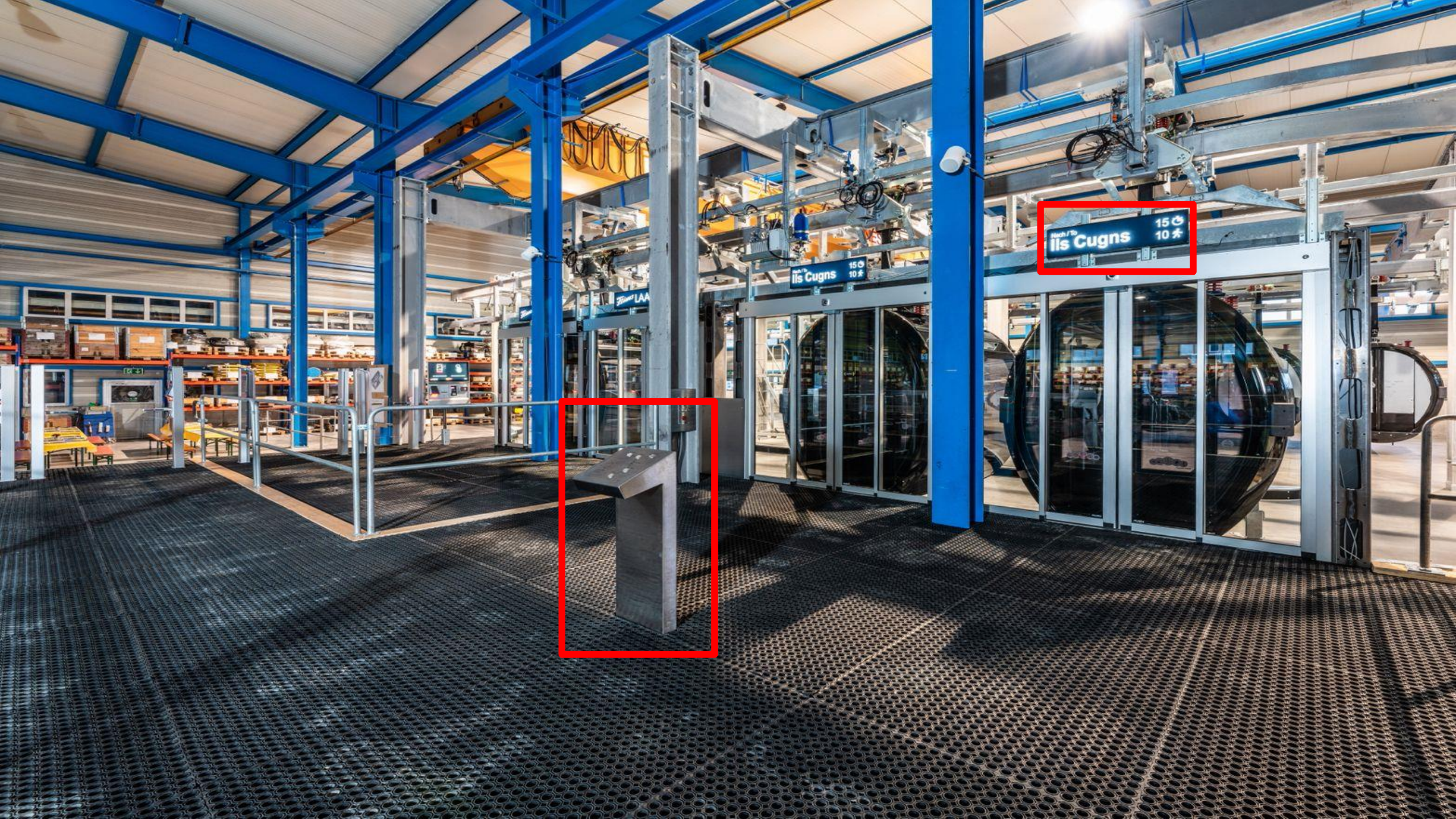
Challenges

- 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




9
13


Nach / To
Ils Cugns
15
10
Nach / To
Ils Cugns
15
10

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

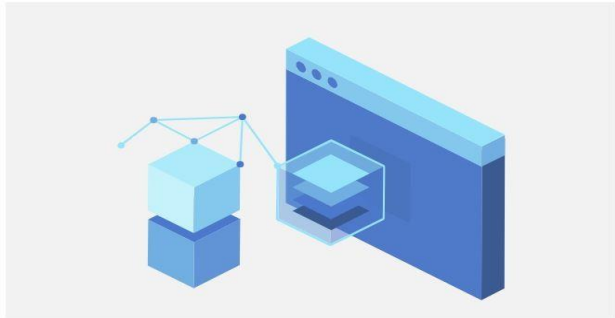
Azure Arc

Microsoft

Search

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

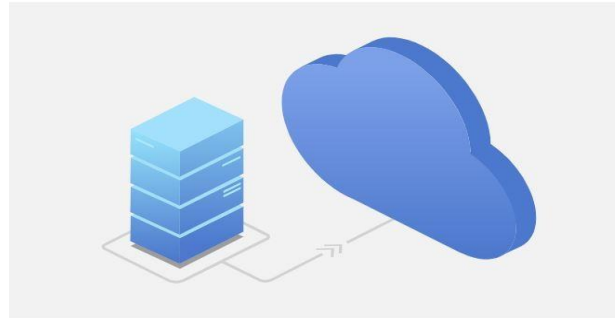
With Azure Arc, you can manage your infrastructure in all your environments, including on-premises, other public clouds, and edge devices. There's no charge to start, just add your infrastructure and enjoy the views. Learn more



Get hands-on with ArcBox (preview)

Use ArcBox to deploy an Azure Arc sandbox in less than an hour. Learn more

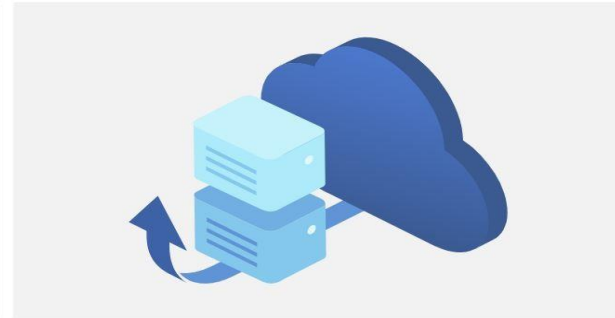
Try ArcBox



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

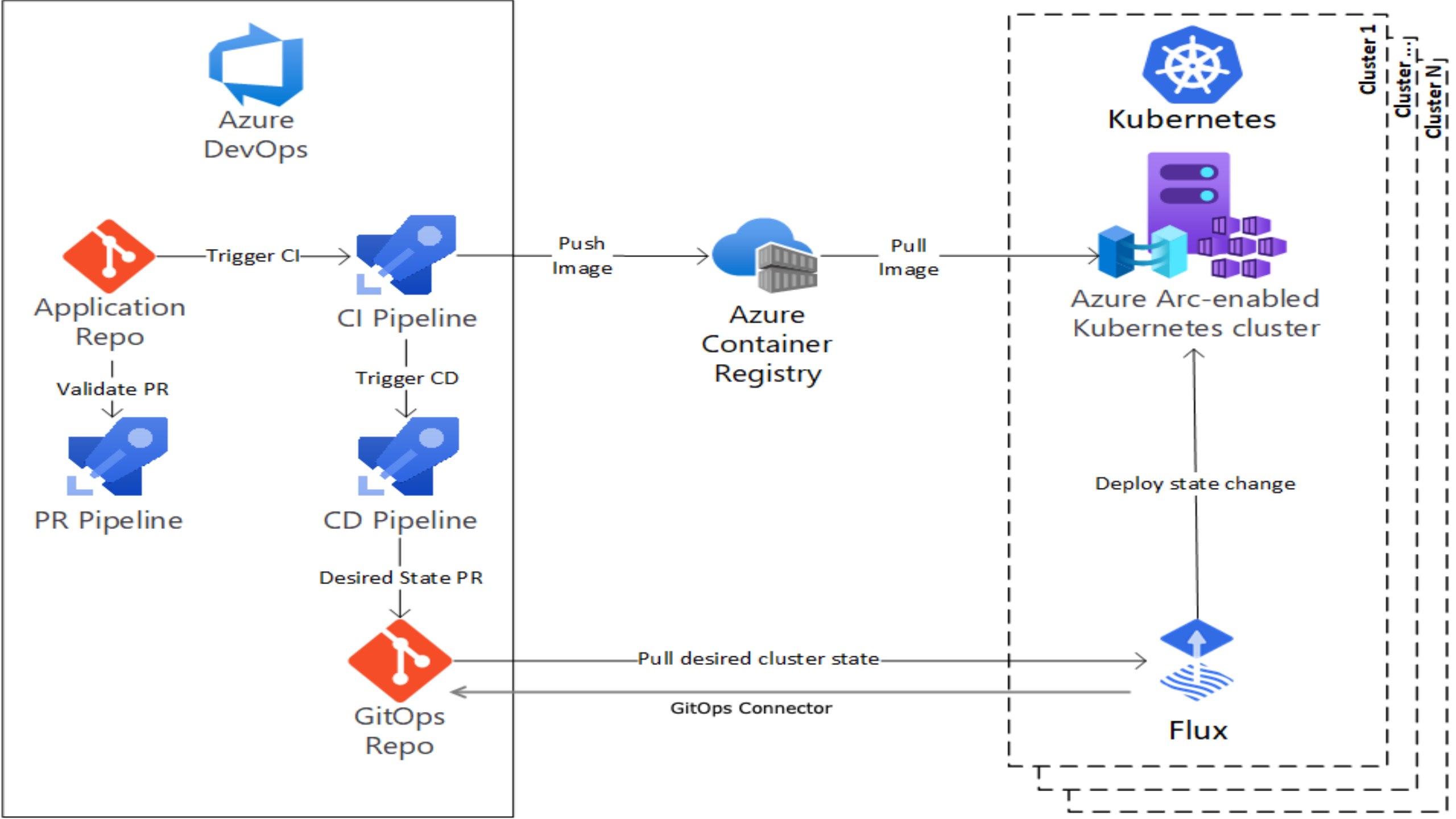
- Install Azure Arc extensions to manage the cluster
  - Azure Monitor
  - GitOps with Flux
  - Azure Policy
  - Azure Key Vault as Secret Store
- Securely access cluster without opening inbound ports

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


Azure DevOps
Application Repo
Trigger CI
CI Pipeline
Push Image
Azure Container Registry
Pull Image
Kubernetes
Cluster 1
Cluster ...
Cluster N
Azure Arc-enabled Kubernetes cluster
Validate PR
PR Pipeline
Trigger CD
CD Pipeline
Deploy state change
Desired State PR
GitOps Repo
Pull desired cluster state
GitOps Connector
Flux

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

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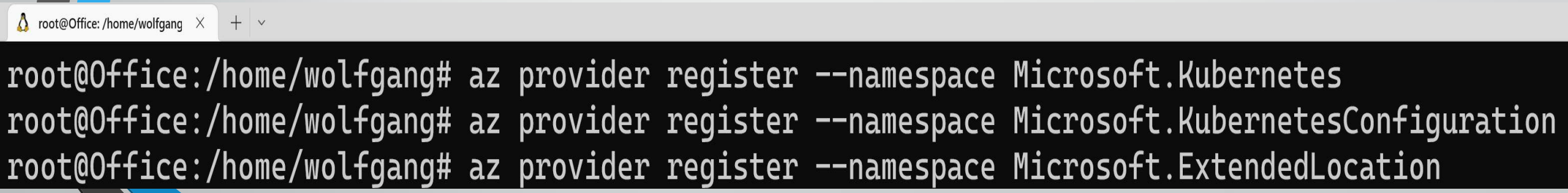
- Register Azure Provider



Azure Arc Installation Prerequisites

- Register Azure Provider

root@Office: /home/wolfgang

```
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

Azure Arc Installation

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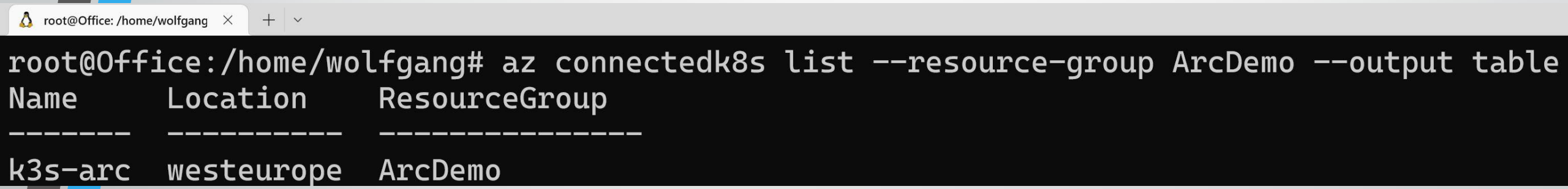

Azure Arc Installation

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

Azure Arc Applications

```
PS C:\Users\Wolfgang> kubectl get pods -n azure-arc
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-qqcbq             2/2     Running   0          44m
```

Azure Arc in the Azure Portal

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

Azure Arc

Microsoft

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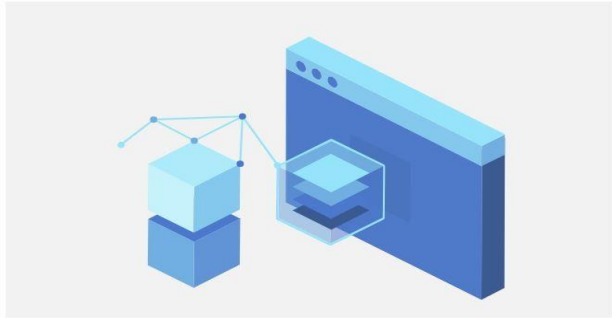

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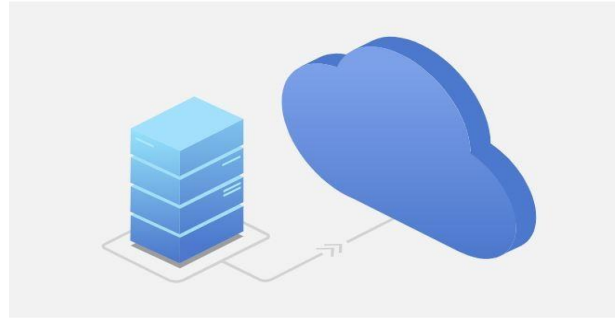

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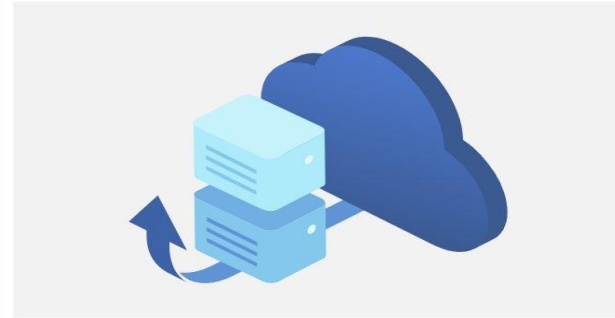


Deploy Azure services

Use Azure Arc to deploy Azure services on your infrastructure. Learn more

Deploy

Azure Arc | Kubernetes clusters

Microsoft

Search

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

Add a Kubernetes cluster with Azure Arc | Manage view | Refresh | Export to CSV | Open query

Filter for any field... | Subscription equals **all** | Resource group equals **all** | Add filter | Mo

No grouping | List view

Name	Type	Resource group	Kuberne...	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

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

Access Cluster using K8s RBAC

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

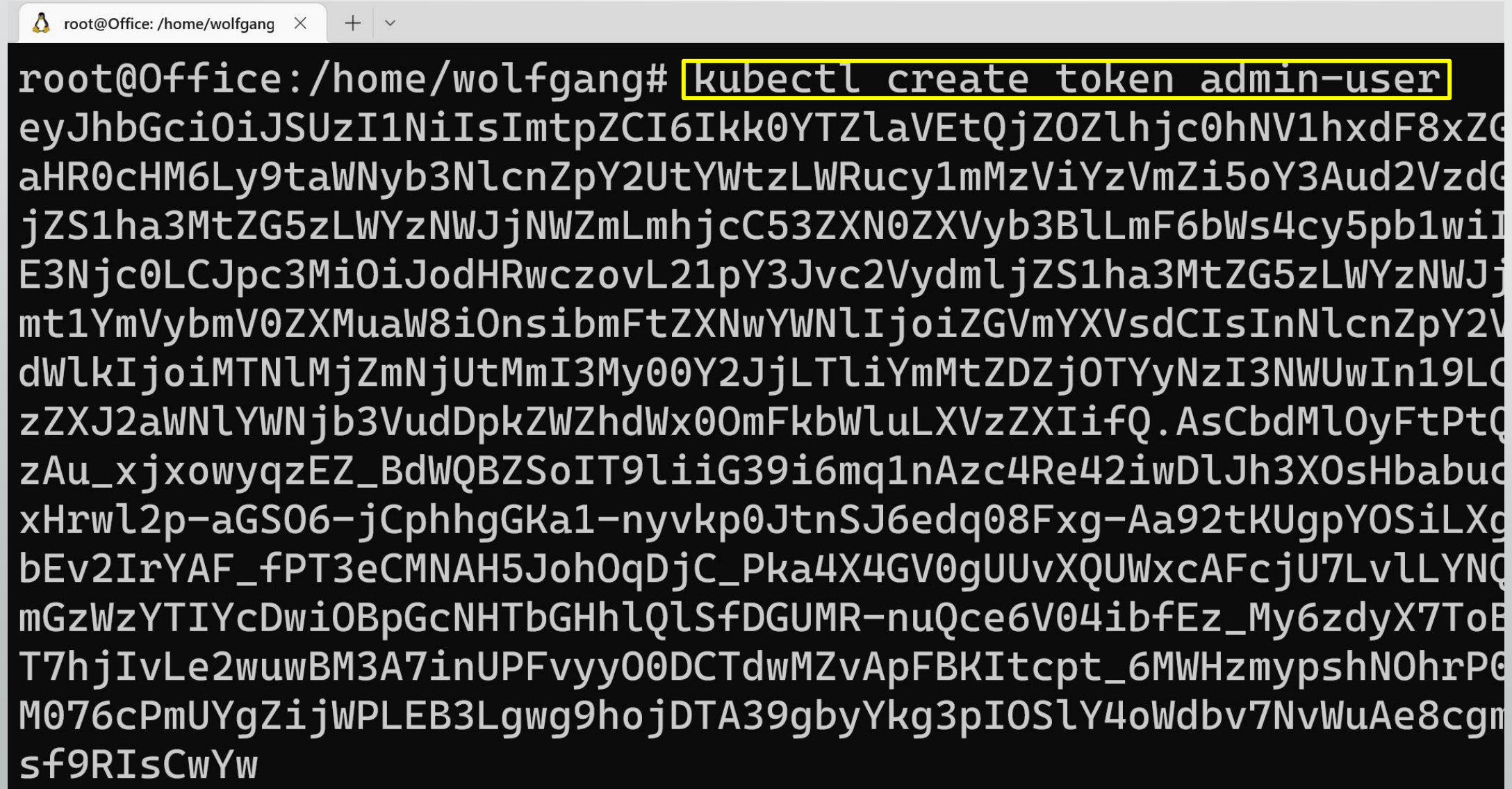
root@Office: /home/wolfgang

```
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



k3s-arc | Workloads

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
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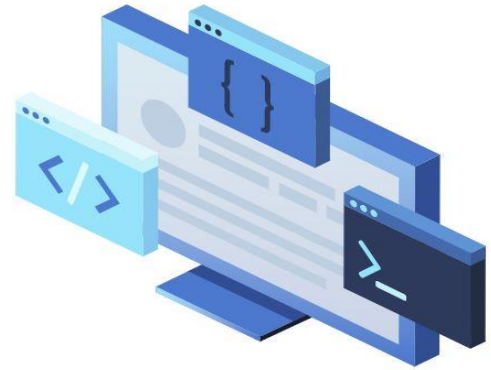

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Service account bearer token *

kiOdK7RA-w-xqoNuMDA2tWHMzB1KDt8W-
Z6D7M4k5yknroHRuMN7MLCr66on9pO6Xul19MIbZDo8KskUD4
GCWOriMTAnMbq5rfpr9Pv1g_tvHocHrmUwH-
m3K4Pes4M_DRQFCOYhURRULsdEeHsJz9KSv7MucEhWAV31L3S
cfxzNpmzvmGS0tana-
rTGWFIlr3mC2KamA2gELHcWyoayKJdfr4TG264Wx1Ce50pyO-
t0xuQU1hoBYB0RoiqXWsEZidFgWvoWVue5qpUKpy5DRImcDCG
YpqvKK7qTCE6m_I9SGnxxNF9mVRIEbuFumfTHmeVilf940TInJ5i6
BNq_yj1kpraaL3zpa9MuT6F9Ccg7IInq9JdZEIbafJBbo-
vvh56sifkq2YOygiSjDBDcumDBOpYIQI9ZG96pdQK5bEMrGCs2E
e9b9zlBb0rTXrxiL2piA9LpaVBMpsJjgkKWTfi1l5Pfyp92262alOwo
ZVJvreM5cU6hPedvSffHIfq-TK4JCSaq3ZEzo8

Sign in

DemoArc | Workloads

Kubernetes - Azure Arc

Search (Ctrl+/)

Overview
Activity log
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GitOps (preview)
Policies
Properties
Locks

Monitoring
Insights
Alerts
Metrics
Logs
Workbooks

Automation
Tasks (preview)

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

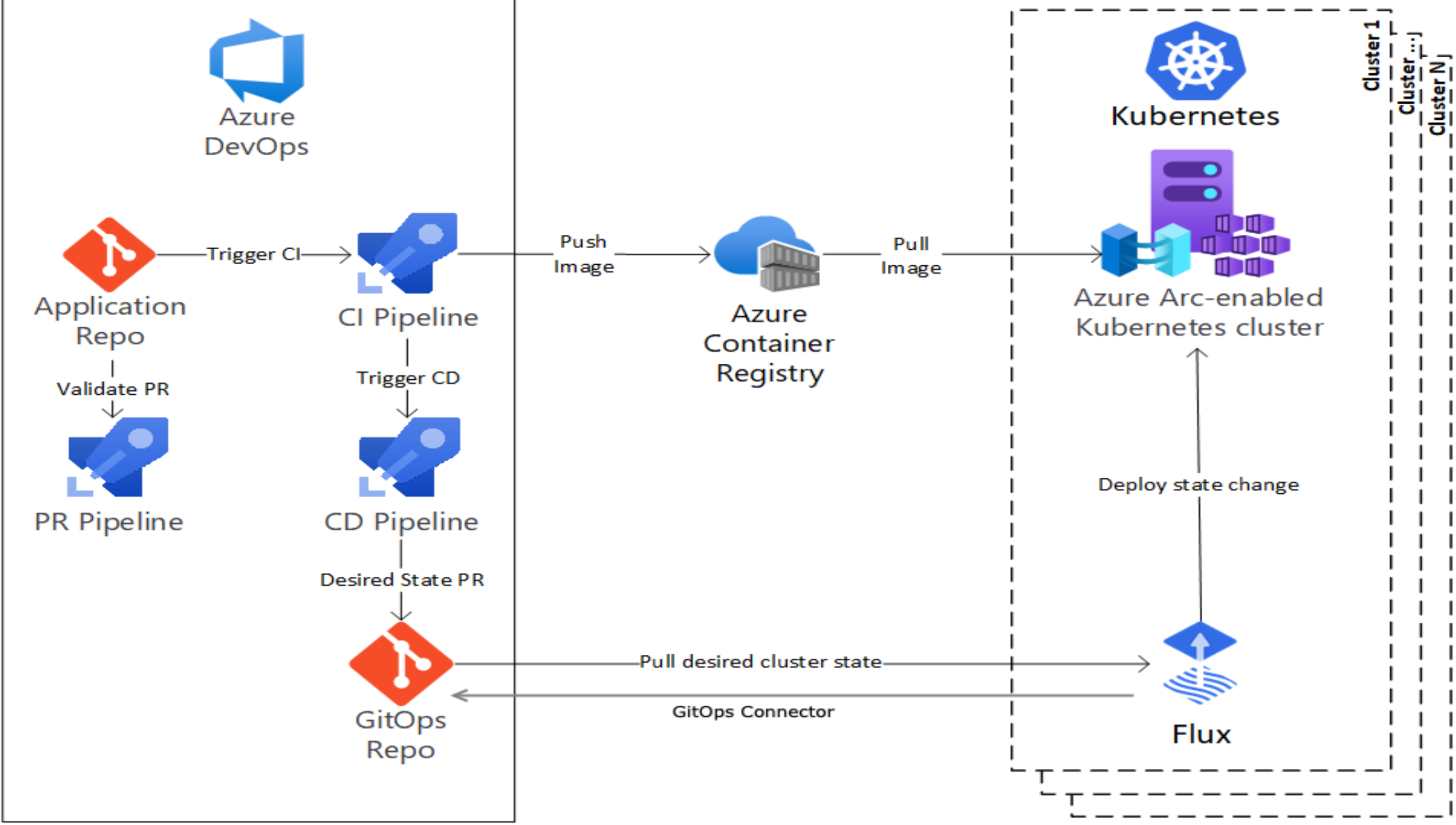
Name	Namespace	Ready	Up-to-date	Available	Age
coredns	kube-system	1/1	1	1	54 minutes
local-path-provisioner	kube-system	1/1	1	1	54 minutes
metrics-server	kube-system	1/1	1	1	54 minutes
traefik	kube-system	1/1	1	1	54 minutes
clusterconnect-agent	azure-arc	1/1	1	1	46 minutes
flux-logs-agent	azure-arc	1/1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


Azure DevOps
Application Repo
Trigger CI
CI Pipeline
Push Image
Azure Container Registry
Pull Image
Kubernetes
Cluster 1
Cluster ...
Cluster N
Azure Arc-enabled Kubernetes cluster
Validate PR
PR Pipeline
Trigger CD
CD Pipeline
Deploy state change
Desired State PR
GitOps Repo
Pull desired cluster state
GitOps Connector
Flux

Git Ops Extension Installation

- Single Azure CLI command to configure and install GitOps operator

Git Ops Extension Installation

root@Office: /home/wolfgang

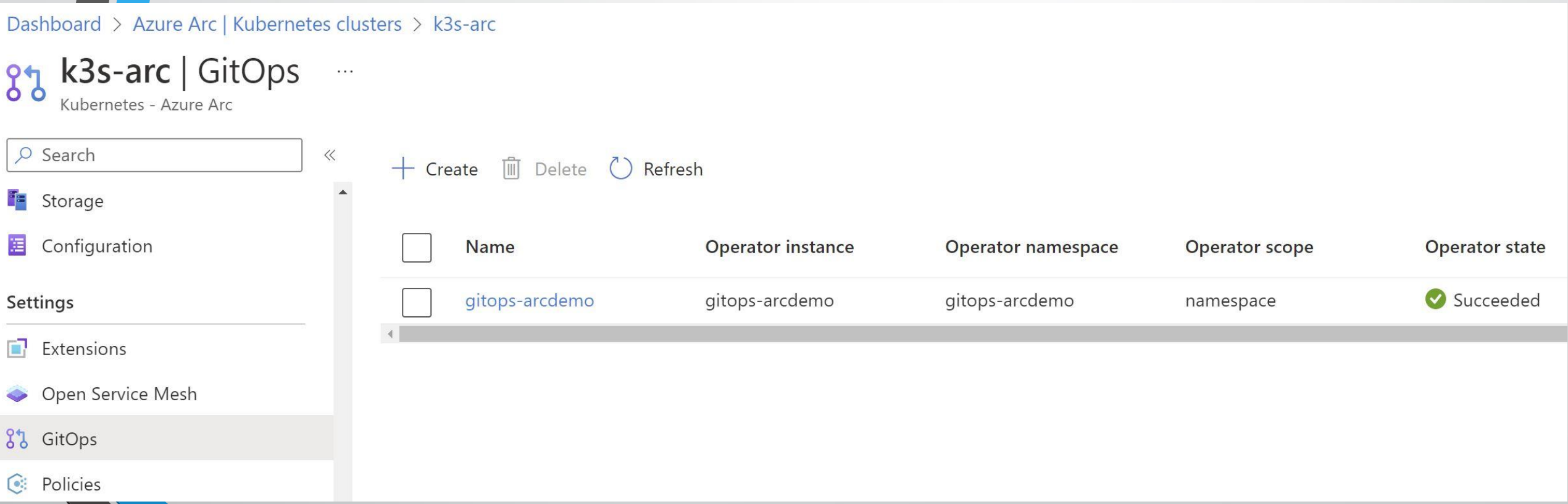
```
root@Office:/home/wolfgang# az k8s-configuration create \
>     --name gitops-arcdemo \
>     --cluster-name k3s-Arc \
>     --resource-group ArcDemo \
>     --operator-instance-name gitops-arcdemo \
>     --operator-namespace gitops-arcdemo \
>     --repository-url git@ssh.dev.azure.com:v3/programmingwithwolfgang/AzureArcDemo/AzureArcDemoGitOps \
>     --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

```
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' i
nstead.
{
  "complianceStatus": {
    "complianceState": "Installed",
    "lastConfigApplied": "2022-10-07T08:25:05.600000+00:00",
    "message": "{\"OperatorMessage\":\"ts=2022-10-07T08:25:02.843024562 caller=main.go:259 version=1.21.2\\nt
s=2022-10-07T08:25:02.843079062Z caller=main.go:284 warning=\\\"--git-readonly prevents use of --sync-state=g
it. Forcing to --sync-state=secret\\\"\\nts=2022-10-07T08:25:02.843106662Z caller=main.go:303 warning=\\\"con
figuring any of {git-user} has no effect when --git-readonly is set\\\"\\nts=2022-10-07T08:25:02.843147763Z c
aller=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_call
er=k8s.io/client-go@v0.17.11/tools/cache/reflector.go:153 err=\\\"pkg/mod/k8s.io/client-go@v0.17.11/tools/cac
he/reflector.go:105: Failed to list *v1beta1.CustomResourceDefinition: the server could not find the requeste
```

Git Ops Extension Installation



sters > k3s-arc

+ Create Delete Refresh

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

gitops-arcdemo

Kubernetes cluster configuration

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
AAAAB3NzaC1yc2EAAAADAQABAAABgQDQ
```

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
AAAAB3NzaC1yc2EAAAADAQABAAABgQDQbjuiGDjSUIjteUih2ZsvKHzY+7Uxa/AB1
+tVmyIXE/GK+Ibc3zlksA/7QsZ2iDA5BQmwV8LOJ9qWcaCRI7gjukPpFam5r5395/
wrlpu15QQFkt9BG11xWq/JQtPFb3QJ+MiKi4FS/
S5hTO1pMmgdpWomSYOJbnYnwAUH+wsoIMb16I4yarv8F5XAXZlzpt3GI
+xaFGSYT3hy24zxCQgcQdRHT0uSqFMAnrsie2c4tAhfuE2PJEpIWjwxkJxutO6QL7
y2jSS7Kd8eZ/RqJKs/xtMkZNr/tluceIngSwphIci5O8IhQ
+nz0SyxhATZ8oDn9mlrCZJtTJegHeCoATDYB/qvdsz/i2A/
1xL9QpE0MEa7kRvRaNX2vESlqQJhWDBIqjRQij4Ldg5t+g02/
hinwmEUalWSsm3bj7zwUXkHbzlPeAzwa8Vw8TZTV8/pYariCjW0Sc54B1qQlt1xZz
+j1GHQCU2wDD0h7QtagXjBqxB4VTg9UDsH1QIFAEfevOU=
root@gitops-arcdemo-9bb7b79c5-vmwlt\"
```

Azure DevOps

Search

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+hEhy1ilN33QOb93QkTfH1pE2vR3WjMwaObanysn
eqm9EtpQkcz4YjpZHoFg4eJaN2A/JvhT91R8yKJG9k/LxM220TAPvSiGh/+KZdq10IL6eM1LyeZ
9nFS0ZgSYUu9Tgpc21IT6etfr6WuKZjnfpq5L4lNkkFDHVMGxggZT0wcqWIEr+YMNamTFLg/
MlU752oUKoj7VrkhVmX3V00qW4u/zNdsV3Hf/BqJS6NxyUrCmoZ+mRDuoKrwCWpIlqwtEEZ
0hrS3GSgiTAO5Tw6G0hri7It8NH6d/KMlK7u2zlRAyxbZrDlELrl/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\"},
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{\"revision\":\"8f9fb1fdb08007c2634a5c7c3a631ef569c1ab50\",
\"message\":\"Prepared azurearcdemo for deployment\"},
{\"revision\":\"9e2949baf020ead8278a688bb3f0624cf53cf5d8\",
\"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}}"
    ],
```
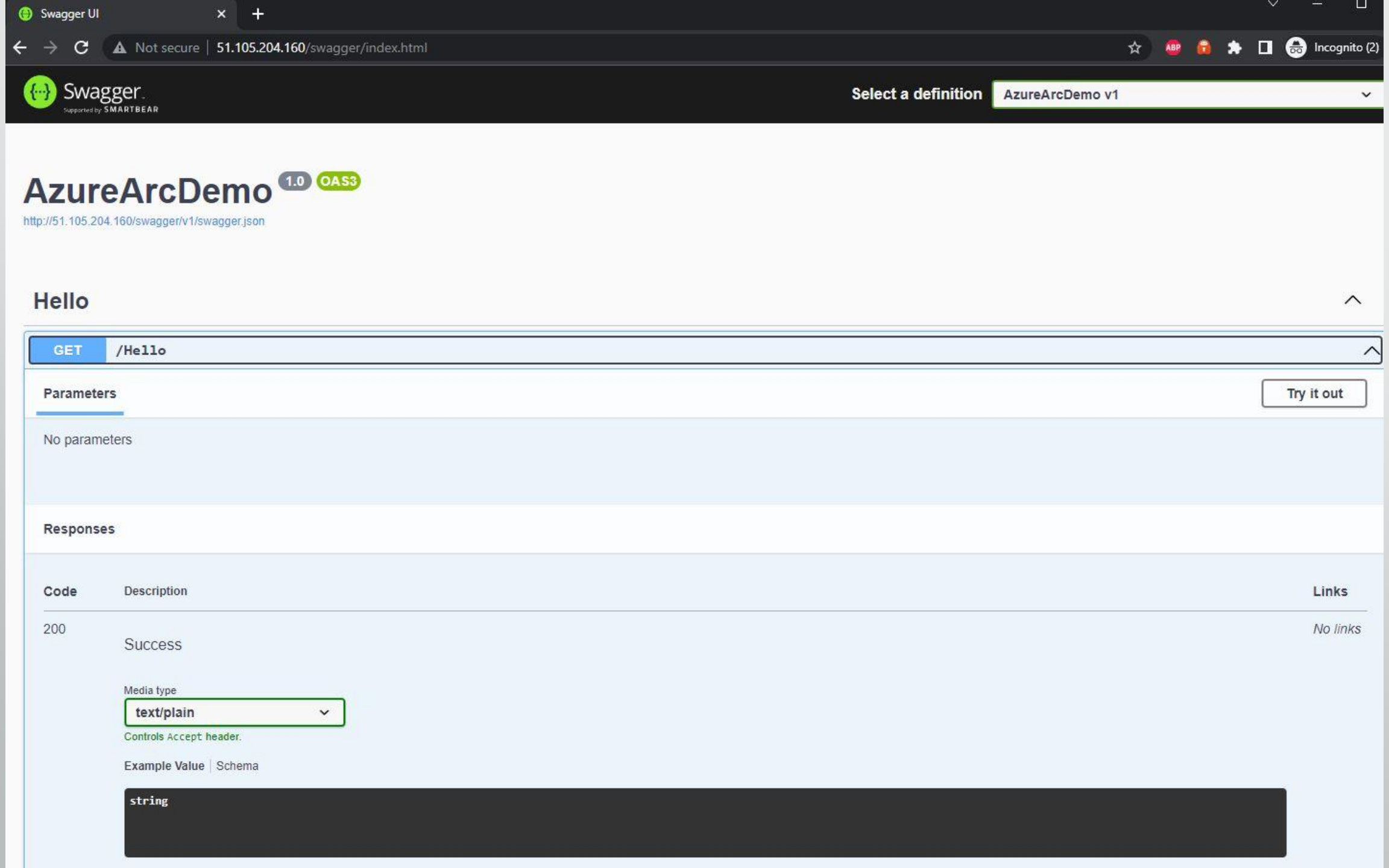

root@Wolfgang-PC: /home/w

```
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
Incognito (2)
Swagger
Supported by SMARTBEAR
Select a definition
AzureArcDemo v1
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

```yaml
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

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

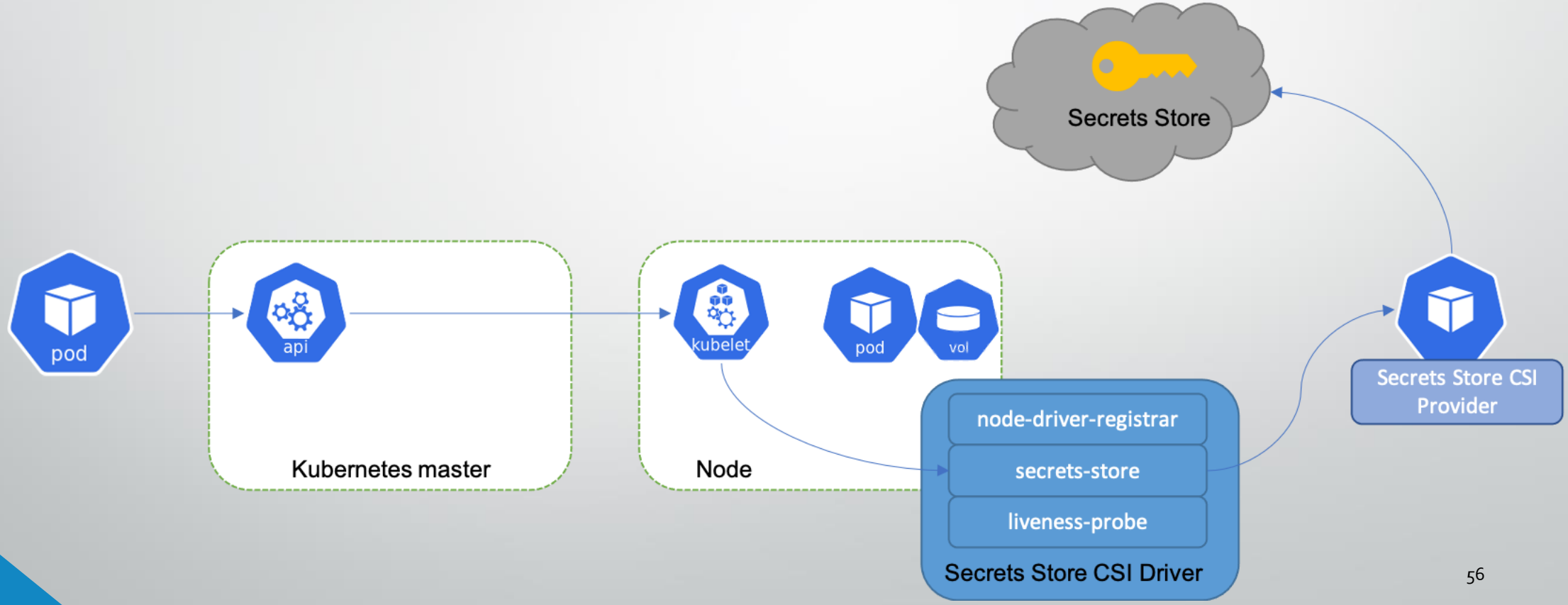
Deployment Demo

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
- 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

Time range = **Last 30 minutes** Add Filter

What's new | Cluster | Reports | Nodes | Controllers | Containers

Node CPU Utilization %

1m granularity

Percentage of Total capacity

Avg | Min | 50th | 90th | 95th | Max

Average DemoArc **16.15** %

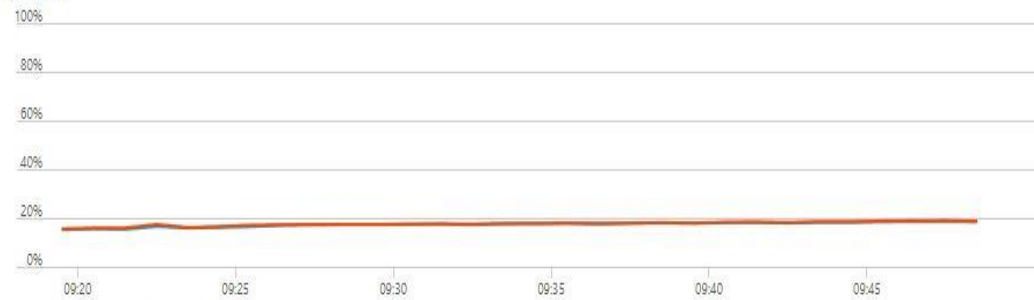
Maximum DemoArc **89.47** %

Node Memory Utilization %

1m granularity

Percentage of Total capacity (memory rss)

Avg | Min | 50th | 90th | 95th | Max



Average DemoArc **18.04** %

Maximum DemoArc **19.56** %

Node Count

1m granularity

Total | Ready | Not Ready

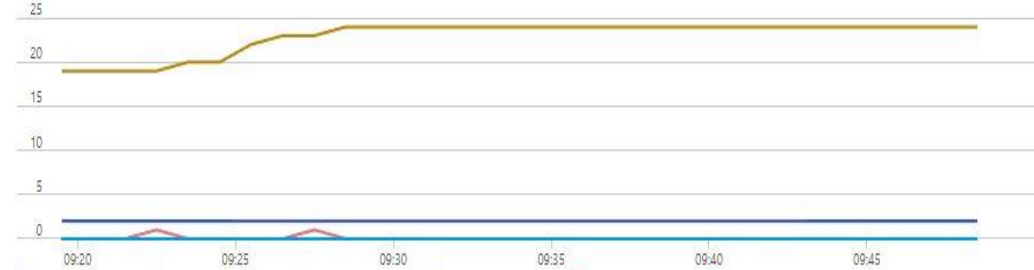
Ready DemoArc **2**

Not Ready DemoArc **0**

Active Pod Count

1m granularity

Total | Pending | Running | Unknown | Succeeded | Failed | Terminating



Pending DemoArc **66.67** m

Running DemoArc **22.93**

Unknown DemoArc **0**

Succeeded DemoArc **2**

Failed DemoArc **0**

Terminating DemoArc **0**

Dashboard > DemoArc

DemoArc | Insights

Kubernetes - Azure Arc

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

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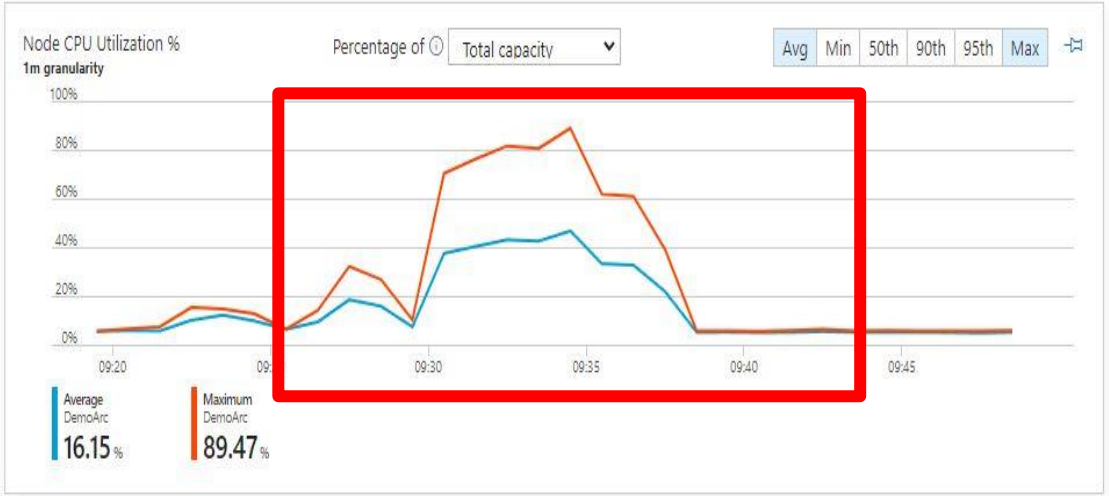

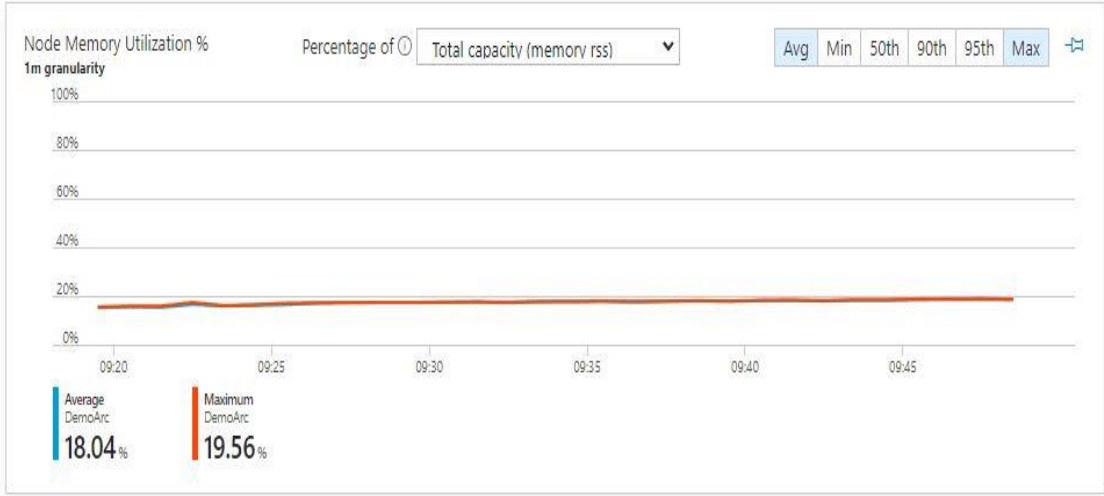

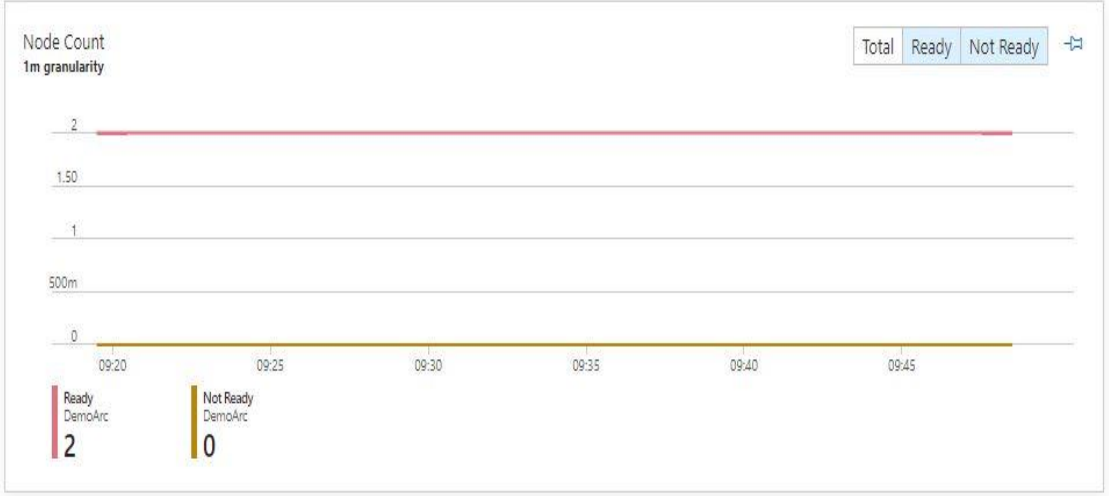

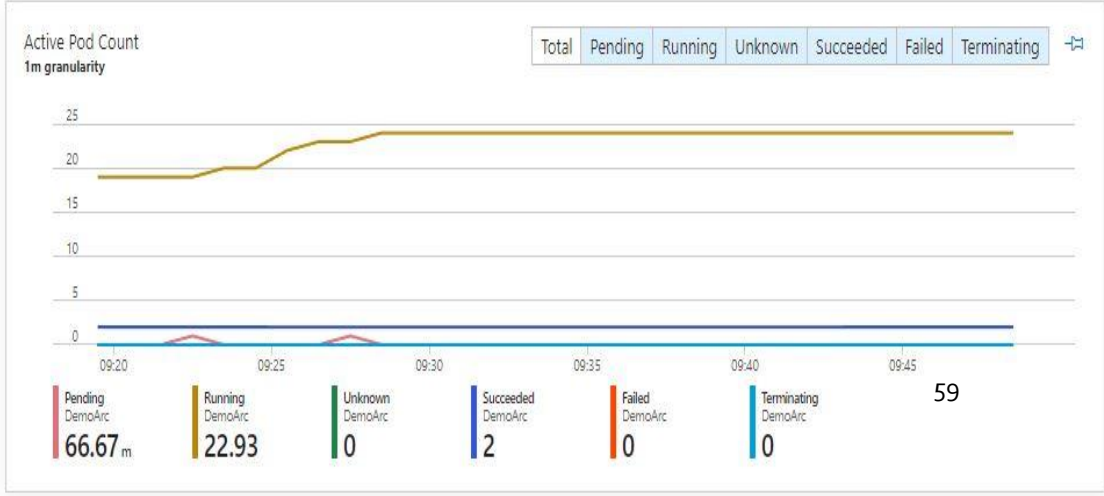

DemoArc | Insights

Kubernetes - Azure Arc

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Settings

- Extensions
- GitOps (preview)
- Policies
- Properties
- Locks

Monitoring

- Insights
- Alerts

Time range = **Last 30 minutes** Add Filter

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-qqcbq	worker1	0	54 mins	
omsagent	Ok	7%	10 mc	omsagent-727fd	worker1	0	31 mins	
omsagent	Ok	4%	6 mc	omsagent-4pftj	master	0	32 mins	
fluent-bit	Ok	4%	0.8 mc	config-agent-69dcdb554d-7swhm	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-sfznl	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

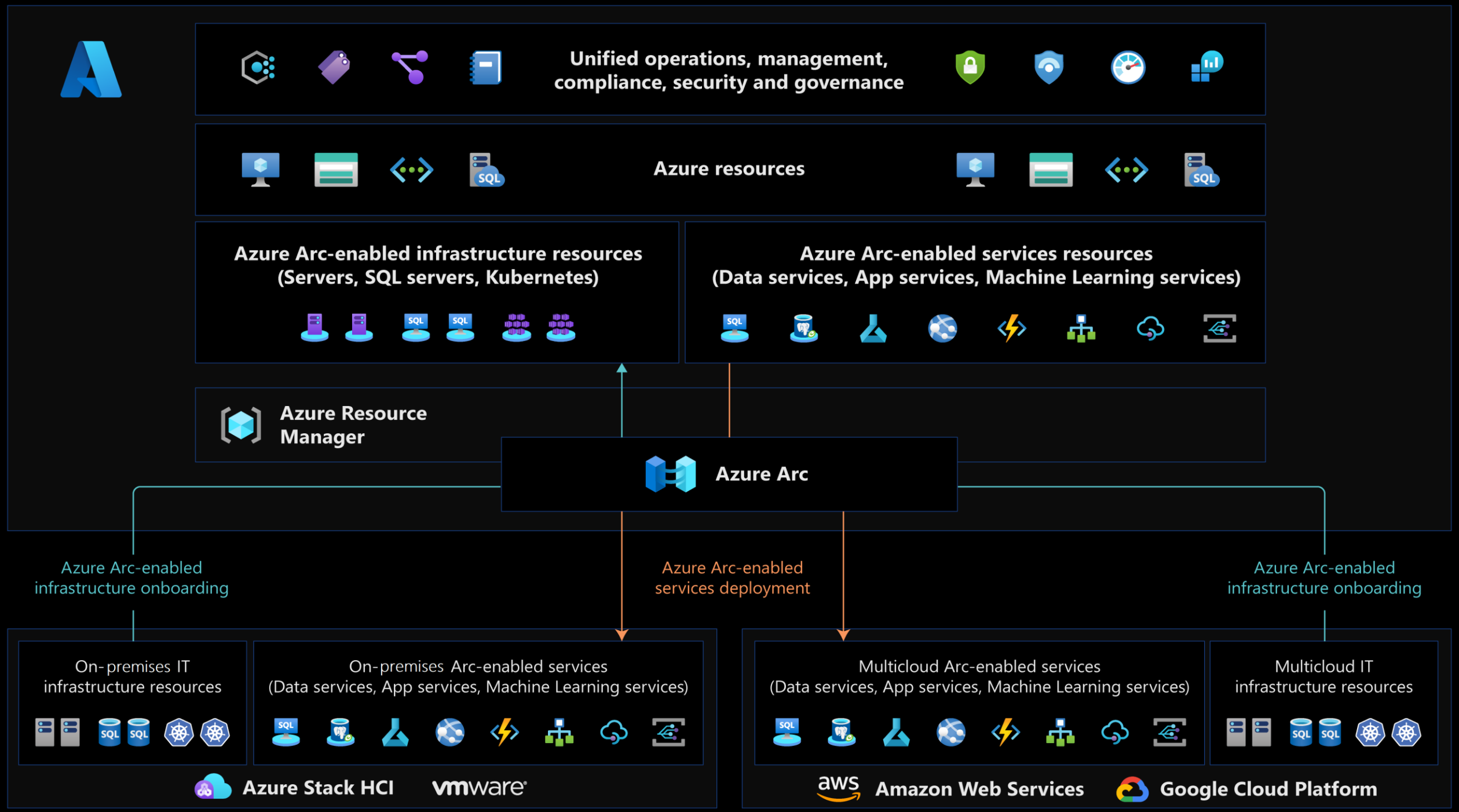
- Azure Arc-enabled services
  - Azure App Service
  - Azure Logic Apps
  - Azure Event Grid
  - Azure Functions
  - Azure API Management

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
aws
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 - Elastic

Not secure | https://20.82.32.124:5601/app/discover#/?_a=(columns:!(_source),filters:!(),index:mssql-log-index,interval:auto,query:(language:kuery,query:'custom_resource_name:arc-database'),sort:!())&_g=(filters:!(),refreshInterval:(pause:!t,...

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

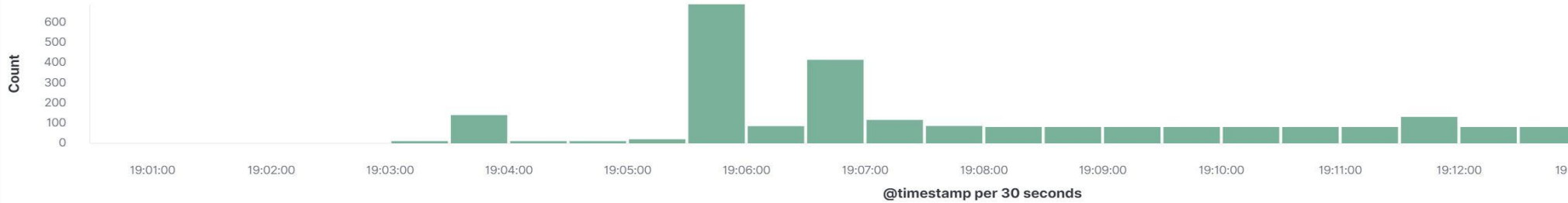
_source

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



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 receieved. orchestrator service_name: ha-supervisor file_path: /var/log/arc-ha-orchestrator/ha-supervisor-stdout.log kubernetes_namespace: wolfgang-attic kubern 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-data kubernetes_container_name: arc-ha-orchestrator service_name: ha-supervisor file_path: /var/log/arc-ha-orchestrator/ha-supervisor-stdout.log kubernete kubernetes_node_name: aks-agentpool-77043942-vmss000003 kubernetes_pod_name: arc-database-ha-0 _id: yZoosoMB_YIqz-hETCea _type: _doc _index: logstas
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 kubernete kubernetes_node_name: aks-agentpool-77043942-vmss000003 kubernetes_pod_name: arc-database-ha-0 _id: ypoosoMB_YIqz-hETCea _type: _doc _index: logstas
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 kubernete kubernetes_node_name: aks-agentpool-77043942-vmss000003 kubernetes_pod_name: arc-database-ha-0 _id: y5oosoMB_YIqz-hETCea _type: _doc _index: logstas
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 sta kubernetes_container_name: arc-ha-orchestrator service_name: ha-supervisor file_path: /var/log/arc-ha-orchestrator/ha-supervisor-stdout.log kubernete kubernetes_node_name: aks-agentpool-77043942-vmss000003 kubernetes_pod_name: arc-database-ha-0 _id: zJoosoMB_YIqz-hETCea _type: _doc _index: logstas

SQL Managed Instance Metrics -

Not secure | https://20.82.32.39:3000/d/40q72HnGk/sql-managed-instance-metrics?orgId=1&var-hostname=arc-database-0&refresh=5s

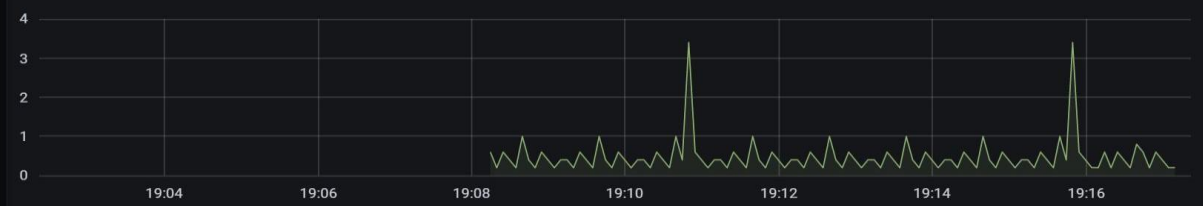
Incognito

General / SQL Managed Instance Metrics

Last 15 minutes | 5s

Host: arc-database-0

Transactions/sec



	max	avg	current
Transactions/sec	3.40	0.476	0.200

Batch Requests/sec

	max	avg	current
Batch Requests/sec	1.80	1.43	1.20

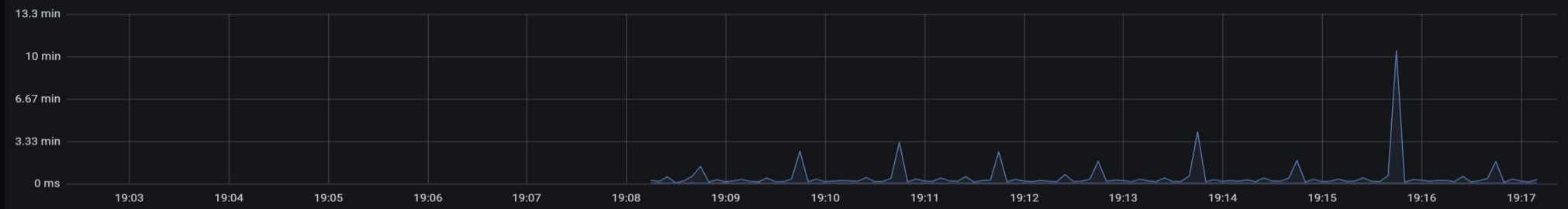
Percent CPU Usage

	max	avg	current
% CPU	30.0	2.08	1.50

Percent Memory Usage

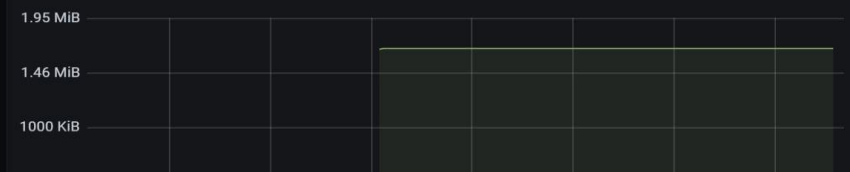
	max	avg	current
% Memory	4.38	4.09	4.38

Wait Statistics (Wait time ms)



	avg	current
SOS_WORK_DISPATCHER	31 s	19 s
HADR_WORK_QUEUE	1 s	2 s
MEMORY_ALLOCATION_EXT	0 ms	0 ms
HADR_TIMER_TASK	148 ms	0 ms

Memory Broker Clerks



	max	avg	current
Buffer Pool	2 MiB	2 MiB	2 MiB
Columnstore	4 KiB	4 KiB	4 KiB

Wait Statistics (Waiting task count)

	avg	current
MEMORY_ALLOCATION_EXT	18	12
SOS_WORK_DISPATCHER	6	6
HADR_WORK_QUEUE	0	0
HADR_TIMER_TASK	0	0

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 --u
se-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

Dashboard > App Services >

Create Web App ...

Basics Docker Networking Mo

App Service Web Apps lets you quickly build
any platform. Meet rigorous performance, s
platform to perform infrastructure maintena

Project Details

Select a subscription to manage deployed r
all your resources.

Subscription * ⓘ

Resource Group * ⓘ

Instance Details

Need a database? Try the new Web + Datab

Name *

Publish *

Operating System *

Region * wolfgang-basement

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

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

Review + create < Previous Next : Docker >

Dashboard > App Services >

Create Web App ...

Create new

Instance Details

Need a database? Try the new Web + Database experience.

Name * basta-azure-arc-demo

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

Publish * Code Docker Container Static Web App

Operating System * Linux Windows

Region * wolfgang-basement

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 < Previous Next : Docker >

basta-azure-arc-demo

App Service

Search

- 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

Browse | Stop | Swap | Restart | Delete | Refresh | Get publish profile | ...

Essentials

JSON View

Resource group (move)
ArcDemo

Status
Running

Location
West Europe

Subscription (move)
Visual Studio Enterprise Subscription

Subscription ID
[redacted]

Tags (edit)
Click here to add tags

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

Custom location
wolfgang-basement

App Service Plan
ASP-ArcDemo-ade2 (K1)

Microsoft Azure App Service - W

basta-azure-arc-demo.appservice-envir-7bkpp2s.westeurope.k4apps.io

Microsoft Azure

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