Provision IaC and Deploy Web Application to AKS

The document describes a web application deployment to Azure Kubernetes (AKS) on Azure.

Tools and applications:

- Azure Cloud
- Azure DevOps
- ASP .NET Core Web Application
- Visual Studio Code
- Azure CLI
- Kubectl
- Terraform

Provision IaC using Terraform

The terraform will provision the services below:

- Azure Continuer Registry (ACR)
- Azure Kubernetes Cluster (AKS)
- Azure SQL Server
- Empty database

Create Service Principal with Contributor role in Azure AD:

```
az ad sp create-for-rbac --role="Contributor" --scopes="subscriptions/133bc1d5-767e-4628-a9d1-0914ff59665c" --
"name="TerraformServicePrincipal”
```

Create backend storage in Azure for terraform.state:

TerraformStorage.ps1.txt

The powershell script creates the storage and provides **access key** like this:
==xaoKqIfd8j8y2txJCfat95rRMMKG15vKkZsX5PTuoKUn801d7mXo/qpkgPRPpPBlSLAPpHxAUTwcRFJK9NbmFg

Set the access key in the environment variable:

```
setx ARM_ACCESS_KEY
==xaoKqIfd8j8y2txJCfat95rRMMKG15vKkZsX5PTuoKUn801d7mXo/qpkgPRPpPBlSLAPpHxAUTwcRFJK9NbmFg
```

Create basic main.tf for ACR, AKS and SQL Server with empty Database:

main.tf.txt

terraform init

terraform plan

terraform apply

Check the AKS is up and running:

```
az aks get-credentials --resource-group rgyaronz --name aksyaronz --overwrite-existing

kubectl get nodes
```

Deploy the Web Application to AKS

Clone the web application source code from:

https://github.com/yaronzlot/EmployeeManagement

git clone https://github.com/yaronzlot/EmployeeManagement.git

Update the Azure SQL Server connection string in the web app code and update the empty database in Azure (using EF migration):

dotnet ef database update

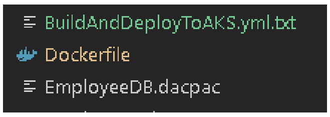
dotnet build

dotnet run

http://localhost:5000 – verify the web application works against the update database in Azure SQL Server

Create Dockerfile:

Dockerfile.txt

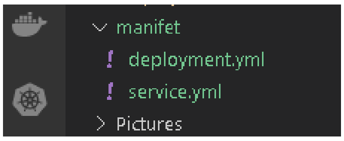


BuildAndDeployToAKS.yml.txt
Dockerfile
EmployeeDB.dacpac

Create deployment.yml and service.yml in manifest folder:

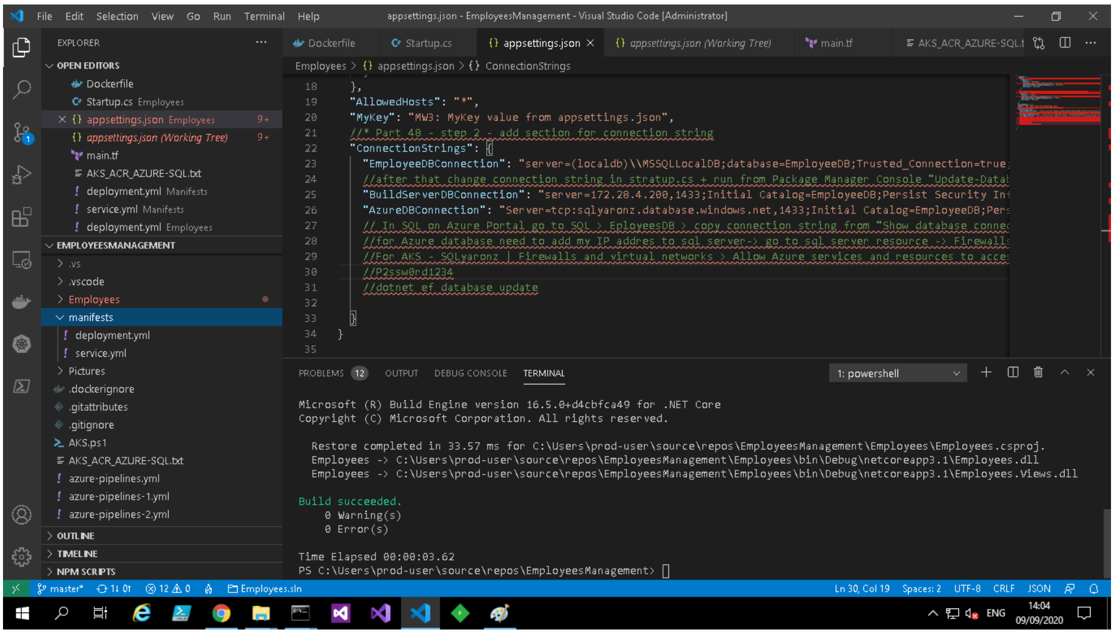
deployment.yml.txt

service.yml.txt



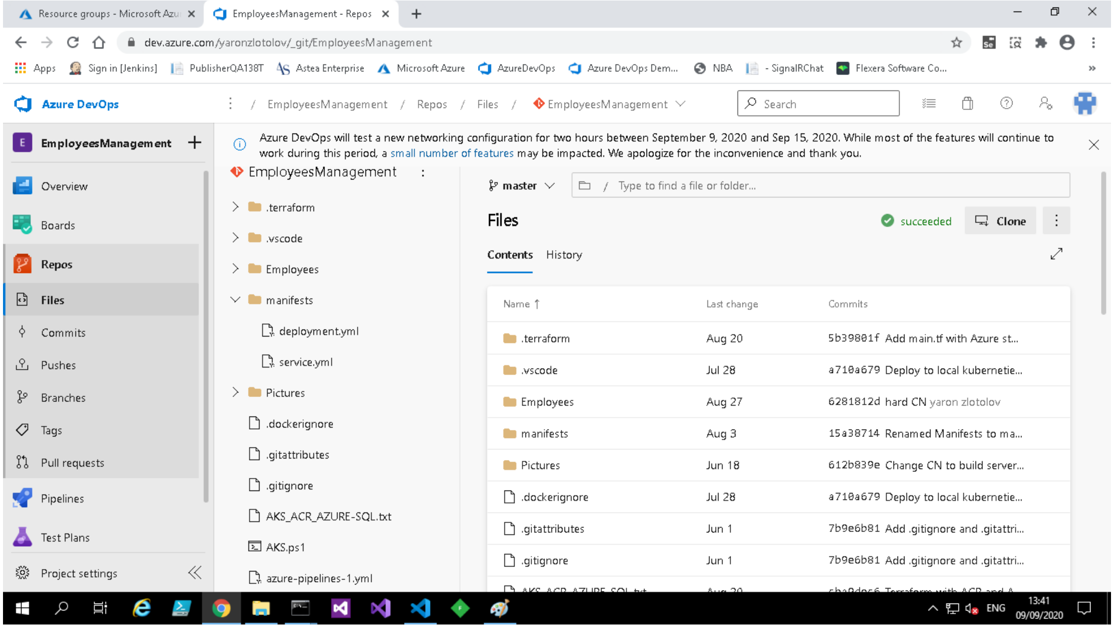
manifet
deployment.yml
service.yml
Pictures

Create project in Azure DevOps and push the code into the Azure GIT repo:



```
  },
  "AllowedHosts": "*",
  "MyKey": "MW3: MyKey value from appsettings.json",
  //* Part 48 - step 2 - add section for connection string
  "ConnectionStrings": {
    "EmployeeDBConnection": "server=(localdb)\\MSSQLLocalDB;database=EmployeeDB;Trusted_Connection=true
    //after that change connection string in stratup.cs + run from Package Manager Console "Update-Datab
    "BuildServerDBConnection": "server=172.28.4.200,1433;Initial Catalog=EmployeeDB;Persist Security Inf
    "AzureDBConnection": "Server=tcp:sqlyaronz.database.windows.net,1433;Initial Catalog=EmployeeDB;Pers
    // In SQL on Azure Portal go to SQL > EployeesDB > copy connection string from "Show database connec
    //for Azure database need to add my IP addres to sql server-> go to sql server resource -> Firewalls
    //For AKS - SQLyaronz | Firewalls and virtual networks > Allow Azure services and resources to acces
    //P2ssw0rd1234
    //dotnet ef database update

  }
}
```

```
Microsoft (R) Build Engine version 16.5.0+d4cbfca49 for .NET Core
Copyright (C) Microsoft Corporation. All rights reserved.

  Restore completed in 33.57 ms for C:\Users\prod-user\source\repos\EmployeesManagement\Employees\Employees.csproj.
  Employees -> C:\Users\prod-user\source\repos\EmployeesManagement\Employees\bin\Debug\netcoreapp3.1\Employees.dll
  Employees -> C:\Users\prod-user\source\repos\EmployeesManagement\Employees\bin\Debug\netcoreapp3.1\Employees.Views.dll

Build succeeded.
    0 Warning(s)
    0 Error(s)

Time Elapsed 00:00:03.62
PS C:\Users\prod-user\source\repos\EmployeesManagement>
```



Azure DevOps will test a new networking configuration for two hours between September 9, 2020 and Sep 15, 2020. While most of the features will continue to work during this period, a small number of features may be impacted. We apologize for the inconvenience and thank you.

Name ↑	Last change	Commits
.terraform	Aug 20	5b39801f Add main.tf with Azure st...
.vscode	Jul 28	a710a679 Deploy to local kubernetie...
Employees	Aug 27	6281812d hard CN yaron zlotolov
manifests	Aug 3	15a38714 Renamed Manifests to ma...
Pictures	Jun 18	612b839e Change CN to build server...
.dockerignore	Jul 28	a710a679 Deploy to local kubernetie...
.gitattributes	Jun 1	7b9e6b81 Add .gitignore and .gitattri...
.gitignore	Jun 1	7b9e6b81 Add .gitignore and .gitattri...
AKS_ACR_AZURE-SQL.txt	Aug 20	cba9dec6 Terraform with ACR and A...

Create the pipeline (below is the pipeline yml):

EmployeesManagement.yml

NOTE: Before this step it is required to remove locks and IP restrictions from AKS done by Terraform:

az lock list

az lock delete –ids $lockid

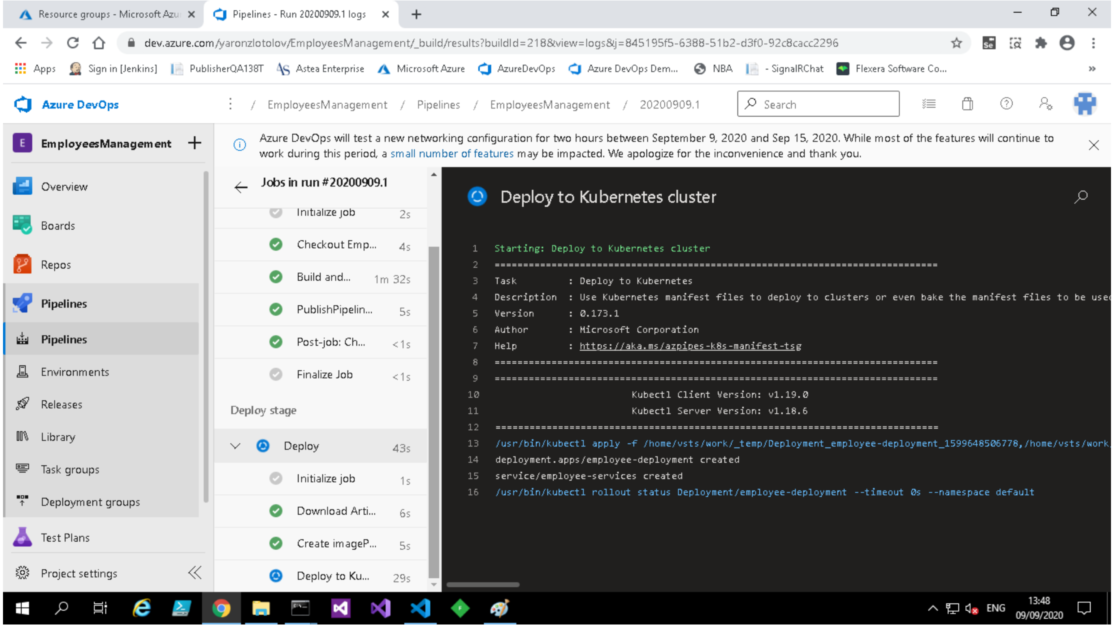
az aks update --resource-group rgyaronz --name aksyaronz --api-server-authorized-ip-ranges=

Build:

- Checkout the code from GIT repo
- Build the web application
- Create docker image
- Push the docker image to ACR
- Publish artifact for deployment

Deploy:

- Download the artifact
- Pull the image from ACR
- Deploy the docker image to AKS



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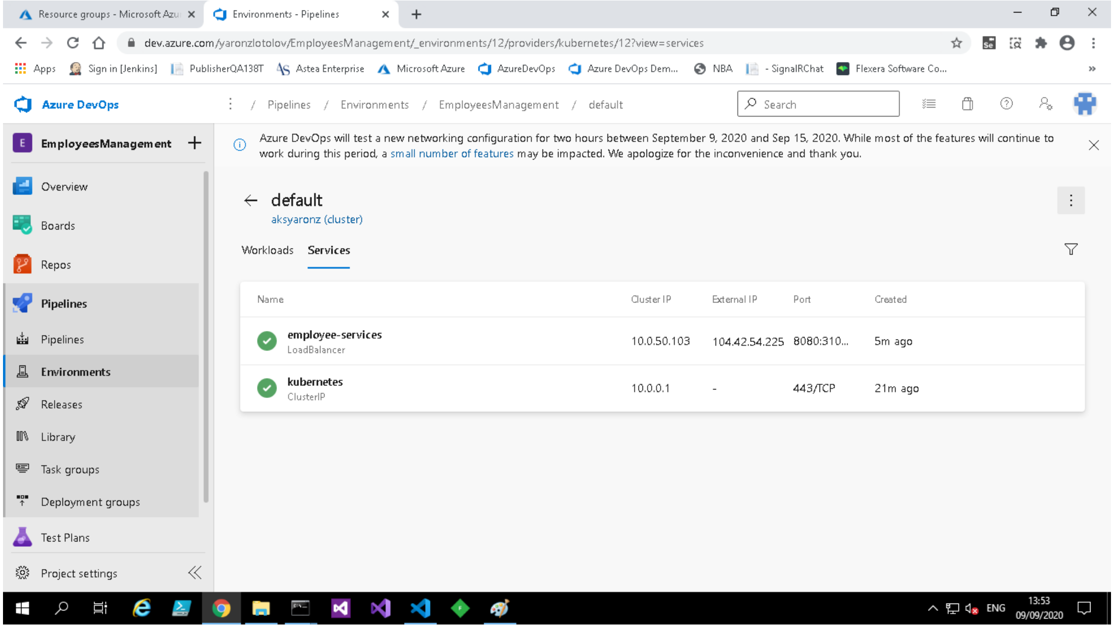
Deploy to Kubernetes cluster

```
Starting: Deploy to Kubernetes cluster
==============================================================================
Task         : Deploy to Kubernetes
Description  : Use Kubernetes manifest files to deploy to clusters or even bake the manifest files to be use
Version      : 0.173.1
Author       : Microsoft Corporation
Help         : https://aka.ms/azpipes-k8s-manifest-tsg
==============================================================================
==============================================================================
                        Kubectl Client Version: v1.19.0
                        Kubectl Server Version: v1.18.6
==============================================================================
/usr/bin/kubectl apply -f /home/vsts/work/_temp/Deployment_employee-deployment_1599648506778,/home/vsts/work
deployment.apps/employee-deployment created
service/employee-services created
/usr/bin/kubectl rollout status Deployment/employee-deployment --timeout 0s --namespace default
```


Resource groups - Microsoft Azure
Environments - Pipelines
dev.azure.com/yaronzlotolov/EmployeesManagement/_environments/12/providers/kubernetes/12?view=services
Azure DevOps
Pipelines / Environments / EmployeesManagement / default
Search
EmployeesManagement
Overview
Boards
Repos
Pipelines
Pipelines
Environments
Releases
Library
Task groups
Deployment groups
Test Plans
Project settings

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default
aksyaronz (cluster)

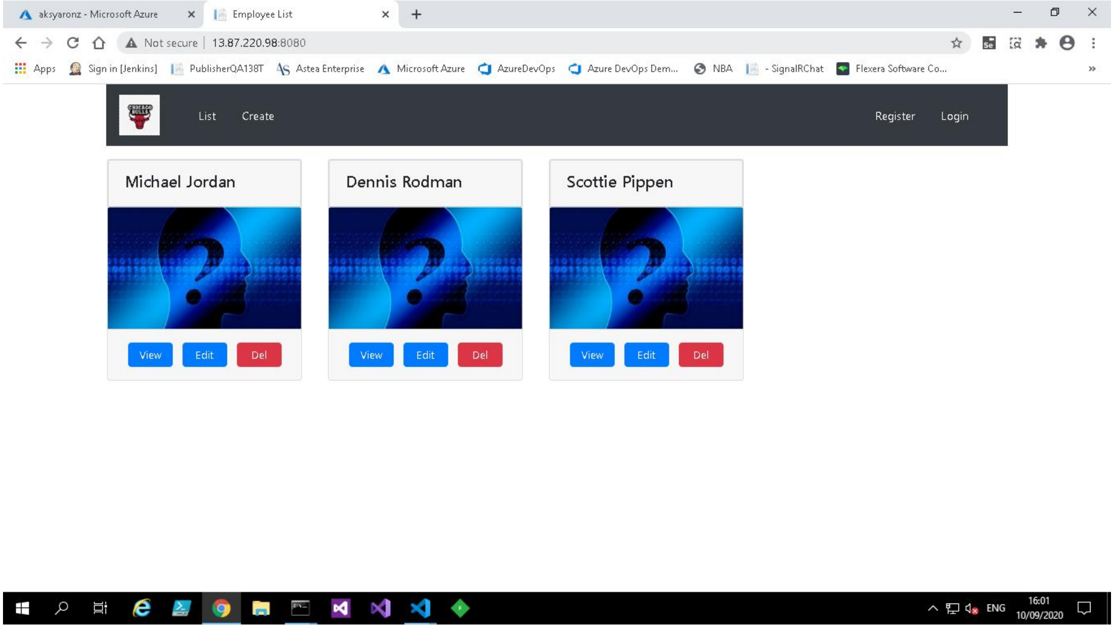
Workloads | Services

Name	Cluster IP	External IP	Port	Created
employee-services LoadBalancer	10.0.50.103	104.42.54.225	8080:310...	5m ago
kubernetes ClusterIP	10.0.0.1	-	443/TCP	21m ago

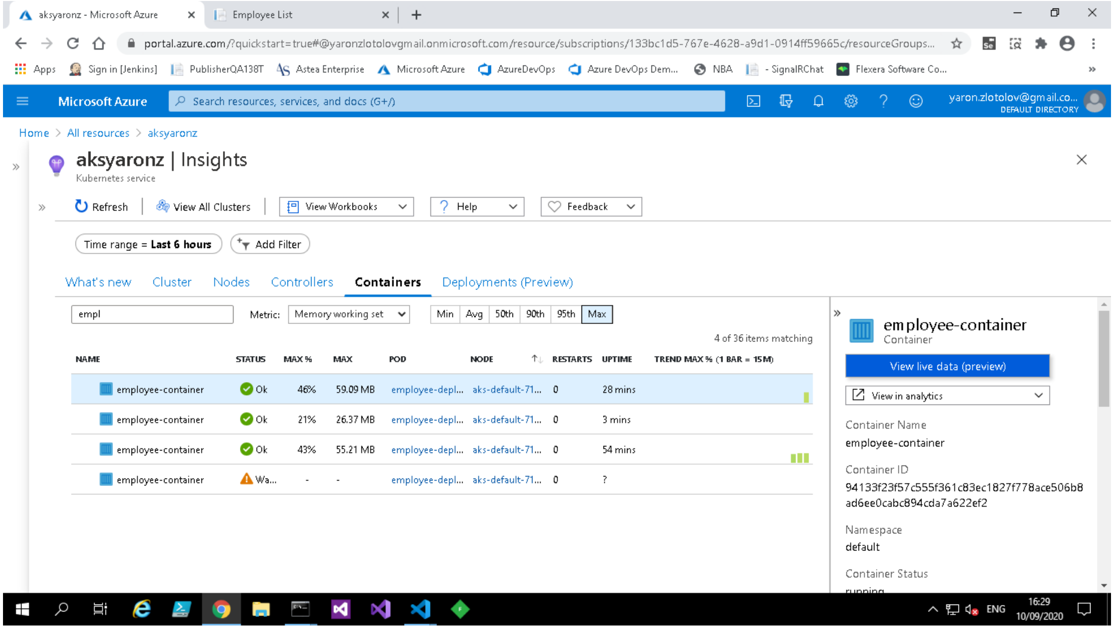
In case of problems with Azure DevOps need to deploy manually:

DeployToAKS.bat.txt

Web application is running on Azure:



Monitoring AKS Memory and CPU usage:



4 of 36 items matching

NAME	STATUS	MAX %	MAX	POD	NODE	RESTARTS	UPTIME	TREND MAX % (1 BAR = 15M)
employee-container	✓ Ok	46%	59.09 MB	employee-depl...	aks-default-71...	0	28 mins	
employee-container	✓ Ok	21%	26.37 MB	employee-depl...	aks-default-71...	0	3 mins	
employee-container	✓ Ok	43%	55.21 MB	employee-depl...	aks-default-71...	0	54 mins	
employee-container	⚠ Wa...	-	-	employee-depl...	aks-default-71...	0	?	

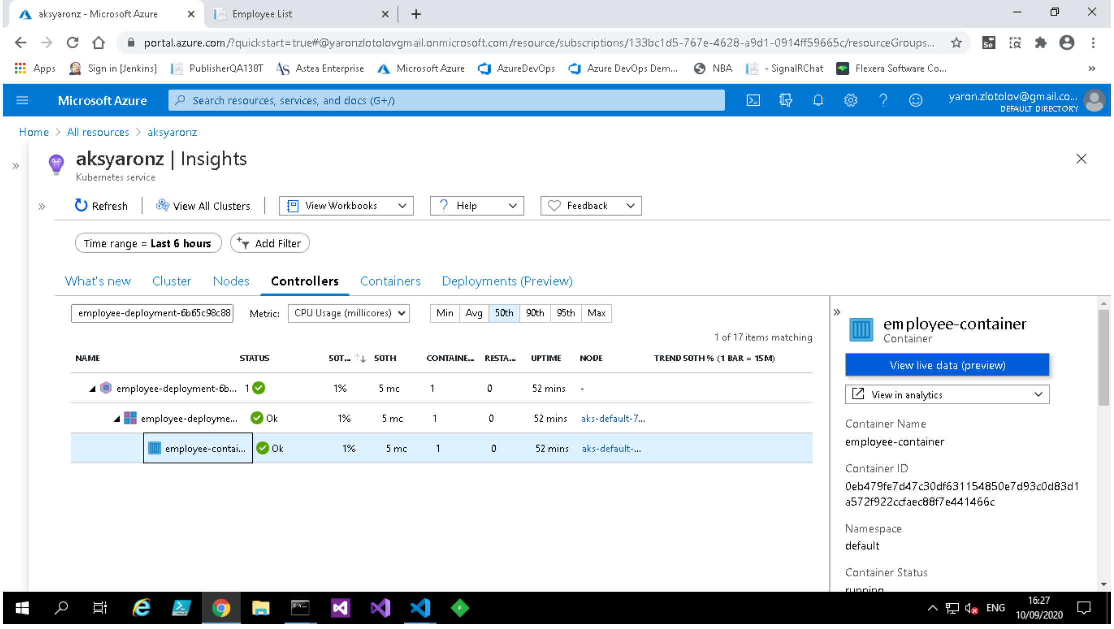
employee-container
Container

Container Name
employee-container

Container ID
94133f23f57c555f361c83ec1827f778ace506b8
ad6ee0cabc894cda7a622ef2

Namespace
default

Container Status
running



1 of 17 items matching

NAME	STATUS	50T...	50TH	CONTAINE...	RESTA...	UPTIME	NODE	TREND 50TH % (1 BAR = 15M)
◢ employee-deployment-6b...	1 ✓	1%	5 mc	1	0	52 mins	-	
◢ employee-deployme...	✓ Ok	1%	5 mc	1	0	52 mins	aks-default-7...	
employee-contai...	✓ Ok	1%	5 mc	1	0	52 mins	aks-default-...	

employee-container
Container

Container Name
employee-container

Container ID
0eb479fe7d47c30df631154850e7d93c0d83d1
a572f922ccfaec88f7e441466c

Namespace
default

Container Status
running

Done - Set the lock and the IP restriction again to AKS