

# CHALLENGE 00: PREREQUISITES

The screenshot shows the Microsoft Azure portal interface. On the left, the navigation menu is visible with various service icons. The main content area displays the 'Subscriptions' page, showing two subscriptions: 'ITS-CSS' and 'Azure for Students'. The 'Azure for Students' subscription is highlighted with a blue border. At the top of the page, there are buttons for '+ Add', 'Manage Policies', 'View Requests', and 'View eligible subscriptions'. Below the table, there are search filters: 'Search for any file...', 'Subscriptions : All (2 of 2)', 'My role == all', and 'Status == all'. A 'Add filter' button is also present.

The right side of the image shows a terminal window with the Azure CLI help documentation for the 'az account' command. The output is as follows:

```
Default: json.
--query      : JMESPath query string. See http://jmespath.org/ for more information and examples.
--verbose    : Increase logging verbosity. Use --debug for full debug logs.

Examples
Set default resource group, webapp and VM names.
az configure --defaults group=myRG web=myweb vm=myvm

Clear default webapp and VM names.
az configure --defaults vm='' web=''

To search AI knowledge base for examples, use: az find "az config"

gaurav [ ~ ]$ az account --help

Group
az account : Manage Azure subscription information.

Subgroups:
lock          : Manage Azure subscription level locks.
management-group : Manage Azure Management Groups.

Commands:
clear         : Clear all subscriptions from the CLI's local cache.
get-access-token : Get a token for utilities to access Azure.
list          : Get a list of subscriptions for the logged in account. By default, only 'Enabled' subscriptions from the current cloud is shown.
list-locations : List supported regions for the current subscription.
set           : Set a subscription to be the current active subscription.
show          : Get the details of a subscription.

To search AI knowledge base for examples, use: az find "az account"

gaurav [ ~ ]$ az account set --subscription 49554a1f-2442-4cf3-b127-551f8bbd8fdc
gaurav [ ~ ]$ 
gaurav [ ~ ]$
```

# CHALLENGE 01: GOT CONTAINERS

Microsoft Azure Search resources, services, and docs (G+/-) Copilot Switch to PowerShell Restart Manage files ...

Home > Virtual machines NC (ncstudents.niagaracollege.ca)

+ Create a resource Home Dashboard All services ★ FAVORITES All resources [Resource groups] App Services Function App SQL databases Azure Cosmos DB Virtual machines Load balancers Storage accounts Virtual networks Microsoft Entra ID Monitor Advisor Microsoft Defender for Cloud Cost Management + Billing Help + support

Virtual machines

Subscription equals all Type equals all Add filter More (2)

Showing 1 to 1 of 1 records.

Name ↑	Subscription ↑	Resource group ↑	Location ↑	Status ↑	Operating sys
vm1	Azure for Students	wth	West US 2	Running	Linux

Page of 0 Give feedback

cache.  
get-access-token : Get a token for utilities to access Azure.  
list : Get a list of subscriptions for the logged in account. By default, only 'Enabled' subscriptions from the current cloud is shown.  
list-locations : List supported regions for the current subscription.  
set : Set a subscription to be the current active subscription.  
show : Get the details of a subscription.

To search AI knowledge base for examples, use: az find "az account"

```
gaurav [ ~ ]$ az account set --subscription 49554a1f-2442-4cf3-b127-551f8bbd8fdc
gaurav [ ~ ]$ 
gaurav [ ~ ]$ az vm create --resource-group wth --name vm1 --image ubuntu2004 --generate-ssh-keys
/usr/lib64/az/lib/python3.9/site-packages/paramiko/pkey.py:100: CryptographyDeprecationWarning: TripleDES has been moved to cryptography.hazmat.decrepit.ciphers.algorithms.TripleDES and will be removed from this module in 48.0.0.
    "cipher": algorithms.TripleDES,
/usr/lib64/az/lib/python3.9/site-packages/paramiko/transport.py:259: CryptographyDeprecationWarning: TripleDES has been moved to cryptography.hazmat.decrepit.ciphers.algorithms.TripleDES and will be removed from this module in 48.0.0.
    "class": algorithms.TripleDES,
SSH key files '/home/gaurav/.ssh/id_rsa' and '/home/gaurav/.ssh/id_rsa.pub' have been generated under ~/.ssh to allow SSH access to the VM. If using machines without permanent storage, back up your keys to a safe location.
{
    "fqdns": "",
    "id": "/subscriptions/49554a1f-2442-4cf3-b127-551f8bbd8fdc/resourceGroups/wth/providers/Microsoft.Compute/virtualMachines/vm1",
    "location": "westus2",
    "macAddress": "00-22-48-BF-67-4E",
    "powerState": "VM running",
    "privateIpAddress": "10.0.0.4",
    "publicIpAddress": "52.247.233.98",
    "resourceGroup": "wth",
    "zones": ""
}
gaurav [ ~ ]$ 
```

Microsoft Azure Search resources, services, and docs (G+/-) Copilot Switch to PowerShell Restart Manage files ...

NC (ncstudents.niagaracollege.ca) gtank2@ncstudents.ni... NC (NCSTUDENTS.NIAGARACOL...

Create a resource Home Dashboard All services FAVORITES All resources Resource groups App Services Function App SQL databases Azure Cosmos DB Virtual machines Load balancers Storage accounts Virtual networks Microsoft Entra ID Monitor Advisor Microsoft Defender for Cloud Cost Management + Billing Help + support

Home > Virtual machines

Virtual machines ...

NC (ncstudents.niagaracollege.ca)

+ Create Switch to classic Reservations Manage view Refresh Export to CSV ...

Filter for any field... Subscription equals all Type equals all Add filter More (2)

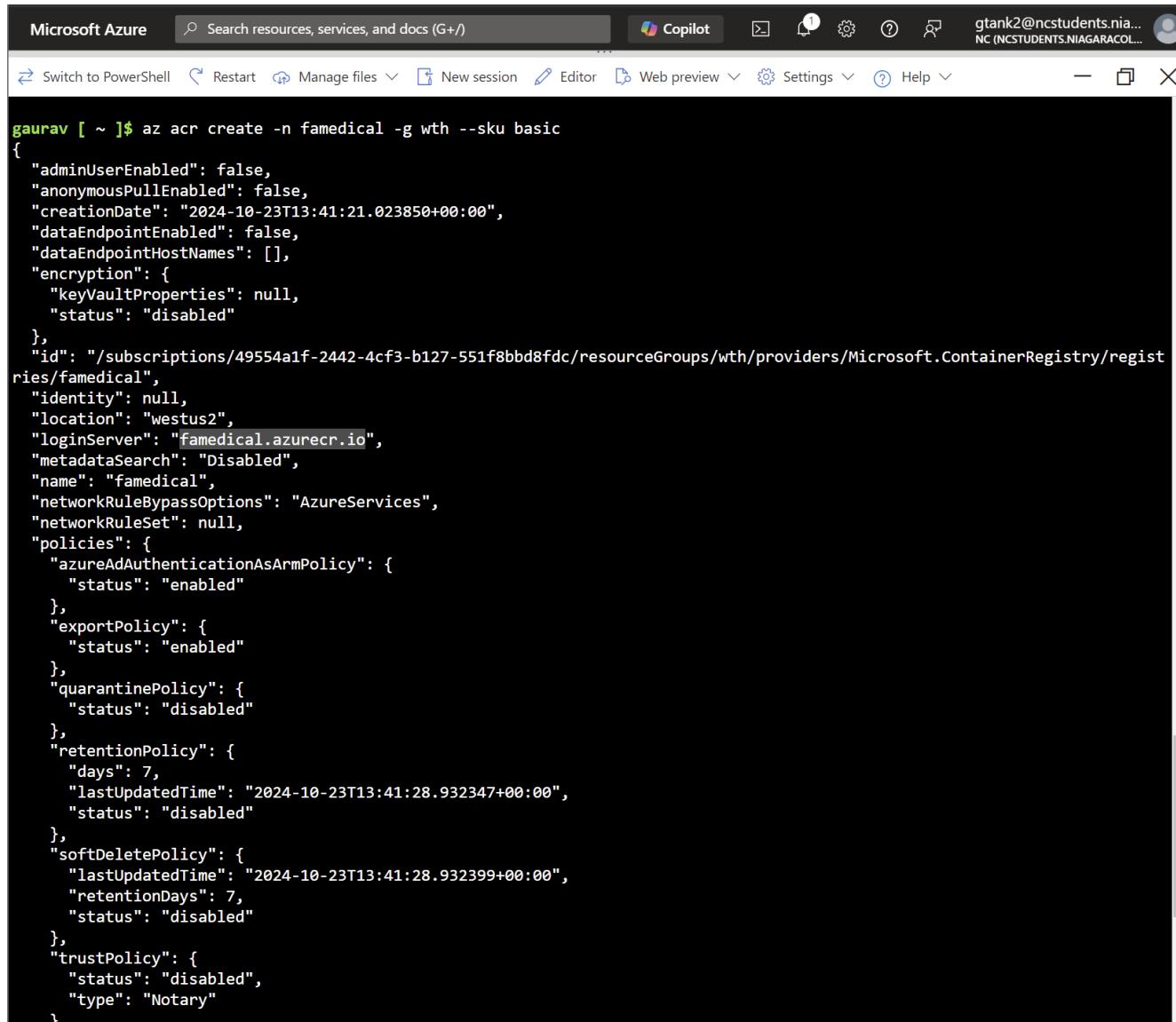
Showing 1 to 1 of 1 records. No grouping List view

Name ↑↓	Subscription ↑↓	Resource group ↑↓	Location ↑↓	Status ↑↓	Operating sys
vm	Azure for Students	wth	West US 2	Running	Linux

Setting up docker-ce-rootless-extras (5:27.3.1-1~ubuntu.20.04~focal...) ...  
Setting up slirp4netns (1.0.1-2) ...  
Setting up docker-ce (5:27.3.1-1~ubuntu.20.04~focal) ...  
Created symlink /etc/systemd/system/multi-user.target.wants/docker.service → /lib/systemd/system/docker.service.  
Created symlink /etc/systemd/system/sockets.target.wants/docker.socket → /lib/systemd/system/docker.socket.  
Processing triggers for man-db (2.10.2-1) ...  
Processing triggers for libc-bin (2.35-0ubuntu3.8) ...  
Scanning processes...  
Scanning linux images...  
Running kernel seems to be up-to-date.  
No services need to be restarted.  
No containers need to be restarted.  
No user sessions are running outdated binaries.  
No VM guests are running outdated hypervisor (qemu) binaries on this host.  
● docker.service - Docker Application Container Engine  
  Loaded: loaded (/lib/systemd/system/docker.service; enabled;)  
  Active: active (running) since Wed 2024-10-23 13:37:35 UTC; 5 days 0 hours ago  
  TriggeredBy: ● docker.socket  
    Docs: https://docs.docker.com  
    Main PID: 3172 (dockerd)  
      Tasks: 7  
      Memory: 21.3M  
        CPU: 332ms  
      CGroup: /system.slice/docker.service  
         └─3172 /usr/bin/dockerd -H fd:// --containerd=/run/contai...  
Oct 23 13:37:33 vm dockerd[3172]: time="2024-10-23T13:37:33.949689" level=info msg="Docker daemon is running as containerd"  
Oct 23 13:37:34 vm dockerd[3172]: time="2024-10-23T13:37:34.682035" level=info msg="Starting containerd"  
Oct 23 13:37:35 vm dockerd[3172]: time="2024-10-23T13:37:35.209199" level=info msg="Containerd has started"  
Oct 23 13:37:35 vm dockerd[3172]: time="2024-10-23T13:37:35.240352" level=info msg="Starting Docker daemon"  
Oct 23 13:37:35 vm dockerd[3172]: time="2024-10-23T13:37:35.240650" level=info msg="Docker daemon is running as containerd"  
Oct 23 13:37:35 vm dockerd[3172]: time="2024-10-23T13:37:35.240835" level=info msg="Starting containerd"  
Oct 23 13:37:35 vm dockerd[3172]: time="2024-10-23T13:37:35.240985" level=info msg="Containerd has started"  
Oct 23 13:37:35 vm dockerd[3172]: time="2024-10-23T13:37:35.241218" level=info msg="Starting Docker daemon"  
Oct 23 13:37:35 vm dockerd[3172]: time="2024-10-23T13:37:35.319575" level=info msg="Docker daemon is running as containerd"  
Oct 23 13:37:35 vm systemd[1]: Started Docker Application Container Engine

Give feedback

## CHALLENGE 02: THE AZURE CONTAINER REPOSITORY



The screenshot shows a Microsoft Azure Cloud Shell interface. The title bar includes the Microsoft Azure logo, a search bar, and user information (gtank2@ncstudents.nia... NC (NCSTUDENTS.NIAGARACOL...)). The main area is a terminal window with the following content:

```
gaurav [ ~ ]$ az acr create -n famedical -g wth --sku basic
{
  "adminUserEnabled": false,
  "anonymousPullEnabled": false,
  "creationDate": "2024-10-23T13:41:21.023850+00:00",
  "dataEndpointEnabled": false,
  "dataEndpointHostNames": [],
  "encryption": {
    "keyVaultProperties": null,
    "status": "disabled"
  },
  "id": "/subscriptions/49554a1f-2442-4cf3-b127-551f8bbd8fdc/resourceGroups/wth/providers/Microsoft.ContainerRegistry/registries/famedical",
  "identity": null,
  "location": "westus2",
  "loginServer": "famedical.azurecr.io",
  "metadataSearch": "Disabled",
  "name": "famedical",
  "networkRuleByPassOptions": "AzureServices",
  "networkRuleSet": null,
  "policies": {
    "azureAdAuthenticationAsArmPolicy": {
      "status": "enabled"
    },
    "exportPolicy": {
      "status": "enabled"
    },
    "quarantinePolicy": {
      "status": "disabled"
    },
    "retentionPolicy": {
      "days": 7,
      "lastUpdatedTime": "2024-10-23T13:41:28.932347+00:00",
      "status": "disabled"
    },
    "softDeletePolicy": {
      "lastUpdatedTime": "2024-10-23T13:41:28.932399+00:00",
      "retentionDays": 7,
      "status": "disabled"
    },
    "trustPolicy": {
      "status": "disabled",
      "type": "Notary"
    }
}
```

Microsoft Azure Search resources, services, and docs (G+/-) Copilot Dashboard > NC (ncstudents.niagaracollege.ca) gtank2@ncstudents.niag...

Create a resource Container registries X

Home Dashboard All services FAVORITES

All resources Resource groups App Services Function App SQL databases Azure Cosmos DB Virtual machines Load balancers

Container registries NC (ncstudents.niagaracollege.ca)

+ Create Manage view Refresh Export to CSV Open query Assign tags

Filter for any field... Subscription equals all Resource group equals all Add filter More (1)

Showing 1 to 1 of 1 records.

Name ↑↓	Type ↑↓	Resource group ↑↓	Location ↑↓	Subscription ↑↓
famedical	Container registry	wth	West US 2	Azure for Students ...

Page 1 of 1 Give feedback

Switch to PowerShell Restart Manage files New session Editor Web preview Settings Help

```
"creationDate": "2024-10-23T13:41:21.023850+00:00",
"dataEndpointEnabled": false,
"dataEndpointHostNames": [],
"encryption": {
  "keyVaultProperties": null,
  "status": "disabled"
},
"id": "/subscriptions/49554a1f-2442-4cf3-b127-551f8bbd8fdc/resourceGroups/wth/providers/Microsoft.ContainerRegistry/registries/famedical",
"identity": null,
"location": "westus2",
"loginServer": "famedical.azurecr.io",
"metadataSearch": "Disabled",
"name": "famedical",
"networkRuleBypassOptions": "AzureServices",
"networkRuleSet": null,
"policies": {
  "azureAdAuthenticationAsArmPolicy": {
    "status": "enabled"
  },
  "exportPolicy": {
    "status": "enabled"
  }
}
```

Microsoft Azure Search resources, services, and docs (G+) Copilot Switch to PowerShell Restart Manage files ...

Dashboard > Container registries > famedical

## famedical | Repositories

Container registry

Properties Locks Services

Repositories Webhooks Geo-replications Tasks Connected registries (Preview) Cache

Repository permissions Tokens Scope maps Policies Content trust Retention (Preview) Monitoring

New to ACR, Artifact streaming helps pull images faster from AKS clusters. The 'Artifact streaming status' column shows which repositories are using this feature. [Learn more](#)

Search to filter repositories ...

Repositories	Cache Rule
conent-api	...
conent-web	...

Switch to PowerShell Restart Manage files New session Editor Web preview Settings Help

```
root@vm:/home/azureuser# az acr login --name famedical
Login Succeeded
root@vm:/home/azureuser# docker push famedical.azurecr.io/conent-api
Using default tag: latest
The push refers to repository [famedical.azurecr.io/conent-api]
f4f510a67648: Pushed
238e27a45e5d: Pushed
7c9279a5a251: Pushed
423451ed44f2: Pushed
b2aaaf85d6633: Pushed
88601a85ce11: Pushed
42f9c2f9c08e: Pushed
99e8bd3efaa: Pushed
bee1e39d7c3a: Pushed
1f59a4b2e206: Pushed
0ca7f54856c0: Pushed
ebb9ae013834: Pushed
latest: digest: sha256:957ecc1c424742aa6dd482c7731ddc858286a895a435
c41a0e4b9d26f79d181a size: 2840
root@vm:/home/azureuser# docker push famedical.azurecr.io/conent-web
using default tag: latest
The push refers to repository [famedical.azurecr.io/conent-web]
dceb6941acff: Pushed
fcb8e19a3ace: Pushed
7c9279a5a251: Mounted from conent-api
423451ed44f2: Mounted from conent-api
b2aaaf85d6633: Mounted from conent-api
88601a85ce11: Mounted from conent-api
42f9c2f9c08e: Mounted from conent-api
99e8bd3efaa: Mounted from conent-api
bee1e39d7c3a: Mounted from conent-api
1f59a4b2e206: Mounted from conent-api
0ca7f54856c0: Mounted from conent-api
ebb9ae013834: Mounted from conent-api
latest: digest: sha256:33aea30038adc3dfb601825a7cc78c0acb5db9be8dc
f23ef31fb7c77ae6c840 size: 2843
root@vm:/home/azureuser#
```

gaurav [ ~ ]\$

# CHALLENGE 03: INTRODUCTION TO KUBERNETES

The screenshot shows the Microsoft Azure portal interface. On the left, the navigation sidebar includes 'Create a resource', 'Home', 'Dashboard', 'All services', 'FAVORITES' (with items like All resources, Resource groups, App Services, Function App, SQL databases, Azure Cosmos DB, Virtual machines, Load balancers, Storage accounts, Virtual networks, Microsoft Entra ID, Monitor, Advisor, and Microsoft Defender for Cloud), and a search bar at the top.

The main content area is titled 'Kubernetes services' and shows a single record: 'mycluster' (Kubernetes service) under 'wth' (Resource group). The table columns are Name, Type, Resource group, Kuberne..., Location, and Subscription.

A terminal window is visible in the background, showing the command 'az aks create -g wth -n mycluster --node-count 1 --generate-ssh-keys' being run, followed by its JSON output:

```
root@vm:/home/azureuser# az aks create -g wth -n mycluster --node-count 1 --generate-ssh-keys
| Running ...
{
  "aadProfile": null,
  "addonProfiles": null,
  "agentPoolProfiles": [
    {
      "availabilityZones": null,
      "capacityReservationGroupId": null,
      "count": 1,
      "creationData": null,
      "currentOrchestratorVersion": "1.29.9",
      "enableAutoScaling": false,
      "enableEncryptionAtHost": false,
      "enableFips": false,
      "enableNodePublicIp": false,
      "enableUltraSsd": false,
      "gpuInstanceProfile": null,
      "hostGroupId": null,
      "kubeletConfig": null,
      "kubernetesDiskType": "OS",
      "linuxOsConfig": null,
      "maxCount": null,
      "maxPods": 110,
      "minCount": null,
      "mode": "System",
      "name": "nodepool1",
      "networkProfile": null,
      "nodeImageVersion": "AKSUbuntu-2204gen2containerd-202410.09.0",
      "nodeLabels": null,
      "nodePublicIpPrefixId": null,
      "nodeTaints": null,
      "orchestratorVersion": "1.29",
      "osDiskSizeGb": 128,
      "osDiskType": "Managed",
      "osSku": "Ubuntu",
      "osType": "Linux",
      "podSubnetId": null,
      "powerState": {
        "code": "Running"
      },
      "provisioningState": "Succeeded",
      "proximityPlacementGroupId": null,
      "scaleDownMode": null
    }
  ],
  "dnsPrefix": "mycluster",
  "enableHorizontalPodAutoscale": false,
  "enableIngress": false,
  "enableVirtualIp": false,
  "fqdn": "mycluster.wth.127.0.0.1.xip.io",
  "httpPort": 44133,
  "identity": null,
  "imageType": "ContainerImage",
  "location": "West US 2",
  "managedCluster": true,
  "managedIdentity": null,
  "managedServiceIdentity": null,
  "nodeCount": 1,
  "nodePools": [
    {
      "count": 1,
      "id": "nodepool1"
    }
  ],
  "nodePools": [
    {
      "count": 1,
      "id": "nodepool1"
    }
  ],
  "nodeRole": "Kubelet",
  "nodeTaints": null,
  "nodeVersion": "1.29.9",
  "osType": "Linux",
  "resourceGroup": "wth",
  "servicePrincipal": null,
  "servicePrincipalClientId": null,
  "servicePrincipalClientSecret": null,
  "servicePrincipalObjectIdentifier": null,
  "servicePrincipalServicePrincipalName": null,
  "servicePrincipalUser": null,
  "tags": null,
  "type": "Microsoft.ContainerService/managedClusters"
}
```

The bottom status bar shows the URL 'https://portal.azure.com/#/ncstudents.niagaracollege.ca/resource/subscriptions/49554a1f-2442-4cf3-b127-551f8bbd8fdc/resourceGroups/wth/providers/Microsoft.ContainerService/managedCluste...' and the message 'az aks create ~ 1s'.

Microsoft Azure Switch to PowerShell Restart Manage files ...

Search resources, services, and docs (G+)

Copilot

Home > Kubernetes services

NC (ncstudents.niagaracollege.ca)

Create a resource

Home

Dashboard

All services

Favorites

All resources

Resource groups

App Services

Function App

SQL databases

Azure Cosmos DB

Virtual machines

Load balancers

Storage accounts

Virtual networks

Microsoft Entra ID

Monitor

Advisor

Microsoft Defender for Cloud

Kubernetes services

Subscription equals all Type equals all Add filter More (2)

Showing 1 to 1 of 1 records.

Name	Type	Resource group	Kubernetes... (K8s)	Location	Subscription
mycluster	Kubernetes service	wth	1.29.9	West US 2	Azure for Students

No grouping List view

Page 1 of 1 Give feedback

Switch to PowerShell Restart Manage files New session Editor Web preview Settings Help

```
root@vm:/home/azureuser# ls
WhatTheHack docker.sh kubectl.sh
azcli.sh kubectl kubectl.sha256
root@vm:/home/azureuser# cd WhatTheHack/001-IntroToKubernetes/Student/Resources/
root@vm:/home/azureuser/WhatTheHack/001-IntroToKubernetes/Student/Resources# ls
Challenge-01 Challenge-04 Challenge-08 Challenge-10
Challenge-02 Challenge-07 Challenge-09
root@vm:/home/azureuser/WhatTheHack/001-IntroToKubernetes/Student/Resources# k get nodes
NAME STATUS ROLES AGE VERSI
ON
aks-nodepool1-90915670-vmss00000 Ready <none> 6m29s v1.29
.9
root@vm:/home/azureuser/WhatTheHack/001-IntroToKubernetes/Student/Resources# 
```

"createdByType": "User",  
"lastModifiedAt": "2024-10-23T13:41:21.023850+00:00",  
"lastModifiedBy": "gtank2@ncstudents.niagaracollege.ca",  
"lastModifiedByType": "User"  
},  
"tags": {},  
"type": "Microsoft.ContainerRegistry/registries",  
"zoneRedundancy": "Disabled"  
}

curl -v ~ 14 https://portal.azure.com/#home

## CHALLENGE 04: YOUR FIRST DEPLOYMENT

The screenshot shows a dual-pane interface. On the left is the official website for Contoso Neuro 2017, featuring a banner image of a brain, event details (September 14-17, 2017, Monterey Conference Center, Monterey, California), and a brief description of the conference's purpose. At the bottom, there is a copyright notice: "Copyright © 2017 Contoso Neuro 2017. All rights reserved." On the right is a terminal window with a dark theme, showing command-line output related to Kubernetes deployment and service status.

```
Switch to PowerShell Restart Manage files ... ×
Session Affinity: None
External Traffic Policy: Cluster
Internal Traffic Policy: Cluster
Events:
  Type   Reason          Age   From           Message
  ----  -- --  ---  ---  -----
  Normal EnsuringLoadBalancer 14s  service-controller  Ensuring
load balancer
  Normal EnsuredLoadBalancer  3s  service-controller  Ensured l
oad balancer
root@vm:/home/azureuser# k describe svc content-web
Name: content-web
Namespace: default
Labels: app=content-web
Annotations: <none>
Selector: app=content-web
Type: LoadBalancer
IP Family Policy: SingleStack
IP Families: IPv4
IP: 10.0.51.150
IPs: 10.0.51.150
LoadBalancer Ingress: 4.155.95.56
Port: 3000 3000/TCP
TargetPort: 3000/TCP
NodePort: 3000 30631/TCP
Endpoints: 10.244.0.13:3000
Session Affinity: None
External Traffic Policy: Cluster
Internal Traffic Policy: Cluster
Events:
  Type   Reason          Age   From           Message
  ----  -- --  ---  ---  -----
  Normal EnsuringLoadBalancer 17s  service-controller  Ensuring
load balancer
  Normal EnsuredLoadBalancer  6s  service-controller  Ensured l
oad balancer
root@vm:/home/azureuser# k get svc
NAME        TYPE        CLUSTER-IP      EXTERNAL-IP      PORT(S)
AGE
content-api  ClusterIP    10.0.59.95    <none>         3001/TCP
34m
content-web   LoadBalancer  10.0.51.150   4.155.95.56   3000:30631/TCP
19s
kubernetes   ClusterIP    10.0.0.1       <none>         443/TCP
59m
root@vm:/home/azureuser#
```



### JOHN MORRIS

MD | Washington University School of Medicine, St Louis, Missouri, USA

**John C Morris** MD is the Friedman Distinguished Professor of Neurology and Director of the Charles F. and Joanne Knight Alzheimer's Disease Research Center at Washington University School of Medicine. Dr. Morris has more than 500 published articles. He has received many honors and awards, including the Lifetime Achievement Award from the Alzheimer's Association (2002); the MetLife Award for Medical Research in Alzheimer's Disease (2004); the Potamkin Prize for Research in Pick's, Alzheimer's, and Related Dementias (2005); and the Peter H. Raven Lifetime Achievement Award from the Academy of Science St. Louis. He is ranked in the top 1% of investigators in the field of Neuroscience and Behavior by Essential Science Indicators database.



### GEOFFREY NICHOL

Dr | Sangamo BioSciences, USA

**Geoff Nichol** BMed Sc, MB, ChB, MBA, FRACP is currently Executive Vice President of Research and Development at Sangamo BioSciences in San Francisco, USA. He has over 20 years of experience in the pharmaceutical and biotechnology industries, and has been closely associated with the development of over 15 new drug candidates and the approval or launch of several marketed drugs, including Augmentin BID (amoxicillin/clavulanate), Foradil (formoterol) and Yervoy (ipilimumab). He started his career in drug development with SmithKline Beecham, then served on the senior global development management team at Novartis. He then led all aspects of product development for Medarex Inc, pioneering the pharmaceutical development of the novel immunotherapeutic antibodies ipilimumab, the first agent to improve survival in advanced melanoma, and nivolumab. Following the acquisition of Medarex by Bristol-Myers Squibb Company in 2009, he served as CMO at Ikaria prior to joining Sangamo.



### IFSI FY IONFS

```

Switch to PowerShell ⌘ Restart ⌘ Manage files ...
Session Affinity: None
External Traffic Policy: Cluster
Internal Traffic Policy: Cluster
Events:
Type Reason Age From Message
---- ---- - - - -
Normal EnsuringLoadBalancer 14s service-controller Ensuring
load balancer
Normal EnsuredLoadBalancer 3s service-controller Ensured l
oad balancer
root@vm:/home/azureuser# k describe svc content-web
Name: content-web
Namespace: default
Labels: app=content-web
Annotations: <none>
Selector: app=content-web
Type: LoadBalancer
IP Family Policy: SingleStack
IP Families: IPv4
IP: 10.0.51.150
IPs: 10.0.51.150
LoadBalancer Ingress: 4.155.95.56
Port: 3000 3000/TCP
TargetPort: 3000/TCP
NodePort: 3000 30631/TCP
Endpoints: 10.244.0.13:3000
Session Affinity: None
External Traffic Policy: Cluster
Internal Traffic Policy: Cluster
Events:
Type Reason Age From Message
---- ---- - - - -
Normal EnsuringLoadBalancer 17s service-controller Ensuring
load balancer
Normal EnsuredLoadBalancer 6s service-controller Ensured l
oad balancer
root@vm:/home/azureuser# k get svc
NAME TYPE CLUSTER-IP EXTERNAL-IP PORT(S)
AGE
content-api ClusterIP 10.0.59.95 <none> 3001/TCP
34m
content-web LoadBalancer 10.0.51.150 4.155.95.56 3000:30631
/TCP 19s
kubernetes ClusterIP 10.0.0.1 <none> 443/TCP
59m
root@vm:/home/azureuser# 

```

# CHALLENGE 06: DEPLOY MONGODB TO AKS



## Challenge 06 - Deploy MongoDB to AKS

< Previous Challenge - Home - Next Challenge >

### Introduction

We are going to need MongoDB for v2 of our application and we'll be running it in our Kubernetes cluster.

### Description

In this challenge we'll be installing MongoDB into our cluster.

- Deploy a MongoDB container in a pod for v2 of the FabMedical app. Use the official MongoDB container image from [https://hub.docker.com/\\_/mongo](https://hub.docker.com/_/mongo)
- Confirm it is running with:
  - `kubectl exec -it <mongo pod name> -- mongosh "--version"`
- Hint: Follow the pattern you used in Challenge 4 and create a deployment and service YAML file for MongoDB.
- Hint: MongoDB runs on port 27017

### Success Criteria

1. Verify MongoDB is installed and run in our cluster
2. Verify the `mongosh --version` command can be run in a pod and shown to work.

```
Switch to PowerShell Restart Manage files ... X
root@vm:/home/azureuser# watch kubectl get po
root@vm:/home/azureuser# kubectl get po
NAME           READY   STATUS    RESTARTS   AGE
content-api-55bbcfb9c6-vszfk  1/1     Running   0          67m
content-web-698d68b646-9v5c9  1/1     Running   0          67m
mongodb-6c45f46db7-snrxb     1/1     Running   0          26s
root@vm:/home/azureuser#
root@vm:/home/azureuser# kubectl exec -it mongodb-6c45f46db7-snrxb
-- mongosh "--version"
2.3.2
root@vm:/home/azureuser#
```

## CHALLENGE 07: UPDATES AND ROLLBACKS

“`Kubectl set image deployment content-web content-web=famedical.azurecr.io/content-web:v2`”

“`Kubectl set image deployment content-api content-api=famedical.azurecr.io/content-api:v2`”

The screenshot shows a dual-pane interface. On the left is the official website for the Contoso Neuro conference, featuring a banner image of a brain cross-section, the event date "SEPTEMBER 14-17, 2022", the location "Monterey Conference Center Monterey, California", and a copyright notice at the bottom. On the right is a terminal window titled "Every 2.0s: kubectl get po" which lists three pods: "content-api-5899676cf6-vf87h", "content-web-6966bf4594-fn8ll", and "mongodb-6c45f46db7-snrxb", all in a "Running" state with zero restarts and ages of 44 seconds or 19 minutes.

NAME	READY	STATUS	RESTARTS	AGE
content-api-5899676cf6-vf87h	1/1	Running	0	44s
content-web-6966bf4594-fn8ll	1/1	Running	0	44s
mongodb-6c45f46db7-snrxb	1/1	Running	0	19m

## Update the app and load data

- We have staged an updated version of the app on Docker Hub with id and version:
  - `whatthehackmsft/content-web:v2`
  - `whatthehackmsft/content-api:v2`
- NOTE:** If you have been building your docker container images from source code and deploying to an Azure Container Registry, you can find v2 of the source code in the `/Challenge-07` folder of the `Resources.zip` package.
- Version 2 of FabMedical stores its data in MongoDB. We have provided a container image with an initialization script called "content-init" that loads the database with the sample content. The container runs as a Kubernetes Job. The container image is available on Dockerhub at: `whatthehackmsft/content-init`.
  - Use the content-init "Job" YAML file provided in the `/Challenge-07` folder of the `Resources.zip` package to run the initialization of MongoDB for our new version of the app.
  - Logs for content-init will provide the detailed logs showing whether it was able to successfully connect and add the contents to the MongoDB. You can use kubectl (or the Azure Portal) to check the logs.
  - You can also verify that the MongoDB contains the FabMedical data after content-init job has completed. Hint: - Connect to the mongodb pod - Use the mongodb command `show dbs`

## Rolling update

- Perform a rolling update of content-web on your cluster to the v2 version of content-web. You will need to edit your deployment to incorporate the following:
  - You'll be doing this from the command-line with a kubectl command (remember, Kubernetes docs are your friend!)
  - With kubectl and its watch feature you should be able to see new pods with the new version come online and the old pods terminate.
  - At the same time, hit the front page to see when you're on the new version by refreshing constantly until you see the conference dates updated to 2022.
- Now we are going to roll back this update.
  - Again, this is done from the command-line using a (different) kubectl command.
  - Confirm that we are back to the original version of the app by checking that the conference dates are back to 2017.

## Blue-Green Deployment

- Perform the update again, this time using the blue/green deployment methodology.
  - This time make sure you update BOTH content-web and content-api.
  - You will need a separate deployment file using different tags.
  - Cut over is done by modifying the app's service to point to this new deployment.
  - The new version of content-api will need to know how to reach the MongoDB server. You will need to pass it an environment variable named: `MONGODB_CONNECTION`, and this needs to be set the URL: `mongodb://mongodb:27017/contentdb`

## Success Criteria

- Verify that you are running v2 of the application.
- Demonstrate that MongoDB has been seeded with speaker and session data.
- Verify that you have upgraded content-web as a rolling update.
- Verify that you have rolled back content-web.
- Verify that you have upgraded both content-web and content-api as a blue/green deployment.

The screenshot shows a terminal window with two panes. The top pane displays the output of the command `kubectl get po`, listing several pods including `content-api`, `content-init`, `content-web`, and `mongodb`. The bottom pane shows a MongoDB shell session where the user connects to the `contentdb` database and lists the available databases: `admin`, `config`, `contentdb`, and `local`.

```
resources/Challenge-07# kubectl get po
NAME           READY   STATUS    RESTARTS   AGE
content-api-5899676cf6-vf87h   1/1     Running   5 (2m ago)   6m3
6s
content-init-kj9n7            0/1     Completed   0          4m8
s
content-web-6966bf4594-fn8ll  1/1     Running   0          6m3
6s
mongodb-6c45f46db7-snrxb     1/1     Running   0          25m
root@vm:/home/azureuser/WhatTheHack/001-IntroToKubernetes/Student/Resources/Challenge-07# kubectl exec -it mongodb-6c45f46db7-snrxb -- sh
# mongosh
Current Mongosh Log ID: 67191f1c1c13b41039fe6910
Connecting to: mongodb://127.0.0.1:27017/?directConnection=true&serverSelectionTimeoutMS=2000&appName=mongosh+2.3.2
Using MongoDB: 8.0.1
Using Mongosh: 2.3.2

For mongosh info see: https://www.mongodb.com/docs/mongodb-shell/
-----
The server generated these startup warnings when booting
2024-10-23T15:41:29.781+00:00: Using the XFS filesystem is strongly recommended with the WiredTiger storage engine. See http://dochub.mongodb.org/core/prodnotes-filesystem
2024-10-23T15:41:30.647+00:00: Access control is not enabled for the database. Read and write access to data and configuration is unrestricted
2024-10-23T15:41:30.647+00:00: For customers running the current memory allocator, we suggest changing the contents of sysfsFile
2024-10-23T15:41:30.647+00:00: We suggest setting the contents of sysfsFile to 0.
2024-10-23T15:41:30.647+00:00: Your system has glibc support for rseq built in, which is not yet supported by tcmalloc-google and has critical performance implications. Please set the environment variable GLIBC_TUNABLES=glibc.pthread.rseq=0
2024-10-23T15:41:30.647+00:00: vm.max_map_count is too low
-----
test> show dbs
admin      40.00 KiB
config     12.00 KiB
contentdb  84.00 KiB
local      40.00 KiB
test> 
```

# CHALLENGE 08: STORAGE

- Redeploy MongoDB with dynamic persistent storage
  - NOTE:** Some types of persistent volumes (specifically, Azure disks) are associated with a single zone, see [this document](#). Since we enabled availability zones in challenge 3, we need to guarantee that the two volumes and the node that the pod runs on are in the same zone.  
- Fortunately, the default azure-disk storage class uses the "volumeBindingMode: WaitForFirstConsumer" setting which forces kubernetes to wait for a workload to be scheduled before provisioning the disks. In other words, AKS is smart enough to create the disk in the same availability zone as the node. - You could optionally create your own storage class to specifically define the volumeBindingMode, but that's not necessary for this exercise.
  - Create two Persistent Volume Claims (PVC) using the new Storage Class, one for data and one for config. - Look in the Resources/Challenge 8 folder for starter templates
  - Modify your MongoDB deployment to use the PVCs. - Look in the `/Challenge-08` folder of the `Resources.zip` package for starter templates
  - Deploy MongoDB
    - Examine the automatically provisioned Persistent Volumes (PVs) and verify that both are in the same zone.
    - Check that the disk and the node that the pod runs on are in the same zone
- Verify that persistent storage works
  - Verify that MongoDB is working fine by connecting to the corresponding MongoDB Pod in interactive mode. Make sure that the disks are associated correctly (bold and italic below)

- `kubectl exec -it <mongo-db pod name> bash`
- `root@mongo-db678745655b-f82vj:/# df -Th`

```
Filesystem      Type   Size  Used Avail Use% Mounted on
overlay        overlay  30G   4.2G  25G  15% /
tmpfs          tmpfs   1.7G    0    1.7G  0% /dev
tmpfs          tmpfs   1.7G    0    1.7G  0% /sys/fs/cgroup
/dev/sdc       ext4    2.0G  304M  1.5G  17% /data/db
/dev/sdd       ext4    2.0G  3.0M  1.8G  1% /data/configdb
/dev/sda1      ext4    30G   4.2G  25G  15% /etc/hosts
shm            tmpfs   64M    0    64M  0% /dev/shm
tmpfs          tmpfs   1.7G   12K  1.7G  1% /run/secrets/kubernetes.io/serviceaccount
tmpfs          tmpfs   1.7G    0    1.7G  0% /sys/firmware
```

- `root@mongo-db678745655b-f82vj:/# mongosh --version`
- MongoDB shell version v3.6.1  
connecting to: mongodb://127.0.0.1:27017  
MongoDB server version: 3.6.1

- Re-load the sample content (Speakers & Sessions data) in to MongoDB by running the content-init job as you did earlier during Challenge 7.
- Make sure that the `contentdb` database is populated by connecting to the MongoDB pod with an interactive terminal and verify the database "contentdb" exists.

- `root@mongo-db678745655b-f82vj:/# mongo`
- MongoDB shell version v3.6.1  
connecting to: mongodb://127.0.0.1:27017

```
Switch to PowerShell  Restart  Manage files  ...
content-init-kj9n7           0/1  Completed  0  2
0m
content-web-6966bf4594-8pdlg 1/1  Running   0  9
m
mongo-db-deploy-58c4bf5d9d-7nc9z 1/1  Running   0  1
6s
root@vm:/home/azureuser# kubectl get po
NAME          READY   STATUS    RESTARTS   AGE
content-api-59c64ddb4-tqc2r   1/1    Running   0          7m50s
content-init-kj9n7           0/1    Completed  0          2
0m
content-web-6966bf4594-8pdlg 1/1    Running   0          9
m
mongo-db-deploy-58c4bf5d9d-7nc9z 1/1    Running   0          1
6s
root@vm:/home/azureuser# kubectl get po
NAME          READY   STATUS    RESTARTS   AGE
content-api-59c64ddb4-tqc2r   1/1    Running   0          7m52s
content-init-kj9n7           0/1    Completed  0          2
1m
content-web-6966bf4594-8pdlg 1/1    Running   0          9
m2s
mongo-db-deploy-58c4bf5d9d-7nc9z 1/1    Running   0          1
8s
root@vm:/home/azureuser# kubectl exec -it mongo-db-deploy-58c4bf5d9d-7nc9z
error: you must specify at least one command for the container
root@vm:/home/azureuser# kubectl exec -it mongo-db-deploy-58c4bf5d9d-7nc9z -- sh
# df -hT
Filesystem      Type   Size  Used Avail Use% Mounted on
overlay        overlay  124G   25G  100G  20% /
tmpfs          tmpfs   64M    0    64M  0% /dev
/dev/sdc       ext4    4.9G  202M  4.7G  5% /data/db
/dev/sdd       ext4    4.9G  1.3M  4.9G  1% /data/configdb
/dev/root      ext4    124G   25G  100G  20% /etc/hosts
shm            tmpfs   64M    0    64M  0% /dev/shm
tmpfs          tmpfs   5.0G   12K  5.0G  1% /run/secrets/kubernetes.io/serviceaccount
tmpfs          tmpfs   3.4G    0    3.4G  0% /proc/acpi
tmpfs          tmpfs   3.4G    0    3.4G  0% /proc/scsi
tmpfs          tmpfs   3.4G    0    3.4G  0% /sys/firmware
#
```

## CHALLENGE 10: NETWORKING AND INGRESS

CONTOSO NEURO

Speakers Sessions Stats

SEPTEMBER 14-17, 2022

Monterey Conference Center  
Monterey, California

CONTOSO NEURO

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Quisque condimentum quis justo eget aliquet. Vestibulum eget lacinia metus. Sed dignissim tincidunt pellentesque. Donec sem neque, mollis a nibh vitae, luctus laoreet est. Proin id dapibus sapien. Etiam vitae odio eget sem tempus consectetur. Fusce ac vehicula erat. Nunc pharetra, turpis sed dapibus accumsan, nibh augue fermentum odio, non laoreet dui diam ac lacus. In hac habitasse platea dictumst. Etiam nisi neque, pulvinar eleifend molestie eget, interdum non nisl. Cras ligula urna, porta sed justo ut, facilisis auctor ligula. Fusce porta urna at tempus varius.

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```
Switch to PowerShell Restart Manage files ... - x
root@vm:/home/azureuser# kubectl get svc
NAME          TYPE        CLUSTER-IP   EXTERNAL-IP   PORT(S)
            AGE
content-api   ClusterIP  10.0.59.95  <none>       3001/TCP
P            10h
content-web    LoadBalancer 10.0.122.161  4.242.110.161  3000:31
366/TCP      13s
kubernetes   ClusterIP  10.0.0.1    <none>       443/TCP
                10h
mongodb      ClusterIP  10.0.53.52  <none>       27017/TCP
CP            8h
root@vm:/home/azureuser# kubectl get ingress
NAME          CLASS      HOSTS     ADDRESS      PORTS   AGE
content-web   <none>    *         80          21s
root@vm:/home/azureuser# kubectl describe ingress content-web
Name:           content-web
Labels:          <none>
Namespace:      default
Address:
Ingress Class: <none>
Default backend: <default>
Rules:
  Host          Path  Backends
  ----          ---   -----
  *
           /      content-web:3000 (10.244.0.24:3000)
Annotations:  kubernetes.io/ingress.class: nginx
Events:
  Type  Reason  Age  From          Message
  ----  -----  --  --   -----
  Normal Sync   77s  nginx-ingress-controller  Scheduled for sync
root@vm:/home/azureuser# [ ]
```

# CHALLENGE 11: OPERATIONS AND MONITORING

The screenshot shows the Microsoft Azure Metrics dashboard for a Kubernetes service named "mycluster". The left sidebar lists various Azure services, and the top navigation bar shows the user's email (gtank2@ncstudents.niagara.col...).

The main dashboard interface includes:

- A search bar at the top.
- A toolbar with "Copilot", "Switch to PowerShell", "Restart", "Manage files", and other options.
- A breadcrumb trail: Home > Kubernetes services > mycluster.
- A title "mycluster | Metrics" with a star icon and three dots.
- A left sidebar with sections like Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Microsoft Defender for Cloud, Cost analysis, Kubernetes resources (Namespaces, Workloads, Services and ingresses, Storage, Configuration, Custom resources, Events, Run command), Settings (Node pools, Cluster configuration, Application scaling, Networking, Extensions + applications, Backup, Service mesh - Istio), and Help + support.
- A chart configuration panel with "Add metric" dropdown, "Line chart" and "Drill into Logs" buttons, "Add filter", "New alert rule", "Save to dashboard", and other options.
- A chart area showing "CPU Usage Millicores" over the last 24 hours. The Y-axis ranges from 0c to 0.26c, and the X-axis shows Wed 23, 6 AM, 12 PM, 6 PM, UTC-04:00. A blue line represents the average CPU usage, which fluctuates between 0.16c and 0.20c, with a notable peak around 12 PM.
- A legend at the bottom of the chart area: CPU Usage Millicores (Avg), mycluster | 0.19 cores.
- A terminal window on the right showing the command "root@vm:/home/azureuser#".

Microsoft Azure Search resources, services, and docs (G+) Copilot Switch to PowerShell Restart Manage files ...

Home > Kubernetes services > mycluster

## mycluster | Metrics

Kubernetes service

Search New chart Refresh Share Feedback

Local Time: Last 24 hours (Automatic - 15 minutes)

+ Add metric Add filter Line chart Drill into Logs New alert rule Save to dashboard Apply splitting

Scope: mycluster Metric Namespace: Container service (ma) Metric: Memory Working Set Aggregation: Avg

Memory Working Set Percentage (Avg), mycluster | 31.9848%

Time	Memory Working Set Percentage (Avg)
00:00	0%
12:00	20%
13:00	32%
18:00	33%
24:00	34%

WED 23 UTC-04:00