

### Practical Task 1: Deploy a Docker Container to Azure Container Instances (ACI) via Azure Portal

1. Create a lightweight Docker image for a simple web application (e.g., a Python Flask app) with minimal dependencies to reduce resource usage.

```
Dockerfile X
Dockerfile > ...
1 FROM adoptopenjdk:11-jre-hotspot-focal@sha256:eac1c6cff5fdded2dd35fc94bb23e7862a08277bd71f9b352a99df5bc740459c3
2
3 RUN apt update
4 RUN apt-get install firefox -y
5
6
7 ARG JAR_FILE=target/back-end-0.0.1-SNAPSHOT.jar
8 COPY ${JAR_FILE} back.jar
9 CMD ["java", "-jar", "/back.jar"]
10 EXPOSE 8080
11
```

### Docker image for Silpo price parser

2. Push the Docker image to Azure Container Registry (ACR) using a low-cost storage option.

Microsoft Azure

Search resources, services, and docs (G+)

100 %

Сбросить

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YAKUBYSYHN.ORG

Home >

### Create container registry

Azure Container Registry allows you to build, store, and manage container images and artifacts in a private registry for all types of container deployments. Use Azure container registries with your existing container development and deployment pipelines. Use Azure Container Registry Tasks to build container images in Azure on-demand, or automate builds triggered by source code updates, updates to a container's base image, or timers. [Learn more](#)

**Project details**

Subscription \*

Resource group \*  [Create new](#)

**Instance details**

Registry name \*  ☒ .azurecr.io

Location \*

Use availability zones ☐ Availability zones are activated on premium registries and in regions that support availability zones. [Learn more](#)

Pricing plan \*

[Review + create](#) [< Previous](#) [Next: Networking >](#)



[Home](#) >



## Create container registry ...



Running final validation

[Basics](#)   [Networking](#)   [Encryption](#)   [Tags](#)   [Review + create](#)

### Registry details

#### Basics

|                    |                    |
|--------------------|--------------------|
| Registry name      | anatoliiyakubyshyn |
| Subscription       | Azure for Students |
| Resource Group     | Sample             |
| Location           | Poland Central     |
| Availability zones | Disabled           |
| Pricing plan       | Basic              |

#### Networking

|                       |     |
|-----------------------|-----|
| Public network access | Yes |
|-----------------------|-----|

#### Encryption

|                      |          |
|----------------------|----------|
| Customer-Managed Key | Disabled |
| Identity             | None     |
| Key Vault            | None     |
| Encryption key       | None     |
| Version              | None     |

```

PS D:\Azure\task4\ButterAndBread-main\rest> docker build . -t silpoparser
[+] Building 166.1s (9/9) FINISHED                                docker:desktop-linux
-> [internal] load build definition from Dockerfile
-> => transferring dockerfile: 317B
-> [internal] load metadata for docker.io/library/adoptopenjdk:11-jre-hotspot-focal@sha256:eac1c6cff5fded2dd35fc94bb23e7862a08277bd71f9b352a99df5bc740459c3
-> [internal] load .dockerignore
-> => transferring context: 2B
-> [1/4] FROM docker.io/library/adoptopenjdk:11-jre-hotspot-focal@sha256:eac1c6cff5fded2dd35fc94bb23e7862a08277bd71f9b352a99df5bc740459c3
-> => resolve docker.io/library/adoptopenjdk:11-jre-hotspot-focal@sha256:eac1c6cff5fded2dd35fc94bb23e7862a08277bd71f9b352a99df5bc740459c3
-> => sha256:eac1c6cff5fded2dd35fc94bb23e7862a08277bd71f9b352a99df5bc740459c3 953B / 953B
-> => sha256:2c57fb3bc67b729194ef8e9542c2c8b66da35e790584faca402273f084e5193b 4.72kB / 4.72kB
-> => sha256:f3ef4ff62e0da0ef761ec1c8a578f3035bef51043e53ae1b13a20b3e03726d17 28.57MB / 28.57MB
-> => sha256:706b9b9c1c443d1cd3d83fa6ecf9e3a4ae13b711dcc6b3aa34e9603c1cb8a930 16.03MB / 16.03MB
-> => sha256:76205aac4d5a82ee8fb973ad9341726fd98259a7c0aed9e47c173ae3a194931f 43.16MB / 43.16MB
-> => extracting sha256:f3ef4ff62e0da0ef761ec1c8a578f3035bef51043e53ae1b13a20b3e03726d17
-> => extracting sha256:706b9b9c1c443d1cd3d83fa6ecf9e3a4ae13b711dcc6b3aa34e9603c1cb8a930
-> => extracting sha256:76205aac4d5a82ee8fb973ad9341726fd98259a7c0aed9e47c173ae3a194931f
-> [internal] load build context
-> => transferring context: 50.93MB
-> [2/4] RUN apt update
-> [3/4] RUN apt-get install firefox -y
-> [4/4] COPY target/back-end-0.0.1-SNAPSHOT.jar back.jar
-> exporting to image
-> exporting layers
-> => writing image sha256:862936a21937574fa2a412d276ad672ba1c0cbdec9d3575bf415dfc69e466694
-> => naming to docker.io/library/silpoparser

```

View build details: [docker-desktop://dashboard/build/desktop-linux/desktop-linux/kjcklsgcx8yxprqrInjy68v7](https://dashboard/build/desktop-linux/desktop-linux/kjcklsgcx8yxprqrInjy68v7)

#### What's next:

View a summary of image vulnerabilities and recommendations → [docker scout quickview](#)

## Then installed azure cli

```

PS C:\Users\Anatoly> az login --tenant be098e76-f2f0-41f0-8292-f151f67b6729
Select the account you want to log in with. For more information on login with Azure CLI, see https://go.microsoft.com/fwlink/?linkid=2271136

Retrieving subscriptions for the selection...

[Tenant and subscription selection]

No      Subscription name      Subscription ID      Tenant
-----
[1] *   Azure for Students   3a612e70-8e22-4425-b3ea-29f6acf32428   be098e76-f2f0-41f0-8292-f151f67b6729

The default is marked with an *; the default tenant is 'be098e76-f2f0-41f0-8292-f151f67b6729' and subscription is 'Azure for Students' (3a612e70-8e22-4425-b3ea-29f6acf32428).

Select a subscription and tenant (Type a number or Enter for no changes):

Tenant: be098e76-f2f0-41f0-8292-f151f67b6729
Subscription: Azure for Students (3a612e70-8e22-4425-b3ea-29f6acf32428)

[Announcements]
With the new Azure CLI login experience, you can select the subscription you want to use more easily. Learn more about it and its configuration at https://go.microsoft.com/fwlink/?linkid=2271236

If you encounter any problem, please open an issue at https://aka.ms/azclibug

[Warning] The login output has been updated. Please be aware that it no longer displays the full list of available subscriptions by default.

```

```

PS C:\Users\Anatoly> az acr login --name anatoliiyakubyshyn.azurecr.io
The login server endpoint suffix '.azurecr.io' is automatically omitted.
Login Succeeded
PS C:\Users\Anatoly> docker push anatoliiyakubyshyn.azurecr.io/silpoparser
Using default tag: latest
The push refers to repository [anatoliiyakubyshyn.azurecr.io/silpoparser]
92c863acf07a: Pushed
488882c9d87e: Pushed
07b79d4282a0: Pushed
83b767b06655: Pushed
14fbd8039ba4: Pushed
da55b45d310b: Pushed
latest: digest: sha256:29e38ac4f0ccf908d42177eb67ede0e628c110d3af453563a5ecbf931cb42d34 size: 1590
PS C:\Users\Anatoly>

```

```

PS C:\Users\Anatoly> docker tag silpoparser anatoliiyakubyshyn.azurecr.io/silpoparser
PS C:\Users\Anatoly>

```

```

PS C:\Users\Anatoly> az acr login --name anatoliiyakubyshyn.azurecr.io
The login server endpoint suffix '.azurecr.io' is automatically omitted.
Login Succeeded
PS C:\Users\Anatoly> docker push anatoliiyakubyshyn.azurecr.io/silpoparser
Using default tag: latest
The push refers to repository [anatoliiyakubyshyn.azurecr.io/silpoparser]
92c863acf07a: Pushed
488882c9d87e: Pushed
07b79d4282a0: Pushed
83b767b06655: Pushed
14fbd8039ba4: Pushed
da55b45d310b: Pushed
latest: digest: sha256:29e38ac4f0ccf908d42177eb67ede0e628c110d3af453563a5ecbf931cb42d34 size: 1590
PS C:\Users\Anatoly>

```

### 3. Use a lightweight ACI instance (e.g., B1s) to deploy the Docker container from ACR.

Microsoft Azure

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anatoliiyakubyshyn | Access keys

Container registry

Search

Registry name: anatoliiyakubyshyn

Login server: anatoliiyakubyshyn.azurecr.io

Admin user: [x]

### Enabled admin user

Microsoft Azure

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Export

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Home > Container instances

### Create container instance

Basics Networking Monitoring Advanced Tags Review & create

Azure Container Instances (ACI) allows you to quickly and easily run containers on Azure without managing servers or having to learn new tools. ACI offers pay-per-second billing to minimize the cost of running containers on the cloud. [Learn more about Azure Container Instances](#)

Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Project details

Subscription: Azure for Students

Resource group: Example

Container details

Container name: silpoparser

Region: Europe Poland Central

Availability zones (Preview): None

SKU: Standard

Image source

Container Images

Azure Container Registry

Other registry

Run with Azure Spot discount

Spot containers are not available in the selected region. [Learn more](#)

Registry: anatoliiyakubyshyn

Image tag: latest

OS type: Linux

Size: 1 vcpu, 1.5 GB memory (B1s)

Change size

Review & create

Next: Networking

Give feedback

Microsoft Azure

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Home > Container instances >

Create container instance

Basics Networking Monitoring Advanced Tags Review + create

Choose between three networking options for your container instance:

Networking type

☒ Public ☐ Private ☐ None

DNS name label

DNS name label scope reuse

Any reuse (unsecure)

Ports

| Ports | Ports protocol |
|-------|----------------|
| 8080  | TCP            |
|       |                |

Review + create

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Next : Monitoring >

Give feedback

Microsoft Azure

Search resources, services, and docs (G+)

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Home > Container instances >

Create container instance

Basics Networking Monitoring Advanced Tags Review + create

Configure monitoring options for your container instance.

Insights

Enable container instance logs

Microsoft Azure

Search resources, services, and docs (G+)

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Home > Container instances >

Create container instance

Basics Networking Monitoring Advanced Tags Review + create

Configure additional container properties and variables.

Restart policy

On failure

Environment variables

| Mark as secure | Key | Value |
|----------------|-----|-------|
| No             |     |       |

Command override

[ ]

Example: [ "/bin/bash", "-c", "echo hello; sleep 100000" ]

Key management

☒ Microsoft-managed keys (MMK)  
☐ Customer-managed keys (CMK)

Customer managed keys require a service principal to grant permissions to ACI. Learn how to add the ACI service principal to your tenant.

Basics

Networking

Monitoring

Advanced

Tags

Review + create

Basics

|                             |   |
|-----------------------------|---|
| Subscription                | Azure for Students                              |
| Resource group              | Sample  |
| Region                      | Poland Central                                  |
| Container name              | silpo-service                                   |
| SKU                         | Standard  |
| Image type                  | Private   |
| Image registry login server | anatoliyakubysbyn.azurecr.io                    |
| Image                       | anatoliyakubysbyn.azurecr.io/silpoparser:latest |
| Image registry user name    | anatoliyakubysbyn                               |
| OS type                     | Linux   |
| Memory (GiB)                | 1.5   |
| Number of CPU cores         | 1   |
| GPU type (preview)          | None  |
| GPU count                   | 0   |

Networking

|                            |                      |
|----------------------------|----------------------|
| Networking type            | Public               |
| Ports                      | 8080 (TCP)           |
| DNS name label scope reuse | Any reuse (unsecure) |

Monitoring

|                                |     |
|--------------------------------|-----|
| Enable container instance logs | Off |
|--------------------------------|-----|

Advanced

|                  |            |
|------------------|------------|
| Restart policy   | On failure |
| Command override | [ ]        |

Tags

(none)

Create

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Download a template for automation

4. Verify the deployment by accessing the web application via the public IP address provided by ACI.

At first, I fixed bug in code.

And pushed again to the ACR

Restarted container instance

Microsoft Azure

Search resources, services, and docs (5+)

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Home > Container instances >

### Create container instance

Basics **Networking** Monitoring Advanced Tags Review + create

Choose between three networking options for your container instance:

Networking type: ☒ Public ☐ Private ☐ None

DNS name label:

DNS name label scope reuse:

Ports:

| Ports                             | Ports protocol                   |
|-----------------------------------|----------------------------------|
| <input type="text" value="8080"/> | <input type="text" value="TCP"/> |
| <input type="text"/>              | <input type="text"/>             |

creating ACI again

Microsoft Azure

Search resources, services, and docs (5+)

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Home > Container instances >

### Create container instance

Basics Networking **Monitoring** Advanced Tags Review + create

Configure monitoring options for your container instance.

Insights

Enable container instance logs: ☒

Subscription for your workspace:

Log Analytics workspace:

[Create new](#)

enabled logs this time and DNS name

← → ↻ Не захищено silpo-server.bzhhdphgejdzevh3.polandcentral.azurecontainer.io:8080/хил6

{ "price": "9.00 грн" }

← → ↻ Не захищено silpo-server.bzhhdphgejdzevh3.polandcentral.azurecontainer.io:8080/молоко

{ "price": "61.99 грн" }

5. Remove the ACI container after verifying the deployment to stop billing.

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## Notifications

[More events in the activity log →](#) [Dismiss all](#)

- Successfully deleted container instances**  
Successfully deleted the container instances in container group 'silpo-server'.  
a few seconds ago
- Deployment succeeded**

## Practical Task 2: Configure Environment Variables in ACI via Azure Portal

```
dockerfile / ...  
# Use official Node.js image  
FROM node:18  
  
# Set working directory  
WORKDIR /app  
  
# Copy package.json and install dependencies  
COPY package.json package-lock.json ./  
RUN npm install  
  
# Copy app files  
COPY main.js .  
  
# Expose port  
EXPOSE 80  
  
# Set default environment variable  
ENV NAME="Docker User"  
  
# Run the app  
CMD ["node", "main.js"]
```

```
const express = require("express");  
const app = express();  
  
const PORT = process.env.PORT || 80;  
const NAME = process.env.NAME || "World";  
  
app.get("/", (req, res) => {  
  res.send(`Hello, ${NAME}!`);  
});  
  
app.listen(PORT, () => {  
  console.log(`Server running on port ${PORT}`);  
});
```

```
PS D:\Azure\task4\app2> docker build -t hellonode .  
[+] Building 154.9s (10/10) FINISHED  
-> [internal] load build definition from Dockerfile  
-> => transferring dockerfile: 397B  
-> [internal] load metadata for docker.io/library/node:18  
-> [internal] load .dockerignore  
-> => transferring context: 2B  
-> [1/5] FROM docker.io/library/node:18@sha256:720e00a325b3da50e108ba34dde0fd69feeb3c59485199c5e22b0ea49a792aa5  
-> => resolve docker.io/library/node:18@sha256:720e00a325b3da50e108ba34dde0fd69feeb3c59485199c5e22b0ea49a792aa5  
-> => sha256:2880d96377d4a21f8684ebf7c3549a7b2c07ca93ee1c3196cf862861e97930c1 2.49kB / 2.49kB  
-> => sha256:c0d22c846dfba5c68261e7acaea5596f6a12a32802ed0645254e31e5bb9297d5 6.39kB / 6.39kB  
-> => sha256:1000000000000000000000000000000000000000000000000000000000000000 0.00kB / 0.00kB
```

```
PS C:\Users\Anatoly> docker tag hellonode anatoliiyakubysyn.azurecr.io/hellonode  
PS C:\Users\Anatoly> docker push anatoliiyakubysyn.azurecr.io/hellonode  
Using default tag: latest  
The push refers to repository [anatoliiyakubysyn.azurecr.io/hellonode]  
74362c881faa: Pushed  
fd975ca59459: Pushed  
231ea03fb497: Pushed  
b41cddd76f7: Pushed  
207fd040c49e: Pushed  
0149b9feb6a3: Pushed  
7e517a081f3d: Pushed  
d3244fce0fd3: Pushed  
ebad64620a59: Pushed  
F379f6005525: Pushed  
0e5c23e041ee: Pushed  
397f1b2e2505: Pushed  
latest: digest: sha256:6fac5f5995f4a73dd95bd1e437bdfdf763639b67f62a26745f16cde5380af824 size: 2836  
PS C:\Users\Anatoly>
```



Create container instance

- Basics
- Networking
- Monitoring
- Advanced
- Tags
- Review + create

Azure Container Instances (ACI) allows you to quickly and easily run containers on Azure without managing servers or having to learn new tools. ACI offers per-second billing to minimize the cost of running containers on the cloud.

[Learn more about Azure Container Instances](#)

Project details

Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription 

Azure for Students

Resource group 

Sample

Create new

Container details

Container name 

hello-node

Region 

(Europe) Poland Central

Availability zones (Preview) 

None

SKU 

Standard

Standard SKU is available for all regions. Confidential SKU is only available for specific regions. [Learn more](#)

Image source 

☐ Quickstart images

☒ Azure Container Registry

☐ Other registry

Run with Azure Spot discount 

☐

Spot containers are not available in the selected region. [Learn more](#)

Registry 

anatoliyakubysghyn

If you do not see your Azure Container Registry, ensure you have been assigned the Reader Role for the Azure Container Registry or select an Azure Container Registry in a different subscription. [Learn more](#)

Image 

hellonode

Image tag 

latest

OS type

Linux

Size 

1 vcpu, 1.5 GiB memory, 0 gpus

[Change size](#)

Create container instance

- Basics
- Networking
- Monitoring
- Advanced
- Tags
- Review + create

Choose between three networking options for your container instance:

Networking type 

☒ Public

☐ Private

☐ None

DNS name label 

hello-node

DNS name label scope reuse 

Tenant

Ports 

| Ports       | Ports protocol |
|-------------|----------------|
| 80          | TCP            |
| <div></div> | <div></div>    |

Home > Container instances >

Create container instance

×

Basics

Networking

Monitoring

Advanced

Tags

Review + create

Configure additional container properties and variables.

Restart policy ⓘ

On failure

Environment variables

| Mark as secure | Key  | Value |
|----------------|------|-------|
| No             | NAME | Tolia |
| No             |      |       |

Command override ⓘ

[ ]

Example: [ "/bin/bash", "-c", "echo hello; sleep 100000" ]

Key management ⓘ

☒ Microsoft-managed keys (MMK)

☐ Customer-managed keys (CMK)

Review + create

< Previous

Next: Tags >

Give feedback

Hello, Tolia!

### Practical Task 3: Scale Out with Azure Container Instances via Azure Portal

*I suppose here it is a typo -> Azure Container Instances -> **Azure Container Apps***

Microsoft Azure

Search resources, services, and docs (G+)

[Home](#) > [Container Apps](#) >

## Create Container app ...

Basics

Container

Ingress

Tags

Review + create

Create a containerized app and run it on a serverless platform—without managing cloud infrastructure.[Quickstart guide](#)

### Project details

Select a subscription to manage resource creation and costs, and a resource group to organize all your resources for this deployment.

Subscription \*

Azure for Students

Resource group \*

Sample

[Create new resource group](#)

Container app name \*

hellonode

Deployment source \*

☒ Container image

Bring your own container registry or build a container from a Dockerfile.

☐ Source code or artifact

Build and deploy your code without using a Dockerfile.

### Container Apps Environment

An environment is a secure boundary around a group of container apps. [Container Apps Pricing](#)

Show environments in all regions ⓘ

☐

Region \*

Poland Central

Container Apps Environment \*

(new) managedEnvironment-Sample-8677 (Sample)

[Create new environment](#)

Review + create

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Microsoft Azure

Search resources, services, and docs (G+)

Home > Container Apps >

Create Container app

Basics

Container

Ingress

Tags

Review + create

Select a quickstart image for your container, or deselect quickstart image to use an existing container.

Use quickstart image☐

Container details

Name \*

hellonode

Image source

☒ Azure Container Registry

☐ Docker Hub or other registries

Subscription \*

Azure for Students

Registry \*

anatoliyakubysyn.azurecr.io

Image \*

hellonode

Image tag \*

latest

Command override ⓘ

Example: /bin/bash

Arguments override ⓘ

Example: -c, while true; do echo hello; sleep 10; done

Development stack-specific features

When you select a specific development stack, you get additional features tailored to that stack—optimizing Container Apps to perform for your unique settings.

Development stack

Generic

Container resource allocation

Choose the workload profile for this app. You can adjust the CPU and memory allocation for this app up to the workload profile limit. [Learn more](#)

Workload profile \*

Consumption - Up to 4 vCPUs, 8 GiB memory

CPU and memory \*

0.5 CPU cores, 1 GiB memory

Environment variables

| Name                                    | Value                                    | Delete |
|---|--|--------|
| <input type="text" value="Enter name"/> | <input type="text" value="Enter value"/> |        |

Microsoft Azure

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Home > Container Apps >

Create Container app

Basics

Container

Ingress

Tags

Review + create

Application ingress settings

Enable ingress for applications that need an HTTP or TCP endpoint.

Ingress ⓘ

☒ Enabled

Ingress traffic

☐ Limited to Container Apps Environment

Select this option if you want to restrict traffic to this container app from within the Container App Environment.

☒ Accepting traffic from anywhere

Select this option if you want to allow traffic to this container app from anywhere.

Ingress type ⓘ

☒ HTTP

☐ TCP

Transport

Auto

Insecure connections

☐ Allowed

Target port ⓘ

80

Session affinity ⓘ

☐ Enabled

^ Additional TCP ports

Microsoft Azure

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9/24/2023 10:51 AM

Home > Microsoft.App-ContainerApp-Portal-8499702c-88ea | Overview > hellonode

hellonode | Scale

Container App

Search

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Overview

Activity log

Access control (IAM)

Tags

Diagnose and solve problems

Application

Revisions and replicas

Containers

Scale

Volumes

Settings

Monitoring

Automation

Help

Based on revision hellonode--ye051qv

Scale

Scale rule settings

Control automatic scaling by setting the range of application replicas that'll be deployed in response to a trigger event. Use scale rules to determine the type of events that trigger scaling. [Learn more](#)

Min replicas 10 Min: 0

Max replicas 10 Max: 1000

Cooldown period 300

Polling interval 30

Current number of replicas 1 (View Details)

Scale rules

Search

+ Add

| Name ↑      | Type ↑       | Del... |
|-------------|--------------|--------|
| http-scaler | HTTP scaling |        |

Refresh Send us your feedback

Based on revision hellonode--ye051qv

Scale

Scale rule settings

Control automatic scaling by setting the range of application replicas that'll be deployed in response to a trigger event. Use scale rules to determine the type of events that trigger scaling. [Learn more](#)

Min replicas 1 Min: 0

Max replicas 3 Max: 1000

Cooldown period 300

Polling interval 30

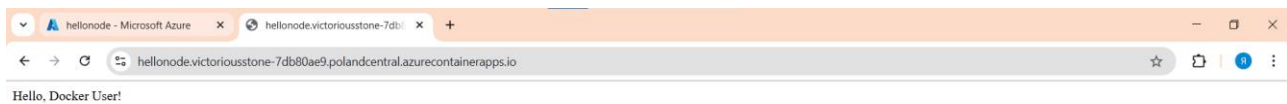
Current number of replicas 1 (View Details)

Scale rules

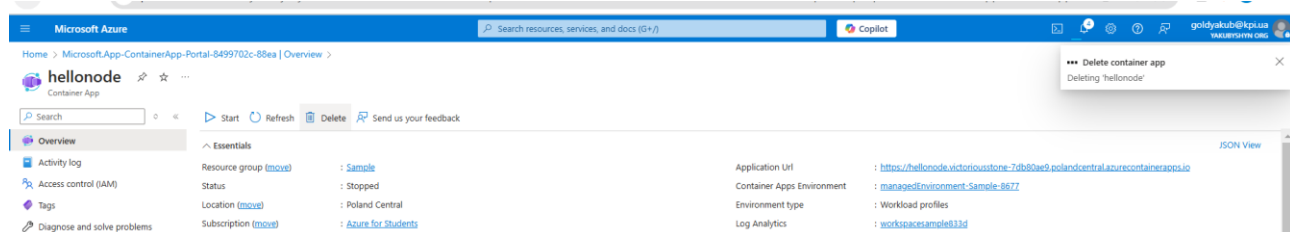
Search

+ Add

| Name ↑      | Type ↑       | Del... |
|-------------|--------------|--------|
| http-scaler | HTTP scaling |        |



(Default parameter for name)



## Practical Task 4: Secure a Docker Container in ACI with Managed Identity via Azure Portal

Microsoft Azure

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Create container instance

BasicsNetworkingMonitoringAdvancedTagsReview + create

Azure Container Instances (ACI) allows you to quickly and easily run containers on Azure without managing servers or having to learn new tools. ACI offers per-second billing to minimize the cost of running containers on the cloud.  
[Learn more about Azure Container Instances](#)

**Project details**

Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription

Azure for Students

Resource group

Sample

Create new

**Container details**

Container name

sample

Region

(Europe) Poland Central

Availability zones (Preview)

None

SKU

Standard

Standard SKU is available for all regions. Confidential SKU is only available for specific regions. [Learn more](#)

Image source

☐ Quickstart images

☒ Azure Container Registry

☐ Other registry

Run with Azure Spot discount

☐

Spot containers are not available in the selected region. [Learn more](#)

Registry

anatoliyakubshyn

If you do not see your Azure Container Registry, ensure you have been assigned the Reader Role for the Azure Container Registry or select an Azure Container Registry in a different subscription. [Learn more](#)

Image

hellonode

Image tag

latest

OS type

Linux

Size

1 vcpu, 1.5 GiB memory, 0 gpus

[Change size](#)

# Create container instance

Validation passed

Basics Networking Monitoring Advanced Tags Review + create

### Basics

|                             |   |
|-----------------------------|---|
| Subscription                | Azure for Students                            |
| Resource group              | Sample  |
| Region                      | Poland Central                                |
| Container name              | sample  |
| SKU                         | Standard                                      |
| Image type                  | Private                                       |
| Image registry login server | anatoliyakubyshyn.azurecr.io                  |
| Image                       | anatoliyakubyshyn.azurecr.io/hellonode:latest |
| Image registry user name    | anatoliyakubyshyn                             |
| OS type                     | Linux   |
| Memory (GiB)                | 1.5   |
| Number of CPU cores         | 1   |
| GPU type (preview)          | None  |
| GPU count                   | 0   |

### Networking

|                            |          |
|----------------------------|----------|
| Networking type            | Public   |
| Ports                      | 80 (TCP) |
| DNS name label             | sample   |
| DNS name label scope reuse | Tenant   |

### Monitoring

|                                |                     |
|--------------------------------|---------------------|
| Enable container instance logs | On                  |
| Monitoring workspace           | workspacesample833d |

### Advanced

|                  |            |
|------------------|------------|
| Restart policy   | On failure |
| Command override | [ ]        |

### Tags

(none)

## sample | Identity

Container instances

- Access control (IAM)
- Tags
- Settings
  - Containers
  - Identity**
  - Properties
  - Locks
- Monitoring

System assigned (preview) User assigned (preview)

A system assigned managed identity is restricted to one per resource and is tied to the lifecycle of this resource. You can grant permissions to the managed identity by using Azure role-based access control (Azure RBAC). The managed identity is authenticated with Microsoft Entra ID, so you don't have to store any credentials in code.

Save Discard Refresh Got feedback?

Status ⓘ

Off On

System assigned (preview) User assigned (preview)

A system assigned managed identity is restricted to one per resource and is tied to the lifecycle of this resource. You can grant permissions to the managed identity by using Azure role-based access control (Azure RBAC). The managed identity is authenticated with Microsoft Entra ID, so you don't have to store any credentials in code.

Save Discard Refresh Got feedback?

Status ⓘ

Off On

Object (principal) ID ⓘ

767211a9-8ff0-4afb-9e1d-c3ba9f686746

Permissions ⓘ

Azure role assignments

Click azure role assignments

Microsoft Azure

Home > Key vaults >

Create a key vault ...

BasicsAccess configurationNetworkingTagsReview + create

Basics

Subscription

Azure for Students

Resource group

Sample

Key vault name

sampleYakub

Region

Poland Central

Pricing tier

Standard

Soft-delete

Enabled

Purge protection during retention period

Disabled

Days to retain deleted vaults

7 days

Access configuration

Azure Virtual Machines for deployment

Disabled

Azure Resource Manager for template deployment

Disabled

Azure Disk Encryption for volume encryption

Disabled

Permission model

Azure role-based access control

Networking

Connectivity method

Private endpoint



Created secret there

Microsoft Azure

Home > sample | Identity >

Azure role assignments

+ Add role assignment (Preview) Refresh

If this identity has role assignments that you don't have permission to read, they won't be shown in the list. [Learn more](#)

Subscription \*  
Azure for Students

Role Resource Name Resource Type

No role assignments found for the selected subscription.

Add role assignment (Preview)

Scope

Subscription

Resource

Role

[Learn more about RBAC](#)

Microsoft Azure

Home > sample

sample | Containers

Container instances

Search Refresh Give feedback

Overview Activity log Access control (IAM) Tags Settings Containers Identity Properties Locks Monitoring Metrics

1 container and 0 init containers

| Name   | Image  | State   | Previous state | Start time               | Restart count |
|--------|--|---------|----------------|--------------------------|---------------|
| sample | anatoliyakub@phyn.azurecr.io/hello-node:latest | Running | -              | 2025-02-01T17:38:20.478Z | 0             |

Events Properties Logs Connect

```
root@SandboxHost-638740282885690993:/app#
```

```
root@SandboxHost-638740282885690993:/app# az
bash: az: command not found
root@SandboxHost-638740282885690993:/app# ls
main.js node_modules package-lock.json package.json
root@SandboxHost-638740282885690993:/app# curl -sL https://aka.ms/InstallAzureCLIDeb | sudo bash
bash: sudo: command not found
root@SandboxHost-638740282885690993:/app# curl -sL https://aka.ms/InstallAzureCLIDeb | bash
Get:1 http://deb.debian.org/debian bookworm InRelease [151 kB]
```

```
root@SandboxHost-638740282885690993:/app# az version
{
  "azure-cli": "2.68.0",
  "azure-cli-core": "2.68.0",
  "azure-cli-telemetry": "1.1.0",
  "extensions": {}
}
```

```
}
root@SandboxHost-638740282885690993:/app# az login --identity
[
  {
    "environmentName": "AzureCloud",
    "homeTenantId": "be098e76-f2f0-41f0-8292-f151f67b6729",
    "id": "3a612e70-8e22-4425-b3ea-29f6acf32428",
    "isDefault": true,
    "managedByTenants": [],
    "name": "Azure for Students",
    "state": "Enabled",
    "tenantId": "be098e76-f2f0-41f0-8292-f151f67b6729",
    "user": {
      "assignedIdentityInfo": "MSI",
      "name": "systemAssignedIdentity",
      "type": "servicePrincipal"
    }
  }
]
```

ting

Microsoft Azure

Home > sample | Identity >

### Azure role assignments

+ Add role assignment (Preview) Refresh

If this identity has role assignments that you don't have permission to read, they won't be shown in the list. [Learn more](#)

Subscription \*  
Azure for Students

| Role   | Resource Name | Resource Type |
|--------|---------------|---------------|
| Reader | sampleYakub   | Key vault     |

#### Add role assignment (Preview)

Scope

Key Vault

Subscription  
Azure for Students

Resource

sampleYakub

Role

Key Vault Reader

[Learn more about RBAC](#)

|                        |             |           |        |      |
|------------------------|-------------|-----------|--------|------|
| Key Vault Secrets User | sampleYakub | Key vault | sample | None |
|------------------------|-------------|-----------|--------|------|

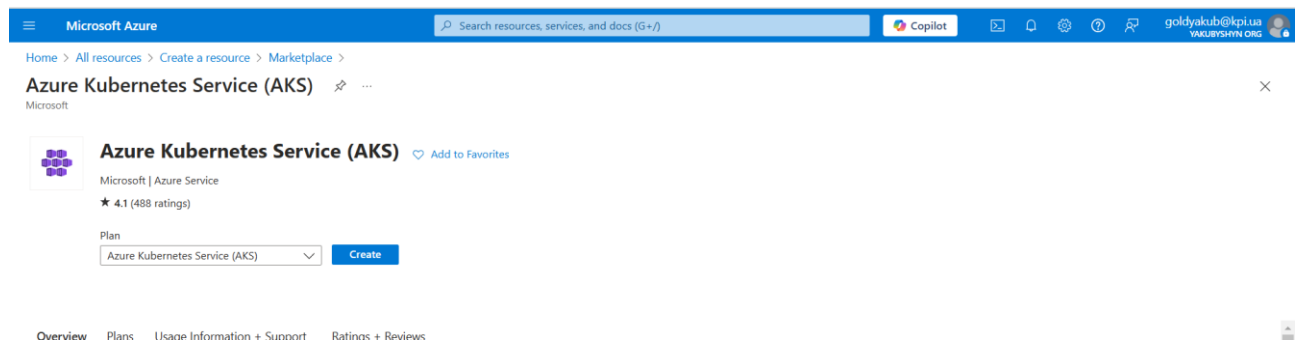
finally, have found needed RBAC role

```
USER      TTY      FROM            LOGIN@      IDLE        JCPU      PCPU      WHAT
root@SandboxHost-638740282885690993:/app# az login --identity
[
  {
    "environmentName": "AzureCloud",
    "homeTenantId": "be098e76-f2f0-41f0-8292-f151f67b6729",
    "id": "3a612e70-8e22-4425-b3ea-29f6acf32428",
    "isDefault": true,
    "managedByTenants": [],
    "name": "Azure for Students",
    "state": "Enabled",
    "tenantId": "be098e76-f2f0-41f0-8292-f151f67b6729",
    "user": {
      "assignedIdentityInfo": "MSI",
      "name": "systemAssignedIdentity",
      "type": "servicePrincipal"
    }
  }
]
root@SandboxHost-638740282885690993:/app# az keyvault secret show --name "secret" --vault-name "sampleYakub" --query "value" -o tsv
secret
root@SandboxHost-638740282885690993:/app#
```

Deleted container instance

## Practical Task 5: Deploy a Kubernetes Cluster with AKS via Azure Portal

1. Create an Azure Kubernetes Service (AKS) cluster with the smallest VM size (e.g., B2s) and the minimum number of nodes (e.g., 1–2).



Microsoft Azure

Search resources, services, and docs (G+)

Copilot

goldyakub@kpi.ua  
YAKUBYSKYI.ORG

Home > All resources > Create a resource > Marketplace >

### Azure Kubernetes Service (AKS)

Microsoft | Azure Service

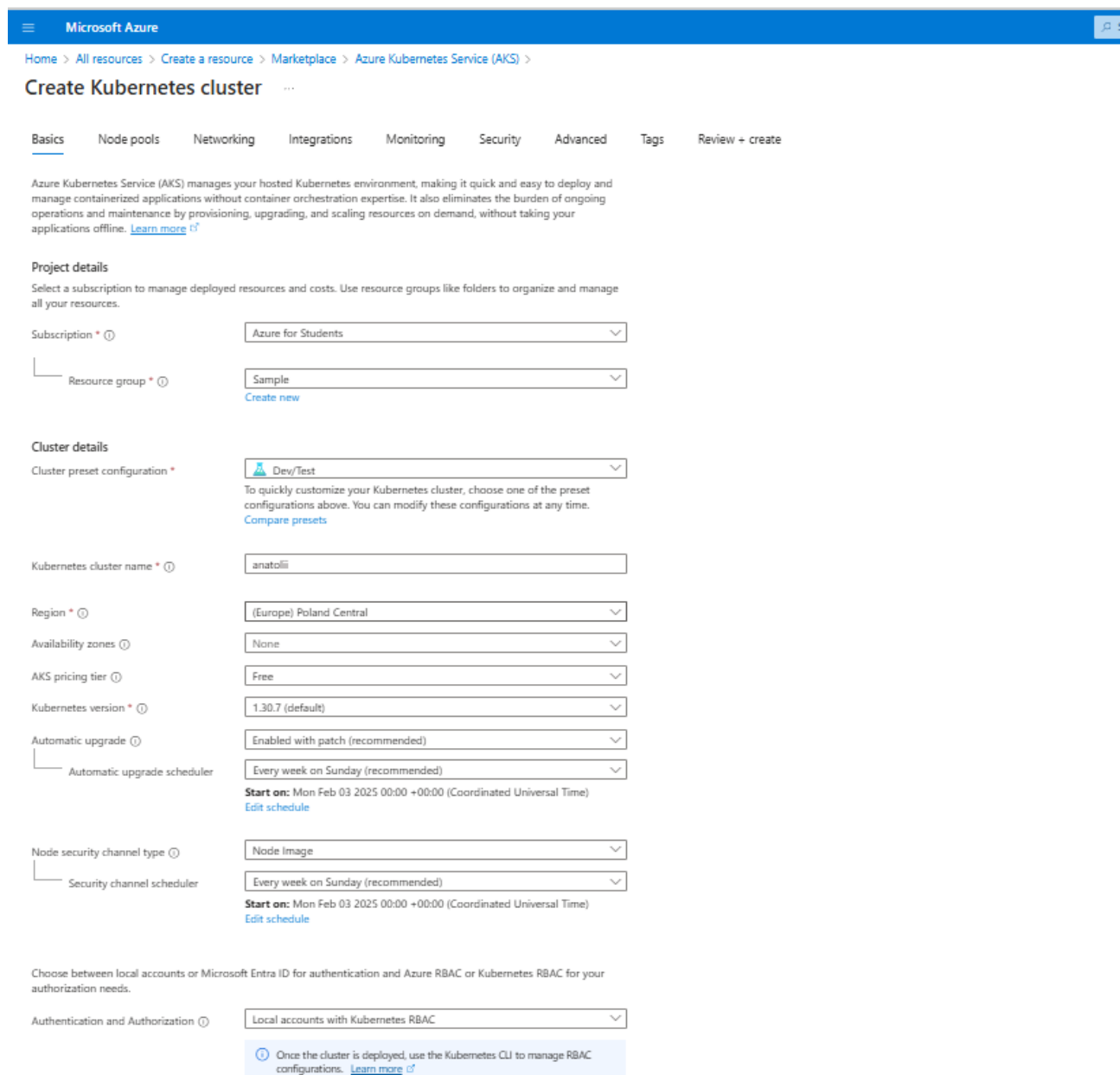
★ 4.1 (488 ratings)

Plan

Azure Kubernetes Service (AKS)

Create

Overview Plans Usage Information + Support Ratings + Reviews



Microsoft Azure

Home > All resources > Create a resource > Marketplace > Azure Kubernetes Service (AKS) >

## Create Kubernetes cluster

Basics Node pools Networking Integrations Monitoring Security Advanced Tags Review + create

Azure Kubernetes Service (AKS) manages your hosted Kubernetes environment, making it quick and easy to deploy and manage containerized applications without container orchestration expertise. It also eliminates the burden of ongoing operations and maintenance by provisioning, upgrading, and scaling resources on demand, without taking your applications offline. [Learn more](#)

### Project details

Select a subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription \* Azure for Students

Resource group \* Sample  
[Create new](#)

### Cluster details

Cluster preset configuration \* Dev/Test

To quickly customize your Kubernetes cluster, choose one of the preset configurations above. You can modify these configurations at any time. [Compare presets](#)

Kubernetes cluster name \* anatoli

Region \* (Europe) Poland Central

Availability zones None

AKS pricing tier Free

Kubernetes version \* 1.30.7 (default)

Automatic upgrade \* Enabled with patch (recommended)

Automatic upgrade scheduler Every week on Sunday (recommended)  
Start on: Mon Feb 03 2025 00:00 +00:00 (Coordinated Universal Time)  
[Edit schedule](#)

Node security channel type \* Node Image

Security channel scheduler Every week on Sunday (recommended)  
Start on: Mon Feb 03 2025 00:00 +00:00 (Coordinated Universal Time)  
[Edit schedule](#)

Choose between local accounts or Microsoft Entra ID for authentication and Azure RBAC or Kubernetes RBAC for your authorization needs.

Authentication and Authorization \* Local accounts with Kubernetes RBAC

Once the cluster is deployed, use the Kubernetes CLI to manage RBAC configurations. [Learn more](#)

Create Kubernetes cluster

- Basics
- Node pools**
- Networking
- Integrations
- Monitoring
- Security
- Advanced
- Tags
- Review + create

Node pools

In addition to the required primary node pool configured on the Basics tab, you can also add optional node pools to handle a variety of workloads [Learn more](#)

+ Add node pool

🗑 Delete

| <input type="checkbox"/> | Name      | Mode   | Node size             | OS SKU | Node count | Availat |
|--------------------------|-----------|--------|-----------------------|--------|------------|---------|
| <input type="checkbox"/> | agentpool | System | Standard_DS2_v2 (...) | Ubuntu | 2 - 5      | None    |
| <input type="checkbox"/> | anatolii  | User   | Standard_B2s (cha...  | Ubuntu | 1 - 2      | None    |

ⓘ

 B-series node sizes are not recommended for node pools due to inconsistent resource availability.

Enable virtual nodes

Virtual nodes allow burstable scaling backed by serverless Azure Container Instances. [Learn more](#)

Enable virtual nodes ⓘ

☐

Node pool OS disk encryption

By default, all disks in AKS are encrypted at rest with Microsoft-managed keys. For additional control over encryption, you can supply your own keys using a disk encryption set backed by an Azure Key Vault. The disk encryption set will be used to encrypt the OS disks for all node pools in the cluster. [Learn more](#)

Encryption type

(Default) Encryption at-rest with a platform-managed key

Create Kubernetes cluster

...

- Basics

Node pools

Networking

Integrations

Monitoring

Security

Advanced

Tags

Review + create

View automation template

Basics

|                             |                                    |
|-----------------------------|------------------------------------|
| Subscription                | Azure for Students                 |
| Resource group              | Sample                             |
| Region                      | Poland Central                     |
| Kubernetes cluster name     | anatolii                           |
| Kubernetes version          | 1.30.7                             |
| Automatic upgrade           | patch                              |
| Automatic upgrade scheduler | Every week on Sunday (recommended) |
| Node security channel type  | NodeImage                          |
| Security channel scheduler  | Every week on Sunday (recommended) |

Node pools

|                      |          |
|----------------------|----------|
| Node pools           | 2        |
| Enable virtual nodes | Disabled |

Access

|                                  |  |
|----------------------------------|--|
| Resource identity                | System-assigned managed identity                         |
| Local accounts                   | Enabled  |
| Authentication and Authorization | Local accounts with Kubernetes RBAC                      |
| Encryption type                  | (Default) Encryption at-rest with a platform-managed key |

Networking

|                       |                   |
|-----------------------|-------------------|
| Private cluster       | Disabled          |
| Authorized IP ranges  | Disabled          |
| Network configuration | Azure CNI Overlay |
| DNS name prefix       | anatolii-dns      |
| Network policy        | None              |
| Load balancer         | Standard          |

Integrations

|                    |          |
|--------------------|----------|
| Container registry | None     |
| Service mesh       | Disabled |
| Azure Policy       | Disabled |

Monitoring

|                           |          |
|---------------------------|----------|
| Enable Container Logs     | Disabled |
| Enable Prometheus metrics | Disabled |
| Enable Grafana            | Disabled |
| Alert rules               | 2 rules  |

Advanced

|                               |                                  |
|-------------------------------|----------------------------------|
| Infrastructure resource group | MC_Sample_anatolii_polandcentral |
|-------------------------------|----------------------------------|

Feedback

|                               |                                  |
|-------------------------------|----------------------------------|
| Enable Grafana                | Disabled                         |
| Alert rules                   | 2 rules                          |
| <b>Advanced</b>               |                                  |
| Infrastructure resource group | MC_Sample_anatolii_polandcentral |
| <b>Security</b>               |                                  |
| Microsoft Defender for Cloud  | Free                             |
| OpenID Connect (OIDC)         | Enabled                          |
| Workload Identity             | Enabled                          |
| Image Cleaner                 | Enabled                          |
| <b>Tags</b>                   |                                  |
| None                          |                                  |

Previous Next Create

## 2. Connect to the AKS cluster using Azure Cloud Shell with kubectl.

The screenshot shows the Microsoft Azure portal interface. On the left, the 'anatolii' AKS cluster is selected under 'Kubernetes services'. The 'Properties' tab is active, displaying details like 'Encryption type' (Encryption at-rest with a platform-managed key) and 'Node pools' (2 node pools). On the right, the 'Connect to anatolii' dialog box is open, showing the 'Cloud shell' tab. It provides instructions on how to connect to the cluster using kubectl and lists sample commands like 'az aks get-credentials' and 'kubectl get deployments'.

### Click open cloudshell

```
Switch to PowerShell Restart Manage files New session Editor Web preview Settings Help
Requesting a Cloud Shell.Succeeded.
Connecting terminal...

Welcome to Azure Cloud Shell

Type "az" to use Azure CLI
Type "help" to learn about Cloud Shell

Your Cloud Shell session will be ephemeral so no files or system changes will persist beyond your current session.
goldyakub [ ~ ]$ az account set --subscription 3a612e70-8e22-4425-b3ea-29f6acf32428
goldyakub [ ~ ]$ az aks get-credentials --resource-group Sample --name anatolii --overwrite-existing
Merged "anatolii" as current context in /home/goldyakub/.kube/config
goldyakub [ ~ ]$
```

## 3. Deploy a lightweight Nginx application for verification

```
Merged "anatolii" as current context in /home/goldyakub/.kube/config
goldyakub [ ~ ]$ kubectl apply -f https://k8s.io/examples/controllers/nginx-deployment.yaml
```

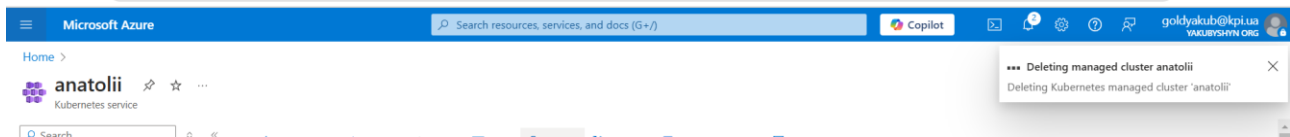
```
goldyakub [ ~ ]$ kubectl get deployments
NAME                READY   UP-TO-DATE   AVAILABLE   AGE
nginx-deployment    3/3     3             3           3m44s
goldyakub [ ~ ]$
```

```

merged 'anatolii' as current context in /home/goldyakub/.kube/config
goldyakub [ ~ ]$ kubectl apply -f https://k8s.io/examples/controllers/nginx-deployment.yaml
deployment.apps/nginx-deployment created
goldyakub [ ~ ]$

```

4. Delete the AKS cluster immediately after testing to avoid additional VM and cluster costs.



## Practical Task 6: Deploy a Containerized Application on AKS

### Requirements:

1. Build a lightweight Docker image for a simple web application (e.g., a Node.js app with minimal dependencies) and push it to Azure Container Registry (ACR).
2. Reuse the AKS cluster from Task 5 to deploy the application using a Kubernetes deployment and service manifest file.
3. Test the application for a limited time and remove the deployment afterward.

```

1  apiVersion: apps/v1
2  kind: Deployment
3  metadata:
4    name: hello-node
5    labels:
6      app: hello-node
7  spec:
8    replicas: 3
9    selector:
10     matchLabels:
11       app: hello-node
12  template:
13    metadata:
14      labels:
15        app: hello-node
16    spec:
17      imagePullSecrets:
18        - name: acr-secret
19      containers:
20        - name: hello-node
21          image: anatoliiyakubyshyn.azurecr.io/hellonode:latest
22          ports:
23            - containerPort: 80
24
25  ---

```

```

22  ---
23  apiVersion: v1
24  kind: Service
25  metadata:
26    name: hello-node-service
27  spec:
28    type: NodePort
29    selector:
30      app: hello-node
31    ports:
32      - protocol: TCP
33        port: 80
34        targetPort: 80
35        nodePort: 30000
36
37
38

```

```

goldyakub [ ~ ]$ code
goldyakub [ ~ ]$ ls
hello-node-deployment.yaml
goldyakub [ ~ ]$ kubectl apply -f hello-node-deployment.yaml
deployment.apps/hello-node created
The Service "hello-node-service" is invalid: spec.ports[0].nodePort: Forbidden: may not be used when `type` is 'ClusterIP'
goldyakub [ ~ ]$ kubectl apply -f hello-node-deployment.yaml
deployment.apps/hello-node unchanged
The Service "hello-node-service" is invalid: spec.ports[0].nodePort: Invalid value: 80: provided port is not in the valid range. The range of valid ports is 30000-32767
goldyakub [ ~ ]$ kubectl apply -f hello-node-deployment.yaml
deployment.apps/hello-node unchanged
service/hello-node-service created
goldyakub [ ~ ]$

```

Executed this command:

```
PS C:\Users\Anatoly> az aks update -n anatolii -g sample --attach-acr anatoliiyakubyslyn
```

To fix this issue

```

goldyakub [ ~ ]$ kubectl get pods
NAME                                READY   STATUS             RESTARTS   AGE
hello-node-57575f4c7-2l8qh          0/1     ImagePullBackOff   0           25m
hello-node-57575f4c7-b8qmk          0/1     ImagePullBackOff   0           25m
hello-node-57575f4c7-lpcvr          0/1     ImagePullBackOff   0           25m
hello-node-5c9b86c4c4-qnx7s7        0/1     ImagePullBackOff   0           7m36s
goldyakub [ ~ ]$

```

Then:

```

goldyakub [ ~ ]$ kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
hello-node-5c9b86c4c4-dxdzr        1/1     Running   0           3m4s
hello-node-5c9b86c4c4-qnx7s7        1/1     Running   0           13m
hello-node-5c9b86c4c4-rlkqp        1/1     Running   0           3m3s
goldyakub [ ~ ]$

```

Changed type of Service:

```

---
apiVersion: v1
kind: Service
metadata:
  name: hello-node-service
spec:
  type: LoadBalancer
  selector:
    app: hello-node
  ports:
    - protocol: TCP
      port: 80
      targetPort: 80

```



3. Test the application for a limited time and remove the deployment afterward.



## Practical Task 7: Configure and Use ConfigMaps and Secrets in AKS

1. Create a ConfigMap to store non-sensitive configuration data with only the required keyvalue pairs for the application

Modified app to use 2 env variables

```
const express = require("express");
const app = express();

const PORT = process.env.PORT || 80;
const NAME = process.env.NAME || "World";

app.get("/", (req, res) => {
  res.send(`Hello, ${NAME} ${process.env.SURNAME}!`);
});

app.listen(PORT, () => {
  console.log(`Server running on port ${PORT}`);
});
```

```
Dockerfile > ...
# Use official Node.js image
FROM node:18

# Set working directory
WORKDIR /app

# Copy package.json and install dependencies
COPY package.json package-lock.json ./
RUN npm install

# Copy app files
COPY main.js .

# Expose port
EXPOSE 80

# Set default environment variable
ENV NAME="Docker"

ENV SURNAME="USER"

# Run the app
CMD ["node", "main.js"]
```

```

PS C:\Users\Anatoly>
PS C:\Users\Anatoly> docker images
REPOSITORY                                TAG                IMAGE ID           CREATED           SIZE
hellonamesurname                         latest            ff8f967b47f1      24 seconds ago   1.09GB
hellonode                               latest            9ad024ed8dc8      22 hours ago     1.09GB
anatoliyakubysyshyn.azurecr.io/hellonod latest            9ad024ed8dc8      22 hours ago     1.09GB
anatoliyakubysyshyn.azurecr.io/hellonode latest            9ad024ed8dc8      22 hours ago     1.09GB
anatoliyakubysyshyn.azurecr.io/hellonode <none>            b6b651fba471      22 hours ago     1.09GB
anatoliyakubysyshyn.azurecr.io/hellonode <none>            06f9a1fbf684      22 hours ago     1.09GB
anatoliyakubysyshyn.azurecr.io/silpoparser latest            7fb2d558b269      24 hours ago     792MB
silpoparser                             latest            369222a50bc4      24 hours ago     792MB
<none>                                  <none>           b2b8bdab32cf      24 hours ago     792MB
<none>                                  <none>           a73acbc15237      24 hours ago     792MB
<none>                                  <none>           5e1dcd4e560f      24 hours ago     792MB
anatoliyakubysyshyn.azurecr.io/silpoparser <none>           862936a21937      25 hours ago     792MB
tomcat                                  latest            9a15eef1e849      3 weeks ago      479MB
mcr.microsoft.com/mssql/server          2022-latest      142124bf195c      2 months ago     1.59GB
PS C:\Users\Anatoly> docker tag hellonamesurname anatoliyakubysyshyn.azurecr.io/hellonamesurname
PS C:\Users\Anatoly> docker push anatoliyakubysyshyn.azurecr.io/hellonamesurname
Using default tag: latest
The push refers to repository [anatoliyakubysyshyn.azurecr.io/hellonamesurname]
2546c74264e3: Pushed
fd975ca59459: Mounted from hellonode
231ea03fb497: Mounted from hellonode
b41cddd76f7: Mounted from hellonode
207fd040c49e: Mounted from hellonode
0149b9feb6a3: Mounted from hellonode
7e517a081f3d: Mounted from hellonode
d3244fce0fd3: Mounted from hellonode
ebad64620a59: Mounted from hellonode
f379f6005525: Mounted from hellonode
0e5c23e041ee: Mounted from hellonode
397f1b2e2505: Mounted from hellonode
latest: digest: sha256:b2be08cd9cda1bc044783277e91d8cc4b4a5202a67df0af536447a7e9ee5a30b size: 2836
PS C:\Users\Anatoly>

```

2. Create a Kubernetes Secret to store sensitive data (e.g., API keys) with the least amount of information needed.

3. Update the application deployment to use the ConfigMap and Secrets

```

/home/colia/.ndshlogin file.
tolia@M515U: /mnt/d/Azure/task4/task7$ echo -n 'Yakubysyshyn' | base64
WwFrWJ5c2h5bg==
tolia@M515U: /mnt/d/Azure/task4/task7$

```

```

io.k8s.api.core.v1.Secret (v1@secret.json)
apiVersion: v1
kind: Secret
metadata:
  name: app-surname
type: Opaque
data:
  SURNAME: WwFrWJ5c2h5bg==

```

```

io.k8s.api.core.v1.ConfigMap (v1@configmap.json)
apiVersion: v1
kind: ConfigMap
✓ metadata:
  name: app-name
✓ data:
  NAME: Anatolii

```

```
io.k8s.api.apps.v1.Deployment (v1@deployment.json)
apiVersion: apps/v1
kind: Deployment
metadata:
  name: hello-name-surname
spec:
  selector:
    matchLabels:
      app: hello-name-surname
  template:
    metadata:
      labels:
        app: hello-name-surname
    spec:
      containers:
        - name: hello-name-surname
          image: anatoliyakubyshyn.azurecr.io/hellonamesurname
          resources:
            limits:
              memory: "128Mi"
              cpu: "500m"
          ports:
            - containerPort: 80
          env:
            - name: NAME
              valueFrom:
                configMapKeyRef:
                  name: app-name
                  key: NAME
            - name: SURNAME
              valueFrom:
                secretKeyRef:
                  name: app-surname
                  key: SURNAME
```

```
! helo-name-surname-deployment.yaml ! service.yaml X ! secrets.yaml ! configmap.yaml
! service.yaml > {} spec > [ ] ports > {} 0
io.k8s.api.core.v1.Service (v1@service.json)
1  apiVersion: v1
2  kind: Service
3  metadata:
4    name: hello-name-surname
5  spec:
6    type: LoadBalancer
7    selector:
8      app: hello-name-surname
9    ports:
10     - port: 80
11       targetPort: 80
12
```

← → ↻ Не захищено 74.248.104.171 ☆ 🗄 📄 9 ⋮

Hello, Anatolii Yakubyshtyn!

#### 4. Remove the ConfigMap, Secret, and deployment after testing.

```
goldyakub [ ~ ]$ kubectl get deploy -A
NAMESPACE   NAME                                     READY   UP-TO-DATE   AVAILABLE   AGE
default     hello-name-surname                     1/1     1            1           6m49s
kube-system  azure-wi-webhook-controller-manager    2/2     2            2           33m
kube-system  coredns                                2/2     2            2           34m
kube-system  coredns-autoscaler                     1/1     1            1           34m
kube-system  eraser-controller-manager              1/1     1            1           33m
kube-system  konnectivity-agent                     2/2     2            2           34m
kube-system  metrics-server                          2/2     2            2           34m
goldyakub [ ~ ]$ kubectl delete deploy hello-name-surname
deployment.apps "hello-name-surname" deleted
goldyakub [ ~ ]$ kubectl delete secret app-surname
secret "app-surname" deleted
goldyakub [ ~ ]$ kubectl delete configmap app-name
configmap "app-name" deleted
```

## Practical Task 8: Scale Applications in AKS

### 1. Deploy a stateless application to the AKS cluster using minimal resource specifications.

Microsoft Azure

Home > Kubernetes services >

## Create Kubernetes cluster

BasicsNode poolsNetworkingIntegrationsMonitoringSecurityAdvancedTagsReview + create

Azure Kubernetes Service (AKS) manages your hosted Kubernetes environment, making it quick and easy to deploy and manage containerized applications without container orchestration expertise. It also eliminates the burden of ongoing operations and maintenance by provisioning, upgrading, and scaling resources on demand, without taking your applications offline. [Learn more](#)

### Project details

Select a subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription \*

Azure for Students

Resource group \*

Sample

[Create new](#)

### Cluster details

Cluster preset configuration \*

Dev/Test

To quickly customize your Kubernetes cluster, choose one of the preset configurations above. You can modify these configurations at any time.  
[Compare presets](#)

Kubernetes cluster name \*

anatolii

Region \*

(Europe) Poland Central

Availability zones

None

AKS pricing tier

Free

Kubernetes version \*

1.30.7 (default)

Automatic upgrade

Enabled with patch (recommended)

Automatic upgrade scheduler

Every week on Sunday (recommended)

Start on: Mon Feb 03 2025 00:00 +00:00 (Coordinated Universal Time)  
[Edit schedule](#)

Node security channel type

Node Image

Security channel scheduler

Every week on Sunday (recommended)

Start on: Mon Feb 03 2025 00:00 +00:00 (Coordinated Universal Time)  
[Edit schedule](#)

Choose between local accounts or Microsoft Entra ID for authentication and Azure RBAC or Kubernetes RBAC for your authorization needs.

Authentication and Authorization

Local accounts with Kubernetes RBAC

Once the cluster is deployed, use the Kubernetes CLI to manage RBAC configurations. [Learn more](#)

## Add a node pool

anatoli

Node pool name \* ⓘ

Mode \* ⓘ ☒ User ☐ System

OS SKU \* ⓘ ☐ Azure Linux ☒ Ubuntu Linux ☐ Windows 2022 ☐ Windows 2019

Availability zones ⓘ

Enable Azure Spot instances ⓘ ☐

Node size \* ⓘ 

Standard B2s  
2 vcpus, 4 GiB memory  
[Choose a size](#)

Scale method ⓘ ☒ Manual ☐ Autoscale - **Recommended**  
☒ This option is recommended so that the cluster is automatically sized correctly for the current running workloads.

Node count \* ⓘ

### Optional settings

Max pods per node \* ⓘ  10 - 250

Enable public IP per node ⓘ ☐

### Labels

Labels are key/value pairs that can be used to categorize or add identifying information to Kubernetes resources such as nodes. Labels for the node pool will be applied to each node in the node pool. [Learn more](#)

| Key                  | Value                |
|----------------------|----------------------|
| <input type="text"/> | <input type="text"/> |

### Taints

Taints are tuples that are used in conjunction with tolerations to determine which pods can be scheduled on which nodes. In order for a pod to be scheduled to a node, it must tolerate all of the taints applied to that node. Taints for the node pool will be applied to each node in the node pool. [Learn more](#)

| Key                  | Value                | Effect                                  |
|----------------------|----------------------|---|
| <input type="text"/> | <input type="text"/> | <input type="text" value="NoSchedule"/> |

Microsoft Azure

Home > Kubernetes services >

## Create Kubernetes cluster

Basics Node pools Networking **Integrations** Monitoring Security Advanced Tags Review + create

Connect your AKS cluster with additional services.

**Azure Container Registry**  
Connect your cluster to an Azure Container Registry to enable seamless deployments from a private image registry. [Learn more](#)

Container registry: anatoliyakubyshtyn [Create new](#)

**Service mesh - Istio**  
Enable Istio to configure traffic management, maximize observability capabilities and reinforce service-to-service security measures without changing the application code. [Learn more](#)

Enable Istio ☐

**Azure Policy**  
Apply at-scale enforcements and safeguards for AKS clusters in a centralized, consistent manner through Azure Policy. [Learn more](#)

Azure Policy ☐ Enabled ☒ Disabled  
 Azure policy is recommended for dev/test configuration.

Previous Next **Review + create**

[Give feedback](#)

deployed the app from previous task

2. Use the `kubectl scale` command to manually scale the application to only 2–3 replicas for testing.

```
kubernetes ClusterIP 10.0.0.1 <none> 443/TCP 21m
goldyakub [ ~ ]$ kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
hello-name-surname-88f866cb5-kqcf8 1/1     Running   0           6m59s
goldyakub [ ~ ]$ kubectl scale --replicas=3 -f hello-name-surname-deployment.yaml
deployment.apps/hello-name-surname scaled
goldyakub [ ~ ]$ kubectl get pods
NAME                                READY   STATUS             RESTARTS   AGE
hello-name-surname-88f866cb5-bcctq 1/1     Running            0           4s
hello-name-surname-88f866cb5-kqcf8 1/1     Running            0          8m40s
hello-name-surname-88f866cb5-tngnx 0/1     ContainerCreating  0           4s
goldyakub [ ~ ]$ kubectl get pods
NAME                                READY   STATUS             RESTARTS   AGE
hello-name-surname-88f866cb5-bcctq 1/1     Running            0          11s
hello-name-surname-88f866cb5-kqcf8 1/1     Running            0          8m47s
hello-name-surname-88f866cb5-tngnx 0/1     ContainerCreating  0          11s
goldyakub [ ~ ]$ kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
hello-name-surname-88f866cb5-bcctq 1/1     Running   0          24s
hello-name-surname-88f866cb5-kqcf8 1/1     Running   0           9m
hello-name-surname-88f866cb5-tngnx 1/1     Running   0          24s
goldyakub [ ~ ]$
```

3. Set up Horizontal Pod Autoscaler (HPA) with reasonable CPU usage thresholds to minimize pod creation.

```
apiVersion: autoscaling/v2
kind: HorizontalPodAutoscaler
metadata:
  name: hello-name-surname
spec:
  scaleTargetRef:
    apiVersion: apps/v1
    kind: Deployment
    name: hello-name-surname
  minReplicas: 1
  maxReplicas: 5
  metrics:
  - type: Resource
    resource:
      name: cpu
      target:
        type: Utilization
        averageUtilization: 40
```

```

goldyakub [ ~ ]$ nano hpa.yaml
goldyakub [ ~ ]$ kubectl apply -f hpa.yaml
horizontalpodautoscaler.autoscaling/hello-name-surname created
goldyakub [ ~ ]$

```

4. Simulate load on the application for a short duration and remove the deployment after observing the scaling behavior.

After apply:

```

goldyakub [ ~ ]$ kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
hello-name-surname-88f866cb5-tngnx 1/1     Running   0           14m
goldyakub [ ~ ]$

```

```

apiVersion: autoscaling/v2
kind: HorizontalPodAutoscaler
metadata:
  name: hello-name-surname
spec:
  scaleTargetRef:
    apiVersion: apps/v1
    kind: Deployment
    name: hello-name-surname
  minReplicas: 1
  maxReplicas: 5
  metrics:
  - type: Resource
    resource:
      name: cpu
      target:
        type: Utilization
        averageUtilization: 5

```

```

goldyakub [ ~ ]$ kubectl top pods
NAME                                CPU(cores)   MEMORY(bytes)
hello-name-surname-88f866cb5-tngnx 1m           39Mi
goldyakub [ ~ ]$ kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
hello-name-surname-88f866cb5-tngnx 1/1     Running   0           26m

```

After running 'ddos.py':

```

goldyakub [ ~ ]$ kubectl top pods
NAME                                CPU(cores)   MEMORY(bytes)
hello-name-surname-88f866cb5-tngnx 28m          36Mi
goldyakub [ ~ ]$ kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
hello-name-surname-88f866cb5-tm972 1/1     Running   0           14s
hello-name-surname-88f866cb5-tngnx 1/1     Running   0           27m
goldyakub [ ~ ]$

```



```

ddos.py > ...
1 import subprocess
2 from concurrent.futures import ThreadPoolExecutor
3
4 # Function to run curl command
5 def run_curl(url):
6     for i in range(10):
7         result = subprocess.run(['curl', '-o', '/dev/null', '-s', url], capture_output=True, text=True)
8         result = subprocess.run(['curl', '-o', '/dev/null', '-s', url], capture_output=True, text=True)
9         result = subprocess.run(['curl', '-o', '/dev/null', '-s', url], capture_output=True, text=True)
10        result = subprocess.run(['curl', '-o', '/dev/null', '-s', url], capture_output=True, text=True)
11        result = subprocess.run(['curl', '-o', '/dev/null', '-s', url], capture_output=True, text=True)
12    result = subprocess.run(['curl', '-o', '/dev/null', '-s', url], capture_output=True, text=True)
13    return result.returncode # Return the status code of the curl request
14
15 # URL to send multiple requests
16 url = 'http://74.248.73.225/'
17
18 # Number of requests to send in parallel
19 num_requests = 1050
20
21 # Using ThreadPoolExecutor to send requests in parallel
22 with ThreadPoolExecutor() as executor:
23     results = executor.map(run_curl, [url] * num_requests)
24
25 # Print results for each request
26 for i, result in enumerate(results, 1):
27     print(f"Request {i} completed with exit code {result}")
28

```

deleted deployment:

```

goldyakub [ ~ ]$ ls
configmap.yaml hello-name-surname-deployment.yaml hpa.yaml secrets.yaml service.yaml
goldyakub [ ~ ]$ kubectl delete deploy hello-name-surname
deployment.apps "hello-name-surname" deleted
goldyakub [ ~ ]$ kubectl top pods
NAME                                CPU(cores)   MEMORY(bytes)
hello-name-surname-88f866cb5-2zf8p  1m           17Mi
hello-name-surname-88f866cb5-jkf65  1m           17Mi
hello-name-surname-88f866cb5-tm972  1m           53Mi
hello-name-surname-88f866cb5-tngnx  1m           54Mi
goldyakub [ ~ ]$ kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
hello-name-surname-88f866cb5-2zf8p  1/1     Terminating   0          2m39s
hello-name-surname-88f866cb5-jkf65  1/1     Terminating   0          2m39s
hello-name-surname-88f866cb5-tm972  1/1     Terminating   0          4m39s
hello-name-surname-88f866cb5-tngnx  1/1     Terminating   0          32m
goldyakub [ ~ ]$

```

but before I did it there have been already 4 pods.

## Practical Task 9: Rolling Update of an Application in AKS

1. Deploy a lightweight version of your application to the AKS cluster.



First version of app. (As in the previous task)

2. Update the Docker image to a new version with minimal changes (e.g., color change).
3. Perform a rolling update using kubectl set image with minimal replicas to reduce resource usage.
4. Verify the update process quickly and remove the deployment after the update

```
golddyakub [ ~ ]$ kubectl set image deployment/hello-name-surname hello-name-surname=anatoliiyakubyshtn.azurecr.io/hellonamesurname:latest
deployment.apps/hello-name-surname image updated
golddyakub [ ~ ]$ kubectl rollout history deployment hello-name-surname
deployment.apps/hello-name-surname
REVISION  CHANGE-CAUSE
1          <none>
2          <none>

golddyakub [ ~ ]$ kubectl get svc
NAME                                TYPE                CLUSTER-IP      EXTERNAL-IP      PORT(S)          AGE
hello-name-surname                 LoadBalancer        10.0.244.119     74.248.77.238    80:31699/TCP     19m
kubernetes                          ClusterIP            10.0.0.1         <none>           443/TCP          32m
```

74.248.77.238

Hello, user: Anatolii Yakubyshtn!

## Bonus task.

### GitOps with AKS Requirements:

1. Setup ArgoCD on Azure Kubernetes Services
2. Perform image update on cluster

```
golddyakub [ ~ ]$ kubectl create namespace argocd
namespace/argocd created
golddyakub [ ~ ]$ kubectl apply -n argocd -f https://raw.githubusercontent.com/argoproj/argo-cd/stable/manifests/install.yaml
customresourcedefinition.apiextensions.k8s.io/applications.argoproj.io created
customresourcedefinition.apiextensions.k8s.io/applicationsets.argoproj.io created
customresourcedefinition.apiextensions.k8s.io/appprojects.argoproj.io created
serviceaccount/argocd-application-controller created
networkpolicy.networking.k8s.io/argocd-repo-server-network-policy created
networkpolicy.networking.k8s.io/argocd-server-network-policy created
golddyakub [ ~ ]$ kubectl patch svc argocd-server -n argocd -p '{"spec": {"type": "LoadBalancer"}}'
service/argocd-server patched
golddyakub [ ~ ]$
```

```
golddyakub [ ~ ]$ kubectl get svc -n argocd
NAME                                TYPE                CLUSTER-IP      EXTERNAL-IP      PORT(S)          AGE
argocd-applicationset-controller     ClusterIP            10.0.144.74      <none>           7000/TCP,8080/TCP 88s
argocd-dex-server                    ClusterIP            10.0.110.13      <none>           5556/TCP,5557/TCP,5558/TCP 88s
argocd-metrics                       ClusterIP            10.0.70.189      <none>           8082/TCP          88s
argocd-notifications-controller-metrics ClusterIP            10.0.109.206     <none>           9001/TCP          88s
argocd-redis                         ClusterIP            10.0.238.160     <none>           6379/TCP          88s
argocd-repo-server                   ClusterIP            10.0.189.251     <none>           8081/TCP,8084/TCP 88s
argocd-server                        LoadBalancer        10.0.120.58      74.248.107.33    80:31277/TCP,443:30706/TCP 88s
argocd-server-metrics                ClusterIP            10.0.67.40       <none>           8083/TCP          88s
```

```
golddyakub [ ~ ]$ kubectl -n argocd get secret argocd-initial-admin-secret -o jsonpath='{.data.password}' | base64 -d; echo
golddyakub [ ~ ]$ kubectl -n argocd get secret argocd-initial-admin-secret -o jsonpath='{.data.password}' | base64 -d; echo
```

To retrieve password

## Windows

### Download With PowerShell: Invoke-WebRequest

You can view the latest version of Argo CD at the link above or run the following command to grab the version:

```
$version = (Invoke-RestMethod https://api.github.com/repos/argoproj/argo-cd/releases/latest)
```

Replace `$version` in the command below with the version of Argo CD you would like to download:

```
$url = "https://github.com/argoproj/argo-cd/releases/download/" + $version + "/argocd-windows"
$output = "argocd.exe"

Invoke-WebRequest -Uri $url -OutFile $output
```

Also please note you will probably need to move the file into your PATH. Use following command to add Argo CD into environment variables PATH

```
[Environment]::SetEnvironmentVariable("Path", "$env:Path;C:\Path\To\ArgoCD-CLI", "User")
```

#### Table

Linux

Arch

Homebrew

Docker

Docker

Docker

Docker

Docker

Mac

Docker

Mac

Homebrew

Docker

Windows

Docker

Inv

```
D:\Azure\task4>argocd login 74.248.107.33 --username admin --password EjLVJrlwJibcpVju --insecure
'admin:login' logged in successfully
Context '74.248.107.33' updated
D:\Azure\task4>
```

The screenshot shows the Argo CD web interface. The top part displays the login screen with the text "Let's get stuff deployed!" and a cartoon character. The login form includes fields for Username (admin) and Password (EjLVJrlwJibcpVju), and a "SIGN IN" button. Below the login screen, the "Settings / Repositories" page is visible, featuring a sidebar with navigation links (Applications, Settings, User Info, Documentation) and a main content area with buttons for "CONNECT REPO" and "REFRESH LIST". The "REPOSITORIES" section is also visible on the right.

CONNECTSAVE AS CREDENTIALS TEMPLATECANCEL

CONNECT REPO USING HTTPS

Type

git

Project

default

Repository URL

https://github.com/YakubT/HelloWorldWithAgroCd

Username (optional)

Password (optional)

TLS client certificate (optional)

argo

v2.13.2+dc43124

Applications

Settings

User Info

Documentation

Settings / Repositories

REPOSITORIES

Log out

+ CONNECT REPO

REFRESH LIST

|  | TYPE | NAME | PROJECT | REPOSITORY                                     | CONNECTION STATUS |
|--|------|------|---------|--|-------------------|
|  | git  |      | default | https://github.com/YakubT/HelloWorldWithAgroCd | Successful        |

CREATECANCEL

GENERAL

EDIT AS YAML

Application Name

hello-node

Project Name

default

SYNC POLICY

Automatic

☐ PRUNE RESOURCES

☐ SELF HEAL

☐ SET DELETION FINALIZER

SYNC OPTIONS

☐ SKIP SCHEMA VALIDATION

☐ PRUNE LAST

☐ RESPECT IGNORE DIFFERENCES

☐ AUTO-CREATE NAMESPACE

☐ APPLY OUT OF SYNC ONLY

☐ SERVER-SIDE APPLY

PRUNE PROPAGATION POLICY: foreground

☐ REPLACE

☐ RETRY

CREATECANCEL

EDIT AS YAML

GENERAL

Application Name

hello-node

Project Name

SYNC POLICY

Manual

☐ SET DELETION FINALIZER @

SYNC OPTIONS

☐ SKIP SCHEMA VALIDATION

☐ PRUNE LAST

☐ RESPECT IGNORE DIFFERENCES

☐ AUTO-CREATE NAMESPACE

☐ APPLY OUT OF SYNC ONLY

☐ SERVER-SIDE APPLY

PRUNE PROPAGATION POLICY: foreground

☐ REPLACE ⚠

☐ RETRY

SOURCE

Repository URL

DESTINATION

Cluster URL

https://kubernetes.default.svc

URL ▾

Namespace

Directory ▾

DIRECTORY

DIRECTORY RECURSE

☐

TYPED CLUST ADDS RESOURCES

SOURCE

Repository URL

https://github.com/YakubT/HelloWorldWithArgoCd

GIT ✓

Revision

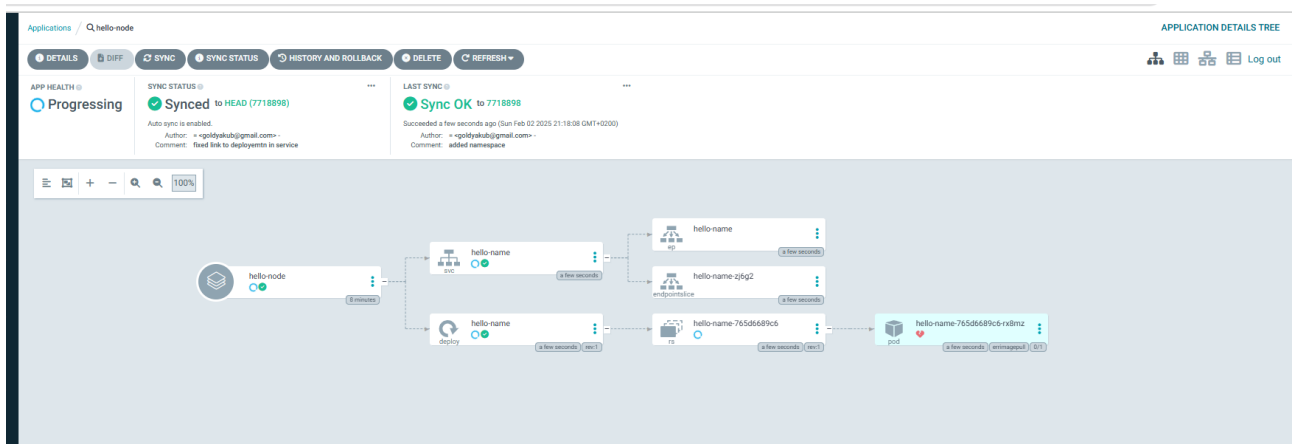
HEAD

Branches ▾

Path

-

DESTINATION



```
goldyakub [ ~ ]$ kubectl get svc
NAME          TYPE          CLUSTER-IP    EXTERNAL-IP    PORT(S)          AGE
hello-name    LoadBalancer 10.0.130.199   74.248.80.33   80:30732/TCP     46s
kubernetes    ClusterIP      10.0.0.1      <none>         443/TCP          41m
goldyakub [ ~ ]$
```

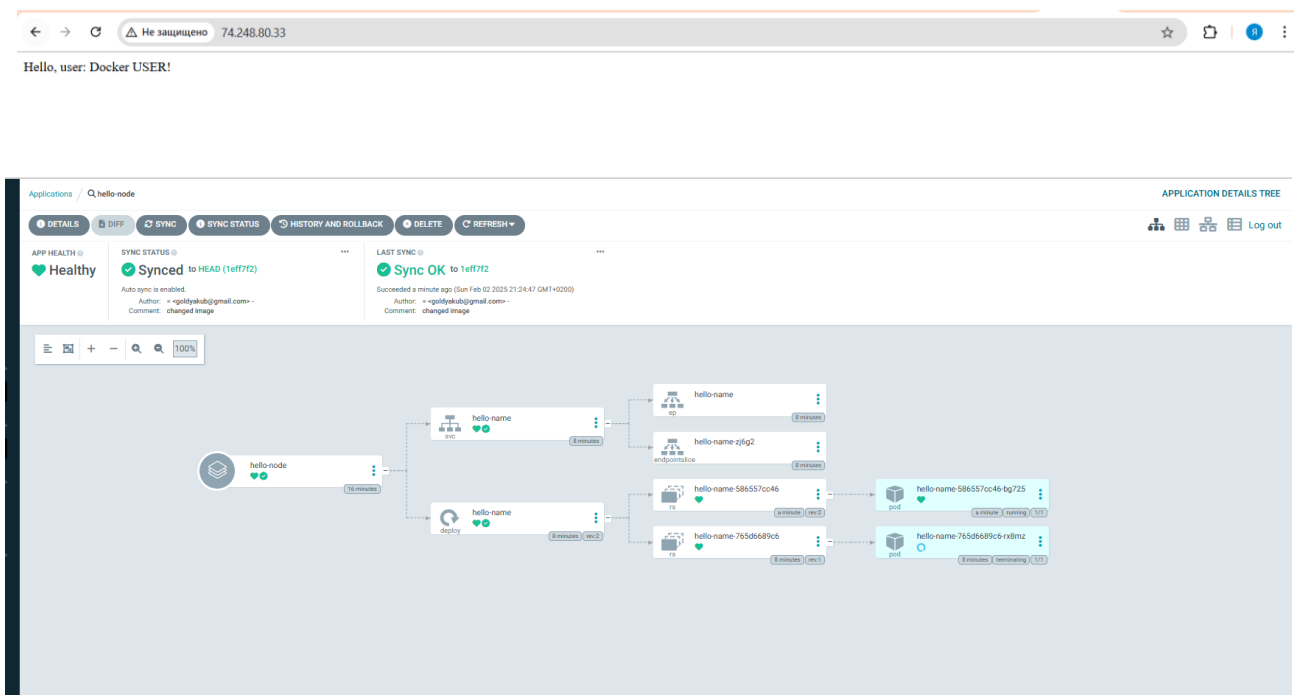
74.248.80.33

Hello, Docker User!

```
io.k8s.api.apps.v1.Deployment (v1@deployment.json)
apiVersion: apps/v1
kind: Deployment
metadata:
  name: hello-name
  namespace: default
spec:
  selector:
    matchLabels:
      app: hello-name
  template:
    metadata:
      labels:
        app: hello-name
    spec:
      containers:
        - name: hello-name
          image: anatoliyakubyshyn.azurecr.io/hellonamesurname
          resources:
            limits:
              memory: "128Mi"
              cpu: "500m"
          ports:
            - containerPort: 80
```

changed image

```
no changes added to commit (use 'git add' and/or 'git commit -a')
PS D:\Azure\task4\agrocd> git add -A
PS D:\Azure\task4\agrocd> git commit -m "changed image"
[main 1eff7f2] changed image
• 1 file changed, 1 insertion(+), 1 deletion(-)
PS D:\Azure\task4\agrocd> git push
Enumerating objects: 5, done.
Counting objects: 100% (5/5), done.
Delta compression using up to 12 threads
Compressing objects: 100% (3/3), done.
Writing objects: 100% (3/3), 331 bytes | 331.00 KiB/s, done.
Total 3 (delta 1), reused 0 (delta 0), pack-reused 0
remote: Resolving deltas: 100% (1/1), completed with 1 local object.
remote: This repository moved. Please use the new location:
remote: https://github.com/YakubT/HelloWorldWithArgoCd.git
To https://github.com/YakubT/HelloWorldWithArgoCd.git
    7718898..1eff7f2  main -> main
PS D:\Azure\task4\agrocd>
```



Deleted ACR and cluster