Runbook

Advanced Development Factory

Version 1.3

Development Security Operations Team
June 21, 2021

SWEN 670 9040 Software Engineering Project (2215) Summer 2021

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Revision History

Author	Date	Reason for Change	Version
Michelle Monfort	06/21/2021	Initial draft	1.0
Rob Wilson	06/27/2021	Build Sections	1.1
Rob Wilson	06/29/2021	Update AKS section and format	1.2
Jeroen Soeurt	06/30/2021	Review, typos, small changes	1.3

Table of Contents

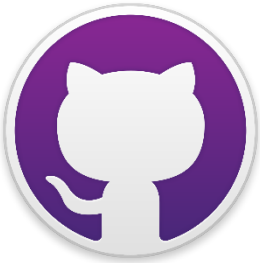
1 Introduction

1.1 Overview

1.1.1 System Components

The components used for the Advanced Development Factory (ADF) range from open source to cloud offerings. The one thing that all of these components have in common is that they are cross-platform in both development of ADF to deployment and consumption by the end user.

1.1.1.1 System Components that will be utilized.



- Docker
- GitHub
- Kubernetes
- Microsoft Azure
- Microsoft Azure DevOps
- Microsoft Teams

- Blazor
- Razor
- SonarCloud

1.2 Infrastructure

1.2.1 The system Infrastructure varies based on development team. The DevSecOps team has provided an general infrastructure via….

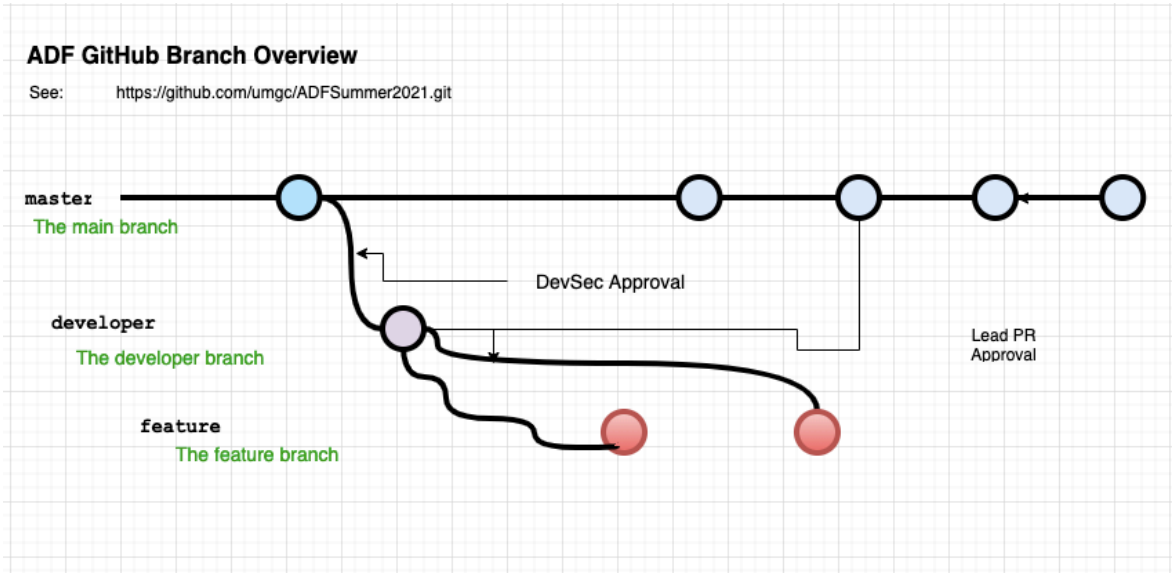
GitHub. GitHub is used to provide repositories, pipelines using GitHub Actions, and pull request review.

GitHub repositories use the Git system; a popular version control system. GitHub Actions allows you to write scripts that are executed when triggered by repository actions. For example, a script can automatically run and analyze the code whenever a new pull request is submitted.

Pull request review is set up so that DevSecOps and the project PM receive a message whenever a new pull request is created. They then are asked to go in, examine the result of the pipeline (for example static code analysis results from SonarCloud), review the changes made, and either approve or deny the request. After this the creator of the pull request is allowed to merge.

2 GitHub

GitHub Branch Overview



2.1 Master Branch: Main Branch of working components that have been previously reviewed and merged to the branch

2.2 Developer Branch: Branch of ideally working components to be reviewed and merged to the main branch

2.3 Feature Branch: Branch for developing features and creating pull request for working components to be reviewed and merged to the developer branch

2.4 GitHub Initial Configuration

Initial GitHub configuration was provided by course mentors, in which case you submit your already established GitHub account and are assigned teams. New GitHub Account can be created at https://github.com for users that do not have a GitHub account

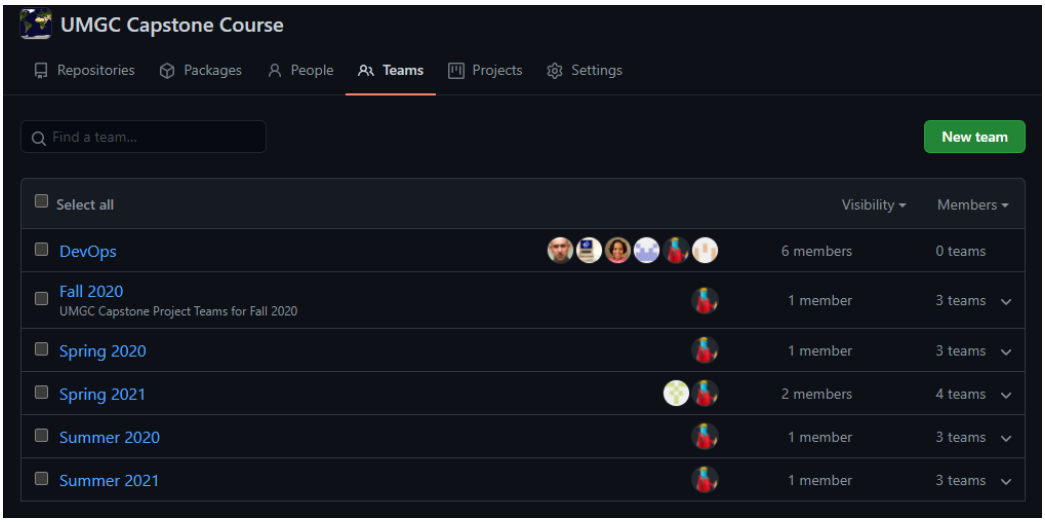
2.5 Creation of Development Teams

2.5.1 Create Team

Using the UMGC service account do the following in order to create desired teams in GitHub. The mentors can provide the DevSecOps team members the UMGC service account credentials. Safe guard and use wisely.

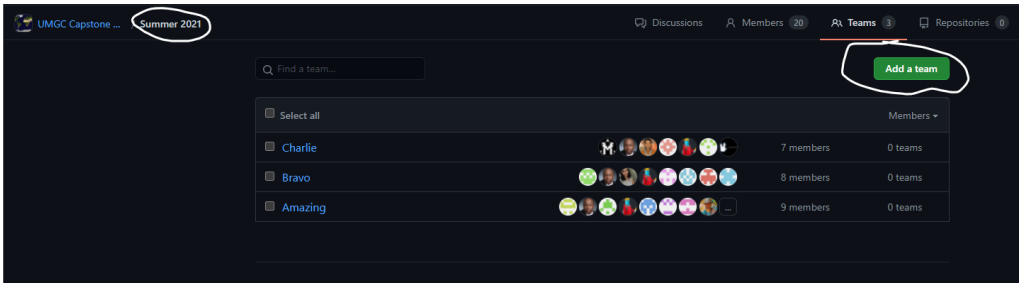
- Go to Profile →
- Your organizations →

- UMGC →
- Teams →
- **Choose team** <team name> (Semester).
    - If the semester is not yet created then click the "New team" green button near the upper right of the page.
    - Enter Team name →
    - Description →



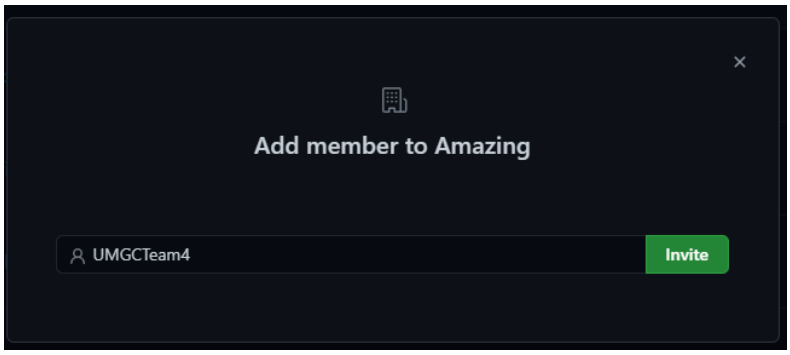
- Choose semester under **Parent team** →
- Create team.

Teams are created for this project.



2.5.2 Add Members to the GitHub team

- Select the desired team to add member →
- Select the "Members" page →
- Add Member →

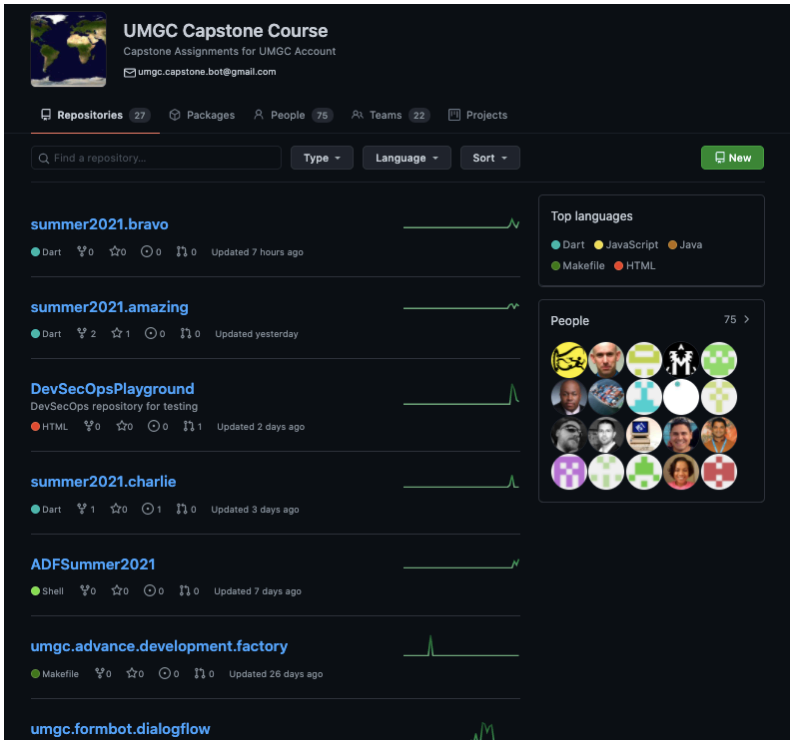


- Invite
- Confirm Invite to this team

2.6 Repository Creation

Login to UMGC SWEN Capstone Course admin GitHub account by means of provided credentials.

- Go to **Profile** →
- Your organizations →
- UMGC →
- New →
- Enter **Repository name** exercising the naming convention **<semester>.<teamname>** →
- Choose **Public** →
- Create repository



2.7 Assign repository to development teams

From the UMGC SWEN Capstone Course admin GitHub account by means of provided credentials.

- Go to **Profile** →
- Your organizations (UMGC) →
- Teams →
- Choose semester →
- Choose team →
- Click Repositories →
- Add repository →
- enter repository name →
- Add repository to team.
- To modify access controls for the repository
    - For DevSecOps team, set the access level to **Admin**
    - For development teams, set the access level to **Write**

3 GitHub Client Installation

Any Git client is capable. However, the specifications in this document will be for the operation of GitHub using the command line or using GitHub Desktop. Commonly used client examples are described below.

Proceed to the following website to view and execute the GitHub command line tools. GitHub CLI is GitHub on the command line. It facilitates Pull Requests, Issues, and Other GitHub concepts in the terminal from your local computer.

https://github.com/cli/cli#installation

3.1.1 MacOS

3.1.1.1 Option using homebrew

- brew install gh

3.1.1.2 Proceed to the following website to view and execute the GitHub Desktop Installation Guide for MacOS (You can install GitHub Desktop on macOS 10.10 or later):

- Please follow the "Install on macOS" section.
- https://central.github.com/deployments/desktop/desktop/latest/darwin

3.1.2 Windows

3.1.2.1 GitHub Desktop install options

- Installer: GitHub Installer

3.1.2.2 Option using WinGet

winget install gh

3.1.3 Linux

Debian based distributions support apt-get and will be used here as an example.

- sudo apt-get install git

RPM based distributions can use yum:

- sudo yum install git

3.2 Initial Configuration

3.2.1 Verify Git Installation.

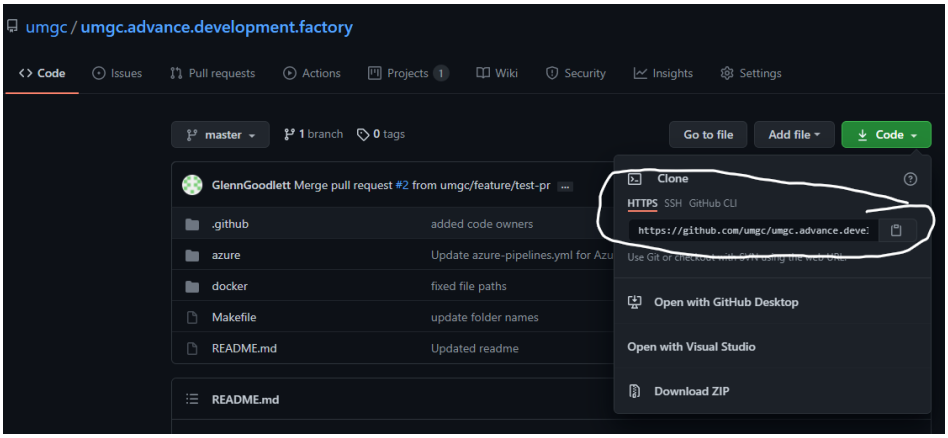
- git –version

3.2.2 Set Git Global Configuration.

- git config --global user.name "<name>"
- git config --global user.email "<email>"

3.2.3 Routine Git Hub Tasks

- Clone the remote repository to local desktop/repository.
  - git clone <repository URL>
    - Location to repository URL
      - Click the green “Code” button
      -



3.2.4 Check out the development branch.

- git checkout <branch name>
- git pull origin develop

3.2.5 Create a new feature branch.

- git checkout -b <feature name>

3.2.6 Publish To Remote

To publish the new branch you created in GitHub and make it accessible for everyone in your team, run the following command:

- git push -u <remote> <branch-name>

3.2.7 Update code, add it, commit and push changes.

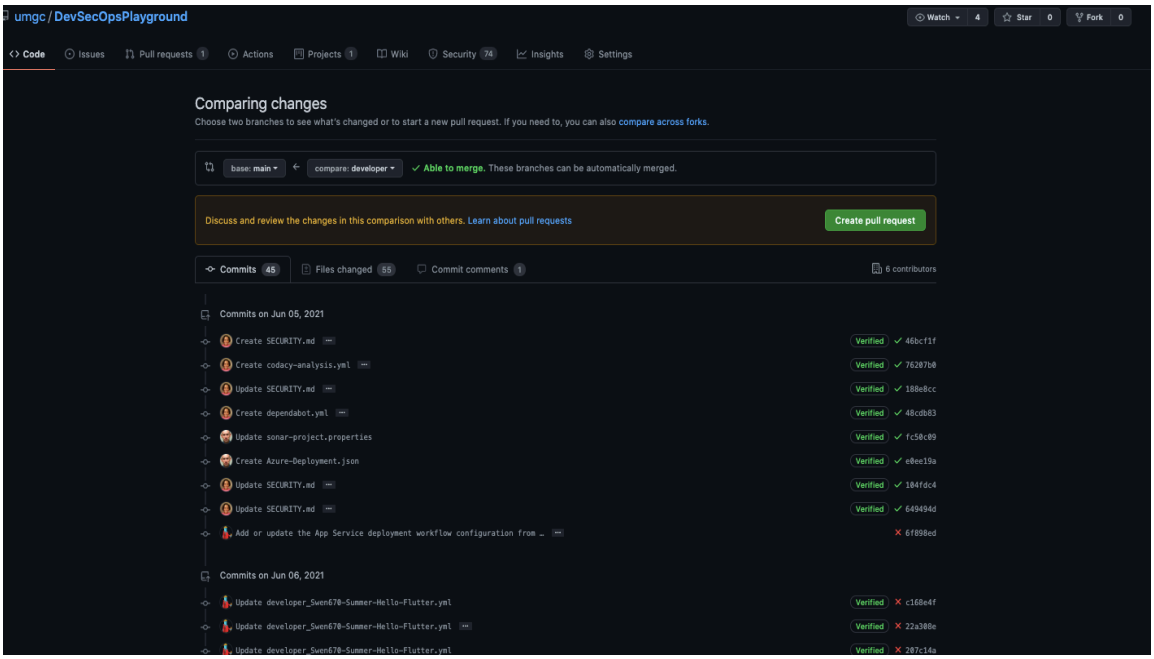
- git status
- git add -A
- git commit -m "<description of the change>"
- git push -u origin <feature name>
- The following naming convention for feature branch name is common: <username>/<feature>, i.e. jersoe/delbutton

4 Submitting Code to be merged

Once you have pushed your local branch to origin, you'll have the option to create a pull request.

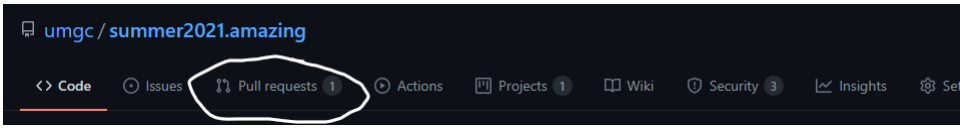
4.1 **Create pull request**

- Login to GitHub website and navigate to the repository.
- From the tabs listed on the top ribbon Choose **Pull request** →
- Click New pull request →
- Choose base <branch> →
- Choose compare <branch> →
- Click Create pull request →
- Insert title →
- Leave a comment describing pull request
- Click Create pull request →

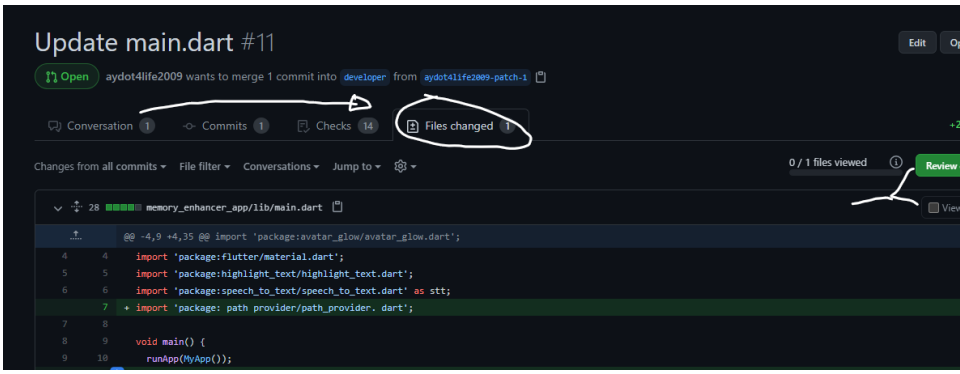


4.2 Merge pull request

- Login to GitHub website and navigate to the repository.
- Click Pull Request →



- Choose the pull request →
- Review the changes →

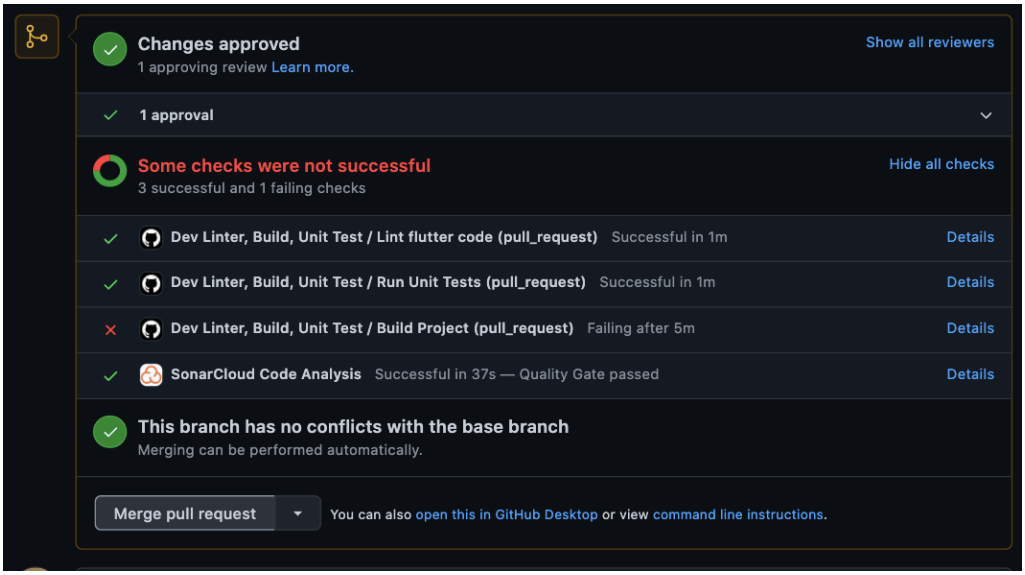


- **NOTE:** General rule of thumb is not to merge a branch into any other branch unless
  - Both branches are yours
  - The owner of the branch receiving the merge has approved your branch to be merged
  - The owner of the branch to be merged has approved their branch to be merged into another

- In other words, if the branch in the PR to be merged is not yours, do not merge it.
- The author may not be done with the branch, although approved.

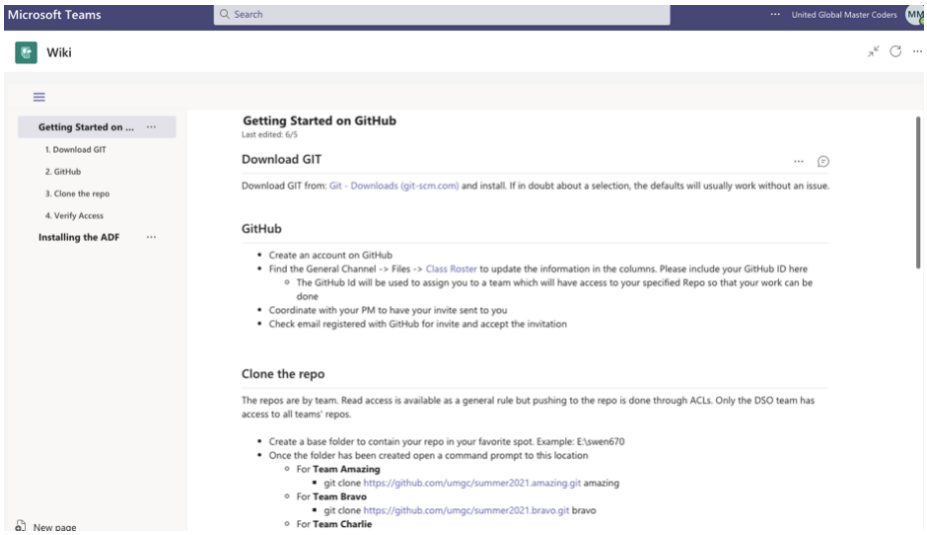
4.3 Merge a Pull Request

- Click the “Merge pull request” button →
- Confirm the merge request →



5 Microsoft Teams

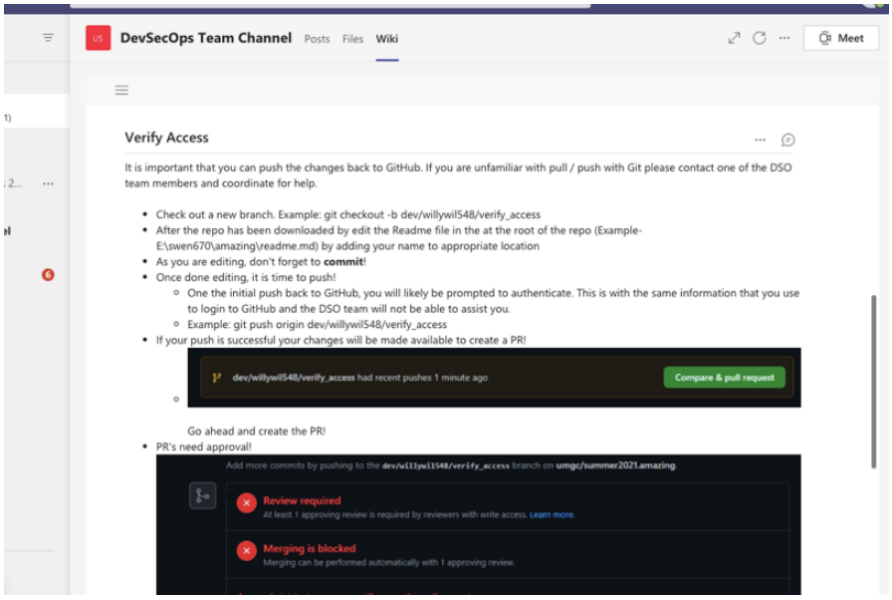
- Create signup sheet for developer access to repositories
- Utilize the DevSecOps channel Wiki to create a page



- Gather development teams to provide their information to be added to their respective team/repository.

Name	Perferred Name	Role	Contact Email	Contact Phone	School User Account	GitHub ID	Timezone
Lead PM							
Malcolm Freeney		Program Manager	mfreeney@student.umgc.edu	301 980 2118	mfreeney@student.umgc.edu		
DevSecOps (DSO)							
Michelle Monfort	Michelle		Michellemnfrt	301-357-9132	mmonfort2@student.umgc.edu	Michellemnfrt	EST
Robert Wilson	Rob		rwilson127@student.umgc.edu	910-489-4873	rwilson127@student.umgc.edu	willywil548	PDT
Jeroen Soeurt		Developer				jersoe	CEST
Team A							
Christian Ahmed		Developer	christian.ahmed@gmail.com	240-381-6669		c-ahmed	
Mitchell Olshansky		Test Engineer	mitch.olshansky@protonmail.com	301-310-1823		mitchUMGC	EST
Chauntika Broggin		Test Engineer	cbrogein@student.umgc.edu	301-541-6230	cbrogein@student.umgc.edu	chauntika	EST
Shawn Kelly		Team PM	shawn_kelly123@yahoo.com			TheMunkeyFist	
Momodou Drammeh	Mo	Developer	mdrammeh3@student.umgc.edu	(301) 305-2484		mdrammeh1	EST
Nicholas Ballo		Test Engineer					EST
Ayodeji Famudehin		Business Analyst	aydot4life@yahoo.com			aydot4life2009	
Team B							
Elshaday Mesfin		Test Engineer					
Tyler Puschinsky		Developer					
Alec Baileys		Test Engineer	alaurencebaileys@gmail.com	(443) 720-8702	abaileys@student.umgc.edu		EST
Benjamin Cushing	Ben	Business Analyst	benandsue@verizon.net	240-481-7205	bcushing@student.umgc.edu	cushingbf	EST
Raul Benavides		Team PM					
Madison Dunning		Developer	madisonrdunning@gmail.com	(361) 232-6951	mdunning4@student.umgc.edu	MDunning14	CST until June 5, then PST until June 24, then ChST
Team C							
Michael Le		Team PM	lemichael5088@yahoo.com	8323664465	mle19@student.umgc.edu		EST
Prince k Antwi Aboagye	Prince	Business Analyst	aprincekyei@yahoo.com dkimbi@student.umgc.edu	2815087084	pantwiaboagye@student.umgc.edu	tipsyKP	EST
Didimus Kimbi		Developer	kdidimus@ymail.com	301 795-8059	dkimbi@student.umgc.edu		EST
Debashis Jena		Developer					EST
Austin Johnson		Developer	austiniiijohnson5@gmail.com	858-204-9628	ajohnson504@student.umgc.edu		EST
Damion Sevilla		Test Engineer					EST

- Create DevSecOps guidelines for development teams
- Utilize the DevSecOps channel Wiki to produce a page with strategies for development teams



- Advise development teams of reference available in team wikis.

6 Build Pipeline – GitHub Actions

The section below describes the setup and configuration of the tools necessary for the DEVSECOPS team to manage and create the components of the CI/CD pipeline.

6.1 ADF Pipeline with GitHub Actions

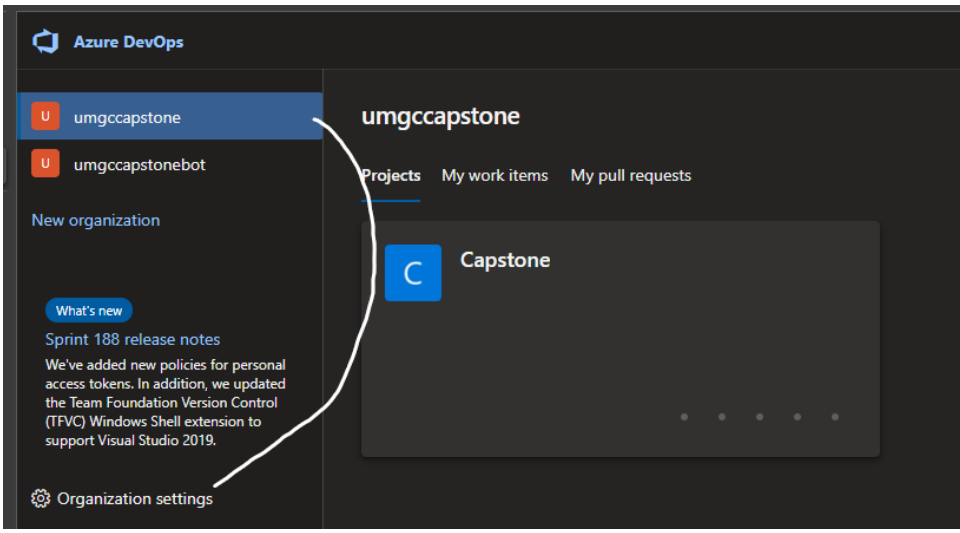
Previous semesters have incorporated teams using Microsoft Azure DevOps. However, teams now operate using GitHub because of the public accountability and accessibility of the repos. Pipelines integrate well with Azure. The association with Azure DevOps and the UMGC

federation actually limits the visibility of what is happening from an instructor/mentor level as well as create a hard dependency on the project and the student who setup the operation.

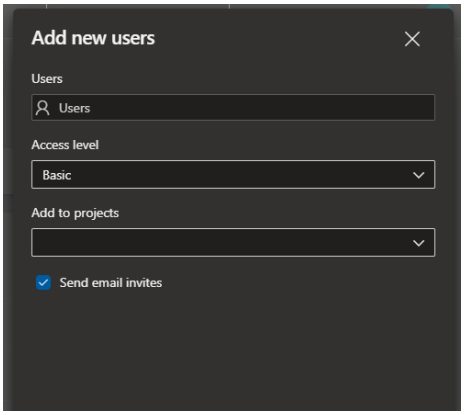
If Microsoft Azure DevOps is a requirement the following steps can be implemented. Otherwise section 6 may be skipped entirely.

6.1.1 Add Users

- Visit site: https://azure.microsoft.com/en-us/services/devops/ and log in to admin UMGC SWEN Capstone account
- Under Azure DevOps Organizations, click **dev.azure.com/umgccapstone**
- Click Organization settings



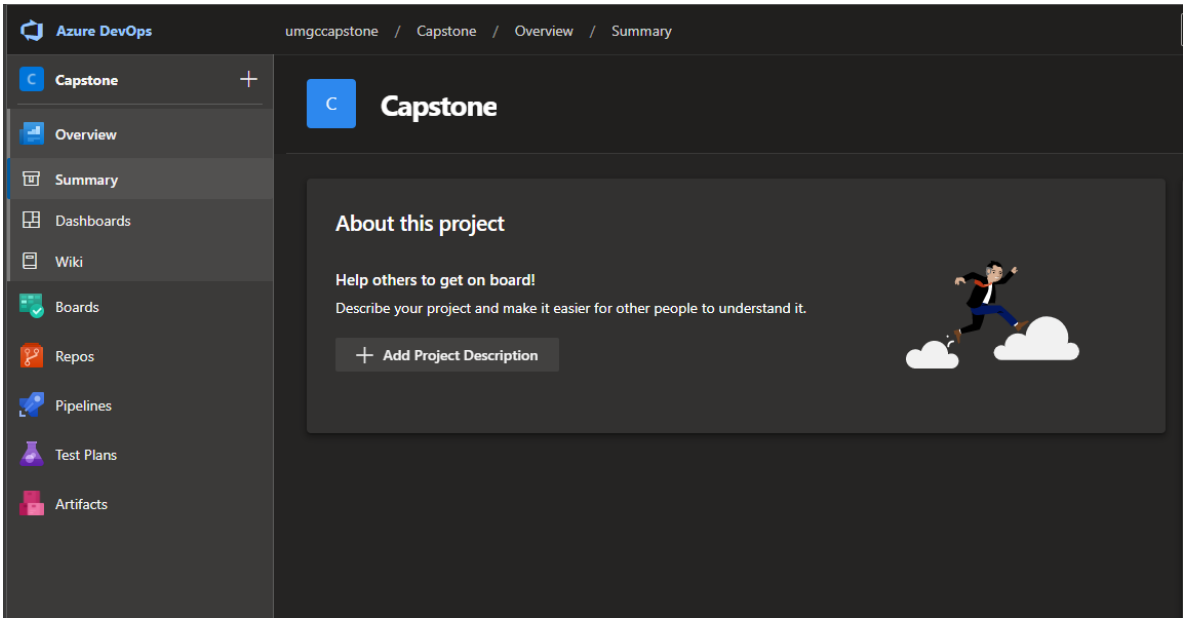
- Click Users →
- Enter email address of DEVSECOPS team members →



- choose **Basic** Access level →
- under Add to projects
- Add users →
- choose Capstone →
- Add

6.2 Access the Capstone Azure DevOps Project

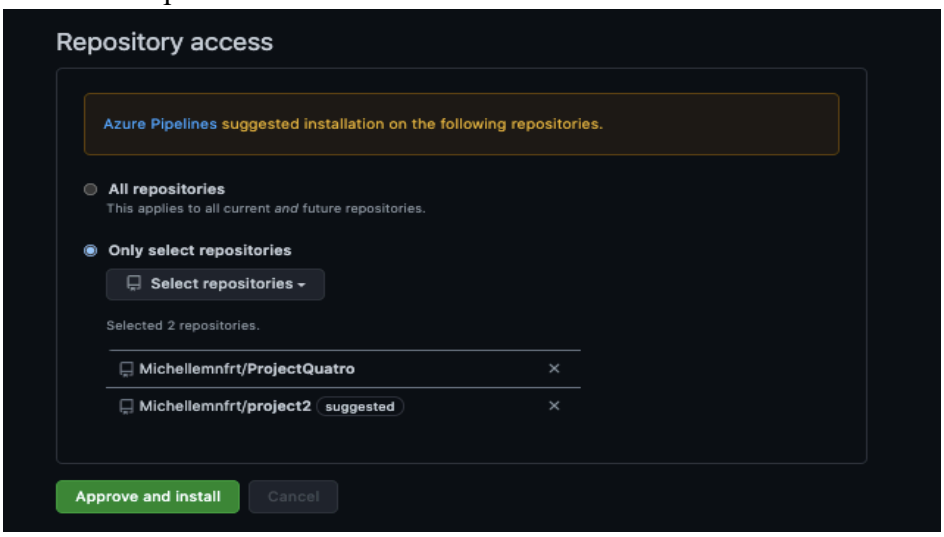
- Go to https://azure.microsoft.com/en-us/services/devops/ and log in with your DEVSECOPS team member account
- Under Azure DevOps Organizations, expand **dev.azure.com/umgccapstone**
- Under Projects, Click **Capstone**



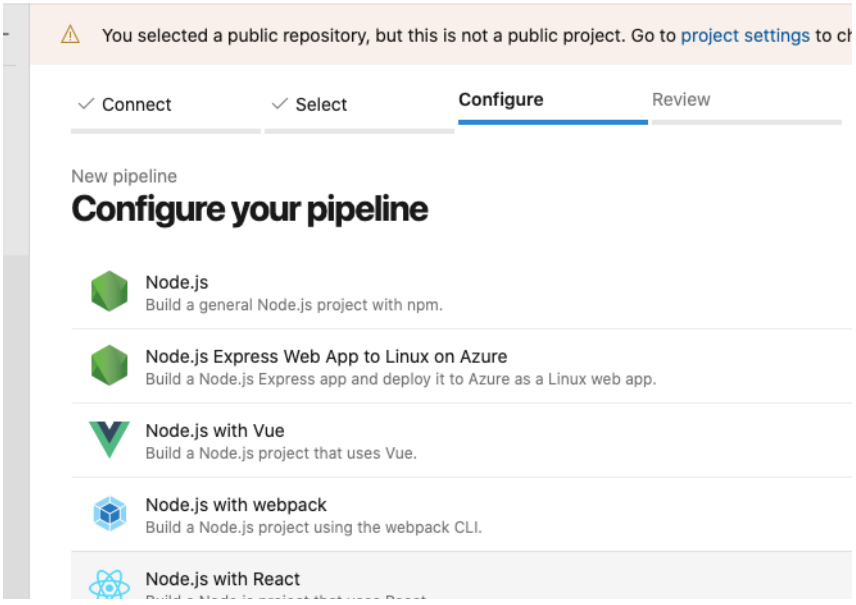
6.2.1 Creation of a continuous integration pipeline

- In the right-side menu, click Pipelines → Pipelines → New pipeline
- Click **GitHub**
- Confirm password
- Choose **All repositories** from the search criteria dropdown
- Search for the repository for which to create a pipeline and Choose it (enter admin account password if prompted)

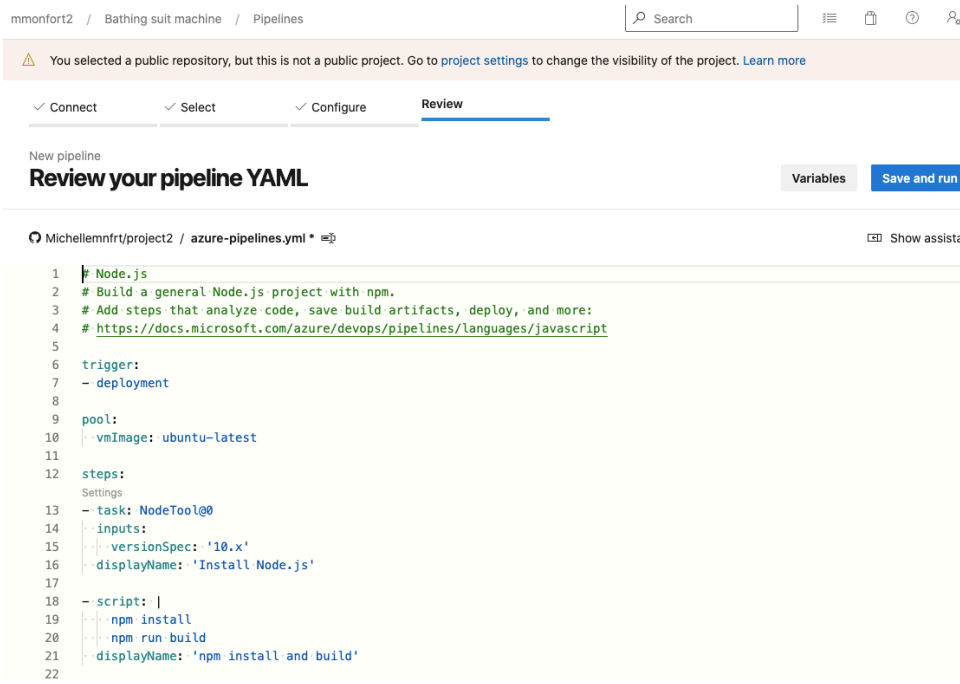
- Approve and install the access to GitHub repository for Azure DevOps



- Figure 1. GitHub – Approve Azure DevOps Access
- Confirm Microsoft account
- Create the pipeline based on the programming language or services being used



- Figure 2. Azure DevOps – Create Pipeline
- Edit or add the initial pipeline YAML template



-
- Save and run

7 Docker

7.1 Get and run Docker images

7.1.1 Ensure that docker images are installed

- docker images

7.1.2 Pull docker image to local machine

- docker pull <image>

7.1.3 Download and execute docker image

- docker run <image>

7.1.4 Get a particular version of docker

- docker pull <image>:<version>

7.1.5 Bind Port to Host

When running more than one version of the same image, the same port will be used, you will need to bind your host port to the container's port using the following command:

- docker run -p<hostport>:<imageport> <image>

7.1.6 To run docker image in detached mode

- docker run -d

7.1.7 Delete an image

- docker rmi <image id>

7.2 Actions with Docker containers

7.2.1 Check running docker containers

- docker ps

7.2.2 Check both running and stopped images

- docker ps -a

7.2.3 Stop docker image

- docker stop <container id>

7.2.4 Start docker image again

- docker start <container id>

7.2.5 Delete container

- docker rm <container id>

7.3 Docker network

7.3.1 List networks

- docker network ls

7.3.2 Create docker network for image communication

- docker network create <network name>

7.3.3 Tell container to run on a specific docker network

- docker run <any other options> --net <network name>

7.4 Docker Compose file (running multiple containers with different configurations)

Reference the following for examples: https://docs.docker.com/compose/

7.4.1 Start images using Compose configurations

- docker-compose -f <yaml file name> up

7.4.2 Shut down images using Compose

- docker-compose -f <yaml file name> down

7.5 Create a Dockerfile (creating a Docker image)

Reference the following for examples: https://docs.docker.com/engine/reference/builder/

7.5.1 Create docker image

- docker build -t <name of your app>:<tag name, such as 1.0 or version-1, etc> <location of Dockerfile, such as root directory: .>

Note: Rebuild image after every modification to the dockerfile

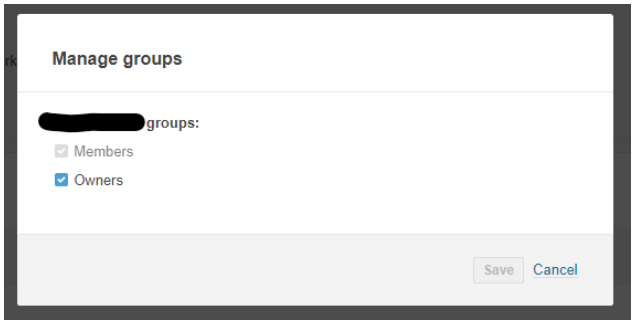
8 Build Development Team Pipelines

GitHub actions contain the capability to build the projects, upload them as artifacts, set up a release schedule, run unit tests, and submit to SonarCloud without leaving the GitHub ecosystem.

8.1 SonarCloud

8.1.1 Create a SonarCloud account

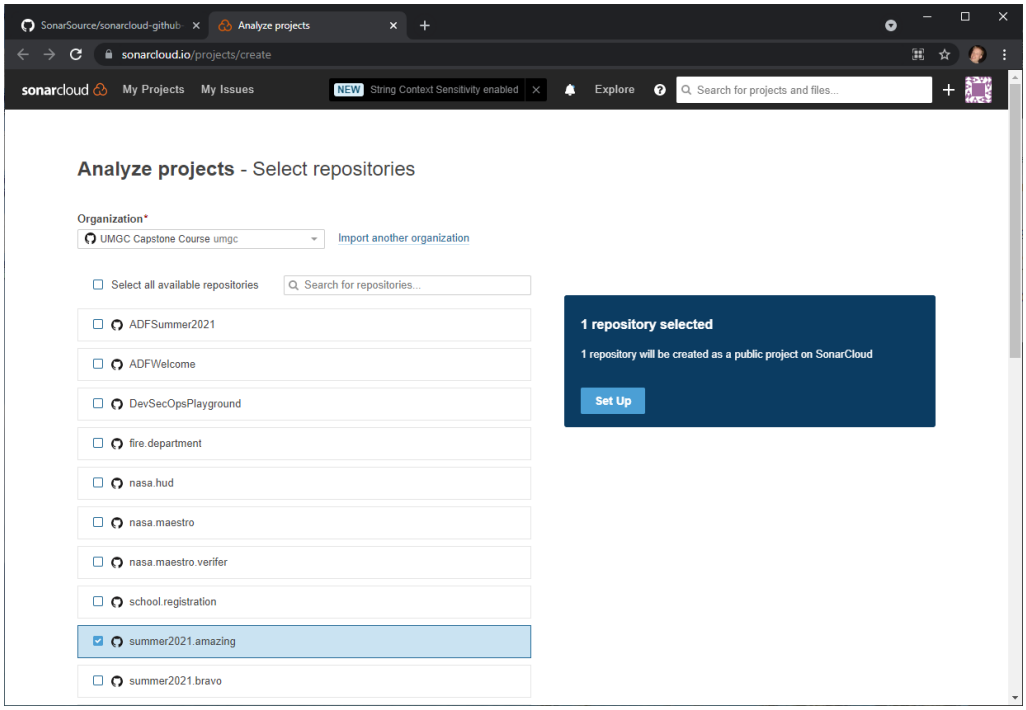
- Sign up to SonarCloud using your GitHub account at https://sonarcloud.io
- Assign yourself as owner along with the other DevSecOps members
- Open a private browser session
- Login into GitHub using UMGC service account
- Open a new private tab and navigate to https://sonarcloud.io
- Login using GitHub
- Choose yourself from the list and make owner



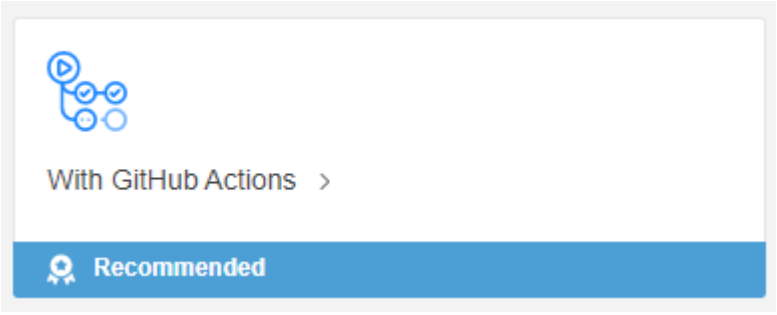
- Log out of service account

8.1.2 Link SonarCloud to a GitHub repository

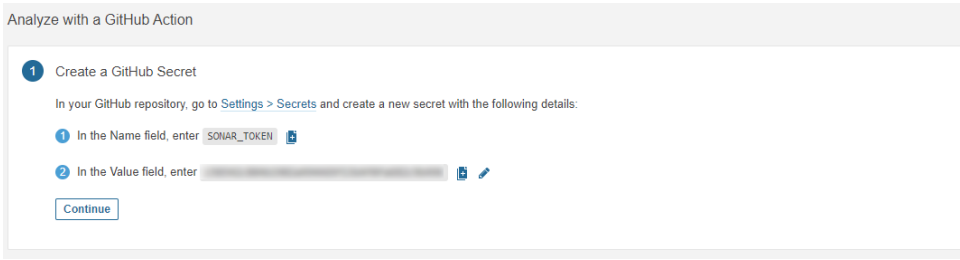
- Back to your account in SonarCloud. Navigate to https://sonarcloud.io/projects/create
- Choose the repository you wish to setup



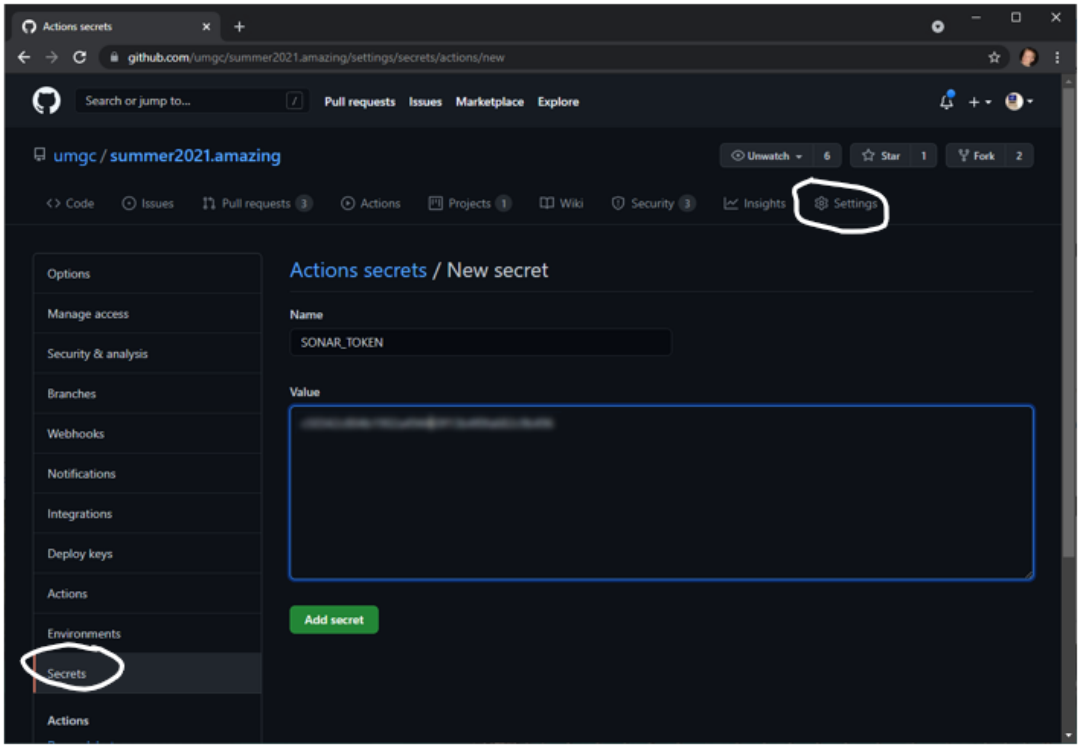
- Click the “Set Up” button
- Choose with GitHub Actions



- Follow the instructions to create the GitHub Secrets. The below screenshots should help guide you



- In a different window open GitHub
- The secrets are under the Settings menu item for the repository then secrets



- Leave the Sonar Cloud configuration window open. You will return to this spot later

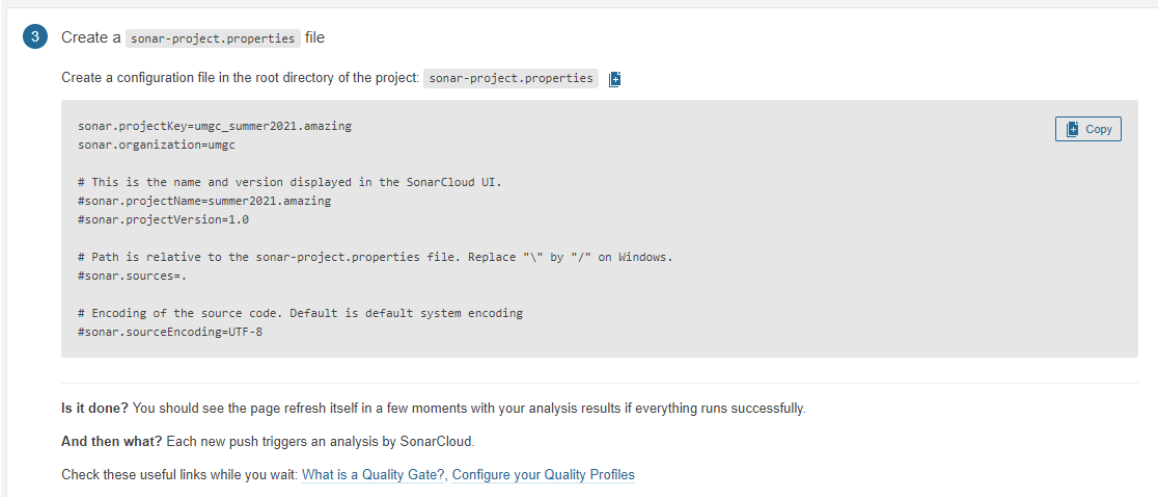
8.1.3 GitHub Analysis Files

- Add analysis_options file from [UMGC/DevSecOpsPlayground] to root of repository of new repo

- Add sonar-project.properties from UMGC/DevSecOpsPlayground to root of repository of new repo

8.1.4 From the SonarCloud set up continue

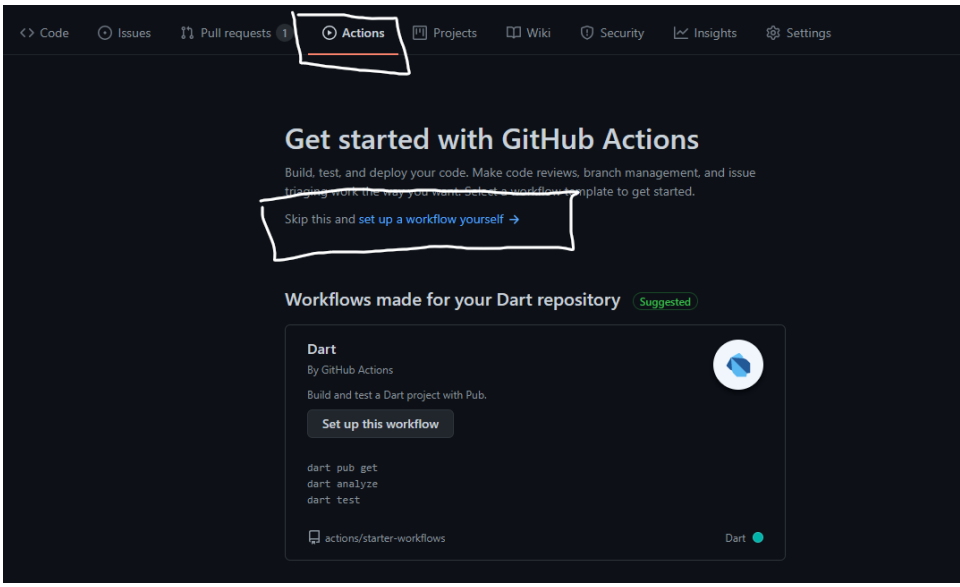
- Choose other and continue
- You should be on step 3. This new "properties" file is much like the property file you've just added to the new repository. But you'll need to replace the first 5 lines of text from the website to the file in the repository.



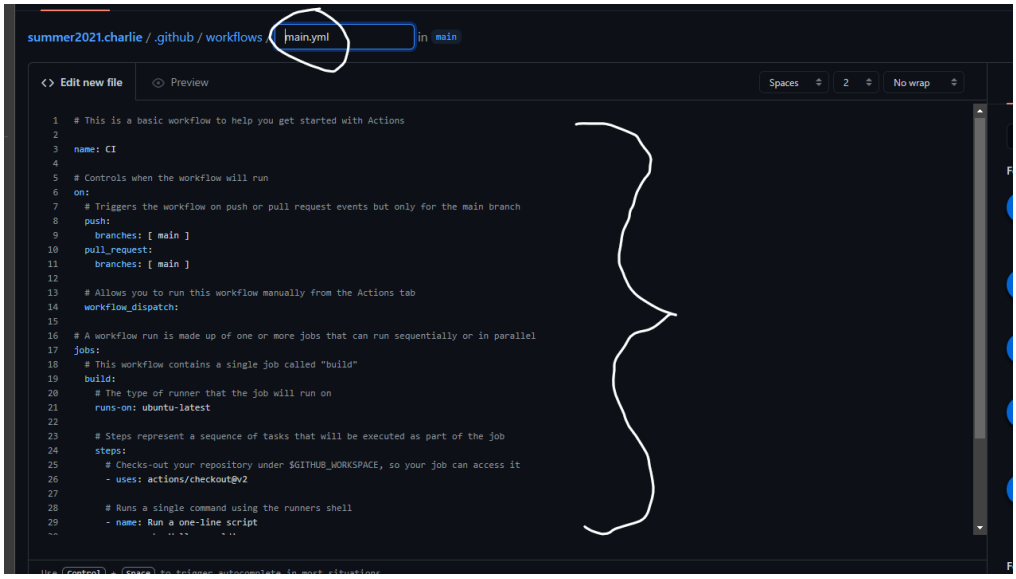
8.2 GitHub Actions

GitHub Actions is the GitHub equivalent of Azure Pipelines. Here you can test, analyze, build, and deploy all within the same place your code is.

- From GitHub and the repository to build the pipeline for
- Click "Actions"
- Then set up a workflow yourself

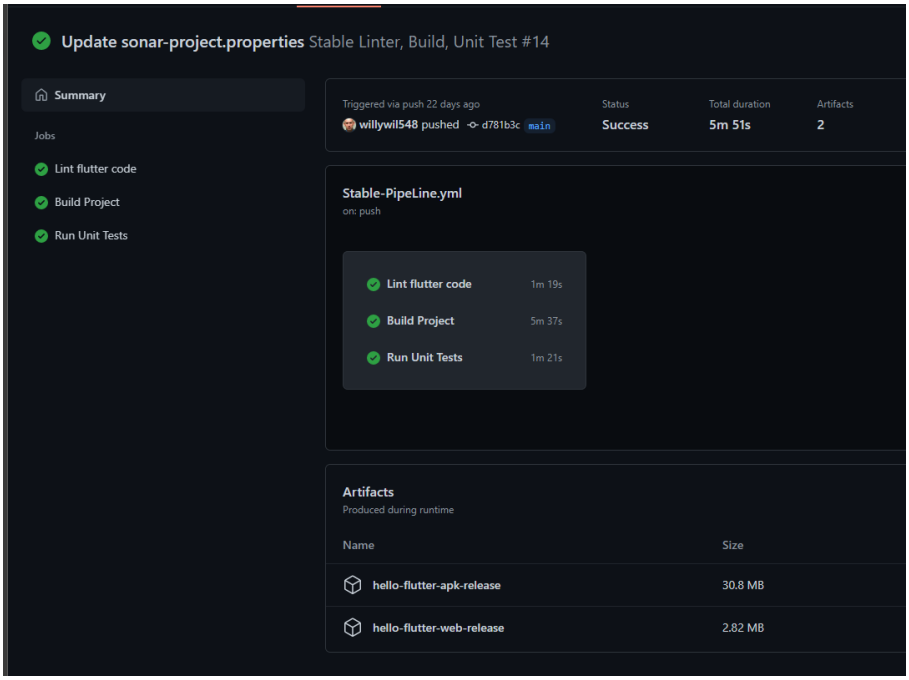


-
- Rename from main.yml to stable.yml. Then highlight the boilerplate code and delete it.



- Retrieve prebuilt pipeline from the [UMGC/DevSecOpsPlayground](), copy the contents and paste into new workflow you are setting up.
- Note: This pipeline assumes the pubspec.yaml file is at the root of the repository. If not then it may have to be modified to be inclusive to the target directory. The analysis file and sonar-project.properties files assume the Flutter project is based in the root of the repository (the pubspec.yaml).
- This finishes the set up of the build pipeline.

- The build pipeline established a Linter, Builder, Artifacts, and Unit Testing. The build artifacts can be obtained after a successful build by taking the following actions:
- Click Actions
- Click Workflow. Example is Stable Workflow that has completed.

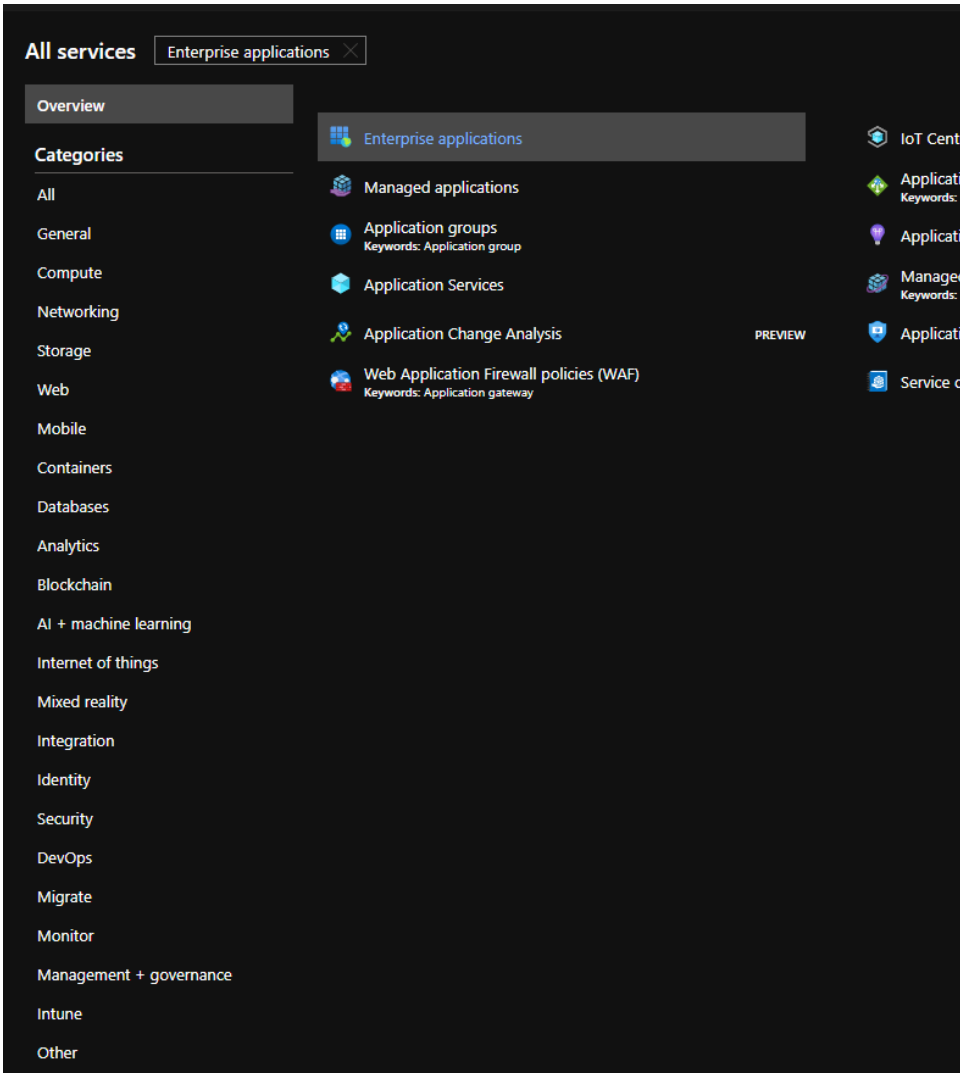
- Artifacts will be at the bottom of the page
- 

8.3 Configure Enterprise Application

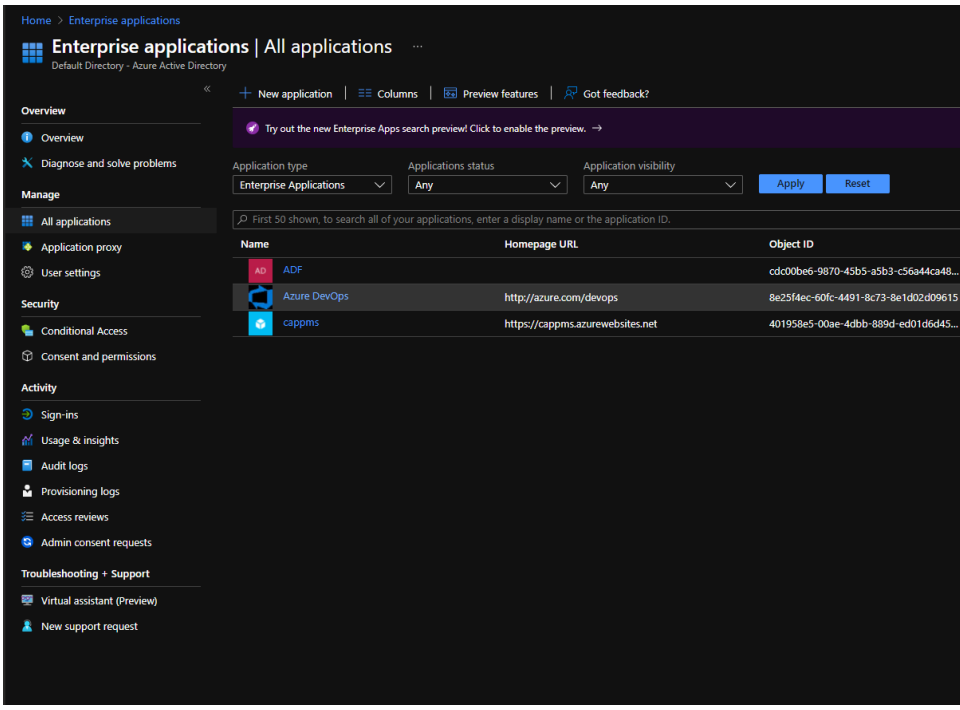
Create or reuse an enterprise application. Enterprise applications are a good place for service accounts and general authentication requirements to be met. An application can be scoped for a specific purpose and contain a limited number of usable accounts and secrets.

- Select Enterprise applications from the Azure service section. This is not to be confused with the Azure Market

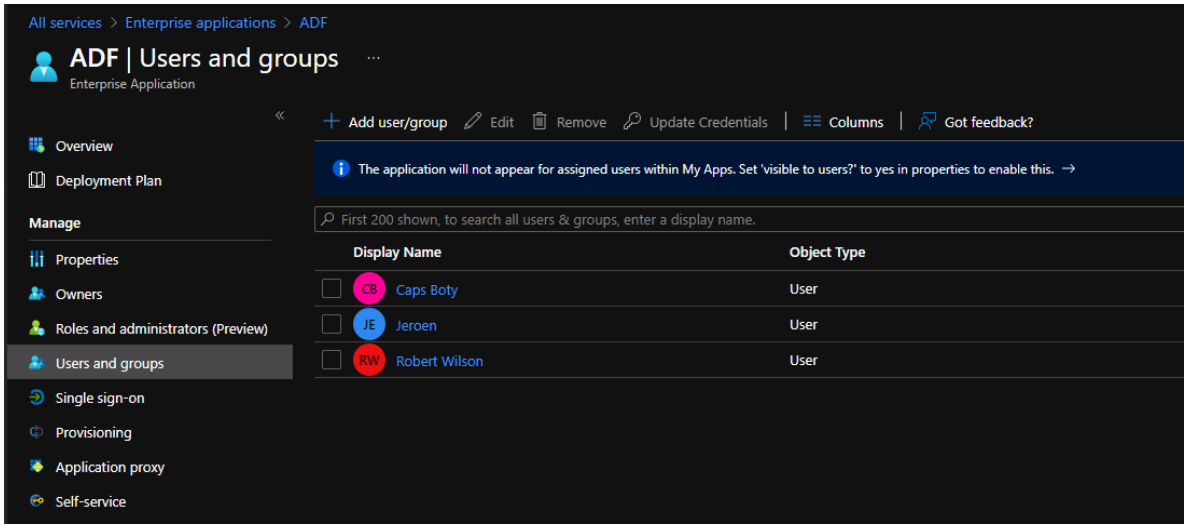
place.



- Select the desired application. In this example we will select ADF. Feel free to create a new application for the desired purpose.

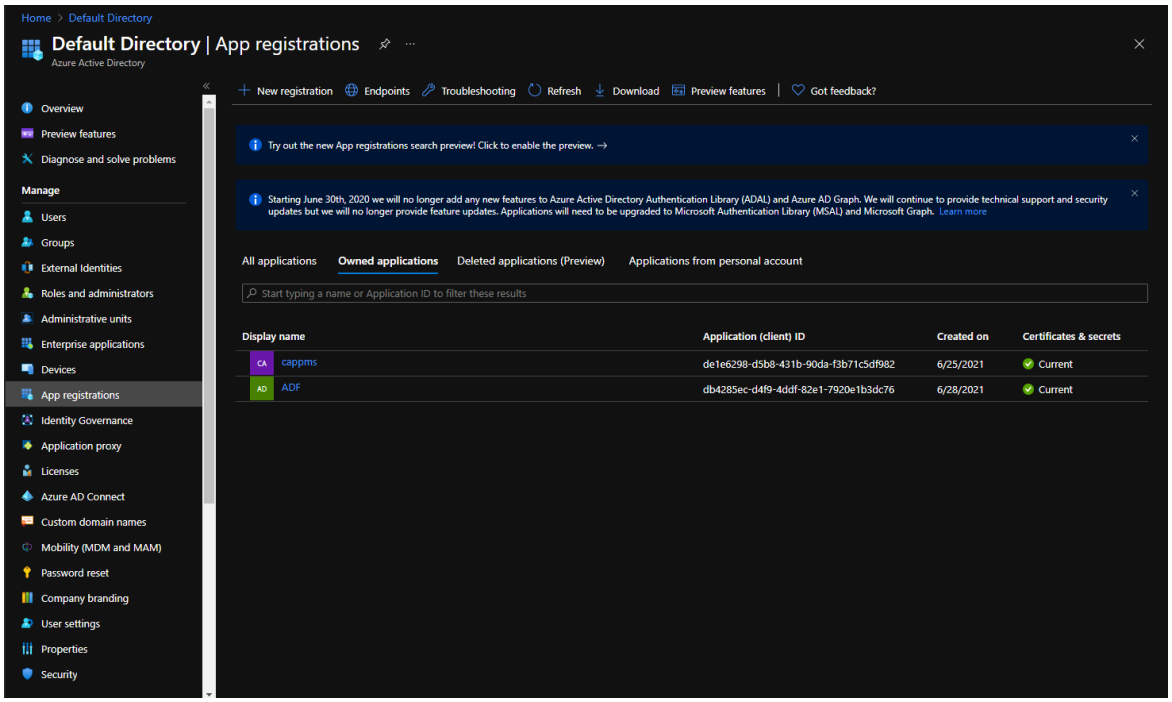


- Add some users to help the chat botty to manage the instance.

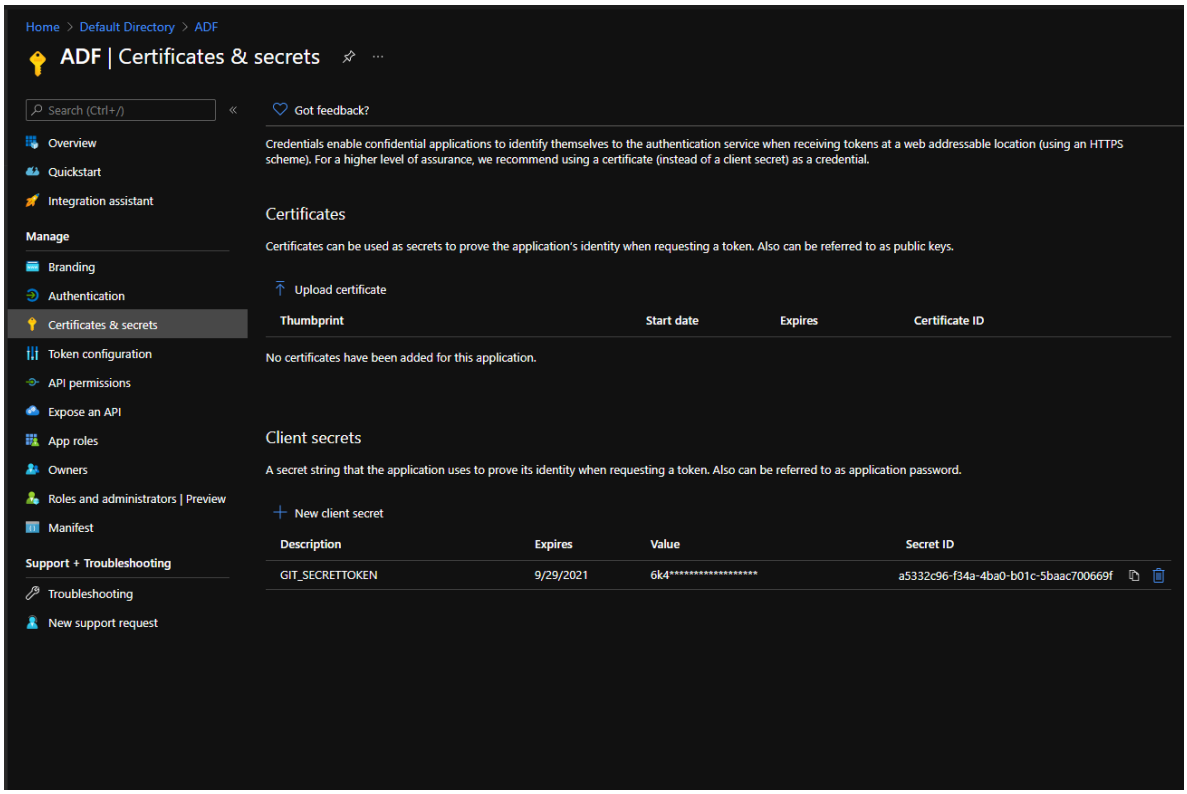


8.4 Setup secrets for AKS

Go to the Azure Directory Service and find App registration. From here select the desired application.



- Create the secrets for the AKS cluster you are about to create. Make note of the secrets value as you won't be able to get it again. You will also need the Application (client) id from the overview or the previous screen. Put these items aside as you will need them in the next step.

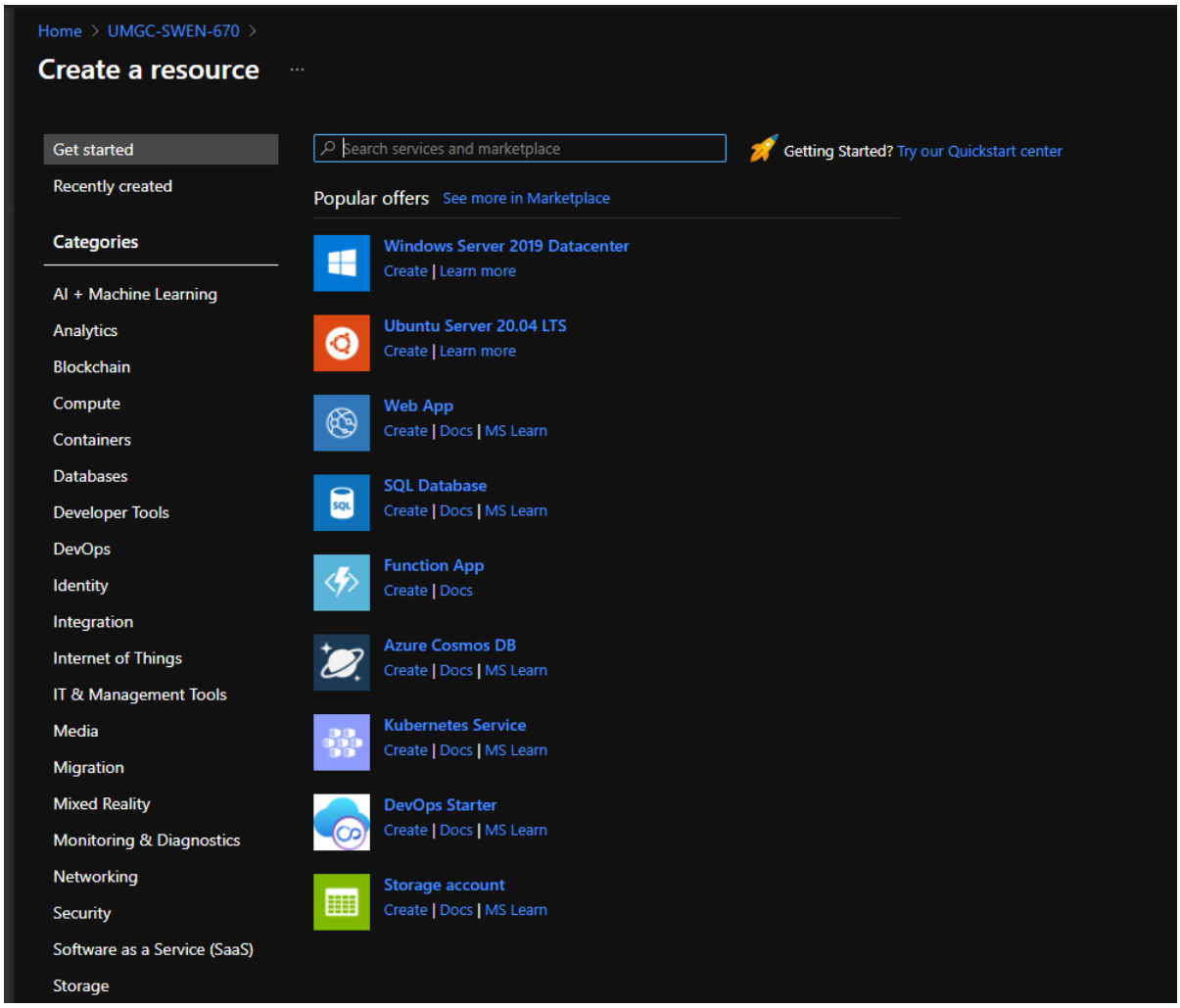


8.5 Docker and Azure Kubernetes Service (AKS)

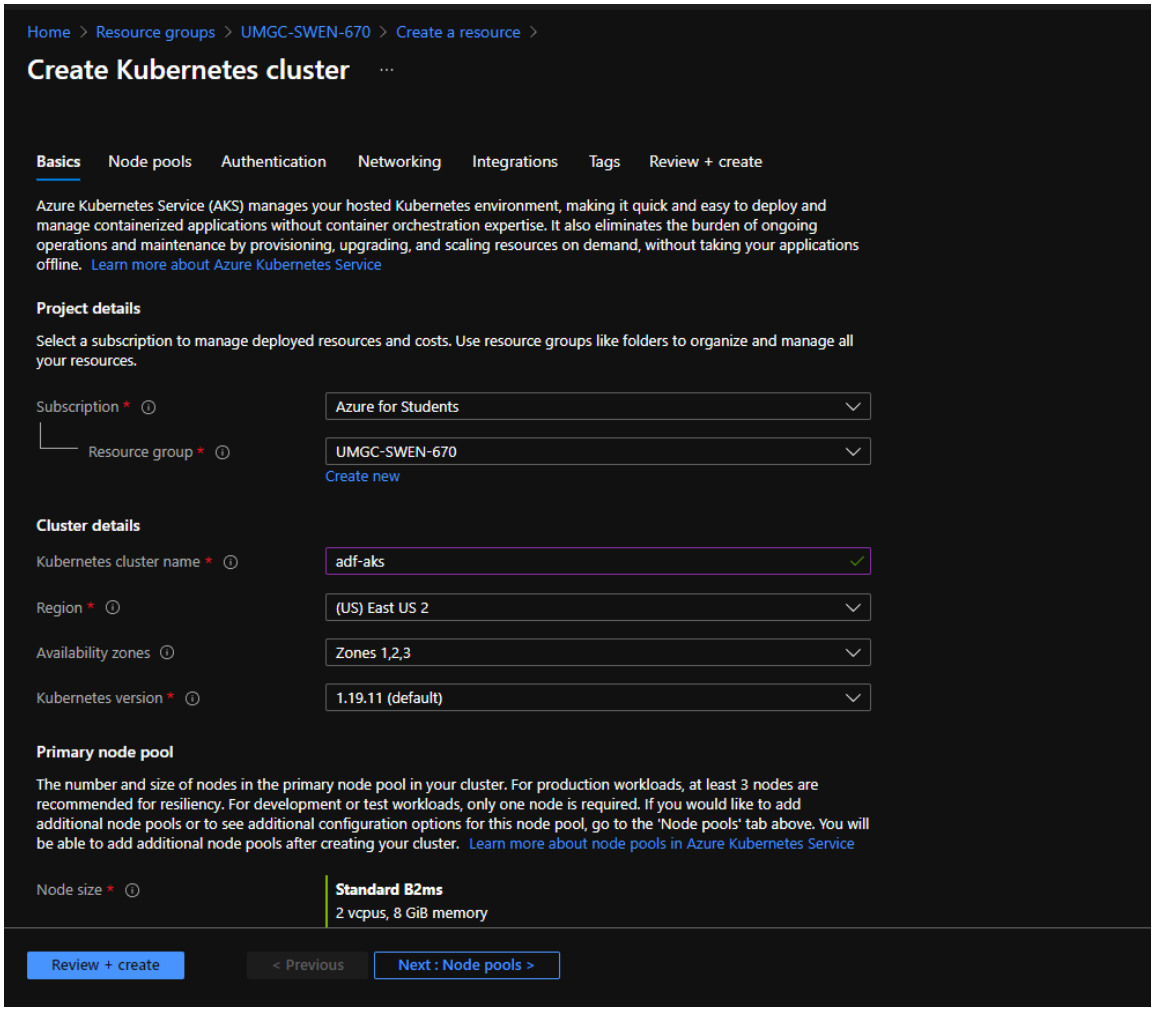
This section involves the setup and configuration of the tools required of the DevSecOps team to create and manage the deployment components of the application.

8.5.1 Create a Kubernetes cluster

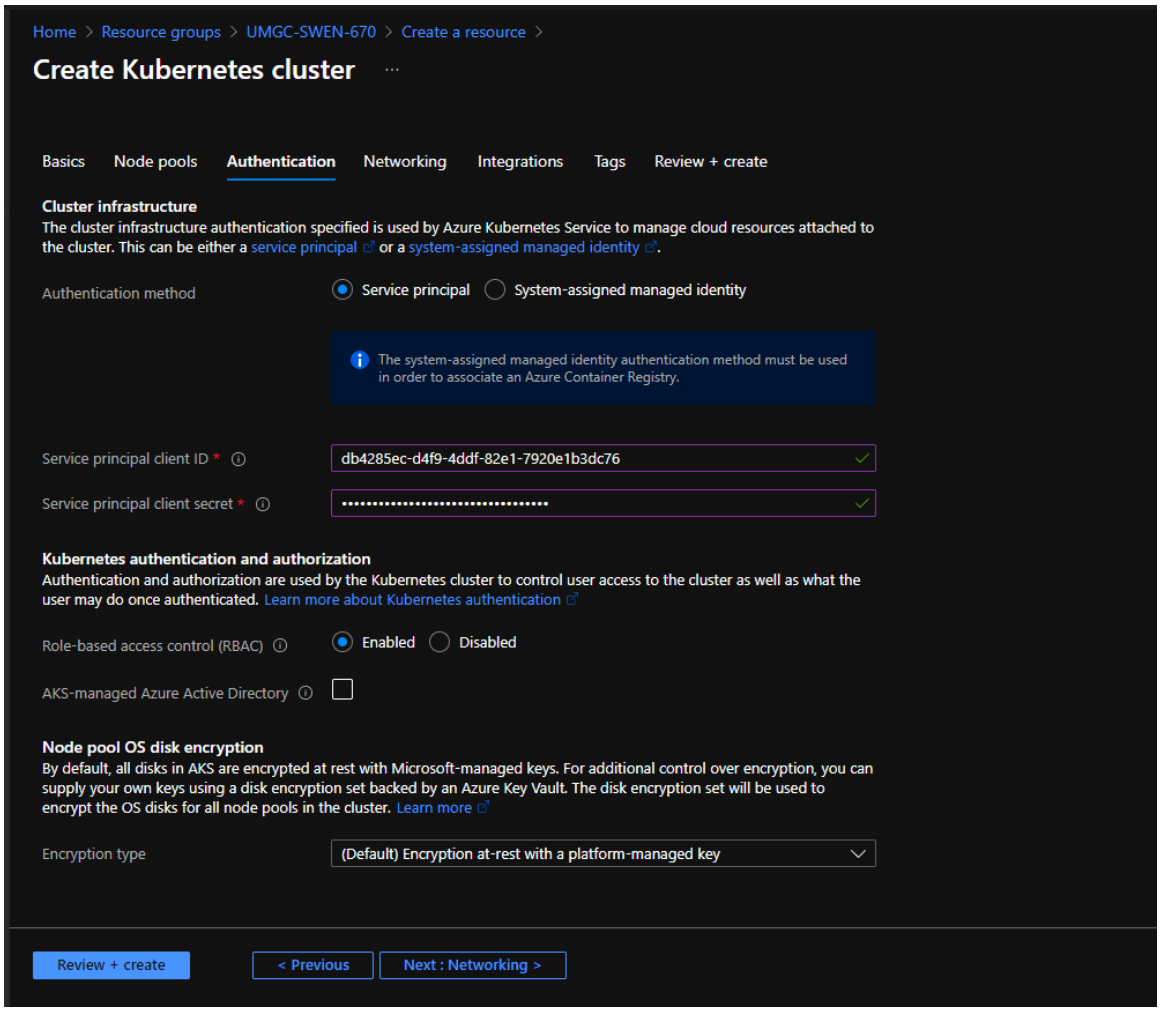
- Login to Azure Portal (https://portal.azure.com)
- Choose Create a resource
- From the icons on the header choose **Kubernetes Service**
- From the icons on the header choose **Create**
- Choose Create Kubernetes cluster



- Choose **Resource Group** or **create new** (A resource group is a collection of resources that share the same lifecycle, permissions, and policies)
- Insert **Kubernetes cluster name** (The name can contain only letters, numbers, underscores and hyphens. The name must start and end with letter or number. Kubernetes service name must be unique in the current resource group)
- Choose Region
- Choose Availability Zones
- Choose Kubernetes Versions



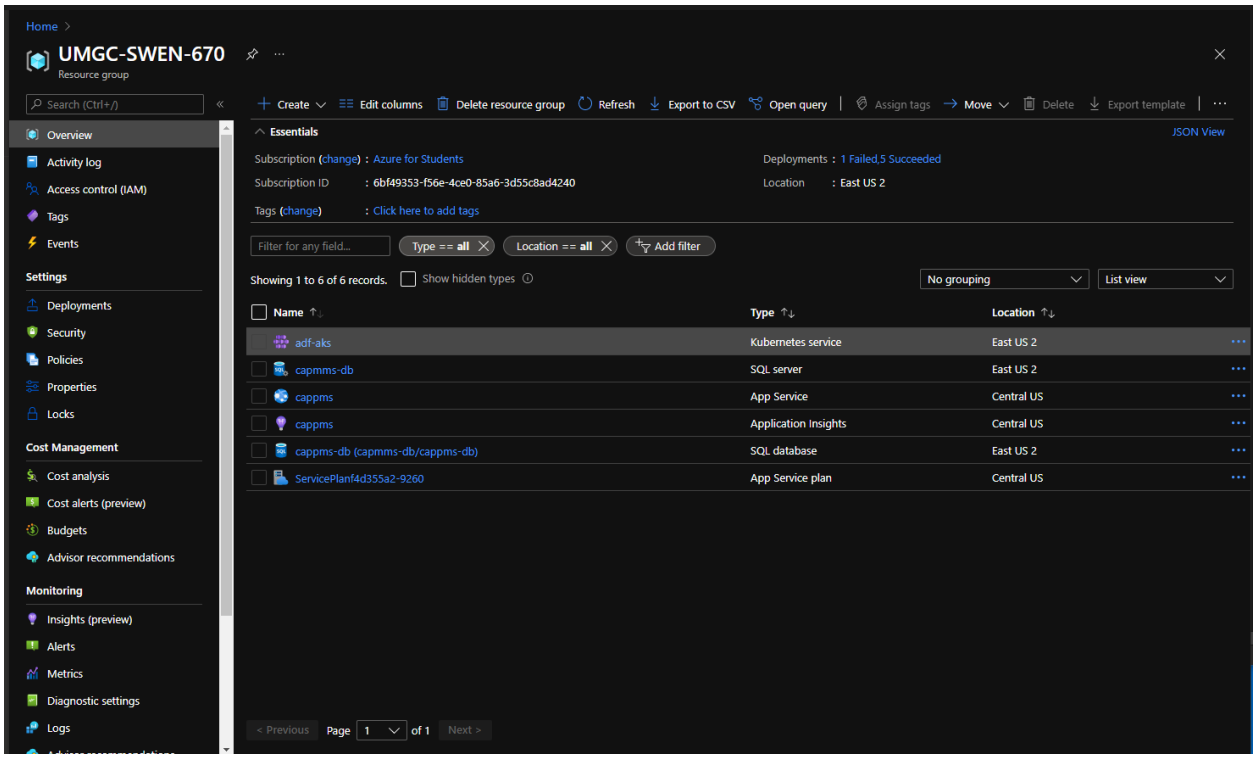
- Go to the authentication page
- Input the service principal client id generated in a previous step
- Input the service principal secret generated in a previous step



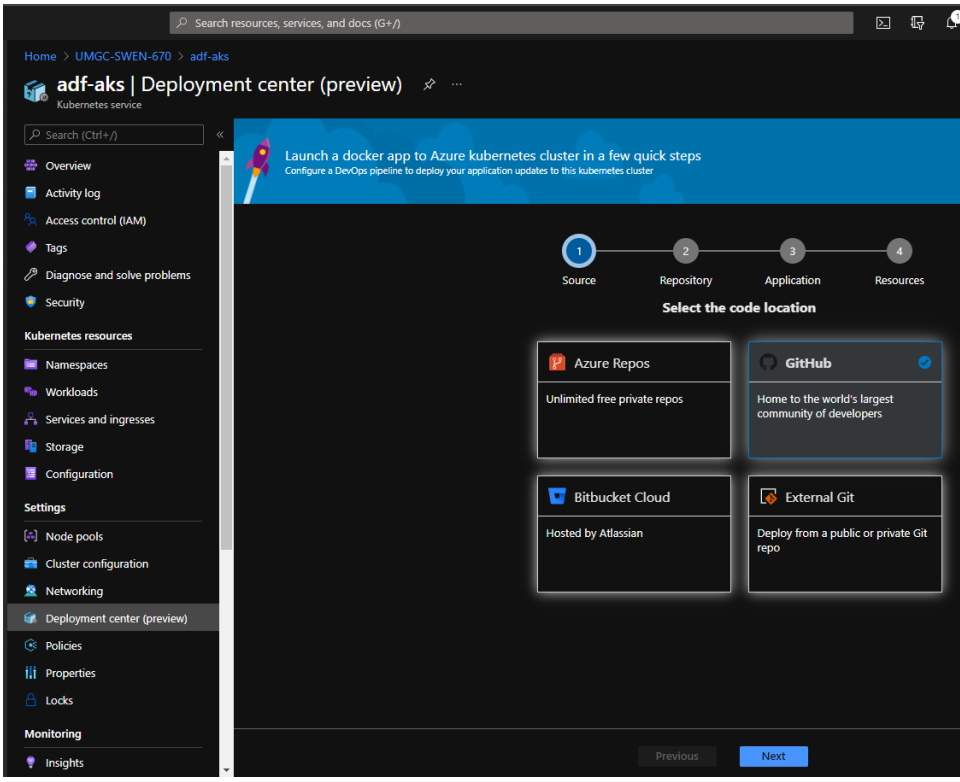
- Finally, Choose **Review + Create**
- Accept remaining defaults and Choose **Create**

8.5.2 Configure Deployment

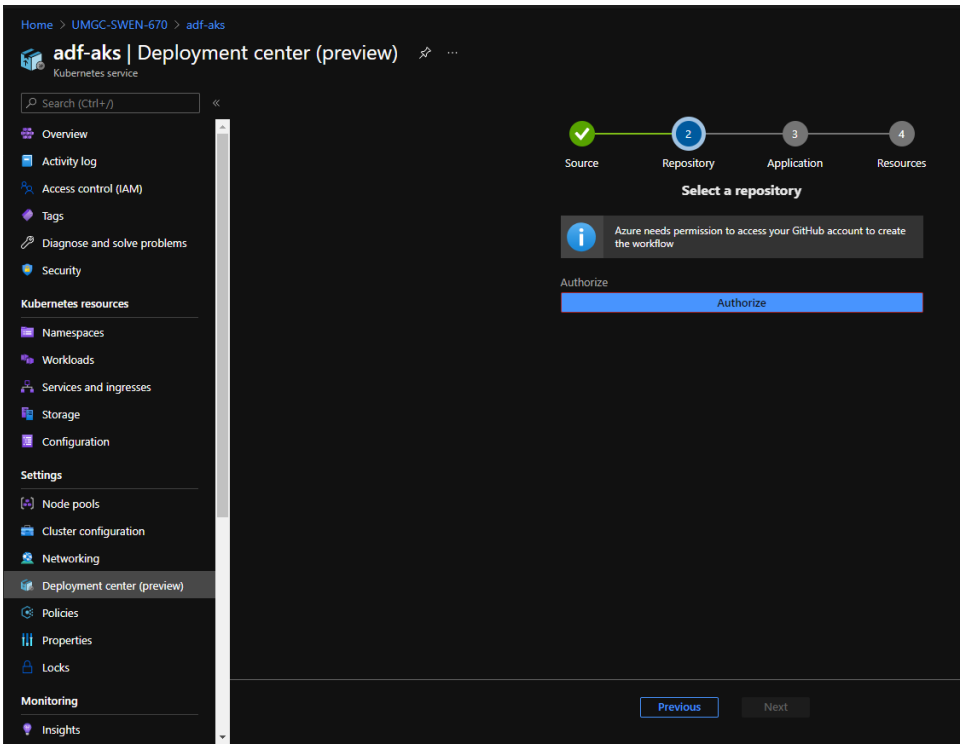
- Using the service account, select your new created Kubernetes cluster from the specified resource.



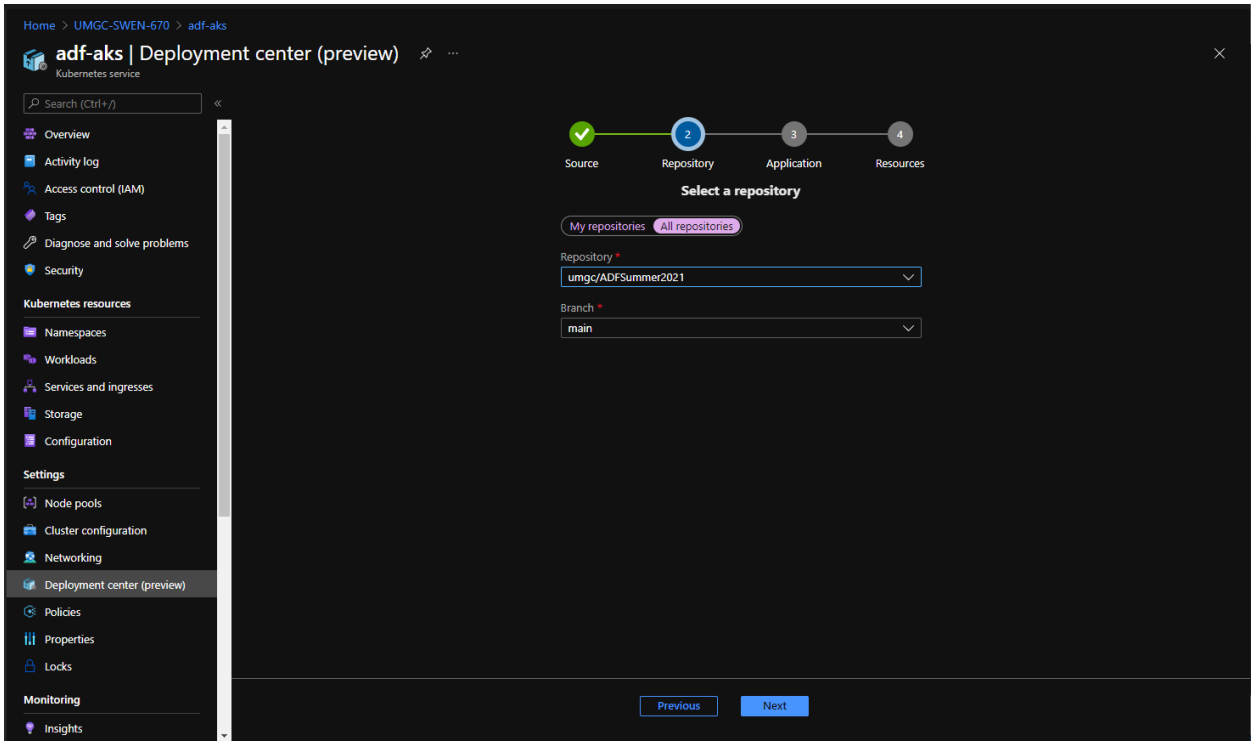
- Select Deployment Center on the left side.
- Select GitHub and then next.

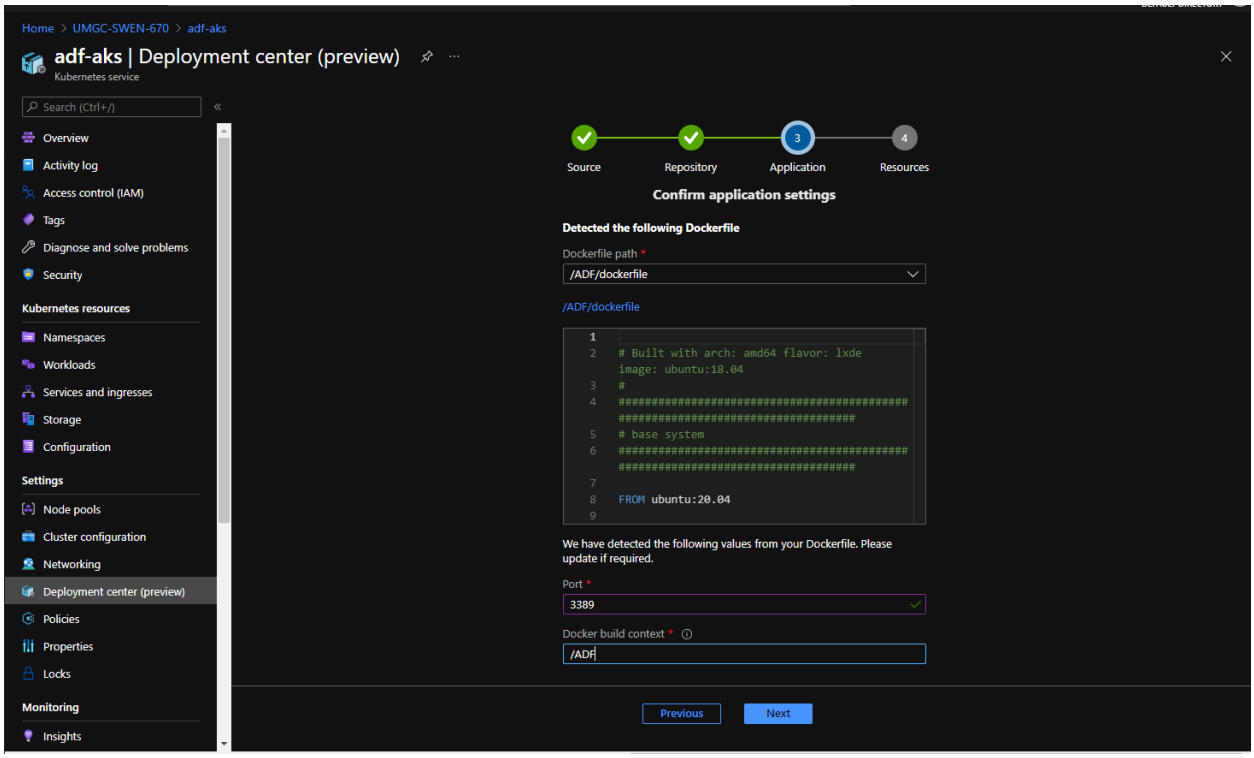


- Authorize Azure to GitHub.

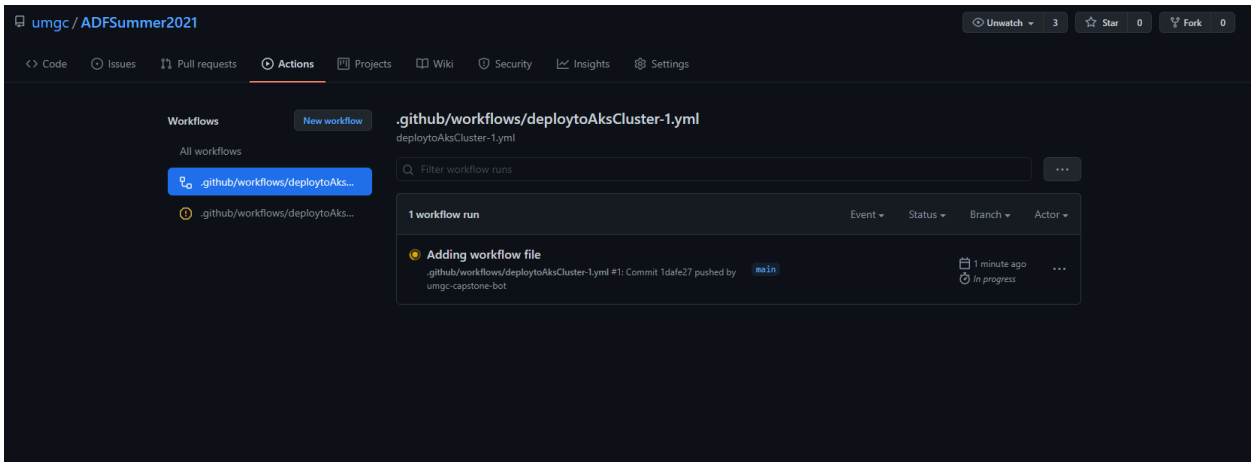


- Select the repository to build the image from.





- Verify the dockerfile and update the port.



- Verify workflow has been added to GitHub Actions.

9 License