Activate Azure with DevOps

Module 06: End-to-End DevOps - Lab 03 - Multistage YAML Pipelines with Approvals

Student Lab Manual

Parts of this lab has been taken from https://azuredevopslabs.com/labs/azuredevops/yaml/. View additional publicly available labs at https://azuredevopslabs.com/.

Contents

Lab 6.3.2: End-to-End DevOps: Deploy using Multi-Stage YAML with Approvals

Introduction

In this lab, you will continue working with previous lab and modify the YAML pipeline to create environments and approvals. You will create approvals for both the stages in your pipeline as well as for the service connection.

You'll learn:

- Introducing environments in your YAML pipeline
- Implementing approvals in the deployment stages
- Implementing approval for the service connection

Prerequisites

- Microsoft Azure subscription https://azure.microsoft.com/
- Lab 6.3.1 - Previous Multistage YAML Pipelines lab

Estimated Time To Complete This Lab
90 minutes

Exercise 1: Split the Deploy stage into multiple stages

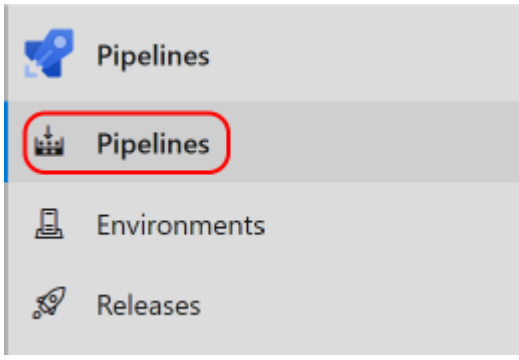
1. In this exercise, we will divide the "Deploy" stage created in the previous lab into multiple stages. The idea is to create three separate stages:

- **DeployAzureResources** - To deploy the ARM Template to create Azure resources in the Azure Portal
- **DeployToDevAndStaging** - To deploy the web application into Dev and Staging environments
- **DeployToProd** - To deploy the web app into the Production environment

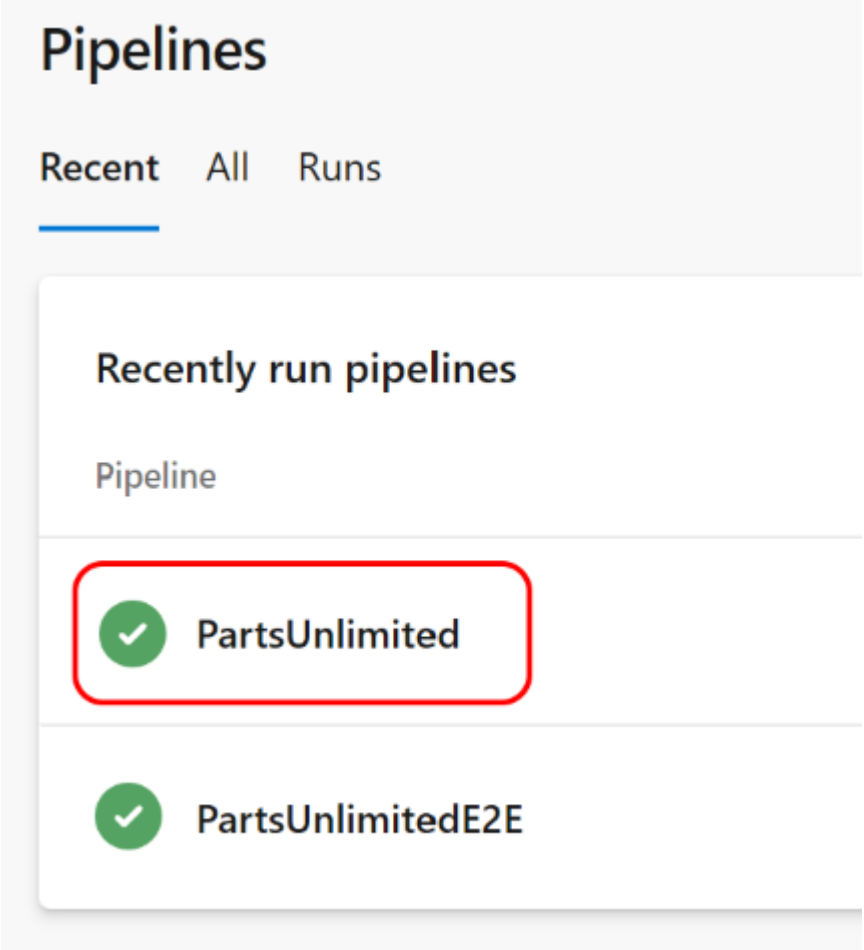
The above is what we will use in this lab. This is just one example. Another way to split the deploy stage could be: ARM deployment, Dev deployment, Staging depoyment and Production deployment. Or combine all into a single Deploy stage. This is a design aproach for YAML that comes with pros and cons for each approach. We get greater control at the stage level when the pipeline runs. For example, we can skip or cancel the deployment to one of the environments without impacting other environments if they are split into separate stages.

1. Navigate to Azure DevOps. Navigate to the project we used in the last lab.

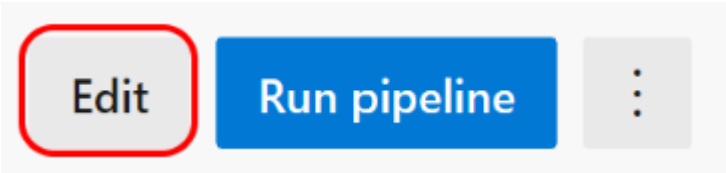
2. Navigate to **Pipelines**, then **Pipelines**.



3. Select and click on the YAML pipeline that we worked on in the previous lab.



4. From the menu on the right, select Edit.



5. Navigate down to the Deploy stage of the YAML file. For convenience, you can **collapse** the Build stage so that only Deploy stage will be visible. This is the stage we will be working on in this lab.

```
9   stages:
10  - stage: Build ...
56
57  - stage: DeployAzureResources
58    jobs:
59    - job: DeployARMTemplate
60
61      pool:
62        name: Hosted VS2017
63
```

6. Replace the stage name from Deploy to **DeployAzureResources** and job name to **DeployARMTemplate**

```
- stage: DeployAzureResources
  jobs:
  - job: DeployARMTemplate
```

```
8
9   stages:
10  - stage: Build ...
55
56  - stage: DeployAzureResources
57    jobs:
58    - job: DeployARMTemplate
59      pool:
60        name: Hosted VS2017
61      steps:
          Settings
62        - task: DownloadPipelineArtifact@2
63          inputs:
```

7. We will also add **displayName** lines for both the stage and the job to add friendly name to this stage and job. Similar *displayName* can be used for *stages, jobs, deployment jobs, and tasks* to make them

more readable when the pipeline runs.

```
- stage: DeployAzureResources
  displayName: Deploy Azure Resources
  jobs:
  - job: DeployARMTemplate
    displayName: Deploy ARM Template
```

```
57  - stage: DeployAzureResources
58    displayName: Deploy Azure Resources
59    jobs:
60    - job: DeployARMTemplate
61      displayName: Deploy ARM Template
62
63      pool:
64        name: Hosted VS2017
```

8. We have successfully created the first stage of our deployment. Now, we will add **DeployToDevAndStaging** stage just before the Web App deployment task.

9. Place the cursor on the next line after the *AzureResourceManagerTemplateDeployment@3* is finished and before the *AzureRmWebAppDeployment@4* task begins.

```
84          overrideParameters: '-WebsiteName $(WebsiteName)
85          deploymentMode: 'Incremental'
86
87
88
            Settings
89      - task: AzureRmWebAppDeployment@4
90        inputs:
91          ConnectionType: 'AzureRM'
```

10. Here we will add the second stage **DeployToDevAndStaging** like below:

```
- stage: DeployToDevAndStaging
  displayName: Deploy to Dev and Staging Environments
  jobs:
    - deployment: DeployToDev
```

```
      displayName: Deploy To Dev Environment

      pool:
        name: Hosted VS2017
```

```
85          deploymentMode: 'Incremental'
86
87      - stage: DeployToDevAndStaging
88        displayName: Deploy to Dev and Staging Environments
89        jobs:
90        - deployment: DeployToDev
91          displayName: Deploy To Dev Environment
92
93          pool:
94            name: Hosted VS2017
95
96          - task: AzureRmWebAppDeployment@4
97            inputs:
```

Note: At this point the YAML file might show syntax error. Ignore this for now. We will fix it in the next exercise.

Note: Unlike the previous stage, instead of using *job* here, we are using *deployment* under Jobs. A deployment job is a special type of job tailored to an environment.

11. Similarly, we will create the last stage **DeployToProd** like below. Place this at the end of the YAML file after the web app deploy task.

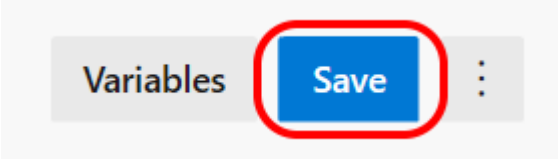
```
- stage: DeployToProd
  displayName: Deploy to Production
  jobs:
  - deployment: DeployToProd
    displayName: Deploy To Prod Environment

    pool:
        name: Hosted VS2017
```

```
102         packageForLinux: '$(System.ArtifactsDirectory)/**/*.zip'
103
104     - stage: DeployToProd
105       displayName: Deploy to Production
106       jobs:
107       - deployment: DeployToProd
108         displayName: Deploy To Prod Environment
109
110         pool:
111           name: Hosted VS2017
```

12. Click **Save** at the top-right to save the changes mades so far.

    Note: The YAML file, at this point, is incomplete and the pipeline cannot run. However, we have set **trigger: none** at the beginning of the YAML file in the previous lab. This will ensure that saving the modifications in the YAML file does not trigger Continuous Integration.



Exercise 2: Configure the Dev and Staging deployment stage

1. In the previous exercise, we fully configured the first deploy stage (DeployAzureResources). However, the second deploy stage (DeployToDevAndStaging) is incomplete and we need to modify it in this exercise.

2. In this stage, we will create Dev and Staging environments. We will also add tasks to deploy the Web App in the Dev and Staging slots of the Azure App Service.

3. Within the DeployToDevAndStaging Stage, place the cursor as shown below between **name: Hosted VS2017** and **- task: AzureRmWebAppDeployment@4** lines. Indent it inline with *Pool:*

```
87  - stage: DeployToDevAndStaging
88    displayName: Deploy to Dev and Staging Environments
89    jobs:
90    - deployment: DeployToDev
91      displayName: Deploy To Dev Environment
92
93      pool:
94        name: Hosted VS2017
95
96      |
97
98      - task: AzureRmWebAppDeployment@4
```

4. Add following snippet and indent it as shown below. This will create the **PUL-Dev** environment.

   Note: We are using the simplest deployment strategy of runOnce. You can find additional details about the deployment strategies here.

```
environment: 'PUL-Dev'
strategy:
    runOnce:
        deploy:
            steps:
```

```
91      displayName: Deploy To Dev Environment
92
93      pool:
94        name: Hosted VS2017
95
96      environment: 'PUL-Dev'
97      strategy:
98        runOnce:
99          deploy:
100           steps:
101
102     - task: AzureRmWebAppDeployment@4
103       inputs:
```

5. Indent the **AzureRmWebAppDeployment@4** task appriopriately by pressing Tab until it aligns with **steps**. The stage should look like this:

```
87  - stage: DeployToDevAndStaging
88    displayName: Deploy to Dev and Staging Environments
89    jobs:
90    - deployment: DeployToDev
91      displayName: Deploy To Dev Environment
92
93      pool:
94        name: Hosted VS2017
95
96      environment: 'PUL-Dev'
97      strategy:
98        runOnce:
99          deploy:
100           steps:
101
            Settings
102           - task: AzureRmWebAppDeployment@4
103             inputs:
104               ConnectionType: 'AzureRM'
105               azureSubscription: 'Microsoft Azure Internal Consumption(
106               appType: 'webApp'
107               WebAppName: '$(WebsiteName)'
108               packageForLinux: '$(System.ArtifactsDirectory)/**/*.zip'
```

6. Since this is the Dev stage, we want the Web App to be deployed to the Dev slot of the Azure App Service. Modify the **AzureRmWebAppDeployment@4** task to add the following lines after

WebAppName and before **packageForLinux**:

```
deployToSlotOrASE: true
ResourceGroupName: 'PartsUnlimitedRG'
SlotName: 'Dev'
```

```
96      environment: 'PUL-Dev'
97      strategy:
98        runOnce:
99          deploy:
100           steps:
101
                Settings
102         - task: AzureRmWebAppDeployment@4
103           inputs:
104             ConnectionType: 'AzureRM'
105             azureSubscription: 'Microsoft Azure Internal Consumption(
106             appType: 'webApp'
107             WebAppName: '$(WebsiteName)'
108             deployToSlotOrASE: true
109             ResourceGroupName: 'PartsUnlimitedRG'
110             SlotName: 'Dev'
111             packageForLinux: '$(System.ArtifactsDirectory)/**/*.zip'
112
```

7. We will also replace **$(System.ArtifactsDirectory)** with **$(Pipeline.Workspace)** in *packageForLinux:* value. This is to avoid having to add Download Pipeline Artifact task in every job under every stage. When we use the *deployment* job, it automatically downloads the published artifacts to $(Pipeline.Workspace)/{artifact} location.

   You can find more about Publish and Download Artifacts here.

   Your AzureRmWebAppDeployment@4 task should now look like below:

```
                Settings
102         - task: AzureRmWebAppDeployment@4
103           inputs:
104             ConnectionType: 'AzureRM'
105             azureSubscription: 'Microsoft Azure Internal Consumption
106             appType: 'webApp'
107             WebAppName: '$(WebsiteName)'
108             deployToSlotOrASE: true
109             ResourceGroupName: 'PartsUnlimitedRG'
110             SlotName: 'Dev'
111             packageForLinux: '$(Pipeline.Workspace)/**/*.zip'
112
```

8. Next, we will add a snippet for the Staging environment. Copy the following *deployment* section.

```yaml
    - deployment: DeployToDev
      displayName: Deploy To Dev Environment

      pool:
        name: Hosted VS2017

      environment: 'PUL-Dev'
      strategy:
        runOnce:
          deploy:
            steps:

                Settings
            - task: AzureRmWebApp Deployment@4
              inputs:
                ConnectionType: 'AzureRM'
                azureSubscription: 'Microsoft Azure Internal Consumption
                appType: 'webApp'
                WebAppName: '$(WebsiteName)'
                deployToSlotOrASE: true
                ResourceGroupName: 'PartsUnlimitedRG'
                SlotName: 'Dev'
                packageForLinux: '$(Pipeline.Workspace)/**/*.zip'
```

9. Paste this section on the next line after **AzureRmWebAppDeployment@4** task ends and before **DeployToProd** stage starts. Correctly indent the pasted section to align with the previous *DeployToDev* deployment job. **Note:** The first **DeployToDev** deployment job is collapsed for better readability.

```yaml
  - stage: DeployToDevAndStaging
    displayName: Deploy to Dev and Staging Environments
    jobs:
    - deployment: DeployToDev ...

    |

  - stage: DeployToProd
    displayName: Deploy to Production
```

```yaml
  - deployment: DeployToDev ...

  - deployment: DeployToDev
    displayName: Deploy To Dev Environment

    pool:
      name: Hosted VS2017

    environment: 'PUL-Dev'
    strategy:
      runOnce:
        deploy:
          steps:

            Settings
            - task: AzureRmWebAppDeployment@4
              inputs:
                ConnectionType: 'AzureRM'
                azureSubscription: 'Microsoft Azure Internal Consumption
                appType: 'webApp'
                WebAppName: '$(WebsiteName)'
                deployToSlotOrASE: true
                ResourceGroupName: 'PartsUnlimitedRG'
                SlotName: 'Dev'
                packageForLinux: '$(Pipeline.Workspace)/**/*.zip'

  - stage: DeployToProd
    displayName: Deploy to Production
```

10. Now, we will rename the second *DeployToDev* deployment job to **DeployToStaging**, rename *displayName* to **Deploy to Staging Environment**, and change the *environment* to **PUL-Staging**.

```yaml
  - deployment: DeployToDev ...

  - deployment: DeployToStaging
    displayName: Deploy To Staging Environment

    pool:
      name: Hosted VS2017

    environment: 'PUL-Staging'
    strategy:
```

11. We also want to ensure that *DeployToDev* deployment runs first and only after it is successfully finished, *DeployToStaging* starts. For enforcing this dependency, we will use **dependsOn**.

```
    deployment: DeployToStaging
    displayName: Deploy To Staging Environment
    dependsOn: DeployToDev
```

```
  - deployment: DeployToStaging
    displayName: Deploy To Staging Environment
    dependsOn: DeployToDev

    pool:
```

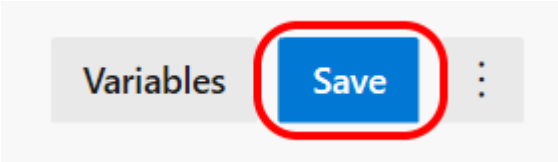
12. Lastly, we will change the *SlotName* to **Staging** in the **AzureRmWebAppDeployment@4** task. This deploys the web app to the Staging slot in this delpoyment job.

```
        environment: 'PUL-Staging'
        strategy:
          runOnce:
            deploy:
              steps:

                Settings
              - task: AzureRmWebAppDeployment@4
                inputs:
                  ConnectionType: 'AzureRM'
                  azureSubscription: 'Microsoft Azure Internal Consumption
                  appType: 'webApp'
                  WebAppName: '$(WebsiteName)'
                  deployToSlotOrASE: true
                  ResourceGroupName: 'PartsUnlimitedRG'
                  SlotName: 'Staging'
                  packageForLinux: '$(Pipeline.Workspace)/**/*.zip'

  - stage: DeployToProd
```

13. Finally, before we start working on the last stage in the next exercise, **Save** the changes made so far.



Exercise 3: Configure the Production deployment stage

1. Add an *environment* section to the last line of the YAML file. Set the environment name to **PUL-Production**

```
    environment: 'PUL-Production'
    strategy:
        runOnce:
            deploy:
                steps:
```

```
137   - stage: DeployToProd
138     displayName: Deploy to Production
139     jobs:
140     - deployment: DeployToProd
141       displayName: Deploy To Prod Environment
142
143       pool:
144         name: Hosted VS2017
145
146       environment: 'PUL-Production'
147       strategy:
148         runOnce:
149           deploy:
150             steps:
```

2. Ensure the environment section is correctly indented to align with the *pool* section.

3. Set the cursor on a new line at the end of the YAML definition. This will be the location where our next task will be added for Azure App Service Deployment.

4. Copy and paste the **AzureRmWebAppDeployment@4** task from the previous stage and remove the following three lines:

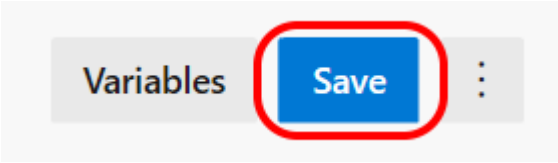
```
deployToSlotOrASE: true
ResourceGroupName: 'PartsUnlimitedRG'
SlotName: 'Staging'
```

```yaml
    environment: 'PUL-Production'
    strategy:
      runOnce:
        deploy:
          steps:

Settings
          - task: AzureRmWebApp Deployment@4
            inputs:
              ConnectionType: 'AzureRM'
              azureSubscription: 'Microsoft Azure Internal Consumption
              appType: 'webApp'
              WebAppName: '$(WebsiteName)'
              packageForLinux: '$(Pipeline.Workspace)/**/*.zip'
```

Note: Since this is the Production environment, we are deploying the app in the production slot or in the actual Azure App Service instead of any slot of this App Service.

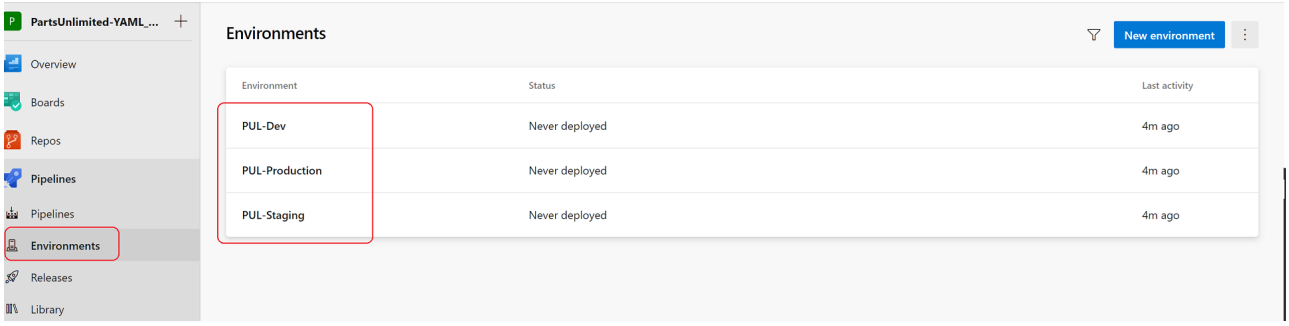
5. Click **Save** to commit the changes.



Exercise 4: Review environments and setup Approval

1. Before we trigger the run of this pipeline, let's review the environments that got created after we saved the YAML file. We will also setup Approvals on the Production environment.

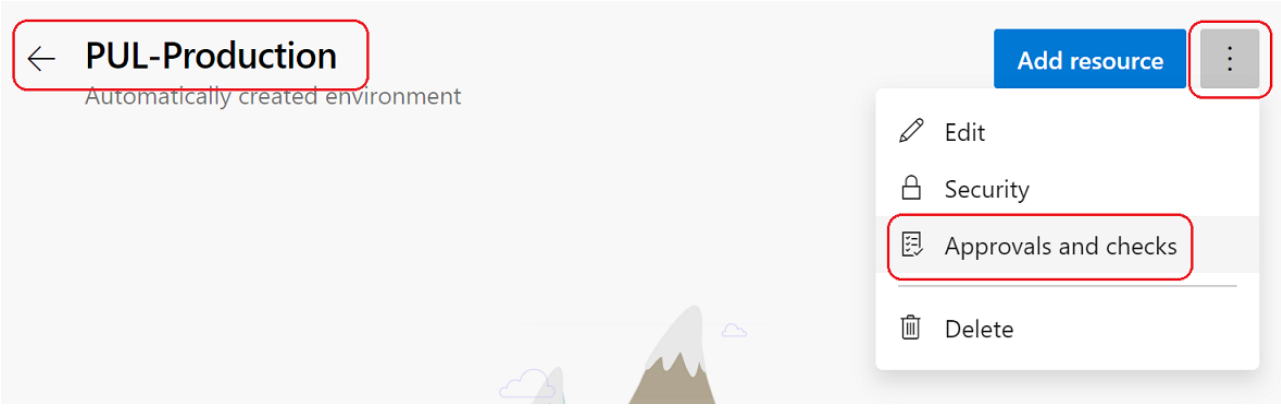
2. Click on **Environments** under the Pipelines section. Notice that three environments are automatically created: PUL-Dev, PUL-Staging and PUL-Production.



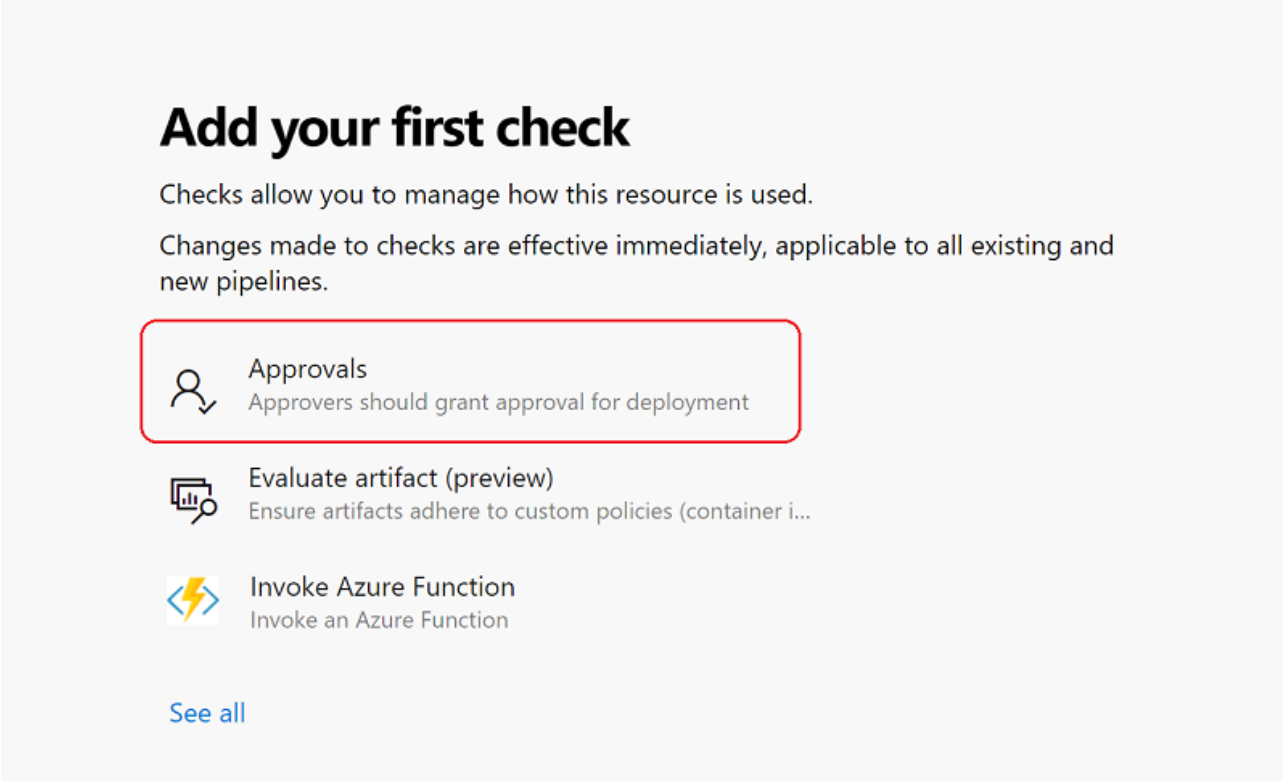
   Note: Notice that the environments indicate that they were created just a few minutes ago (when we saved the YAML file) and have never been deployed to. We could have manually created these environments as well. However, it's easier to create those directly from the YAML definition.

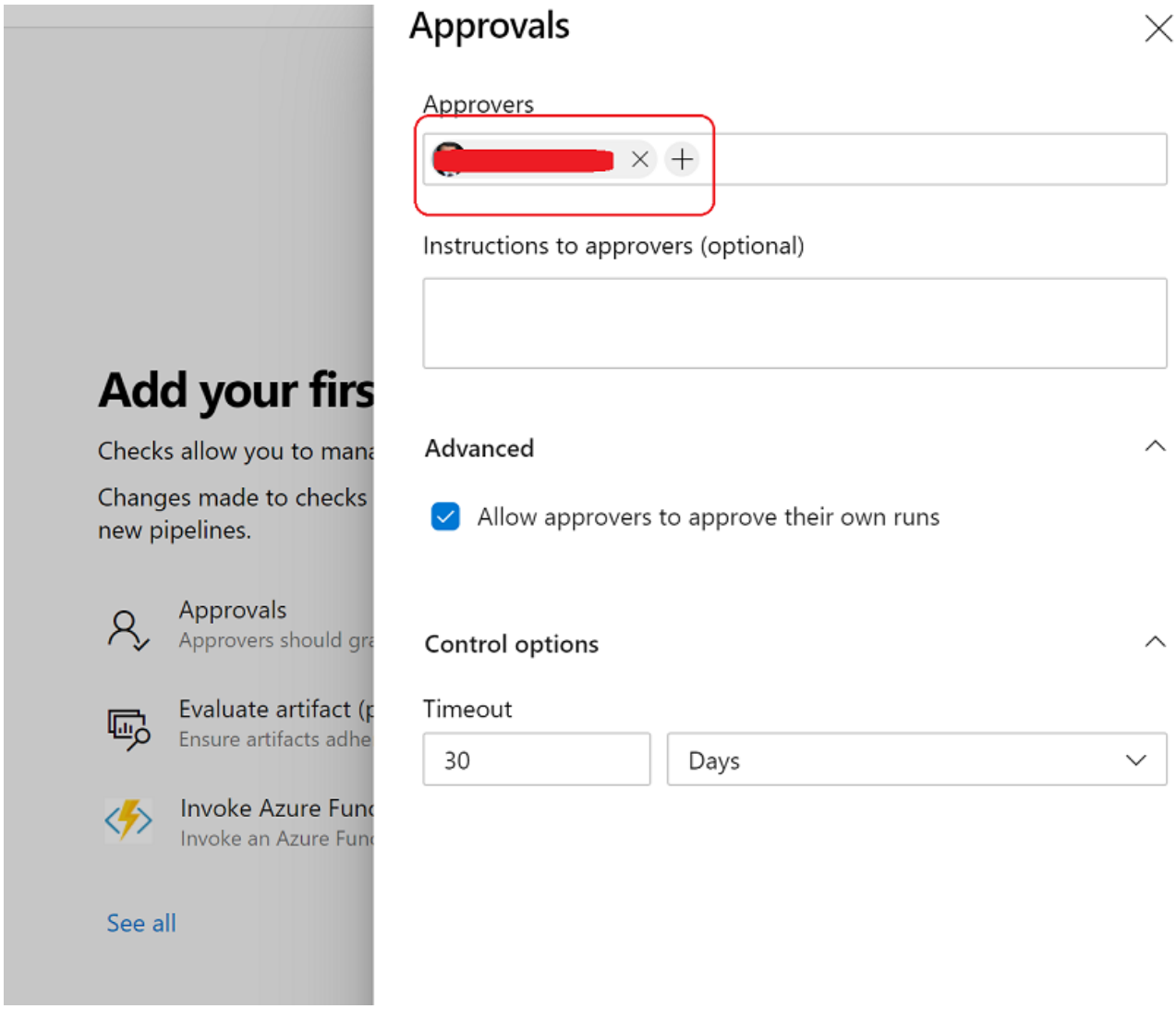
3. Now, we want to ensure that deployments to the PUL-Production environment don't happen without the approval of an individual/group that is responsible for the Production releases. For this we will use **Approvals**.

4. Select the **PUL-Production** environment. Select the vertical "..." section at the top-right. Select **Approvals and Checks**



5. Select **Aprovals** and add yourself as the **Approver**. Click **Create**.

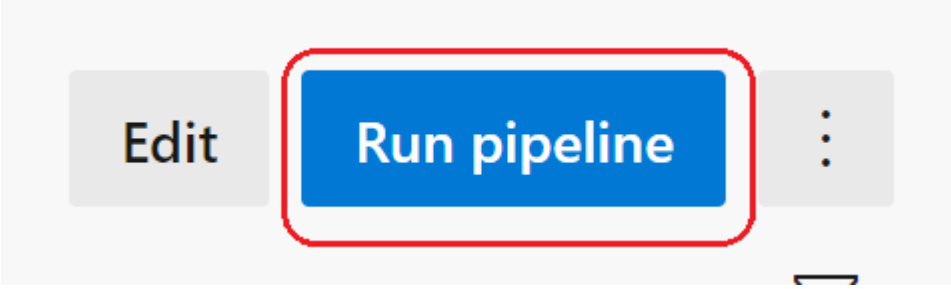

Add your first check
Checks allow you to manage how this resource is used.
Changes made to checks are effective immediately, applicable to all existing and new pipelines.
Approvals
Approvers should grant approval for deployment
Evaluate artifact (preview)
Ensure artifacts adhere to custom policies (container i...
Invoke Azure Function
Invoke an Azure Function
See all


Approvals
Approvers
Instructions to approvers (optional)
Advanced
Allow approvers to approve their own runs
Control options
Timeout
30
Days
See all

Exercise 5: Deploy the Web App to Multiple Environments

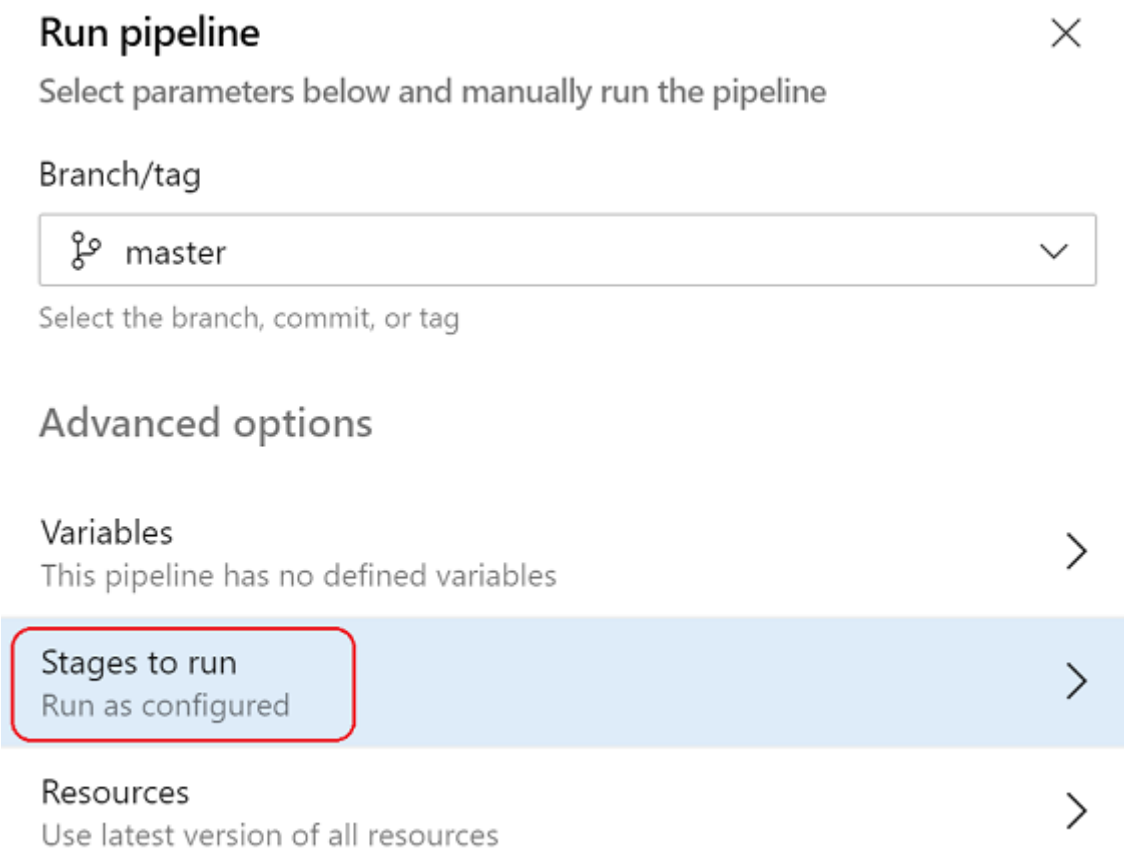
1. Let's run the pipeline to check if everything is working the way we are expecting.

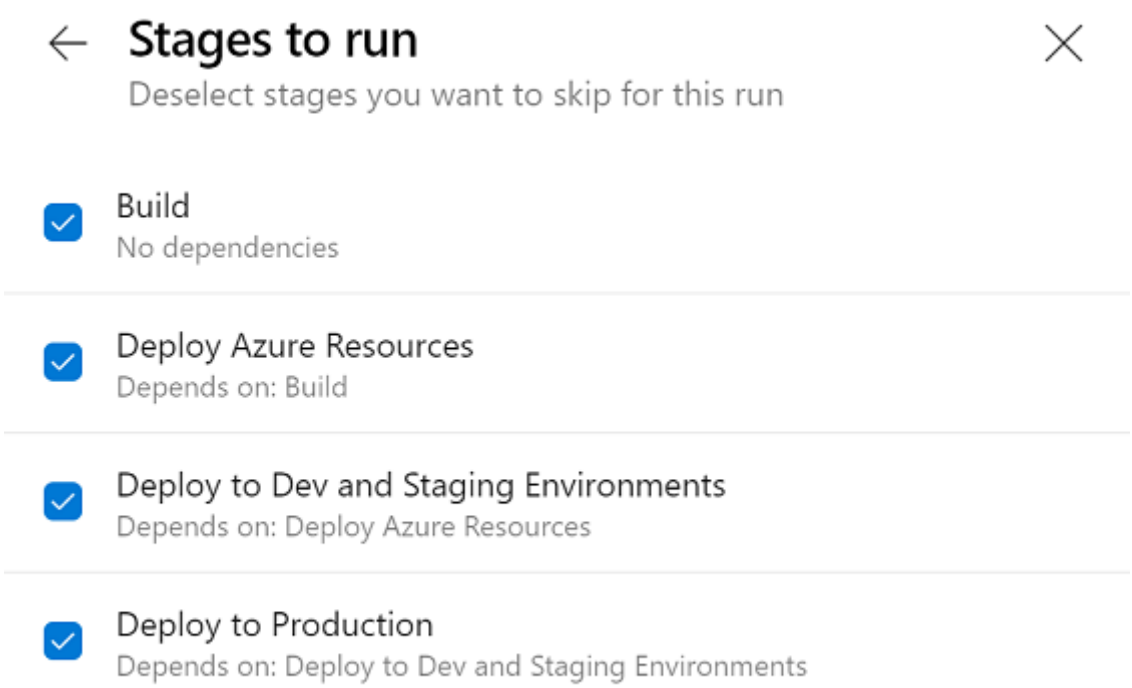
2. Navigate back to Pipelines, select your YAML pipeline and click **Run pipeline**.



3. While we will not make any modifications at this time, select **Advanced Options**, expand **Stages to run**. You will notice all the stages we have configured in the YAML definitions are showing up here with the option to uncheck any of the stage.

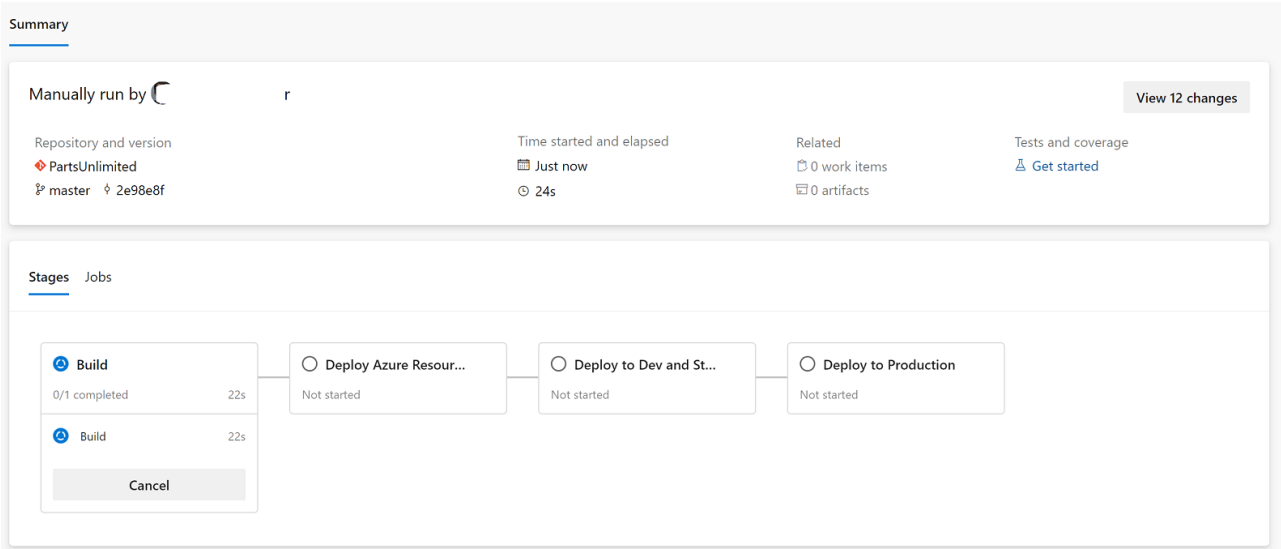
   Since we have combined the deployment of Dev and Staging environments into a single stage, we cannot unselect Dev or Staging independently. Click **Cancel**.



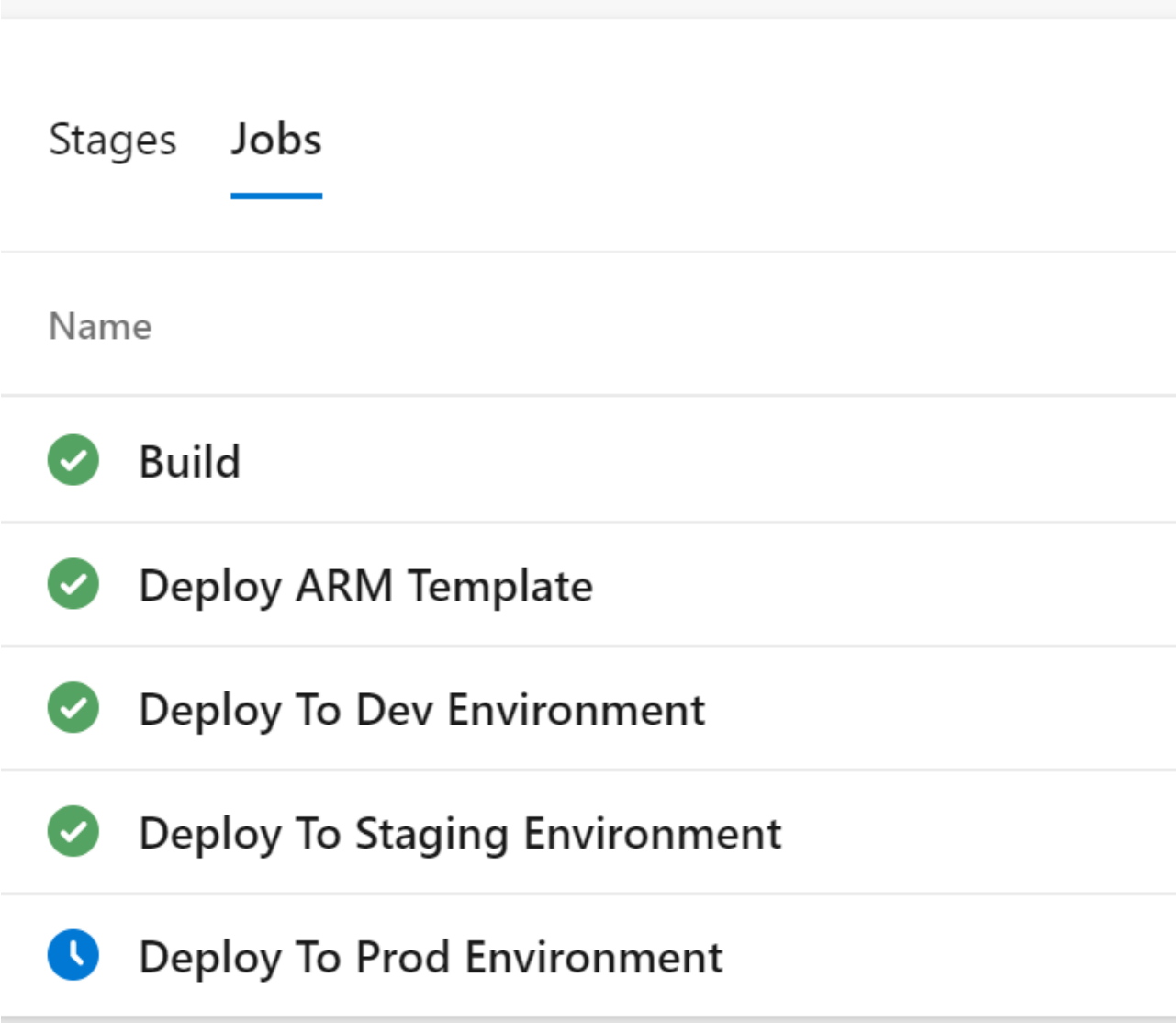


4. Click **Run** to start the pipeline. Review the summary.

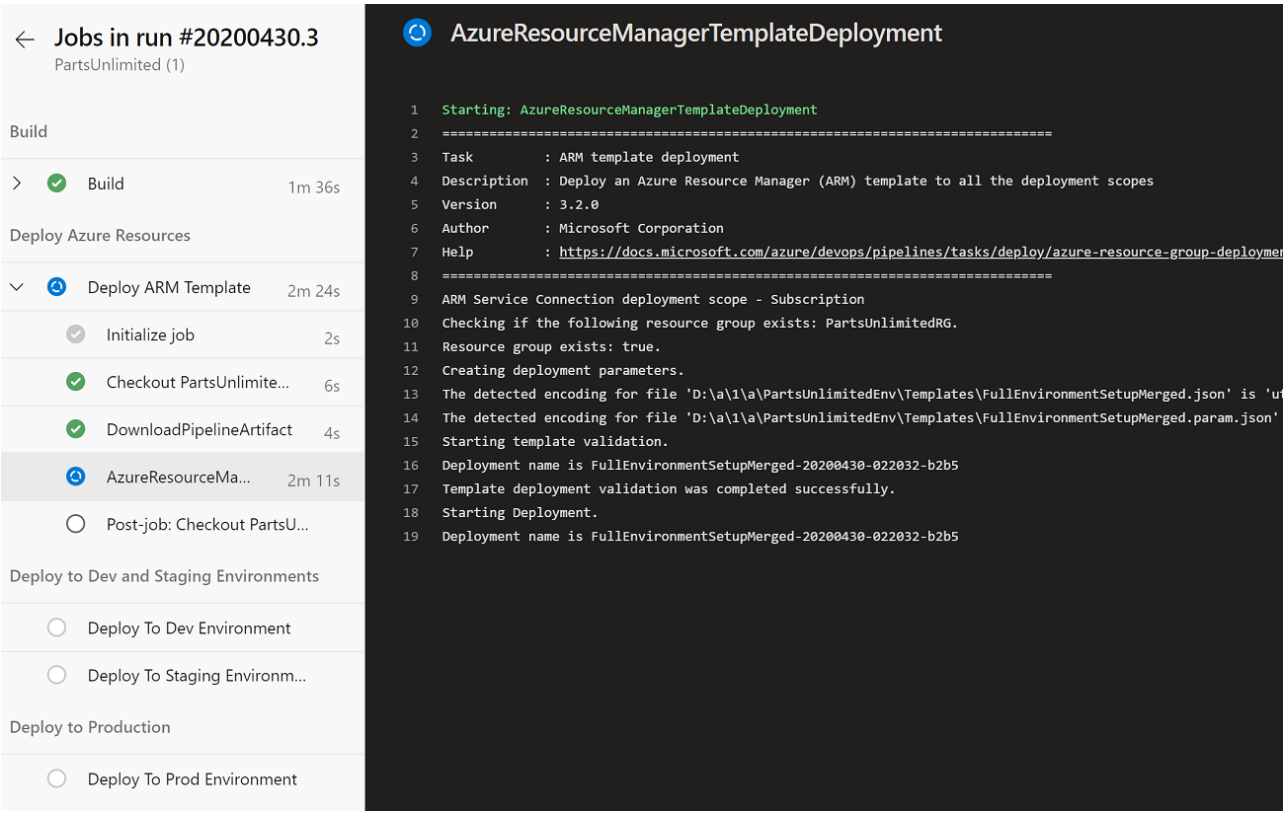
   Note: Here you can see multiple stages under the **Stages** section. Also, notice the friendly names of those stages based on the *displayName* value in the YAML definitions.



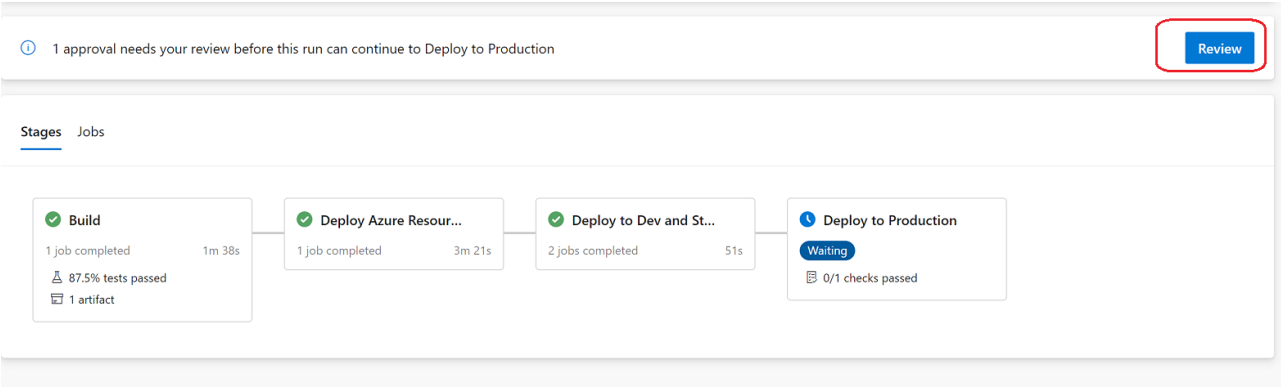
5. Click **Jobs** to review the jobs defined in the YAML definitions.

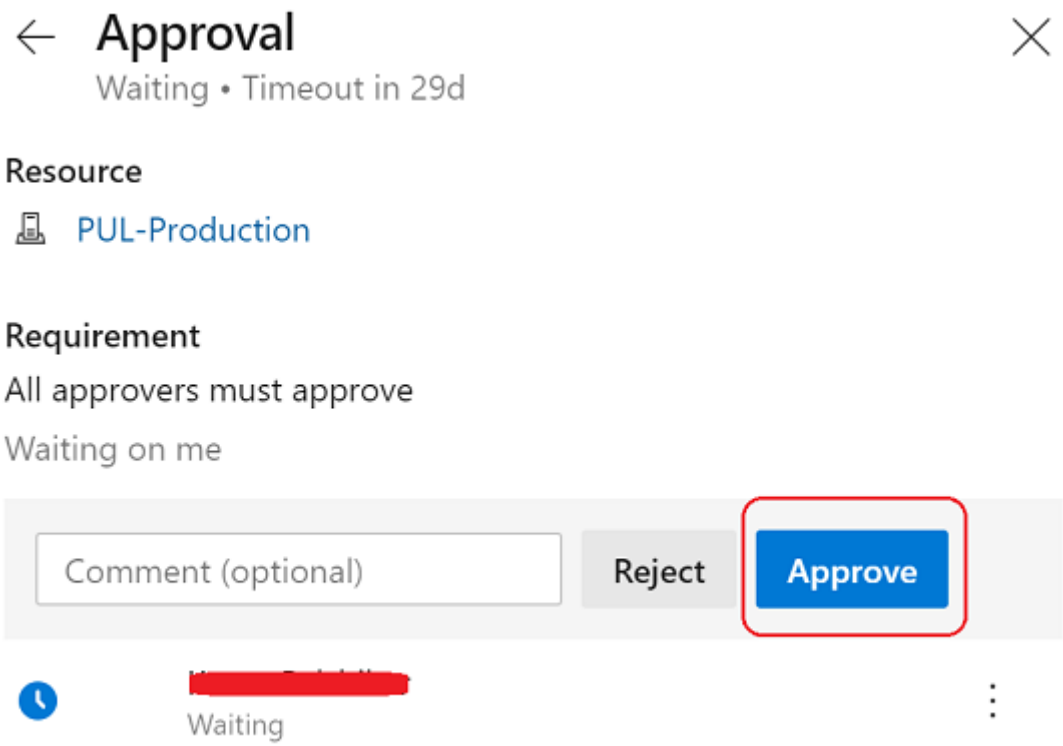


6. At any time during the running of the pipeline, click on any stage or job to view more details.

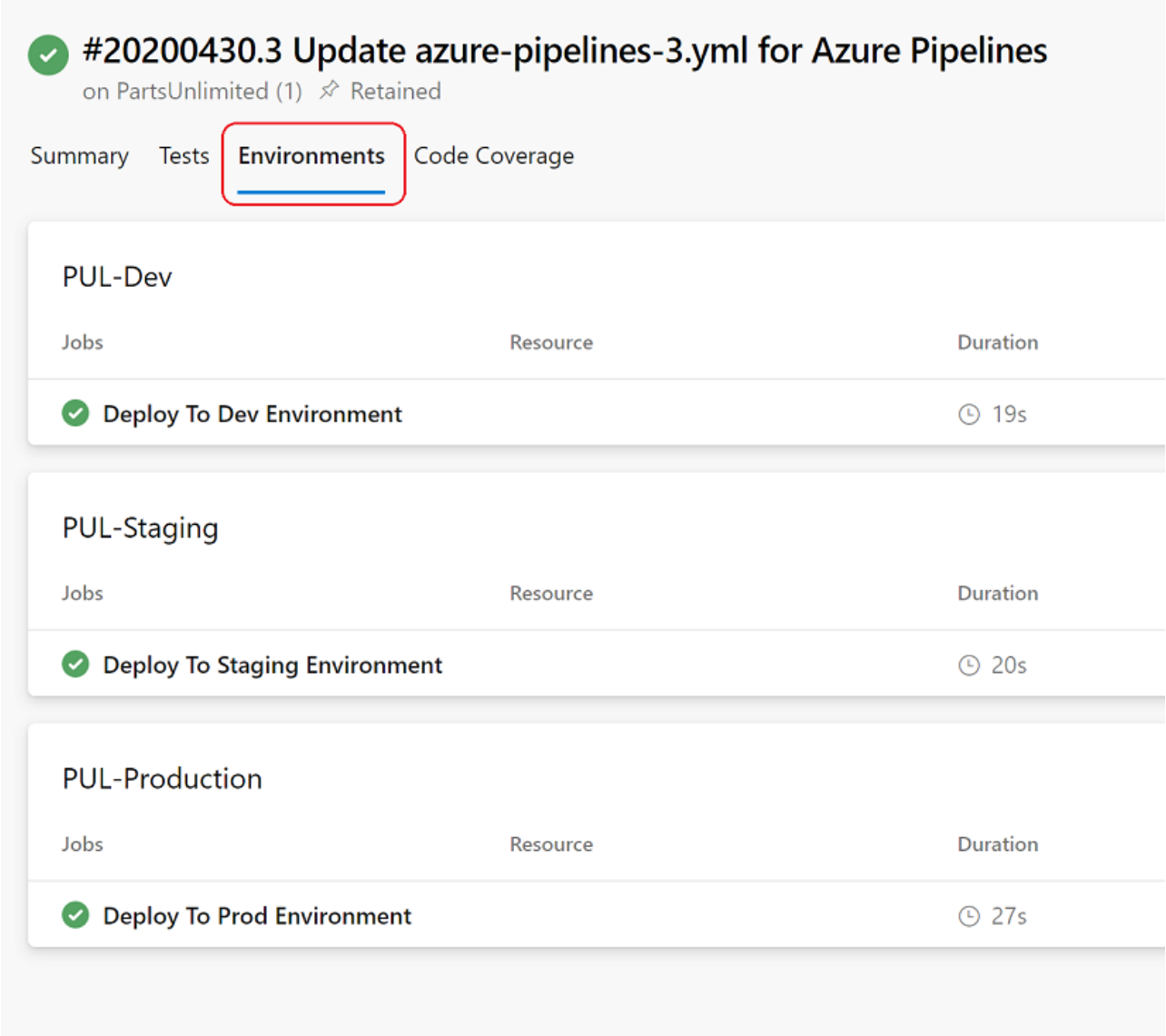


7. As the deployment reaches the Production environment, it will pause for the review and approval first. Click on **Review** and **Approve** the deployment.

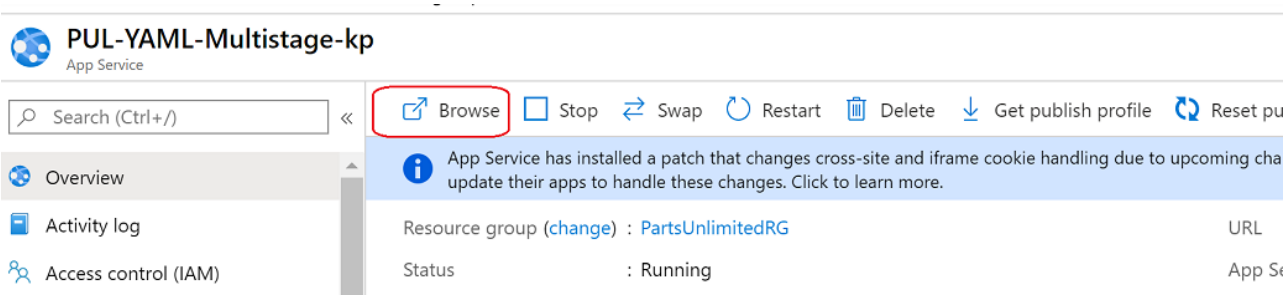




8. Also, back in the pipeline summary, click on **Environments** to review the deployment for all the environments.

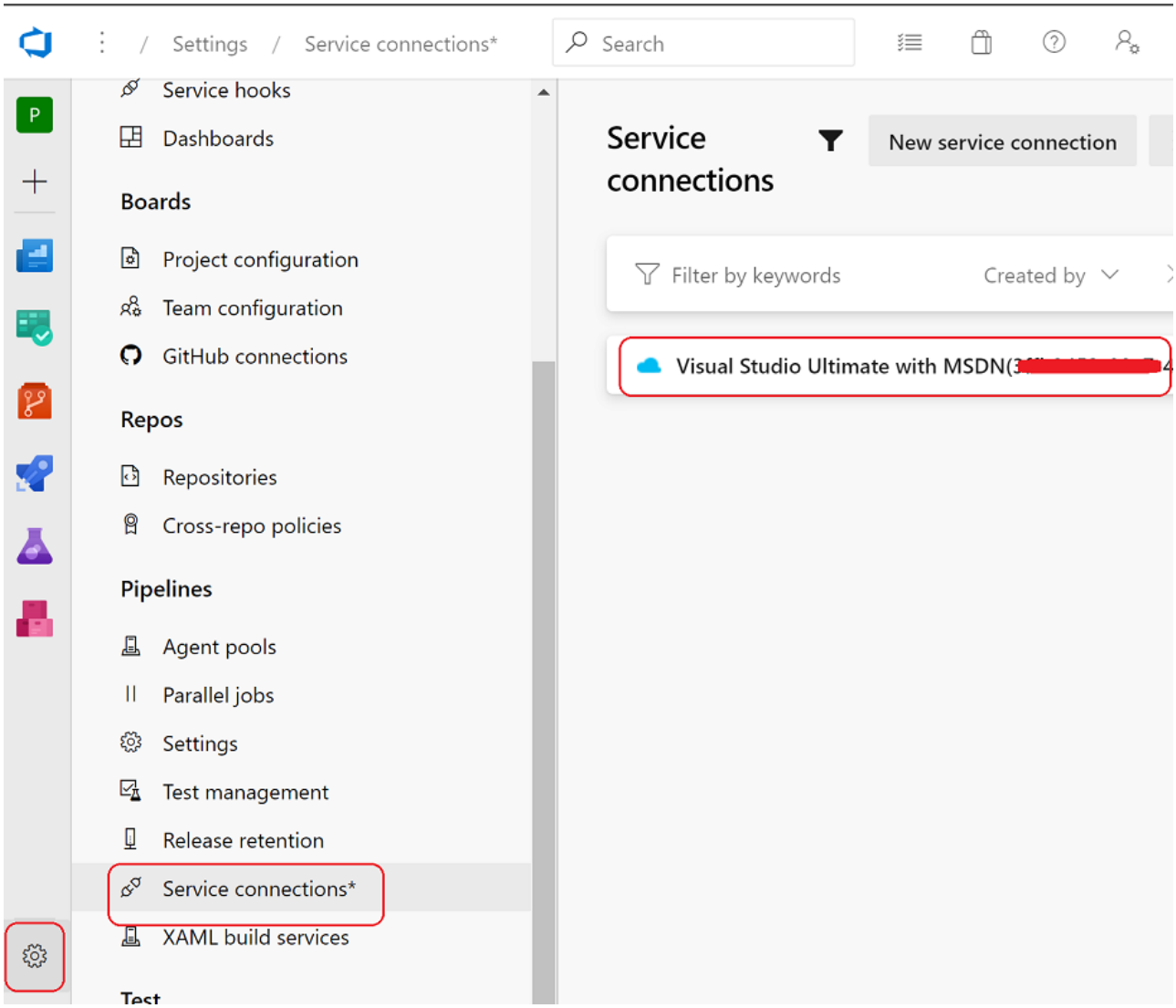


9. As the deployment completes, we want to check our deployment in Azure. Navigate to the Azure Portal. Select the PartsUnlimitedRG resource group and click on the App Service for the Dev slot. Click on **Browse** and verify that the site is running. Repeat this for the Staging slot and Production application.



Exercise 6: Set the Approval on the Service Connection

1. In this last exercise, we will set up Approval on the Service Connection used in the pipeline.
2. At this point, everyone should be quite comfortable navigating through Azure DevOps. Also, setting up an Approval on the Service Connection is very similar to setting the Approvals in Environments. For these reasons, the following steps are deliberately provided with fewer screenshots.
3. Navigate to **Project Settings** at the bottom-left of the Project you are working on.
4. Under the **Pipelines** section in the Project Settings, select **Service connections**.
5. Notice a Service connection has already been created. This service connection was created the first time you authorized the connection from Azure DevOps to the Azure Portal in an earlier lab.



6. Select the Service connection and click on the vertical (...) to configure the settings of this connection.
7. Click on **Approvals and checks**. This UI should be similar to that of the Approvals and Checks for the Environments.
8. Select **Approvals** and add yourself as the approver. Click **Create**.

9. Run the pipeline again. In each stage that the service connections is invoked, the pipeline will now ask for an approval. This will protect unauthorized and unintended deployments from Azure DevOps into a particular Azure subscription!