- 1. We change some source code.
- 2. Push that source code control into an environment.
- 3. Build a low code app and use the code-based control.
- 4. Run a workflow in GitHub to promote the changes from the developer environment to your test environment and understand the difference between managed and unmanaged solutions.

#### As a prerequisite, you will need:

- 1. A GitHub Account.
- 2. Microsoft Power Platform Developer Plan (link)
- 3. Azure portal access using AAD account to be used for this lab.

#### Items to be provisioned:

- 1) Developer environment (using Developer Plan)
- 2) Test environment (using Developer Plan)
- 3) App registration in Azure AD and create the APP ID and Client ID and the SECRET (this is required for the workflow; use **Setup** page to review how to get these)

We will need to provide the ability to clone GitHub repository with all modifications for the PCF control.

#### What is expected out of this lab?

The expectation of this lab is as follows:

Understand the few of the code first capabilities available in Power Platform and how can code first developers work with Power Platform using their existing tools. We will go through a set of tools that are familiar to developers and a few concepts that are unfamiliar to developers. We will also experience how to develop and deploy low code applications using a continuous integration/continuous delivery paradigm. The intent of this lab is to do everything over the web and not have install any components on the local workstation, but you will have step by step instructions on how to proceed and become productive with your existing developer skills with low code platforms.

We will learn how to deploy low code applications with code first components and how to stage them from Development, to QA to Production.

#### We will:

- 1. Use codespace and build a PCF control.
- 2. Push it into a DEV environment.
- 3. Add the PCF control to an app.
- 4. Export the new app with PCF control to GitHub.
- 5. Have a GitHub workflow to deploy from Dev to Test.

### Setup

### How to get a Tenant ID?

Follow "Create App registration in Azure portal" (steps on next page) to build Tenant ID, Client ID, and Client Secret.

#### How to get Application ID (a.k.a. Client ID)?

Follow "Create App registration in Azure portal" (steps on next page) to build Tenant ID, Client ID, and Client Secret.

#### How to get a Client Secret?

Follow "Create App registration in Azure portal" (steps on next page) to build Tenant ID, Client ID, and Client Secret.

#### How to create a Service Principal Name (SPN)?

Creating a service principal application using PowerShell - Power Platform | Microsoft Learn

#### **Getting an Environment URL & Environment ID?**

Once users are connected to Power Platform via Visual Studio Code (VSCode) using Power Platform Tools extension via *GitHub Codespaces*. In the Terminal window of VSCode, user can type below commands to create (up to 3) developer environments. When creating an environment, output will show Environment URL & Environment ID.

```
pac admin create --type Developer --name dev
pac admin create --type Developer --name test
Microsoft Power Platform CLI admin command group - Power Platform | Microsoft Learn
```

### **How to Create App User?**

#### Command:

```
pac admin assign-user --environment <ENVIRONMENT_URL> --user
"<APPLICATION_ID_FROM_APP_REGISTRATION>" --role "System Administrator"
--application-user
```

### Create App registration in Azure portal.

#### Create App Registration

- 1. Go to Azure portal (<a href="https://portal.azure.com">https://portal.azure.com</a>) and login using AAD enabled account.
- 2. Select Azure Active Directory
- 3. Select **App Registration** from the left blade.
- 4. Select New registration.
- 5. Type **BuildLabRegistration** → click **Register**, write down/save below items.

Application (client) ID:	GUID
Object ID:	GUID
Directory (tenant) ID:	GUID

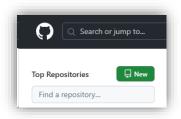
- 6. Click Manifest → Change "allowPublicClient" to TRUE → click Save
- 7. Click API Permissions → click Add a permission → select APIs my organization uses → type Dataverse → click Delegate permissions → click user\_impersonation → click Add permissions.
- 8. Click API Permissions → click Add a permission → select APIs my organization uses → select PowerApps-Advisor → click Delegate permissions → click user\_impersonation → click Add permissions.
- 9. Click API Permissions → click Add a permission → select APIs my organization uses → select PowerApps Service → click Delegate permissions → click user\_impersonation → click Add permissions.
- 10. Select **Certificates & secrets** → click **New client secret** → type **BuildLabSecret** → select **90 days (3-months)** → click **Add,**, write down/save (Name, Value, Secret ID)

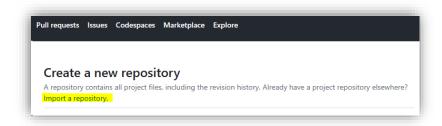
### Use GitHub Repository, Codespaces and build a PCF control.

We begin with GitHub once connected to your Lab machine. We will experience how to make use of GitHub codespace to create and deploy code component using Microsoft Power Platform CLI.

- 1. Please login to your GitHub account.
- 2. Let's start to create a clone of GitHub repository that consists of needed artifacts.

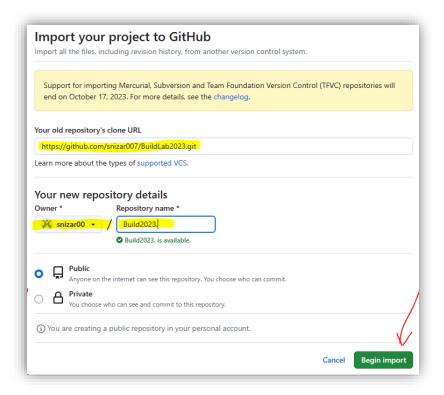
Click **New** for repository and on the next screen find a hyperlink **Importing a repository** to click on.

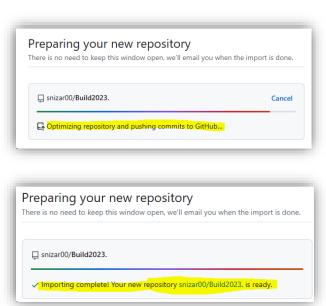




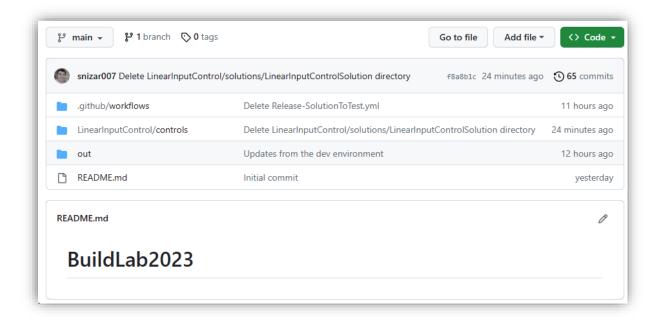
GitHub Repo to use: https://github.com/snizar007/BuildLab2023.git

Create a repository of your choice and make a note of the repository name that will be used later. Click **Begin import.** 

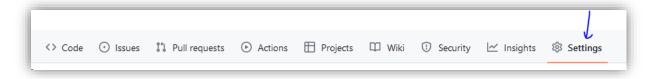




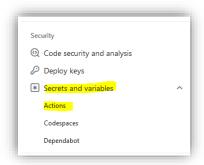
3. Once your repository has been imported, you should see it in your list of repositories. Click on your repository name to view imported artifacts (*like below*).



4. Now let's setup GitHub secret that is provided as part of the lab using steps below:



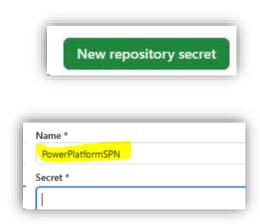
5. Click on Secretes and variables > Actions.



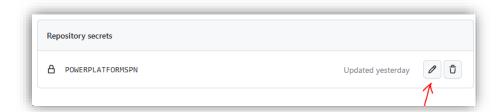
6. Click the **New repository secret** button.

Name the secret **PowerPlatformSPN** under **Repository secrets**. Type the **Client Secret Value** provided in the **Lab** > in the **Secret** area.

After adding the value, click **Add secret**.



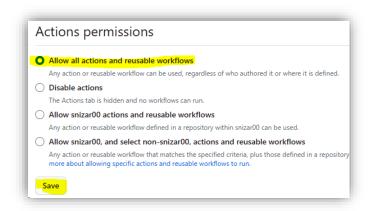
**NOTE:** If you need to update the secret value, click **edit** (*below*) and type the Secret value and click **Update secret**.



7. Please make sure that you have proper Actions Permissions. On **Settings** page, click **Actions** > **General**.

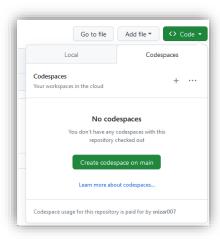


Make sure "Allow all actions and reusable workflows" is checked. If not, check it and click **Save**.

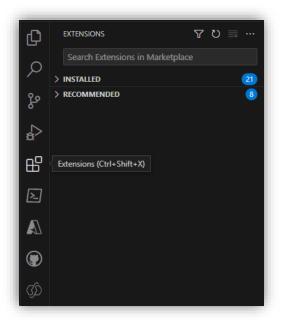


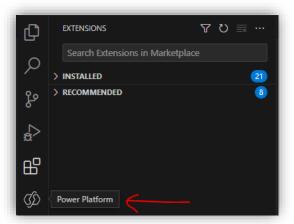
8. Next, you will create a GitHub codespace in the same REPO.

On Code menu option, click on <> Code > Create codespace on main under Codespaces tab.

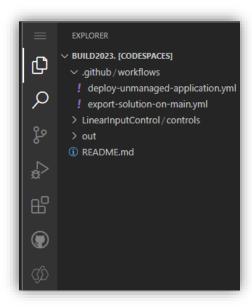


9. Once your codespace starts, let's install **Power Platform Tools** Extension. . Click **Extensions >** search **Power Platform Tools** > click **Install**.





You shall see a cloned repo and Power Platform extension.



In your TERMINAL section of the screen let's review. We have a Code component folder (*LinearInputControl*) and an **README.md** file. Below image shows folders (*LinearInputControl, and controls folder within LinearInputControl folder*) you should see in your TERMINAL section.

```
PROBLEMS
            OUTPUT
                     DEBUG CONSOLE
                                     TERMINAL
                                                PORTS
                                                       COMMENTS

    @snizar@ →/workspaces/BuildTest (main) $ 1s -1

 drwxrwxrwx+ 3 codespace root 4096 May 22 20:26 lineanIngutControl
 -rw-rw-rw- 1 codespace root 14 May 22 20:26 READNE.md

■ @snizar00 →/workspaces/BuildTest (main) $ cd LinearInputControl/
○ @snizar00 →/workspaces/BuildTest/LinearInputControl (main) $

○ @snizar00 →/workspaces/BuildTest/LinearInputControl (main) $

• @snizar00 →/workspaces/BuildTest/LinearInputControl (main) $ 1s -1

 total 4
 drwxrwxrwx+ 3 codespace root 4096 May 22 20:26 controls

♠ @snizar@@ →/workspaces/BuildTest/LinearInputControl (main) $ cd controls/
○ @snizar@@ →/workspaces/BuildTest/LinearInputControl/controls (main) $

♠ @snizar00 →/workspaces/BuildTest/LinearInputControl/controls (main) $ 1s -1

 total 340
                                4096 May 22 20:26 LineanInputControl
 drwxrwxrwx+ 4 codespace root
 -rw-rw-rw- 1 codespace root 2284 May 22 20:26 controls.pcfproj
 -rw-rw-rw- 1 codespace root 325495 May 22 20:26 package-lock.json
 -rw-rw-rw- 1 codespace root 947 May 22 20:26 package.json
  -rw-rw-rw- 1 codespace root
                                34 May 22 20:26 pcfconfig.json
 -rw-rw-rw- 1 codespace root
                                 144 May 22 20:26 tsconfig.json
○ @snizar00 →/workspaces/BuildTest/LinearInputControl/controls (main) $
```

Use GitHub codespace and build a PCF control:

```
≥ pwsh - LinearInputControl + ∨ □ · · · · ·
                 TERMINAL
        Directory: C:\Users\kartikka\Documents\GitHub\control\LinearInputControl
Mode
                    LastWriteTime
                                        Length Name
               9/1/2022 3:51 PM
                                               LinearInputControl/
                                           node_modules/
obj/
out/
            9/1/2022 3:51 PM
12/16/2021 12:05 PM
                                        445 .eslintrc.json
185 .gitignore
2215 LinearInputControl.pcfproj
            12/16/2021 12:05 PM
                           3:48 PM 565146 package-lock.json
               9/1/2022
             12/16/2021 12:05 PM
                                         825 package.json
```

Here we are going to go into the **LinearInputControl/LinearInputControl** folder (in the left explorer blade) and click on the **index.ts** fileand change the following value from a 1000 to a 100. This is to reduce the slider numbers that go upto 100.

NOTE: Please make sure to commit your GitHub changes.

```
//setting the max and min values for the control.
this.inputElement.setAttribute("min", "1");
this.inputElement.setAttribute("max", "100");
this.inputElement.setAttribute("class", "linearslider");
this.inputElement.setAttribute("id", "linearrangeinput");
// creating a HTML label element that shows the value that is set on the l
```

11. Now we **save**. Then we go to the terminal window and type **npm run build** (NOTE: we will need to run **npm install** first within LinearInputControl/control folder where you have package.json file)

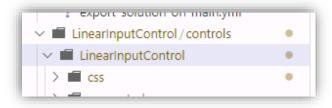
Once the build is successful you will see the following result with successful build message (below).

```
> pcf-project@1.0.0 build
> pcf-scripts build

[7:40:30 PM] [build] Initializing...
[7:40:30 PM] [build] Validating manifest...
[7:40:30 PM] [build] Validating control...
[7:40:32 PM] [build] Generating manifest types...
[7:40:32 PM] [build] Generating design types...
[7:40:32 PM] [build] Compiling and bundling control...

Browserslist: caniuse-lite is outdated. Please run:
    npx update-browserslist-db@latest
    Why you should do it regularly: https://github.com/browserslist/update-db#readme
[Webpack stats]:
    asset bundle.js 7.21 KiB [emitted] (name: main)
    ./LinearInputControl/index.ts 5.52 KiB [built] [code generated]
    webpack 5.74.0 compiled successfully in 17671 ms
[7:41:02 PM] [build] Generating build outputs...
[7:41:02 PM] [build] Succeeded
```

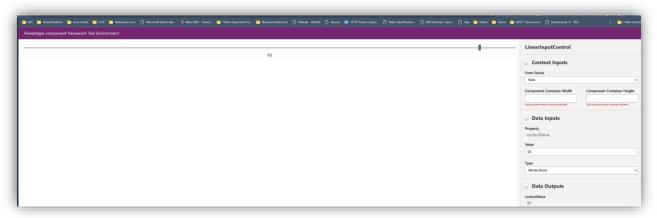
If the build does not run, this is so that the repository was cloned hence it does not have the dependencies to run the build. This is why we should run **npm install** (*in LinearInputControls folder*).



```
@snizar00 →/workspaces/Build2023./LinearInputControl/controls (main) $ npm run build
 > pcf-project@1.0.0 build
 > pcf-scripts build
 sh: 1: pcf-scripts: not found
■ @snizar00 →/workspaces/Build2023./LinearInputControl/controls (main) $ npm i -g
 added 1 package in 135ms
■ @snizar00 →/workspaces/Build2023./LinearInputControl/controls (main) $ npm install
 added 693 packages, and audited 694 packages in 13s
 115 packages are looking for funding
   run `npm fund` for details
 found 0 vulnerabilities
 npm notice New patch version of npm available! 9.6.3 -> 9.6.6
 npm notice Changelog: https://github.com/npm/cli/releases/tag/v9.6.6
 npm notice Run npm install -g npm@9.6.6 to update!
 npm notice
@snizar00 →/workspaces/Build2023./LinearInputControl/controls (main) $
```

12. Now your build should succeed when you run **npm run build** as you can see a succeeded build below.

13. Now let us test this component and type in **npm run start.** You will be prompted to open browser, go ahead and do that. (*NOTE:If your browser tab is taking time, click stop > refresh.*)



This will start the test harness and make sure that our changes are in. We changed slider value to 100.

Once confirmed slider, close slider browser TAB, come back to GitHub codespaces and press Ctrl-C in the TERMINAL.

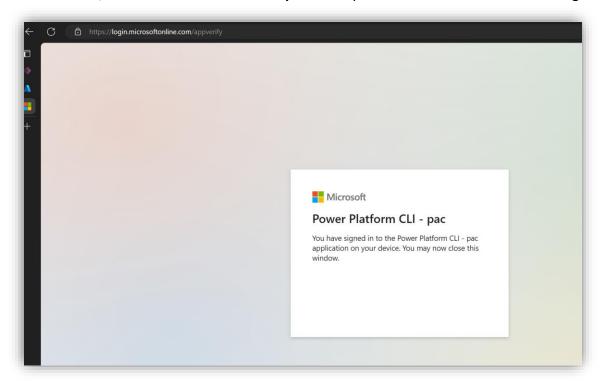
### Build PCF control and push it into a DEV environment.

Now that we have built the control let us make it available to our Power platform environment.

1. First, we authenticate using a device code, this is the preferred method especially when using browser-based sessions. For this step, go back to your GitHub Codespaces environment. In your terminal, type in **pac auth create --devicecode** which will provide a URL with a code to be used at the provided URL to authenticate.

```
kartikka@OCAMPA-1 LinearInputControl pwsh no config pac auth create --deviceCode
To sign in, use a web browser to open the page https://microsoft.com/devicelogin and enter the code RUR8Y2PR4 to authenticate.
'user8@wrkdevops.onmicrosoft.com' authenticated successfully.
Validating connection...
Default organization: T-Logistics-Dev
Authentication profile created
* UNIVERSAL https://orgab9e0a25.crm.dynamics.com/ : user8@wrkdevops.onmicrosoft.com
Public
```

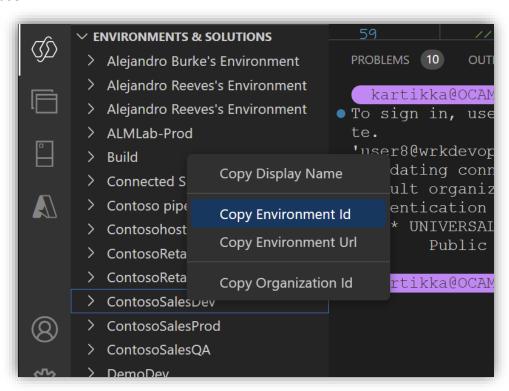
Enter the code, and use the **username and password** provided in the lab resources to sign in.



 Once authenticated, now let us select our development environment, that has been created for us using the command pac org select –environment <ENVIRONMENT\_URL -or ENVIRONMENT\_ID>

**NOTE:** ENVIRONMENT\_ID is provided at the top of the lab. For ENVIRONMENT\_URL, refresh your Power Platform in the left blade, you will see an authenticated profile (*top*) and list of environments (*dev and test at the bottom*), **right-click** on the **DEV** environment to get the Environment URL.

Let us select the environment (*select DEV environment*) we want to push our new controller for use.



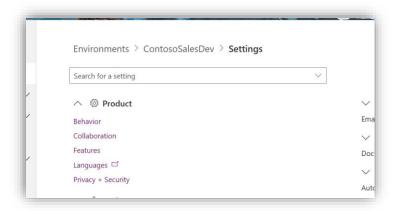


- Now make sure that the developer environments all have the code component enabled. You can run a check by using command pac org who to ensure you are connected to the correct environment.
- 4. Now open another brower tab and using Office 365 Tenant credentials provided in the Lab Resources area, go to <a href="https://admin.powerplatform.microsoft.com">https://admin.powerplatform.microsoft.com</a> (we have pre-provisioned environments that you will see when you click Environments on left pane)

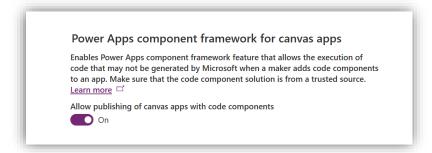
Select Environments on left pane.

Select **DEV environment > Settings > Product > Features** Select **TEST environment > Settings > Product > Features** 

**NOTE:** This step must be done for both **dev** and **test** environments.



Set below flag to ON and click Save.



5. Now that is done. Go to GitHub Codespaces tab. Let us run a **pac pcf push** command at the TERMINAL prompt from the **LinearInputControl/controls** folder. (*pac pcf push --publisher-prefix < prefix < prefix >*)

**NOTE:** We used "lic" as prefix (prefix must be between 2-8 letters)

This will push the content into your DEV environment.

```
Build succeeded.

0 Warning(s)
0 Error(s)

Time Elapsed 00:00:39.85

Building temporary solution wrapper: done.
Dropping temporary solution wrapper zip file: done.
File at C:\Users\kartikka\Documents\GitHub\control\LinearInputControl\obj\PowerAppsTools_linp
Debug\PowerAppsTools_linp.zip.
Importing the temporary solution wrapper into the current org.

Solution Importing...

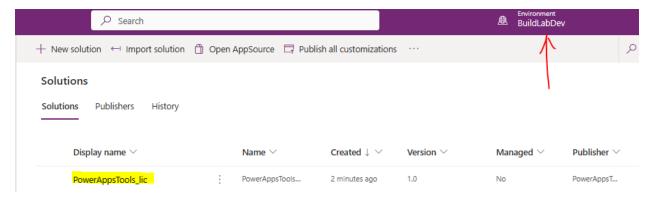
Solution Imported successfully.

Publishing All Customizations...
```

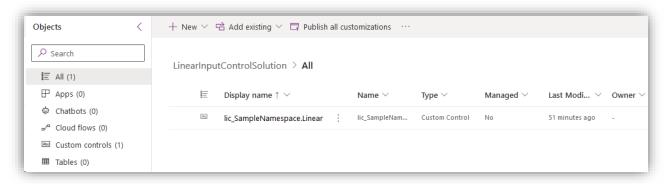
And now PCF control has been pushed into the DEV environment.

6. Now let us build an application.

Open a new browser tab and using Office 365 Tenant credentials provided in Lab Resources area, go to <a href="https://make.powerapps.com">https://make.powerapps.com</a> and select DEV environment at top right. Now select **Solutions** on the left. We should see the imported solution in our DEV environment.



Clicking the **solution** will show Code component imported into your DEV environment as part of the PCF PUSH in this solution (*see image below*).

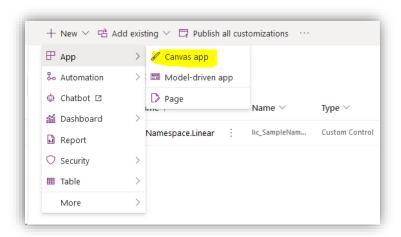


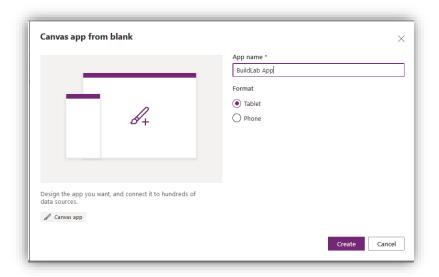
## Add the PCF control to an App

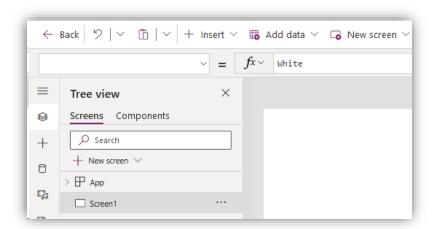
Now we are going to create a Canvas app and insert/import the PCF control that we built.

Starting at the screen from the last step (Environments > Solutions > select PowerAppstools\_lic) in previous section.

1. To build a new Canvas app, click on New > App > Canvas app.

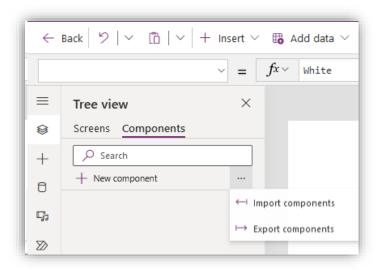


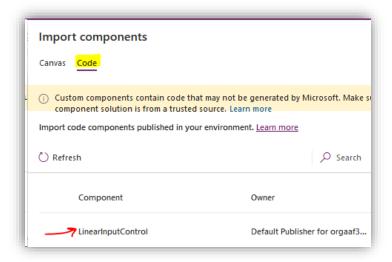


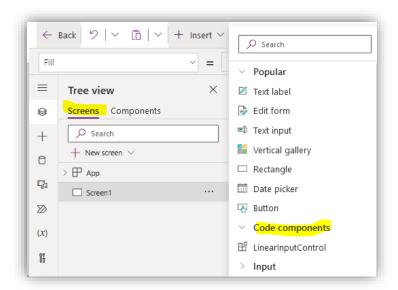


2. Now we will import the component that we built to be used in the Canvas App.

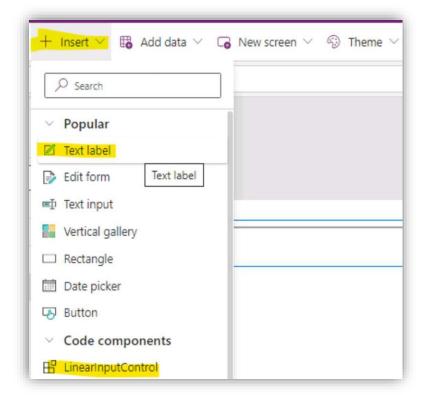
Click **Components > Import components > Code >** select component (*LinearInputControl*)



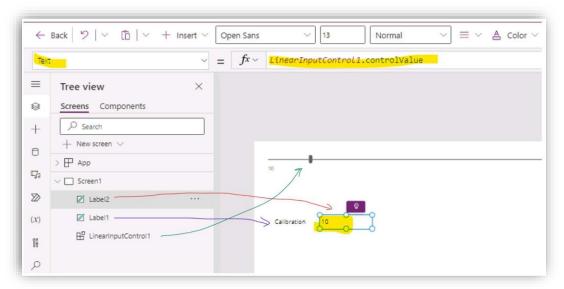




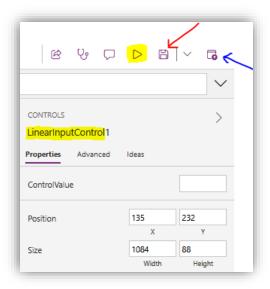
- 3. Insert a **Code component** that we imported and resize as you see fit. Also, check the "Text" value in the formula bar to **<ControlName>.controlValue**. In the below case, ControlName is *LinearInputcontrol1*.
- 4. Now you are on a **Screens** tab in the **Tree view**. Insert two(2) **Text labels** as shown below. (a) One for word Calibration.

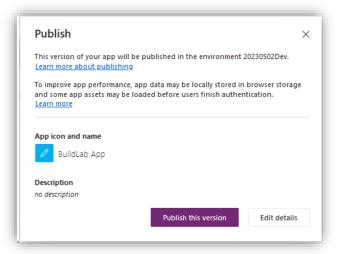


(b) Second for the Slider value.



5. Now Save and Publish your app.

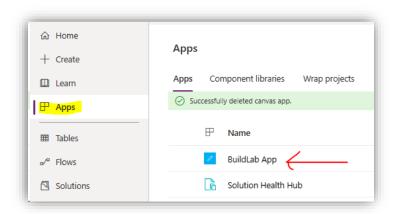




6. Now **Play** the app to test.



You should see your App in Apps on the left.



Now we have created a code component and imported solution with the code component to the Power Platform environment.

### Export the new app with PCF control to GitHub

Let's use GitHub Actions to promote our Canvas app solution embedded is the PCF control to the TEST environment.

1. On **GitHub webpage**, click **<> Code > .github/workflows** and you shall see 2 workflows. (1) export-solution-on-main and (2) deploy-unmanaged-application.

We will **make the changes** listed below to **both of the workflows** and run them in order. Be sure to change the values (*SOLUTION\_NAME*, *ENVIRONMENT\_URL*, *CLIENT\_ID/ApplicationId*, *TENANT\_ID*) in both of your workflows.

**NOTE:** On GitHub Codespaces tab, click on *Power Platform Extension*, under left bottom side of your screen you will see 2 environments under "ENVIRONMENTS & SOLUTIONS".

**For export-solution-on-main workflow**. Right-click on the **DEV environment** to get the Environment URL.

**For Deploy Unmanaged Application workflow**. Right-click on the **TEST environment** to get the Environment\_URL.

Click Edit icon (like below) to edit workflow.



```
solution_name:

description: "name of the Solution"

required: true

default: <SOLUTION_NAME, i.e, PowerAppsTools_lic>
```

Get **Environment URL** from Codespaces under Power Platform (*left bottom window*)

```
environment_url:

description: "http endpoint of your Dataverse environment"

required: true

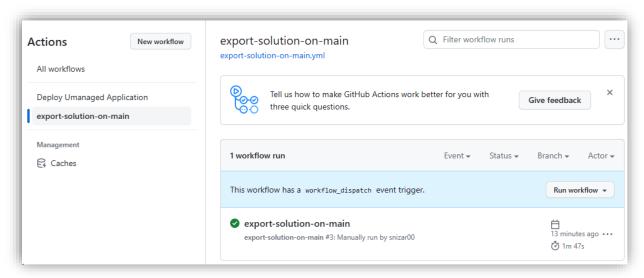
default: "<ENVIRONMENT_URL>"
```

Get Client ID (Application ID) & Tenant ID from Lab Instructions.

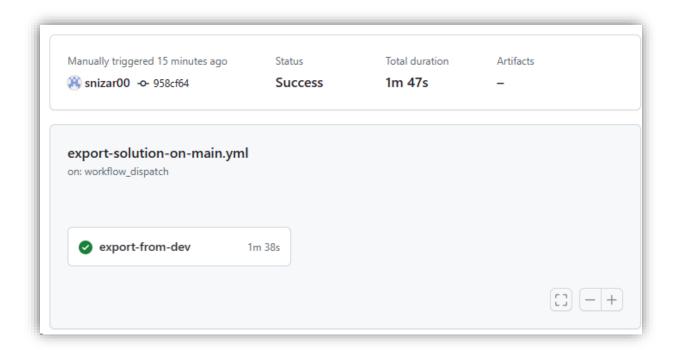
```
CLIENT_ID: '<CLIENT_ID_FROM_THE_LAB_INSTRUCTIONS>'
TENANT_ID: '<TENANT_ID_FROM_THE_LAB_INSTRUCTIONS>'
```

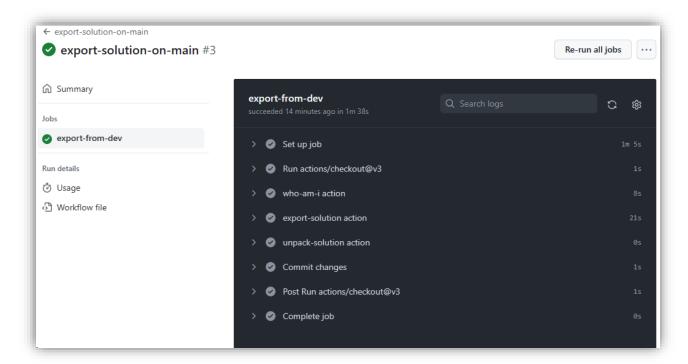
Once updated SOLUTION\_NAME, CLIENT\_ID (which is Application Id), and TENANT\_ID, click **Commit changes** and then **Commit changes** again to save.

2. Under the **Actions** menu in GitHub, you will see your 2 workflows. Let's run workflow **export-solution-on-main**.



Your GitHub Actions (workflows) should be completed successfully.

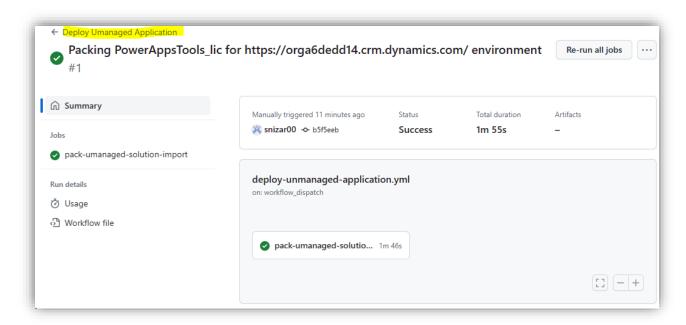


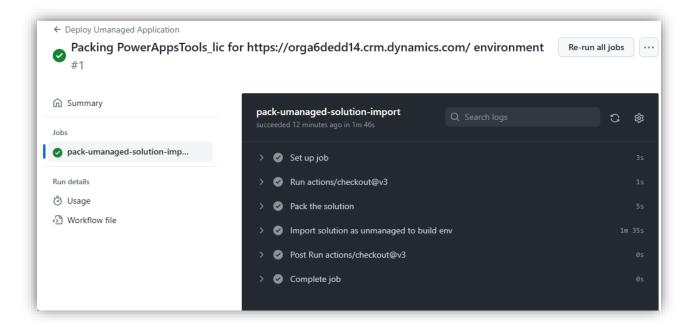


### Have a GitHub workflow to deploy from Dev to Test

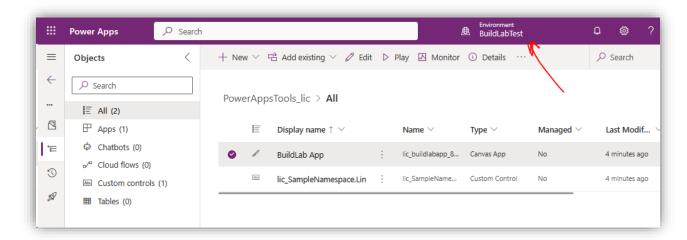
In the last section we exported our App with PCF control. In this section we will promote our solution with the PCF control and the App to the Test environment.

1. Now let's run a second workflow **Deploy Unmanaged Application** and that should complete successfully.

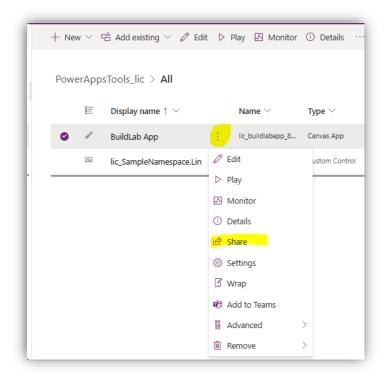




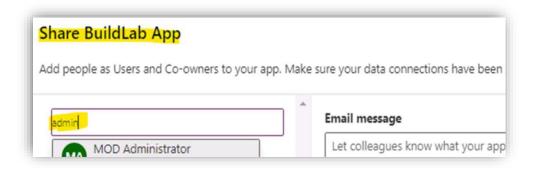
2. You will see the solution imported to into your **TEST** environment. Click on **Solution** in left pane, select **Solution** > click **All** > select your app > click on three dots in front of your app and select **Play** 

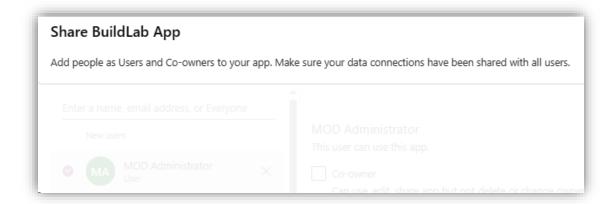


You may have to share the App in order to play using the below steps. Click *three dots* > **Share** (*as highlighted below*)



Type admin in the field and click Share.





After sharing, click on Cancel to exit the screen. Now Play the App, you should be able to test it.

## Congratulations!

You have successfully completed this Module, to mark the lab as complete click End.