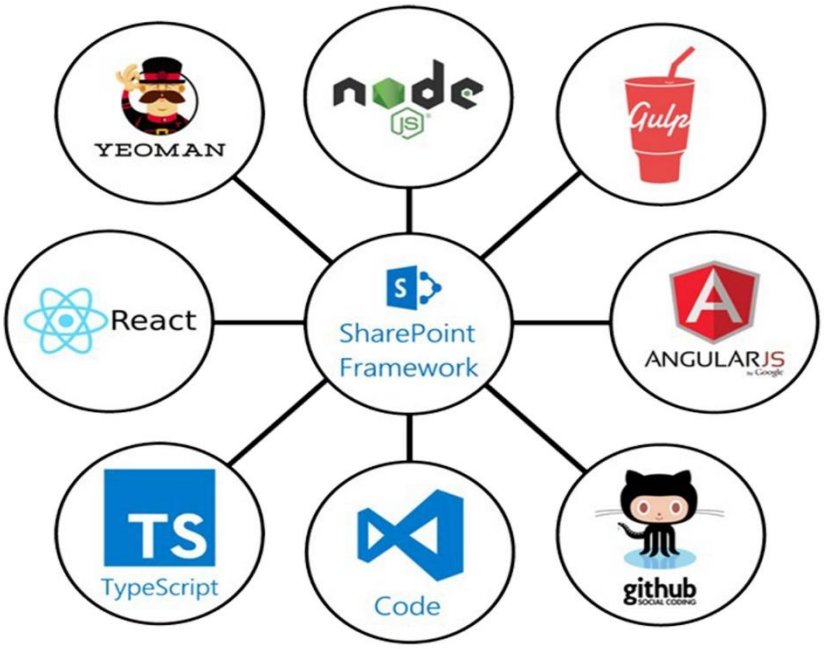
SharePoint Framework (SPFx)

A Developers Guide



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About the Author

Nanddeep Nachan is results-oriented Technology Architect with over 13 years' experience in Microsoft Technologies especially with .NET, MS Azure and SharePoint. He has been working with SharePoint since last 10 years and has exposure to SharePoint versions starting from SharePoint 2007 (MOSS).

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What you will learn

This book is targeted for beginners to intermediate SharePoint developers who want to build SharePoint Framework (SPFx) solutions from scratch and get their hands dirty with practical examples. I have tried to author this book in an easy to follow way and help develop SharePoint Framework knowledge. As you go along and until such time you finished following the book, you will learn:

- Overview of SharePoint Framework (SPFx)
- Using JavaScript frameworks with SharePoint Framework
- Deploying SharePoint Framework
- SharePoint operations with SharePoint Framework

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Table of Contents

Chapter 1: Overview of SharePoint Framework (SPFx) 10
Overview 10
Script Editor WebParts vs App Parts vs SPFx WebParts 10
Light weight Components / Tools Used 11
Flow of Client Side Web Part 12
Setup Developer Environment for SPFx 13
Summary 14
Chapter 2: Develop First Client Side Web Part 15
Overview 15
Create SPFx Solution 15
Open Solution in Code Editor 18
Run WebPart on local server 19
SharePoint Local Workbench 21
Summary 21
Chapter 3: Understand the Solution Structure 22
Overview 22
Solution Structure 22
Major Elements of Solution 23
Summary 26
Chapter 4: Avoid NPM Package Dependencies 27
Overview 27
Semantic Versioning 27
Lock Down the Package version 27
Freeze the entire tree of dependencies 28
Updating npm-shrinkwrap.json file 28
Summary 29
Chapter 5: Introduction to Web Part Property Pane 30
Overview 30
Property Pane Metadata 30
Create SPFx Solution 31
Property Pane Code 32
Add Our Properties 33

Test the Property Pane 37
Summary 38
Chapter 6: Deploy SPFx WebParts to Azure CDN 39
Overview 39
Configure MS Azure Storage Account 39
Configure BLOB Container 41
Enable Azure CDN for Storage Account 42
Configure SPFx Solution for Azure CDN 43
Deploy Package to SharePoint 45
Test the web part 45
Summary 46
Chapter 7: Deploy SPFx WebParts to Office 365 Public CDN 47
Overview 47
Configure CDN in Office 365 Tenant 47
Setup New Office 365 CDN in Tenant 49
Configure SPFx Solution for Azure CDN 50
Test the web part 51
Summary 52
Chapter 8: Deploy SPFx WebParts to SharePoint Library 53
Overview 53
Deployment to CDN 53
Create SharePoint Library as CDN 54
Configure SPFx Solution for SharePoint Library 54
Test the web part 56
Summary 57
Chapter 9: Integrating JQuery with SPFx WebParts 58
Overview 58
Create SPFx Solution 58
Configured Required Packages and Dependencies 59
Solution Changes 60
Test the web part 63
Summary 64
Chapter 10: CRUD operations using No Framework 65

Overview 65
Create SPFx Solution 65
Configure Property for List Name 66
Model for List Item 69
Add Controls to WebPart 69
Implement Create Operation 72
Implement Read Operation 73
Implement Update Operation 74
Implement Delete Operation 75
Test the WebPart 76
Troubleshooting 79
Summary 79
Chapter 11: CRUD operations using React JS 80
Overview 80
Brief about React JS 80
Create SPFx Solution 80
Configure Property for List Name 82
Model for List Item 86
Add Controls to WebPart 88
Implement Create Operation 91
Implement Read Operation 92
Implement Update Operation 93
Implement Delete Operation 94
Test the WebPart 96
Summary 98
Chapter 12: CRUD operations using Angular JS 99
Overview 99
Brief about Angular JS 99
Create SPFx Solution 99
Configure Angular JS 101
Configure Property for List Name 103
Build an Angular application 106
Add Controls to WebPart 114

Test the WebPart 115
Troubleshooting 118
Summary 118
Chapter 13: CRUD operations using Knockout JS 119
Overview 119
Brief about Knockout JS 119
Create SPFx Solution 119
Configure Property for List Name 121
Configure ViewModel 128
Add Controls to Knockout template 134
Test the WebPart 136
Troubleshooting 138
Summary 139
Chapter 14: CRUD operations using SP PNP JS 140
Overview 140
Brief about SP-PnP-JS 140
Create SPFx Solution 140
Configure sp-pnp-js 142
Configure Property for List Name 142
Model for List Item 144
Add Controls to WebPart 144
Import sp-pnp-js 146
Implement Create Operation 147
Implement Read Operation 147
Implement Update Operation 148
Implement Delete Operation 149
Test the WebPart 150
Summary 152
Chapter 15: Integrating Office UI Fabric 153
Overview 153
The UI Challenges 153
Brief information about Office UI Fabric 153
Office UI Fabric for SharePoint Framework 153

Create SPFx Solution 154
Office UI Fabric Components 155
How to use Office UI Fabric Components in SPFx WebPart 157
Implement Greet Message WebPart using Office UI Fabric 159
Test the WebPart 160
Summary 161
Chapter 16: Provision SharePoint Assets 162
Overview 162
SharePoint Assets 162
Create SPFx Solution 163
Add SharePoint Assets to Solution 165
Custom Schema 167
Package Assets as part of Solution 168
Deploy and Test 169
Summary 171
Chapter 17: Consume Microsoft Graph API using MSGraphClient 172
Overview 172
Brief about Microsoft Graph 172
Create SPFx Solution 172
Access MS Graph 174
Typings for MS Graph 174
Permissions 174
Configure Props 175
Configure State 176
Get User Details 176
Enable Targeted Release on your Tenant 177
Test the WebPart 178
API Management 178
Troubleshooting 179
Summary 179
Chapter 18: Consume Microsoft Graph API using AadHttpClient 180
Overview 180
Create SPFx Solution 180

Access MS Graph using AadHttpClient 181
Permissions 182
Configure Props 182
Configure State 183
Get User Details 183
Enable Targeted Release on your Tenant 184
Test the WebPart 185
API Management 186
Summary 186
Chapter 19: Logging 187
Overview 187
Logging Overview 187
Create SPFx Solution 187
Working with Logging API 189
Summary 190
Chapter 20: SPFx Extensions Overview 191
Overview 191
How will SharePoint Framework Extensions help? 191
Application Customizers 191
Field Customizers 191
Command Sets 191
Update Generators for SharePoint Framework Extensions 191
Useful commands 192
Create an SharePoint Framework Extensions Project 193
Visual Studio Extension for SharePoint Framework 193
How does Visual Studio extension work? 194
Summary 194
Chapter 21: Application Customizer Overview 195
Overview 195
Brief about Application Customizer 195
Page Placeholders 195
Create SPFx Solution 195
Solution Structure 197

Implement Application Customizer 198
Test the extension 201
Summary 203
Chapter 22: Field Customizer Overview 204
Overview 204
Brief about Field Customizer 204
Create SPFx Solution 204
Solution Structure 206
Implement Field Customizer 207
Debug Field Customizer 207
Update the Solution for Field changes 210
Apply Field Customization 212
Summary 213
Chapter 23: ListView Command Set Overview 214
Overview 214
Brief about Field Customizer 214
Create SPFx Solution 214
Solution Structure 216
Implement Field Customizer 217
Debug Field Customizer 218
Update the Solution for Field changes 221
Apply List View Command Set Customization 224
Summary 225
Recommendations 226
Resources 226
The Final Word 226

Chapter 1: Overview of SharePoint Framework (SPFx)

Overview

The customization in modern sites is supported using SharePoint Framework (SPFx). SPFx is an open and connected platform. SPFx is page and web part model. It can be entirely developed using client-side languages and open source tooling. SPFx provides easy integration with SharePoint data.

Key Features of SharePoint Framework

1. No iframes, runs within the context of the user browser and connection in the browser
2. Faster rendering on the browser as all controls all rendered in normal DOM
3. Controls are responsive
4. Runs in the context of current user
5. Gives controls to access the lifecycle of the SharePoint Framework web part (component) (Init, render, load, serialize, deserialize, configuration changes and many more)
6. No dependency on underlying Framework. You can use any framework like React, Angular, Knockout and more
7. Open source Development tools are used (npm, TypeScript, Yeoman, webpack and Gulp)
8. Can be added on both classic pages and modern pages
9. Safe and Secure, need tenant access to deploy/make changes to the SPFx webpart
10. Controlled visibility, we can decide who can view this webpart in the App Catalog of the site contents
11. You can leverage your earlier knowledge of CSOM, as the data models are not changed and is completely transferable
12. SPFx web parts can be used with classic or modern sites in SharePoint
13. Supports mobile views of SharePoint Online sites

Script Editor Web Parts vs App Parts vs SPFx Web Parts

Script Editor Web Parts

- The obvious choice of developers for customizing DOM on classic SharePoint sites.
- Script can be edited by any users easily
- Cannot be added to “NoScript” sites

App Parts

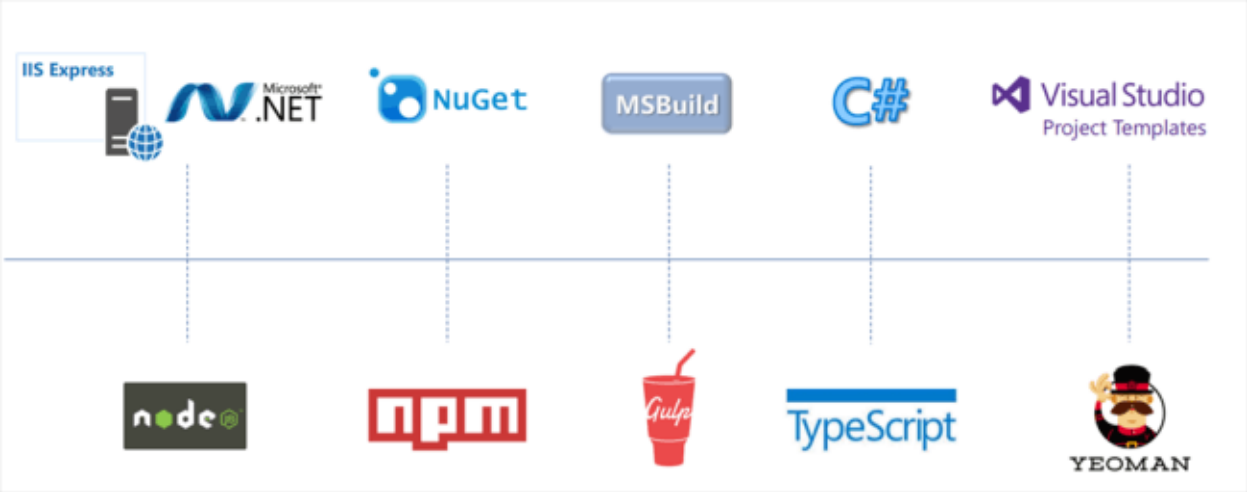
- Developed using Add-in model
- Uses iframe
- Cannot access DOM of SharePoint page
- Development and deployment is bit complicated

SPFx Web Parts

- Client side web parts, leverages modern JavaScript frameworks

- Can be used with classic SharePoint pages
- Provides modern experience, responsiveness out of the box
- Free, open source tool chain

Light-weight Components / Tools Used



Node.js

- Open source JavaScript runtime
- Used to build and run the applications which is equivalent to the .Net
- SPFx supports latest LTS (Long Term Support) version

NPM Packages

- Stands for Node Package Manager
- Installs modules and its dependencies (equivalent to NuGet Package)
- Packages can be installed globally (-g switch) or locally
- Installed packages go inside node_modules folder

Gulp

- Automates SPFx development and deployment tasks
- Bundle and minify JavaScript and CSS files
- Run tools to call the bundling and minification tasks before each build
- Compiles LESS or SASS files to CSS
- Compiles TypeScript files to JavaScript
- Equivalent to MSBuild in Microsoft World
- Compiles, bundle and copies files to deployment folder for packaging

Yeoman

- Relies on NPM and Gulp
- Scaffolding tool for Modern web apps
- Used as SPFx solution generator and builds required project structure
- 'yo' is the command line utility for creation of projects

TypeScript

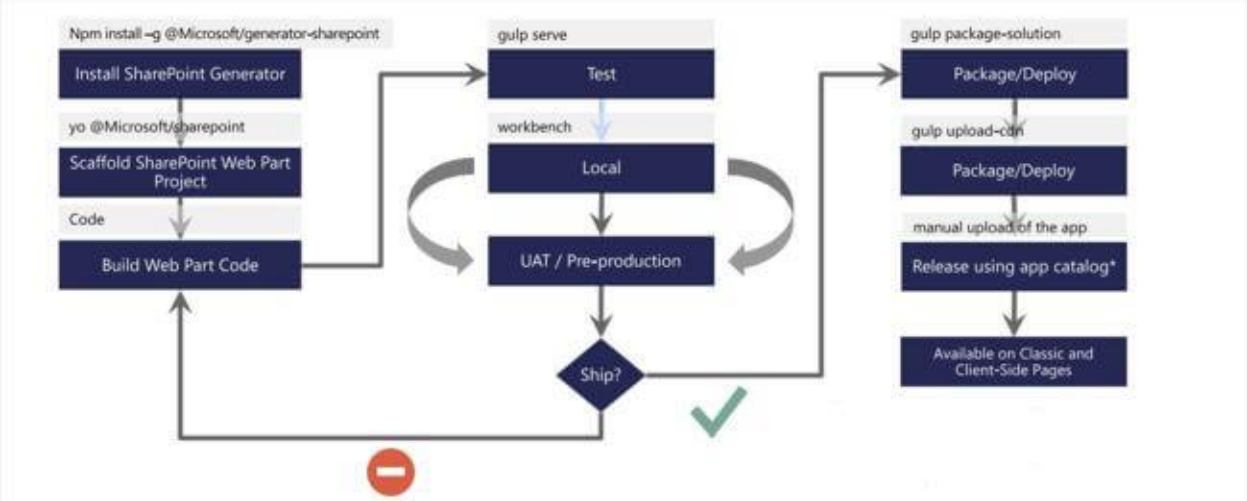
- Strongly typed language
- Adds compile time syntax and type checking for JavaScript
- Help to build the Applications which will be then compiled to clean JS code

Visual Studio Code

- Interface for working with SPFx solutions
- Fast and light weight IDE
- Can work on Windows, Mac OS, and Linux

Flow of Client Side Web Part

The below diagram depicts the flow of client side web part from installation, development, and deployment.



Setup Developer Environment for SPFx

Follow the below set of commands to get your developer environment ready for SPFx.

Install Node JS

- Install latest LTS version from https://nodejs.org
- If you already have NodeJS installed, check the version

```
node -v
```

Install Yeoman and gulp

Run the below command (to install globally)

```
npm install -g yo gulp
```

Install Yeoman SharePoint Generator

Run the below command

```
npm install -g @microsoft/generator-sharepoint
```

Note:

You can create batch files to install all packages. Please find the attached one for reference.

Install Code Editor

Install any of below code editors:

1. Visual Studio Code (https://code/visualstudio.com)
2. Atom (https://atom.io)
3. Webstorm (https://www.jetbrains.com/webstorm)
4. Visual Studio SPFx Project Template (https://marketplace.visualstudio.com/items?itemName=SharePointPnP.SPFxProjectTemplate)

Updating NPM packages

Yo, Gulp, Yeoman SharePoint Generator gets installed as NPM packages. Use the below commands to check and update them.

To update NPM,

```
npm i -g npm
```

To check outdated packages,

```
npm outdated –global
```

This command will report packages that need updates. Use the below command to update the reported packages.

```
npm update -g <package-name>
```

Summary

In this chapter, we had a walkthrough on high level understanding of SharePoint Framework. We also discussed key features of SharePoint Framework. We also discussed the tool comparison which will be used in SharePoint Framework development and along with that we had a discussion on high level flow of Client Side Web Parts development.

Chapter 2: Develop First Client Side Web Part

Overview

Client Side Web Parts developed using SharePoint Framework (SPFx) are the future of Modern SharePoint. Client Side Web Parts are developed using modern UI standards, modern JavaScript tools and libraries. They run inside context of SharePoint page and are responsive in nature.

Features of SPFx Client Side Web Parts:

- Lightweight - Developed using JavaScript libraries and HTML
- Responsive - Renders on any device
- Environments - Work on both SharePoint Online and OnPremise (SharePoint 2016 onwards)

In this chapter, we will learn practically how to build a simple SPFx based Client Side Web Part. Follow the instructions from previous chapter to setup your development environment first.

Create SPFx Solution

Follow below steps to create first SPFx solution.

1. Create a directory for SPFx solution

```
md firstspfx-webpart
```

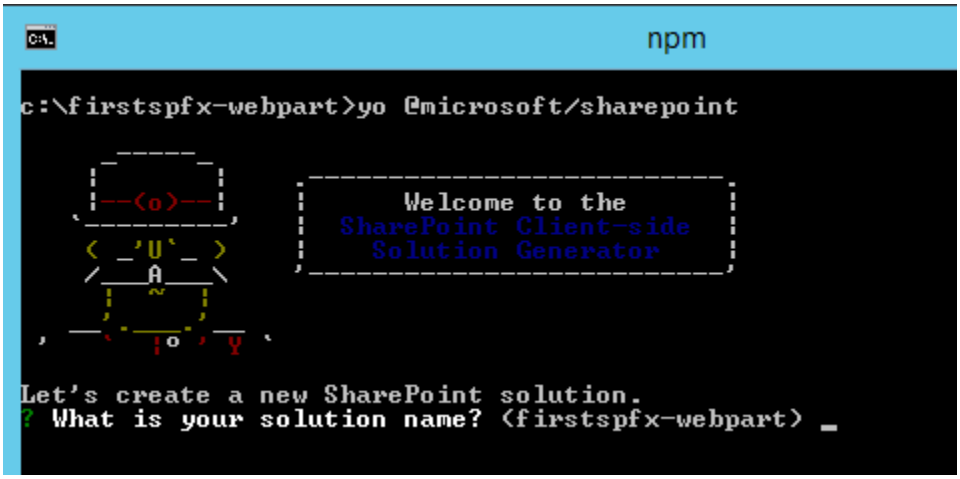
2. Navigate to above created directory

```
Cd firstspfx-webpart
```

3. Run Yeoman SharePoint Generator to create the solution

```
yo @microsoft/sharepoint
```

4. Yeoman generator will present you with the wizard by asking questions about the solution to be created.



Solution Name: Hit enter to have default name (firstspfx-webpart in this case) or type in any other name for your solution.

Selected choice: Hit enter

Target for component: Here we can select the target environment where we are planning to deploy the client web part, i.e., SharePoint Online or SharePoint OnPremise (SharePoint 2016 onwards).
Selected choice: SharePoint Online only (latest)

Place of files: We may choose to use the same folder or create a subfolder for our solution.
Selected choice: Same folder

Deployment option: Selecting Y will allow the app to deployed instantly to all sites and will be accessible everywhere.
Selected choice: N (install on each site explicitly)

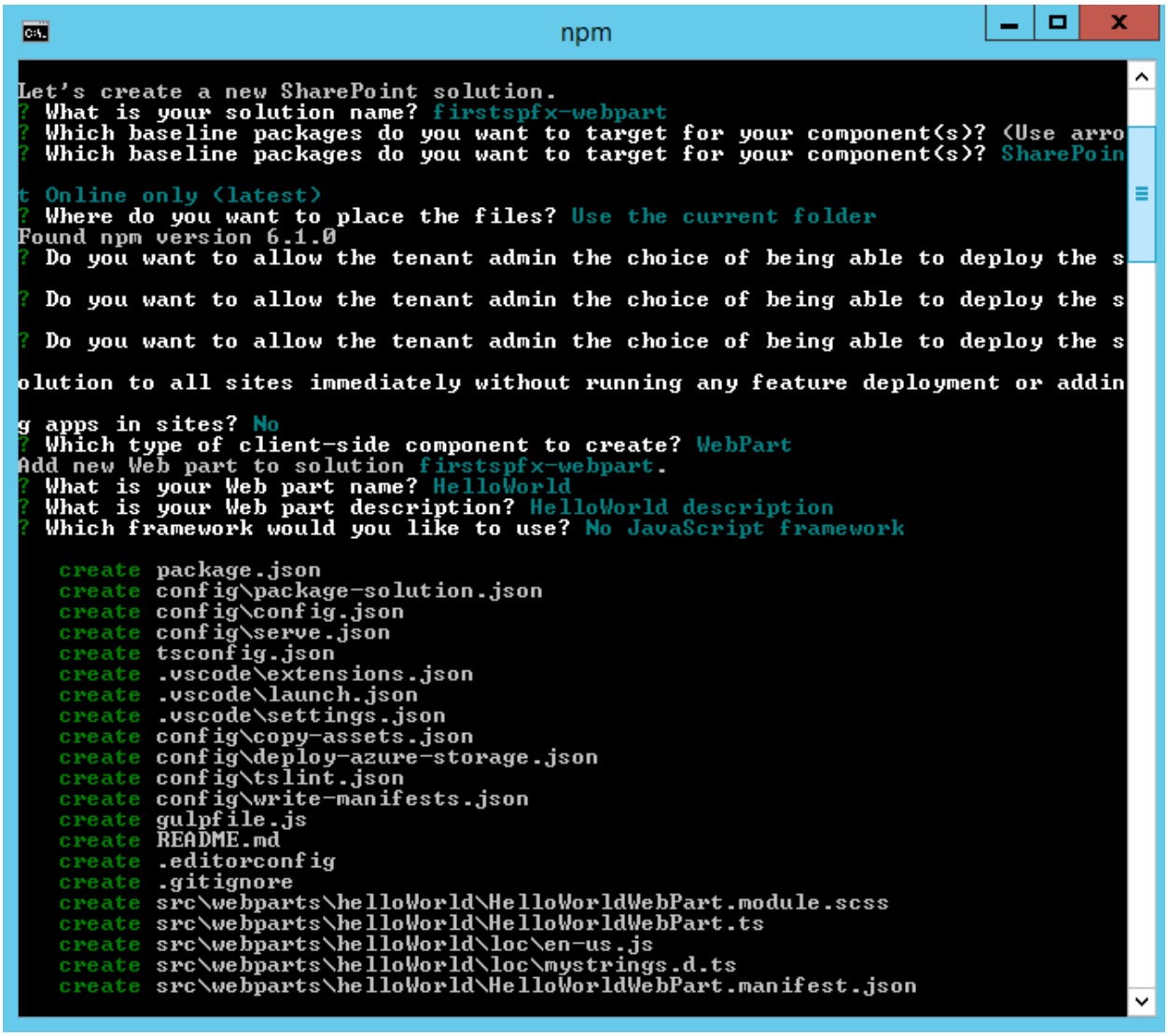
Type of client-side component to create: We can choose to create client side web part or an extension. Choose web part option.
Selected choice: Web Part

Web part name: Hit enter to select the default name or type in any other name.
Selected choice: Hit enter (default name)

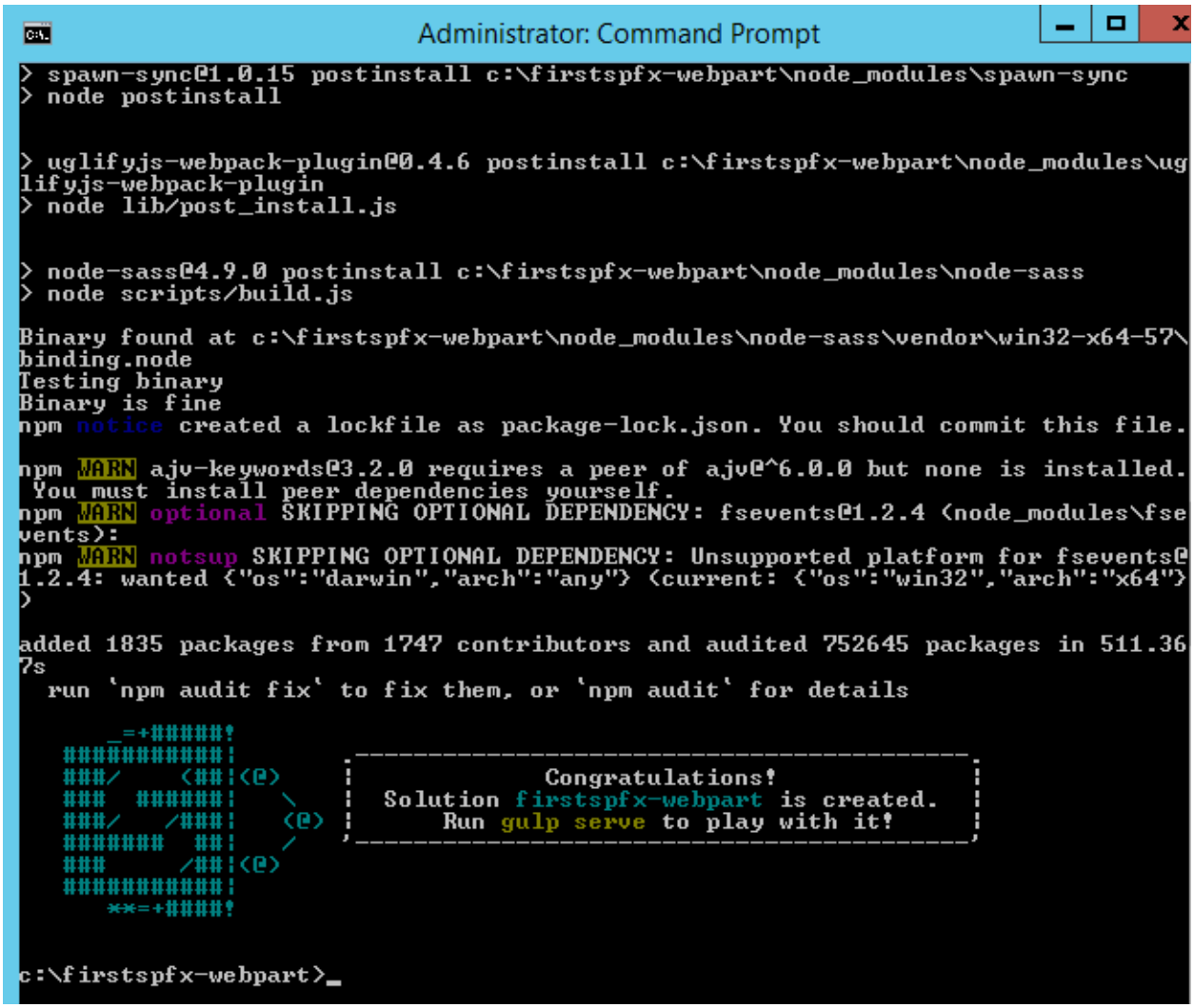
Web part description: Hit enter to select the default description or type in any other value.
Selected choice: Hit enter (default description)

Framework to use: Select any JavaScript framework to develop the component. Available choices are (No JavaScript Framework, React, and Knockout)
Selected choice: No JavaScript Framework

5. Yeoman generator will start the scaffolding process to create the solution and will install required dependencies. This process will take significant amount of time.



6. Once scaffolding is completed, Yeoman will show the below message



Open Solution in Code Editor

Any of below code editor can be used to open the SPFx client side solution.

- Visual Studio Code (https://code.visualstudio.com/)
- Atom (https://atom.io/)
- Webstorm (https://www.jetbrains.com/webstorm)

Install any of above code editor. Being in the solution folder in command prompt, type below command to open the solution in code editor.

```
code .
```

Run the Web Part on a local server

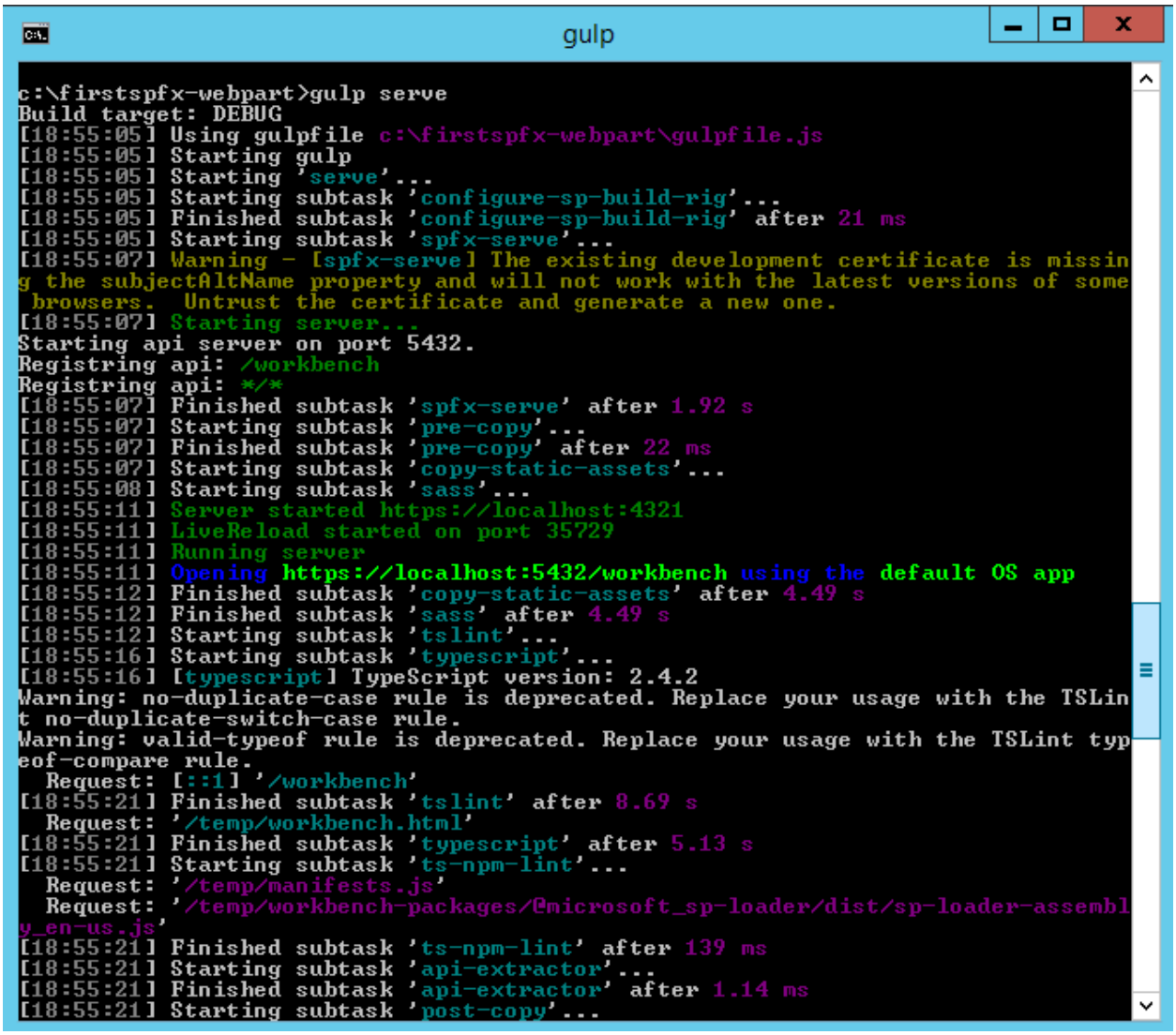
As client side toolchain uses HTTPS endpoint, we need to install the developer certificate that comes with SPFx toolchain.

To install developer certificate, run below command from the command prompt

```
gulp trust-dev-cert
```

Run below command to preview the web part

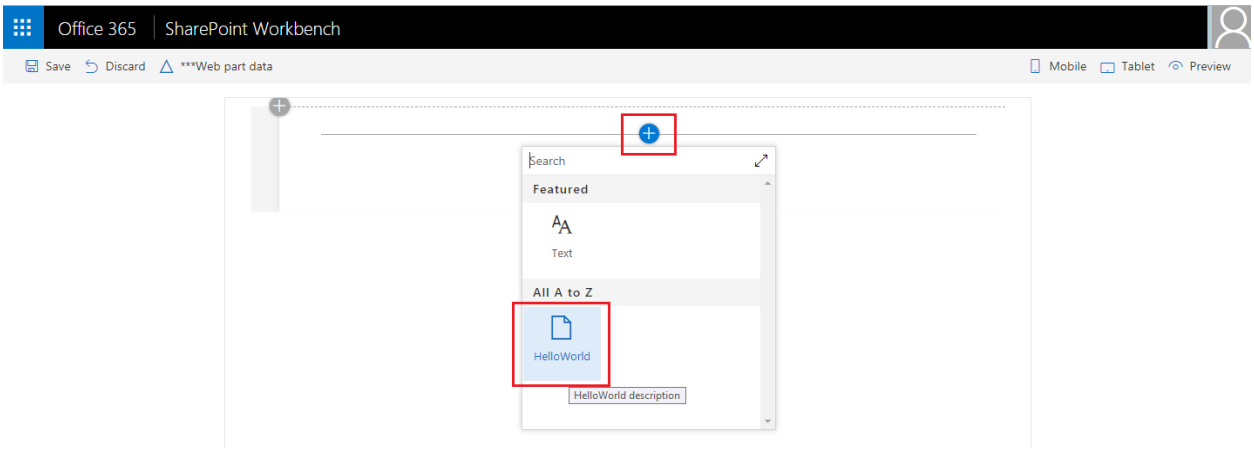
```
gulp serve
```



This command runs series of gulp tasks that performs below:

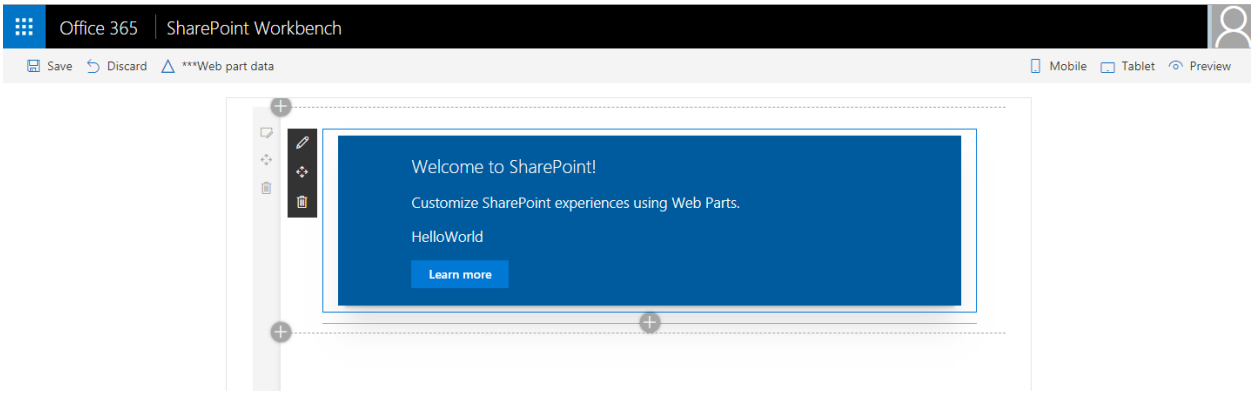
- Minify and bundle JavaScript and CSS files
- Compiles SASS (Syntactically Awesome Style Sheets) to CSS
- Compiles TypeScript to JavaScript

Upon successful compilation and running the gulp tasks, it will open up SharePoint local workbench.



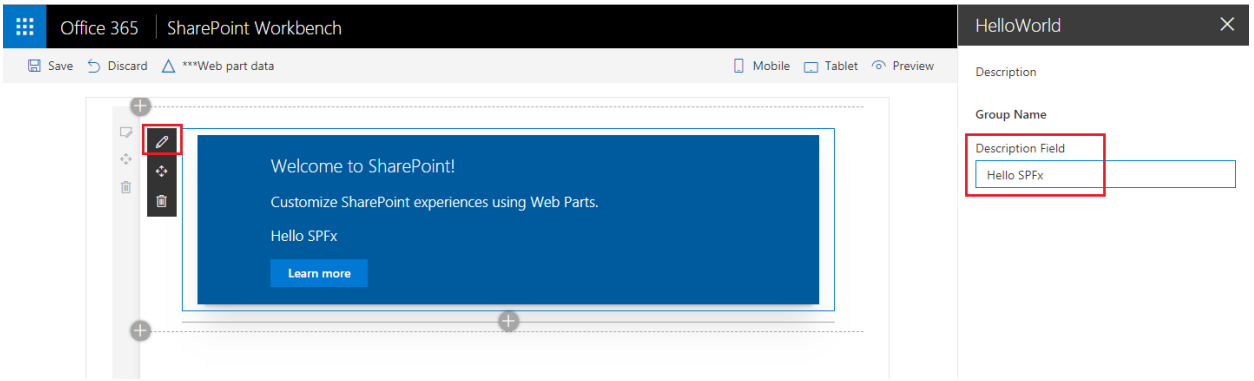
Click Add (+) icon

Select the web part to add it on page.



Congratulations! The first client side web part is ready.

Click Edit icon, modify description from properties pane and it will be reflected on client side web part.



SharePoint Local Workbench

SharePoint Local Workbench is HTML page which helps to preview and test client side web parts without deploying to SharePoint. It gets served locally usually on the URL - https://localhost:4321/temp/workbench.html

Summary

SPFx client side web parts are based on modern JavaScript libraries, which can be created using Yeoman generator. We can choose the JavaScript library (No JavaScript Framework, React, and Knockout) to build the client side web part. They can be tested locally on SharePoint Workbench.

Chapter 3: Understand the Solution Structure

Overview

SharePoint Framework (SPFx) client side web parts are lightweight in nature. They can be developed using open source tools such as Node.JS, NPM, Yeoman generators and can be opened in code editors of our choice (Visual Studio Code, Atom, Webstorm). Node Package Manager (NPM) helps to install modules and its dependencies. Yeoman generator carries out the scaffolding and builds the required project structure.

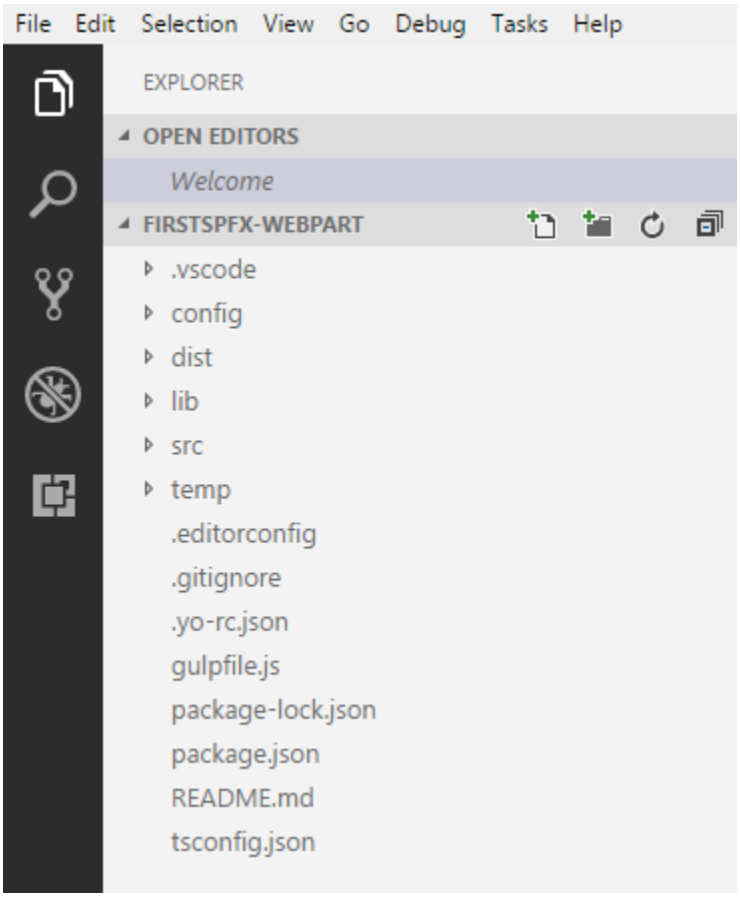
In this chapter, we will have a close look at the solution structure of SPFx client side web part and understand major elements of it.

Solution Structure

In the previous chapter, we developed our first SPFx client side web part.

In the command prompt, run below command to open the solution in code editor of your choice.

```
code .
```



The solution structure consists of various folders and few configuration files at the root. The primary language used is TypeScript (which is a superset of JavaScript). The code mostly uses classes, modules and interfaces written in TypeScript.

Major Elements of Solution

Web Part Class (HelloWorldWebPart.ts)

This defines the entry point of the web part. In our solution, we have only one web part class - HelloWorldWebPart.ts located at src\webparts\helloWorld folder. The web part class extends **BaseClientSideWebPart**. Each client side web part should extend from BaseClientSideWebPart, which provides basic functioning for web part.

Property Type Interface (IHelloWorldWebPartProps)

The interface resides in the same web part file. The web part class accepts the property type of interface. This interface is used to define our own custom properties for web part. We can add any of below type of property.

- Button
- Checkbox
- Choice group
- Dropdown
- Horizontal rule
- Label
- Link
- Slider
- Textbox
- Multi-line Textbox
- Toggle
- Custom

The properties can be used in web part as below

```
<p class="${ styles.description }">${escape(this.properties.description)}</p>
```

WebPart Manifest

HelloWorldWebPart.manifest.json holds the metadata of web part such as display name, description, icon, version, id.

```
{
  "$schema": "https://developer.microsoft.com/json-schemas/spfx/client-side-web-part-manifest.schema.json",
  "id": "a925e124-f0f8-4a26-a797-d384046cf5a7",
  "alias": "HelloWorldWebPart",
  "componentType": "WebPart",

  // The "*" signifies that the version should be taken from the package.json
  "version": "*",
  "manifestVersion": 2,

  // If true, the component can only be installed on sites where Custom Script is allowed.
  // Components that allow authors to embed arbitrary script code should set this to true.
  // https://support.office.com/en-us/article/Turn-scripting-capabilities-on-or-off-1f2c515f-5d7e-448a-9fd7-835da935584f
  "requiresCustomScript": false,

  "preconfiguredEntries": [{
    "groupId": "5c03119e-3074-46fd-976b-c60198311f70", // Other
    "group": { "default": "Other" },
    "title": { "default": "HelloWorld" },
    "description": { "default": "HelloWorld description" },
    "officeFabricIconFontName": "Page",
    "properties": {
      "description": "HelloWorld"
    }
  }]
}
```

Config.json

The configuration file contains the bundling information, the components used in the solution and entry point of the solution.

This file also records the external references (for e.g. jQuery) and its dependencies. Also, references to localization resources are stored in this file.

```
{
  "$schema": "https://developer.microsoft.com/json-schemas/spfx-
build/config.2.0.schema.json",
  "version": "2.0",
  "bundles": {
    "hello-world-web-part": {
      "components": [
        {
          "entrypoint": "./lib/webparts/helloWorld/HelloWorldWebPart.js",
          "manifest":
"./src/webparts/helloWorld/HelloWorldWebPart.manifest.json"
        }
      ]
    }
  },
  "externals": {},
  "localizedResources": {
    "HelloWorldWebPartStrings": "lib/webparts/helloWorld/loc/{locale}.js"
  }
}
```

deploy-azure-storage.json

This file is used while deploying the client-side web part to Azure CDN. This file contains Azure storage account details.

```
{
  "$schema": "https://developer.microsoft.com/json-schemas/spfx-build/deploy-
azure-storage.schema.json",
  "workingDir": "./temp/deploy/",
  "account": "<!-- STORAGE ACCOUNT NAME -->",
  "container": "spfxcontainer",
  "accessKey": "<!–ACCESS KEY -->"
}
```

package-solution.json

This file contains solution path configurations.

```
{
  "$schema": "https://developer.microsoft.com/json-schemas/spfx-build/package-solution.schema.json",
  "solution": {
    "name": "spfx-helloworld-client-side-solution",
    "id": "41c6825d-8ef2-45e1-b544-5f0d64a480e6",
    "version": "1.0.0.0",
    "includeClientSideAssets": false,
    "skipFeatureDeployment": true
  },
  "paths": {
    "zippedPackage": "solution/spfx-helloworld.sppkg"
  }
}
```

gulpfile.js

Defines gulp tasks to run.

package.json

Defines JavaScript library dependencies.

tsconfig.json

Defines settings for TypeScript compilation

Summary

Yeoman generators help to generate SPFx client-side web part solution. The solution has a predefined structure. Each folder and file has its own significance. It is important to understand the role of each file for better development.

Chapter 4: Avoid NPM Package Dependencies

Overview

NPM (Node Package Manager) is a package manager for JavaScript as like Nuget for managed code of .Net framework. NPM is used to consume third party libraries in SharePoint Framework (SPFx) solutions. All of the required packages like jQuery, React, Angular, Office Fabric UI, etc. can be added to the solution using NPM. The packages are dependent on each other. Change of semantic versioning (semver) of one package can break the dependency build toolchain.

In this chapter, we will understand the package dependencies and how it can be avoided.

Semantic Versioning

Each package has a version associated with it which is denoted by 3 numbers (major.minor.patch)

- **Major** represents substantial changes to package that may break the existing code.
- **Minor** represents non-breaking changes.
- **Patch** represents no interface changes.

The dependencies in SPFx solutions are recorded in package.json in following ways:

Caret dependency: Any version up to (but not including) is accepted

Example: ^2.3.1 means greater than or equal to 2.3.1 but less than 3.0.0

Tilde dependency: It is similar to Caret dependency, but the range is narrower

Example: ~2.3.1 means greater than or equal to 2.3.1 but less than 2.4.0

Exact dependency: Constrained to a specific version

Example: 2.3.1 means 2.3.1 only

Lock Down the Package version

When a package is added to SPFx solution using “npm install” command, the package is downloaded and installed to the solution. It can be found under “node_modules” folder and entry of it is recorded in package.json file. Adding --save flag to “npm install” command ensure that the dependency is recorded to package.json. This means, whenever any developer runs “npm install” or “npm update” on the SPFx solution, NPM will download package of appropriate version. It is always recommended to specify --save or --save-exact while running “npm install” command to record and track the dependencies.

Failing to specify --save flag will not record the entry in package.json and can cause code to fail because of missing packages. TypeScript compiler might throw an error “Cannot find module”.

“node_modules” folder contains tree of dependencies for packages. First level of dependencies are stored in child “node_modules” folders. Because of this reason, “node_modules” folder can grow bigger in size and deep in hierarchy.

"--save-exact" will avoid caret or tilde dependencies only at first level, which makes difficult to get the exact build unless we check-in entire "node_modules" folder to source control (which is not recommended and feasible solution).

Freeze the entire tree of dependencies

"npm shrinkwrap" command will help you to freeze the entire tree of dependencies. It creates a JSON file called "npm-shrinkwrap.json" which records exact version of each package used in the solution. It is important in the production environment that same versions of packages get installed as that used during development.

npm-shrinkwrap.json

```
{
  "name": "angular-1-hello-world",
  "version": "0.0.1",
  "lockfileVersion": 1,
  "requires": true,
  "dependencies": {
    "@microsoft/api-extractor": {
      "version": "4.2.6",
      "resolved": "https://registry.npmjs.org/@microsoft/api-extractor/-/api-extractor-4.2.6.tgz",
      "integrity": "sha1-LEQcgMR1AO/lG49ICH+gNkAGC5U=",
      "dev": true,
      "requires": {
        "@microsoft/node-core-library": "0.3.16",
        "@microsoft/ts-command-line": "2.2.4",
        "@types/fs-extra": "0.0.37",
        "@types/node": "6.0.88",
        "@types/z-schema": "3.16.31",
        "colors": "1.1.2",
        "fs-extra": "0.26.7",
        "jju": "1.3.0",
        "lodash": "4.15.0",
        "typescript": "2.4.2",
        "z-schema": "3.18.4"
      },
      "dependencies": {
        "@types/node": {
          "version": "6.0.88",
          "resolved": "https://registry.npmjs.org/@types/node/-/node-6.0.88.tgz",
          "integrity": "sha512-bYDPZTX0/s1aihdjLuAgogUAT5M+TpoWChEMea2p0yOcfn5bu3k6cJb9cp6nw268XeSNIGGr+4+/8V5K6BGzLQ==",
          "dev": true
        },
```

Because of using "npm shrinkwrap", if "npm install" or "npm update" commands are used against the solution containing "npm-shrinkwrap.json" will restore the exact version of packages and avoids code break issues for other developers.

Updating npm-shrinkwrap.json file

npm-shrinkwrap.json file freezes the version of package. However, we might have to update any single version of the package in future.

To update single package version run below command:

```
npm update <package_name>
```

This will only update a single package. Once done re-run “npm shrinkwrap” command to update npm-shrinkwrap.json file.

To find out the outdated packages in the solution, run below command:

```
npm outdated
```

Summary

It is recommended to run “npm shrinkwrap” every time against the SPFx solution before you release the version of your solution. It will record exact version of package dependencies. Also ensure to check-in the “npm-shrinkwrap.json” file to source control. This will allow to rebuild your solution on any machine even though newer versions of used packages are released in the future.

Chapter 5: Introduction to Web Part Property Pane

Overview

In classic SharePoint, web parts can be configured using the properties, generally referred as Web Part properties. In the SPFx world they are referred as property panes. The property panes allows to control behavior and appearance of web part. In this chapter we will deep dive into configuring the property panes.

Property Pane Metadata

Property pane has below metadata:

Pages

Allows to separate complex interactions and divide them across one or multiple pages. Pages has sub-metadata as Header and Groups.

Header

Defines title of the property pane.

Groups

Groups together various property fields. Below is the list of out of box supported property fields.

#	Property field	SPFx Typed Object
1	Label	PropertyPaneLabel
2	Textbox	PropertyPaneTextField
3	Multiple lines of text	PropertyPaneTextField
4	Link	PropertyPaneLink
5	Dropdown	PropertyPaneDropdown
6	Checkbox	PropertyPaneCheckbox
7	Choice	PropertyPaneChoiceGroup
8	Toggle	PropertyPaneToggle
9	Slider	PropertyPaneSlider
10	Button	PropertyPaneButton
11	Horizontal Rule	PropertyPaneHorizontalRule
12	Custom	Our own implementation using combination of above

Create SPFx Solution

1. Create a directory for SPFx solution.

```
md spfx-ooopropertypanes
```

2. Navigate to the above-created directory.

```
cd spfx-ooopropertypanes
```

3. Run Yeoman SharePoint Generator to create the solution.

```
yo @microsoft/sharepoint
```

4. Provide below values in the Yeoman generator wizard
   Solution Name: Hit enter to have default name (spfx-ooopropertypanes in this case) or type in any other name for your solution.
   Selected choice: Hit enter

   Target for component: Here we can select the target environment where we are planning to deploy the client web part, i.e., SharePoint Online or SharePoint OnPremise (SharePoint 2016 onwards).
   Selected choice: SharePoint Online only (latest)

   Place of files: We may choose to use the same folder or create a subfolder for our solution.
   Selected choice: Same folder

   Deployment option: Selecting Y will allow the app to deployed instantly to all sites and will be accessible everywhere.
   Selected choice: N (install on each site explicitly)

   Type of client-side component to create: We can choose to create client side webpart or an extension. Choose web part option.
   Selected choice: Web Part

   Web part name: Hit enter to select the default name or type in any other name.
   Selected choice: SPFXPropertyPane

   Web part description: Hit enter to select the default description or type in any other value.
   Selected choice: Hit enter (default description)

   Framework to use: Select any JavaScript framework to develop the component. Available choices are (No JavaScript Framework, React, and Knockout)
   Selected choice: No JavaScript Framework

5. Once Yeoman finishes generating the solution, on command prompt type “code .” to open the solution in code editor.

Property Pane Code

Open file SpfxPropertyPaneWebPart.ts located at \src\webparts\spfxPropertyPane

The method **getPropertyPaneConfiguration()** contains the configuration to build the property pane.

```
protected getPropertyPaneConfiguration(): IPropertyPaneConfiguration {
    return {
      pages: [
        {
          header: {
            description: strings.PropertyPaneDescription
          },
          groups: [
            {
              groupName: strings.BasicGroupName,
              groupFields: [
                PropertyPaneTextField('description', {
                  label: strings.DescriptionFieldLabel
                })
              ]
            }
          ]
        }
      ]
    };
  }
```

The default class “SpfxPropertyPaneWebPart” accepts property type of interface “ISpfxPropertyPaneWebPartProps”, which by default has description property of type string. The property can be used in render() method as below.

```
${escape(this.properties.description)}
```

```
export interface ISpfxPropertyPaneWebPartProps {
  description: string;
}

export default class SpfxPropertyPaneWebPart extends BaseClientSideWebPart<ISpfxPropertyPaneWebPartProps> {

  public render(): void {
    this.domElement.innerHTML = `
      <div class="${ styles.spfxPropertyPane }">
        <div class="${ styles.container }">
          <div class="${ styles.row }">
            <div class="${ styles.column }">
              <span class="${ styles.title }">Welcome to SharePoint!</span>
              <p class="${ styles.subTitle }">Customize SharePoint experiences using Web Parts.</p>
              <p class="${ styles.description }">${escape(this.properties.description)}</p>
              <a href="https://aka.ms/spfx" class="${ styles.button }">
                <span class="${ styles.label }">Learn more</span>
              </a>
            </div>
          </div>
        </div>
      </div>`;
  }
```

The import section has the property types defined.

```
import {
  BaseClientSideWebPart,
  IPropertyPaneConfiguration,
  PropertyPaneTextField
} from '@microsoft/sp-webpart-base';
```

Add Our Properties

To add new properties

1. Import corresponding typed objects first

```
import {
  BaseClientSideWebPart,
  IPropertyPaneConfiguration,
  PropertyPaneTextField,   // Textbox
  PropertyPaneCheckbox,    // Checkbox
  PropertyPaneLabel,       // Label
  PropertyPaneLink,        // Link
  PropertyPaneSlider,      // Slider
  PropertyPaneToggle,      // Toggle
  PropertyPaneDropdown     // Dropdown
} from '@microsoft/sp-webpart-base';
```

2. Add new properties. Map fields to typed objects.

```
export interface ISpfxPropertyPaneWebPartProps {
  name: string;
  description: string;
  Slider:string;
  Toggle:string;
  dropdowm:string;
  checkbox:string;
  URL:string;
  textbox:string;
}
```

3. Add new property pane fields and map to respective typed objects in getPropertyPaneConfiguration method.

```
protected textBoxValidationMethod(value: string): string {
  if (value.length < 10) { return "Name should be at least 10 characters!"; }
  else { return ""; }
}

protected getPropertyPaneConfiguration(): IPropertyPaneConfiguration {
  return {
    pages: [
      { //Page 1
        header: {
          description: "Page 1 – Name and Description"
        },
        groups: [
          {
            groupName: "Group one",
            groupFields: [
              PropertyPaneTextField('name', {
                label: "Name",
                multiline: false,
                resizable: false,
                onGetErrorMessage: this.textBoxValidationMethod,
                errorMessage: "This is the error message",
                deferredValidationTime: 5000,
                placeholder: "Please enter name","description": "Name property field"
              }),
              PropertyPaneTextField('description', {
                label: "Description",
                multiline: true,
                resizable: true,
                placeholder: "Please enter description","description": "Description property field"
              })
            ]
          }
        ]
      }
    ]
  };
}
}
```

4. We can add multiple pages as below.

```
{ //Page 2
  header: {
    description: "Page 2 – Slider and Dropdown"
  },
  groups: [
    {
      groupName: "Group one",
      groupFields: [
        PropertyPaneSlider('Slider', {
          label:'Slider',min:1,max:10
        }),
        PropertyPaneToggle('Toggle', {
        label: 'Slider'
        })
      ]
    },
    {
      groupName: "Group Two",
      groupFields: [
        PropertyPaneDropdown('dropdowm', {
          label:'Drop Down',
          options: [
            { key: 'Item1', text: 'Item 1' },
            { key: 'Item2', text: 'Item 2' },
            { key: 'Item3', text: 'Item 3' }
          ]
        }),
        PropertyPaneCheckbox('checkbox',
          { text: 'Yes/No'})
      ]
    }
  ]
},
```

5. Setup one more page for remaining fields.

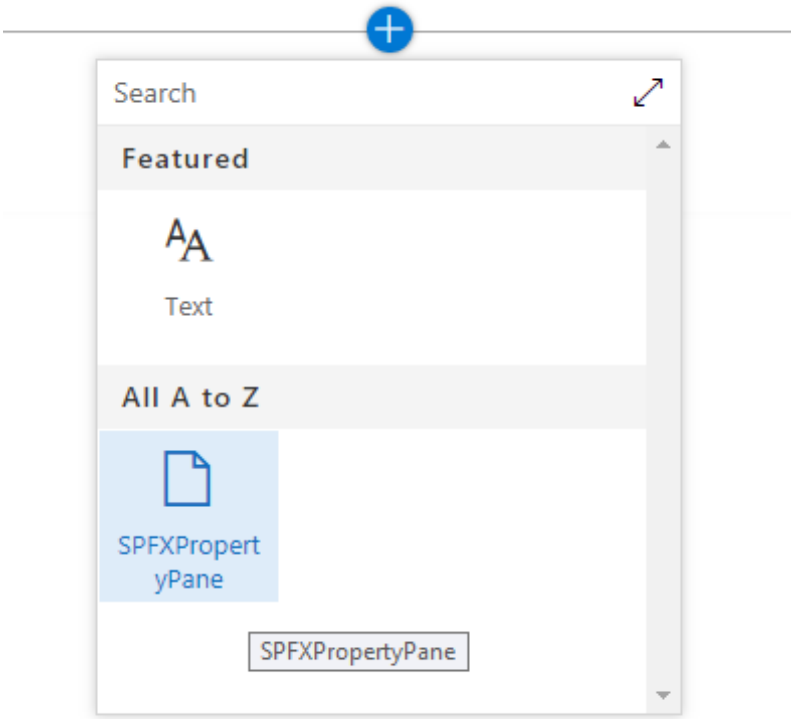
```
{ //Page 3
  header: {
    description: "Page 3 - URL and Label"
  },
  groups: [
    {
      groupName: "Group One",
      groupFields: [
        PropertyPaneLink('URL',
        { text:"Microsoft", href:'http://www.microsoft.com',target:'_blank'}),
         PropertyPaneLabel('label',
        { text:'Please enter designation',required:true}),
         PropertyPaneTextField('textbox',{})
      ]
    }
  ]
}
```

6. Modify render method to show selected field values.

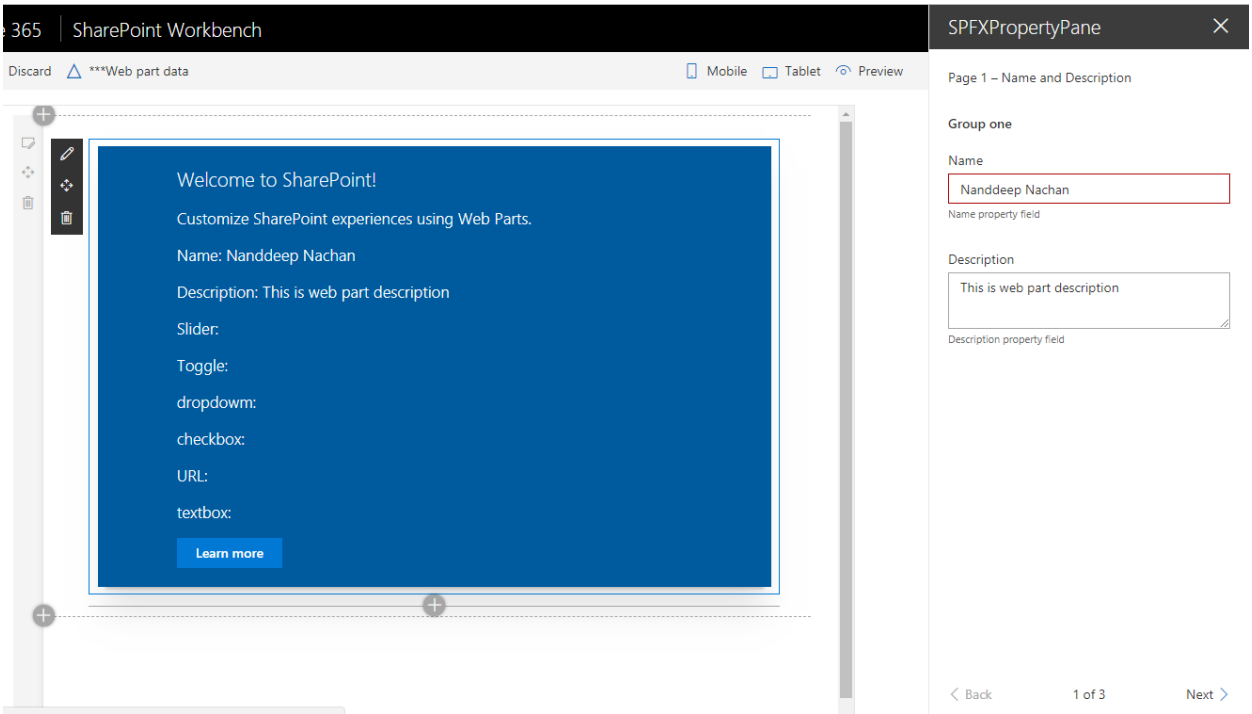
```
export default class SpfxPropertyPaneWebPart extends BaseClientSideWebPart<ISpfxPropertyPaneWebPartProps> {

  public render(): void {
    this.domElement.innerHTML = `
      <div class="${ styles.spfxPropertyPane }">
        <div class="${ styles.container }">
          <div class="${ styles.row }">
            <div class="${ styles.column }">
              <span class="${ styles.title }">Welcome to SharePoint!</span>
              <p class="${ styles.subTitle }">Customize SharePoint experiences using Web Parts.</p>
              <p class="${ styles.description }">Name: ${escape(this.properties.name)}</p>
              <p class="${ styles.description }">Description: ${escape(this.properties.description)}</p>

              <p class="${ styles.description }">Slider: ${escape(this.properties.Slider)}</p>
              <p class="${ styles.description }">Toggle: ${escape(this.properties.Toggle)}</p>
              <p class="${ styles.description }">dropdowm: ${escape(this.properties.dropdowm)}</p>
              <p class="${ styles.description }">checkbox: ${escape(this.properties.checkbox)}</p>

              <p class="${ styles.description }">URL: ${escape(this.properties.URL)}</p>
              <p class="${ styles.description }">textbox: ${escape(this.properties.textbox)}</p>
              <a href="https://aka.ms/spfx" class="${ styles.button }">
                <span class="${ styles.label }">Learn more</span>
              </a>
            </div>
          </div>
        </div>
      </div>`;
  }
```

Test the Property Pane

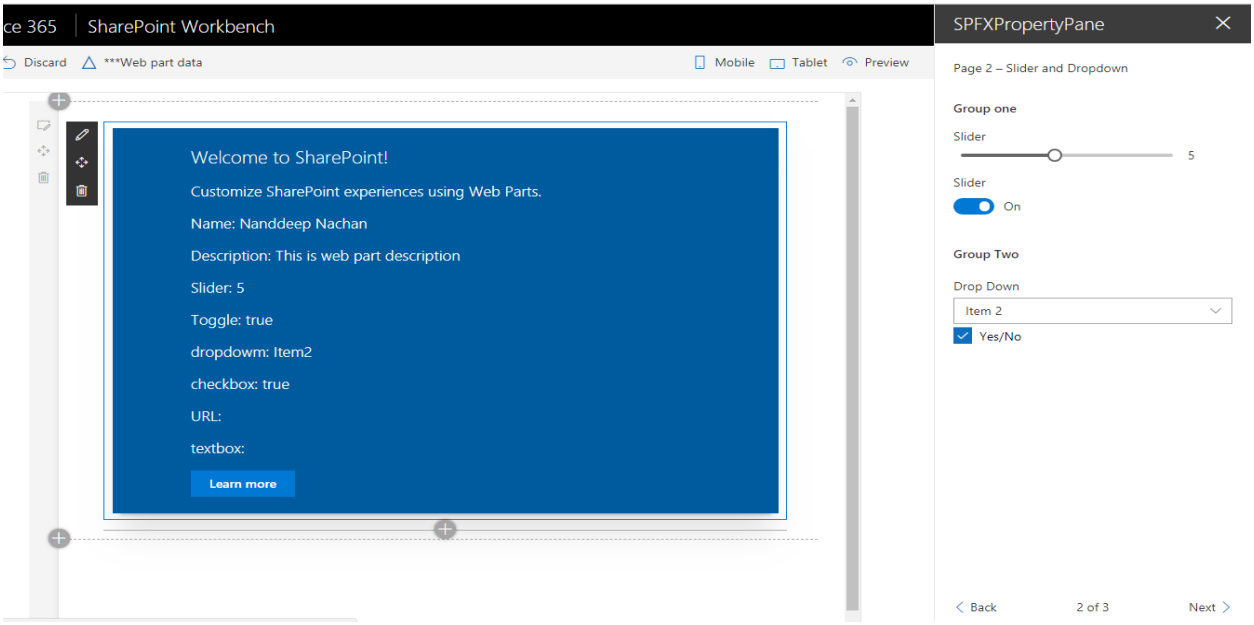
1. On the command prompt type “gulp serve”.
2. In SharePoint workbench, add your web part.



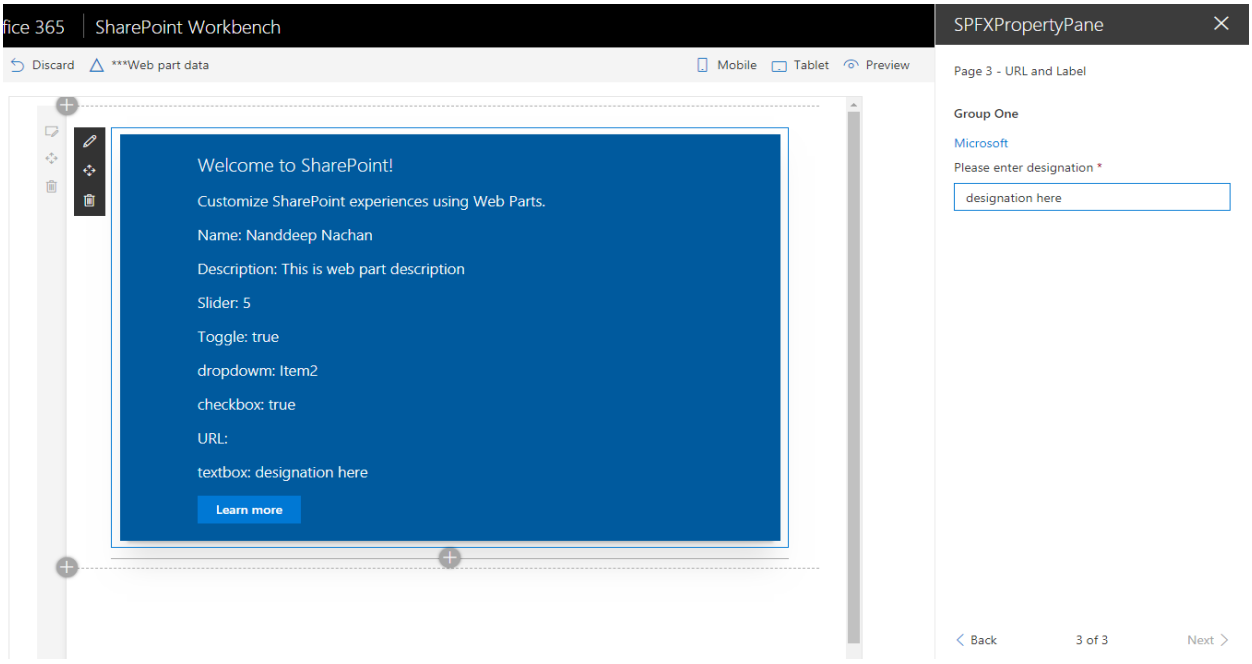
3. Edit web part to modify property fields.



4. Click Next to see next page of fields



5. Click Next to see next page of fields



Summary

Property panes allows easy configuration of SPFx client side web part. We can use predefined typed objects to create properties for web part. Properties can be grouped by pages.

Chapter 6: Deploy SPFx Web Parts to Azure CDN

Overview

In the chapters so far, we developed SharePoint Framework client side webparts and tested it on local SharePoint workbench. The local SharePoint workbench allows to quickly test the SPFx web parts. The Node.js provides the hosting platform to run on local environment. However in the real life scenarios we will have to deploy these SPFx web parts to some hosting environments from where it can be served to SharePoint.

Majorly the SPFx web parts are deployed on either of below CDN (Content Delivery Network) options:

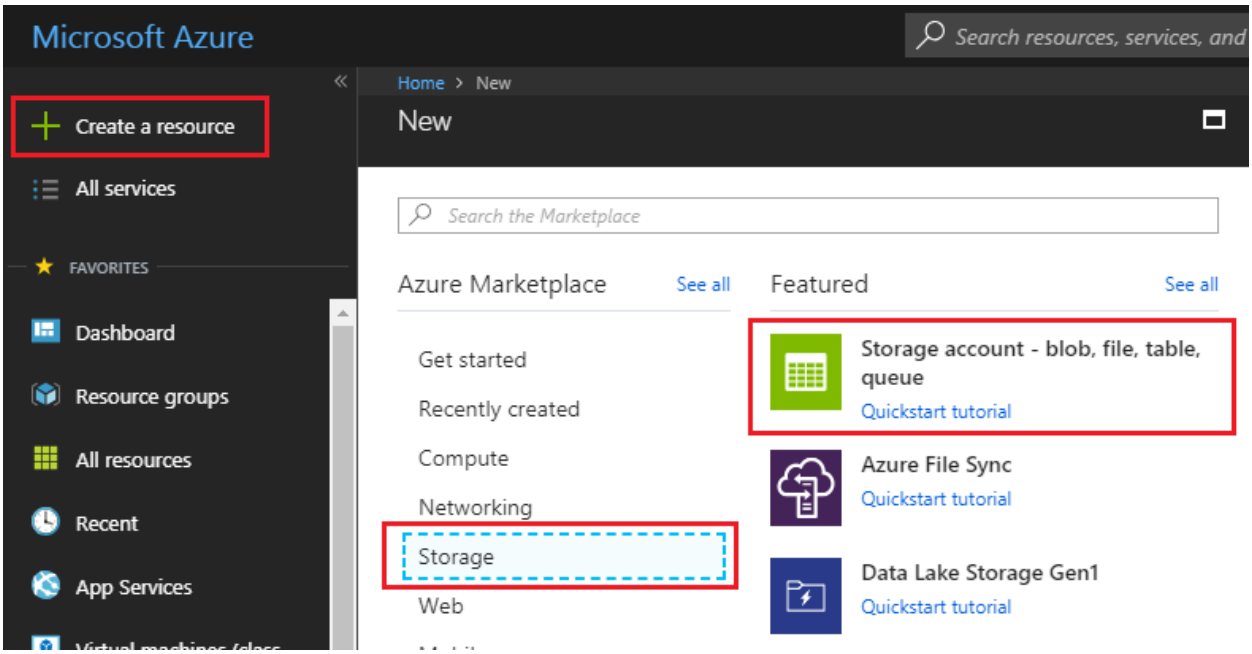
1. Azure CDN
2. Office 365 Public CDN
3. SharePoint Library in your tenant

In this chapter, we will have a look at how SPFx web parts can be deployed to Azure CDN.

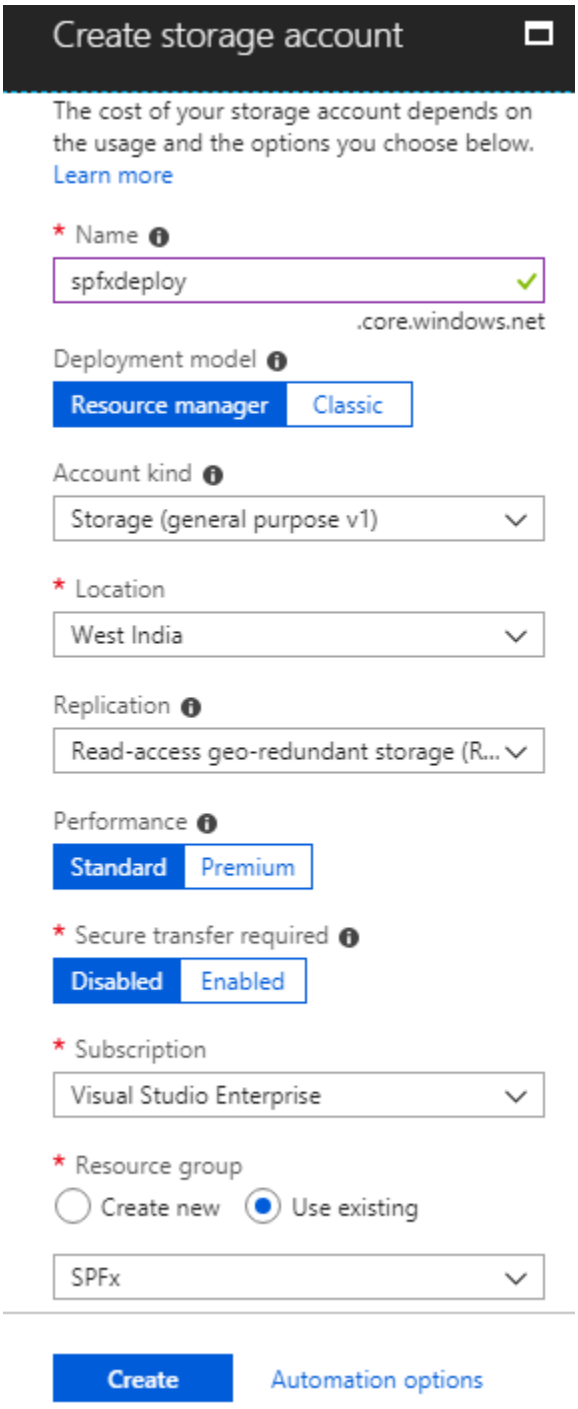
Configure MS Azure Storage Account

Follow below steps to configure MS Azure storage account and integrate it with CDN

1. Login to MS Azure Portal (https://portal.azure.com)
2. Click “Create a resource”
3. Click “Storage account - blob, file, table, queue”.



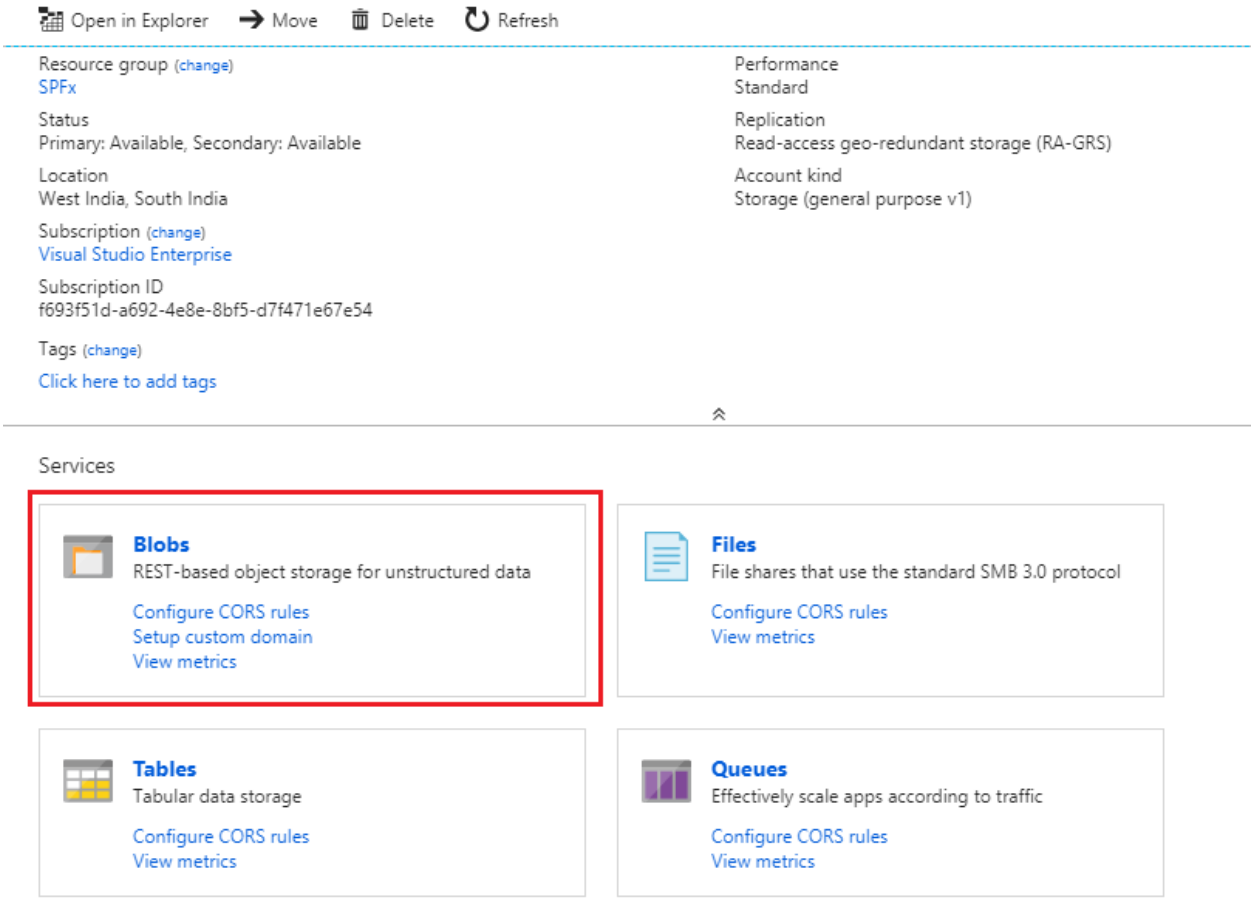
4. Fill out the form



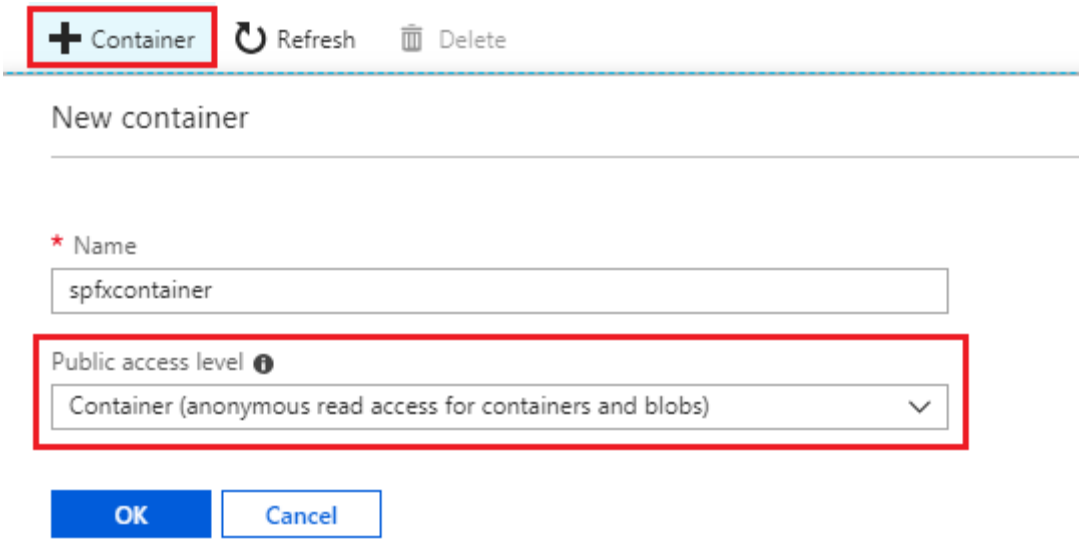
5. Click **Create**
6. The storage account endpoint can be referred by URI – http://<StorageAccountName>.blob.core.windows.net

Configure BLOB Container

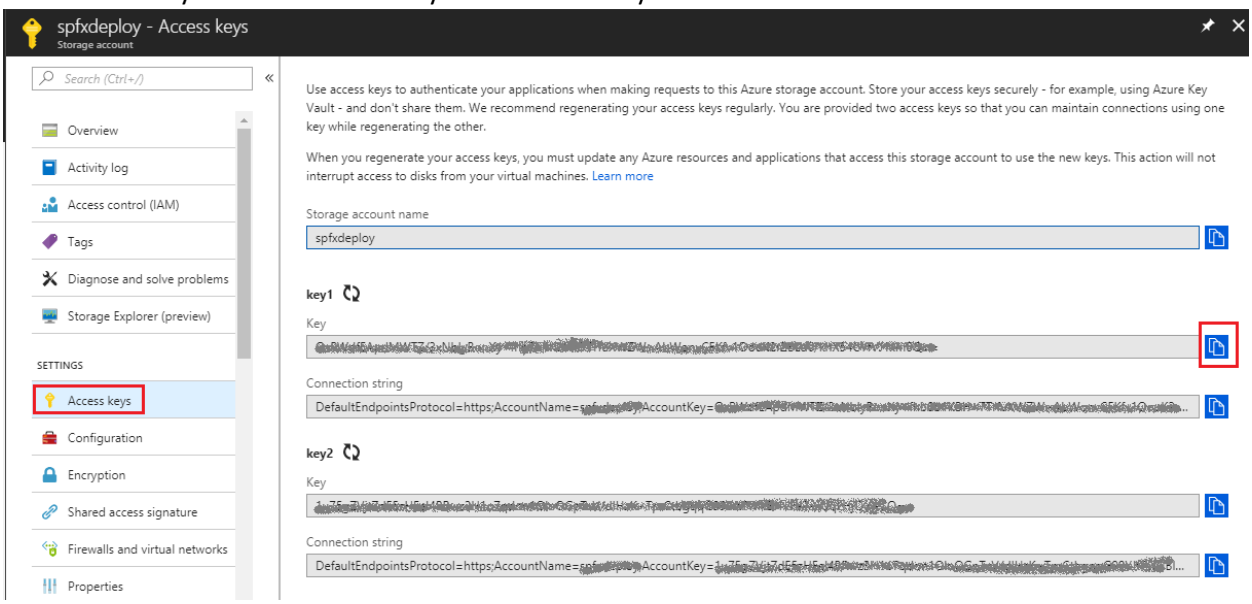
1. Select storage account from dashboard
2. Click “Blobs”



3. Click “+ Container”



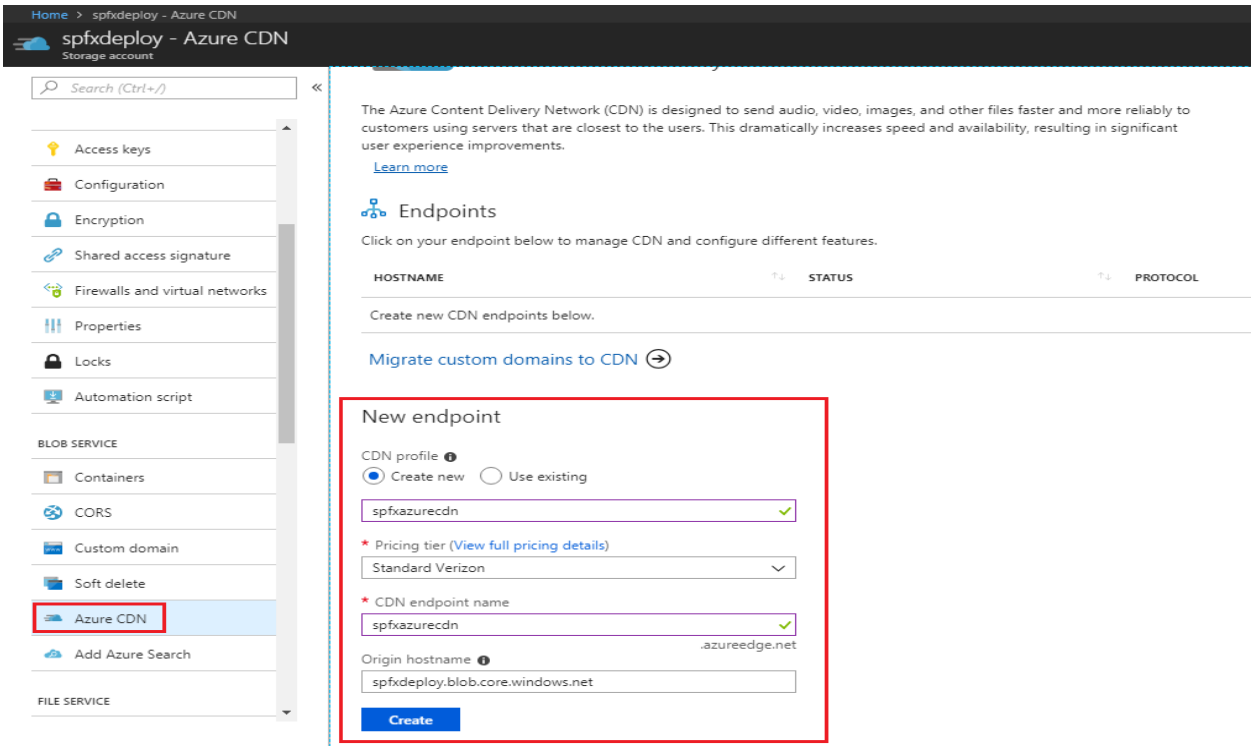
4. Click Access keys and note down any of the access key



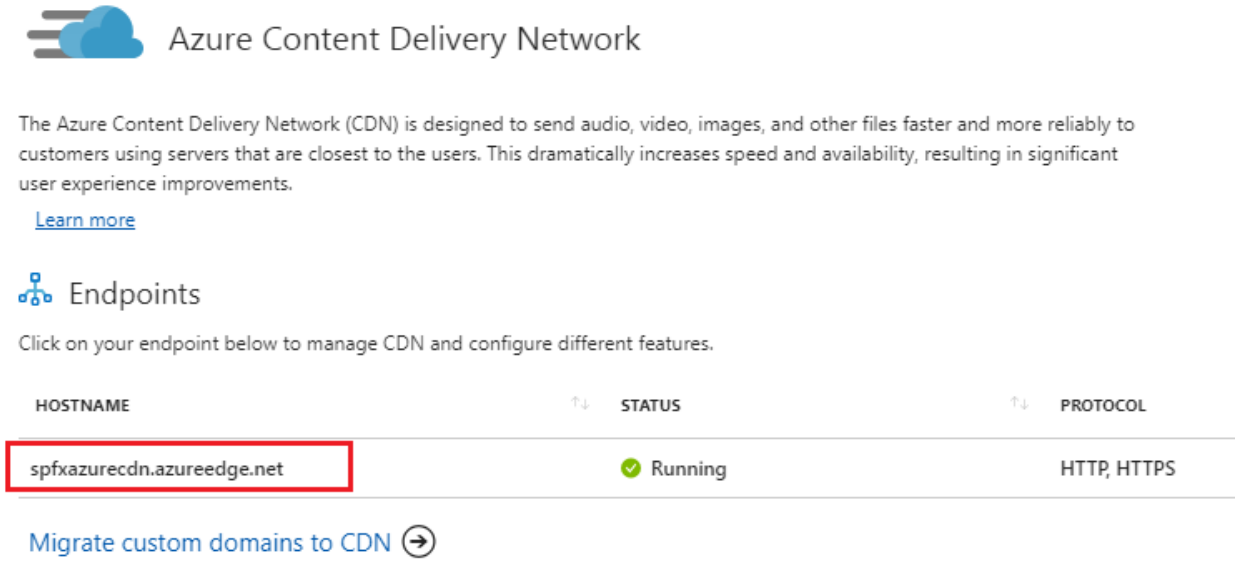
Enable Azure CDN for Storage Account

We will enable CDN for the above created storage account.

1. Select storage account from dashboard
2. Under “BLOB Service”, select “Azure CDN”



3. Click **Create**
4. The endpoint will appear in the endpoint list



5. The BLOB container can be accessed from url: http://<EndpointName>.azureedge.net/<myPublicContainer>/<BlobName>

Configure SPFx Solution for Azure CDN

Update package details

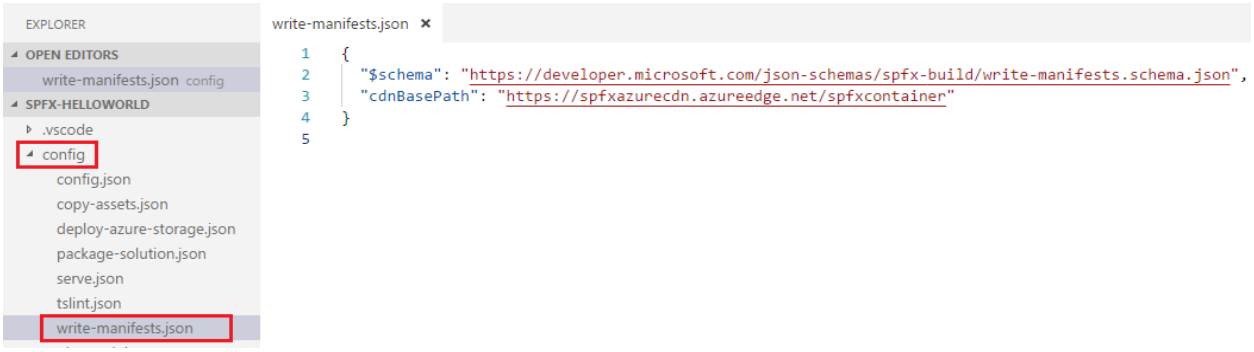
1. Open command prompt
2. In the command prompt, navigate to SPFx solution folder
3. Type “code .” to open the solution in code editor of your choice
4. Open **package-solution.json** file from **config** folder. This file takes care of solution packaging.
5. Set **includeClientSideAsserts** value as **false**. The client side assets will not be packaged inside final package (sppkg file) because these will be hosted on external CDN.

Update Azure storage account details to Solution

1. Open **deploy-azure-storage.json** from **config** folder to specify the Azure storage account details
2. Update values as below
    - account: storage account name
    - container: BLOB container
    - accessKey: storage account access key (primary or secondary)

Update CDN Path

1. Open **write-manifests.json** from **config** folder
2. Update CDN base path as BLOB container end point



Prepare the package

In the command prompt, type below command

```
gulp bundle --ship
```

This will minify the required assets to upload to CDN. The ship switch denotes distribution. The minified assets are located at “temp\deploy” folder.

Deploy assets to Azure Storage

In the command prompt, type below command

```
gulp deploy-azure-storage
```

This will deploy the assets (JavaScript, CSS files) to Azure CDN.

Deploy Package to SharePoint

The next step is to deploy the app package (sppkg) to SharePoint App catalog.

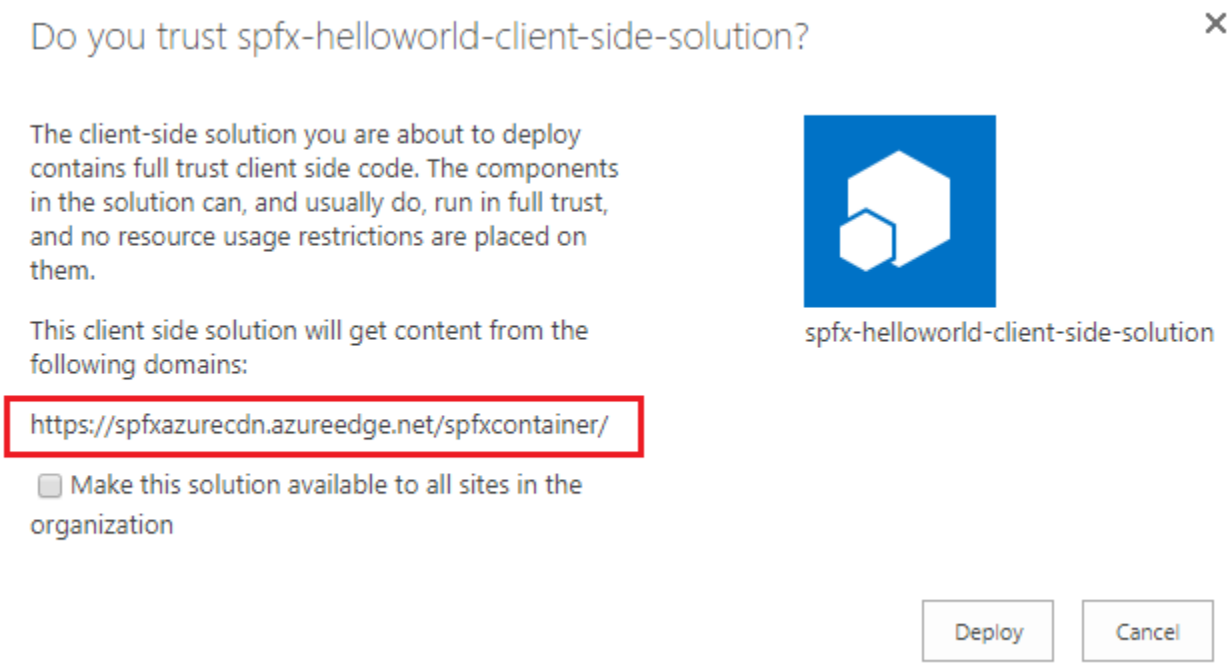
In the command prompt, type below command

```
gulp package-solution --ship
```

This will create the solution package (sppkg) in sharepoint\solution folder

Upload package to app catalog

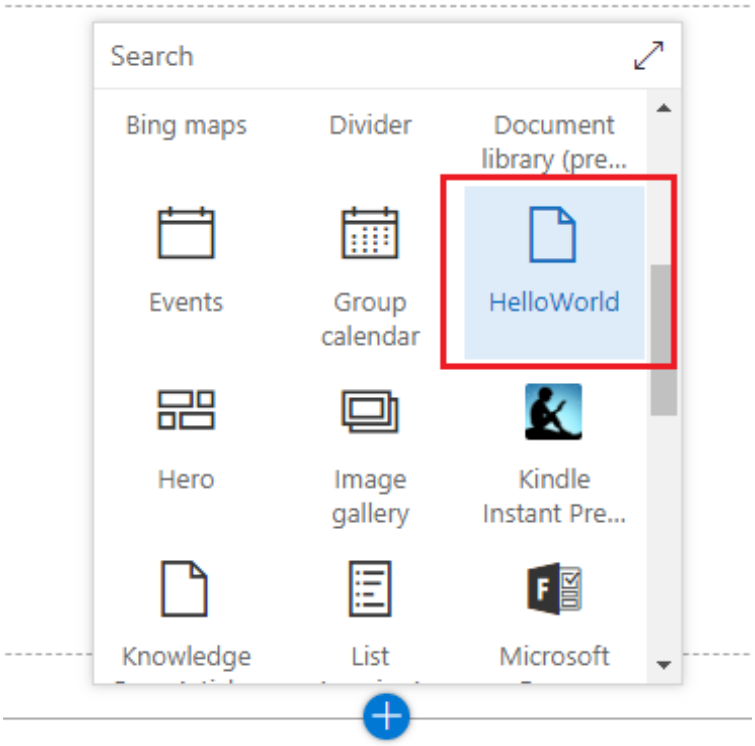
1. Open the SharePoint app catalog site
2. Upload the solution package (sppkg) from sharepoint\solution folder to app catalog
3. Make sure the url is pointing to Azure CDN



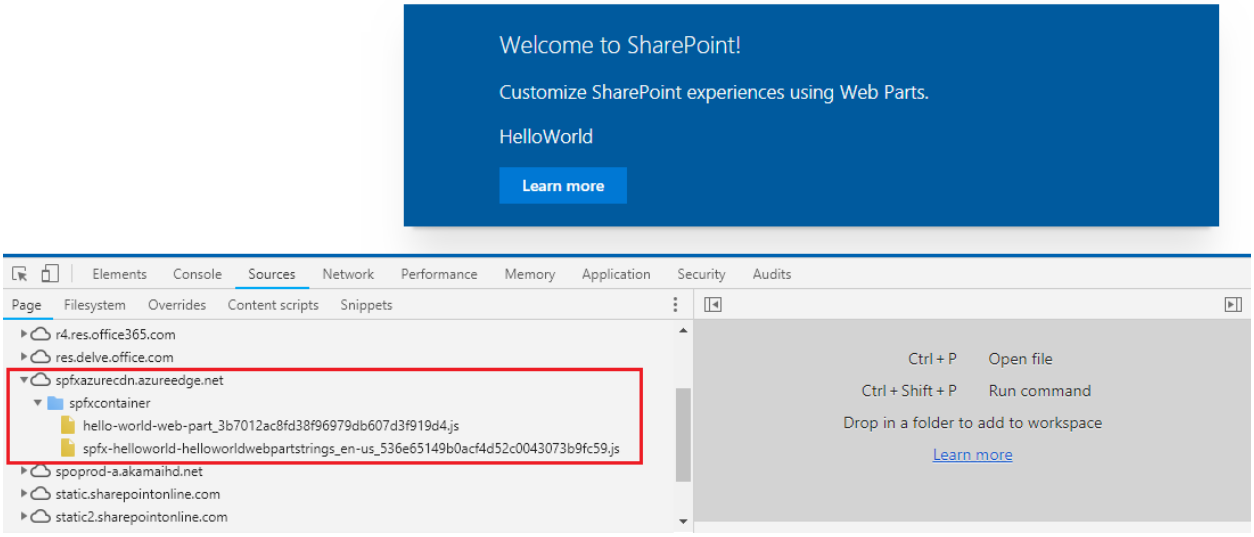
4. Click **Deploy**

Test the web part

1. Open any SharePoint site in your tenant
2. Add the App to your site from “Add an App” menu
3. Edit any page and add the webpart



4. Click F12 to open developer toolbar. Confirm that it is served from Azure CDN



Summary

Azure CDN is one of the preferred option to deploy the SPFx client side webpart. SharePoint framework provides out of box support to deploy assets to Azure CDN. You can update the CDN path later in SPFx solution and redeploy it.

Chapter 7: Deploy SPFx WebParts to Office 365 Public CDN

Overview

In the real life scenarios we will have to deploy these SPFx webparts to some hosting environments from where it can be served to SharePoint.

Below are the more common followed deployment approaches

1. Azure CDN
2. Office 365 Public CDN
3. SharePoint Library in your tenant

In this chapter, we will explore how SPFx webparts can be deployed to office 365 CDN.

Configure CDN in Office 365 Tenant

Any of the document library in SharePoint Online tenant can be promoted as a CDN, which will help to serve the JS files for SPFx client webparts hosted in SharePoint. This CDN location being public can be accessed easily.

To configure the CDN in Office 365 follow below steps:

1. Download and install latest version of SharePoint Online Management Shell from https://www.microsoft.com/en-us/download/details.aspx?id=35588
2. Open the SharePoint Online Management Shell
3. Connect to SharePoint Online tenant using below cmdlet

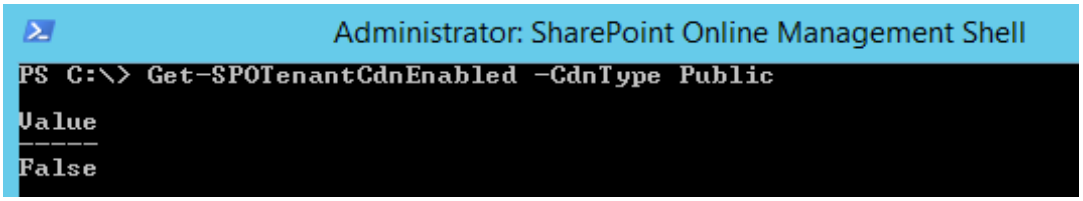
```
Connect-SPOService -Url https://[tenant]-admin.sharepoint.com
```

Replace [tenant] with your actual tenant name

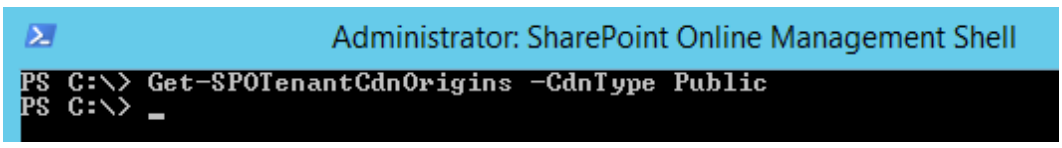
4. Run below set of commands to review the existing Office 365 public CDN settings on your tenant

```
Get-SPOTenantCdnEnabled -CdnType Public
```

This command will return the status of CDN. True if CDN is enabled, false otherwise.

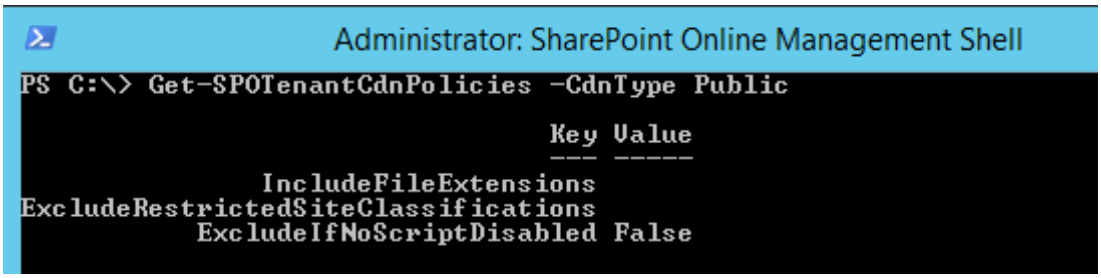



```
Get-SPOTenantCdnOrigins -CdnType Public
```



This command will return the location of already configured CDN origins. The urls are relative. On first instance, it will not return any values as CDN is not yet setup.

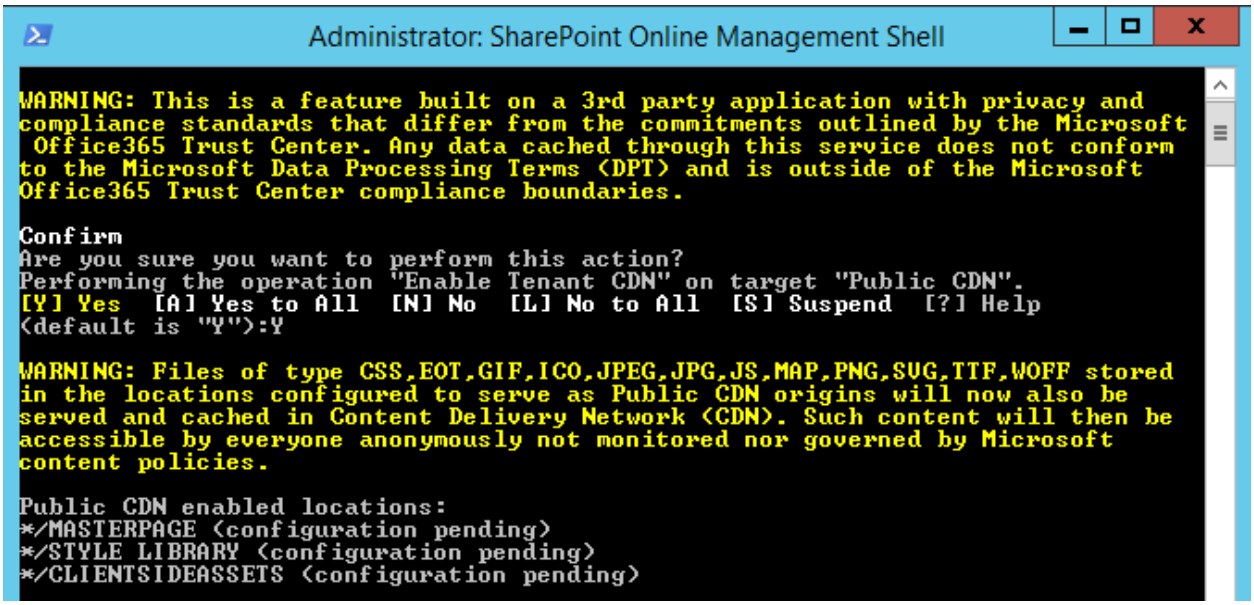
```
Get-SPOTenantCdnPolicies -CdnType Public
```



This command will return the policy settings for CDN

5. Run below command to enable the CDN

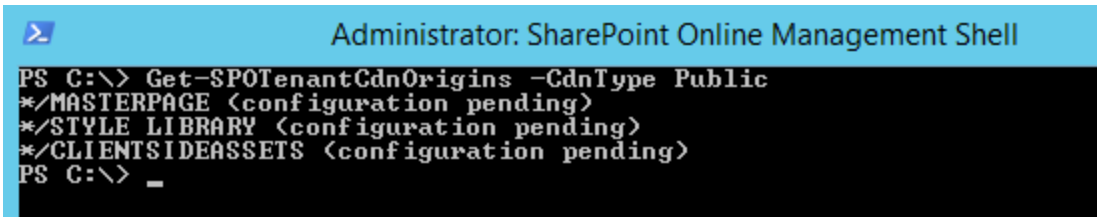
```
Set-SPOTenantCdnEnabled -CdnType Public
```



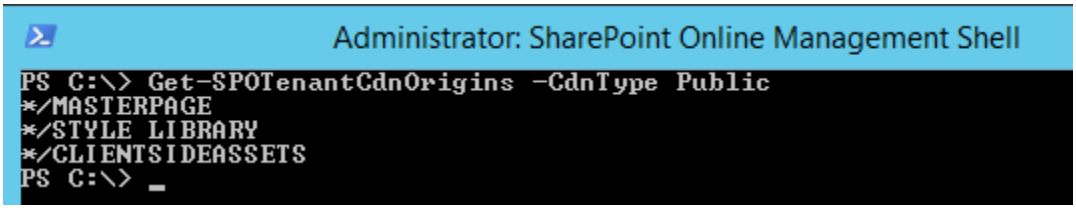
After enabling the CDN, */CLIENTSIDEASSETS origin is by default added as valid origin. By default allowed file extensions are: CSS, EOT, GIF, ICO, JPEG, JPG, JS, MAP, PNG, SVG, TTF, and WOFF. The configuration takes up to 15 to 20 minutes.

6. To check the current status of CDN end points, run below command

```
Get-SPOTenantCdnOrigins -CdnType Public
```



The origin will be listed without (configuration pending) status when it is ready. Please be patient for 15 to 20 minutes until it is ready.
Once CDN origin is ready, the output will be as below.



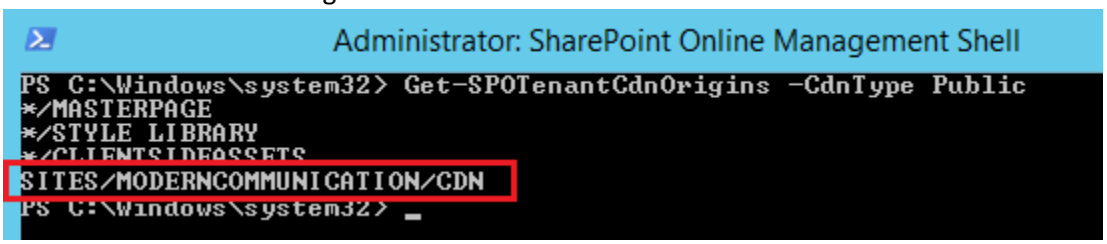
Setup New Office 365 CDN in Tenant

Follow below steps to setup new CDN location

1. Open SharePoint site (e.g. https://[tenant].sharepoint.com/sites/[site-collection-name]
2. Create a document library (e.g. CDN)
3. Run below command in SharePoint Online Management Shell

   ```
   Add-SPOTenantCdnOrigin -CdnType Public -OriginUrl sites/[site-collection-name]/ [document-library]
   ```

   The OriginUrl is a relative url. New CDN origin configuration will again take 15 to 20 minutes.
4. Run Get-SPOTenantCdnOrigins to check the status



5. Create a folder in document library preferably with name of SPFx web part (e.g. O365CDNDeploy)
6. To get the path of CDN type below url in browser

   ```
   https://[tenant].sharepoint.com/_vti_bin/publiccdn.ashx/url?itemurl=https://[tenant].sharepoint.com/sites/[site-collection-name]/[document-library]/[folder]
   ```

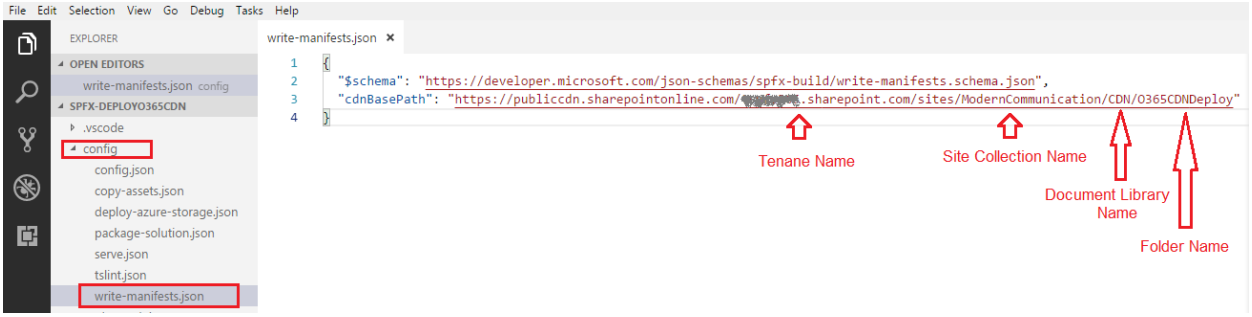
Configure SPFx Solution for Azure CDN

Update package details

1. Open command prompt
2. In the command prompt, navigate to SPFx solution folder
3. Type “code .” to open the solution in code editor of your choice
4. Open package-solution.json file from config folder. This file takes care of solution packaging.
5. Set includeClientSideAssets value as false. The client side assets will not be packaged inside final package (sppkg file) because these will be hosted on external Office 365 public CDN.

Update CDN Path

1. Open write-manifests.json from config folder
2. Update CDN base path as Office 365 CDN end point https://publiccdn.sharepointonline.com/[tenant]/sites/[site-collection-name]/[document-library]/[folder]



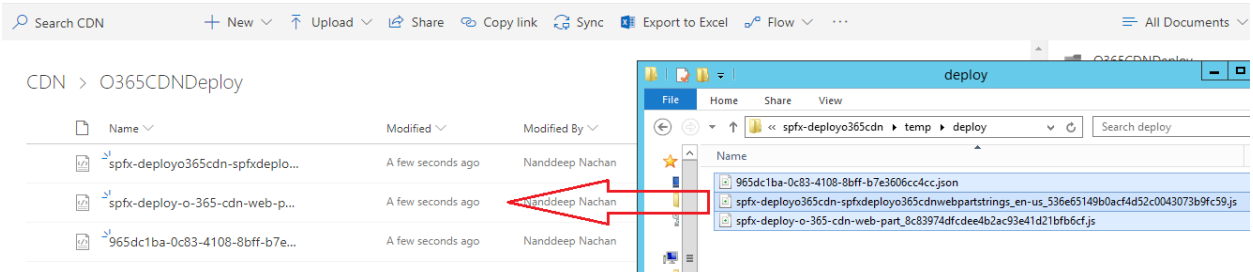
Prepare the package

In the command prompt, type the below command

```
gulp bundle --ship
```

This will minify the required assets to upload to CDN. The ship switch denotes distribution. The minified assets are located at “temp\deploy” folder.

Upload the files from “temp\deploy” folder to CDN location (SharePoint document library setup as CDN)



Deploy Package to SharePoint

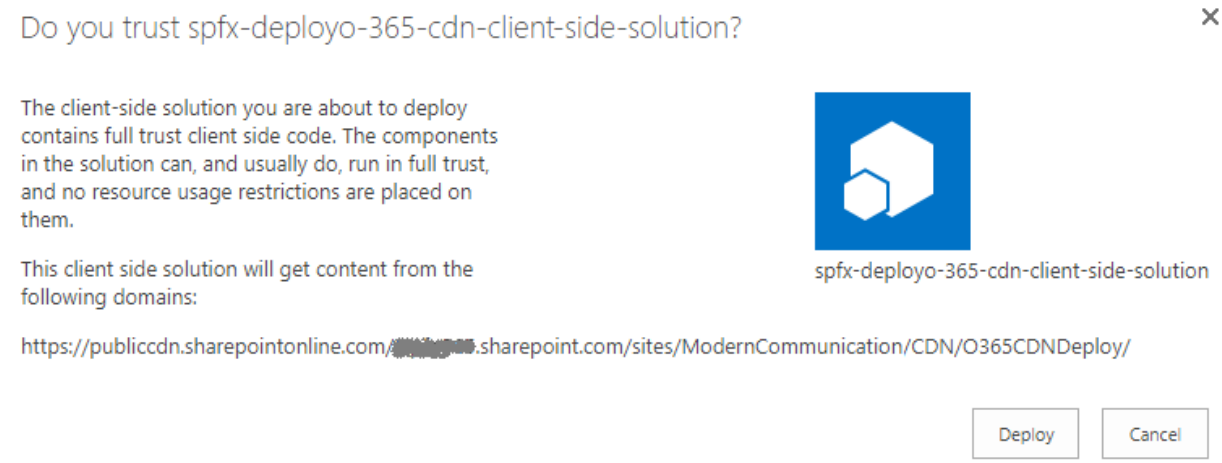
In the command prompt, type the below command

```
gulp package-solution --ship
```

This will create the solution package (sppkg) in sharepoint\solution folder.

Upload package to app catalog

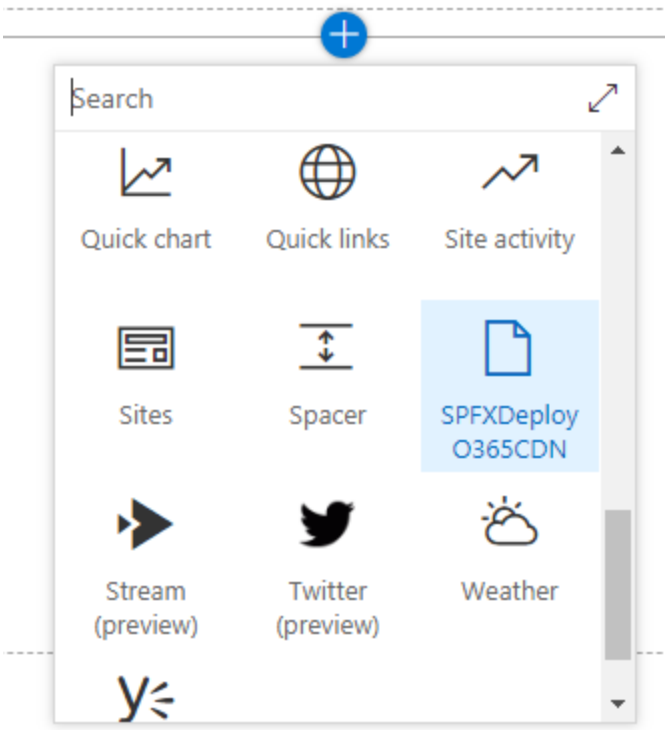
1. Open the SharePoint app catalog site
2. Upload the solution package (sppkg) from sharepoint\solution folder to app catalog
3. Make sure the url is pointing to Office 365 CDN



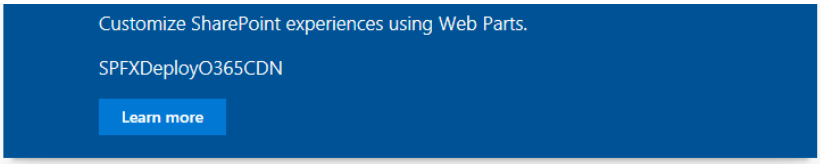
4. Click Deploy

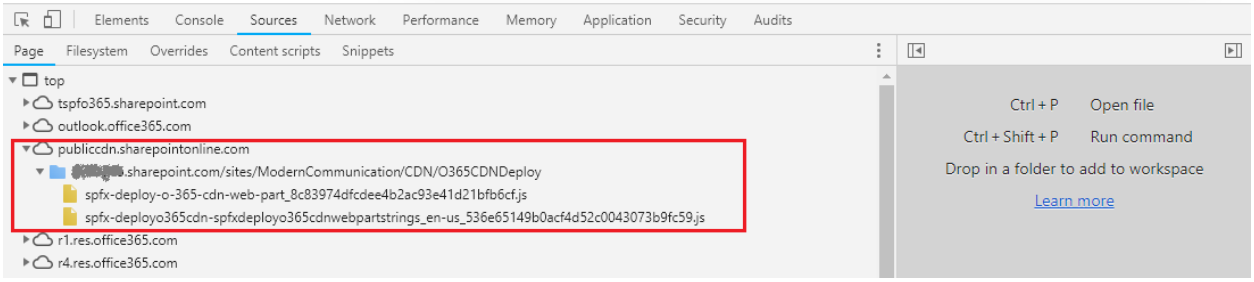
Test the web part

1. Open any SharePoint site in your tenant
2. Add the App to your site from “Add an App” menu
3. Edit any page and add the webpart



4. Click F12 to open developer toolbar. Confirm that it is served from Office 365 Public CDN





Summary

Office 365 CDN is one of the feasible option to deploy the SPFx client side webpart. It requires some manual steps to copy the assets to CDN path. You can update the Office 365 CDN path later in SPFx solution and redeploy it.

Chapter 8: Deploy SPFx WebParts to SharePoint Library

Overview

Please refer chapters to get started with developing SPFx client side web parts and test it on a local SharePoint workbench.

In the production ready scenario, the webparts can be deployed to any of below

1. Azure CDN
2. Office 365 Public CDN
3. SharePoint Library in your tenant

In this chapter, we will explore the option of deploying the SPFx webparts using SharePoint library.

Deployment to CDN

The build output of SPFx client side webpart consists of solution package (.sppkg file) and various scripts, css and other assets. The sppkg file is deployed to SharePoint which includes manifest with url pointing to location where script files are deployed. The script files should exists at the location specified in manifest file, otherwise the web part will not work in SharePoint.

These files usually gets deployed to a CDN location. CDN location could be Azure BLOB storage or Office 365 public CDN. We can use any of this CDN location, however using CDN is not must. SharePoint Framework does not impose any restrictions that scripts should be deployed to any CDN. You can upload the scripts anywhere from where it can be accessed. That means, you can even upload the scripts to a SharePoint library inside your tenant to which everyone has an access. SharePoint Framework client webpart can access the scripts from SharePoint library.

In short, scripts can be deployed to any location including Azure BLOB storage, Office 365 CDN, any document library in SharePoint or even a physical web server from where it can be accessed. However each of these approaches has its own pros and cons with regards to cost, performance, and scalability.

If the organization has its users worldwide across different geo locations, having a CDN will help to serve as a central repository.

In package-solution.json, specifying includeClientSideAssets as true will include the assets in .sppkg file. After deploying the sppkg solution to app catalog, SharePoint will unpack the assets to predefined location in tenant.

Create SharePoint Library as CDN

1. Open SharePoint Site
2. Click Settings (gear icon) > Add an App
3. Click Document Library tile
4. Give it a name - SPFxDeploy
5. Click (gear icon) > Library settings
6. Under “Permissions and Management”, click “Permissions for this document library”
7. Give read permission to all users (use everyone user)

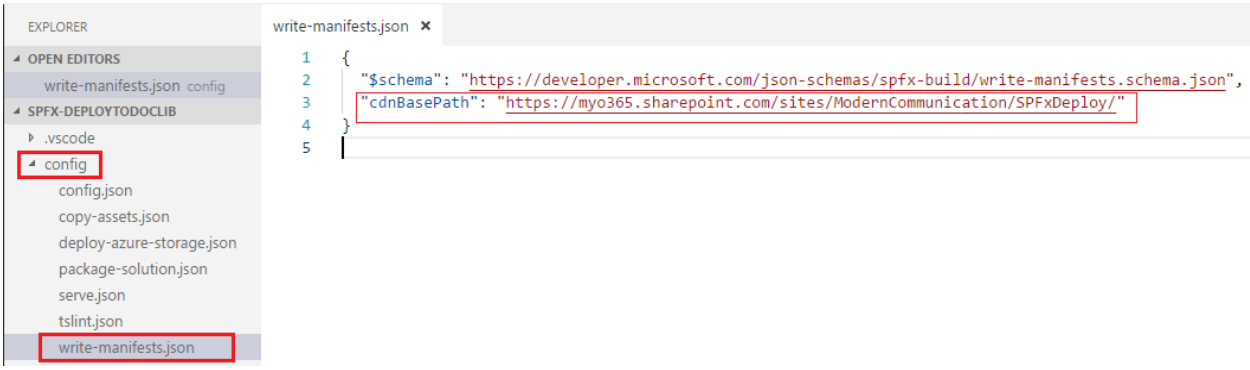
Configure SPFx Solution for SharePoint Library

Update package details

1. Open command prompt
2. In the command prompt, navigate to SPFx solution folder
3. Type “code .” to open the solution in code editor of your choice
4. Open package-solution.json file from config folder. This file takes care of solution packaging.
5. Set includeClientSideAssets value as false. The client side assets will not be packaged inside final package (sppkg file) because these will be hosted in SharePoint library.

Update CDN Path

3. Open write-manifests.json from config folder
4. Update CDN base path as SharePoint library url



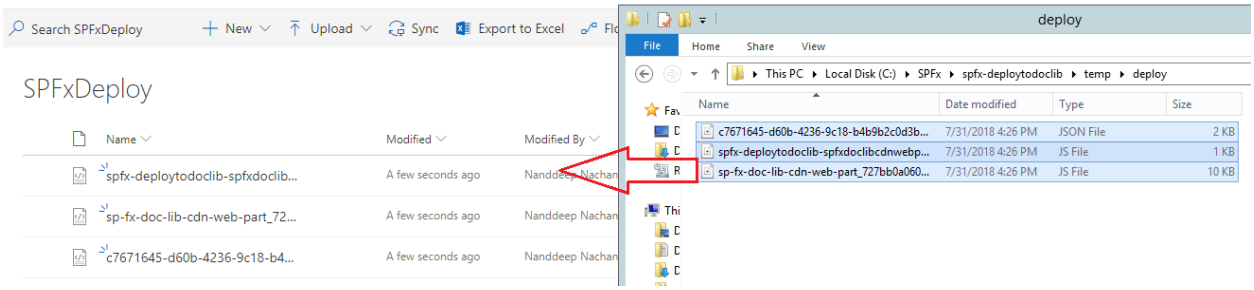
Prepare the package

In the command prompt, type the below command

```
gulp bundle --ship
```

This will minify the required assets to upload to CDN. The ship switch denotes distribution. The minified assets are located at “temp\deploy” folder.

Upload the files from “temp\deploy” folder to SharePoint library



Deploy Package to SharePoint

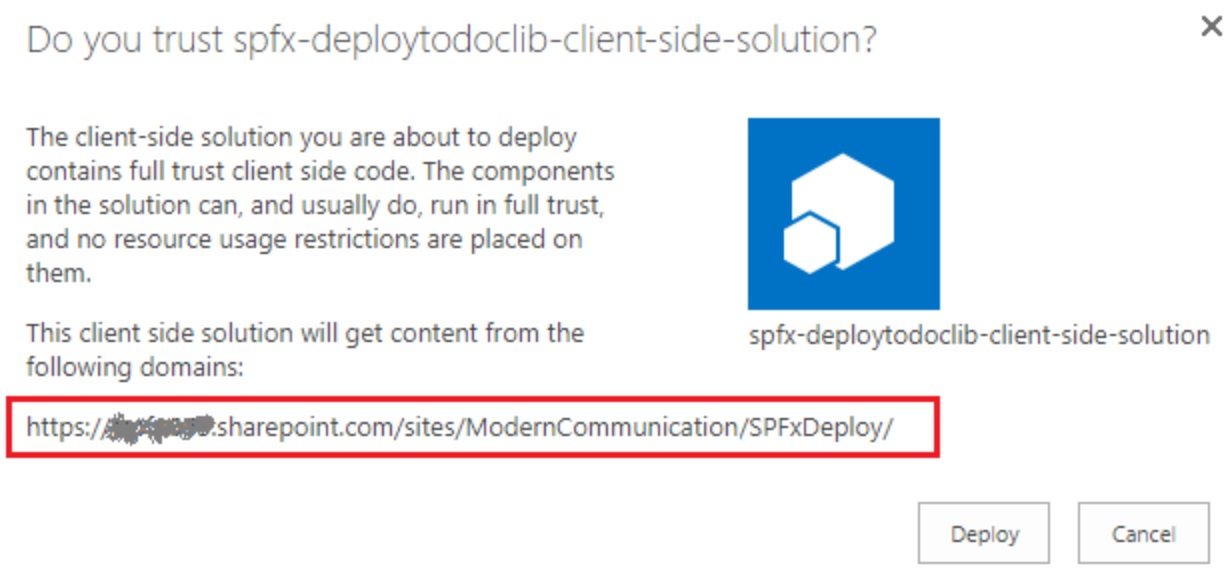
In the command prompt, type the below command

```
gulp package-solution --ship
```

This will create the solution package (sppkg) in sharepoint\solution folder.

Upload package to app catalog

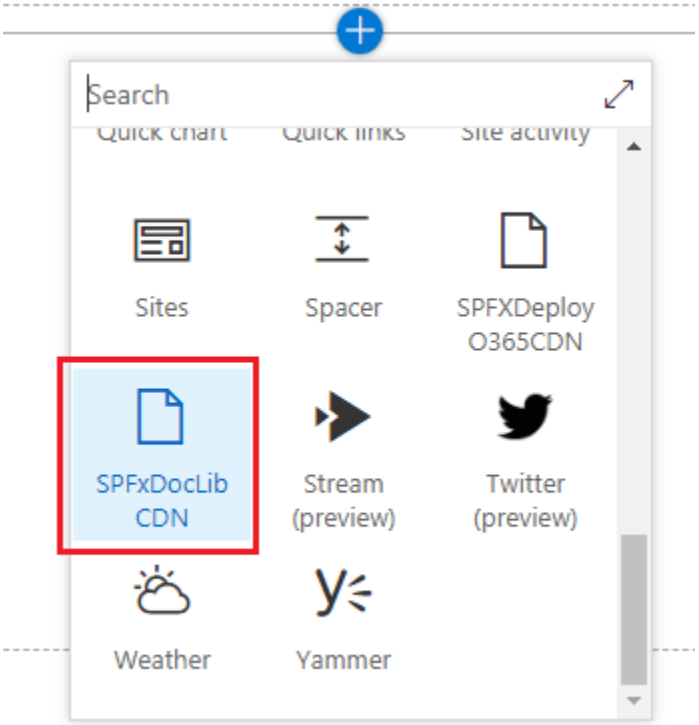
1. Open the SharePoint app catalog site
2. Upload the solution package (sppkg) from sharepoint\solution folder to app catalog
3. Make sure the url is pointing to SharePoint library



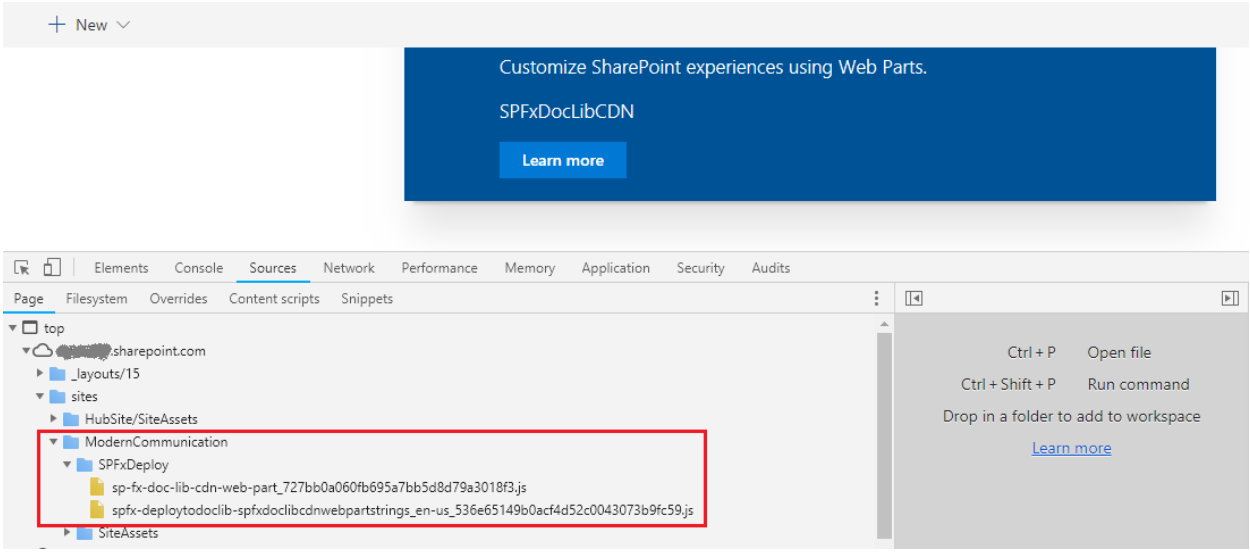
4. Click **Deploy**

Test the web part

1. Open any SharePoint site in your tenant
2. Add the App to your site from “Add an App” menu
3. Edit any page and add the webpart



4. Click F12 to open developer toolbar. Confirm that it is served from SharePoint library



Summary

There are multiple options to deploy the SPFx client side webparts ranging from Azure BLOB storage, Office 365 public CDN, or even regular SharePoint library. Considering the pros and cons of each option, choose the one that suits you better.

Chapter 9: Integrating JQuery with SPFx Web Parts

Overview

SharePoint Framework Client side webparts are developed using JavaScript framework. JQuery is one of the largely used JavaScript framework.

In this chapter, we will explore how to integrate JQuery with SPFx web parts.

Create SPFx Solution

1. Create a directory for SPFx solution

```
md spfx-jqueryintegration
```

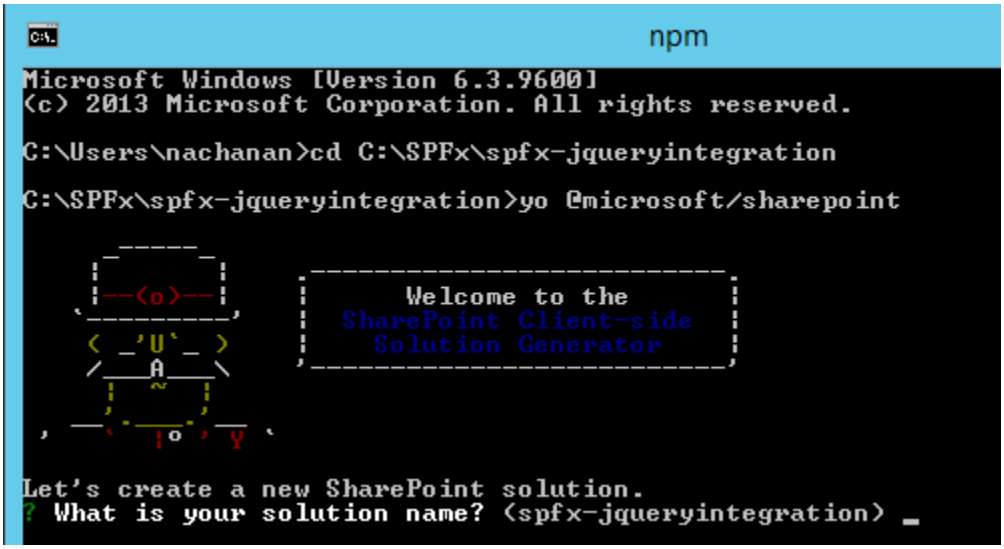
2. Navigate to above created directory

```
cd spfx-jqueryintegration
```

3. Run Yeoman SharePoint Generator to create the solution

```
yo @microsoft/sharepoint
```

4. Yeoman generator will present you with the wizard by asking questions about the solution to be created.



Solution Name: Hit enter to have default name (spfx-jqueryintegration in this case) or type in any other name for your solution.
Selected choice: Hit enter

Target for component: Here we can select the target environment where we are planning to deploy the client webpart i.e. SharePoint Online or SharePoint OnPremise (SharePoint 2016 onwards).
Selected choice: SharePoint Online only (latest)

Place of files: We may choose to use the same folder or create a subfolder for our solution.
Selected choice: Same folder

Deployment option: Selecting Y will allow the app to deployed instantly to all sites and will be accessible everywhere.
Selected choice: N (install on each site explicitly)

Type of client-side component to create: We can choose to create client side webpart or an extension. Choose webpart option.
Selected choice: WebPart

Web part name: Hit enter to select the default name or type in any other name.
Selected choice: SPFxJqueryIntegration

Web part description: Hit enter to select the default description or type in any other value.
Selected choice: Hit enter (default description)

Framework to use: Select any JavaScript framework to develop the component. Available choices are (No JavaScript Framework, React, and Knockout)
Selected choice: No JavaScript Framework. We will integrate JQuery to this solution.

Configured Required Packages and Dependencies

Include Packages

We will now include the JQuery packages. Type in below commands on command prompt.

```
npm i jquery jqueryui combokeys --save
```

The --save option enables NPM to include the packages to dependencies section of package.json file.

Include Typings

Typings will help for auto complete while writing the code in code editor. Type below command.

```
tsd install jquery jqueryui combokeys --save
```

Lock down the package dependencies

Type in below command to lock down the package dependencies

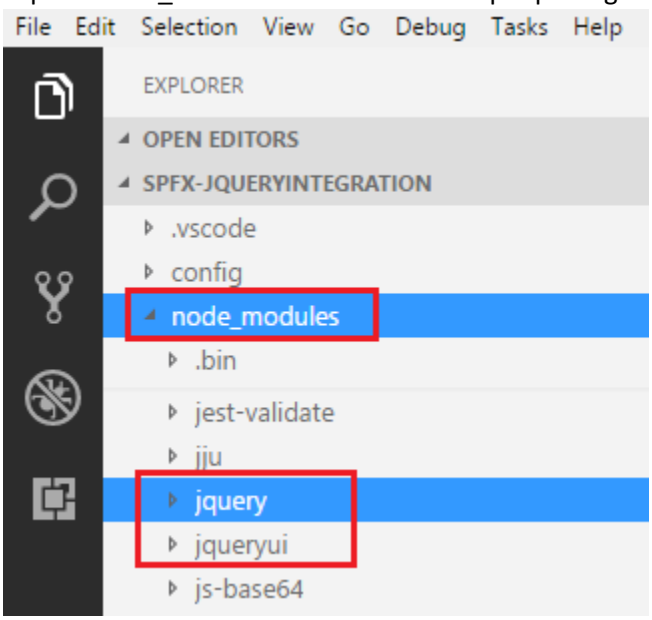
```
npm shrinkwrap
```

Solution Changes

1. In the command prompt, type below command to open the solution in code editor of your choice.

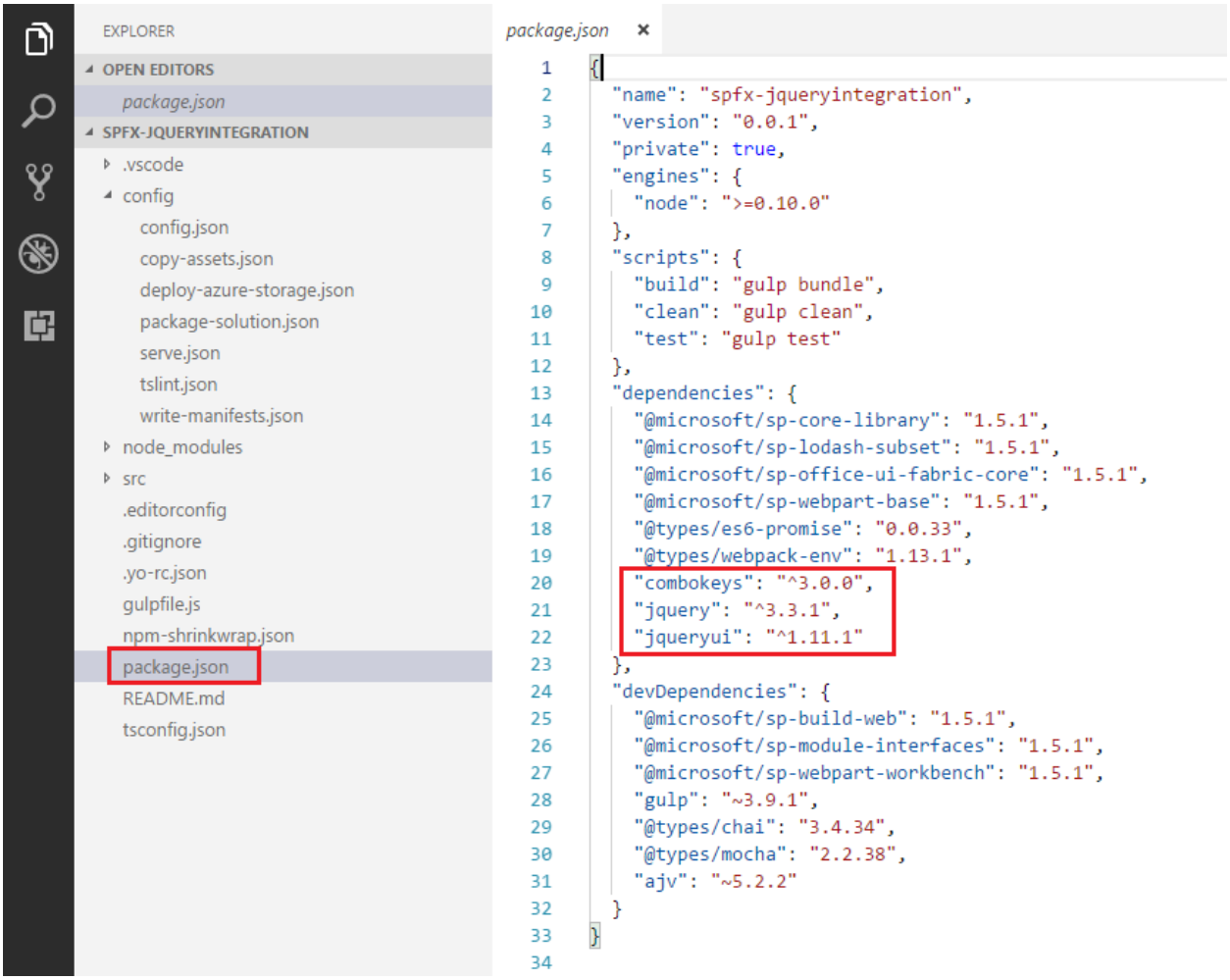
```
code .
```

2. Expand node_module folder to see the npm packages being added for jQuery

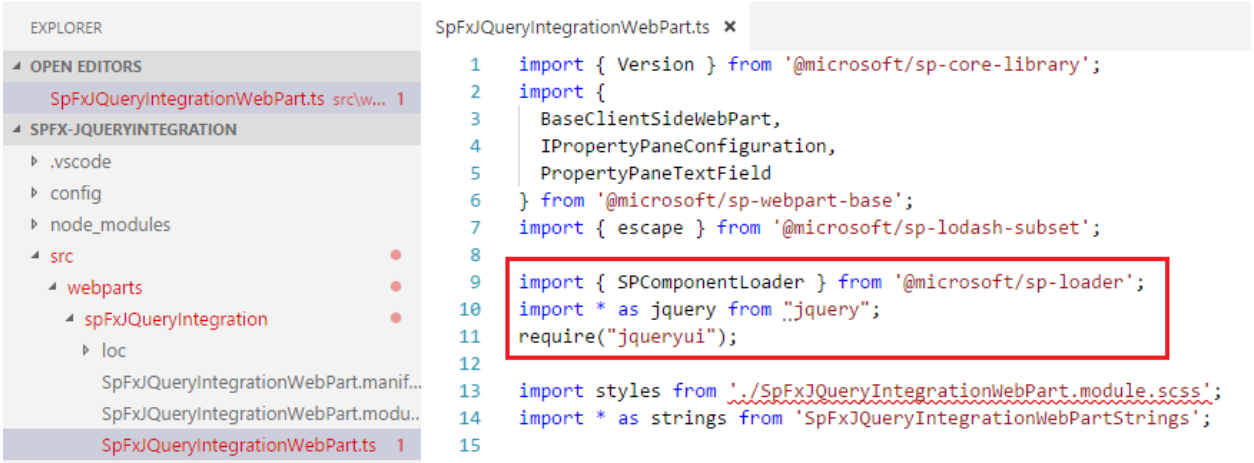


3. Open config.json under config folder
4. Under externals node, add jQuery references

5. Open package.json and verify jQuery dependencies are listed



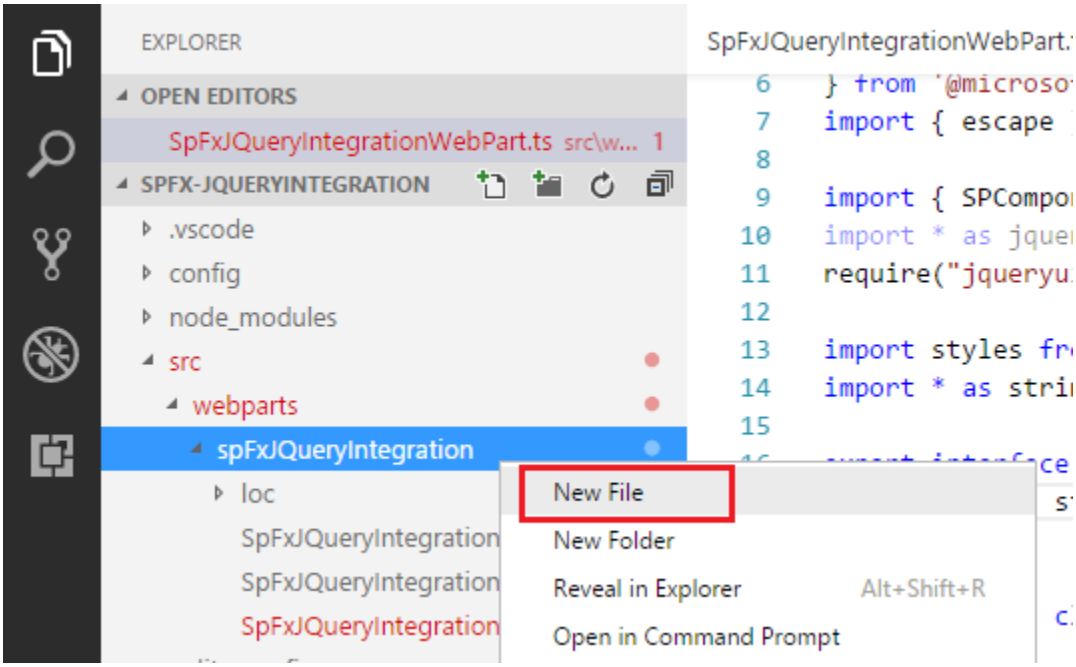
6. Open webpart file SpFxJQueryIntegrationWebPart.ts and import jQuery



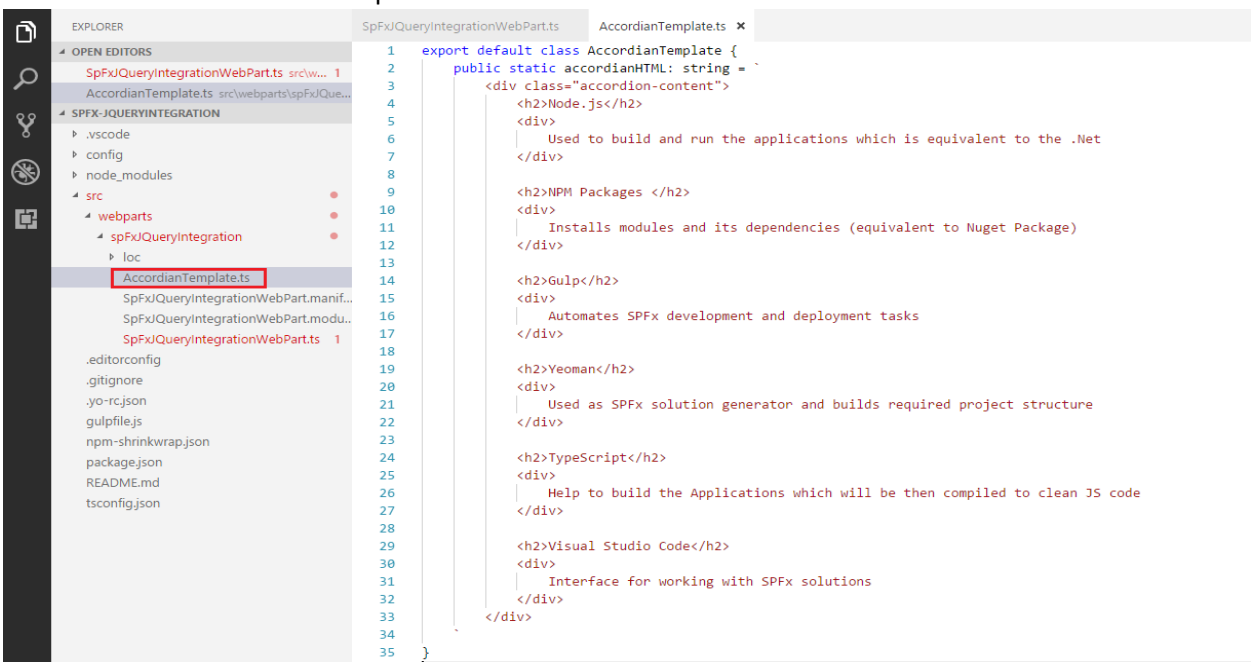
7. Define a constructor and load external jQuery UI css from it.

```
export default class SpFxJQueryIntegrationWebPart extends BaseClientSideWebPart<ISpFxJQueryIntegrationWebPartProps> {
  public constructor() {
    super();
    SPComponentLoader.loadCss("//code.jquery.com/ui/1.12.0/themes/smoothness/jquery-ui.css");
  }
```

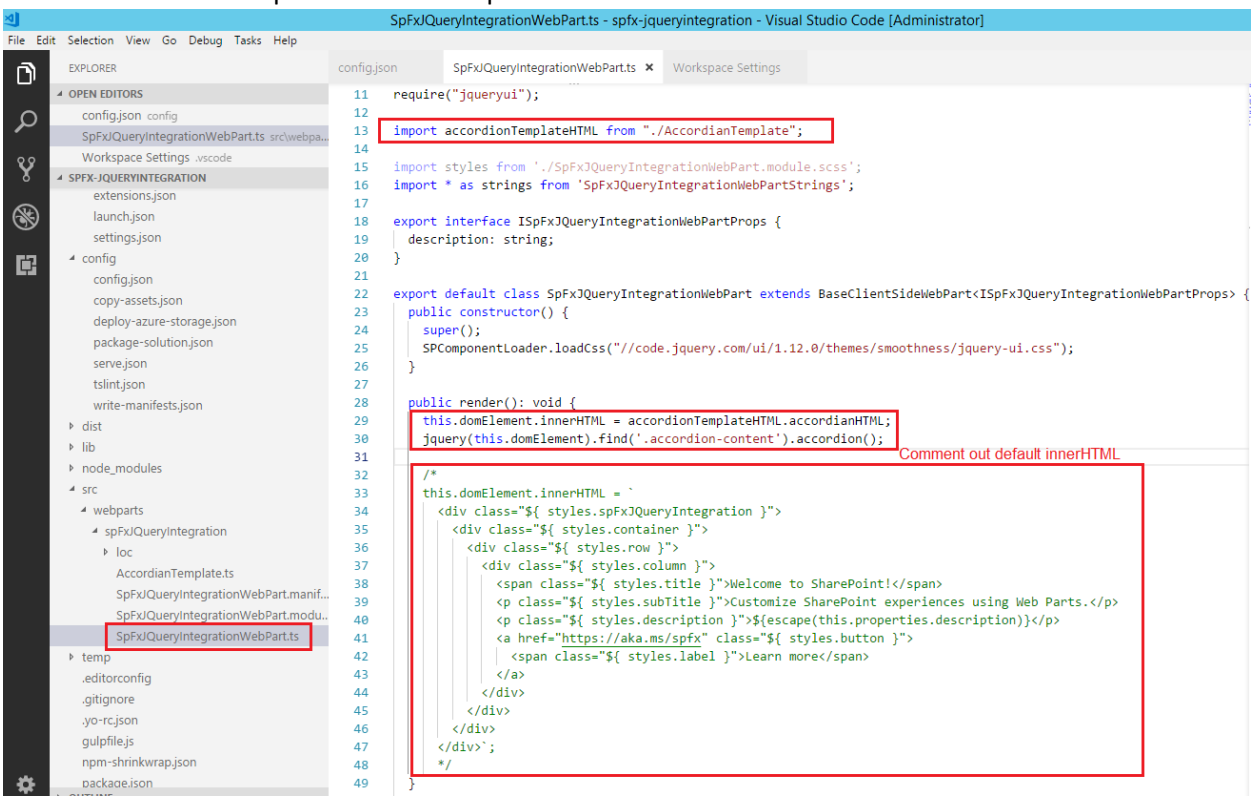
8. Right click on spFxJQueryIntegration folder, click New file



9. Name the file as AccordianTemplate.ts and add below content

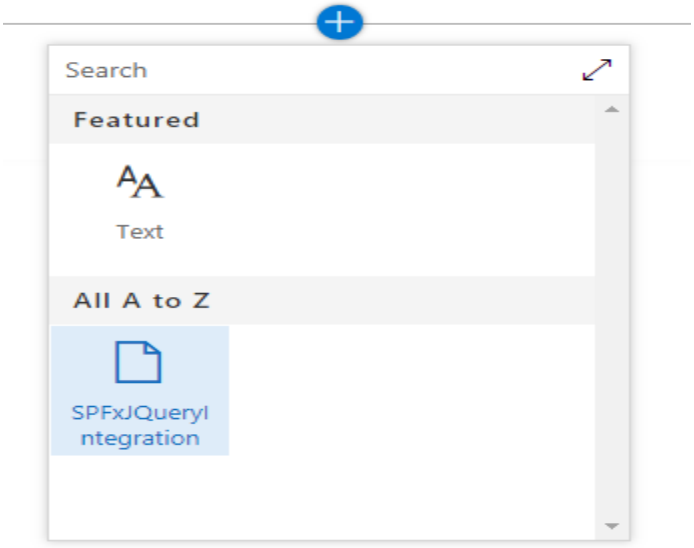


10. Use the accordion template in main webpart class

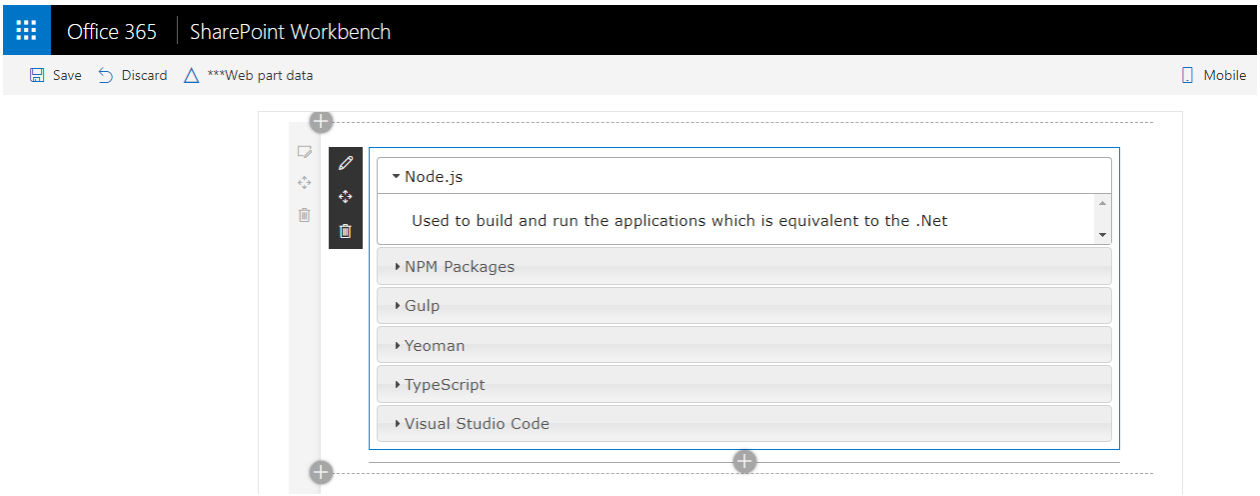


Test the web part

1. On command prompt, type gulp serve
2. Open any SharePoint site in your tenant or use SharePoint local workbench
3. Add the App to your site from “Add an App” menu
4. Edit any page and add the webpart



5. See the webpart working



Summary

JavaScript frameworks like JQuery can be easily integrated with SPFx client web parts. They also supports typings which helps for intellisense while developing the code in editors.

Chapter 10: CRUD operations using No Framework

Overview

In the chapters so far, we have explored on developing basic SharePoint client web part which can run independently without any interaction with SharePoint.

In this chapter, we will explore to interact with the SharePoint list for CRUD (Create, Read, Update, and Delete) operations using No framework option. The CRUS operations will be performed using REST APIs.

Create SPFx Solution

1. Open command prompt. Create a directory for SPFx solution

```
md spfx-crud-no-framework
```

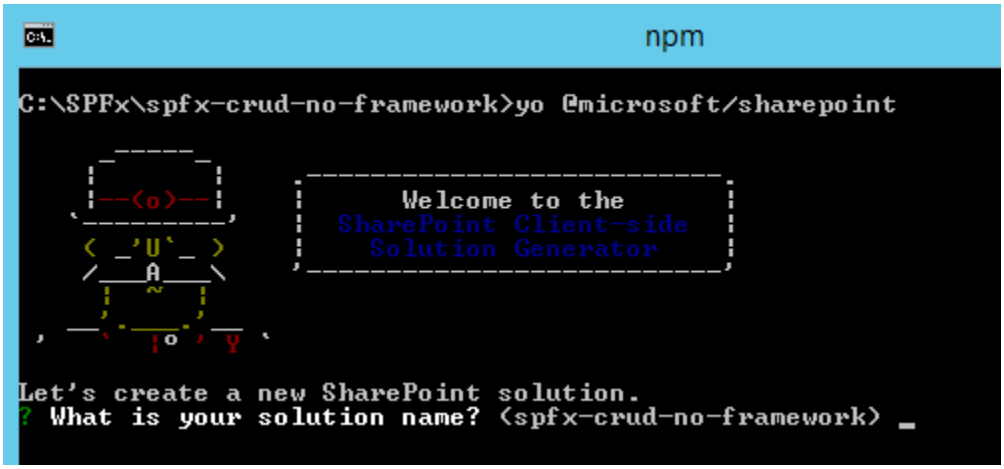
2. Navigate to above created directory

```
cd spfx-crud-no-framework
```

3. Run Yeoman SharePoint Generator to create the solution

```
yo @microsoft/sharepoint
```

4. Yeoman generator will present you with the wizard by asking questions about the solution to be created.



Solution Name: Hit enter to have default name (spfx-crud-no-framework in this case) or type in any other name for your solution.
Selected choice: Hit enter

Target for component: Here we can select the target environment where we are planning to deploy the client webpart i.e. SharePoint Online or SharePoint OnPremise (SharePoint 2016 onwards).

Selected choice: SharePoint Online only (latest)

Place of files: We may choose to use the same folder or create a subfolder for our solution.
Selected choice: Same folder

Deployment option: Selecting Y will allow the app to deployed instantly to all sites and will be accessible everywhere.
Selected choice: N (install on each site explicitly)

Type of client-side component to create: We can choose to create client side webpart or an extension. Choose webpart option.
Selected choice: WebPart

Web part name: Hit enter to select the default name or type in any other name.
Selected choice: NoFrameworkCRUD

Web part description: Hit enter to select the default description or type in any other value.
Selected choice: CRUD operations with no framework

Framework to use: Select any JavaScript framework to develop the component. Available choices are (No JavaScript Framework, React, and Knockout)
Selected choice: No JavaScript Framework

5. Yeoman generator will perform scaffolding process to generate the solution. The scaffolding process will take significant amount of time.
6. Once the scaffolding process is completed, in the command prompt type below command to open the solution in code editor of your choice.

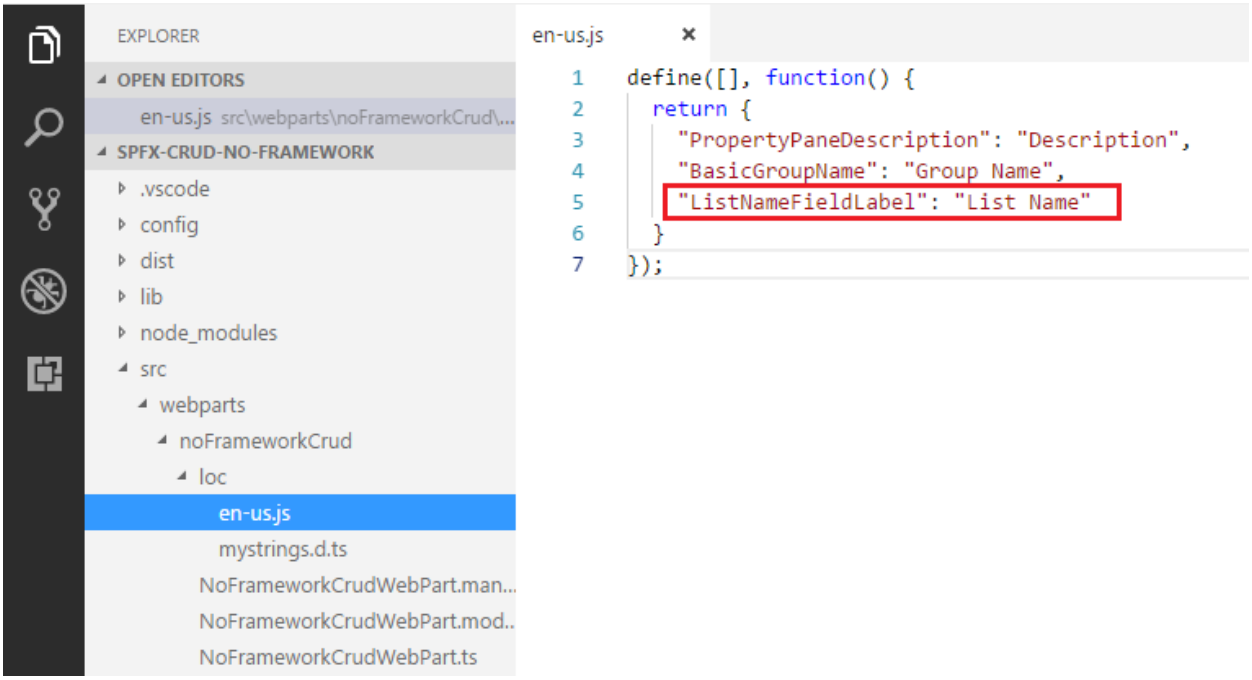
```
code .
```

Configure Property for List Name

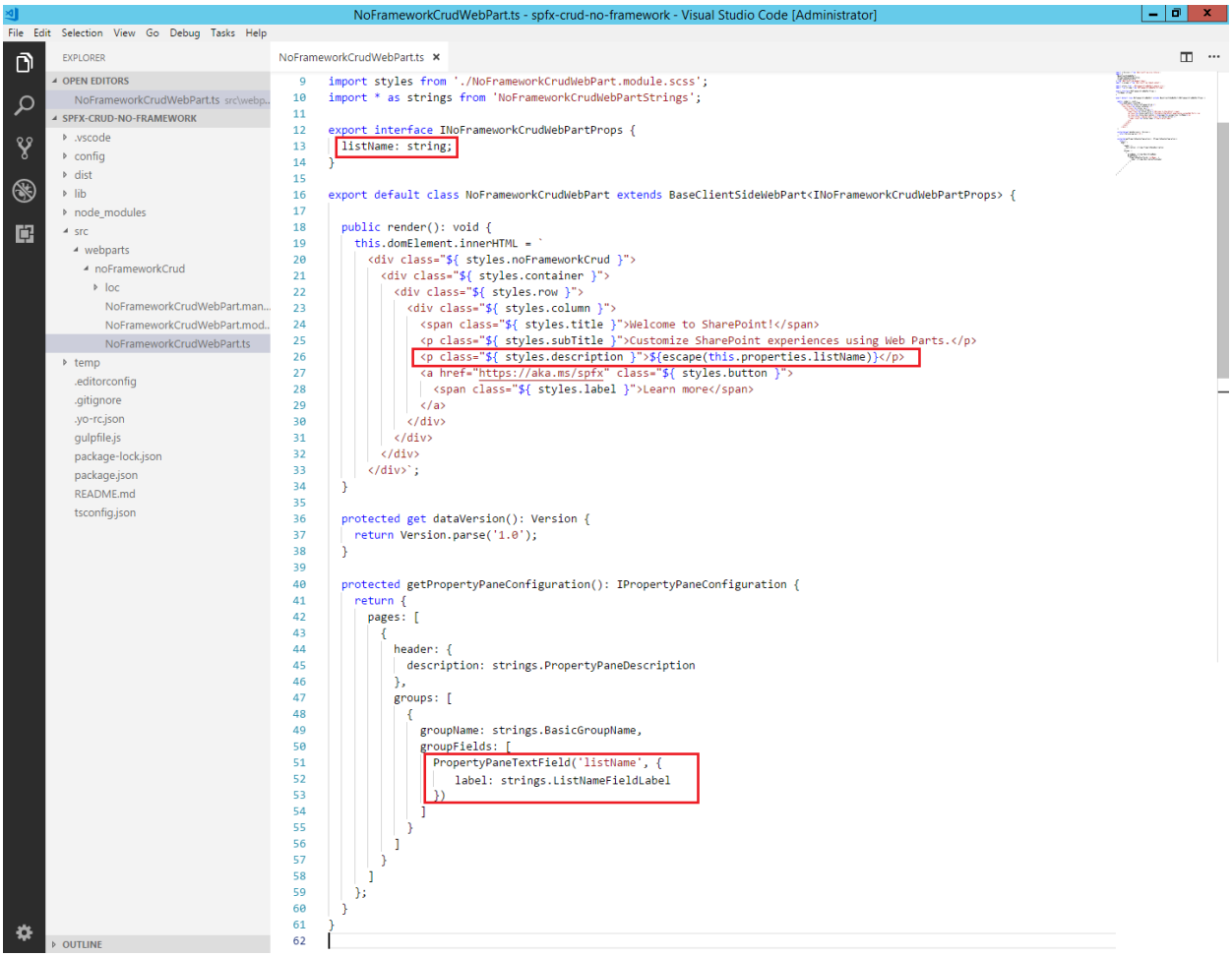
SPFx solution by default have description property created. Let us change the property to list name. We will use this property to configure the list name on which the CRUD operation is to perform.

1. Open mystrings.d.ts under \src\webparts\noFrameworkCrud\loc\ folder
2. Rename DescriptionFieldLabel to ListNameFieldLabel

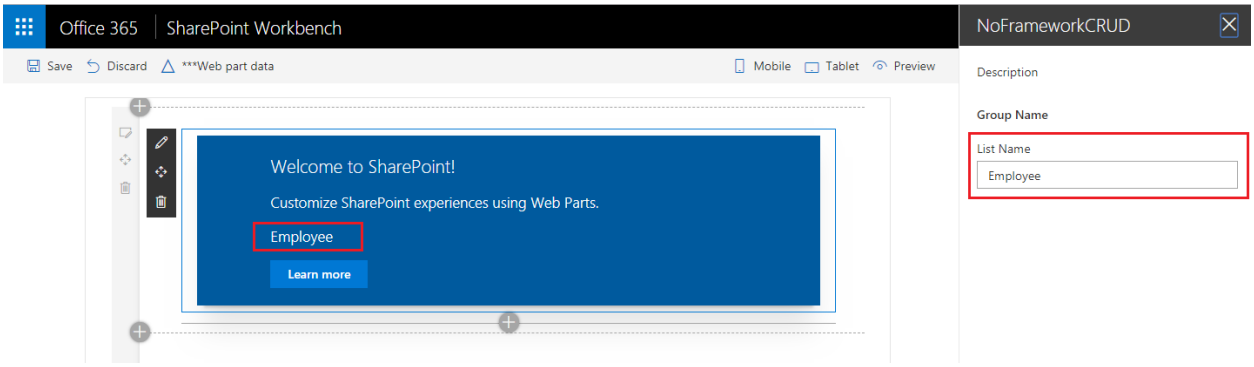
3. In en-us.js file under \src\webparts\noFrameworkCrud\loc\ folder set the display name for listName property



4. Open main webpart file (NoFrameworkCrudWebPart.ts) under \src\webparts\noFrameworkCrud folder.
5. Rename description property pane field to listName

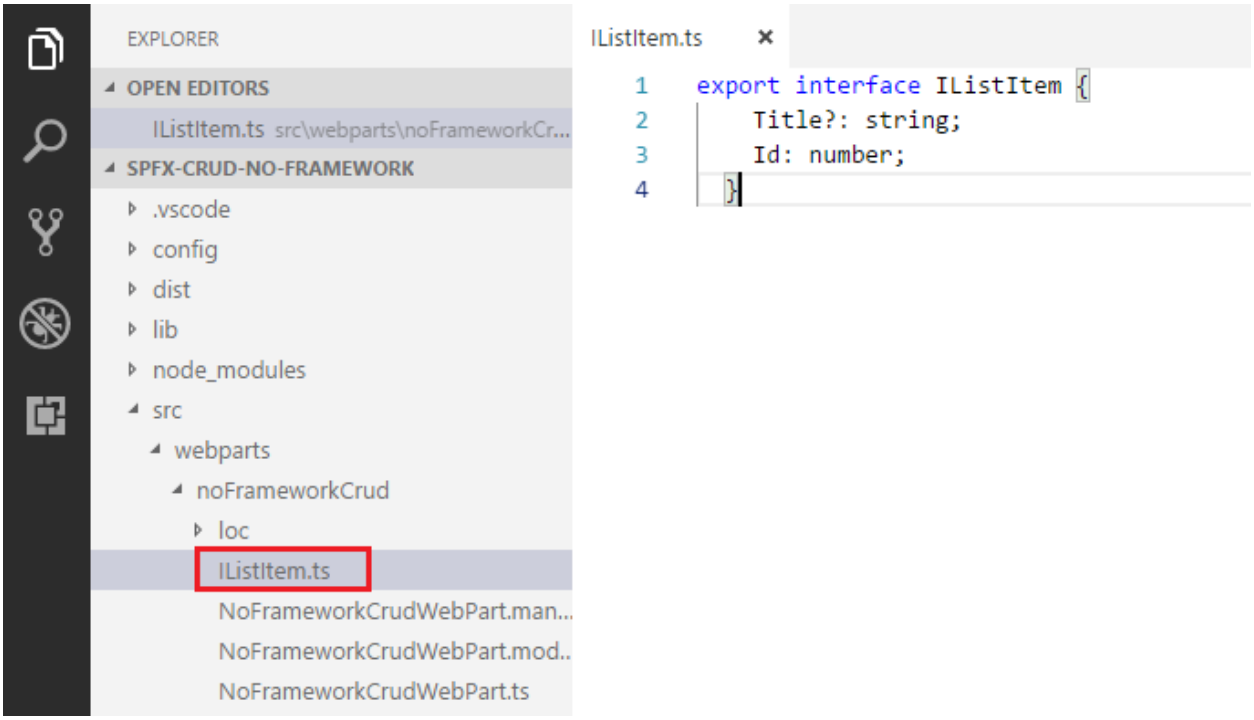


6. In the command prompt, type “gulp serve”
7. In the SharePoint local workbench page, add the web part.
8. Edit the web part to ensure the listName property pane field is getting reflected.



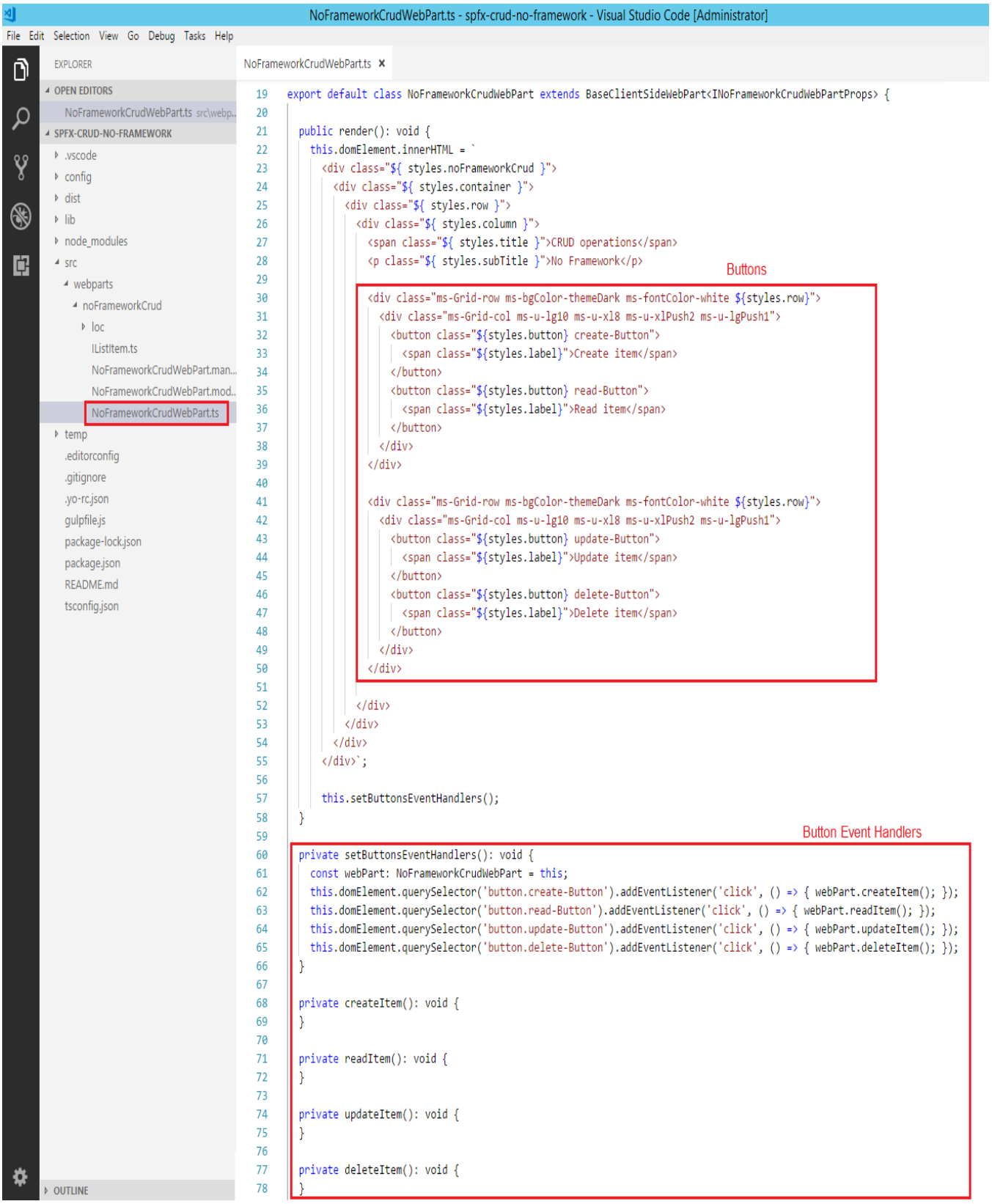
Model for List Item

Let us add a class (IListItem.ts) representing the list item.



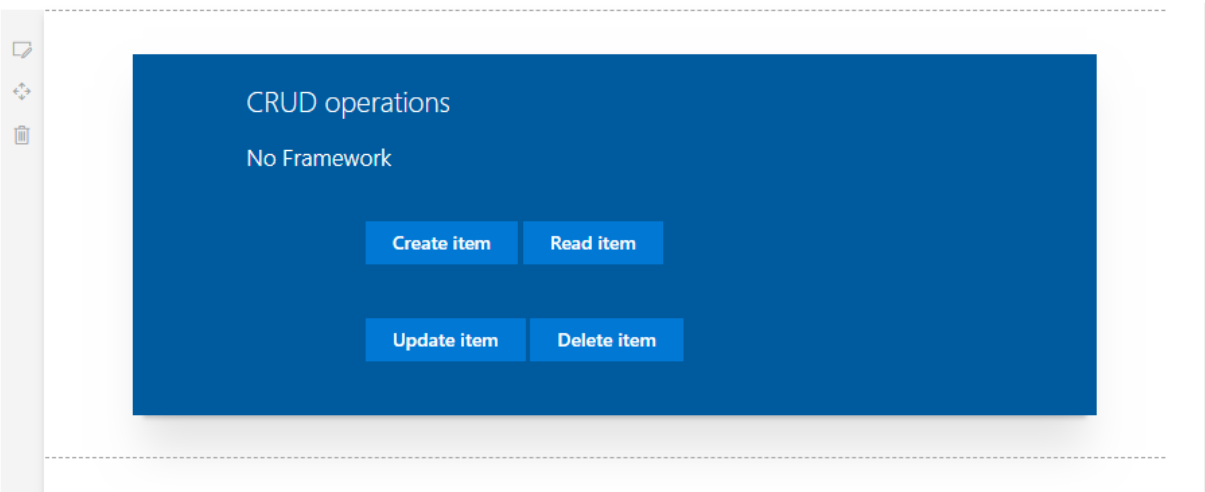
Add Controls to WebPart

1. Open main webpart file (NoFrameworkCrudWebPart.ts) under \src\webparts\noFrameworkCrud folder.
2. Modify Render method to include buttons for CRUD operations and add event handlers to each of the button




```
export default class NoFrameworkCrudWebPart extends BaseClientSideWebPart<INoFrameworkCrudWebPartProps> {

  public render(): void {
    this.domElement.innerHTML = `
      <div class="${ styles.noFrameworkCrud }">
        <div class="${ styles.container }">
          <div class="${ styles.row }">
            <div class="${ styles.column }">
              <span class="${ styles.title }">CRUD operations</span>
              <p class="${ styles.subTitle }">No Framework</p>

              <div class="ms-Grid-row ms-bgColor-themeDark ms-fontColor-white ${styles.row}">
                <div class="ms-Grid-col ms-u-lg10 ms-u-xl8 ms-u-xlPush2 ms-u-lgPush1">
                  <button class="${styles.button} create-Button">
                    <span class="${styles.label}">Create item</span>
                  </button>
                  <button class="${styles.button} read-Button">
                    <span class="${styles.label}">Read item</span>
                  </button>
                </div>
              </div>

              <div class="ms-Grid-row ms-bgColor-themeDark ms-fontColor-white ${styles.row}">
                <div class="ms-Grid-col ms-u-lg10 ms-u-xl8 ms-u-xlPush2 ms-u-lgPush1">
                  <button class="${styles.button} update-Button">
                    <span class="${styles.label}">Update item</span>
                  </button>
                  <button class="${styles.button} delete-Button">
                    <span class="${styles.label}">Delete item</span>
                  </button>
                </div>
              </div>

            </div>
          </div>
        </div>
      </div>`;

    this.setButtonsEventHandlers();
  }

  private setButtonsEventHandlers(): void {
    const webPart: NoFrameworkCrudWebPart = this;
    this.domElement.querySelector('button.create-Button').addEventListener('click', () => { webPart.createItem(); });
    this.domElement.querySelector('button.read-Button').addEventListener('click', () => { webPart.readItem(); });
    this.domElement.querySelector('button.update-Button').addEventListener('click', () => { webPart.updateItem(); });
    this.domElement.querySelector('button.delete-Button').addEventListener('click', () => { webPart.deleteItem(); });
  }

  private createItem(): void {
  }

  private readItem(): void {
  }

  private updateItem(): void {
  }

  private deleteItem(): void {
  }
```

3. In the command prompt type “gulp serve” to see the buttons on webpart.



4. We will perform read, update, and delete operations on latest item in SharePoint list. Let us implement generic method which will return the id of latest item from given list. We will use the REST API to query the list.

```
private getLatestItemId(): Promise<number> {
  return new Promise<number>((resolve: (itemId: number) => void, reject:
(error: any) => void): void => {

this.context.spHttpClient.get(`${this.context.pageContext.web.absoluteUr
l}/_api/web/lists/getbytitle('${this.properties.listName}')/items?$order
by=Id desc&$top=1&$select=id`,
      SPHttpClient.configurations.v1,
      {
        headers: {
          'Accept': 'application/json;odata=nometadata',
          'odata-version': ''
        }
      })
      .then((response: SPHttpClientResponse): Promise<{ value: { Id:
number }[] }> => {
        return response.json();
      }, (error: any): void => {
        reject(error);
      })
      .then((response: { value: { Id: number }[] }): void => {
        if (response.value.length === 0) {
          resolve(-1);
```

```
        }
        else {
          resolve(response.value[0].Id);
        }
      });
  });
}
```

Implement Create Operation

First start by implementing create method, which will add an item to SharePoint list.

```
private createItem(): void {
  const body: string = JSON.stringify({
    'Title': `Item ${new Date()}`
  });


this.context.spHttpClient.post(`${this.context.pageContext.web.absoluteUrl}/_api
/web/lists/getbytitle('${this.properties.listName}')/items`,
  SPHttpClient.configurations.v1,
  {
    headers: {
      'Accept': 'application/json;odata=nometadata',
      'Content-type': 'application/json;odata=nometadata',
      'odata-version': ''
    },
    body: body
  })
  .then((response: SPHttpClientResponse): Promise<IListItem> => {
    return response.json();
  })
  .then((item: IListItem): void => {
    this.updateStatus(`Item '${item.Title}' (ID: ${item.Id}) successfully
created`);
  }, (error: any): void => {
    this.updateStatus('Error while creating the item: ' + error);
  });
}
```

Implement Read Operation

We will use REST API to read the latest item

```
private readItem(): void {
  this.getLatestItemId()
    .then((itemId: number): Promise<SPHttpClientResponse> => {
      if (itemId === -1) {
        throw new Error('No items found in the list');
      }

      this.updateStatus(`Loading information about item ID: ${itemId}...`);

      return
this.context.spHttpClient.get(`${this.context.pageContext.web.absoluteUrl}/_api
/web/lists/getbytitle('${this.properties.listName}')/items(${itemId})?$select=T
itle,Id`,
        SPHttpClient.configurations.v1,
        {
          headers: {
            'Accept': 'application/json;odata=nometadata',
            'odata-version': ''
          }
        });
    })
    .then((response: SPHttpClientResponse): Promise<IListItem> => {
      return response.json();
    })
    .then((item: IListItem): void => {
      this.updateStatus(`Item ID: ${item.Id}, Title: ${item.Title}`);
    }, (error: any): void => {
      this.updateStatus('Loading latest item failed with error: ' + error);
    });
}
```

Implement Update Operation

Firstly we will get the latest item and update it.

```
private updateItem(): void {
  let latestItemId: number = undefined;
  this.updateStatus('Loading latest item...');

  this.getLatestItemId()
    .then((itemId: number): Promise<SPHttpClientResponse> => {
      if (itemId === -1) {
        throw new Error('No items found in the list');
      }

      latestItemId = itemId;
      this.updateStatus(`Loading information about item ID: ${itemId}...`);

      return
this.context.spHttpClient.get(`${this.context.pageContext.web.absoluteUrl}/_api
/web/lists/getbytitle('${this.properties.listName}')/items(${latestItemId})?$se
lect=Title,Id`,
        SPHttpClient.configurations.v1,
        {
          headers: {
            'Accept': 'application/json;odata=nometadata',
            'odata-version': ''
          }
        });
    })
    .then((response: SPHttpClientResponse): Promise<IListItem> => {
      return response.json();
    })
    .then((item: IListItem): void => {
      this.updateStatus(`Item ID1: ${item.Id}, Title: ${item.Title}`);

      const body: string = JSON.stringify({
        'Title': `Updated Item ${new Date()}`
      });


this.context.spHttpClient.post(`${this.context.pageContext.web.absoluteUrl}/_ap
i/web/lists/getbytitle('${this.properties.listName}')/items(${item.Id})`,
        SPHttpClient.configurations.v1,
        {
          headers: {
            'Accept': 'application/json;odata=nometadata',
```

```
            'Content-type': 'application/json;odata=nometadata',
            'odata-version': '',
            'IF-MATCH': '*',
            'X-HTTP-Method': 'MERGE'
          },
          body: body
        })
        .then((response: SPHttpClientResponse): void => {
          this.updateStatus(`Item with ID: ${latestItemId} successfully
updated`);
        }, (error: any): void => {
          this.updateStatus(`Error updating item: ${error}`);
        });
    });
}
```

Implement Delete Operation

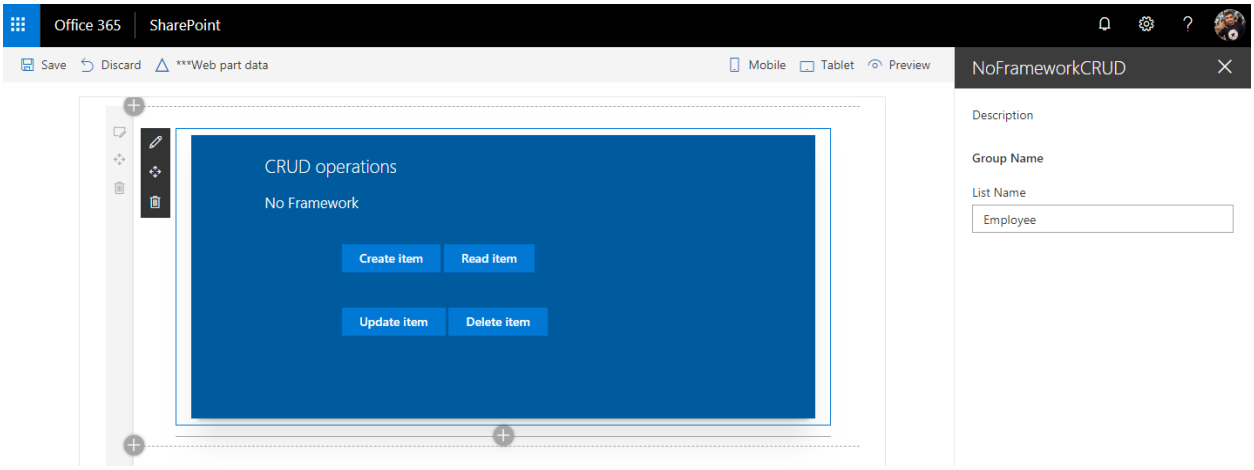
REST APIs are used to find and delete the latest item.

```
private deleteItem(): void {
  if (!window.confirm('Are you sure you want to delete the latest item?')) {
    return;
  }

  this.updateStatus('Loading latest items...');
  let latestItemId: number = undefined;
  let etag: string = undefined;
  this.getLatestItemId()
    .then((itemId: number): Promise<SPHttpClientResponse> => {
      if (itemId === -1) {
        throw new Error('No items found in the list');
      }

      latestItemId = itemId;
      this.updateStatus(`Loading information about item ID:
${latestItemId}...`);
      return
this.context.spHttpClient.get(`${this.context.pageContext.web.absoluteUrl}/_api
/web/lists/getbytitle('${this.properties.listName}')/items(${latestItemId})?$se
lect=Id`,
        SPHttpClient.configurations.v1,
        {
          headers: {
```

```
            'Accept': 'application/json;odata=nometadata',
            'odata-version': ''
          }
        });
    })
    .then((response: SPHttpClientResponse): Promise<IListItem> => {
      etag = response.headers.get('ETag');
      return response.json();
    })
    .then((item: IListItem): Promise<SPHttpClientResponse> => {
      this.updateStatus(`Deleting item with ID: ${latestItemId}...`);
      return
this.context.spHttpClient.post(`${this.context.pageContext.web.absoluteUrl}/_ap
i/web/lists/getbytitle('${this.properties.listName}')/items(${item.Id})`,
        SPHttpClient.configurations.v1,
        {
          headers: {
            'Accept': 'application/json;odata=nometadata',
            'Content-type': 'application/json;odata=verbose',
            'odata-version': '',
            'IF-MATCH': etag,
            'X-HTTP-Method': 'DELETE'
          }
        });
    })
    .then((response: SPHttpClientResponse): void => {
      this.updateStatus(`Item with ID: ${latestItemId} successfully deleted`);
    }, (error: any): void => {
      this.updateStatus(`Error deleting item: ${error}`);
    });
}
```

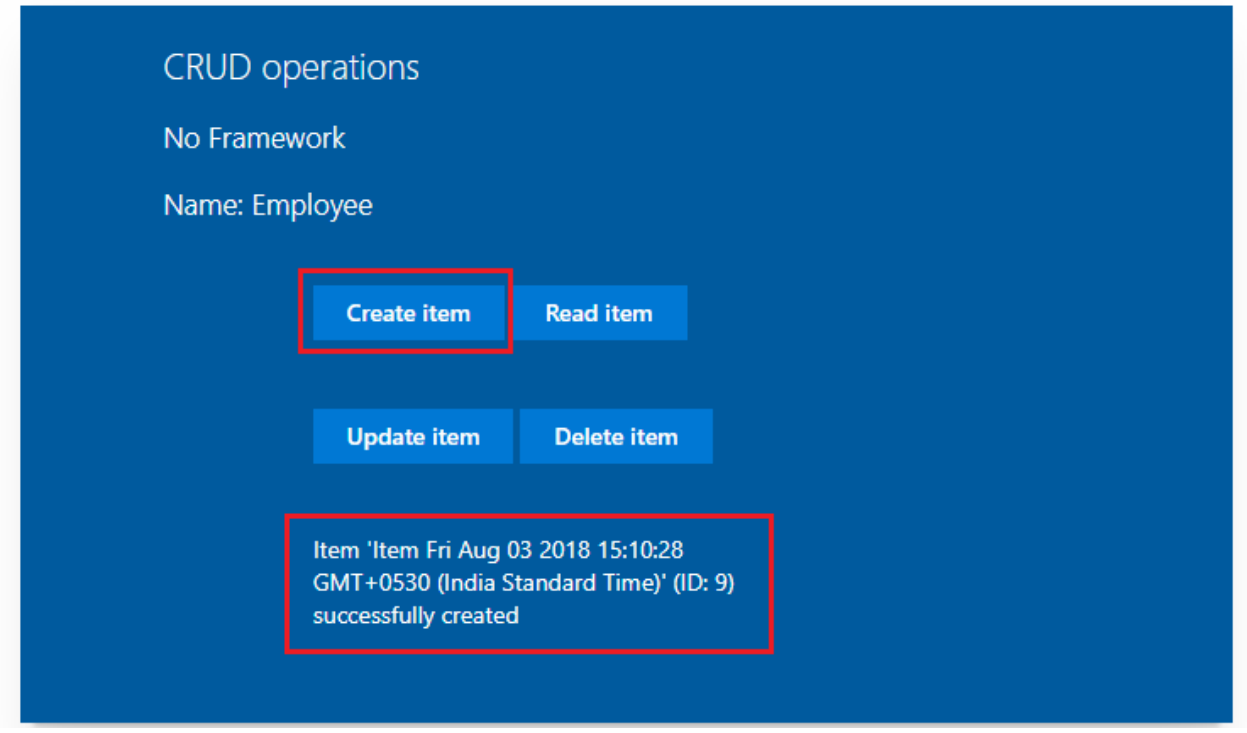
Test the WebPart

1. On the command prompt, type “gulp serve”
2. Open SharePoint site
3. Navigate to /_layouts/15/workbench.aspx
4. Add the webpart to page.
5. Edit webpart, in the properties pane type the list name

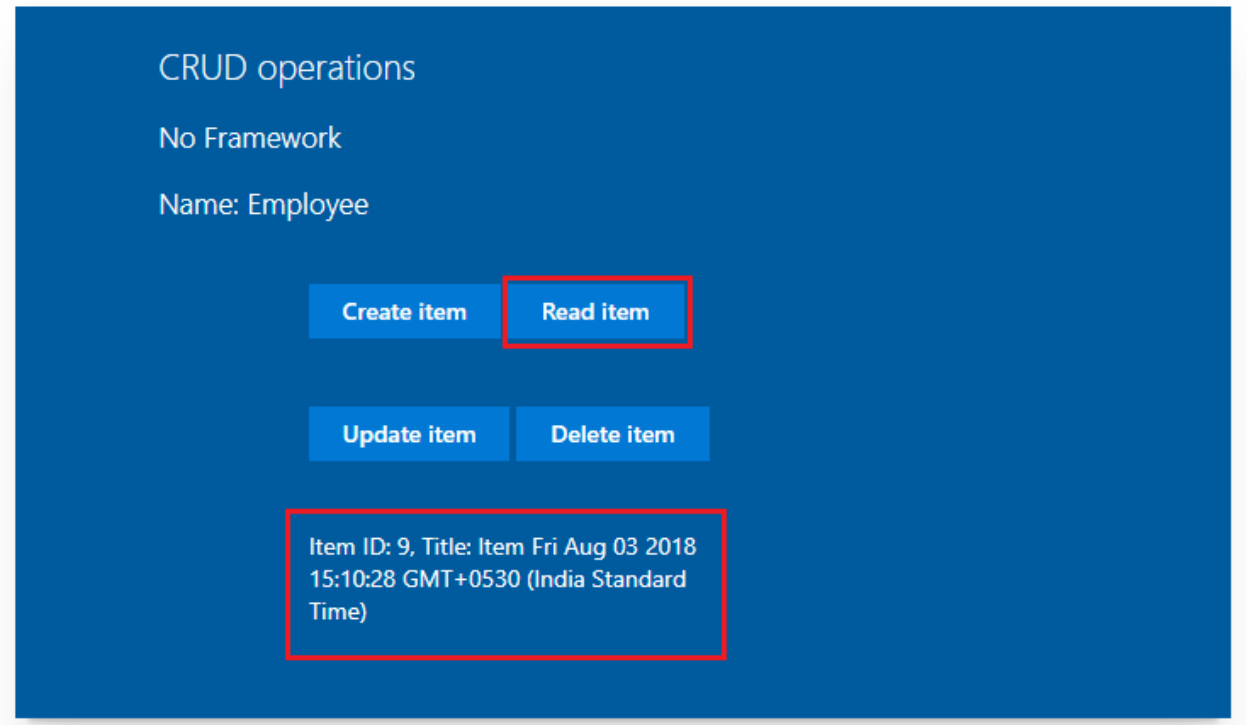


6. Click the buttons (Create Item, Read Item, Update Item, and Delete Item) one by one to test the webpart
7. Verify the operations are taking place in SharePoint list.

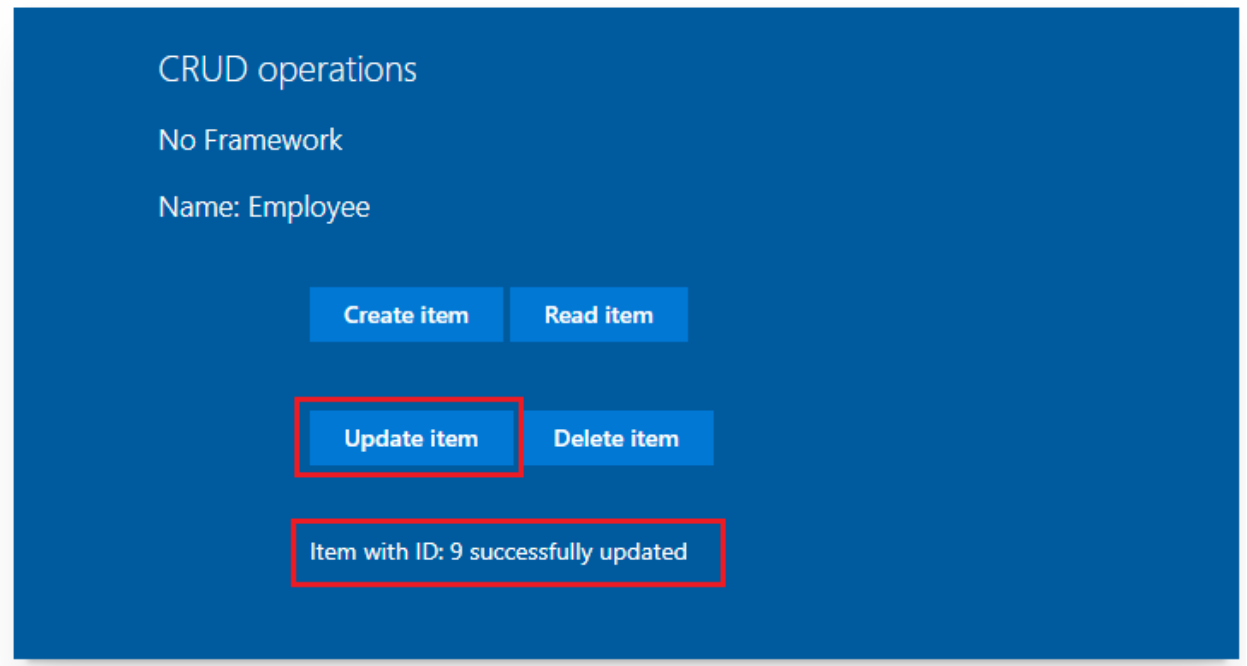
Create Operation



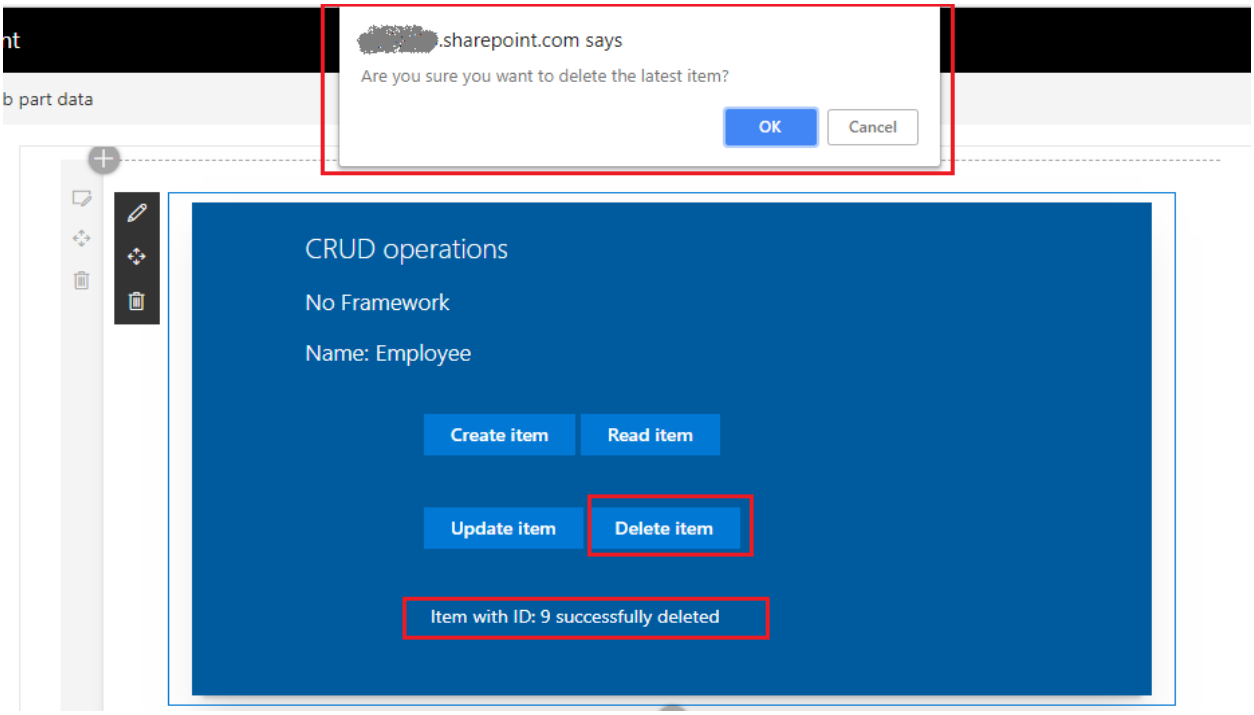
Read Operation



Update Operation

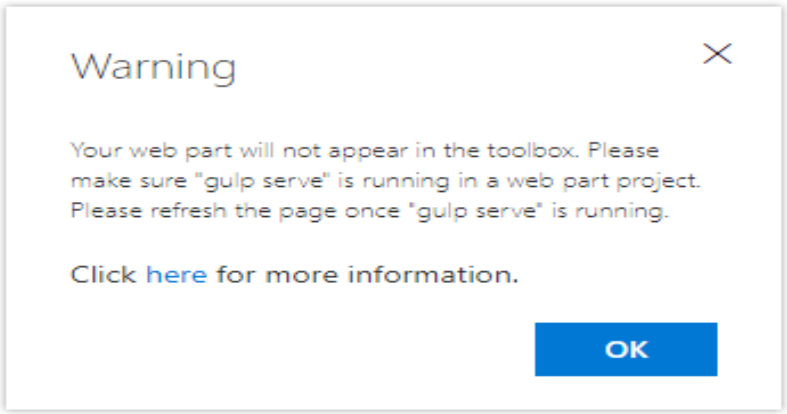


Delete Operation



Troubleshooting

In some cases SharePoint workbench (https://[tenant].sharepoint.com/_layouts/15/workbench.aspx) shows below error although "gulp serve" is running.



Open below url (https://localhost:4321/temp/manifests.js) in the next tab of browser. Accept the warning message.

Summary

SharePoint framework client web parts can be developed with No JavaScript options. REST APIs can be used to perform the CRUD operations on SharePoint list.

Chapter 11: CRUD operations using React JS

Overview

In the chapters so far, we have explored on developing basic SharePoint client web part which can run independently without any interaction with SharePoint.

In this chapter, we will explore to interact with the SharePoint list for CRUD (Create, Read, Update, and Delete) operations using React JS. React JS is natively supported by SharePoint Framework.

Brief about React JS

React is JavaScript library developed and licensed by Facebook. It represents V (View) in MVC (Model View Controller). React JS can react to changes in application state. SharePoint Framework itself is built using React JS. Read more about React JS at https://reactjs.org/

Create SPFx Solution

1. Open command prompt. Create a directory for SPFx solution

```
md spfx-crud-reactjs
```

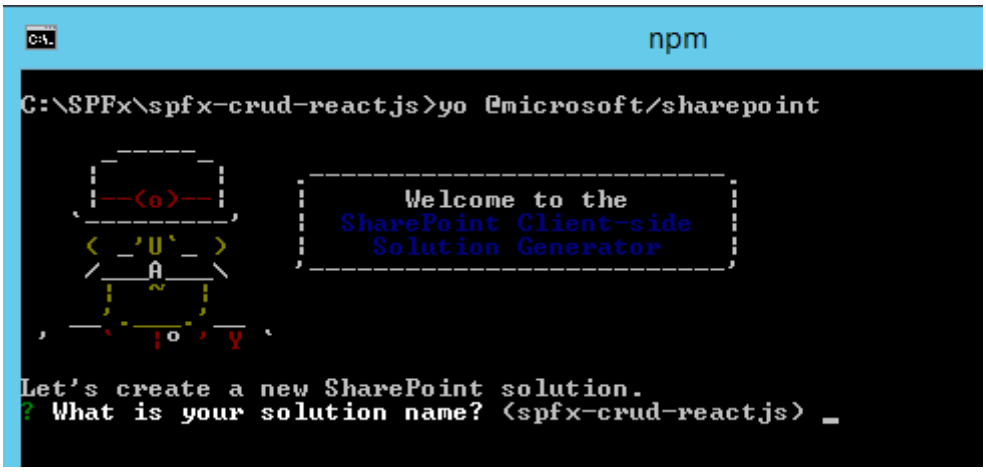
2. Navigate to above created directory

```
cd spfx-crud-reactjs
```

3. Run Yeoman SharePoint Generator to create the solution

```
yo @microsoft/sharepoint
```

4. Yeoman generator will present you with the wizard by asking questions about the solution to be created.



Solution Name: Hit enter to have default name (spfx-crud-reactjs in this case) or type in any other name for your solution.
Selected choice: Hit enter

Target for component: Here we can select the target environment where we are planning to deploy the client webpart i.e. SharePoint Online or SharePoint OnPremise (SharePoint 2016 onwards).
Selected choice: SharePoint Online only (latest)

Place of files: We may choose to use the same folder or create a subfolder for our solution.
Selected choice: Same folder

Deployment option: Selecting Y will allow the app to deployed instantly to all sites and will be accessible everywhere.
Selected choice: N (install on each site explicitly)

Type of client-side component to create: We can choose to create client side webpart or an extension. Choose webpart option.
Selected choice: WebPart

Web part name: Hit enter to select the default name or type in any other name.
Selected choice: ReactCRUD

Web part description: Hit enter to select the default description or type in any other value.
Selected choice: CRUD operations with React JS

Framework to use: Select any JavaScript framework to develop the component. Available choices are (No JavaScript Framework, React, and Knockout)
Selected choice: React

5. Yeoman generator will perform scaffolding process to generate the solution. The scaffolding process will take significant amount of time.
6. Once the scaffolding process is completed, lock down the version of project dependencies by running below command

```
npm shrinkwrap
```

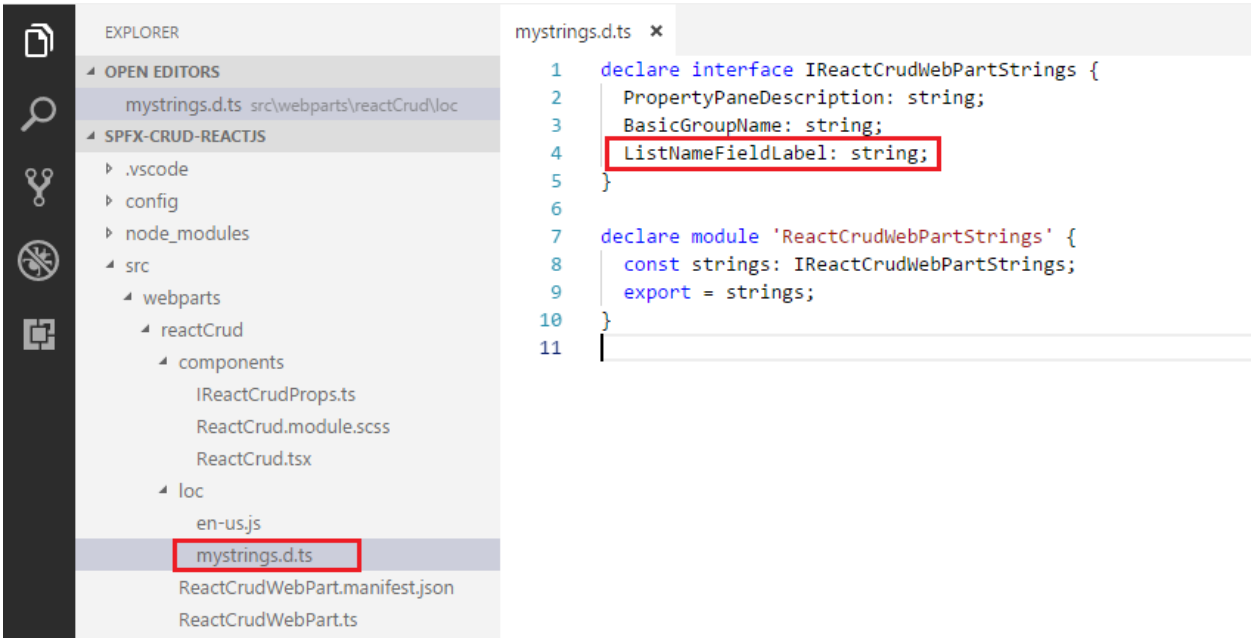
7. In the command prompt type below command to open the solution in code editor of your choice.

```
code .
```

Configure Property for List Name

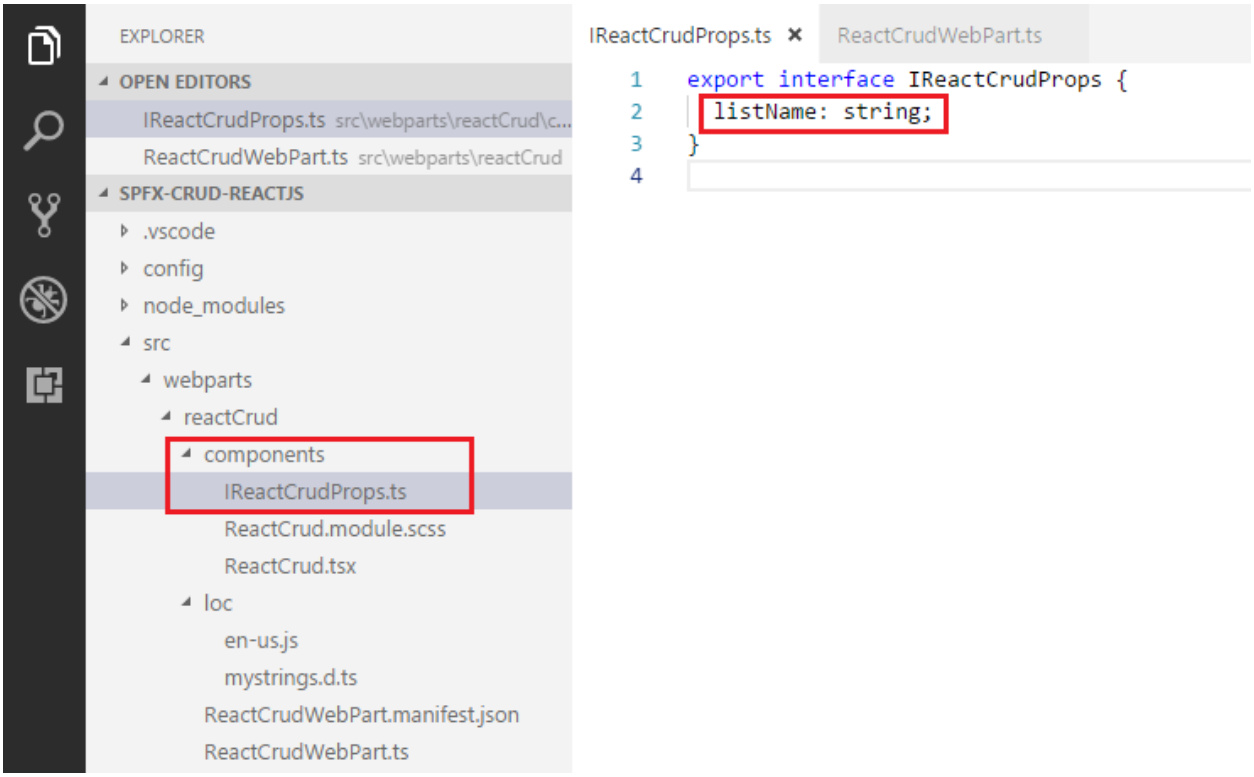
SPFx solution by default have description property created. Let us change the property to list name. We will use this property to configure the list name on which the CRUD operation is to perform.

1. Open mystrings.d.ts under \src\webparts\reactCrud\loc\ folder
2. Rename DescriptionFieldLabel to ListNameFieldLabel

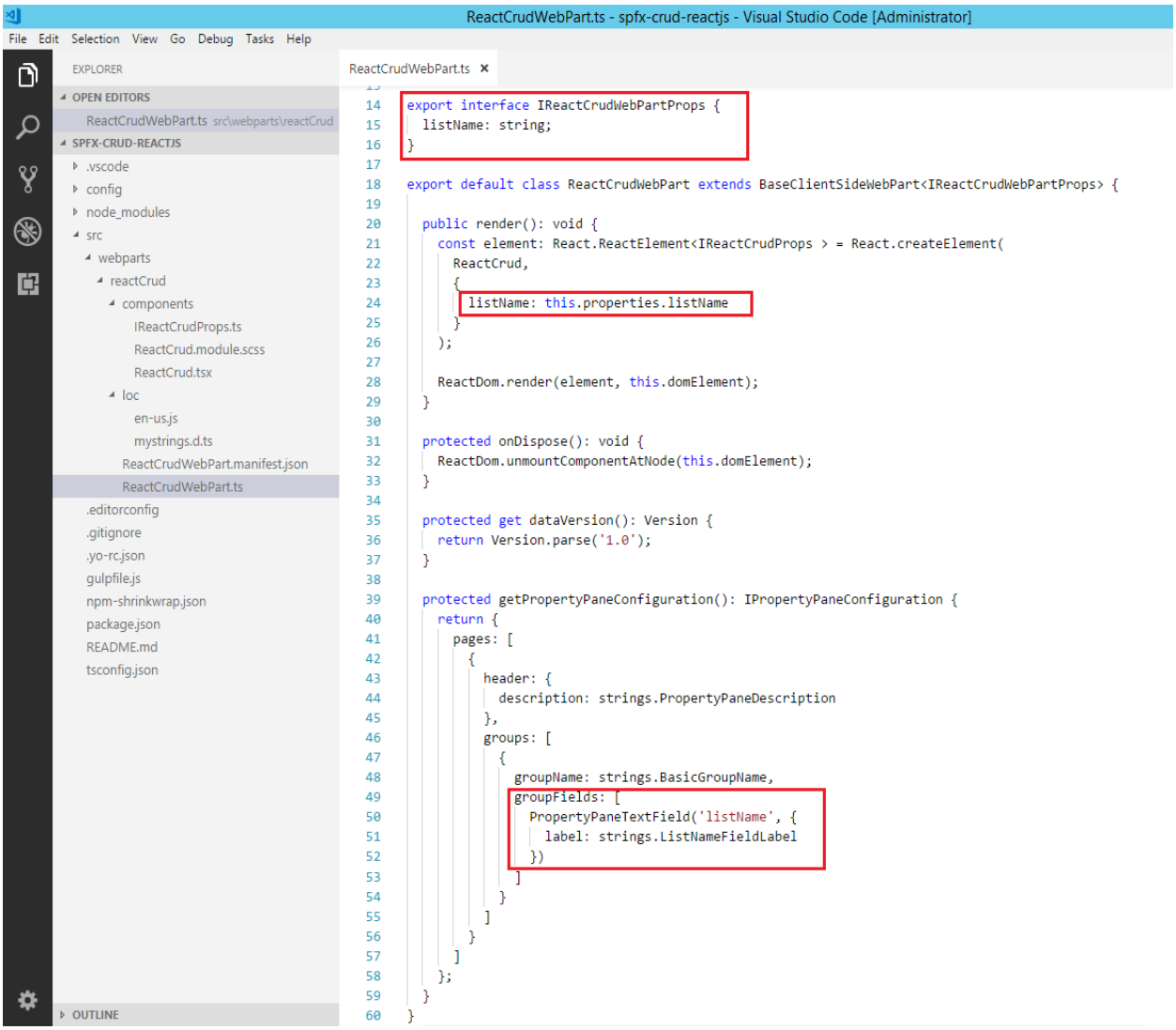


3. In en-us.js file under \src\webparts\reactCrud \loc\ folder set the display name for listName property

4. In the interface IReactCrudProps.ts under \src\webparts\reactCrud\components\ set the member name to listName

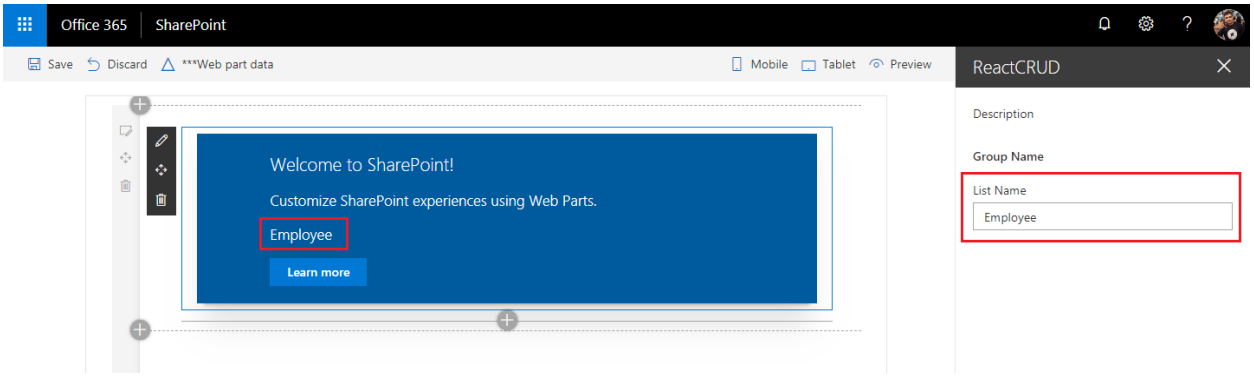


5. Open main webpart file (ReactCrudWebPart.ts) under \src\webparts\reactCrud folder.
6. Rename description property pane field to listName



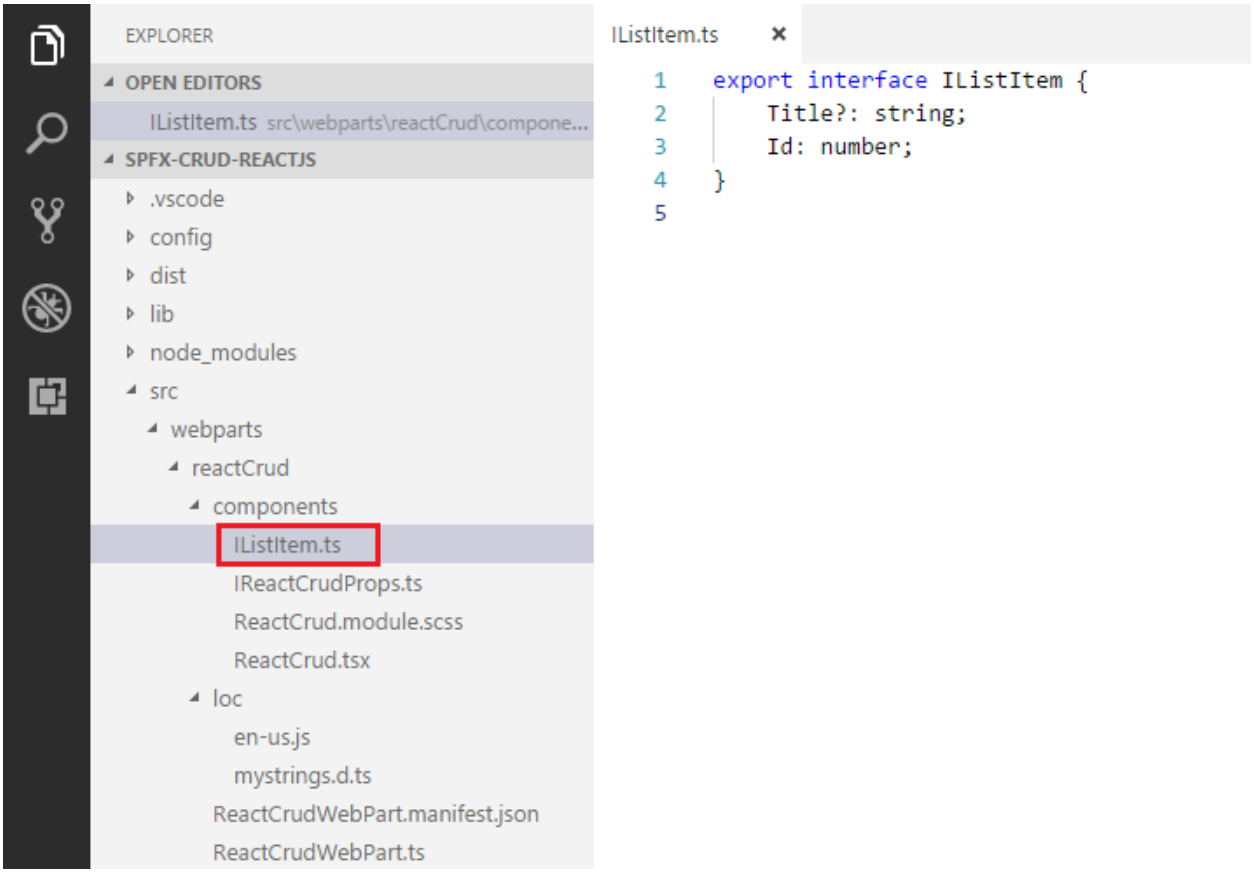
7. The UI in React gets served from component ReactCrud.tsx under \src\webparts\reactCrud\components\ReactCrud.tsx. Make the changes for listName property in the component.

8. In the command prompt, type “gulp serve”
9. In the SharePoint local workbench page, add the web part.
10. Edit the web part to ensure the listName property pane field is getting reflected.

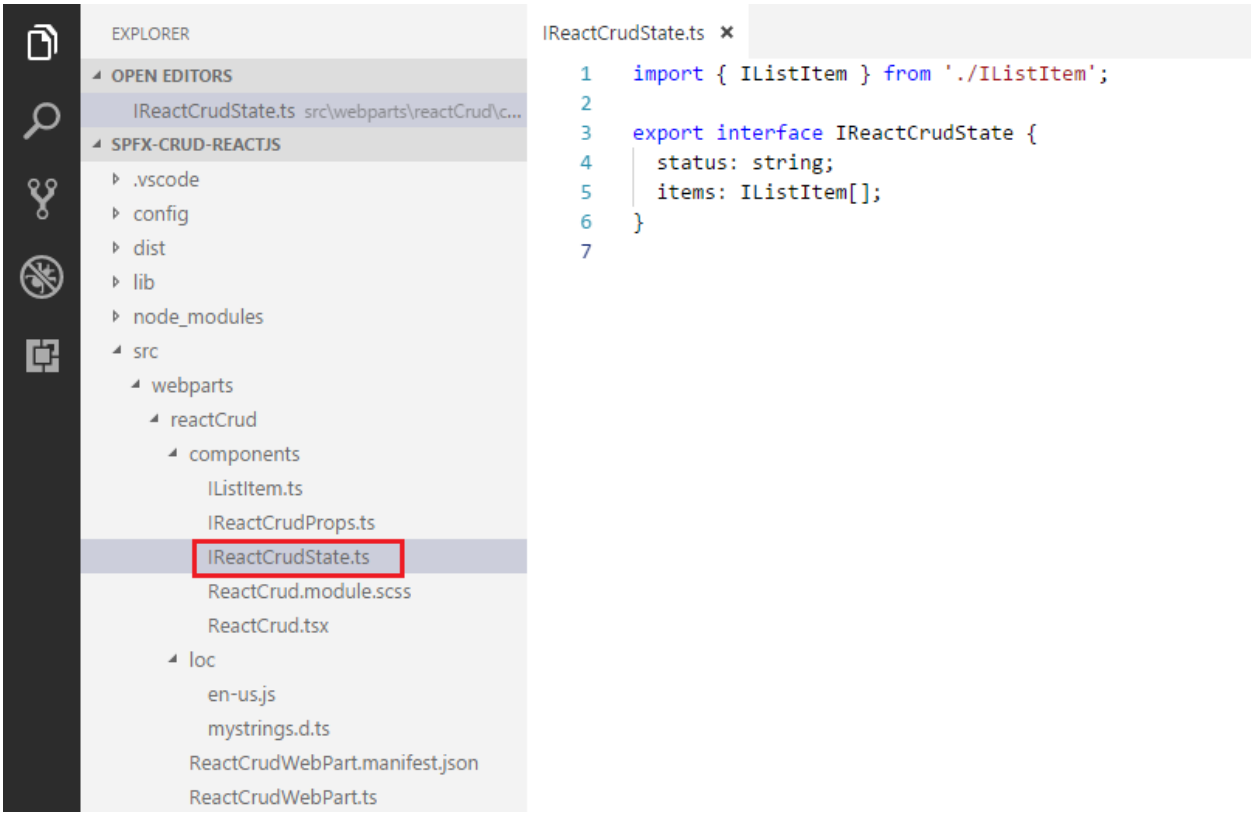


Model for List Item

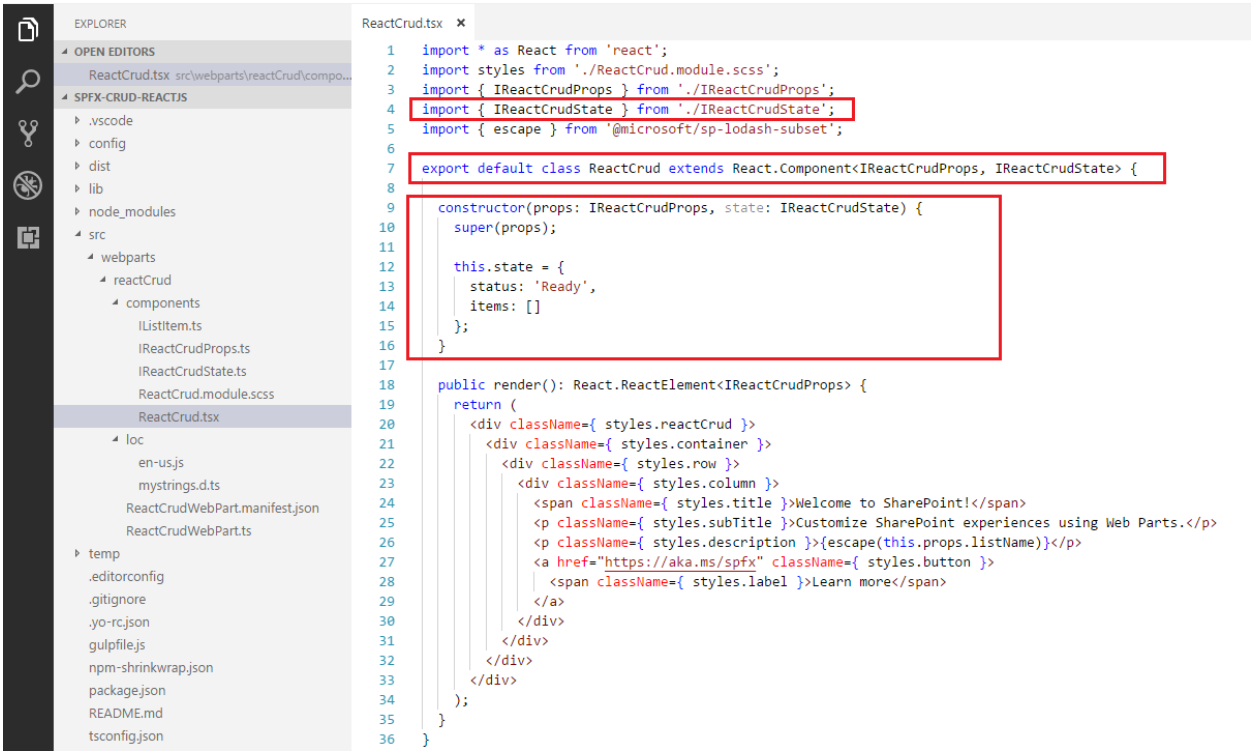
1. Add a class (IListItem.ts) representing the list item.



2. React JS acts on the state change. Let us add state to our solution.

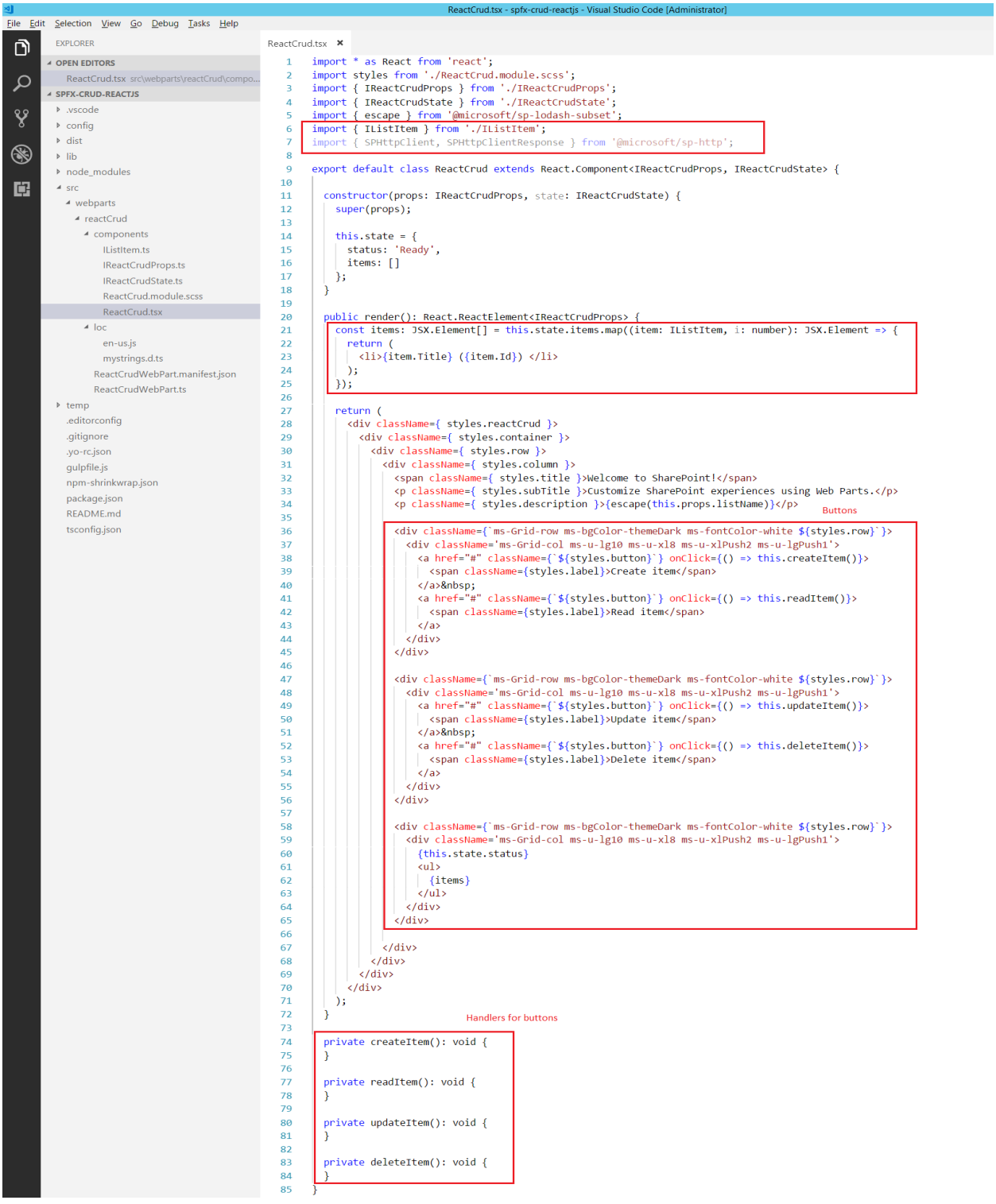


3. Configure ReactCrud.tsx for this state

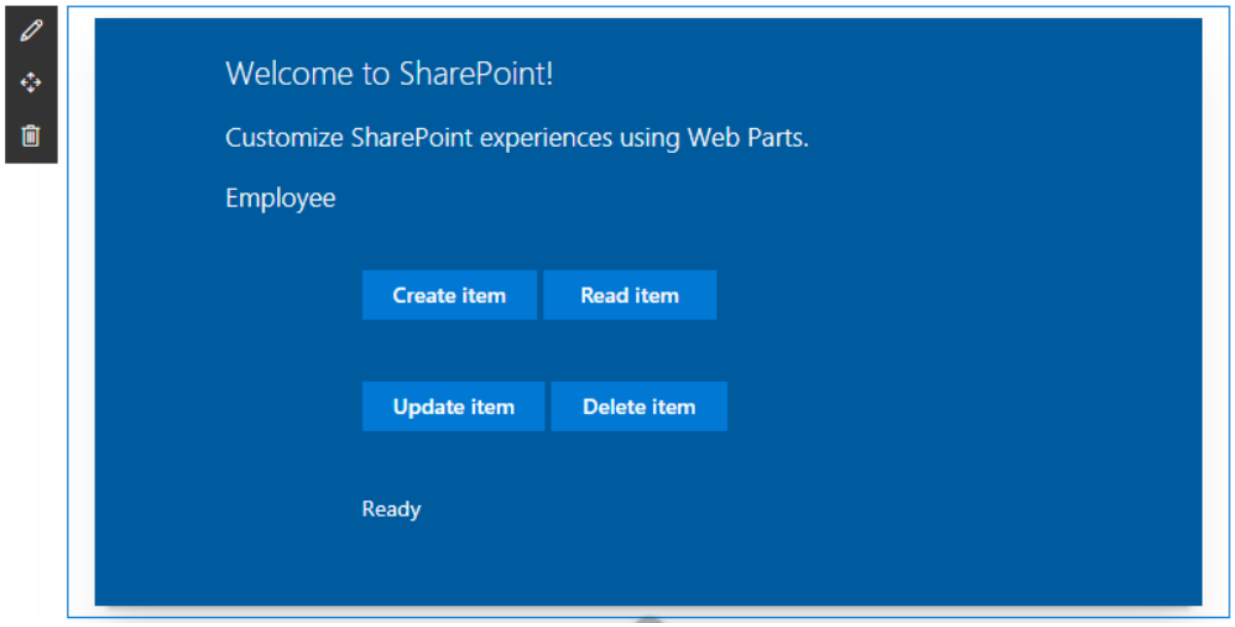


Add Controls to WebPart

1. Open ReactCrud.tsx under \src\webparts\reactCrud\components\ReactCrud.tsxfolder.
2. Modify Render method to include buttons for CRUD operations and add event handlers to each of the button

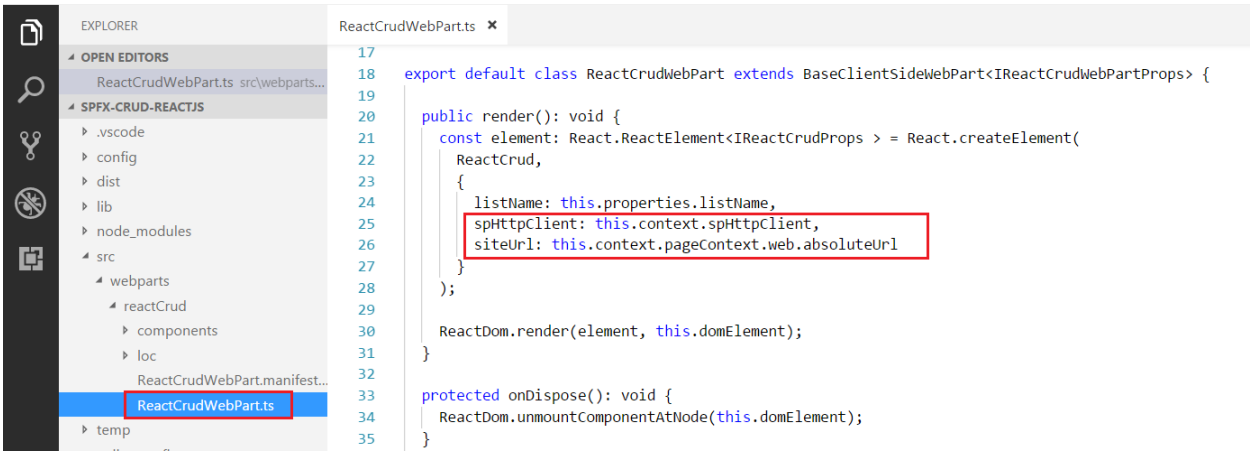


3. In the command prompt type “gulp serve” to see the buttons on webpart.



4. The read, update and delete operations will be performed on latest item. Update interface IReactCrudProps.ts at \src\webparts\reactCrud\components\ to include site url and spHttpClient

5. Update \src\webparts\reactCrud\ReactCrudWebPart.ts to initiate site url and spHttpClient



6. Let us implement generic method which will return the id of latest item from given list.

```
private getLatestItemId(): Promise<number> {
  return new Promise<number>((resolve: (itemId: number) => void, reject:
(error: any) => void): void => {

this.props.spHttpClient.get(`${this.props.siteUrl}/_api/web/lists/getbyt
itle('${this.props.listName}')/items?$orderby=Id
desc&$top=1&$select=id`,
      SPHttpClient.configurations.v1,
      {
        headers: {
          'Accept': 'application/json;odata=nometadata',
          'odata-version': ''
        }
      })
      .then((response: SPHttpClientResponse): Promise<{ value: { Id:
number }[] }> => {
        return response.json();
      }, (error: any): void => {
        reject(error);
      })
      .then((response: { value: { Id: number }[] }): void => {
        if (response.value.length === 0) {
          resolve(-1);
        }
        else {
          resolve(response.value[0].Id);
        }
```

```
      });
  });
}
```

Implement Create Operation

We will use the REST API to add the item to list.

```
private createItem(): void {
  this.setState({
    status: 'Creating item...',
    items: []
  });

  const body: string = JSON.stringify({
    'Title': `Item ${new Date()}`
  });


this.props.spHttpClient.post(`${this.props.siteUrl}/_api/web/lists/getbytitle('
${this.props.listName}')/items`,
  SPHttpClient.configurations.v1,
  {
    headers: {
      'Accept': 'application/json;odata=nometadata',
      'Content-type': 'application/json;odata=nometadata',
      'odata-version': ''
    },
    body: body
  })
  .then((response: SPHttpClientResponse): Promise<IListItem> => {
    return response.json();
  })
  .then((item: IListItem): void => {
    this.setState({
      status: `Item '${item.Title}' (ID: ${item.Id}) successfully created`,
      items: []
    });
  }, (error: any): void => {
    this.setState({
      status: 'Error while creating the item: ' + error,
      items: []
    });
  });
}
```

Implement Read Operation

We will use REST API to read the latest item.

```
private readItem(): void {
  this.setState({
    status: 'Loading latest items...',
    items: []
  });

  this.getLatestItemId()
    .then((itemId: number): Promise<SPHttpClientResponse> => {
      if (itemId === -1) {
        throw new Error('No items found in the list');
      }

      this.setState({
        status: `Loading information about item ID: ${itemId}...`,
        items: []
      });
      return
this.props.spHttpClient.get(`${this.props.siteUrl}/_api/web/lists/getbytitle('$
{this.props.listName}')/items(${itemId})?$select=Title,Id`,
        SPHttpClient.configurations.v1,
        {
          headers: {
            'Accept': 'application/json;odata=nometadata',
            'odata-version': ''
          }
        });
    })
    .then((response: SPHttpClientResponse): Promise<IListItem> => {
      return response.json();
    })
    .then((item: IListItem): void => {
      this.setState({
        status: `Item ID: ${item.Id}, Title: ${item.Title}`,
        items: []
      });
    }, (error: any): void => {
      this.setState({
        status: 'Loading latest item failed with error: ' + error,
        items: []
      });
    });
}
```

Implement Update Operation

We will use REST API to update the latest item.

```
private updateItem(): void {
  this.setState({
    status: 'Loading latest items...',
    items: []
  });

  let latestItemId: number = undefined;

  this.getLatestItemId()
    .then((itemId: number): Promise<SPHttpClientResponse> => {
      if (itemId === -1) {
        throw new Error('No items found in the list');
      }

      latestItemId = itemId;
      this.setState({
        status: `Loading information about item ID: ${latestItemId}...`,
        items: []
      });

      return
this.props.spHttpClient.get(`${this.props.siteUrl}/_api/web/lists/getbytitle('$
{this.props.listName}')/items(${latestItemId})?$select=Title,Id`,
        SPHttpClient.configurations.v1,
        {
          headers: {
            'Accept': 'application/json;odata=nometadata',
            'odata-version': ''
          }
        });
    })
    .then((response: SPHttpClientResponse): Promise<IListItem> => {
      return response.json();
    })
    .then((item: IListItem): void => {
    this.setState({
      status: 'Loading latest items...',
      items: []
    });

    const body: string = JSON.stringify({
      'Title': `Updated Item ${new Date()}`
```

```
    });


this.props.spHttpClient.post(`${this.props.siteUrl}/_api/web/lists/getbytitle('
${this.props.listName}')/items(${item.Id})`,
      SPHttpClient.configurations.v1,
      {
        headers: {
          'Accept': 'application/json;odata=nometadata',
          'Content-type': 'application/json;odata=nometadata',
          'odata-version': '',
          'IF-MATCH': '*',
          'X-HTTP-Method': 'MERGE'
        },
        body: body
      })
      .then((response: SPHttpClientResponse): void => {
        this.setState({
          status: `Item with ID: ${latestItemId} successfully updated`,
          items: []
        });
      }, (error: any): void => {
        this.setState({
          status: `Error updating item: ${error}`,
          items: []
        });
      });
  });
}
```

Implement Delete Operation

We will use REST API to delete the latest item.

```
private deleteItem(): void {
  if (!window.confirm('Are you sure you want to delete the latest item?')) {
    return;
  }

  this.setState({
    status: 'Loading latest items...',
    items: []
  });

  let latestItemId: number = undefined;
```

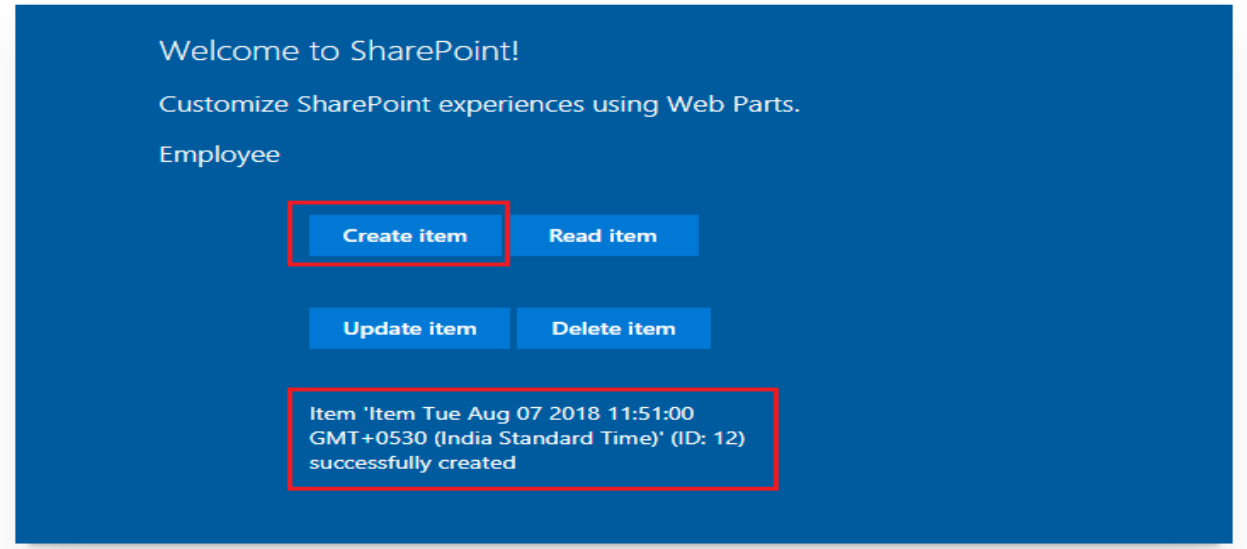
```
  let etag: string = undefined;
  this.getLatestItemId()
    .then((itemId: number): Promise<SPHttpClientResponse> => {
      if (itemId === -1) {
        throw new Error('No items found in the list');
      }

      latestItemId = itemId;
      this.setState({
        status: `Loading information about item ID: ${latestItemId}...`,
        items: []
      });

      return
this.props.spHttpClient.get(`${this.props.siteUrl}/_api/web/lists/getbytitle('$
{this.props.listName}')/items(${latestItemId})?$select=Id`,
        SPHttpClient.configurations.v1,
        {
          headers: {
            'Accept': 'application/json;odata=nometadata',
            'odata-version': ''
          }
        });
    })
    .then((response: SPHttpClientResponse): Promise<IListItem> => {
      etag = response.headers.get('ETag');
      return response.json();
    })
    .then((item: IListItem): Promise<SPHttpClientResponse> => {
      this.setState({
        status: `Deleting item with ID: ${latestItemId}...`,
        items: []
      });

      return
this.props.spHttpClient.post(`${this.props.siteUrl}/_api/web/lists/getbytitle('
${this.props.listName}')/items(${item.Id})`,
        SPHttpClient.configurations.v1,
        {
          headers: {
            'Accept': 'application/json;odata=nometadata',
            'Content-type': 'application/json;odata=verbose',
            'odata-version': '',
            'IF-MATCH': etag,
            'X-HTTP-Method': 'DELETE'
```

```
          }
        });
    })
    .then((response: SPHttpClientResponse): void => {
      this.setState({
        status: `Item with ID: ${latestItemId} successfully deleted`,
        items: []
      });
    }, (error: any): void => {
      this.setState({
        status: `Error deleting item: ${error}`,
        items: []
      });
    });
}
```

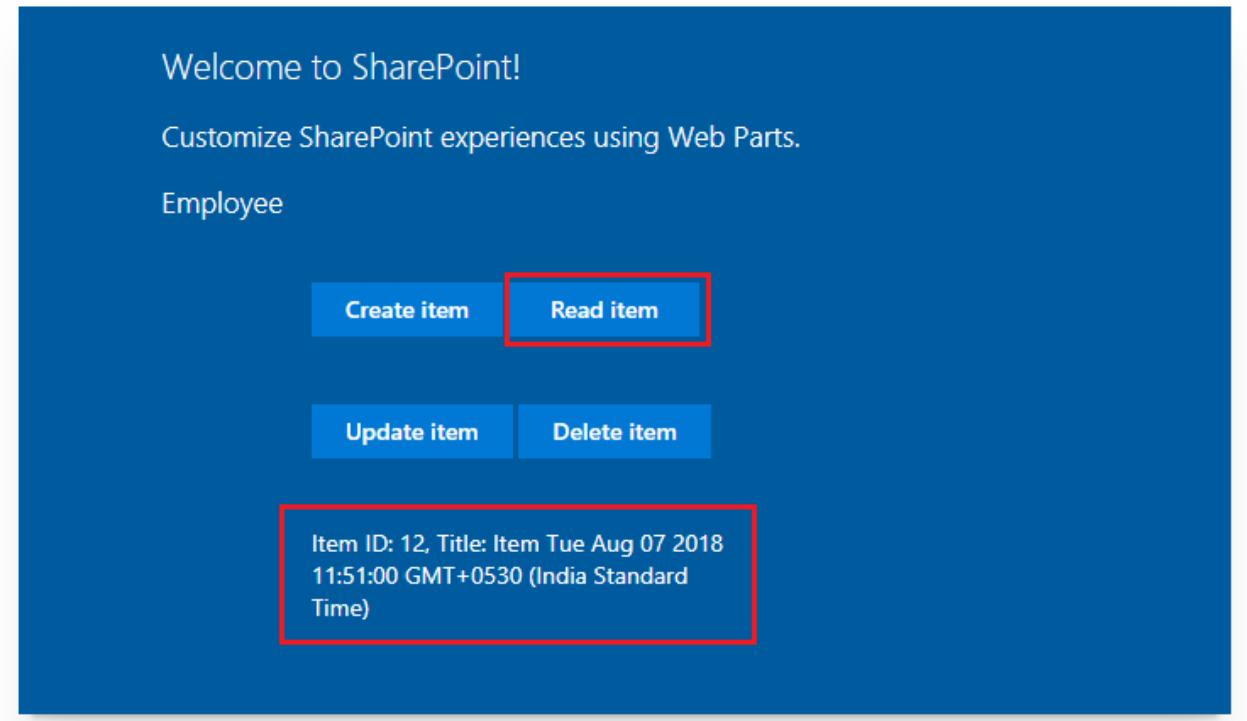
Test the WebPart

1. On the command prompt, type “gulp serve”
2. Open SharePoint site
3. Navigate to /_layouts/15/workbench.aspx
4. Add the webpart to page.
5. Edit webpart, in the properties pane type the list name
6. Click the buttons (Create Item, Read Item, Update Item, and Delete Item) one by one to test the webpart
7. Verify the operations are taking place in SharePoint list.

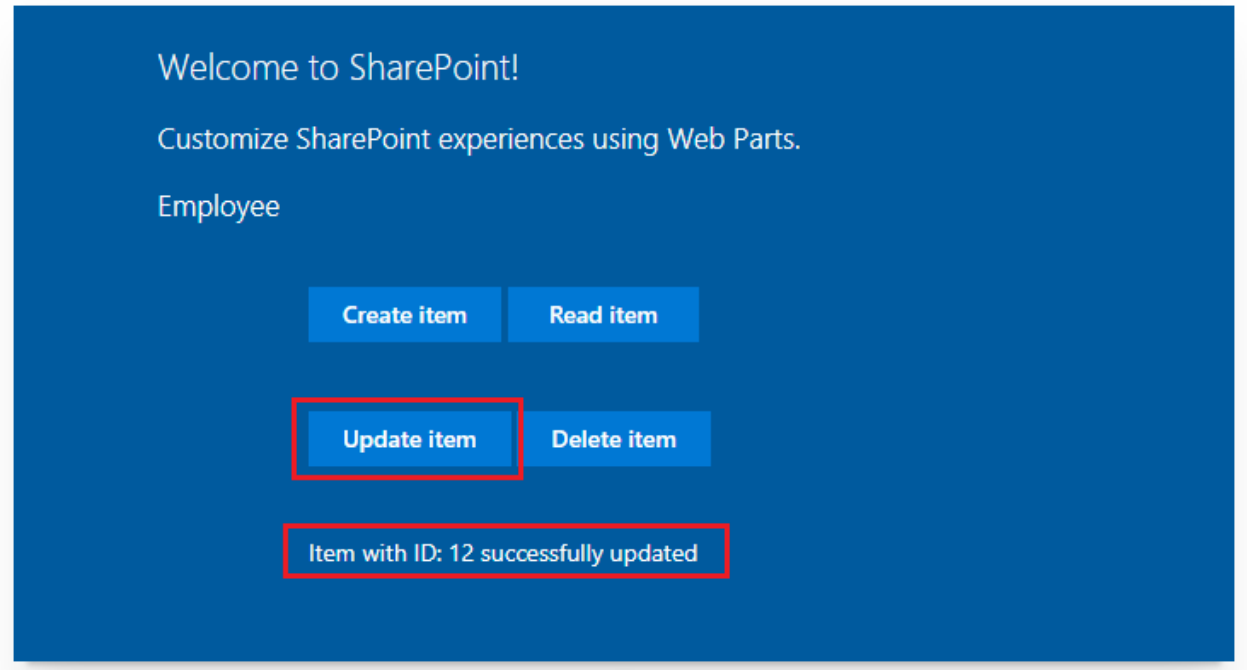
Create Operation



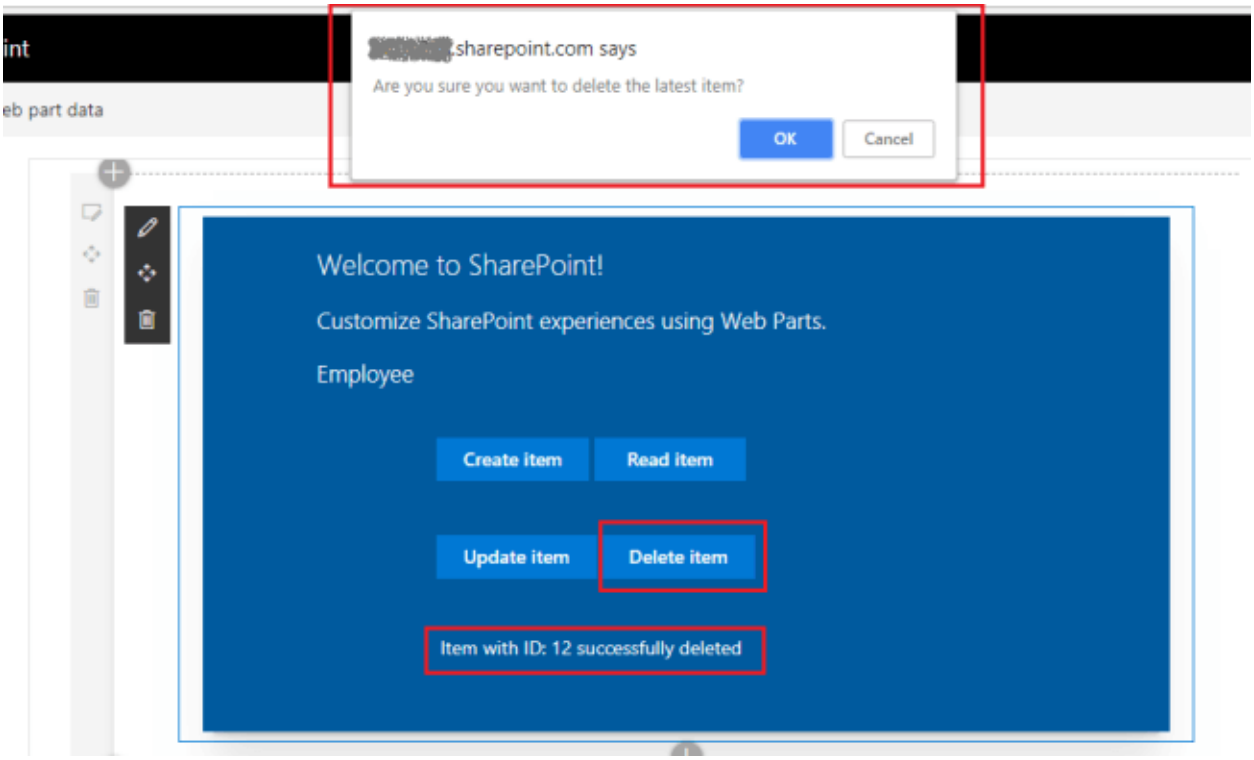
Read Operation



Update Operation



Delete Operation



Summary

React JS is natively supported by SharePoint framework. SPFx generates all needed React components for you to get started with the development. React JS supports the application to be broken down into small React components, which simplifies development and maintenance. React JS focuses more on UI development, in contrast to Angular which is more famous for creating SPA (Single Page Applications).

Chapter 12: CRUD operations using Angular JS

Overview

In the chapters so far, we have explored on developing basic SharePoint client web part which can run independently without any interaction with SharePoint.

In this chapter, we will explore to interact with the SharePoint list for CRUD (Create, Read, Update, and Delete) operations using Angular JS. React JS is not natively supported by SharePoint Framework.

Brief about Angular JS

AngularJS is a JavaScript framework which extends HTML with new attributes. It is popular for creating SPA (Single Page Application). Read more about Angular JS at https://angularjs.org/

Create SPFx Solution

1. Open command prompt. Create a directory for SPFx solution

```
md spfx-crud-angularjs
```

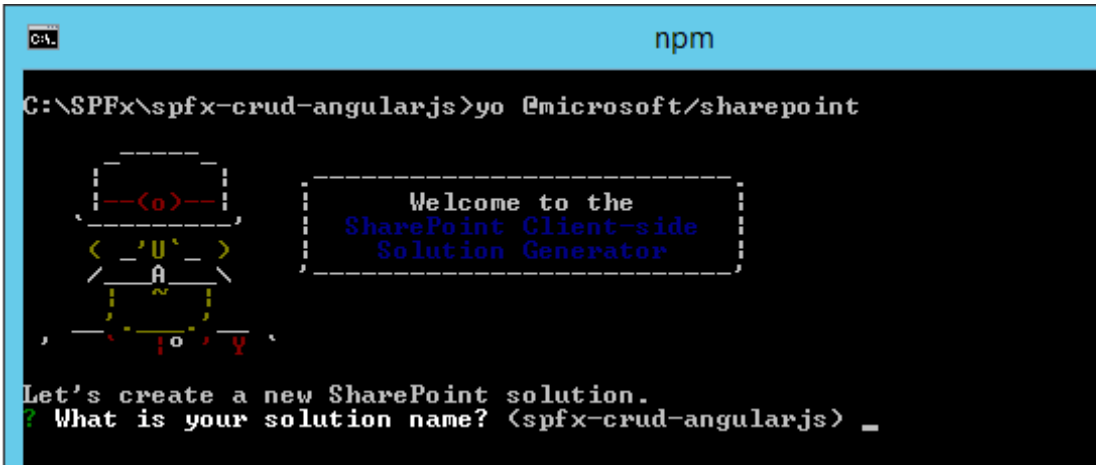
2. Navigate to above created directory

```
cd spfx-crud-angularjs
```

3. Run Yeoman SharePoint Generator to create the solution

```
yo @microsoft/sharepoint
```

4. Yeoman generator will present you with the wizard by asking questions about the solution to be created.



Solution Name: Hit enter to have default name (spfx-crud-angularjs in this case) or type in any other name for your solution.
Selected choice: Hit enter

Target for component: Here we can select the target environment where we are planning to deploy the client webpart i.e. SharePoint Online or SharePoint OnPremise (SharePoint 2016 onwards).
Selected choice: SharePoint Online only (latest)

Place of files: We may choose to use the same folder or create a subfolder for our solution.
Selected choice: Same folder

Deployment option: Selecting Y will allow the app to deployed instantly to all sites and will be accessible everywhere.
Selected choice: N (install on each site explicitly)

Type of client-side component to create: We can choose to create client side webpart or an extension. Choose webpart option.
Selected choice: WebPart

Web part name: Hit enter to select the default name or type in any other name.
Selected choice: AngularCRUD

Web part description: Hit enter to select the default description or type in any other value.
Selected choice: CRUD operations with Angular JS

Framework to use: Select any JavaScript framework to develop the component. Available choices are (No JavaScript Framework, React, and Knockout)
Selected choice: React

5. Yeoman generator will perform scaffolding process to generate the solution. The scaffolding process will take significant amount of time.

6. Once the scaffolding process is completed, lock down the version of project dependencies by running below command

```
npm shrinkwrap
```

7. In the command prompt type below command to open the solution in code editor of your choice.

```
code .
```

Configure Angular JS

As Angular JS is not natively supported in SharePoint framework, we have to add a reference of it to our solution using NPM package. Type in the below commands on the command prompt.

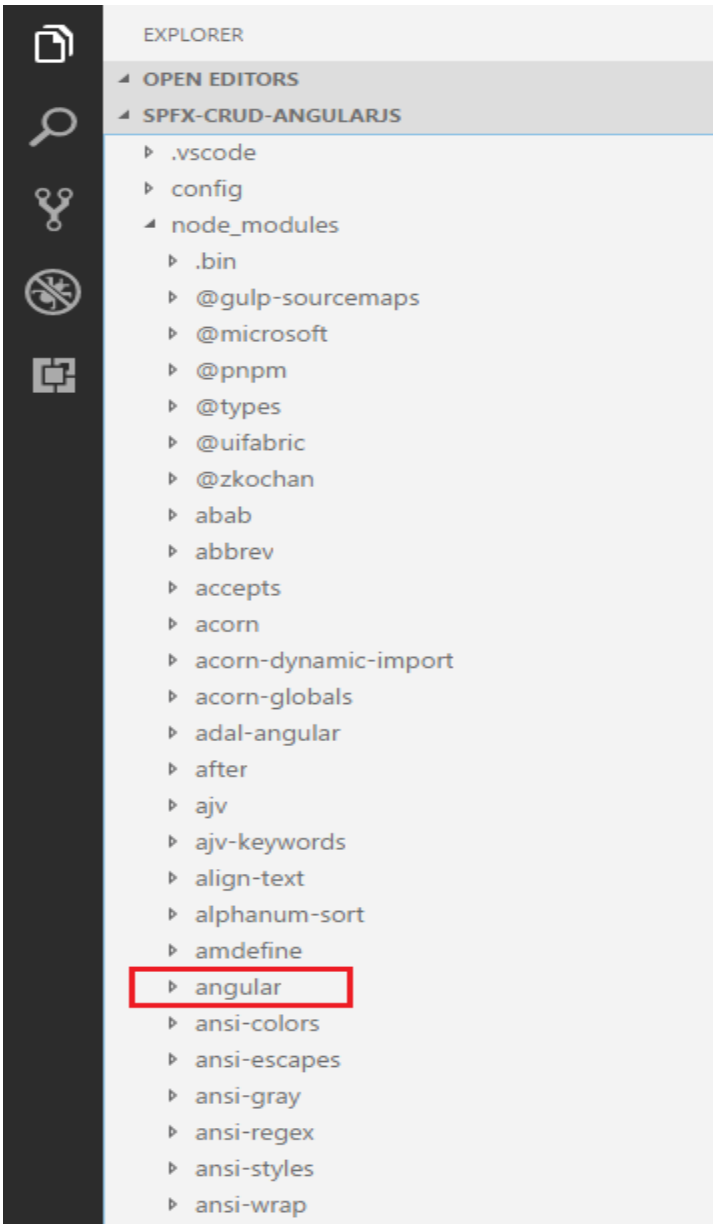
```
npm i angular ng-office-ui-fabric --save
```

The --save option enables NPM to include the packages to dependencies section of the package.json file.

Install Angular typings for TypeScript. Typings will help for auto complete while writing the code in the code editor.

```
tsd install @types/angular --save
```

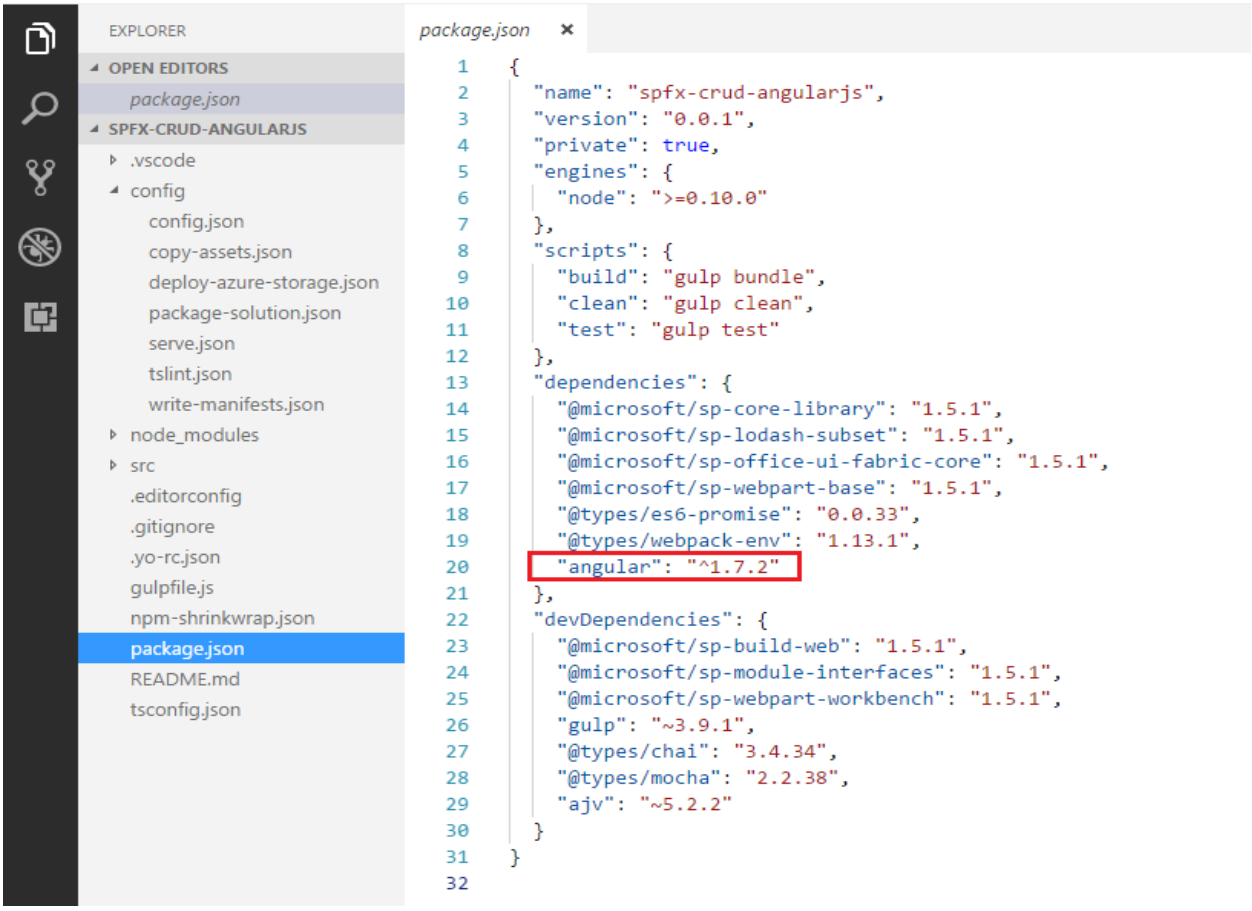
Expand node_module folder to see the npm packages being added for Angular.



Open **config.json** under config folder. Under externals node, add Angular reference.

You may also add path from external CDN.

Open **package.json** and verify Angular dependency is listed.



Configure Property for List Name

SPFx solution by default have description property created. Let us change the property to list name. We will use this property to configure the list name on which the CRUD operation is to perform.

1. Open mystrings.d.ts under \src\webparts\angularCrud\loc\ folder
2. Rename DescriptionFieldLabel to ListNameFieldLabel

3. In en-us.js file under \src\webparts\angularCrud\loc\ folder set the display name for listName property

4. Open main webpart file (AngularCrudWebPart.ts) under \src\webparts\angularCrud folder.

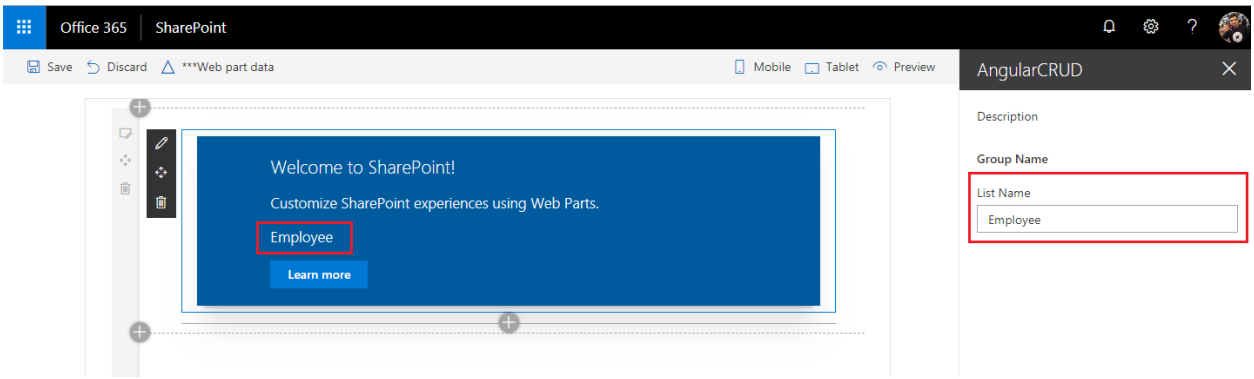
5. Rename description property pane field to listName

```
export interface IAngularCrudWebPartProps {
  listName: string;
}

export default class AngularCrudWebPart extends BaseClientSideWebPart<IAngularCrudWebPartProps> {

  public render(): void {
    this.domElement.innerHTML = `
      <div class="${ styles.angularCrud }">
        <div class="${ styles.container }">
          <div class="${ styles.row }">
            <div class="${ styles.column }">
              <span class="${ styles.title }">Welcome to SharePoint!</span>
              <p class="${ styles.subTitle }">Customize SharePoint experiences using Web Parts.</p>
              <p class="${ styles.description }">${escape(this.properties.listName)}</p>
              <a href="https://aka.ms/spfx" class="${ styles.button }">
                <span class="${ styles.label }">Learn more</span>
              </a>
            </div>
          </div>
        </div>
      </div>`;
  }

  protected get dataVersion(): Version {
    return Version.parse('1.0');
  }

  protected getPropertyPaneConfiguration(): IPropertyPaneConfiguration {
    return {
      pages: [
        {
          header: {
            description: strings.PropertyPaneDescription
          },
          groups: [
            {
              groupName: strings.BasicGroupName,
              groupFields: [
                PropertyPaneTextField('listName', {
                  label: strings.ListNameFieldLabel
                })
              ]
            }
          ]
        }
      ]
    };
  }
}
```

```
export interface IAngularCrudWebPartProps {
  listName: string;
}

export default class AngularCrudWebPart extends
BaseClientSideWebPart<IAngularCrudWebPartProps> {

  public render(): void {
    this.domElement.innerHTML = `
      <div class="${ styles.angularCrud }">
        <div class="${ styles.container }">
          <div class="${ styles.row }">
            <div class="${ styles.column }">
```

```
              <span class="${ styles.title }">Welcome to
SharePoint!</span>
              <p class="${ styles.subTitle }">Customize SharePoint
experiences using Web Parts.</p>
              <p class="${ styles.description
}">${escape(this.properties.listName)}</p>
              <a href="https://aka.ms/spfx" class="${ styles.button }">
                <span class="${ styles.label }">Learn more</span>
              </a>
            </div>
          </div>
        </div>
      </div>`;
  }

  protected get dataVersion(): Version {
    return Version.parse('1.0');
  }

  protected getPropertyPaneConfiguration(): IPropertyPaneConfiguration {
    return {
      pages: [
        {
          header: {
            description: strings.PropertyPaneDescription
          },
          groups: [
            {
              groupName: strings.BasicGroupName,
              groupFields: [
                PropertyPaneTextField('listName', {
                  label: strings.ListNameFieldLabel
                })
              ]
            }
          ]
        }
      ]
    };
  }
}
```

6. In the command prompt, type “gulp serve”
7. In the SharePoint local workbench page, add the web part.
8. Edit the web part to ensure the listName property pane field is getting reflected.



Build an Angular application

Add folder named “app” as starting point for creating Angular app.

Configure Data Service

Add a file DataService.ts under app folder and define the data services we are going to perform.

```
export interface IListItem {
    Id: number;
    Title?: string;
  }

  export interface IDataService {
    createItem(title: string, webUrl: string, listName: string):
angular.IPromise<IListItem>;
    readItem(itemId: number, webUrl: string, listName: string):
angular.IPromise<IListItem>;
    getLatestItemId(webUrl: string, listName: string):
angular.IPromise<number>;
    updateItem(item: IListItem, webUrl: string, listName: string):
angular.IPromise<{}>;
    deleteItem(item: IListItem, webUrl: string, listName: string):
angular.IPromise<{}>;
  }

  export default class DataService implements IDataService {
    public static $inject: string[] = ['$q', '$http'];

    constructor(private $q: angular.IQService, private $http:
angular.IHttpService) {
    }

    public createItem(title: string, webUrl: string, listName: string):
angular.IPromise<IListItem> {
```

```
        const deferred: angular.IDeferred<IListItem> = this.$q.defer();
        return deferred.promise;
    }

    public readItem(itemId: number, webUrl: string, listName: string):
angular.IPromise<IListItem> {
        const deferred: angular.IDeferred<IListItem> = this.$q.defer();
        return deferred.promise;
    }

    public getLatestItemId(webUrl: string, listName: string):
angular.IPromise<number> {
        const deferred: angular.IDeferred<number> = this.$q.defer();
        return deferred.promise;
    }

    public updateItem(item: IListItem, webUrl: string, listName: string):
angular.IPromise<{}> {
        const deferred: angular.IDeferred<IListItem> = this.$q.defer();
        return deferred.promise;
    }

    public deleteItem(item: IListItem, webUrl: string, listName: string):
angular.IPromise<{}> {
        const deferred: angular.IDeferred<IListItem> = this.$q.defer();
        return deferred.promise;
    }
  }
```

Implement Create Operation

We will use the REST API to add the item to list.

```
public createItem(title: string, webUrl: string, listName: string):
angular.IPromise<IListItem> {
    const deferred: angular.IDeferred<IListItem> = this.$q.defer();
    const body: string = JSON.stringify({
        'Title': `Item ${new Date()}`
      });

    this.getRequestDigest(webUrl)
      .then((requestDigest: string):
angular.IPromise<angular.IHttpPromiseCallbackArg<IListItem>> => {
        return this.$http({
```

```
            url: `${webUrl}/_api/web/lists/getbytitle('${listName}')/items`,
            method: 'POST',
            headers: {
                "Accept": "application/json;odata=nometadata",
                "Content-type": "application/json;odata=verbose",
                "X-RequestDigest": requestDigest
            }
          });
        })
        .then((response: angular.IHttpPromiseCallbackArg<IListItem>): void => {
            deferred.resolve(response.data);
          }, (error: any): void => {
            deferred.reject(error);
          });

    return deferred.promise;
}
```

Implement Read Operation

We will use REST API to read the latest item.

```
public readItem(itemId: number, webUrl: string, listName: string):
angular.IPromise<IListItem> {
    const deferred: angular.IDeferred<IListItem> = this.$q.defer();

    this.$http({
        url:
`${webUrl}/_api/web/lists/getbytitle('${listName}')/items(${itemId})`,
        method: 'GET',
        headers: {
          'Accept': 'application/json;odata=nometadata'
        }
    })
    .then((response: angular.IHttpPromiseCallbackArg<IListItem>): void => {
            const item: IListItem = response.data;
            item.ETag = response.headers('ETag');
            deferred.resolve(item);
        }, (error: any): void => {
            deferred.reject(error);
    });

    return deferred.promise;
}
```

Implement Update Operation

We will use REST API to update the latest item.

```
public updateItem(item: IListItem, webUrl: string, listName: string):
angular.IPromise<{}> {
    const deferred: angular.IDeferred<IListItem> = this.$q.defer();

    const body: string = JSON.stringify({
        'Title': `Item ${new Date()}`
    });

    this.$http({
        url:
`${webUrl}/_api/web/lists/getbytitle('${listName}')/items(${item.Id})`,
        method: 'POST',
        headers: {
          'Accept': 'application/json;odata=nometadata',
          'Content-type': 'application/json;odata=nometadata',
          'odata-version': '',
          'IF-MATCH': '*',
          'X-HTTP-Method': 'MERGE'
        },
        data: body
      })
    .then((result: {}): void => {
      deferred.resolve();
    }, (error: any): void => {
      deferred.reject(error);
    });

    return deferred.promise;
}
```

Implement Delete Operation

We will use REST API to delete the latest item.

```
public deleteItem(item: IListItem, webUrl: string, listName: string):
angular.IPromise<{}> {
    const deferred: angular.IDeferred<IListItem> = this.$q.defer();

    this.$http({
        url:
`${webUrl}/_api/web/lists/getbytitle('${listName}')/items(${item.Id})`,
        method: 'POST',
```

```
        headers: {
            'Accept': 'application/json;odata=nometadata',
            'Content-type': 'application/json;odata=verbose',
            'odata-version': '',
            'IF-MATCH': item.ETag,
            'X-HTTP-Method': 'DELETE'
        }
    })
    .then((result: {}): void => {
      deferred.resolve();
    }, (error: any): void => {
      deferred.reject(error);
    });

    return deferred.promise;
}
```

Configure Controller

Add a file HomeController.ts under app folder

```
import { IDataService, IListItem } from './DataService';

interface IConfigurationChangedArgs {
  webUrl: string;
  listName: string;
}

export default class HomeController {
  public static $inject: string[] = ['DataService', '$window', '$rootScope',
'$scope'];

  public status: string = undefined;
  public items: IListItem[] = [];

  private webUrl: string = undefined;
  private listName: string = undefined;

  constructor(private dataService: IDataService, private $window:
angular.IWindowService, private $rootScope: angular.IRootScopeService, private
$scope: angular.IScope) {
    const vm: HomeController = this;
    this.init(undefined, undefined, undefined);

    $rootScope.$on('configurationChanged',
```

```
      (event: angular.IAngularEvent, args: IConfigurationChangedArgs): void =>
{
        vm.init(args.webUrl, args.listName, vm.$scope);
      });
  }

  private init(webUrl: string, listName: string, $scope: angular.IScope): void
{
    if (webUrl !== undefined && webUrl.length > 0 &&
      listName !== undefined && listName.length > 0) {
      this.webUrl = webUrl;
      this.listName = listName;
    }

    if ($scope) {
      $scope.$digest();
    }
  }

  public createItem(): void {
    const itemTitle: string = `Item ${new Date()}`;
    this.status = 'Creating item...';
    this.items.length = 0;
    this.dataService.createItem(itemTitle, this.webUrl, this.listName)
      .then((item: IListItem): void => {
        this.status = `Item '${item.Title}' (ID: ${item.Id}) successfully
created`;
      }, (error: any): void => {
        this.status = 'Error while creating the item: ' + error;
      });
  }

  public readItem(): void {
    this.status = 'Loading latest items...';
    this.items.length = 0;
    this.dataService.getLatestItemId(this.webUrl, this.listName)
      .then((itemId: number): angular.IPromise<IListItem> => {
        if (itemId === -1) {
          throw new Error('No items found in the list');
        }

        this.status = `Loading information about item ID: ${itemId}...`;
        return this.dataService.readItem(itemId, this.webUrl, this.listName);
      })
      .then((item: IListItem): void => {
```

```
        this.status = `Item ID: ${item.Id}, Title: ${item.Title}`;
      }, (error: any): void => {
        this.status = 'Loading latest item failed with error: ' + error;
      });
  }

  public updateItem(): void {
    this.status = 'Loading latest items...';
    this.items.length = 0;
    let latestItemId: number = undefined;
    this.dataService.getLatestItemId(this.webUrl, this.listName)
      .then((itemId: number): angular.IPromise<IListItem> => {
        if (itemId === -1) {
          throw new Error('No items found in the list');
        }

        latestItemId = itemId;
        this.status = `Loading information about item ID: ${latestItemId}...`;

        return this.dataService.readItem(latestItemId, this.webUrl,
this.listName);
      })
      .then((latestItem: IListItem): angular.IPromise<{}> => {
        this.status = `Updating item with ID: ${latestItemId}...`;
        latestItem.Title = `Item ${new Date()}`;
        return this.dataService.updateItem(latestItem, this.webUrl,
this.listName);
      })
      .then((result: {}): void => {
        this.status = `Item with ID: ${latestItemId} successfully updated`;
      }, (error: any): void => {
        this.status = `Error updating item: ${error}`;
      });
  }

  public deleteItem(): void {
    if (!this.$window.confirm('Are you sure you want to delete this todo
item?')) {
      return;
    }

    this.status = 'Loading latest items...';
    this.items.length = 0;
    let latestItemId: number = undefined;
    this.dataService.getLatestItemId(this.webUrl, this.listName)
```

```
      .then((itemId: number): angular.IPromise<IListItem> => {
        if (itemId === -1) {
          throw new Error('No items found in the list');
        }

        latestItemId = itemId;
        this.status = `Loading information about item ID: ${latestItemId}...`;

        return this.dataService.readItem(latestItemId, this.webUrl,
this.listName);
      })
      .then((latestItem: IListItem): angular.IPromise<{}> => {
        this.status = `Deleting item with ID: ${latestItemId}...`;
        return this.dataService.deleteItem(latestItem, this.webUrl,
this.listName);
      })
      .then((result: {}): void => {
        this.status = `Item with ID: ${latestItemId} successfully deleted`;
      }, (error: any): void => {
        this.status = `Error deleting item: ${error}`;
      });
  }
}
```

Configure Module

Add a file app-module.ts under app folder

```
import * as angular from 'angular';
import HomeController from './HomeController';
import DataService from './DataService';

import 'ng-office-ui-fabric';

const crudapp: ng.IModule = angular.module('crudapp', [
  'officeuifabric.core',
  'officeuifabric.components'
]);

crudapp
  .controller('HomeController', HomeController)
  .service('DataService', DataService);
```

Add Controls to WebPart

1. Open AngularCrudWebPart.ts under "\src\webparts\angularCrud\" folder.
2. Import Angular module

```
import * as angular from 'angular';
import './app/app-module';
```

3. Modify Render method to include buttons for CRUD operations and add event handlers to each of the button

```
export default class AngularCrudWebPart extends
BaseClientSideWebPart<IAngularCrudWebPartProps> {
  private $injector: angular.auto.IInjectorService;

  public render(): void {
    if (this.renderedOnce === false) {
      this.domElement.innerHTML = `
        <div class="${styles.angularCrud}" data-ng-
controller="HomeController as vm">
          <div class="${styles.container}">
            <div class="ms-Grid-row ms-bgColor-themeDark ms-fontColor-
white ${styles.row}">
              <div class="ms-Grid-col ms-u-lg10 ms-u-xl8 ms-u-xlPush2
ms-u-lgPush1">
                <span class="ms-font-xl ms-fontColor-white">
                  Sample SharePoint CRUD operations in Angular
                </span>
              </div>
            </div>
            <div class="ms-Grid-row ms-bgColor-themeDark ms-fontColor-
white ${styles.row}">
              <div class="ms-Grid-col ms-u-lg10 ms-u-xl8 ms-u-xlPush2
ms-u-lgPush1">
                <uif-button ng-click="vm.createItem()" ng-
disabled="vm.listNotConfigured">Create item</uif-button>
                <uif-button ng-click="vm.readItem()" ng-
disabled="vm.listNotConfigured">Read item</uif-button>
              </div>
            </div>
            <div class="ms-Grid-row ms-bgColor-themeDark ms-fontColor-
white ${styles.row}">
              <div class="ms-Grid-col ms-u-lg10 ms-u-xl8 ms-u-xlPush2
ms-u-lgPush1">
                <uif-button ng-click="vm.readItems()" ng-
disabled="vm.listNotConfigured">Read all items</uif-button>
              </div>
```

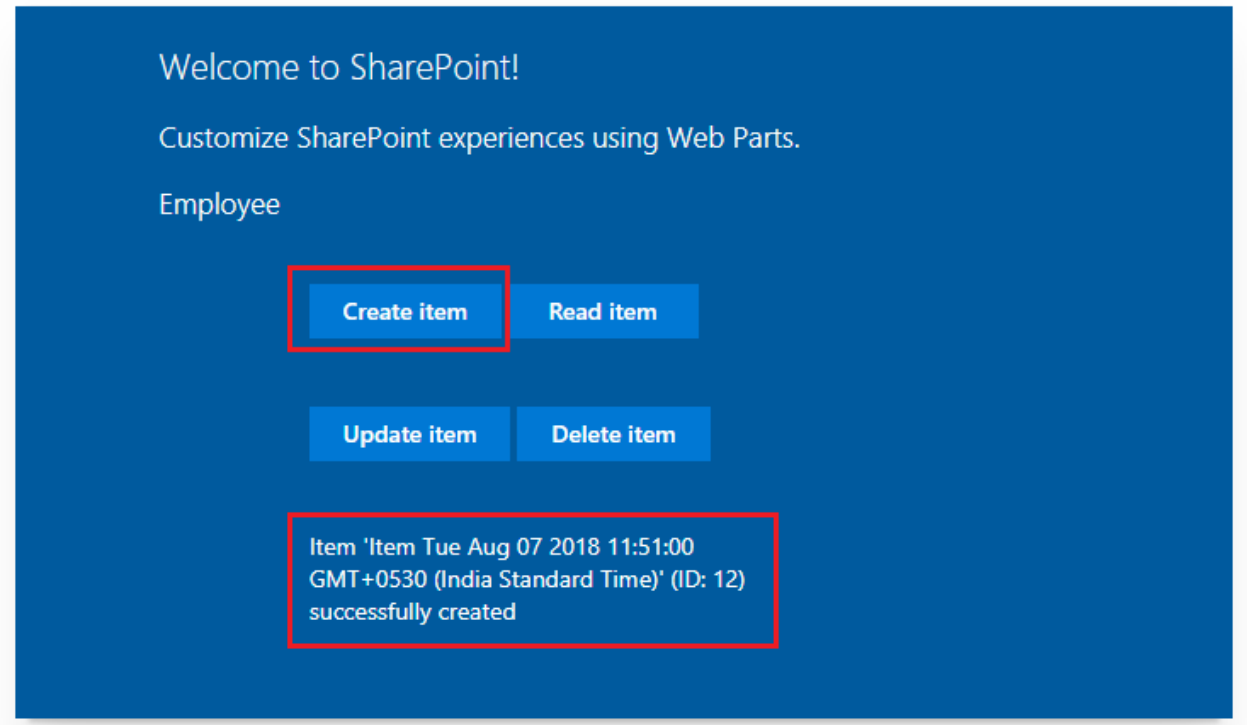
```
              </div>
              <div class="ms-Grid-row ms-bgColor-themeDark ms-fontColor-
white ${styles.row}">
                <div class="ms-Grid-col ms-u-lg10 ms-u-xl8 ms-u-xlPush2
ms-u-lgPush1">
                  <uif-button ng-click="vm.updateItem()" ng-
disabled="vm.listNotConfigured">Update item</uif-button>
                  <uif-button ng-click="vm.deleteItem()" ng-
disabled="vm.listNotConfigured">Delete item</uif-button>
                </div>
              </div>
              <div class="ms-Grid-row ms-bgColor-themeDark ms-fontColor-
white ${styles.row}">
                <div class="ms-Grid-col ms-u-lg10 ms-u-xl8 ms-u-xlPush2
ms-u-lgPush1">
                  <div>{{vm.status}}</div>
                  <ul>
                    <li ng-repeat="item in vm.items">{{item.Title}}
({{item.Id}})</li>
                  <ul>
                </div>
              </div>
          </div>
        </div>`;

      this.$injector = angular.bootstrap(this.domElement, ['crudapp']);
    }

    this.$injector.get('$rootScope').$broadcast('configurationChanged',
{
      webUrl: this.context.pageContext.web.absoluteUrl,
      listName: this.properties.listName
    });
  }
}
```

Test the WebPart

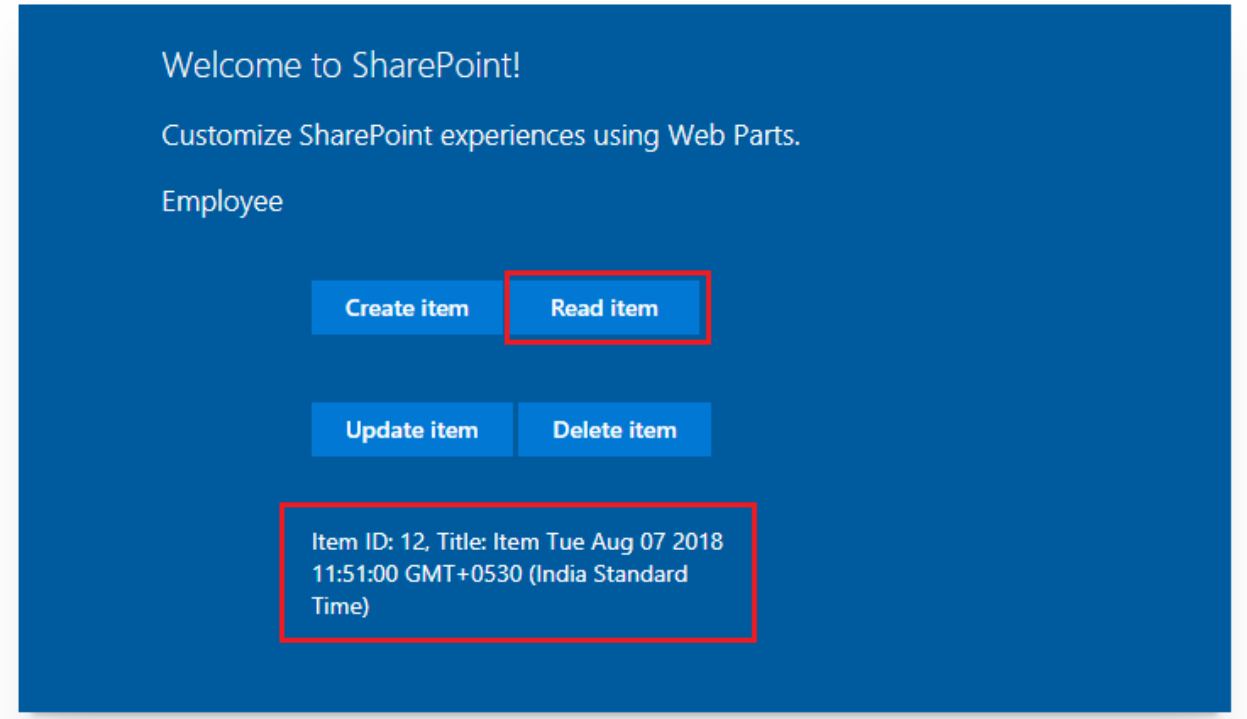
1. On the command prompt, type “gulp serve”
2. Open SharePoint site
3. Navigate to /_layouts/15/workbench.aspx
4. Add the webpart to page.
5. Edit webpart, in the properties pane type the list name
6. Click the buttons (Create Item, Read Item, Update Item, and Delete Item) one by one to test the webpart

7. Verify the operations are taking place in SharePoint list.

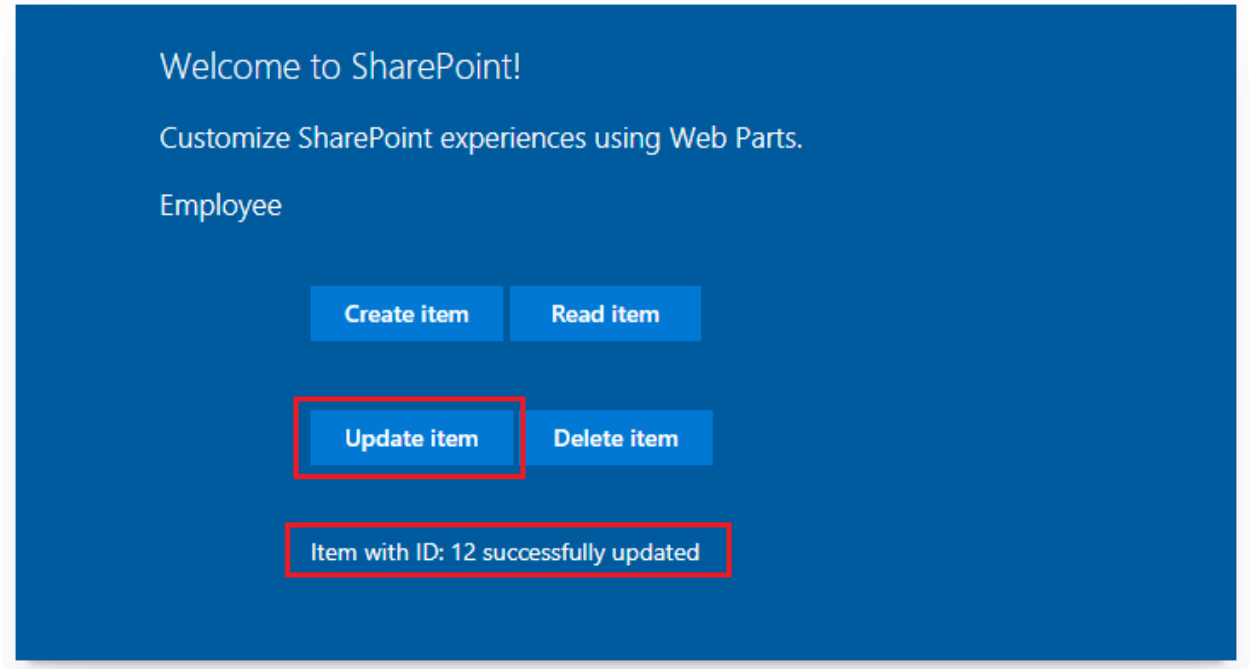
Create Operation



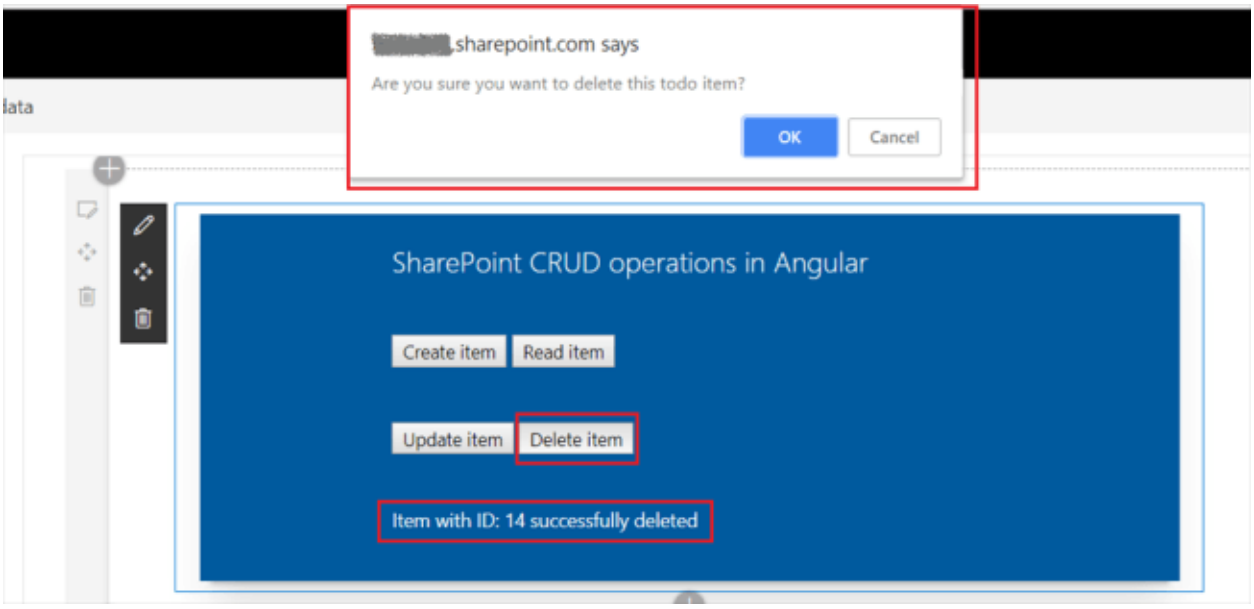
Read Operation



Update Operation

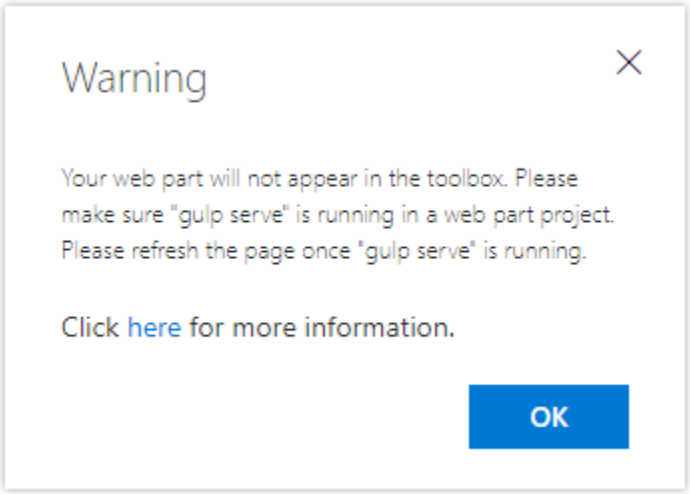


Delete Operation



Troubleshooting

In some cases SharePoint workbench (https://[tenant].sharepoint.com/_layouts/15/workbench.aspx) shows below error although “gulp serve” is running.



Open below url in the next tab of browser. Accept the warning message.

https://localhost:4321/temp/manifests.js

Summary

React JS is natively supported by SharePoint framework. SPFx generates all needed React components for you to get started with the development. React JS supports the application to be broken down into small React components, which simplifies development and maintenance. React JS focuses more on UI development, in contrast to Angular which is more famous for creating SPA (Single Page Applications).

Chapter 13: CRUD operations using Knockout JS

Overview

In the chapters so far, we have explored on developing basic SharePoint client web part which can run independently without any interaction with SharePoint.

In this chapter, we will explore to interact with the SharePoint list for CRUD (Create, Read, Update, and Delete) operations using Knockout JS. Knockout JS is not natively supported by SharePoint Framework.

Brief about Knockout JS

Knockout JS was developed and maintained as an open source project by Steve Sanderson, a Microsoft employee. Knockout JS follows JavaScript implementation of the Model-View-ViewModel pattern with templates. Read more about Knockout JS at http://knockoutjs.com/

Create SPFx Solution

1. Open command prompt. Create a directory for SPFx solution

```
md spfx-crud-knockoutjs
```

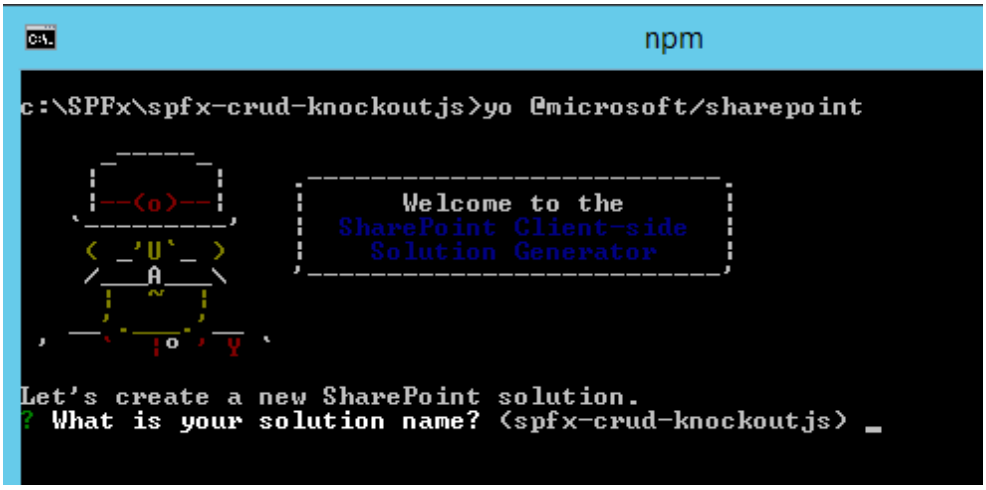
2. Navigate to above created directory

```
cd spfx-crud-knockout js
```

3. Run Yeoman SharePoint Generator to create the solution

```
yo @microsoft/sharepoint
```

4. Yeoman generator will present you with the wizard by asking questions about the solution to be created.



Solution Name: Hit enter to have default name (spfx-crud-knockoutjs in this case) or type in any other name for your solution.
Selected choice: Hit enter

Target for component: Here we can select the target environment where we are planning to deploy the client webpart i.e. SharePoint Online or SharePoint OnPremise (SharePoint 2016 onwards).
Selected choice: SharePoint Online only (latest)

Place of files: We may choose to use the same folder or create a subfolder for our solution.
Selected choice: Same folder

Deployment option: Selecting Y will allow the app to deployed instantly to all sites and will be accessible everywhere.
Selected choice: N (install on each site explicitly)

Type of client-side component to create: We can choose to create client side webpart or an extension. Choose webpart option.
Selected choice: WebPart

Web part name: Hit enter to select the default name or type in any other name.
Selected choice: KnockoutCRUD

Web part description: Hit enter to select the default description or type in any other value.
Selected choice: CRUD operations with Knockout JS

Framework to use: Select any JavaScript framework to develop the component. Available choices are (No JavaScript Framework, React, and Knockout)
Selected choice: Knockout

5. Yeoman generator will perform scaffolding process to generate the solution. The scaffolding process will take significant amount of time.

6. Once the scaffolding process is completed, lock down the version of project dependencies by running below command

```
npm shrinkwrap
```

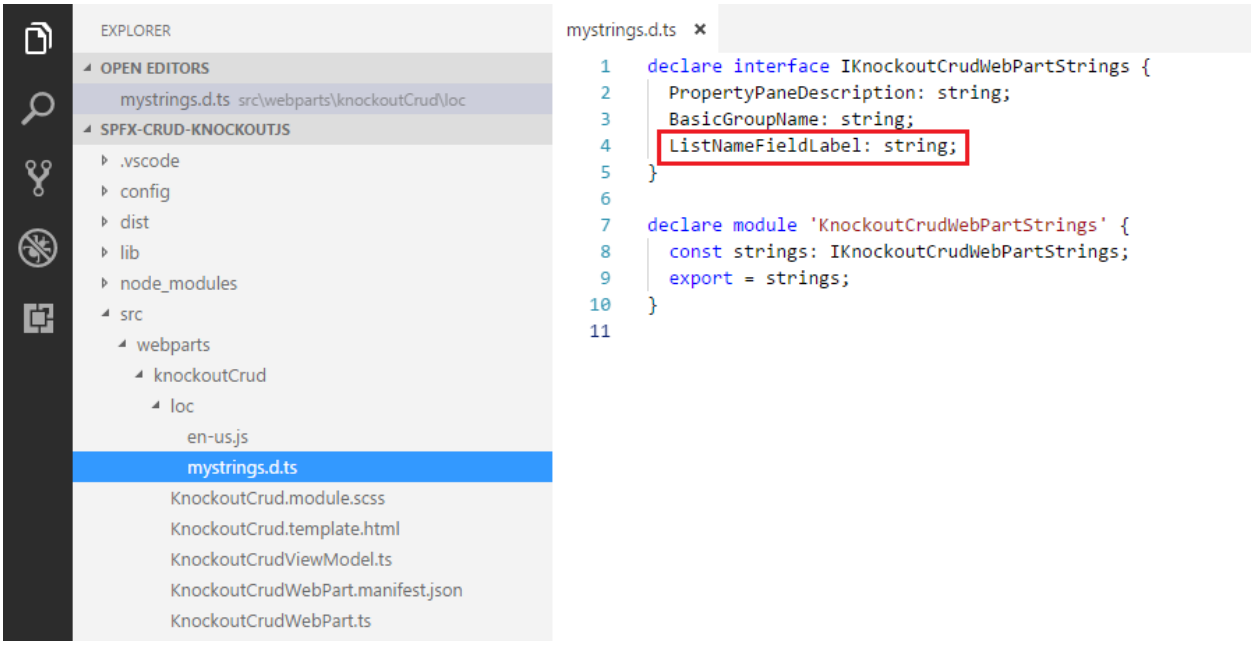
7. In the command prompt type below command to open the solution in code editor of your choice.

```
code .
```

Configure Property for List Name

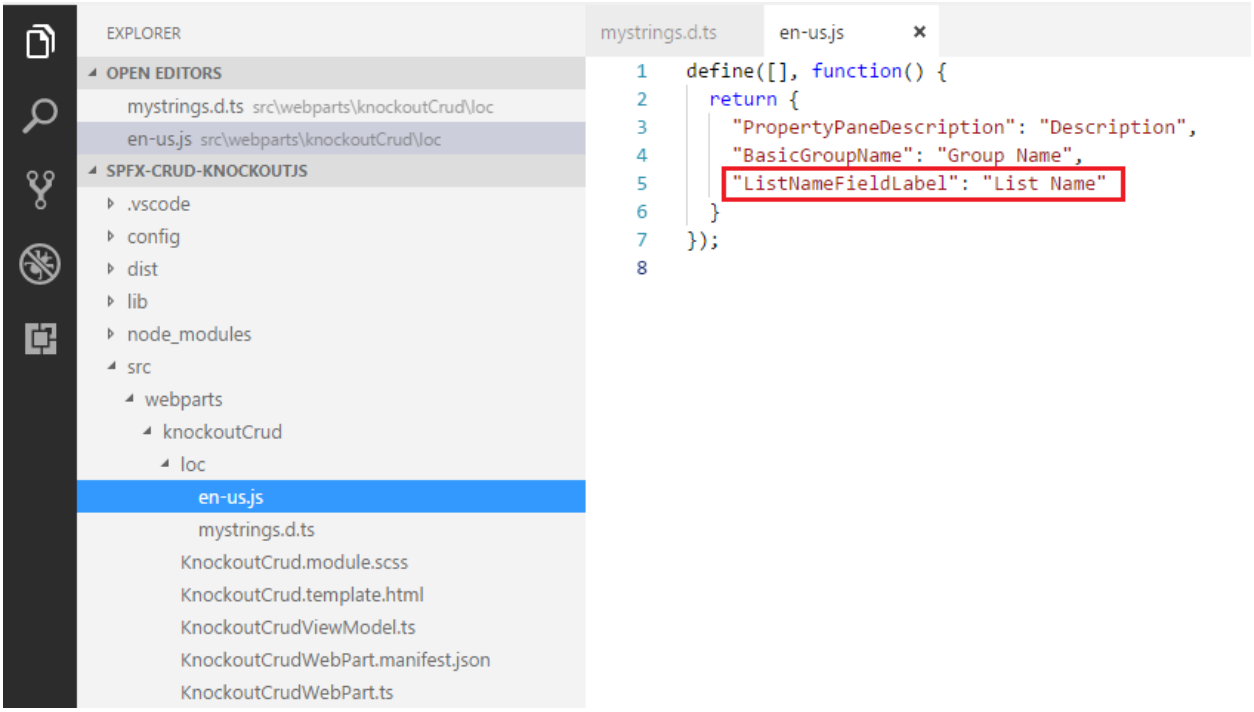
SPFx solution by default have description property created. Let us change the property to list name. We will use this property to configure the list name on which the CRUD operation is to perform.

1. Open mystrings.d.ts under \src\webparts\knockoutCrud\loc\ folder
2. Rename DescriptionFieldLabel to ListNameFieldLabel



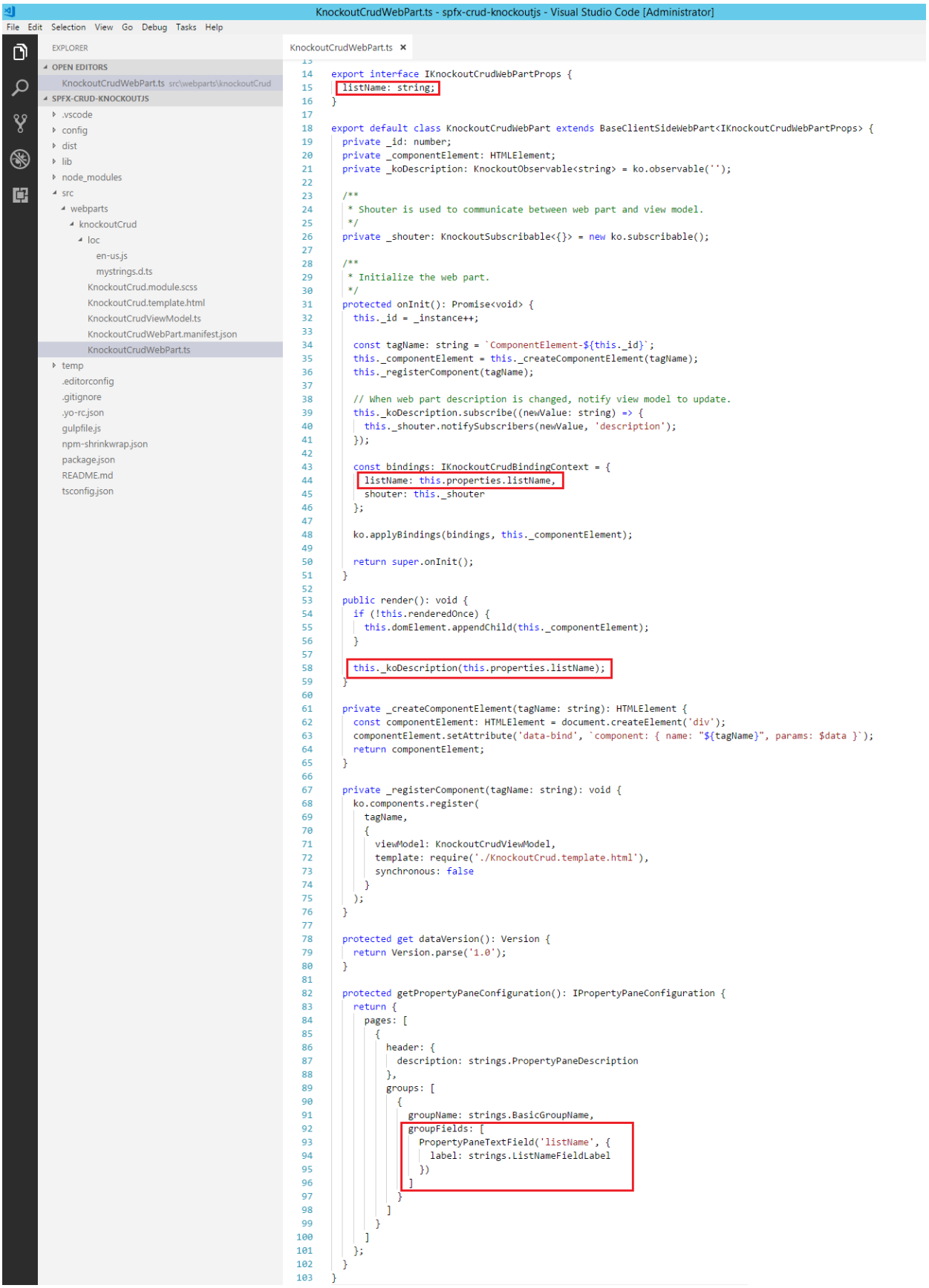

```
declare interface IKnockoutCrudWebPartStrings {
  PropertyPaneDescription: string;
  BasicGroupName: string;
  ListNameFieldLabel: string;
}

declare module 'KnockoutCrudWebPartStrings' {
  const strings: IKnockoutCrudWebPartStrings;
  export = strings;
}
```

3. In en-us.js file under \src\webparts\knockoutCrud\loc\ folder set the display name for listName property




```
define([], function() {
  return {
    "PropertyPaneDescription": "Description",
    "BasicGroupName": "Group Name",
    "ListNameFieldLabel": "List Name"
  }
});
```

4. Open main webpart file (KnockoutCrudWebPart.ts) under \src\webparts\knockoutCrud folder.
5. Rename description property pane field to listName



```
import * as ko from 'knockout';
import { Version } from '@microsoft/sp-core-library';
import {
  BaseClientSideWebPart,
  IPropertyPaneConfiguration,
  PropertyPaneTextField
} from '@microsoft/sp-webpart-base';

import * as strings from 'KnockoutCrudWebPartStrings';
import KnockoutCrudViewModel, { IKnockoutCrudBindingContext } from
'./KnockoutCrudViewModel';

let _instance: number = 0;

export interface IKnockoutCrudWebPartProps {
  listName: string;
}

export default class KnockoutCrudWebPart extends
BaseClientSideWebPart<IKnockoutCrudWebPartProps> {
  private _id: number;
  private _componentElement: HTMLElement;
  private _koDescription: KnockoutObservable<string> =
ko.observable('');

  /**
   * Shouter is used to communicate between web part and view model.
   */
  private _shouter: KnockoutSubscribable<{}> = new ko.subscribable();

  /**
   * Initialize the web part.
   */
  protected onInit(): Promise<void> {
    this._id = _instance++;

    const tagName: string = `ComponentElement-${this._id}`;
    this._componentElement = this._createComponentElement(tagName);
    this._registerComponent(tagName);

    // When web part description is changed, notify view model to
update.
    this._koDescription.subscribe((newValue: string) => {
      this._shouter.notifySubscribers(newValue, 'description');
    });
```

```
    const bindings: IKnockoutCrudBindingContext = {
      listName: this.properties.listName,
      shouter: this._shouter
    };

    ko.applyBindings(bindings, this._componentElement);

    return super.onInit();
  }

  public render(): void {
    if (!this.renderedOnce) {
      this.domElement.appendChild(this._componentElement);
    }

    this._koDescription(this.properties.listName);
  }

  private _createComponentElement(tagName: string): HTMLElement {
    const componentElement: HTMLElement = document.createElement('div');
    componentElement.setAttribute('data-bind', `component: { name:
"${tagName}", params: $data }`);
    return componentElement;
  }

  private _registerComponent(tagName: string): void {
    ko.components.register(
      tagName,
      {
        viewModel: KnockoutCrudViewModel,
        template: require('./KnockoutCrud.template.html'),
        synchronous: false
      }
    );
  }

  protected get dataVersion(): Version {
    return Version.parse('1.0');
  }

  protected getPropertyPaneConfiguration(): IPropertyPaneConfiguration {
    return {
      pages: [
        {
```

```
          header: {
            description: strings.PropertyPaneDescription
          },
          groups: [
            {
              groupName: strings.BasicGroupName,
              groupFields: [
                PropertyPaneTextField('listName', {
                  label: strings.ListNameFieldLabel
                })
              ]
            }
          ]
        }
      ]
    };
  }
}
```

6. Update the ViewModel inside KnockoutCrudViewModel.ts to reflect listName property

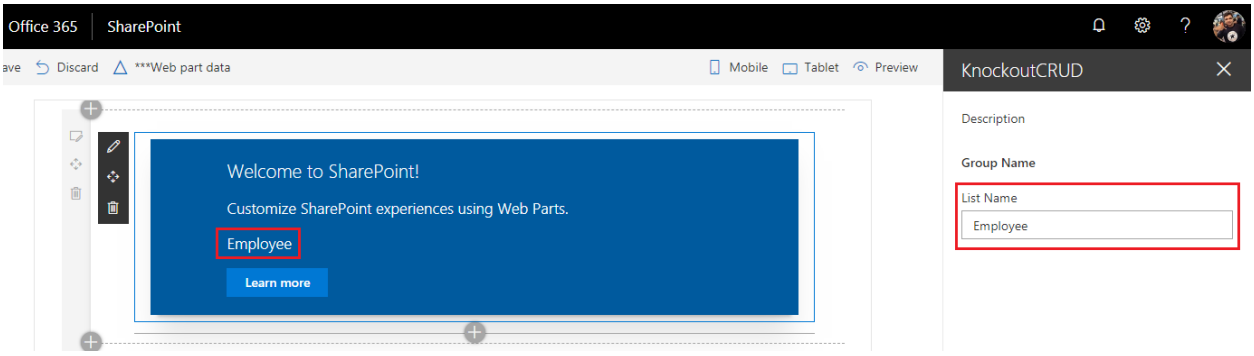
```
import * as ko from 'knockout';
import styles from './KnockoutCrud.module.scss';
import { IKnockoutCrudWebPartProps } from './KnockoutCrudWebPart';

export interface IKnockoutCrudBindingContext extends
IKnockoutCrudWebPartProps {
  shouter: KnockoutSubscribable<{}>;
}

export default class KnockoutCrudViewModel {
  public listName: KnockoutObservable<string> = ko.observable('');

  public knockoutCrudClass: string = styles.knockoutCrud;
  public containerClass: string = styles.container;
  public rowClass: string = styles.row;
  public columnClass: string = styles.column;
  public titleClass: string = styles.title;
  public subTitleClass: string = styles.subTitle;
  public descriptionClass: string = styles.description;
  public buttonClass: string = styles.button;
  public labelClass: string = styles.label;

  constructor(bindings: IKnockoutCrudBindingContext) {
    this.listName(bindings.listName);
```

```
        // When web part description is updated, change this view model's
    description.
        bindings.shouter.subscribe((value: string) => {
          this.listName(value);
        }, this, 'listName');
      }
    }
```

7. In the template (KnockoutCrud.template.html) reflect the listName property


```
<div data-bind="attr: { class:knockoutCrudClass }">
    <div data-bind="attr: { class:containerClass }">
      <div data-bind="attr: { class:rowClass }">
        <div data-bind="attr: { class:columnClass }">
          <span data-bind="attr: { class:titleClass }">Welcome to
SharePoint!</span>
          <p data-bind="attr: { class:subTitleClass }">Customize
SharePoint experiences using Web Parts.</p>
          <p data-bind="attr: { class:descriptionClass },
text:listName"></p>
          <a href="https://aka.ms/spfx" data-bind="attr: {
class:buttonClass }">
            <span data-bind="attr: { class:labelClass }">Learn
more</span>
          </a>
        </div>
      </div>
    </div>
  </div>
```

8. In the command prompt, type “gulp serve”
9. In the SharePoint local workbench page, add the web part.
10. Edit the web part to ensure the listName property pane field is getting reflected.



Configure ViewModel

1. Open KnockoutCrudViewModel.ts, add below import statements

```
import { IWebPartContext } from '@microsoft/sp-webpart-base';
import { SPHttpClient, SPHttpClientResponse } from '@microsoft/sp-http';
```

KnockoutCrudViewModel.ts

```
1   import * as ko from 'knockout';
2   import styles from './KnockoutCrud.module.scss';
3   import { IKnockoutCrudWebPartProps } from './KnockoutCrudWebPart';
4   import { IWebPartContext } from '@microsoft/sp-webpart-base';
5   import { SPHttpClient, SPHttpClientResponse } from '@microsoft/sp-http';
```

2. Add context to interface IKnockoutCrudBindingContext

```
export interface IKnockoutCrudBindingContext extends
IKnockoutCrudWebPartProps {
  shouter: KnockoutSubscribable<{}>;
  context: IWebPartContext;
}
```

3. Add an interface for representing SharePoint list item

```
export interface IListItem {
  Id: number;
  Title: string;
}
```

KnockoutCrudViewModel.ts

```
1   import * as ko from 'knockout';
2   import styles from './KnockoutCrud.module.scss';
3   import { IKnockoutCrudWebPartProps } from './KnockoutCrudWebPart';
4   import { IWebPartContext } from '@microsoft/sp-webpart-base';
5   import { SPHttpClient, SPHttpClientResponse } from '@microsoft/sp-http';
6
7   export interface IKnockoutCrudBindingContext extends IKnockoutCrudWebPartProps {
8     shouter: KnockoutSubscribable<{}>;
9     context: IWebPartContext;
10  }
11
12  export interface IListItem {
13    Id: number;
14    Title: string;
15  }
```

4. Add below properties to bind to UI

```
public message: KnockoutObservable<string> = ko.observable('');
```

5. Implement generic method to get latest item id

```
private getLatestItemId(): Promise<number> {
    return
this._context.spHttpClient.get(this._context.pageContext["web"]["absolut
eUrl"]
      +
`/_api/web/lists/GetByTitle('${this.listName}')/items?$orderby=Id
desc&$top=1&$select=id`, SPHttpClient.configurations.v1)
      .then((response: SPHttpClientResponse): Promise<any> => {
        return response.json();
      })
      .then((data: any): number => {
        this.message("Load succeeded");
        return data;
      },
      (error: any) => {
        this.message("Load failed");
      }) as Promise<number>;
  }
```

Implement Create Operation

We will use the REST API to add the item to list.

```
private createItem(): void {
  const body: string = JSON.stringify({
    'Title': `Item ${new Date()}`
  });


this._context.spHttpClient.post(`${this._context.pageContext["web"]["absoluteUrl"]}/_api/web/lists/getbytitle('${this._listName}')/items`,
  SPHttpClient.configurations.v1,
  {
    headers: {
      'Accept': 'application/json;odata=nometadata',
      'Content-type': 'application/json;odata=nometadata',
      'odata-version': ''
    },
    body: body
  })
  .then((response: SPHttpClientResponse): Promise<IListItem> => {
    return response.json();
  })
  .then((item: IListItem): void => {
    this.message(`Item '${item.Title}' (ID: ${item.Id}) successfully created`);
  }, (error: any): void => {
    this.message('Error while creating the item: ' + error);
  });
}
```

Implement Read Operation

We will use REST API to read the latest item.

```
private readItem(): void {
  this.getLatestItemId()
    .then((itemId: number): Promise<SPHttpClientResponse> => {
      if (itemId === -1) {
        throw new Error('No items found in the list');
      }

      this.message(`Loading information about item ID: ${itemId}...`);

      return
this._context.spHttpClient.get(`${this._context.pageContext["web"]["absoluteUrl
```

```
"]}/_api/web/lists/getbytitle('${this._listName}')/items(${itemId})?$select=Tit
le,Id`,
        SPHttpClient.configurations.v1,
        {
          headers: {
            'Accept': 'application/json;odata=nometadata',
            'odata-version': ''
          }
        });
    })
    .then((response: SPHttpClientResponse): Promise<IListItem> => {
      return response.json();
    })
    .then((item: IListItem): void => {
      this.message(`Item ID: ${item.Id}, Title: ${item.Title}`);
    }, (error: any): void => {
      this.message('Loading latest item failed with error: ' + error);
    });
}
```

Implement Update Operation

We will use REST API to update the latest item.

```
private updateItem(): void {
  let latestItemId: number = undefined;
  this.message('Loading latest item...');

  this.getLatestItemId()
    .then((itemId: number): Promise<SPHttpClientResponse> => {
      if (itemId === -1) {
        throw new Error('No items found in the list');
      }

      latestItemId = itemId;
      this.message(`Loading information about item ID: ${itemId}...`);

      return
this._context.spHttpClient.get(`${this._context.pageContext["web"]["absoluteUrl
"]}/_api/web/lists/getbytitle('${this._listName}')/items(${latestItemId})?$sele
ct=Title,Id`,
        SPHttpClient.configurations.v1,
        {
          headers: {
            'Accept': 'application/json;odata=nometadata',
```

```
            'odata-version': ''
          }
        });
    })
    .then((response: SPHttpClientResponse): Promise<IListItem> => {
      return response.json();
    })
    .then((item: IListItem): void => {
      this.message(`Item ID1: ${item.Id}, Title: ${item.Title}`);

      const body: string = JSON.stringify({
        'Title': `Updated Item ${new Date()}`
      });


this._context.spHttpClient.post(`${this._context.pageContext["web"]["absoluteUr
l"]}/_api/web/lists/getbytitle('${this._listName}')/items(${item.Id})`,
        SPHttpClient.configurations.v1,
        {
          headers: {
            'Accept': 'application/json;odata=nometadata',
            'Content-type': 'application/json;odata=nometadata',
            'odata-version': '',
            'IF-MATCH': '*',
            'X-HTTP-Method': 'MERGE'
          },
          body: body
        })
        .then((response: SPHttpClientResponse): void => {
          this.message(`Item with ID: ${latestItemId} successfully updated`);
        }, (error: any): void => {
          this.message(`Error updating item: ${error}`);
        });
    });
}
```

Implement Delete Operation

We will use REST API to delete the latest item.

```
private deleteItem(): void {
  if (!window.confirm('Are you sure you want to delete the latest item?')) {
    return;
  }
```

```
  this.message('Loading latest items...');
  let latestItemId: number = undefined;
  let etag: string = undefined;
  this.getLatestItemId()
    .then((itemId: number): Promise<SPHttpClientResponse> => {
      if (itemId === -1) {
        throw new Error('No items found in the list');
      }

      latestItemId = itemId;
      this.message(`Loading information about item ID: ${latestItemId}...`);
      return
this._context.spHttpClient.get(`${this._context.pageContext["web"]["absoluteUrl
"]}/_api/web/lists/getbytitle('${this._listName}')/items(${latestItemId})?$sele
ct=Id`,
        SPHttpClient.configurations.v1,
        {
          headers: {
            'Accept': 'application/json;odata=nometadata',
            'odata-version': ''
          }
        });
    })
    .then((response: SPHttpClientResponse): Promise<IListItem> => {
      etag = response.headers.get('ETag');
      return response.json();
    })
    .then((item: IListItem): Promise<SPHttpClientResponse> => {
      this.message(`Deleting item with ID: ${latestItemId}...`);
      return
this._context.spHttpClient.post(`${this._context.pageContext["web"]["absoluteUr
l"]}/_api/web/lists/getbytitle('${this._listName}')/items(${item.Id})`,
        SPHttpClient.configurations.v1,
        {
          headers: {
            'Accept': 'application/json;odata=nometadata',
            'Content-type': 'application/json;odata=verbose',
            'odata-version': '',
            'IF-MATCH': etag,
            'X-HTTP-Method': 'DELETE'
          }
        });
    })
    .then((response: SPHttpClientResponse): void => {
      this.message(`Item with ID: ${latestItemId} successfully deleted`);
```

```
    }, (error: any): void => {
      this.message(`Error deleting item: ${error}`);
    });
}
```

6. In KnockoutCrudWebPart.ts file update the bindings in OnInit method

```
const bindings: IKnockoutCrudBindingContext = {
      listName: this.properties.listName,
      context: this.context,
      shouter: this._shouter
    };
```

Add Controls to Knockout template

1. Open KnockoutCrud.template.html under "\src\webparts\knockoutCrud\" folder.
2. Import Angular module

```
import * as angular from 'angular';
import './app/app-module';
```

3. Modify Render method to include buttons for CRUD operations and add event handlers to each of the button

```
export default class AngularCrudWebPart extends
BaseClientSideWebPart<IAngularCrudWebPartProps> {
  private $injector: angular.auto.IInjectorService;

  public render(): void {
    if (this.renderedOnce === false) {
      this.domElement.innerHTML = `
        <div class="${styles.angularCrud}" data-ng-
controller="HomeController as vm">
          <div class="${styles.container}">
            <div class="ms-Grid-row ms-bgColor-themeDark ms-fontColor-
white ${styles.row}">
              <div class="ms-Grid-col ms-u-lg10 ms-u-xl8 ms-u-xlPush2
ms-u-lgPush1">
                <span class="ms-font-xl ms-fontColor-white">
                  Sample SharePoint CRUD operations in Angular
                </span>
              </div>
            </div>
            <div class="ms-Grid-row ms-bgColor-themeDark ms-fontColor-
white ${styles.row}">
```

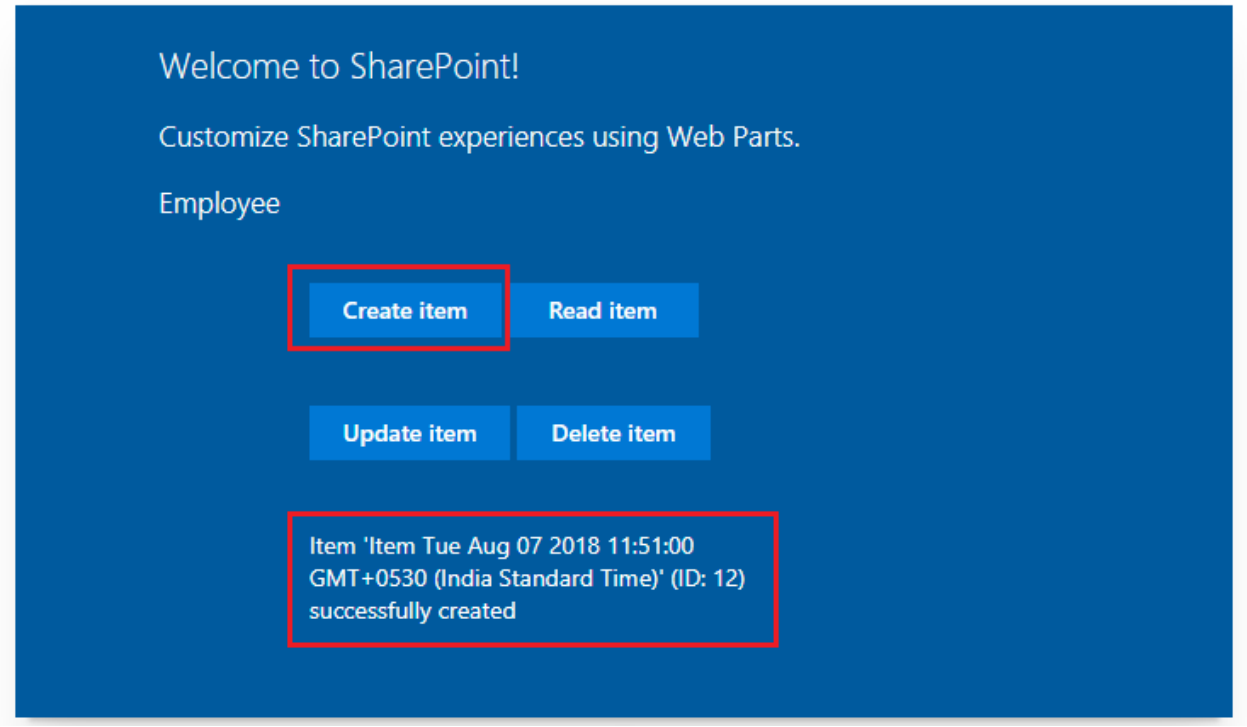
```
                <div class="ms-Grid-col ms-u-lg10 ms-u-xl8 ms-u-xlPush2
ms-u-lgPush1">
                  <uif-button ng-click="vm.createItem()" ng-
disabled="vm.listNotConfigured">Create item</uif-button>
                  <uif-button ng-click="vm.readItem()" ng-
disabled="vm.listNotConfigured">Read item</uif-button>
                </div>
              </div>
              <div class="ms-Grid-row ms-bgColor-themeDark ms-fontColor-
white ${styles.row}">
                <div class="ms-Grid-col ms-u-lg10 ms-u-xl8 ms-u-xlPush2
ms-u-lgPush1">
                  <uif-button ng-click="vm.readItems()" ng-
disabled="vm.listNotConfigured">Read all items</uif-button>
                </div>
              </div>
              <div class="ms-Grid-row ms-bgColor-themeDark ms-fontColor-
white ${styles.row}">
                <div class="ms-Grid-col ms-u-lg10 ms-u-xl8 ms-u-xlPush2
ms-u-lgPush1">
                  <uif-button ng-click="vm.updateItem()" ng-
disabled="vm.listNotConfigured">Update item</uif-button>
                  <uif-button ng-click="vm.deleteItem()" ng-
disabled="vm.listNotConfigured">Delete item</uif-button>
                </div>
              </div>
              <div class="ms-Grid-row ms-bgColor-themeDark ms-fontColor-
white ${styles.row}">
                <div class="ms-Grid-col ms-u-lg10 ms-u-xl8 ms-u-xlPush2
ms-u-lgPush1">
                  <div>{{vm.status}}</div>
                  <ul>
                    <li ng-repeat="item in vm.items">{{item.Title}}
({{item.Id}})</li>
                  <ul>
                </div>
              </div>
          </div>
        </div>`;

      this.$injector = angular.bootstrap(this.domElement, ['crudapp']);
    }

    this.$injector.get('$rootScope').$broadcast('configurationChanged',
{
```

```
      webUrl: this.context.pageContext.web.absoluteUrl,
      listName: this.properties.listName
    });
  }
}
```

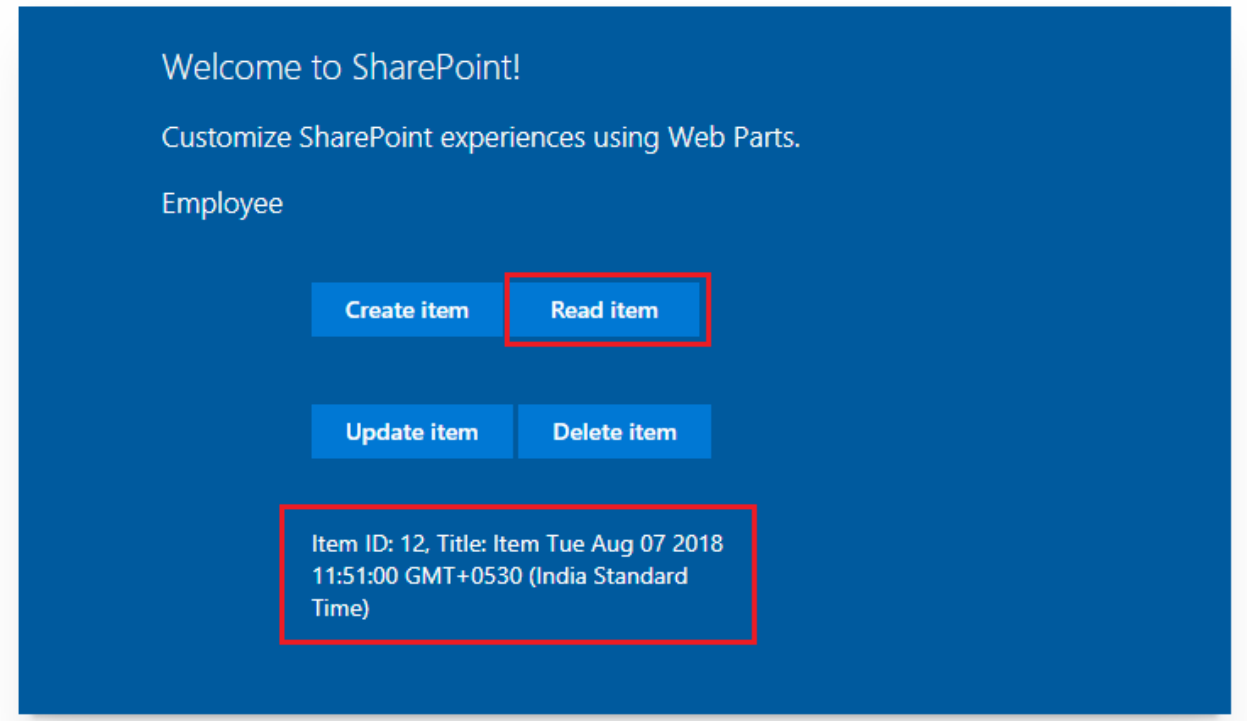
Test the WebPart

1. On the command prompt, type “gulp serve”
2. Open SharePoint site
3. Navigate to /_layouts/15/workbench.aspx
4. Add the webpart to page.
5. Edit webpart, in the properties pane type the list name
6. Click the buttons (Create Item, Read Item, Update Item, and Delete Item) one by one to test the webpart
7. Verify the operations are taking place in SharePoint list.

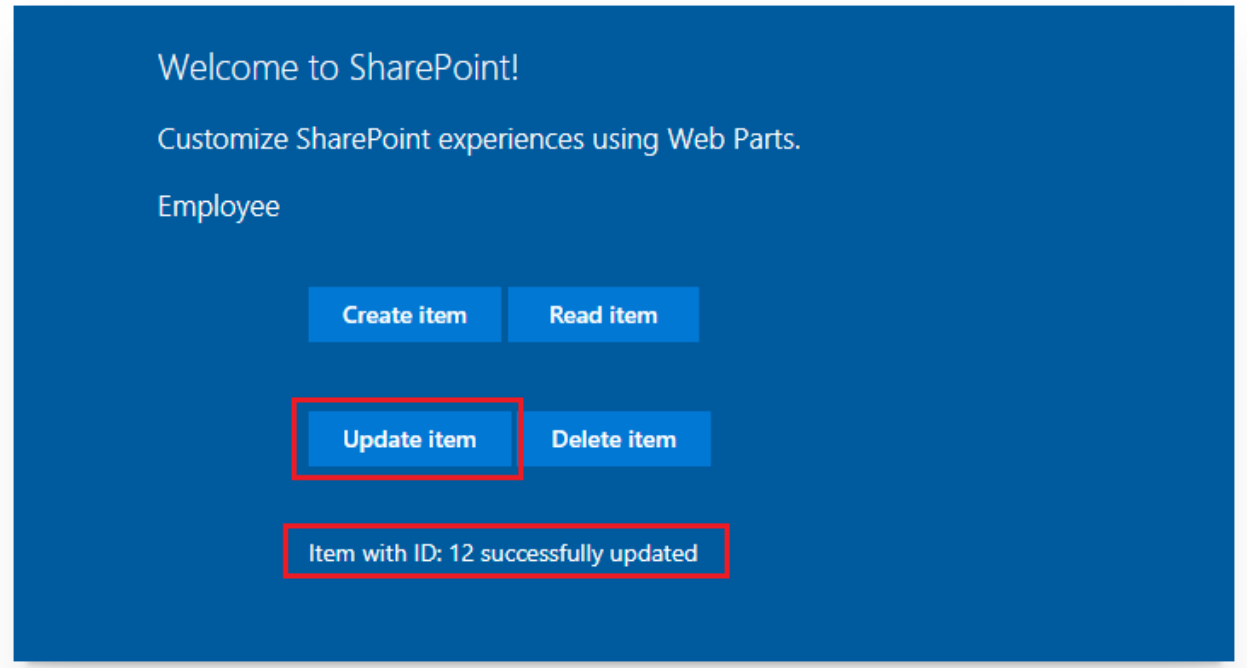
Create Operation



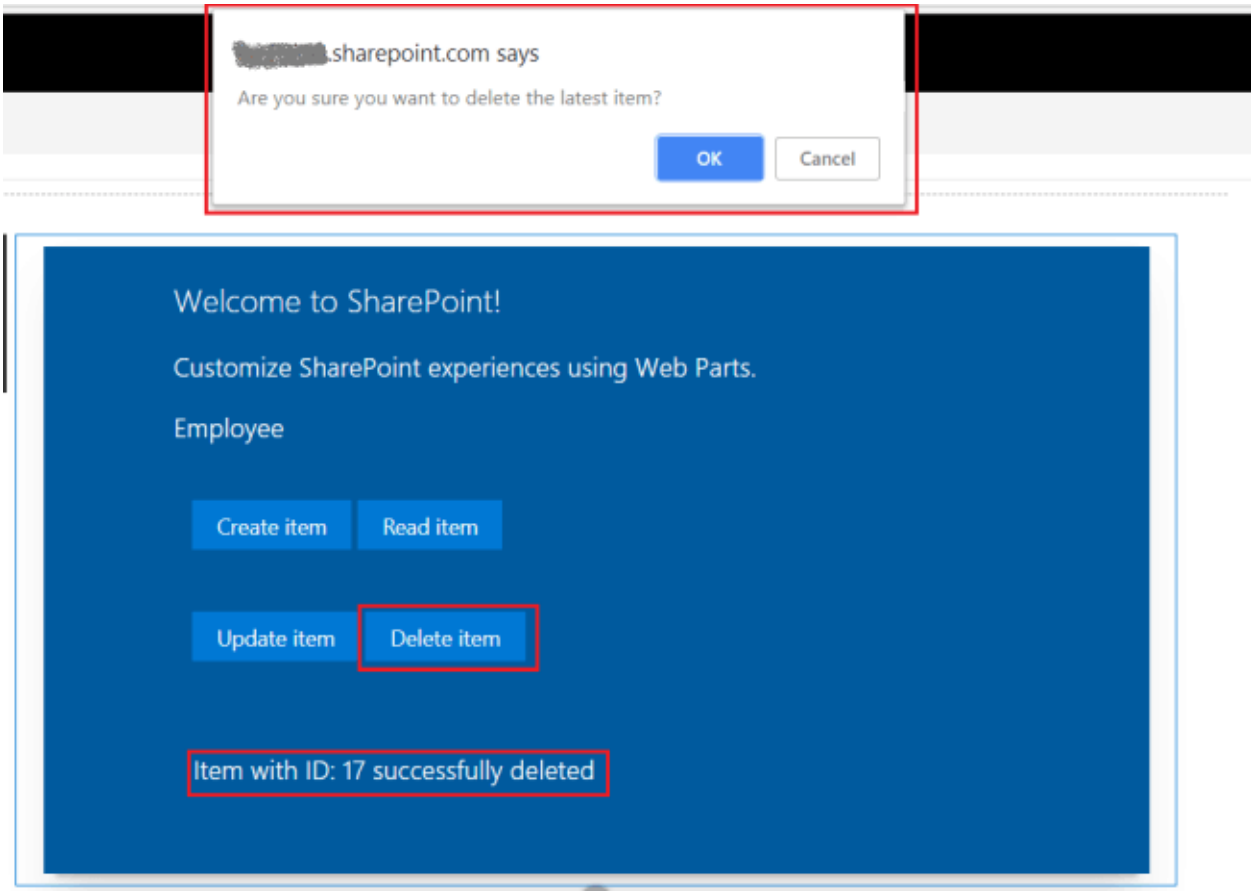
Read Operation



Update Operation

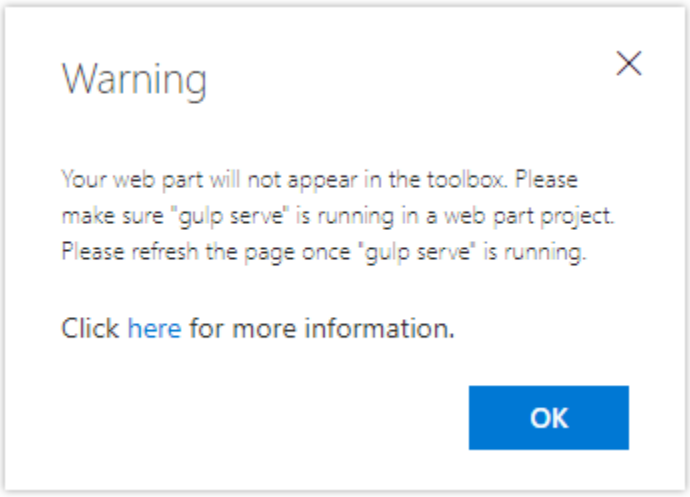


Delete Operation



Troubleshooting

In some cases SharePoint workbench (https://[tenant].sharepoint.com/_layouts/15/workbench.aspx) shows below error although “gulp serve” is running.



Open below url in the next tab of browser. Accept the warning message.

https://localhost:4321/temp/manifests.js

Summary

React JS is natively supported by SharePoint framework. SPFx generates all needed React components for you to get started with the development. React JS supports the application to be broken down into small React components, which simplifies development and maintenance. React JS focuses more on UI development, in contrast to Angular which is more famous for creating SPA (Single Page Applications).

Chapter 14: CRUD operations using SP PNP JS

Overview

In the chapters so far, we have explored on developing basic SharePoint client web part which can run independently without any interaction with SharePoint.

In this chapter, we will explore to interact with the SharePoint list for CRUD (Create, Read, Update, and Delete) operations using external JavaScript library called SP PNP JS. The CRUS operations will be performed using REST APIs.

Brief about SP-PnP-JS

SP PnP JS is pattern and practices core JavaScript library offers simplified common operations with SharePoint to help developers concentrate on business logic without worrying much about the underlying technical implementation. It contains fluent APIs to work with SharePoint REST APIs. Read more about it at - https://www.npmjs.com/package/sp-pnp-js

Create SPFx Solution

1. Open command prompt. Create a directory for SPFx solution

```
md spfx-crud-sppnpjs
```

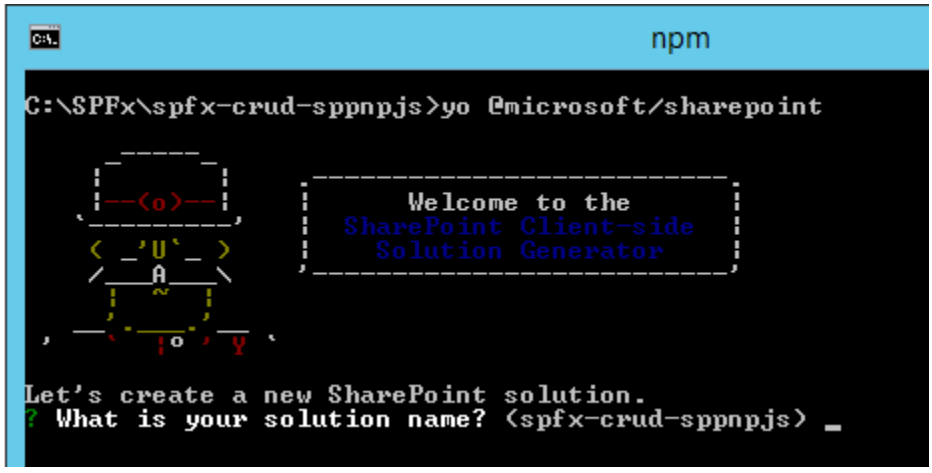
2. Navigate to above created directory

```
cd spfx-crud-sppnpjs
```

3. Run Yeoman SharePoint Generator to create the solution

```
yo @microsoft/sharepoint
```

4. Yeoman generator will present you with the wizard by asking questions about the solution to be created.



Solution Name: Hit enter to have default name (spfx-crud-no-framework in this case) or type in any other name for your solution.
Selected choice: Hit enter

Target for component: Here we can select the target environment where we are planning to deploy the client webpart i.e. SharePoint Online or SharePoint OnPremise (SharePoint 2016 onwards).
Selected choice: SharePoint Online only (latest)

Place of files: We may choose to use the same folder or create a subfolder for our solution.
Selected choice: Same folder

Deployment option: Selecting Y will allow the app to deployed instantly to all sites and will be accessible everywhere.
Selected choice: N (install on each site explicitly)

Type of client-side component to create: We can choose to create client side webpart or an extension. Choose webpart option.
Selected choice: WebPart

Web part name: Hit enter to select the default name or type in any other name.
Selected choice: SPPnPJSCRUD

Web part description: Hit enter to select the default description or type in any other value.
Selected choice: CRUD operations with SP PnP JS

Framework to use: Select any JavaScript framework to develop the component. Available choices are (No JavaScript Framework, React, and Knockout)
Selected choice: No JavaScript Framework

5. Yeoman generator will perform scaffolding process to generate the solution. The scaffolding process will take significant amount of time.

6. Once the scaffolding process is completed, lock down the version of project dependencies by running below command

```
npm shrinkwrap
```

7. In the command prompt type below command to open the solution in code editor of your choice.

```
code .
```

Configure sp-pnp-js

In the command prompt, run below command to install sp-pnp-js

```
npm install sp-pnp-js --save
```

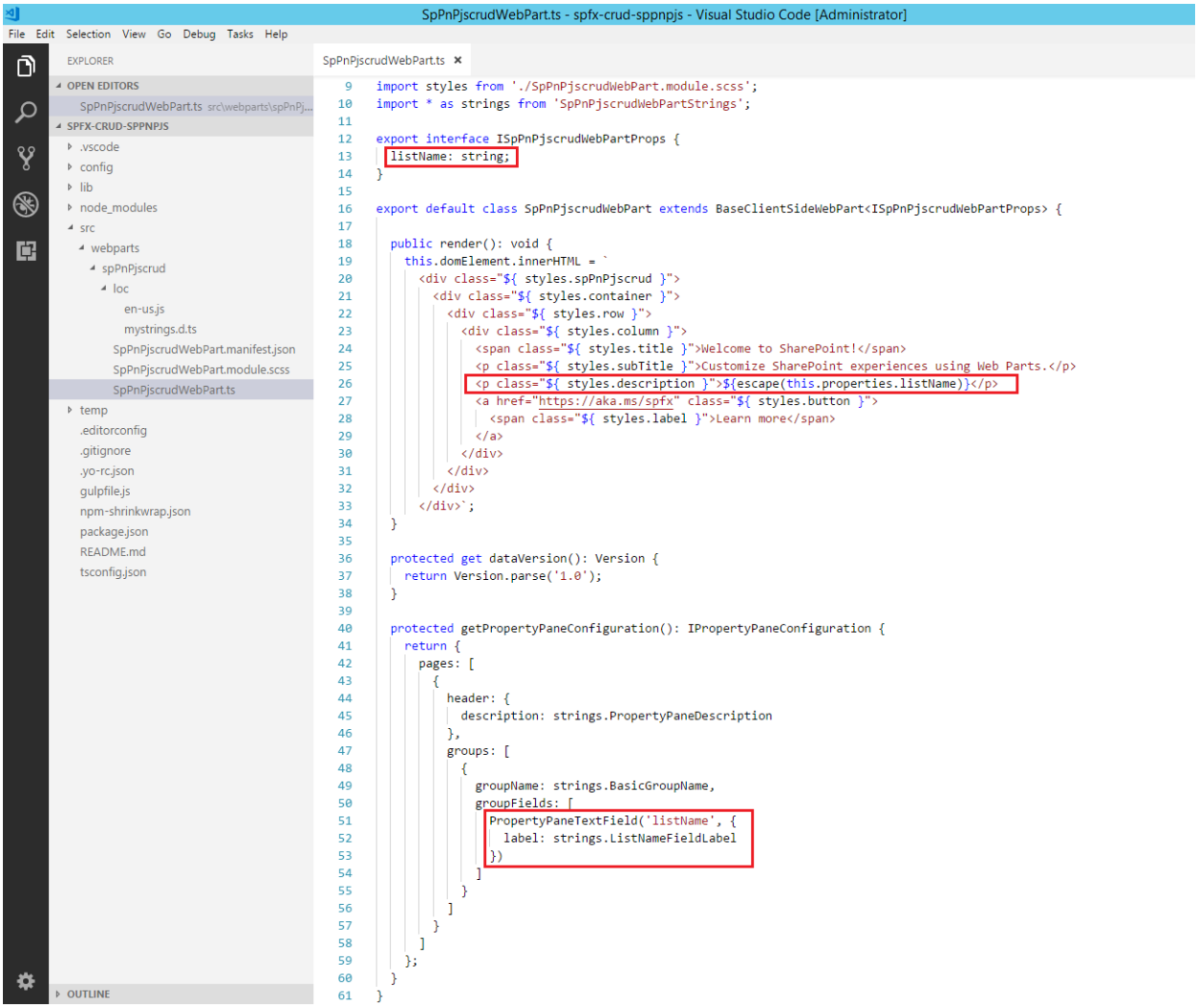
Configure Property for List Name

SPFx solution by default have description property created. Let us change the property to list name. We will use this property to configure the list name on which the CRUD operation is to perform.

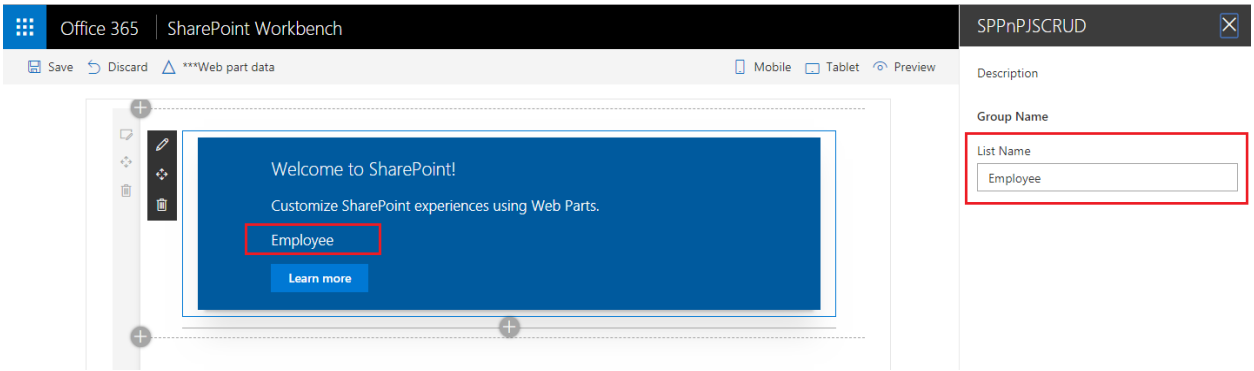
1. Open mystrings.d.ts under \src\webparts\spPnPjscrud\loc\ folder
2. Rename DescriptionFieldLabel to ListNameFieldLabel

3. In en-us.js file under \src\webparts\spPnPjscrud\loc\ folder set the display name for listName property

4. Open main webpart file (SpPnPjscrudWebPart.ts) under \src\webparts\spPnPjscrud folder.
5. Rename description property pane field to listName

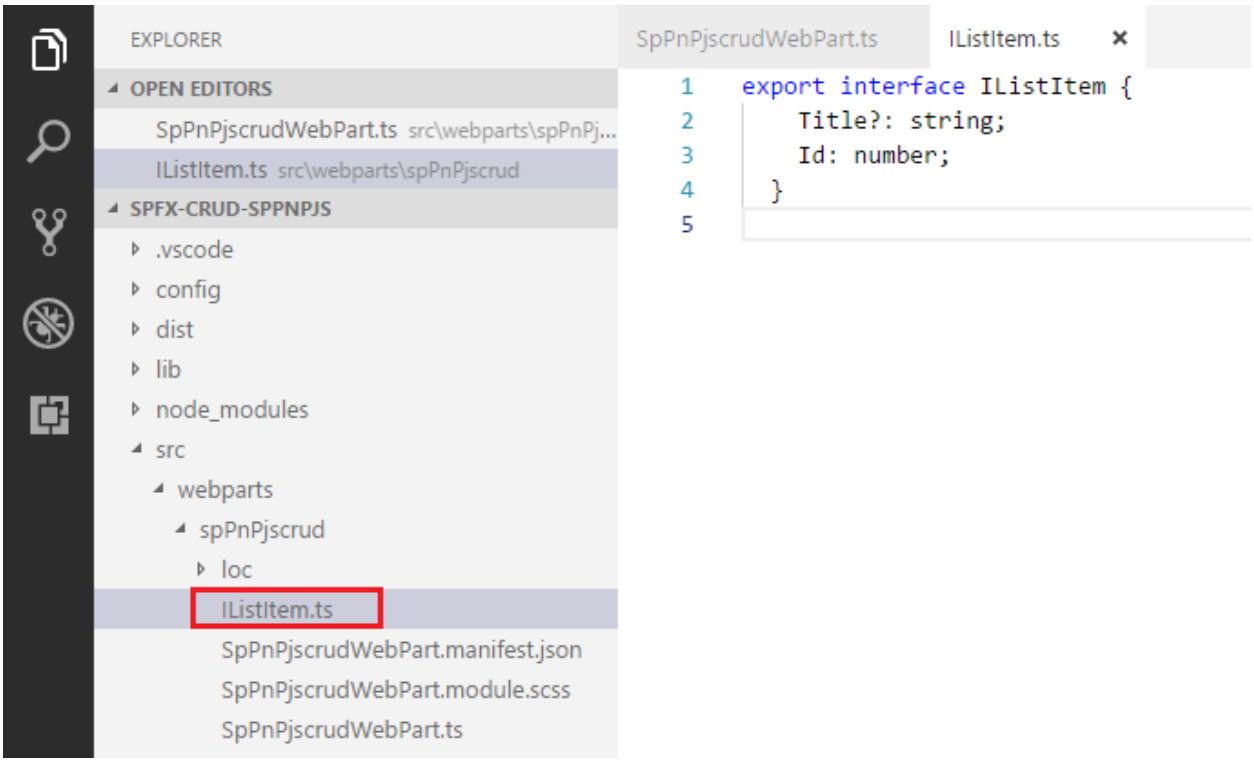


6. In the command prompt, type “gulp serve”
7. In the SharePoint local workbench page, add the web part.
8. Edit the web part to ensure the listName property pane field is getting reflected.



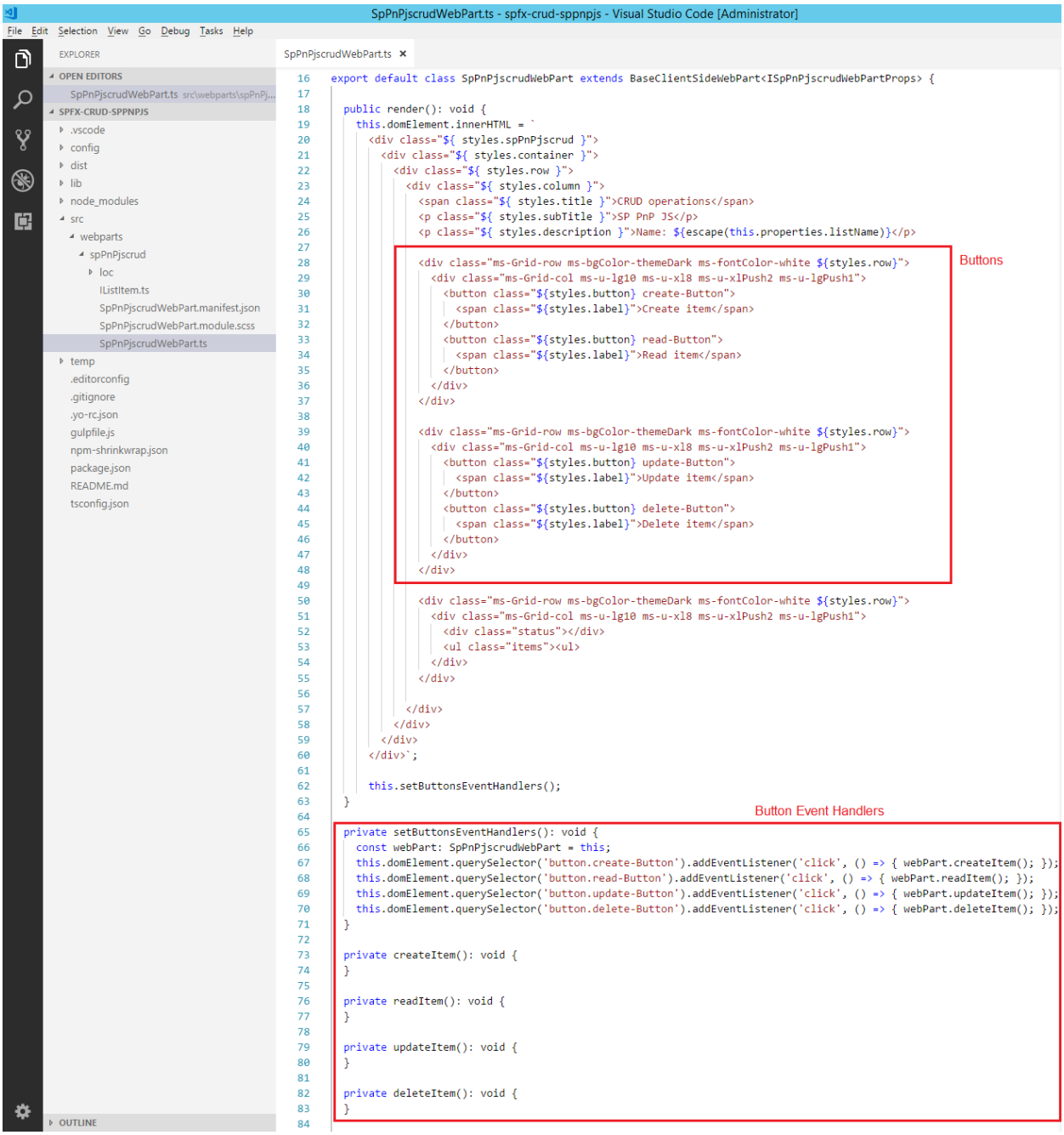
Model for List Item

Add a class (IListItem.ts) representing the list item.

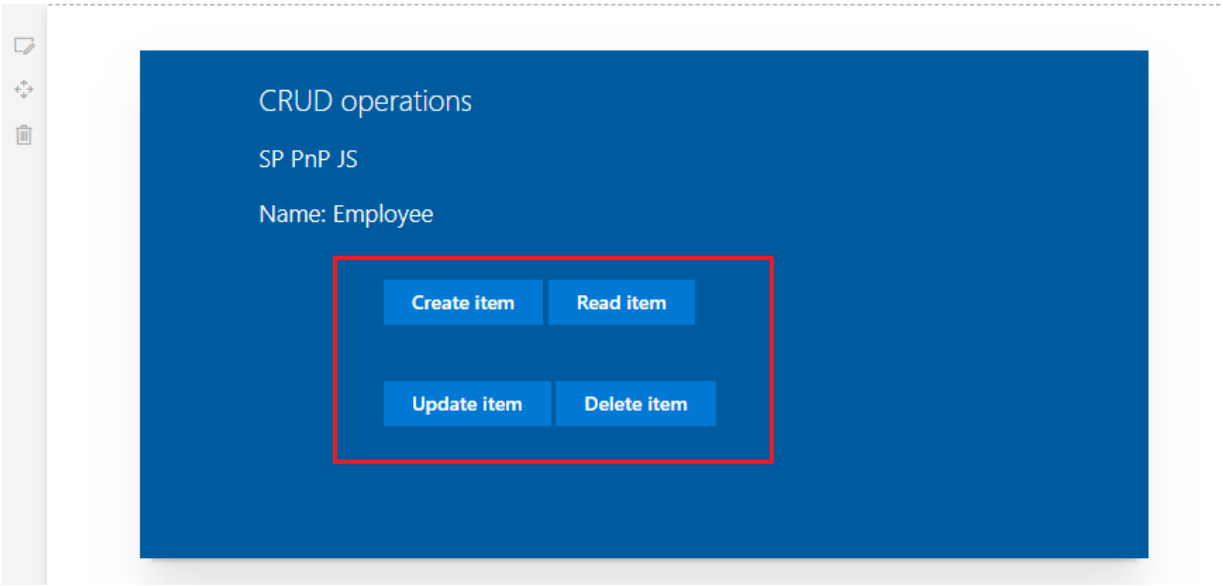


Add Controls to WebPart

1. Open main webpart file (SpPnPjscrudWebPart.ts) under \src\webparts\spPnPjscrud folder.
2. Modify Render method to include buttons for CRUD operations and add event handlers to each of the button



3. In the command prompt type “gulp serve” to see the buttons on webpart.



4. We will use the sp-pnp-js APIs to perform CRUD operations. Let us implement generic method which will return the id of latest item from given list using sp-pnp-js APIs.

```
private getLatestItemId(): Promise<number> {
  return new Promise<number>((resolve: (itemId: number) => void, reject: (error: any) => void): void => {
    sp.web.lists.getByTitle(this.properties.listName)
      .items.orderBy('Id', false).top(1).select('Id').get()
      .then((items: { Id: number }[]): void => {
        if (items.length === 0) {
          resolve(-1);
        }
        else {
          resolve(items[0].Id);
        }
      }, (error: any): void => {
        reject(error);
      });
  });
}
```

Import sp-pnp-js

Add below import statements to main web part.

SpPnPjscrudWebPart.ts

```
11
12  import { IListItem } from './IListItem';
13  import pnp, { sp, Item, ItemAddResult, ItemUpdateResult } from "sp-pnp-js";
14
```

Implement Create Operation

We will use the sp-pnp-js API of items.add to add the item to list

```
private createItem(): void {
  this.updateStatus('Creating item...');

  sp.web.lists.getByTitle(this.properties.listName).items.add({
    'Title': `Item ${new Date()}`
  }).then((result: ItemAddResult): void => {
    const item: IListItem = result.data as IListItem;
    this.updateStatus(`Item '${item.Title}' (ID: ${item.Id}) successfully created`);
  }, (error: any): void => {
    this.updateStatus('Error while creating the item: ' + error);
  });
}
```

Implement Read Operation

We will use sp-pnp-js API - getById to read the item.

```
private readItem(): void {
  this.updateStatus('Reading latest items...');

  this.getLatestItemId()
    .then((itemId: number): Promise<IListItem> => {
      if (itemId === -1) {
        throw new Error('No items found in the list');
      }

      this.updateStatus(`Loading information about item ID: ${itemId}...`);
      return sp.web.lists.getByTitle(this.properties.listName)
        .items.getById(itemId).select('Title', 'Id').get();
    })
    .then((item: IListItem): void => {
      this.updateStatus(`Item ID: ${item.Id}, Title: ${item.Title}`);
    }, (error: any): void => {
      this.updateStatus('Loading latest item failed with error: ' + error);
    });
}
```

Implement Update Operation

We will use sp-pnp-js API - update

```
private updateItem(): void {
  this.updateStatus('Loading latest items...');
  let latestItemId: number = undefined;
  let etag: string = undefined;

  this.getLatestItemId()
    .then((itemId: number): Promise<Item> => {
      if (itemId === -1) {
        throw new Error('No items found in the list');
      }

      latestItemId = itemId;
      this.updateStatus(`Loading information about item ID: ${itemId}...`);
      return sp.web.lists.getByTitle(this.properties.listName)
        .items.getById(itemId).get(undefined, {
          headers: {
            'Accept': 'application/json;odata=minimalmetadata'
          }
        });
    })
    .then((item: Item): Promise<IListItem> => {
      etag = item["odata.etag"];
      return Promise.resolve((item as any) as IListItem);
    })
    .then((item: IListItem): Promise<ItemUpdateResult> => {
      return sp.web.lists.getByTitle(this.properties.listName)
        .items.getById(item.Id).update({
          'Title': `Updated Item ${new Date()}`
        }, etag);
    })
    .then((result: ItemUpdateResult): void => {
      this.updateStatus(`Item with ID: ${latestItemId} successfully updated`);
    }, (error: any): void => {
      this.updateStatus('Loading latest item failed with error: ' + error);
    });
}
```

Implement Delete Operation

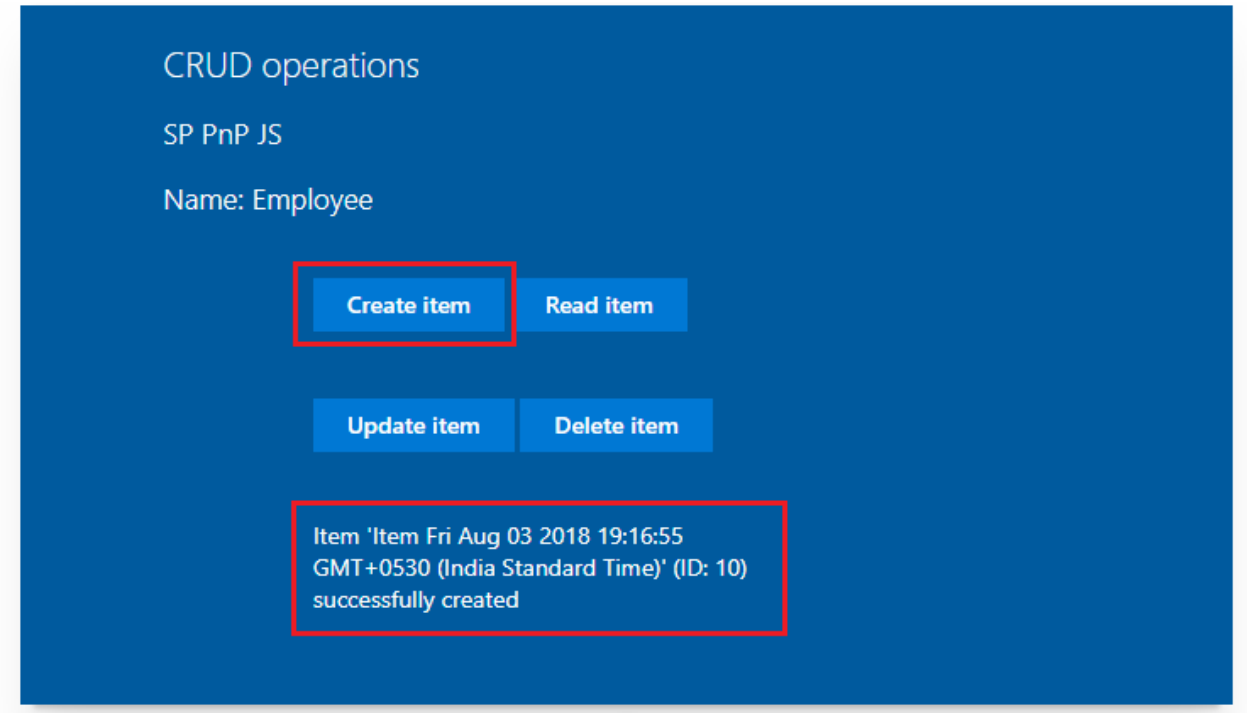
We will use sp-pnp-js API - delete

```
private deleteItem(): void {
  if (!window.confirm('Are you sure you want to delete the latest item?')) {
    return;
  }

  this.updateStatus('Loading latest items...');
  let latestItemId: number = undefined;
  let etag: string = undefined;
  this.getLatestItemId()
    .then((itemId: number): Promise<Item> => {
      if (itemId === -1) {
        throw new Error('No items found in the list');
      }

      latestItemId = itemId;
      this.updateStatus(`Loading information about item ID: ${latestItemId}...`);
      return sp.web.lists.getByTitle(this.properties.listName)
        .items.getById(latestItemId).select('Id').get(undefined, {
          headers: {
            'Accept': 'application/json;odata=minimalmetadata'
          }
        });
    })
    .then((item: Item): Promise<IListItem> => {
      etag = item["odata.etag"];
      return Promise.resolve((item as any) as IListItem);
    })
    .then((item: IListItem): Promise<void> => {
      this.updateStatus(`Deleting item with ID: ${latestItemId}...`);
      return sp.web.lists.getByTitle(this.properties.listName)
        .items.getById(item.Id).delete(etag);
    })
    .then((): void => {
      this.updateStatus(`Item with ID: ${latestItemId} successfully deleted`);
    }, (error: any): void => {
      this.updateStatus(`Error deleting item: ${error}`);
    });
}
```

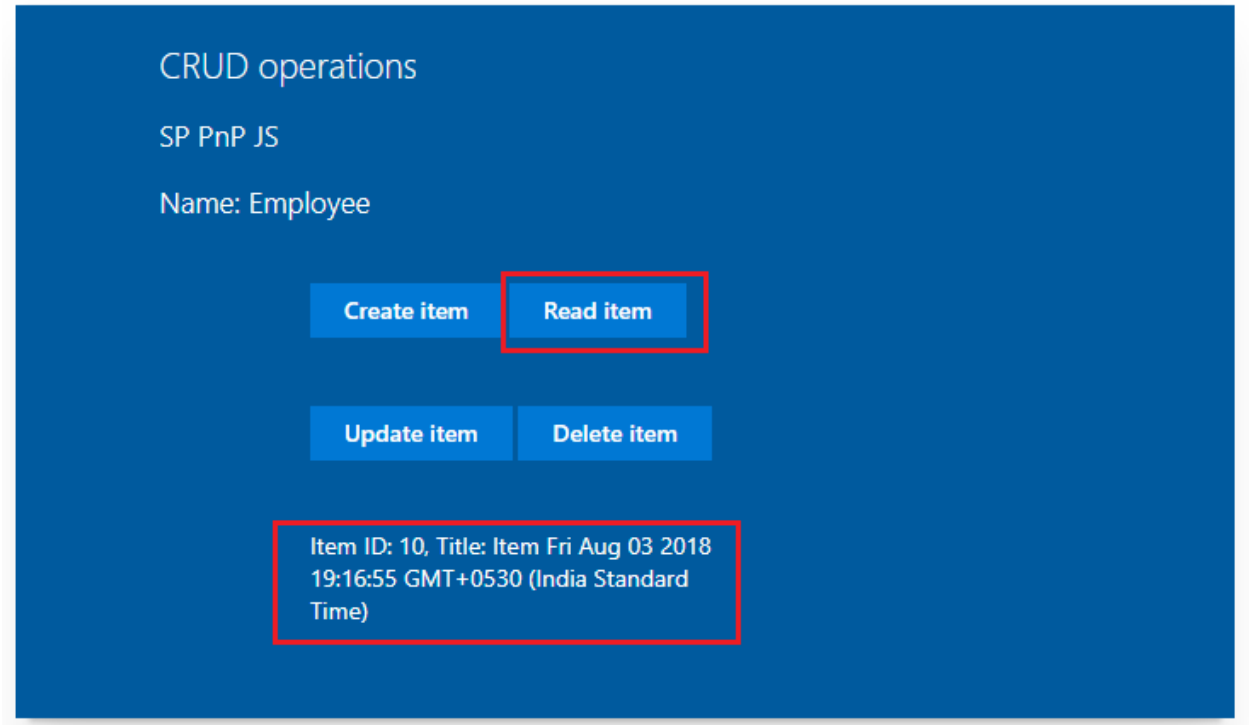
Test the WebPart

1. On the command prompt, type “gulp serve”
2. Open SharePoint site
3. Navigate to /_layouts/15/workbench.aspx
4. Add the webpart to page.
5. Edit webpart, in the properties pane type the list name
6. Click the buttons (Create Item, Read Item, Update Item, and Delete Item) one by one to test the webpart
7. Verify the operations are taking place in SharePoint list.

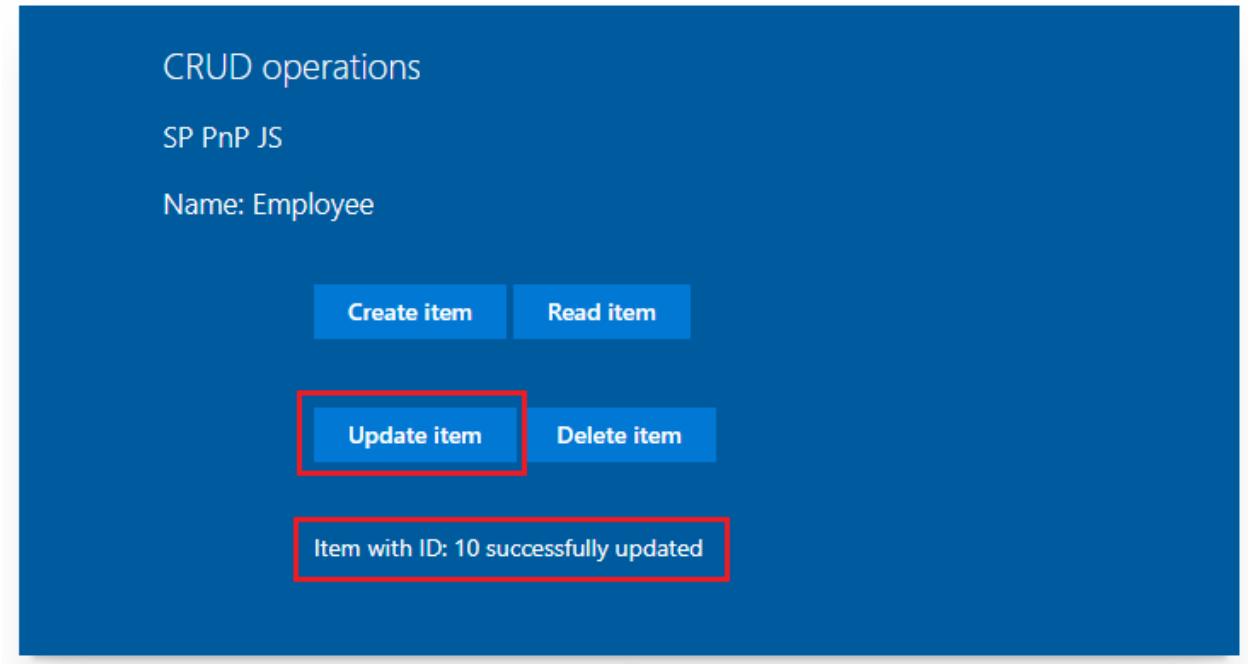
Create Operation



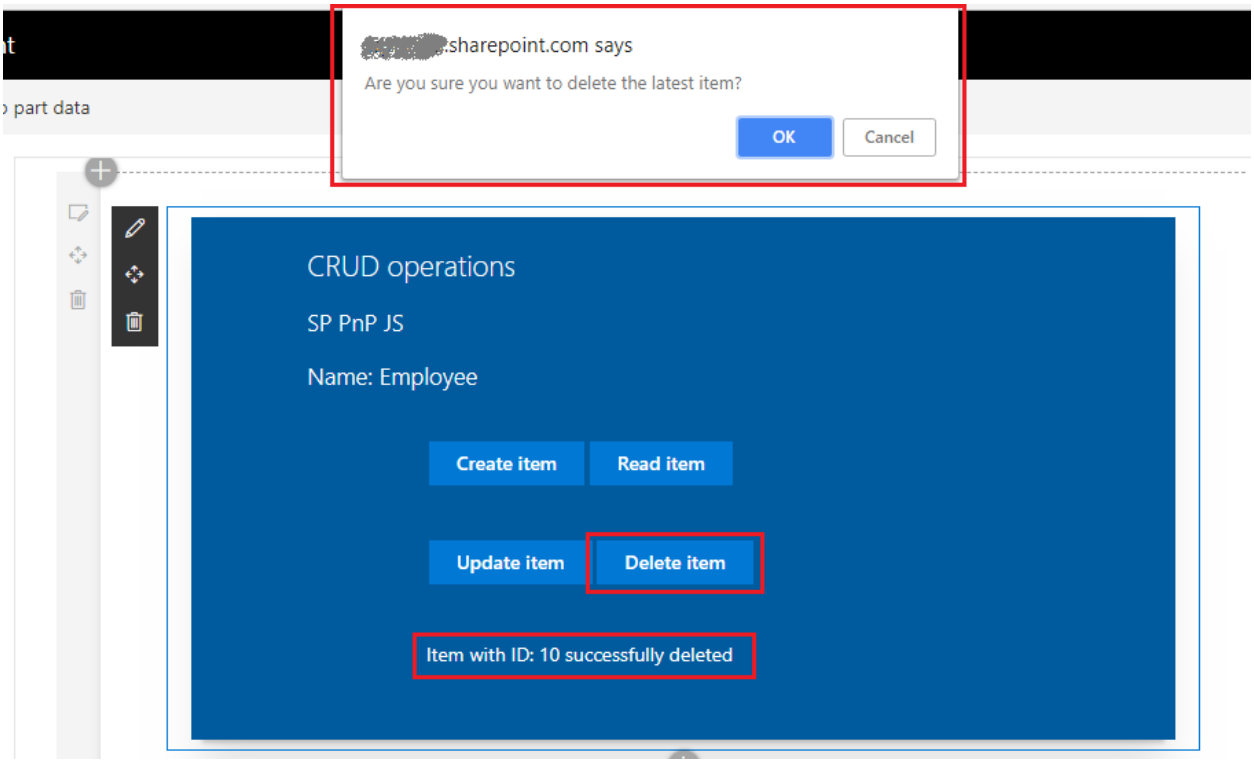
Read Operation



Update Operation



Delete Operation



Summary

sp-pnp-js APIs helps to perform common operations (like CRUD) with SharePoint easily. It makes the code lesser to maintain. Developer can concentrate on business logic rather than worrying about the identifying and using various REST APIs to use in the code.

Chapter 15: Integrating Office UI Fabric

Overview

SharePoint Framework (SPFx) offers lightweight, responsive client side web part development for classic as well modern SharePoint. In this chapter, we will explore how we can integrate the Office UI Fabric in to SharePoint Framework.

The UI Challenges

In the SharePoint journey so far, we have been developing custom web parts. Developing the visual interface for each of the custom web part had involved significant efforts from SharePoint developers as well UX designers and UI developers to make the web part look like an integral part of the SharePoint portal. Huge efforts were invested in designing the CSS classes and placing the required controls (like labels, textboxes, buttons, etc.) on the web part. This also had its own challenge to rewrite while re-branding the SharePoint portals.

Office UI Fabric handles this challenges gracefully for SharePoint developers and designers so that they can build the client side web parts which can resemble their appearance to Office 365 and provide responsiveness.

Brief information about Office UI Fabric

Office UI Fabric is official front end framework to build the experiences that fit seamlessly in Office 365. The Office UI Fabric components are built with React JS. Microsoft uses Fabric Core and Fabric React which offers numerous components and styles. Read more about Office UI Fabric at https://developer.microsoft.com/en-us/fabric

Office UI Fabric for SharePoint Framework

SharePoint Framework Fabric Core npm package (@microsoft/sp-office-ui-fabric-core) is a subset of Fabric core styles that can be easily integrated with SharePoint Framework. Yeoman generator for SharePoint Framework (from version 1.3.4 onwards) supports Office UI Fabric by default.

To install Fabric Core package in your existing project, use below command

```
npm install @microsoft/sp-office-ui-fabric-core –save
```

To use Fabric Core styles, use below declaration

```
@import '~@microsoft/sp-office-ui-fabric-core/dist/sass/SPFabricCore.scss';
```

However, it is recommended to use Office UI Fabric React package with SharePoint Framework.

Create SPFx Solution

1. Open command prompt. Create a directory for SPFx solution

```
md spfx-officeuifabric
```

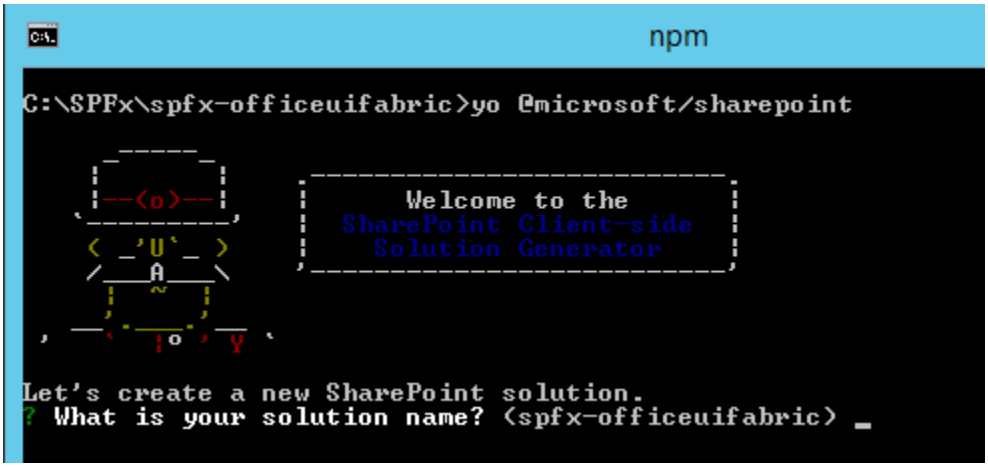
2. Navigate to above created directory

```
cd spfx-officeuifabric
```

3. Run Yeoman SharePoint Generator to create the solution

```
yo @microsoft/sharepoint
```

4. Yeoman generator will present you with the wizard by asking questions about the solution to be created.



Solution Name: Hit enter to have default name (spfx-officeuifabric in this case) or type in any other name for your solution.
Selected choice: Hit enter

Target for component: Here we can select the target environment where we are planning to deploy the client webpart i.e. SharePoint Online or SharePoint OnPremise (SharePoint 2016 onwards).
Selected choice: SharePoint Online only (latest)

Place of files: We may choose to use the same folder or create a subfolder for our solution.
Selected choice: Same folder

Deployment option: Selecting Y will allow the app to deployed instantly to all sites and will be accessible everywhere.
Selected choice: N (install on each site explicitly)

Type of client-side component to create: We can choose to create client side webpart or an extension. Choose webpart option.

Selected choice: WebPart

Web part name: Hit enter to select the default name or type in any other name.
Selected choice: OfficeUIFabricExamples

Web part description: Hit enter to select the default description or type in any other value.
Selected choice: Office UI Fabric Integration with SPFx

Framework to use: Select any JavaScript framework to develop the component. Available choices are (No JavaScript Framework, React, and Knockout)
Selected choice: React

5. Yeoman generator will perform scaffolding process to generate the solution. The scaffolding process will take significant amount of time.
6. Once the scaffolding process is completed, lock down the version of project dependencies by running below command

```
npm shrinkwrap
```

7. In the command prompt type below command to open the solution in code editor of your choice.

```
code .
```

Office UI Fabric Components

Office UI Fabric majorly have below categorized components:

Basic Inputs

- Button
- Checkbox
- ChoiceGroup
- ComboBox
- ContextualMenu
- Dropdown
- Label
- Link
- Rating
- Slider
- SpinButton
- TextField
- Toggle

Navigation

- Breadcrumb
- CommandBar
- Nav
- OverflowSet
- Pivot
- SearchBox

Content

- ActivityItem
- Calendar
- DetailsList
- Facepile
- GroupedList
- Icon
- Image
- List
- Persona

Pickers

- Pickers
- ColorPicker
- DatePicker
- PeoplePicker
- SwatchColorPicker

Progress & Validation

- MessageBar
- ProgressIndicator
- Shimmer
- Spinner

Surfaces

- Callout
- Dialog

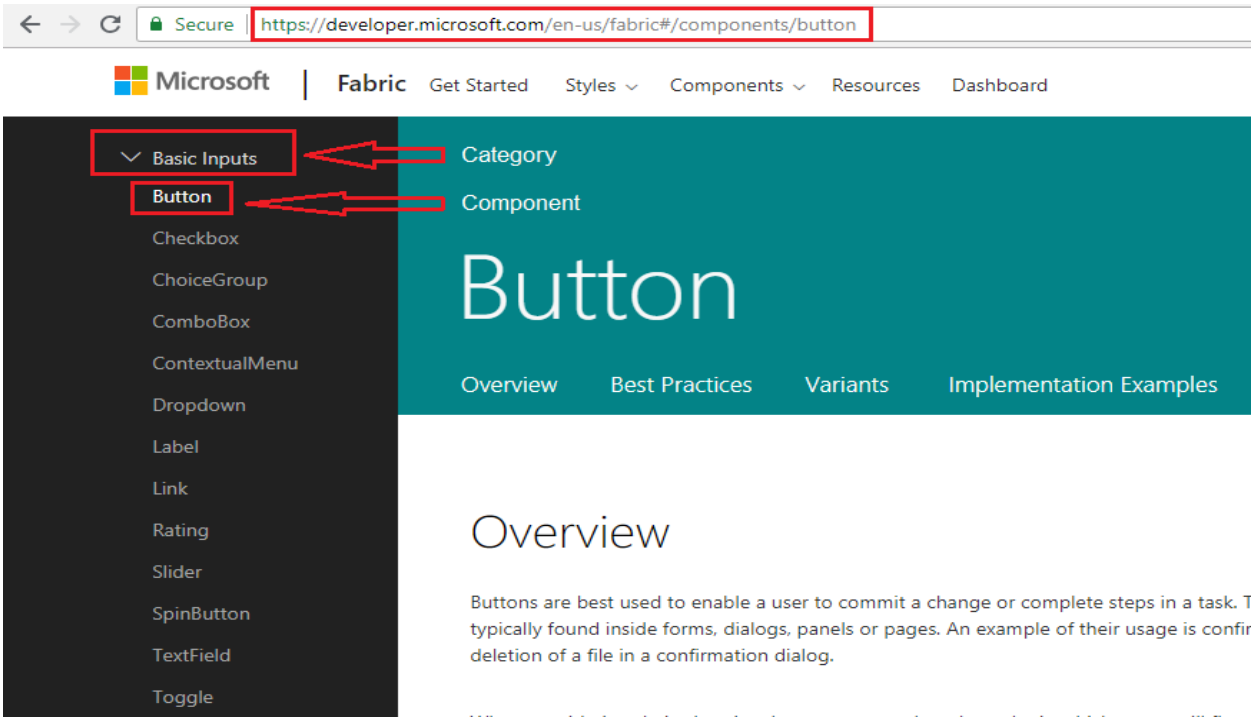
- DocumentCard
- HoverCard
- Layer
- Modal
- Overlay
- Panel
- ScrollablePane
- TeachingBubble
- Tooltip
- Coachmark

Utilities

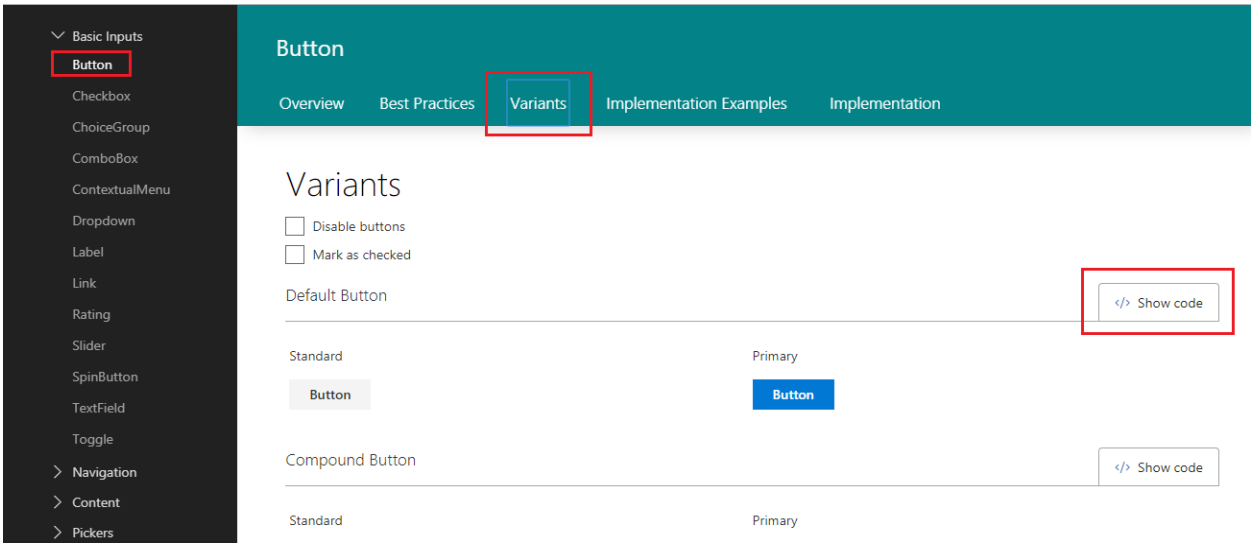
- FocusTrapZone
- FocusZone
- MarqueeSelection
- ResizeGroup
- Selection
- Themes

How to use Office UI Fabric Components in SPFx WebPart

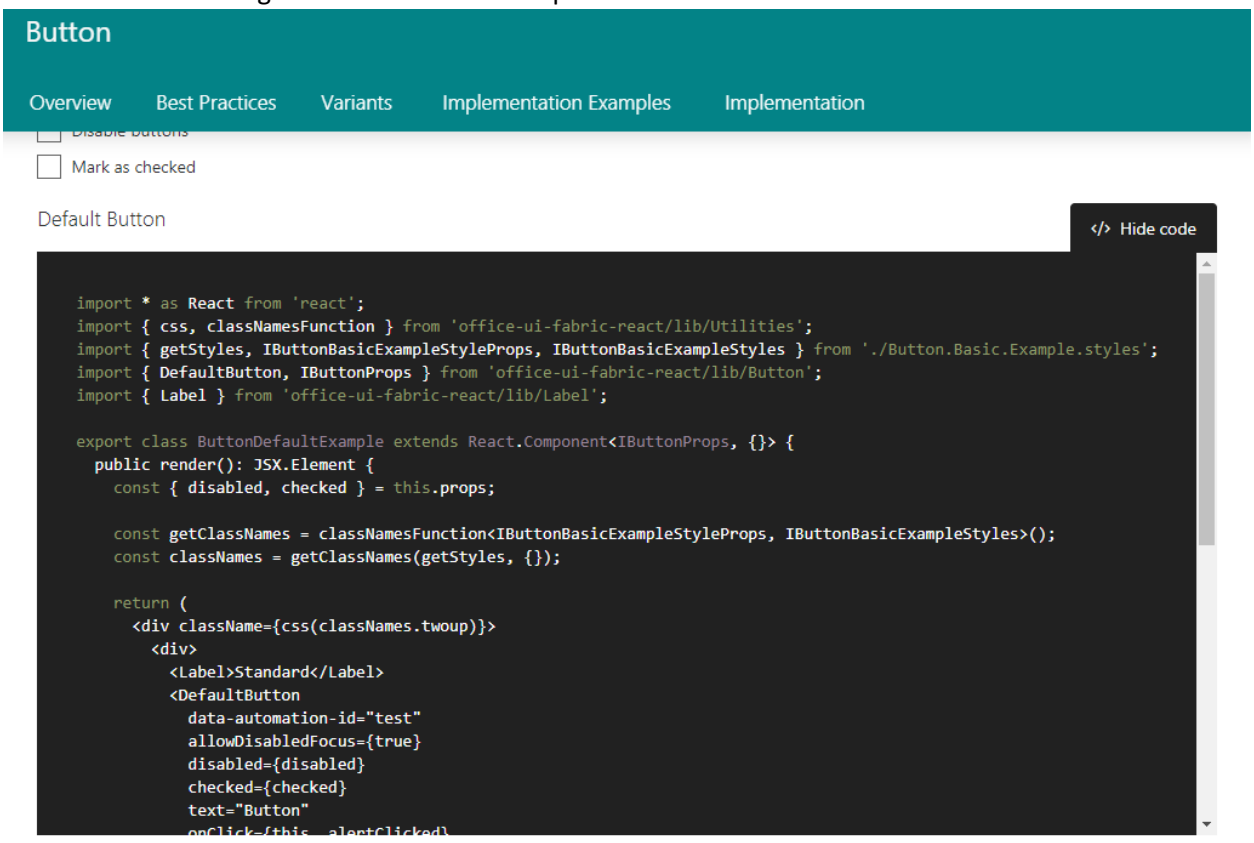
1. Navigate to Office UI Fabric Components site at https://developer.microsoft.com/en-us/fabric#/components
2. Select and expand the Category of your component
3. Click the component node
4. Below is an example of selecting a button component



5. Alternatively, search your component from search box
6. Click **Variants** tab to see the variations for use of the component



7. Click “Show code” to get the code for the component



8. Copy entire code or part of it to use in your SPFx solution

Implement Greet Message WebPart using Office UI Fabric

Using the Office UI Fabric components, we will implement simple webpart, having below components

Textbox – Accepts user name

Button – with text as “Greet” on click of which will show an alert greeting the text typed in textbox

1. In the solution, add file IComponentState.ts, which will represent the state of entered user name

```
export interface IComponentState {
    userName: string;
}
```

2. open OfficeUiFabricExamples.tsx under “\src\webparts\officeUiFabricExamples\components\” folder
3. Import Textfield and button components

```
// Import Textfield component
import { TextField } from 'office-ui-fabric-react/lib/TextField';

// Import Button component
import { IButtonProps, DefaultButton } from 'office-ui-fabric-
react/lib/Button';
```

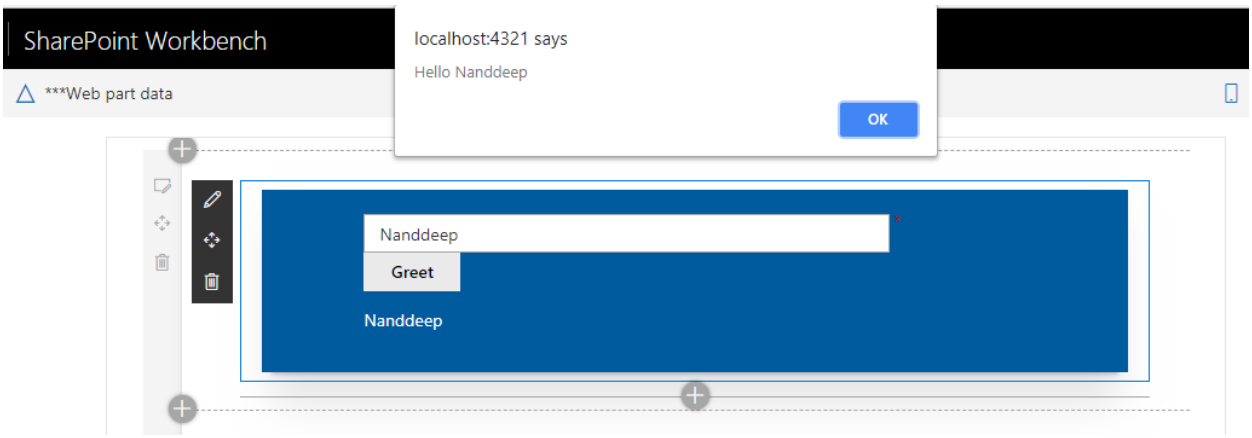
4. Add components to Render method

```
export default class OfficeUiFabricExamples extends
React.Component<IOfficeUiFabricExamplesProps, IComponentState> {
  constructor(props: IOfficeUiFabricExamplesProps, state:
IComponentState) {
    super(props);

    this.state = ({
      userName: ''
    });

    this._greetClicked = this._greetClicked.bind(this);
  }

  public render(): React.ReactElement<IOfficeUiFabricExamplesProps> {
    return (
      <div className={ styles.officeUiFabricExamples }>
        <div className={ styles.container }>
          <div className={ styles.row }>
            <div className={ styles.column }>
```

```
              <div className="docs-TextFieldExample">
                <TextField
                  required={true}
                  name="txtUserName"
                  placeholder="Your name please!"
                  value={this.state.userName}
                  onChanged={e => this.setState({ userName: e })}
                />

                <DefaultButton
                  data-automation-id="greet"
                  target="_blank"
                  title="Greet the user!"
                  onClick={this._greetClicked}
                  >
                  Greet
                </DefaultButton>

                <p>{this.state.userName}</p>
              </div>
            </div>
          </div>
        </div>
      </div>
    );
  }

  private _greetClicked(): void {
    alert('Hello ' + this.state.userName);
  }
}
```

Test the WebPart

1. On the command prompt, type “gulp serve”
2. SharePoint local workbench will open
3. Add the webpart to page
4. Enter text in TextBox component, click Greet button. An alert should appear greeting the value entered in textbox



Summary

Office UI Fabric React components helps to develop robust and consistent design across SharePoint modern experiences. Office UI Fabric is available out of the box for developers in SharePoint Framework.

Chapter 16: Provision SharePoint Assets

Overview

SharePoint components like web parts normally interact with the SharePoint assets like lists, libraries, content types, etc. In the full trust solutions, we deploy these SharePoint assets along with web part in a single deployable package (.wsp).

Similarly, SharePoint Framework (SPFx) client side web parts do interact with the underlying lists and libraries in SharePoint site. These SharePoint assets needs to be provisioned along with the client side solution package. SharePoint framework toolchain allows to package and deploy SharePoint assets with client side solution package.

In this chapter, we will explore how we can package together the SharePoint assets needed for SPFx web parts.

SharePoint Assets

SharePoint assets is a generic term referred to basic building blocks of SharePoint that constitutes fields, content types, list instances.

Fields (Site Columns):

A field is metadata that describes property or attribute of object we want to represent. For example, an Employee can be represented with ID, Name, Department, etc. Each field has a specific type such as text, number, Boolean, etc.

Below is an example of field representing number

```
<Field ID="{060E50AC-E9C1-4D3C-B1F9-DE0BCAC300F6}"
           Name="SPFxAmount"
           DisplayName="Amount"
           Type="Currency"
           Decimals="2"
           Min="0"
           Required="FALSE"
           Group="SPFx Columns" />
```

Content types

Content type is reusable collection of site columns.

Below is an example of content type that uses site column.

```
<ContentType ID="0x010042D0C1C200A14B6887742B6344675C8B"
           Name="Cost Center"
           Group="SPFx Content Types"
           Description="Content types from SPFx">
       <FieldRefs>
```

```
            <FieldRef ID="{060E50AC-E9C1-4D3C-B1F9-DE0BCAC300F6}" />
        </FieldRefs>
    </ContentType>
```

List instance

List instance is pre-defined SharePoint list with well-known identifier. We can add, update, and delete items from list.

```
<ListInstance
            FeatureId="00bfea71-de22-43b2-a848-c05709900100"
            Title="SPFx List"
            Description="SPFx List"
            TemplateType="100"
            Url="Lists/SPFxList">
    </ListInstance>
```

List instance with custom schema

We can create our own schema to define fields, content types, and views for list instance. Use CustomSchema attribute in ListInstance element to reference custom schema.

```
<ListInstance
            CustomSchema="schema.xml"
            FeatureId="00bfea71-de22-43b2-a848-c05709900100"
            Title="SPFx List"
            Description="SPFx List"
            TemplateType="100"
            Url="Lists/SPFxList">
    </ListInstance>
```

Create SPFx Solution

1. Open command prompt. Create a directory for SPFx solution

```
md spfx-provisionspassets
```

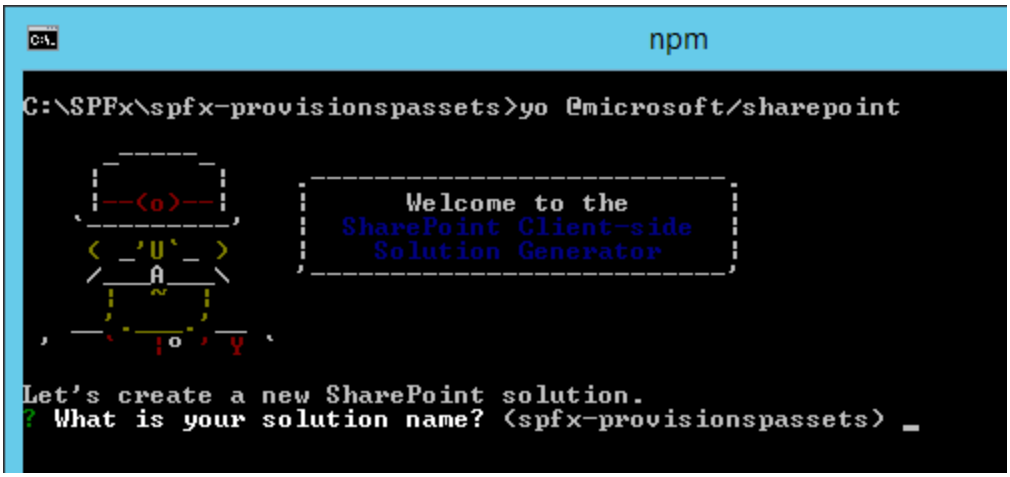
2. Navigate to above created directory

```
cd spfx-provisionspassets
```

3. Run Yeoman SharePoint Generator to create the solution

```
yo @microsoft/sharepoint
```

4. Yeoman generator will present you with the wizard by asking questions about the solution to be created.



Solution Name: Hit enter to have default name (spfx-provisionspassets in this case) or type in any other name for your solution.
Selected choice: Hit enter

Target for component: Here we can select the target environment where we are planning to deploy the client webpart i.e. SharePoint Online or SharePoint OnPremise (SharePoint 2016 onwards).
Selected choice: SharePoint Online only (latest)

Place of files: We may choose to use the same folder or create a subfolder for our solution.
Selected choice: Same folder

Deployment option: Selecting Y will allow the app to deployed instantly to all sites and will be accessible everywhere.
Selected choice: N (install on each site explicitly)

Type of client-side component to create: We can choose to create client side webpart or an extension. Choose webpart option.
Selected choice: WebPart

Web part name: Hit enter to select the default name or type in any other name.
Selected choice: ProvisionSPAssets

Web part description: Hit enter to select the default description or type in any other value.
Selected choice: Provision SharePoint Assets with SPFx

Framework to use: Select any JavaScript framework to develop the component. Available choices are (No JavaScript Framework, React, and Knockout)
Selected choice: No JavaScript Framework

5. Yeoman generator will perform scaffolding process to generate the solution. The scaffolding process will take significant amount of time.
6. Once the scaffolding process is completed, lock down the version of project dependencies by running below command

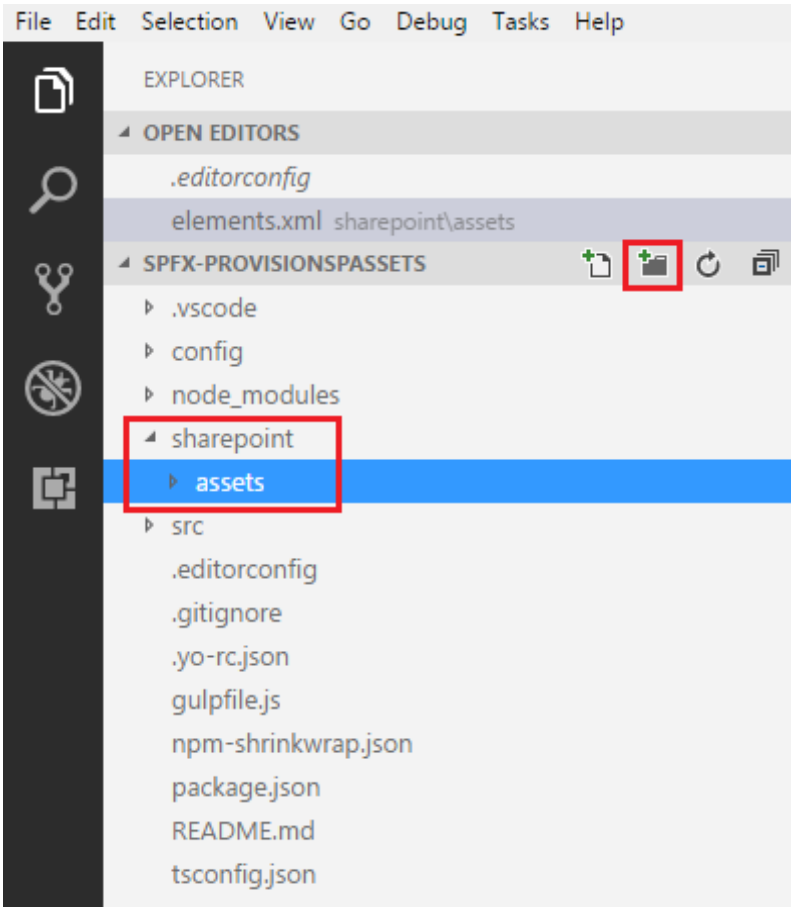
```
npm shrinkwrap
```

7. In the command prompt type below command to open the solution in code editor of your choice.

```
code .
```

Add SharePoint Assets to Solution

1. Create a folder hierarchy as sharepoint\assets



2. Add a file elements.xml under sharepoint\assets folder

```
<?xml version="1.0" encoding="utf-8"?>
<Elements xmlns="http://schemas.microsoft.com/sharepoint/">

   <Field ID="{060E50AC-E9C1-4D3C-B1F9-DE0BCAC300F6}"
```

```
            Name="SPFxAmount"
            DisplayName="Amount"
            Type="Currency"
            Decimals="2"
            Min="0"
            Required="FALSE"
            Group="SPFx Columns" />

    <Field ID="{943E7530-5E2B-4C02-8259-CCD93A9ECB18}"
            Name="SPFxCostCenter"
            DisplayName="Cost Center"
            Type="Choice"
            Required="FALSE"
            Group="SPFx Columns">
        <CHOICES>
        <CHOICE>Administration</CHOICE>
        <CHOICE>Information</CHOICE>
        <CHOICE>Facilities</CHOICE>
        <CHOICE>Operations</CHOICE>
        <CHOICE>Sales</CHOICE>
        <CHOICE>Marketing</CHOICE>
        </CHOICES>
    </Field>

    <ContentType ID="0x010042D0C1C200A14B6887742B6344675C8B"
            Name="Cost Center"
            Group="SPFx Content Types"
            Description="Sample content types from web part solution">
        <FieldRefs>
            <FieldRef ID="{060E50AC-E9C1-4D3C-B1F9-DE0BCAC300F6}" />
            <FieldRef ID="{943E7530-5E2B-4C02-8259-CCD93A9ECB18}" />
        </FieldRefs>
    </ContentType>

    <ListInstance
            CustomSchema="schema.xml"
            FeatureId="00bfea71-de22-43b2-a848-c05709900100"
            Title="SPFx List"
            Description="SPFx List"
            TemplateType="100"
            Url="Lists/SPFxList">
    </ListInstance>

</Elements>
```

We are provisioning 2 fields, content type and list instance with custom schema. FeatureId in the ListInstance represents the ID of feature which contains list definition. The featureId mentioned in the xml represents the ID for custom list definition.

Custom Schema

Add schema.xml file as our custom schema

```
<List xmlns:ows="Microsoft SharePoint" Title="Basic List"
EnableContentTypes="TRUE" FolderCreation="FALSE"
Direction="$Resources:Direction;" Url="Lists/Basic List" BaseType="0"
xmlns="http://schemas.microsoft.com/sharepoint/">
 <MetaData>
   <ContentTypes>
     <ContentTypeRef ID="0x010042D0C1C200A14B6887742B6344675C8B" />
   </ContentTypes>
   <Fields></Fields>
   <Views>
     <View BaseViewID="1" Type="HTML" WebPartZoneID="Main"
DisplayName="$Resources:core,objectiv_schema_mwsidcamlidC24;"
DefaultView="TRUE" MobileView="TRUE" MobileDefaultView="TRUE"
SetupPath="pages\viewpage.aspx" ImageUrl="/_layouts/images/generic.png"
Url="AllItems.aspx">
       <XslLink Default="TRUE">main.xsl</XslLink>
       <JSLink>clienttemplates.js</JSLink>
       <RowLimit Paged="TRUE">30</RowLimit>
       <Toolbar Type="Standard" />
       <ViewFields>
         <FieldRef Name="LinkTitle"></FieldRef>
         <FieldRef Name="SPFxAmount"></FieldRef>
         <FieldRef Name="SPFxCostCenter"></FieldRef>
       </ViewFields>
       <Query>
         <OrderBy>
           <FieldRef Name="ID" />
         </OrderBy>
       </Query>
     </View>
   </Views>
   <Forms>
     <Form Type="DisplayForm" Url="DispForm.aspx"
SetupPath="pages\form.aspx" WebPartZoneID="Main" />
     <Form Type="EditForm" Url="EditForm.aspx"
SetupPath="pages\form.aspx" WebPartZoneID="Main" />
```

```
      <Form Type="NewForm" Url="NewForm.aspx" SetupPath="pages\form.aspx"
WebPartZoneID="Main" />
   </Forms>
 </MetaData>
</List>
```

Package Assets as part of Solution

We have created the assets and custom schema. We need to package these files as part of solution.

1. Open package-solution.json file under config folder
2. Include feature framework definition for solution package

```
{
  "$schema": "https://developer.microsoft.com/json-schemas/spfx-build/package-
solution.schema.json",
  "solution": {
    "name": "spfx-provisionspassets-client-side-solution",
    "id": "ea551656-9f74-4107-b049-e296e475932d",
    "version": "1.0.0.0",
    "includeClientSideAssets": true,
    "features": [{
      "title": "asset-deployment-webpart-client-side-solution",
      "description": "asset-deployment-webpart-client-side-solution",
      "id": "523fe887-ced5-4036-b564-8dad5c6c6e24",     // Specify unique GUID
      "version": "1.0.0.0",
      "assets": {
        "elementManifests": [
          "elements.xml"
        ],
        "elementFiles":[
          "schema.xml"
        ]
      }
    }]
  },
  "paths": {
    "zippedPackage": "solution/spfx-provisionspassets.sppkg"
  }
}
```

Specify unique GUID for feature ID.

Deploy and Test

1. Package your client-side solution by running below command

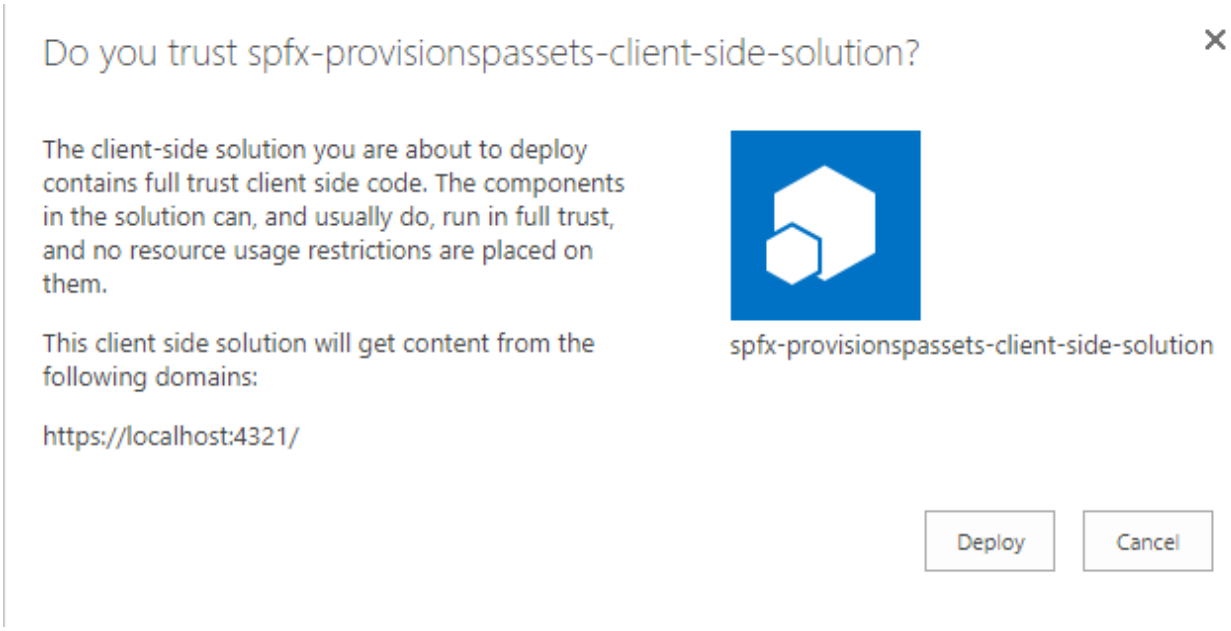
```
gulp bundle
```

2. Create solution package by running below command

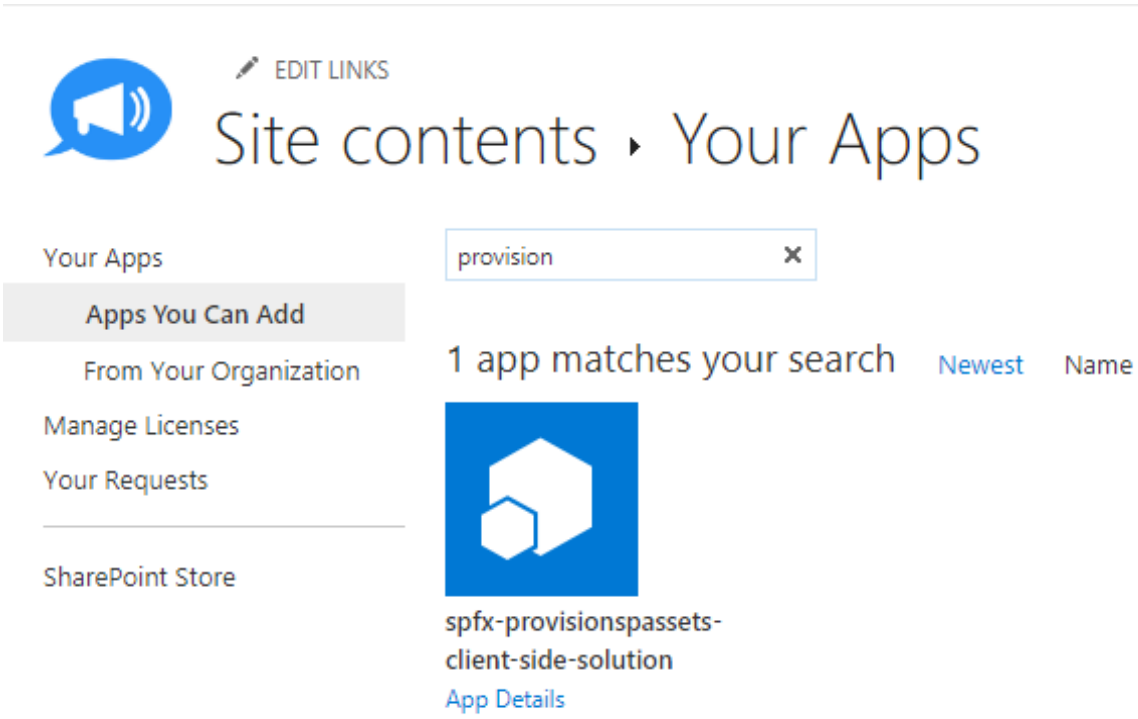
```
gulp package-solution
```

This command will create package (.sppkg) inside sharepoint/solution folder.

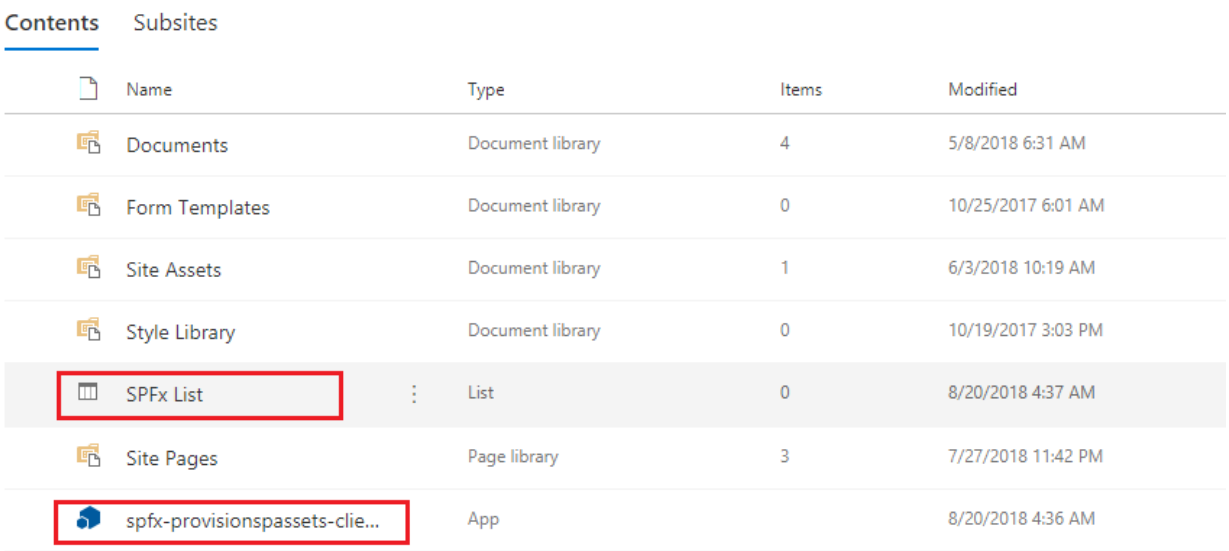
3. Deploy the package to app catalog



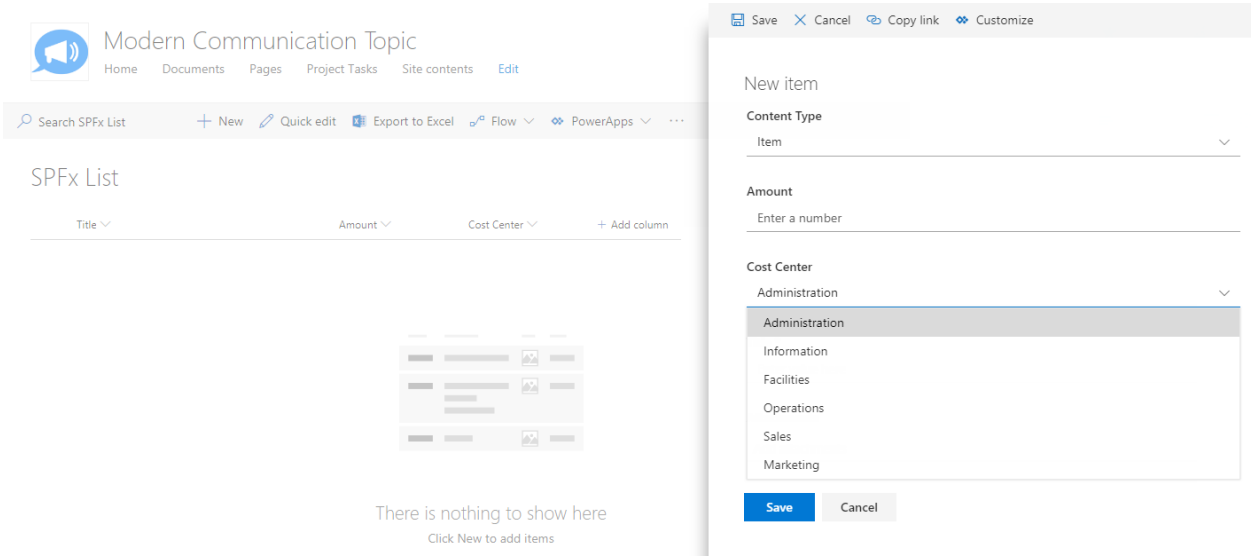
4. Click Deploy
5. Open SharePoint site, click “Add an app”
6. Install the app



7. When installation finishes, refresh the page. The site should have “SPFx List” provisioned.



8. Open “SPFx List”, it should have our content type with site columns inside it.



Summary

SharePoint assets can be provisioned using SPFx. We can define the needed structure to provision on SharePoint site, which can be utilized by SPFx web parts.

Chapter 17: Consume Microsoft Graph API using MSGraphClient

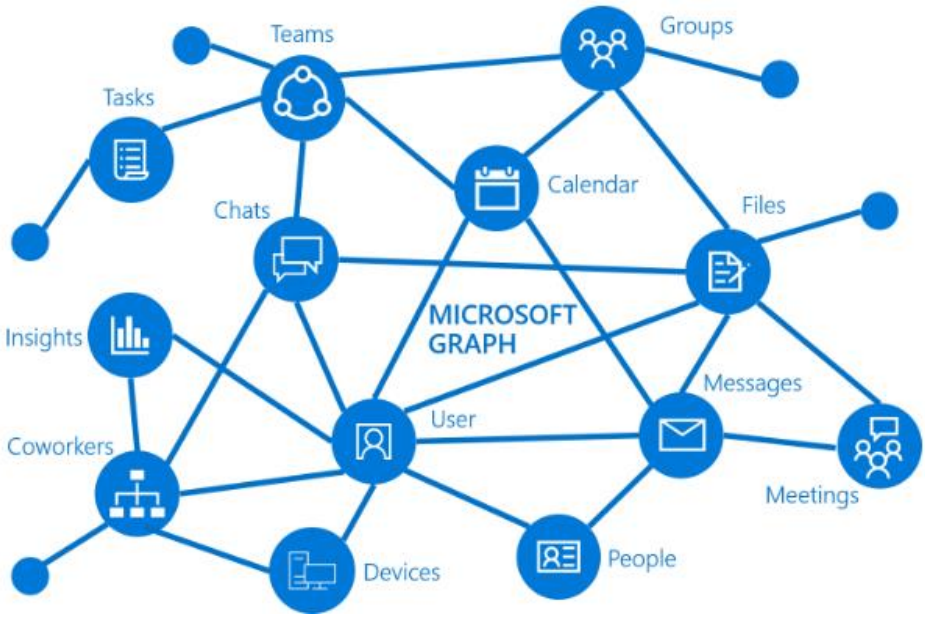
Overview

In the chapters so far, we have explored on developing basic SharePoint client web part which can run independently without any interaction with SharePoint.

In this chapter, we will explore to consume the Microsoft Graph in SharePoint Framework client side web parts.

Brief about Microsoft Graph

MS Graph is a rich and fast growing set of REST APIs provided by Microsoft to access content and services provided by Office 365. For example using Microsoft graph we can access mailbox, calendar, and one drive for business (OD4B) of a user. As well as we can access Site collection, sites, and lists in SharePoint Online. Also, we can access Office 365 Groups, Teams using MS Graph.



Read more about MS Graph at https://developer.microsoft.com/en-us/graph/docs/concepts/overview

Create SPFx Solution

1. Open command prompt. Create a directory for SPFx solution

```
md spfx-consume-msgraph
```

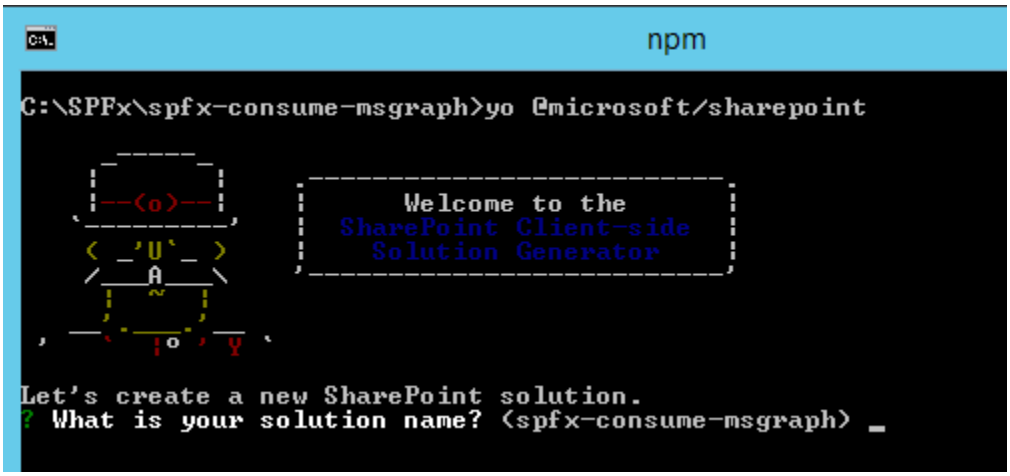
2. Navigate to above created directory

```
cd spfx-consume-msgraph
```

3. Run Yeoman SharePoint Generator to create the solution

```
yo @microsoft/sharepoint
```

4. Yeoman generator will present you with the wizard by asking questions about the solution to be created.



Solution Name: Hit enter to have default name (spfx-consume-msgraph in this case) or type in any other name for your solution.
Selected choice: Hit enter

Target for component: Here we can select the target environment where we are planning to deploy the client webpart i.e. SharePoint Online or SharePoint OnPremise (SharePoint 2016 onwards).
Selected choice: SharePoint Online only (latest)

Place of files: We may choose to use the same folder or create a subfolder for our solution.
Selected choice: Same folder

Deployment option: Selecting Y will allow the app to deployed instantly to all sites and will be accessible everywhere.
Selected choice: N (install on each site explicitly)

Type of client-side component to create: We can choose to create client side webpart or an extension. Choose webpart option.
Selected choice: WebPart

Web part name: Hit enter to select the default name or type in any other name.
Selected choice: ConsumeMSGraph

Web part description: Hit enter to select the default description or type in any other value.
Selected choice: Consume MS Graph with SPFx

Framework to use: Select any JavaScript framework to develop the component. Available choices are (No JavaScript Framework, React, and Knockout)
Selected choice: React

5. Yeoman generator will perform scaffolding process to generate the solution. The scaffolding process will take significant amount of time.
6. Once the scaffolding process is completed, lock down the version of project dependencies by running below command

```
npm shrinkwrap
```

7. In the command prompt type below command to open the solution in code editor of your choice.

```
code .
```

Access MS Graph

Microsoft Graph can be accessed by either native graph client (MSGraphClient) or low-level type used to access Azure AD secured REST API (AadHttpClient)

In the ConsumeMsGraph.tsx file under "\src\webparts\consumeMsGraph\components\" folder, add below import statement

```
import { MSGraphClient } from '@microsoft/sp-client-preview';
```

Typings for MS Graph

Microsoft Graph TypeScript Types enables intellisense on Microsoft Graph objects including users, messages, and groups.

On the command prompt, run below command to include typings

```
npm install @microsoft/microsoft-graph-types --save-dev
```

This command will install types and save in package.json as a development dependency.

In the ConsumeMsGraph.tsx file under "\src\webparts\consumeMsGraph\components\" folder, add below import statement

```
import * as MicrosoftGraph from '@microsoft/microsoft-graph-types';
```

Permissions

In order to consume MS Graph or any third party REST APIs, we need to explicitly specify the permissions in manifest of solution.

In the package-solution.json file under "config" folder, configure webApiPermissionRequests property to specify User.ReadBasic.All permission.

```
{
  "$schema": "https://developer.microsoft.com/json-schemas/spfx-build/package-solution.schema.json",
  "solution": {
    "name": "spfx-consume-msgraph-client-side-solution",
    "id": "f95e77e7-842b-4ac9-b3f7-f5c421efdb0d",
    "version": "1.0.0.0",
    "includeClientSideAssets": true,
    "webApiPermissionRequests": [
      {
        "resource": "Microsoft Graph",
        "scope": "User.ReadBasic.All"
      }
    ]
  },
  "paths": {
    "zippedPackage": "solution/spfx-consume-msgraph.sppkg"
  }
}
```

webApiPermissionRequests is an array of webApiPermissionRequest items where each item is defined as below:

- resource: name or the ObjectId (in Azure AD). E.g. Microsoft Graph
- scope: name or unique ID of the permission

Please refer the permission API documentation at - https://developer.microsoft.com/en-us/graph/docs/concepts/permissions_reference

Configure Props

Define the context property in IConsumeMsGraphProps.ts under "\src\webparts\consumeMsGraph\components\"

```
import { WebPartContext } from '@microsoft/sp-webpart-base';

export interface IConsumeMsGraphProps {
  description: string;
  context: WebPartContext;
}
```

Configure State

We will define the state for our React component.

To define interface to represent user, add file IUserItem.ts under "\src\webparts\consumeMsGraph\components\"

```
export interface IUserItem {
    displayName: string;
    mail: string;
    userPrincipalName: string;
}
```

Add file IConsumeMsGraphState.ts under "\src\webparts\consumeMsGraph\components\"

```
import { IUserItem } from './IUserItem';

export interface IConsumeMsGraphState {
    users: Array<IUserItem>;
}
```

Get User Details

Implement below method to get the user details from your tenant.

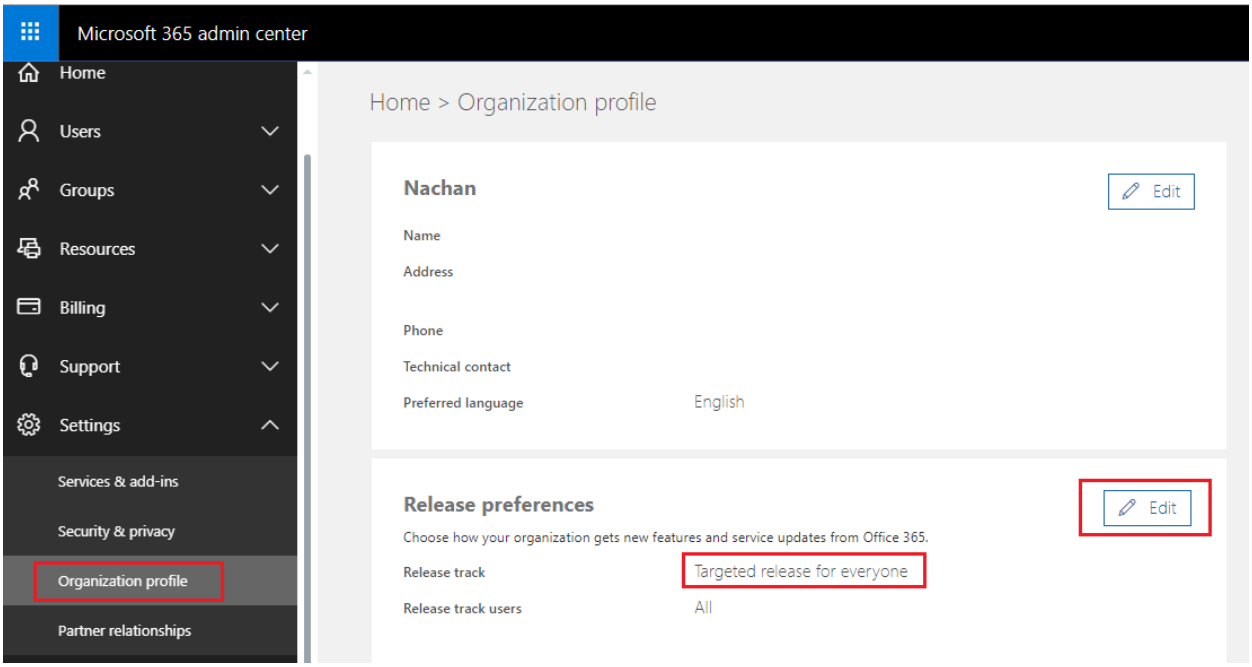
```
private getUserDetails(): void {

    const graphClient: MSGraphClient = this.props.context.serviceScope.consume(
      MSGraphClient.serviceKey
    );

    graphClient
      .api("users")
      .version("v1.0")
      .select("displayName,mail,userPrincipalName")
      .get((err, res) => {

        if (err) {
          console.error(err);
          return;
        }

        // Prepare the output array
        var users: Array<IUserItem> = new Array<IUserItem>();

        // Map the JSON response to the output array
        res.value.map((item: any) => {
```

```
          users.push( {
            displayName: item.displayName,
            mail: item.mail,
            userPrincipalName: item.userPrincipalName,
          });
        });

        // Update the component state accordingly to the result
        this.setState(
          {
            users: users,
          }
        );
      });
  }
```

Enable Targeted Release on your Tenant

The MS Graph operation is part of an experimental feature and is only available in Targeted release (first release) tenants

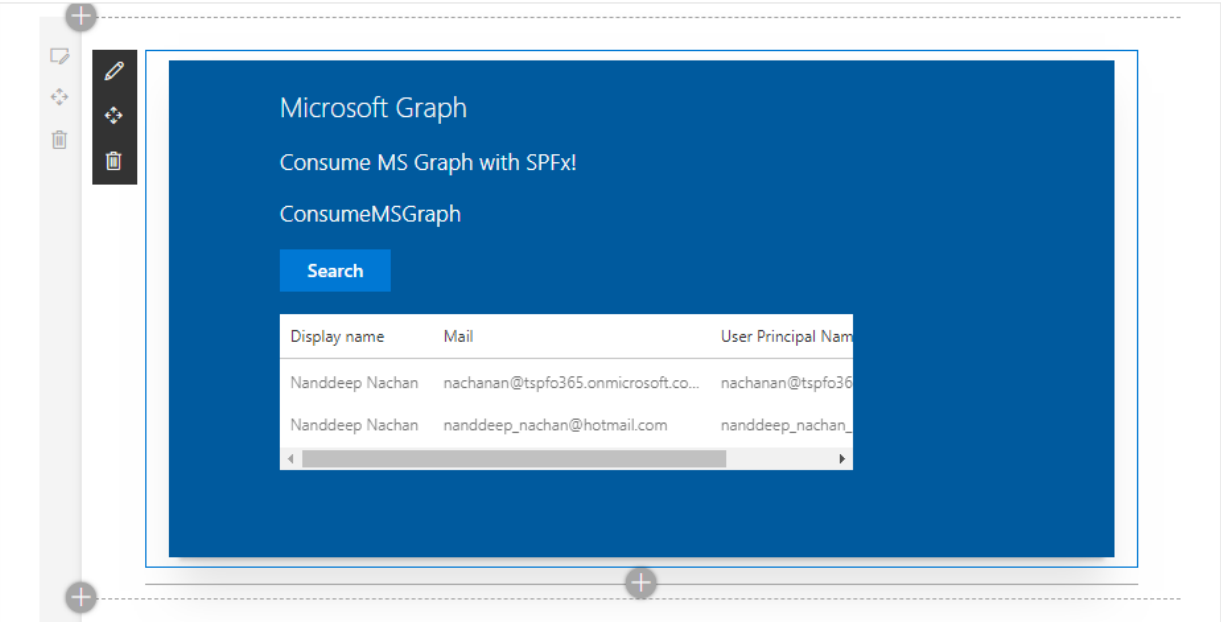
1. Open Office 365 admin center
2. Click Settings > Organization profile
3. Click Edit against “Release preferences”
4. Select the preference



Please refer article here (https://support.office.com/en-us/article/set-up-the-standard-or-targeted-release-options-in-office-365-3b3adfa4-1777-4ff0-b606-fb8732101f47#bkmk_setup) to setup your tenant for targeted release.

Test the WebPart

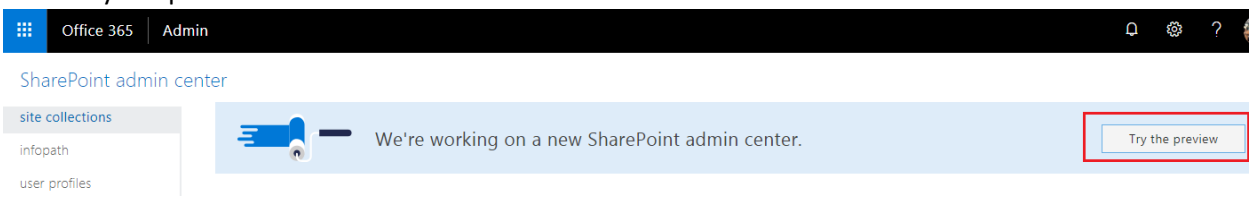
1. On the command prompt, type “gulp serve”
2. Open SharePoint site
3. Navigate to /_layouts/15/workbench.aspx
4. Add the webpart to page.



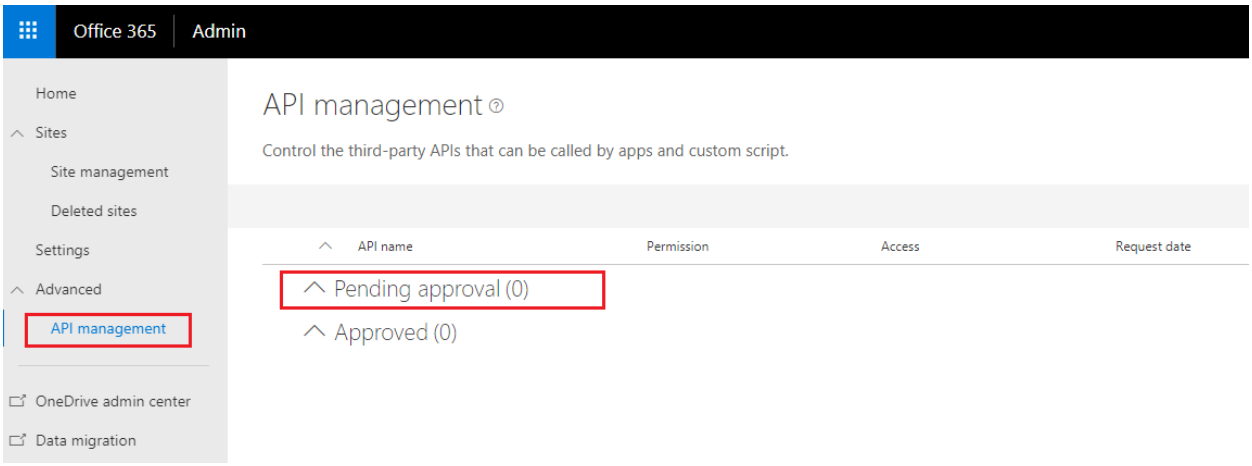
API Management

In the Production environment, after deploying the web part follow below steps to approve API requests.

1. Open SharePoint Admin Center (https://[tenant]-admin.sharepoint.com)
2. Click “Try the preview”

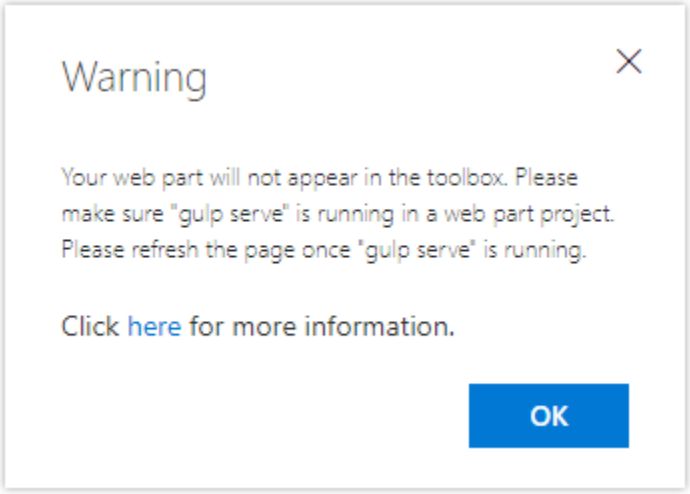


3. From left navigation, Click “API Management”
4. Approve pending requests



Troubleshooting

In some cases SharePoint workbench (https://[tenant].sharepoint.com/_layouts/15/workbench.aspx) shows below error although “gulp serve” is running.



Open below url in the next tab of browser. Accept the warning message.

https://localhost:4321/temp/manifests.js

Summary

Microsoft Graph offers wide range of REST APIs to access content and services provided by Office 365. The MS Graph operation is part of an experimental feature and is only available in Targeted release (first release) tenants only.

Chapter 18: Consume Microsoft Graph API using AadHttpClient

Overview

In the chapters so far, we have explored on developing basic SharePoint client web part which can run independently without any interaction with SharePoint.

In this chapter, we will explore to consume the Microsoft Graph in SharePoint Framework client side web parts using AadHttpClient.

Create SPFx Solution

1. Open command prompt. Create a directory for SPFx solution

```
md spfx-msgraph-aadhttpclient
```

2. Navigate to above created directory

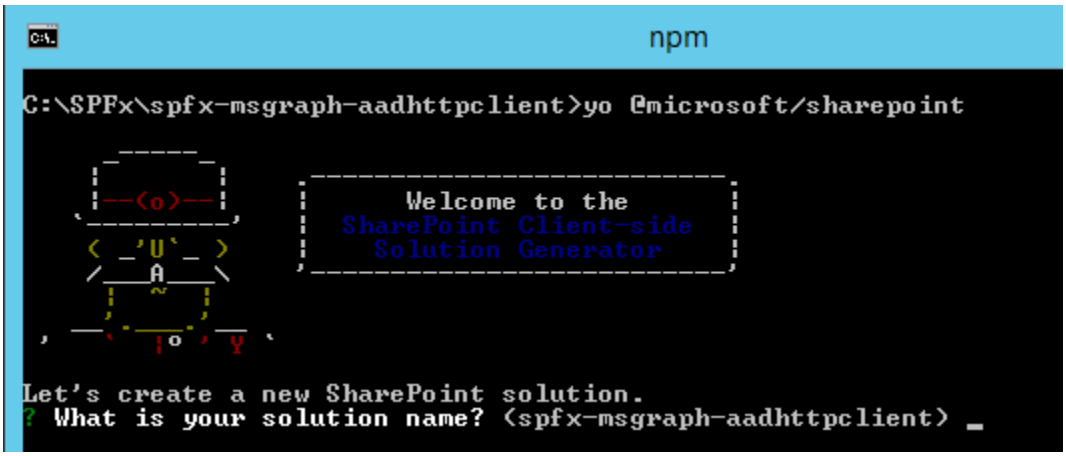
```
cd spfx-msgraph-aadhttpclient
```

3. Run Yeoman SharePoint Generator to create the solution

```
yo @microsoft/sharepoint --plusbeta
```

Since AadHttpClient is in beta, use --plusbeta with Yeoman generator.

4. Yeoman generator will present you with the wizard by asking questions about the solution to be created.



Solution Name: Hit enter to have default name (spfx-msgraph-aadhttpclient in this case) or type in any other name for your solution.
Selected choice: Hit enter

Target for component: Here we can select the target environment where we are planning to deploy the client webpart i.e. SharePoint Online or SharePoint OnPremise (SharePoint 2016 onwards).
Selected choice: SharePoint Online only (latest)

Place of files: We may choose to use the same folder or create a subfolder for our solution.
Selected choice: Same folder

Deployment option: Selecting Y will allow the app to deployed instantly to all sites and will be accessible everywhere.
Selected choice: N (install on each site explicitly)

Type of client-side component to create: We can choose to create client side webpart or an extension. Choose webpart option.
Selected choice: WebPart

Web part name: Hit enter to select the default name or type in any other name.
Selected choice: MSGraphAADHttpClient

Web part description: Hit enter to select the default description or type in any other value.
Selected choice: Consume MS Graph with SPFx using AADHttpClient

Framework to use: Select any JavaScript framework to develop the component. Available choices are (No JavaScript Framework, React, and Knockout)
Selected choice: React

5. Yeoman generator will perform scaffolding process to generate the solution. The scaffolding process will take significant amount of time.
6. Once the scaffolding process is completed, lock down the version of project dependencies by running below command

```
npm shrinkwrap
```

7. In the command prompt type below command to open the solution in code editor of your choice.

```
code .
```

Access MS Graph using AadHttpClient

Microsoft Graph can be accessed by low-level type used to access Azure AD secured REST API (AadHttpClient). AadHttpClient client object can be used to consume any REST API, whereas MSGraphClient client object can only consume Microsoft Graph.

In the MsGraphAadHttpClient.tsx file under "\src\webparts\msGraphAadHttpClient\components\" folder, add below import statement

```
import { AadHttpClient } from '@microsoft/sp-http';
```

Permissions

In order to consume MS Graph or any third party REST APIs, we need to explicitly specify the permissions in manifest of solution.

In the package-solution.json file under "config" folder, configure webApiPermissionRequests property to specify User.ReadBasic.All permission.

```
{
  "$schema": "https://developer.microsoft.com/json-schemas/spfx-build/package-solution.schema.json",
  "solution": {
    "name": "spfx-msgraph-aadhttpclient-client-side-solution",
    "id": "f4213803-dc4b-42d9-b6c4-96e895ec02fe",
    "version": "1.0.0.0",
    "includeClientSideAssets": true,
    "webApiPermissionRequests": [
      {
        "resource": "Microsoft Graph",
        "scope": "User.ReadBasic.All"
      }
    ]
  },
  "paths": {
    "zippedPackage": "solution/spfx-msgraph-aadhttpclient.sppkg"
  }
}
```

webApiPermissionRequests is an array of webApiPermissionRequest items where each item is defined as below:

- resource: name or the ObjectId (in Azure AD). E.g. Microsoft Graph
- scope: name or unique ID of the permission

Please refer the permission API documentation at - https://developer.microsoft.com/en-us/graph/docs/concepts/permissions_reference

Configure Props

Define the context property in IMsGraphAadHttpClientProps.ts under "\src\webparts\msGraphAadHttpClient\components\"

```
import { WebPartContext } from '@microsoft/sp-webpart-base';
```

```
export interface IMsGraphAadHttpClientProps {
  description: string;
  context: WebPartContext;
}
```

Configure State

We will define the state for our React component.

To define interface to represent user, add file IUserItem.ts under "\src\webparts\msGraphAadHttpClient\components\"

```
export interface IUserItem {
    displayName: string;
    mail: string;
    userPrincipalName: string;
}
```

Add file IMsGraphAadHttpClientState.ts under "\src\webparts\msGraphAadHttpClient\components\"

```
import { IUserItem } from './IUserItem';

export interface IMsGraphAadHttpClientState {
    users: Array<IUserItem>;
}
```

Get User Details

Implement below method to get the user details from your tenant.

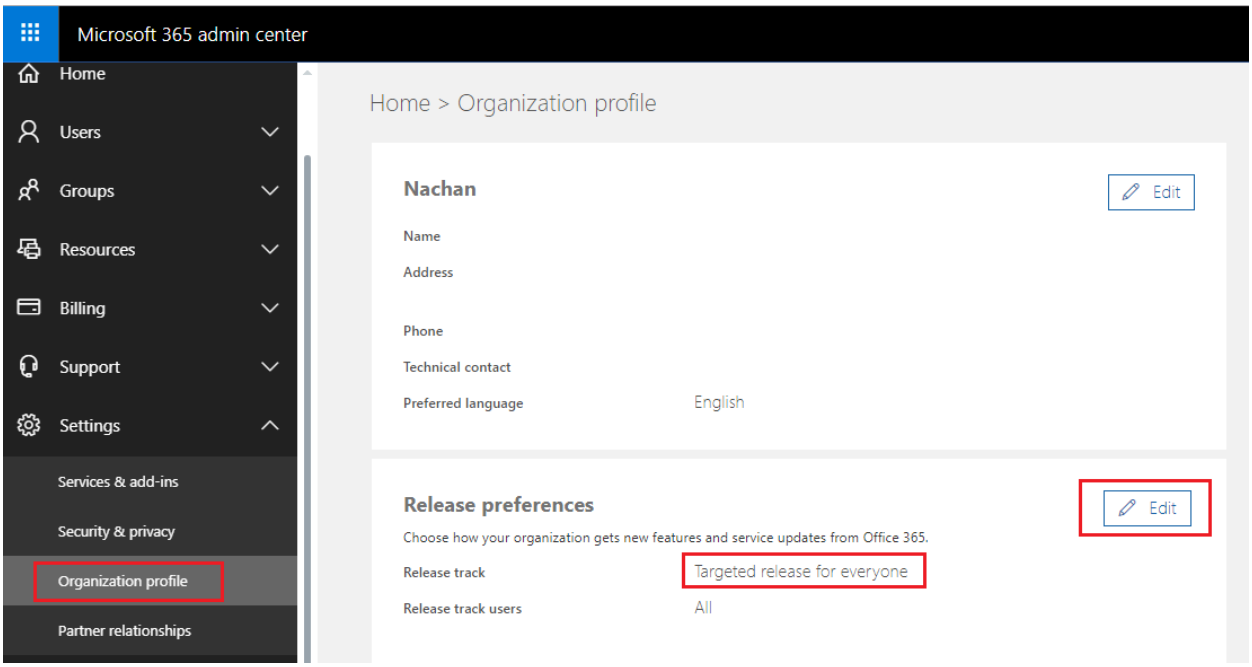
```
private getUserDetails(): void {
    const aadClient: AadHttpClient = new AadHttpClient(
      this.props.context.serviceScope,
      "https://graph.microsoft.com"
    );

    // Get users with givenName, surname, or displayName
    aadClient
      .get(

`https://graph.microsoft.com/v1.0/users?$select=displayName,mail,userPrincipalName`,
        AadHttpClient.configurations.v1
      )
      .then(response => {
        return response.json();
```

```
      })
      .then(json => {
        // Prepare the output array
        var users: Array<IUserItem> = new Array<IUserItem>();

        // Log the result in the console for testing purposes
        console.log(json);

        // Map the JSON response to the output array
        json.value.map((item: any) => {
          users.push( {
            displayName: item.displayName,
            mail: item.mail,
            userPrincipalName: item.userPrincipalName,
          });
        });

        // Update the component state accordingly to the result
        this.setState(
          {
            users: users,
          }
        );
      })
      .catch(error => {
        console.error(error);
      });
  }
```

Enable Targeted Release on your Tenant

The MS Graph operation is part of an experimental feature and is only available in Targeted release (first release) tenants

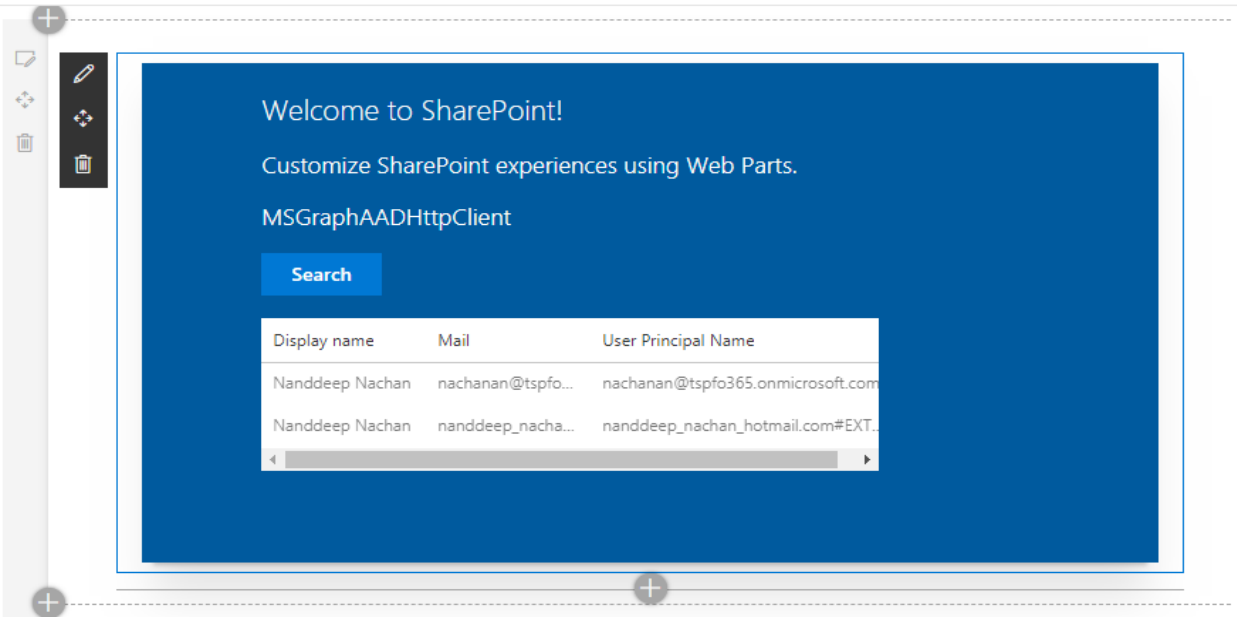
1. Open Office 365 admin center
2. Click Settings > Organization profile
3. Click Edit against “Release preferences”
4. Select the preference



Please refer article here (https://support.office.com/en-us/article/set-up-the-standard-or-targeted-release-options-in-office-365-3b3adfa4-1777-4ff0-b606-fb8732101f47#bkmk_setup) to setup your tenant for targeted release.

Test the WebPart

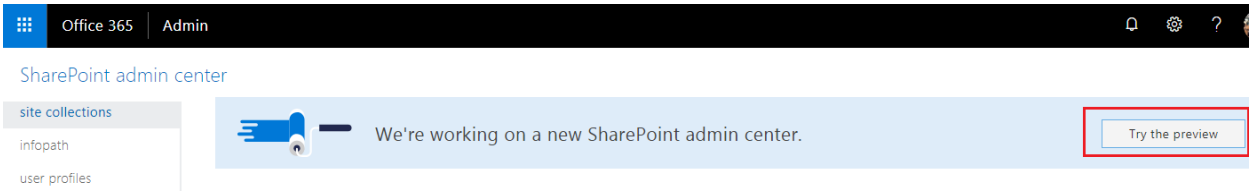
1. On the command prompt, type “gulp serve”
2. Open SharePoint site
3. Navigate to /_layouts/15/workbench.aspx
4. Add the webpart to page.



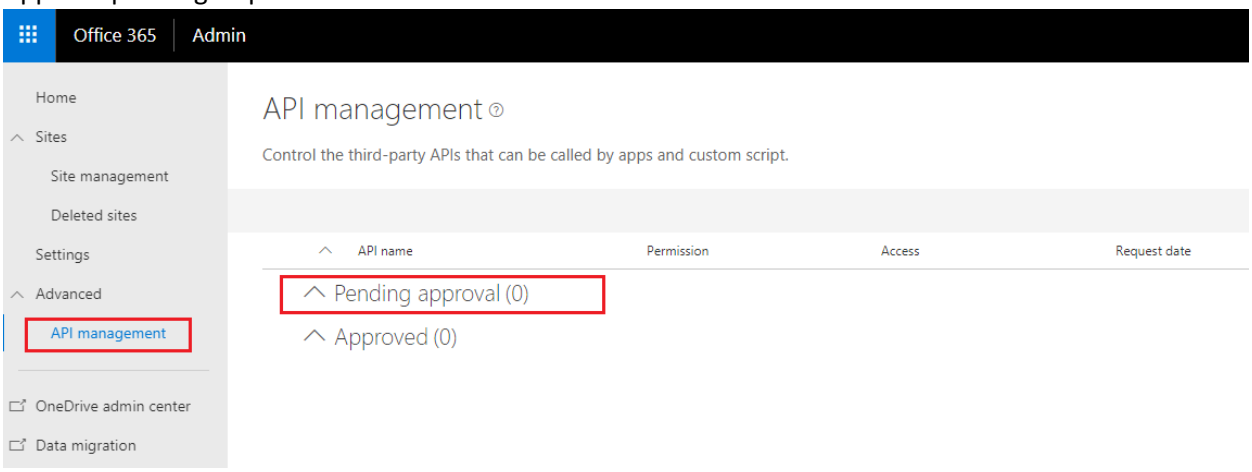
API Management

In the Production environment, after deploying the web part follow below steps to approve API requests.

1. Open SharePoint Admin Center (https://[tenant]-admin.sharepoint.com)
2. Click “Try the preview”



3. From left navigation, Click “API Management”
4. Approve pending requests



Summary

Microsoft Graph offers wide range of REST APIs to access content and services provided by Office 365. The MS Graph operation is part of an experimental feature and is only available in Targeted release (first release) tenants only. AadHttpClient is in preview mode, avoid using it in Production.

Chapter 19: Logging

Overview

SharePoint web parts follows their own life cycle while executing the user requests. Everything looks normal till the time all requests goes well and web part performs the user interactions (without any error). The awkward moment comes when any of the user request fails and web part starts displaying error message.

SharePoint by default supports logging. If the verbose logging is enabled, SharePoint tracks each of the activity and obviously it creates loads of logs. In these situations, going through huge logs and finding related information about our error is cumbersome. It is always advisable to have our own logging mechanism implemented.

SharePoint Framework (SPFx) also has no exception to it and supports logging APIs which can be used during the lifecycle of the web part.

Logging Overview

The logging levels are predefined.

Logging Level	Definition
Verbose	Corresponds to lengthy events. Logs almost everything.
Information	Do not require any attention. However they provides valuable data for monitoring state of solution
Warning	Indicates potential problem or issue that might needs attention. We should monitor the pattern over the time. If ignored warning may result in sever error.
Error	Requires urgent attention. All error events should be investigated.
Critical	Indicates serious error that has caused major failure in the solution
None	No logging occurs

Verbose is least important followed by information, warning and error.

Create SPFx Solution

1. Open command prompt. Create a directory for SPFx solution

```
md spfx-logging
```

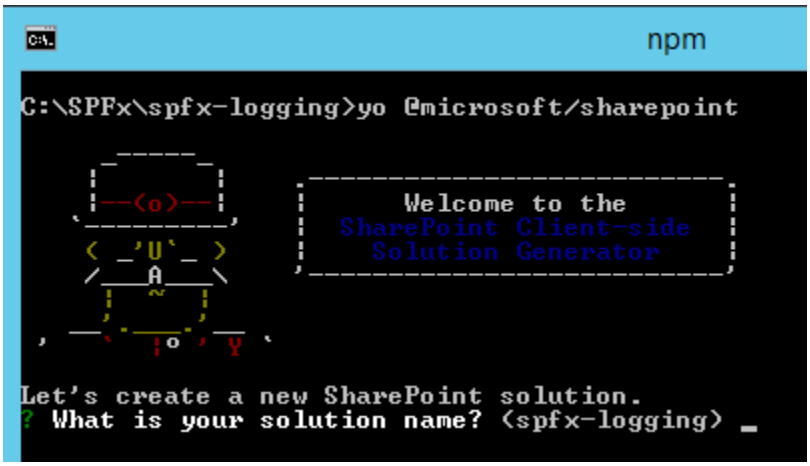
2. Navigate to above created directory

```
cd spfx-logging
```

3. Run Yeoman SharePoint Generator to create the solution

```
yo @microsoft/sharepoint
```

4. Yeoman generator will present you with the wizard by asking questions about the solution to be created.



Solution Name: Hit enter to have default name (spfx-logging in this case) or type in any other name for your solution.
Selected choice: Hit enter

Target for component: Here we can select the target environment where we are planning to deploy the client webpart i.e. SharePoint Online or SharePoint OnPremise (SharePoint 2016 onwards).
Selected choice: SharePoint Online only (latest)

Place of files: We may choose to use the same folder or create a subfolder for our solution.
Selected choice: Same folder

Deployment option: Selecting Y will allow the app to deployed instantly to all sites and will be accessible everywhere.
Selected choice: N (install on each site explicitly)

Type of client-side component to create: We can choose to create client side webpart or an extension. Choose webpart option.
Selected choice: WebPart

Web part name: Hit enter to select the default name or type in any other name.
Selected choice: SPFxLogger

Web part description: Hit enter to select the default description or type in any other value.
Selected choice: Logging with SPFx

Framework to use: Select any JavaScript framework to develop the component. Available choices are (No JavaScript Framework, React, and Knockout)
Selected choice: No JavaScript Framework

5. Yeoman generator will perform scaffolding process to generate the solution. The scaffolding process will take significant amount of time.
6. Once the scaffolding process is completed, lock down the version of project dependencies by running below command

```
npm shrinkwrap
```

7. In the command prompt type below command to open the solution in code editor of your choice.

```
code .
```

Working with Logging API

SharePoint Framework supports logging out of the box. Use below import for logs.

```
import { Log } from '@microsoft/sp-core-library';
```

Define our log source

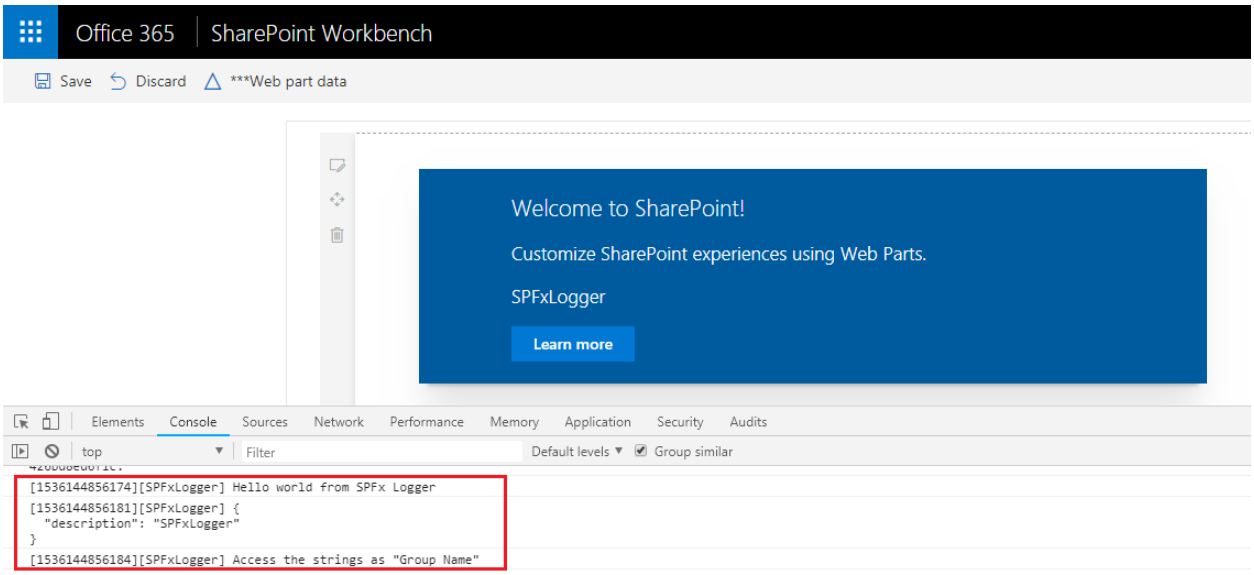
```
const LOG_SOURCE: string = 'SPFxLogger';
```

Log the messages from web part

```
@override
public onInit(): Promise<void> {
  Log.info(LOG_SOURCE, 'Hello world from SPFx Logger');
  Log.info(LOG_SOURCE, JSON.stringify(this.properties, undefined, 2));
  Log.info(LOG_SOURCE, `Access the strings as "${strings.BasicGroupName}"`);
  return Promise.resolve<void>();
}
```

The Log class offers 4 methods to log the information each of which represents corresponding log level – verbose, info, warn, and error. The first parameter is logging location. By default it is name of the web part. But can be overridden. The next parameter is the message to be logged. Optionally we can specify the service scope.

While debugging the SPFx web part, the log message should appear in the console window of browser.



Summary

SharePoint Framework out of the box provides an API to log information in your solutions. Use the logs effectively to get benefited out of it at the time of investigating the cause of error.

Chapter 20: SPFx Extensions Overview

Overview

SharePoint Framework (SPFx) was launched in February 2017 which changed the perspectives of SharePoint developers. Developers then started to build and deploy modern client side web parts using SharePoint Framework across their Office 365 tenants. We will also see this available soon in SharePoint OnPremise version of SP2016.

Earlier, development scenarios included adding Script Editor web parts all over the place on SharePoint site. Troubleshooting the issues to find out which script on page does the trick was very tricky. SharePoint Framework brought some governance to developers' lives to address these issues.

How will SharePoint Framework Extensions help?

SharePoint Framework Extensions has an ability to expand further SharePoint modern UI which includes site, list, and command extensions, and Graph HttpClient support.

SharePoint Framework includes three new extension types:

Application Customizers

- Allows predefined HTML element placeholders and extend them with custom renderings.
- Used to embed visible or hidden JavaScript on the SharePoint site
- It can be added to Site collection, site or at list scope

Field Customizers

- Allows us to modify views to data for fields within a list.
- Can be used to override field presentation in the list
- Can be used with site columns or directly on the field in list.

Command Sets

- Allows developers to extend command surfaces of SharePoint to add new actions, along with client side code that can be used to implement behaviors.
- Can be used to provide action buttons to list
- Supports toolbar and context menu

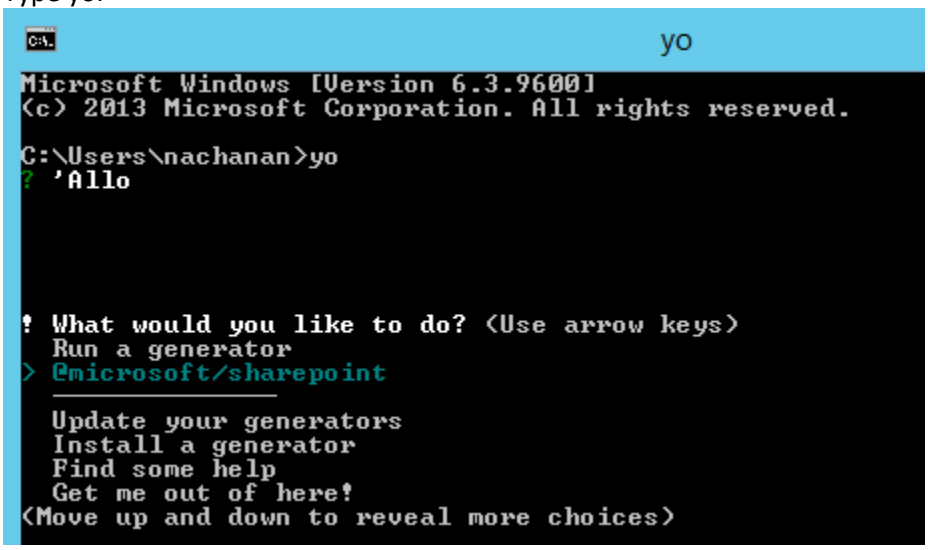
Update Generators for SharePoint Framework Extensions

SharePoint Framework Yeoman Generator gets frequent updates to support the SharePoint Framework Extensions.

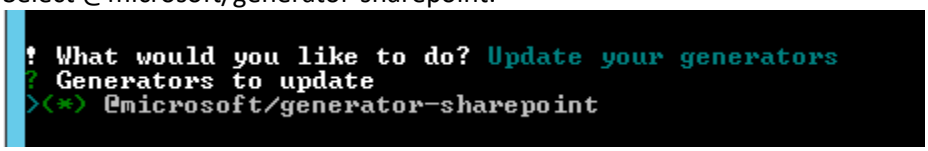
If you already have the Yeoman generator installed, you will have to update it by following below instructions:

1. Open command prompt.

2. Type yo.



3. Select option "Update your generators".
4. Select @microsoft/generator-sharepoint.



5. Hit Enter to update the microsoft/generator-sharepoint

Useful commands

1. Update your SharePoint Framework Yeoman generator.

npm update -g @microsoft/generator-sharepoint@latest

You may run this command as you want, if there is no update available – the command will simply return.

2. Check the SharePoint Framework Yeoman generator version

npm view @microsoft/generator-sharepoint version

3. npm list

npm list -g @microsoft/generator-sharepoint

Displays information of installed package on your workstation. Optionally you may use -g parameter to get information on the globally installed package.

```
C:\>npm view @microsoft/generator-sharepoint version
1.1.1

C:\>npm list -g @microsoft/generator-sharepoint
C:\Users\nachanan\AppData\Roaming\npm
`-- @microsoft/generator-sharepoint@1.1.1
```

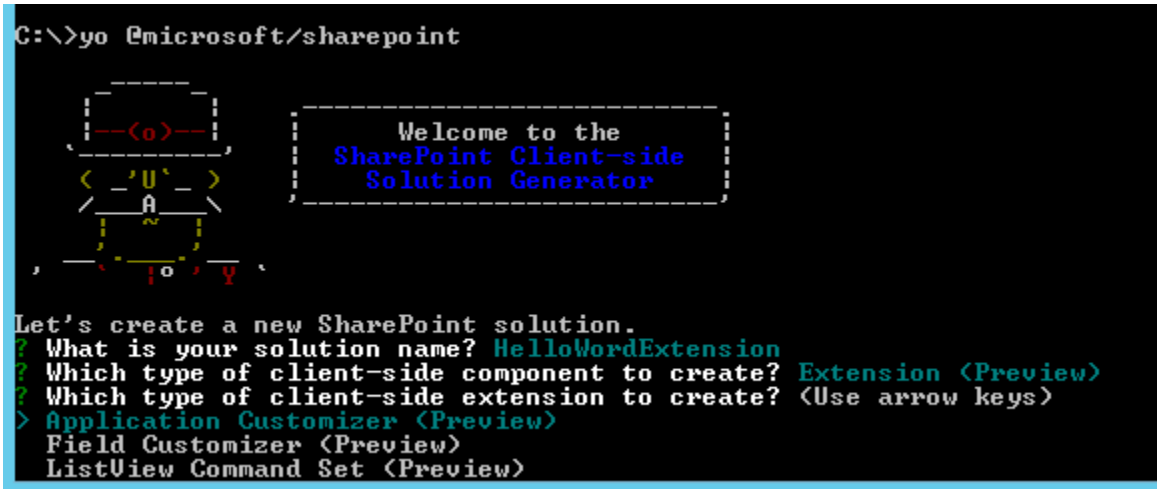
Create an SharePoint Framework Extensions Project

1. Open Command Prompt
2. Run the below command

yo @microsoft/sharepoint

3. When prompted

    1. Enter the solution name
    2. Choose Extension (Preview) as the client-side component type to create
    3. Choose any of below customizer to create
        1. Application Customizer
        2. Field Customizer
        3. ListView Command Set



    4. Enter name of your extension and press Enter
    5. Enter description of your extension and press Enter

Yeoman will install the required dependencies and start scaffolding the solution files. This might take a few minutes to generate the project.

Visual Studio Extension for SharePoint Framework

Visual Studio Code is one of the editors for developing SharePoint Framework web parts and SharePoint Framework Extensions.

If you are a Visual Studio enthusiast, SharePoint Patterns and Practices group recently have released a Visual Studio extension.

How does Visual Studio extension work?

The Visual Studio extension is a wrapper around the cmdlets of the Microsoft Yeoman generator (yo @microsoft/sharepoint) and presents it in the windows forms experience.

The extension generator project executes the scaffolding behind the scene to create all necessary files.

Once the project creation is successful, developers then can launch the local Workbench by pressing F5.

Summary

SharePoint Framework extensions helps to expand further SharePoint modern UI. Application Customizers, Field Customizers, and Command Sets are the available extension types to help extend the SharePoint site functionality.

Chapter 21: Application Customizer Overview

Overview

SharePoint Framework (SPFx) Extensions allows to extend the SharePoint user experience. Using SharePoint Framework Extensions, we can customize overall SharePoint user experience involving notification area, list views, and toolbars. In this chapter, we will explore the Application Customizer part of SharePoint extensions.

Brief about Application Customizer

Application customizer provides access to predefined locations on SharePoint page and allows to customize them. In this chapter, we will add header and footer to SharePoint site using application customizer.

In the classic SharePoint, we used to extend predefined HTML elements or placeholders from master page to display the custom content. In the modern SharePoint as JavaScript cannot be used on page, the application customizer helps to implement these scenarios.

Page Placeholders

The application customizer helps to get access to below zones on Modern SharePoint page

- Top: Header section of page
- Bottom: Footer section of page

Create SPFx Solution

1. Open command prompt. Create a directory for SPFx solution

```
md spfx-extensions-applicationcustomizer
```

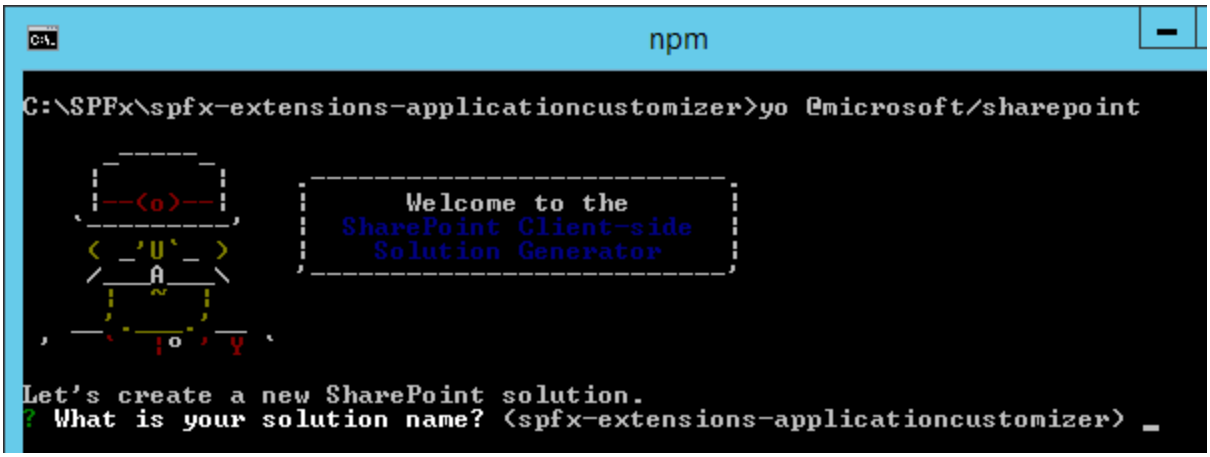
2. Navigate to above created directory

```
cd spfx-extensions-applicationcustomizer
```

3. Run Yeoman SharePoint Generator to create the solution

```
yo @microsoft/sharepoint
```

4. Yeoman generator will present you with the wizard by asking questions about the solution to be created.



Solution Name: Hit enter to have default name (spfx-logging in this case) or type in any other name for your solution.
Selected choice: Hit enter

Target for component: Here we can select the target environment where we are planning to deploy the client webpart i.e. SharePoint Online or SharePoint OnPremise (SharePoint 2016 onwards).
Selected choice: SharePoint Online only (latest)

Place of files: We may choose to use the same folder or create a subfolder for our solution.
Selected choice: Same folder

Deployment option: Selecting Y will allow the app to deployed instantly to all sites and will be accessible everywhere.
Selected choice: N (install on each site explicitly)

Type of client-side component to create: We can choose to create client side webpart or an extension.
Selected choice: Extension

Type of client-side extension to create: We can choose to create Application customizer, Field customizer, or ListView Command Set.
Selected choice: Application customizer

Application customizer name: Hit enter to select the default name or type in any other name.
Selected choice: CustomHeaderFooter

Application customizer description: Hit enter to select the default description or type in any other value.
Selected choice: Adds custom header and footer to SharePoint site

5. Yeoman generator will perform scaffolding process to generate the solution. The scaffolding process will take significant amount of time.
6. Once the scaffolding process is completed, lock down the version of project dependencies by running below command

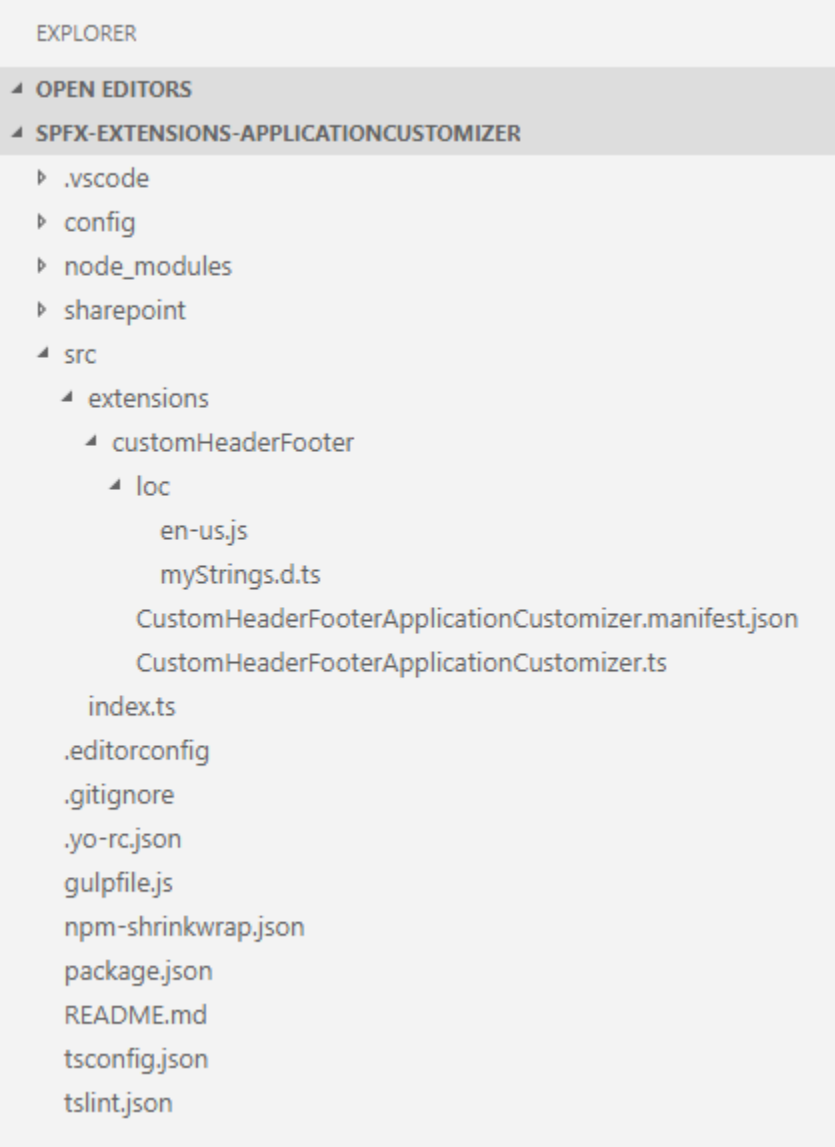
```
npm shrinkwrap
```

7. In the command prompt type below command to open the solution in code editor of your choice.

```
code .
```

Solution Structure

The solution structure is similar to client-side web parts with similar configuration options.



The file CustomHeaderFooterApplicationCustomizer.manifest.json inside the folder "\src\extensions\customHeaderFooter\" defines the extension type and unique identifier for the solution. Please note down the id. We will need it later for debugging purpose.

```
{
  "$schema": "https://developer.microsoft.com/json-schemas/spfx/client-side-extension-manifest.schema.json",

  "id": "f58a0902-c9d8-4cce-bd5e-4da887e21bed",
  "alias": "CustomHeaderFooterApplicationCustomizer",
  "componentType": "Extension",
  "extensionType": "ApplicationCustomizer",

  // The "*" signifies that the version should be taken from the package.json
  "version": "*",
  "manifestVersion": 2,

  // If true, the component can only be installed on sites where Custom Script is allowed.
  // Components that allow authors to embed arbitrary script code should set this to true.
  // https://support.office.com/en-us/article/Turn-scripting-capabilities-on-or-off-1f2c515f-5d7e-448a-9fd7-835da935584f
  "requiresCustomScript": false
}
```

Implement Application Customizer

Open CustomHeaderFooterApplicationCustomizer.ts under "\src\extensions\customHeaderFooter\" folder.

To get access to placeholders on the page, use below imports

```
import {
  BaseApplicationCustomizer,
  PlaceholderContent,
  PlaceholderName
} from '@microsoft/sp-application-base';
```

Update the interface IAlertApplicationCustomizerProperties to include Top and Bottom properties

```
export interface ICustomHeaderFooterApplicationCustomizerProperties {
  Top: string;
  Bottom: string;
}
```

Implement OnInit method

```
public onInit(): Promise<void> {
    Log.info(LOG_SOURCE, `Initialized ${strings.Title}`);

    // Added to handle possible changes on the existence of placeholders.
    this.context.placeholderProvider.changedEvent.add(this,
this._renderPlaceHolders);

    // Call render method for generating the HTML elements.
    this._renderPlaceHolders();

    return Promise.resolve();
  }
```

Implement _renderPlaceHolders method

```
private _renderPlaceHolders(): void {
    console.log('HelloWorldApplicationCustomizer._renderPlaceHolders()');
    console.log('Available placeholders: ',
    this.context.placeholderProvider.placeholderNames.map(name =>
PlaceholderName[name]).join(', '));

    // Handling the top placeholder
    if (!this._topPlaceholder) {
      this._topPlaceholder =
        this.context.placeholderProvider.tryCreateContent(
          PlaceholderName.Top,
          { onDispose: this._onDispose });

      // The extension should not assume that the expected placeholder is
available.
      if (!this._topPlaceholder) {
        console.error('The expected placeholder (Top) was not found.');
        return;
      }

      if (this.properties) {
        let topString: string = this.properties.Top;
        if (!topString) {
          topString = '(Top property was not defined.)';
        }

        if (this._topPlaceholder.domElement) {
          this._topPlaceholder.domElement.innerHTML = `
```

```
            <div class="${styles.app}">
              <div class="ms-bgColor-themeDark ms-fontColor-white
${styles.top}">
                <i class="ms-Icon ms-Icon--Info" aria-hidden="true"></i>
${escape(topString)}
              </div>
            </div>`;
        }
      }
    }

    // Handling the bottom placeholder
    if (!this._bottomPlaceholder) {
      this._bottomPlaceholder =
        this.context.placeholderProvider.tryCreateContent(
          PlaceholderName.Bottom,
          { onDispose: this._onDispose });

      // The extension should not assume that the expected placeholder is
available.
      if (!this._bottomPlaceholder) {
        console.error('The expected placeholder (Bottom) was not found.');
        return;
      }

      if (this.properties) {
        let bottomString: string = this.properties.Bottom;
        if (!bottomString) {
          bottomString = '(Bottom property was not defined.)';
        }

        if (this._bottomPlaceholder.domElement) {
          this._bottomPlaceholder.domElement.innerHTML = `
            <div class="${styles.app}">
              <div class="ms-bgColor-themeDark ms-fontColor-white
${styles.bottom}">
                <i class="ms-Icon ms-Icon--Info" aria-hidden="true"></i>
${escape(bottomString)}
              </div>
            </div>`;
        }
      }
    }
  }
```

Use this.context.placeholderProvider.tryCreateContent to get access the placeholder, without assuming that the placeholder will exists

Custom Styles

Add a file CustomHeaderFooterApplicationCustomizer.module.scss under "\src\extensions\customHeaderFooter\" folder

```
.app {
    .top {
      height:60px;
      text-align:center;
      line-height:2.5;
      font-weight:bold;
      display: flex;
      align-items: center;
      justify-content: center;
    }

    .bottom {
      height:40px;
      text-align:center;
      line-height:2.5;
      font-weight:bold;
      display: flex;
      align-items: center;
      justify-content: center;
    }
  }
```

Include the styles in extension CustomHeaderFooterApplicationCustomizer.ts

```
import styles from './CustomHeaderFooterApplicationCustomizer.module.scss';
```

Test the extension

1. Open serve.json under config folder.
2. Update the properties section to include Top and Bottom messages.

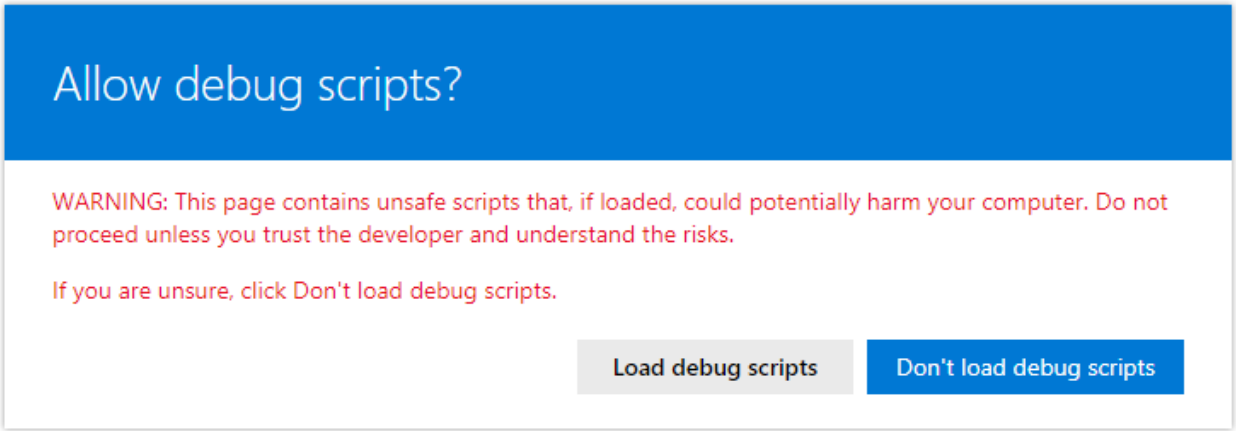
```
{
  "$schema": "https://developer.microsoft.com/json-schemas/core-
build/serve.schema.json",
  "port": 4321,
  "https": true,
  "serveConfigurations": {
    "default": {
```

```
      "pageUrl":
"https://contoso.sharepoint.com/sites/mySite/SitePages/myPage.aspx",
      "customActions": {
        "f58a0902-c9d8-4cce-bd5e-4da887e21bed": {
          "location": "ClientSideExtension.ApplicationCustomizer",
          "properties": {
            "Top": "Header of the page",
            "Bottom": "Footer of the page"
          }
        }
      }
    },
    "customHeaderFooter": {
      "pageUrl":
"https://contoso.sharepoint.com/sites/mySite/SitePages/myPage.aspx",
      "customActions": {
        "f58a0902-c9d8-4cce-bd5e-4da887e21bed": {
          "location": "ClientSideExtension.ApplicationCustomizer",
          "properties": {
            "Top": "Header of the page",
            "Bottom": "Footer of the page"
          }
        }
      }
    }
  }
}
```

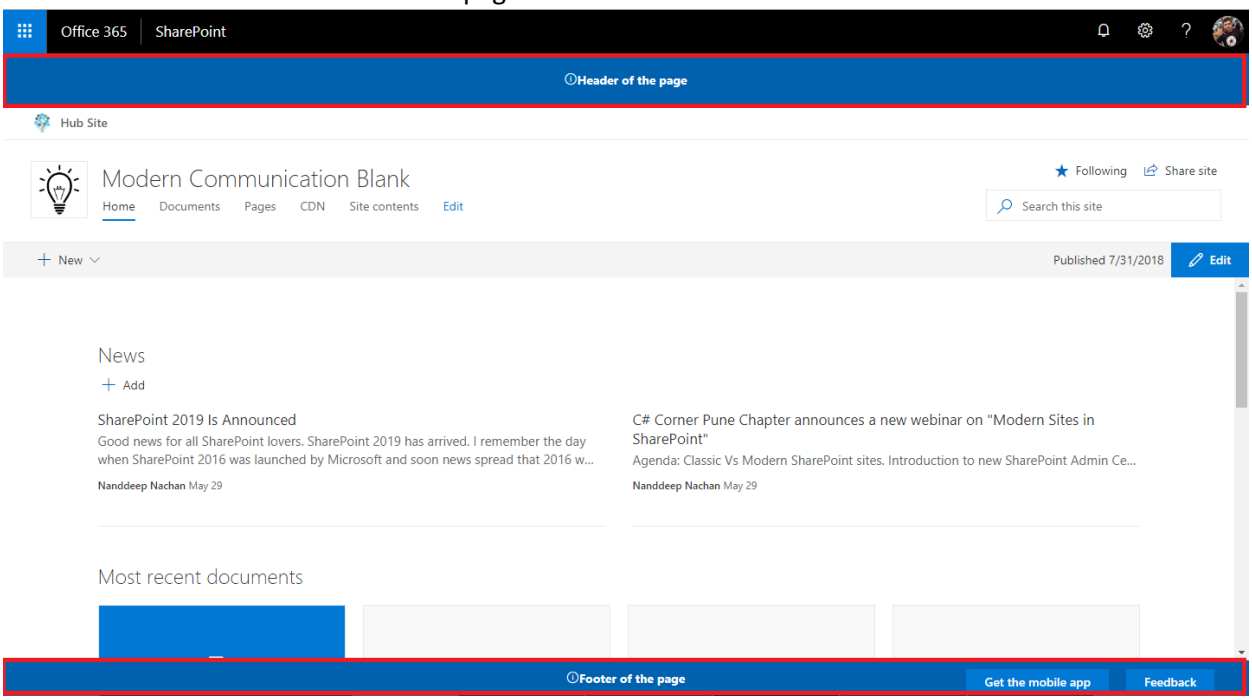
3. In the command prompt, type below command

```
gulp serve
```

4. The SharePoint site will open, click “Load debug scripts”



5. Observe the header and footer on the page.



Summary

Application customizer SharePoint Framework extension helps to extend the predefined placeholders on Modern SharePoint page. These extensions can be deployed tenant wide.

Chapter 22: Field Customizer Overview

Overview

SharePoint Framework (SPFx) Extensions are client side components which allows extending the SharePoint user experience. In this chapter, we will explore the Field Customizer part of SharePoint extensions.

Brief about Field Customizer

Field customizer allows to modify views for the field in a list view. It can be used to override the field representation in the list. Field customizer can be used with site columns or directly to the field inside a list.

In the classic SharePoint, we used to modify the representation of SharePoint list fields using JSLink property of the web part. In the modern SharePoint as JavaScript cannot be used on page, the field customizer helps to implement these scenarios.

Create SPFx Solution

1. Open command prompt. Create a directory for SPFx solution

```
md spfx-extensions-fieldcustomizer
```

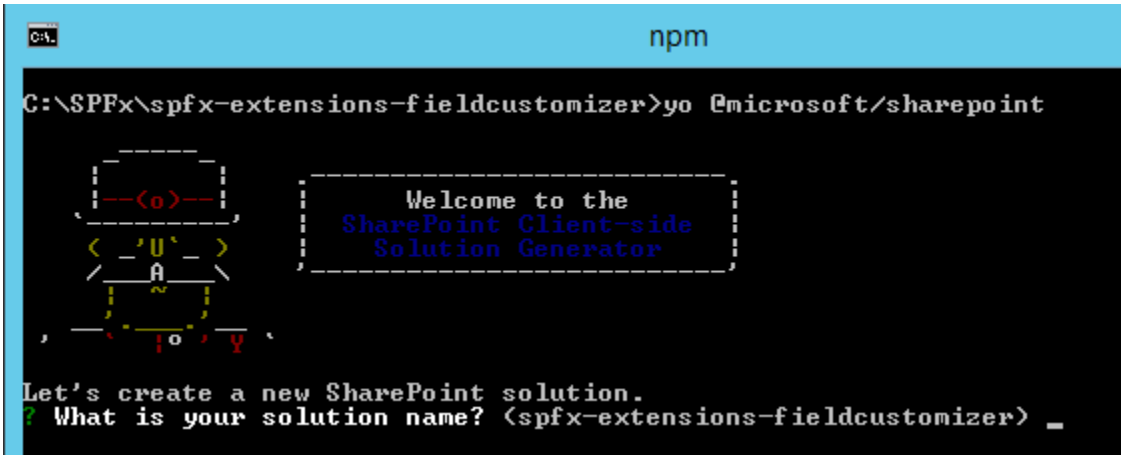
2. Navigate to above created directory

```
cd spfx-extensions-fieldcustomizer
```

3. Run Yeoman SharePoint Generator to create the solution

```
yo @microsoft/sharepoint
```

4. Yeoman generator will present you with the wizard by asking questions about the solution to be created.



Solution Name: Hit enter to have default name (spfx-extensions-fieldcustomizer in this case) or type in any other name for your solution.
Selected choice: Hit enter

Target for component: Here we can select the target environment where we are planning to deploy the client webpart i.e. SharePoint Online or SharePoint OnPremise (SharePoint 2016 onwards).
Selected choice: SharePoint Online only (latest)

Place of files: We may choose to use the same folder or create a subfolder for our solution.
Selected choice: Same folder

Deployment option: Selecting Y will allow the app to deployed instantly to all sites and will be accessible everywhere.
Selected choice: N (install on each site explicitly)

Type of client-side component to create: We can choose to create client side webpart or an extension.
Selected choice: Extension

Type of client-side extension to create: We can choose to create Application customizer, Field customizer, or ListView Command Set.
Selected choice: Field customizer

Field customizer name: Hit enter to select the default name or type in any other name.
Selected choice: PercentFieldCustomizer

Field customizer description: Hit enter to select the default description or type in any other value.
Selected choice: Displays field in percentage

Framework to use: Select any JavaScript framework to develop the component. Available choices are (No JavaScript Framework, React)
Selected choice - No JavaScript Framework

5. Yeoman generator will perform scaffolding process to generate the solution. The scaffolding process will take significant amount of time.
6. Once the scaffolding process is completed, lock down the version of project dependencies by running below command

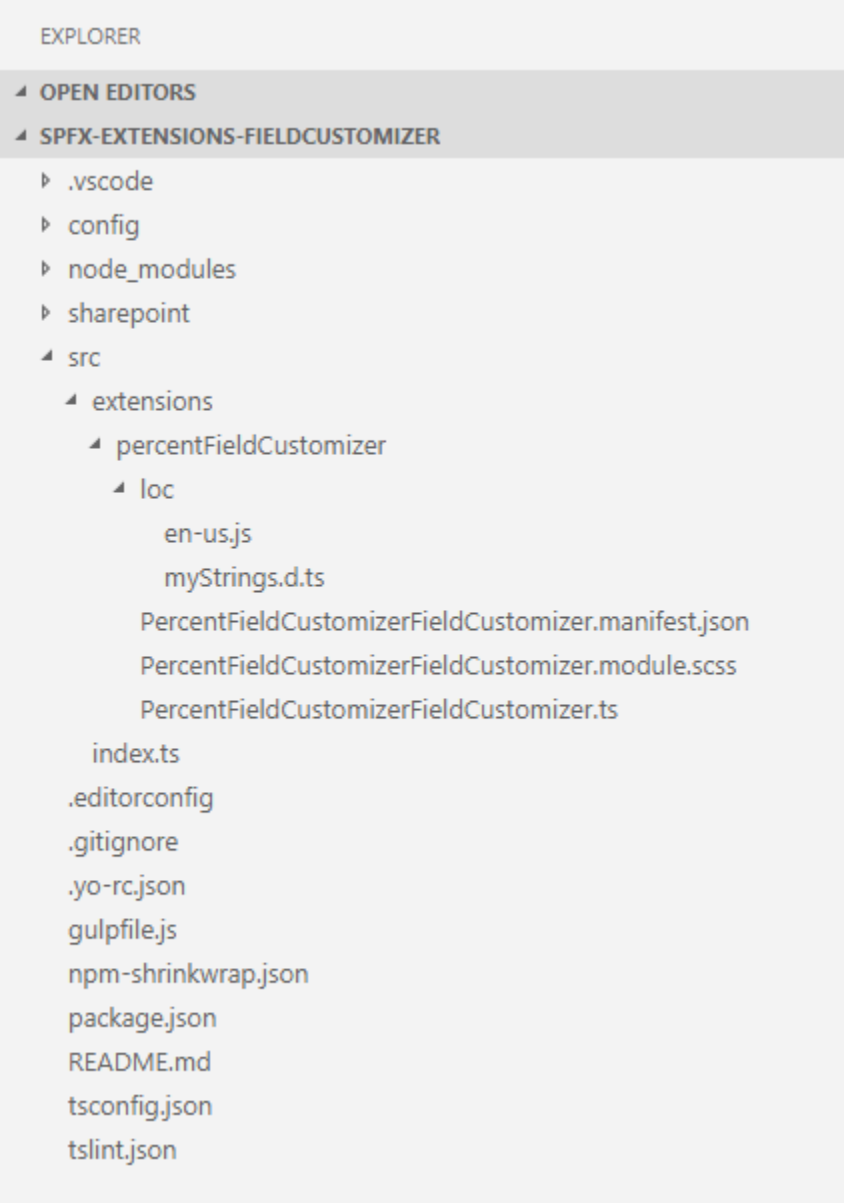
```
npm shrinkwrap
```

7. In the command prompt type below command to open the solution in code editor of your choice.

```
code .
```

Solution Structure

The solution structure is similar to client-side web parts with similar configuration options.



The file PercentFieldCustomizerFieldCustomizer.manifest.json inside the folder "\src\extensions\percentFieldCustomizer\" defines the extension type and unique identifier for the solution. Please note down the id. We will need it later for debugging purpose.

```
{
  "$schema": "https://developer.microsoft.com/json-schemas/spfx/client-side-extension-manifest.schema.json",

  "id": "8db272d2-a083-48e7-b6da-dbf14fc98bbf",
  "alias": "PercentFieldCustomizerFieldCustomizer",
```

```
  "componentType": "Extension",
  "extensionType": "FieldCustomizer",

  // The "*" signifies that the version should be taken from the package.json
  "version": "*",
  "manifestVersion": 2,

  // If true, the component can only be installed on sites where Custom Script
is allowed.
  // Components that allow authors to embed arbitrary script code should set
this to true.
  // https://support.office.com/en-us/article/Turn-scripting-capabilities-on-
or-off-1f2c515f-5d7e-448a-9fd7-835da935584f
  "requiresCustomScript": false
}
```

Implement Field Customizer

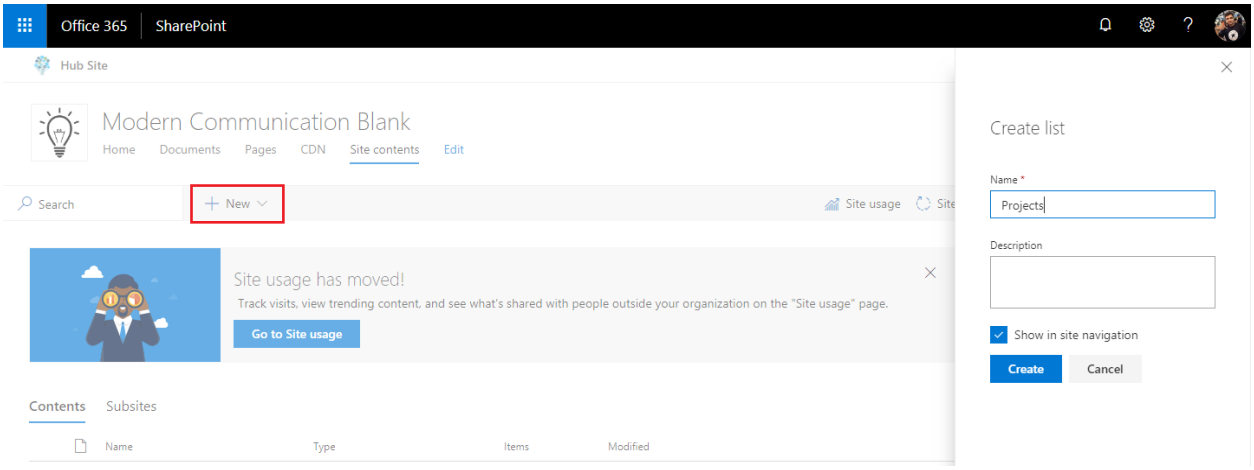
Open PercentFieldCustomizerFieldCustomizer.ts under "\src\extensions\percentFieldCustomizer\" folder. The class has below important methods:

- **onInit()** event occurs before the page DOM is ready. It returns promise to perform asynchronous operations. onRenderCell() is not invoked until this promise is resolved.
- **onRenderCell()** event occurs when each cell is rendered. It provides event.domElement to customize the representation of field.
- **onDisposeCell()** can be used to free up any used resources that were allocated during rendering of the field to avoid any resource leak.

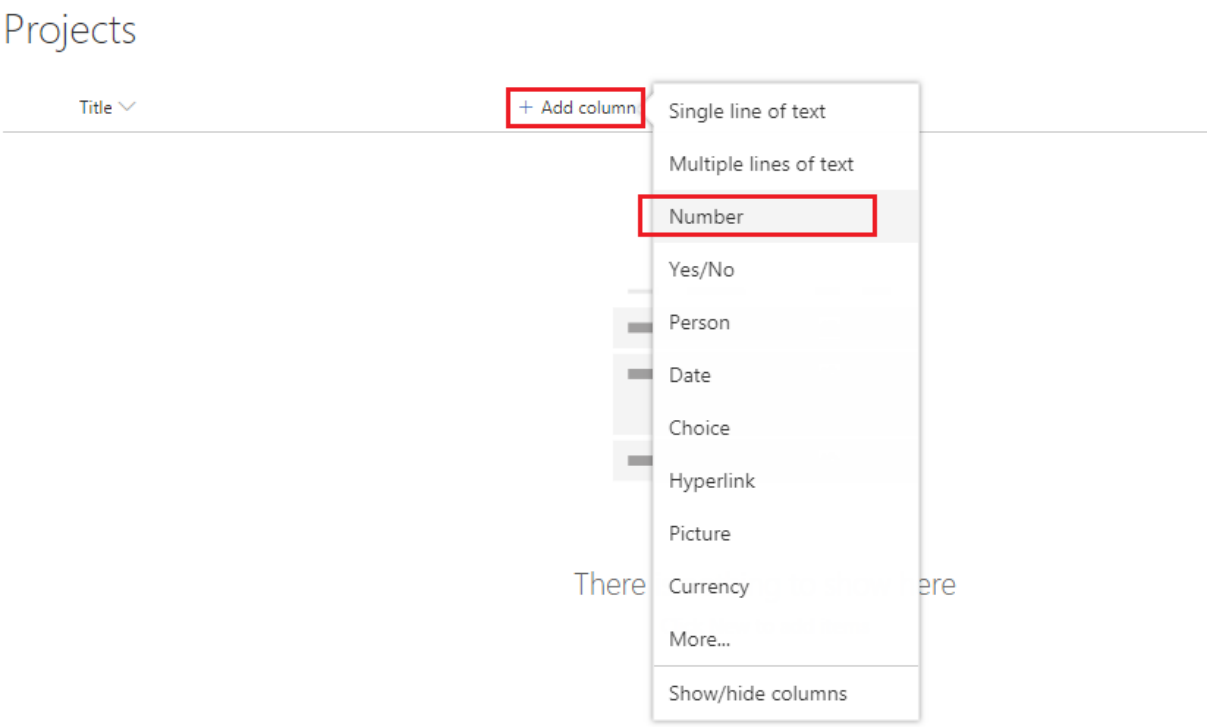
Debug Field Customizer

The SharePoint local workbench now cannot be used to test the field customizer as we will need an actual SharePoint site to create needed list and fields.

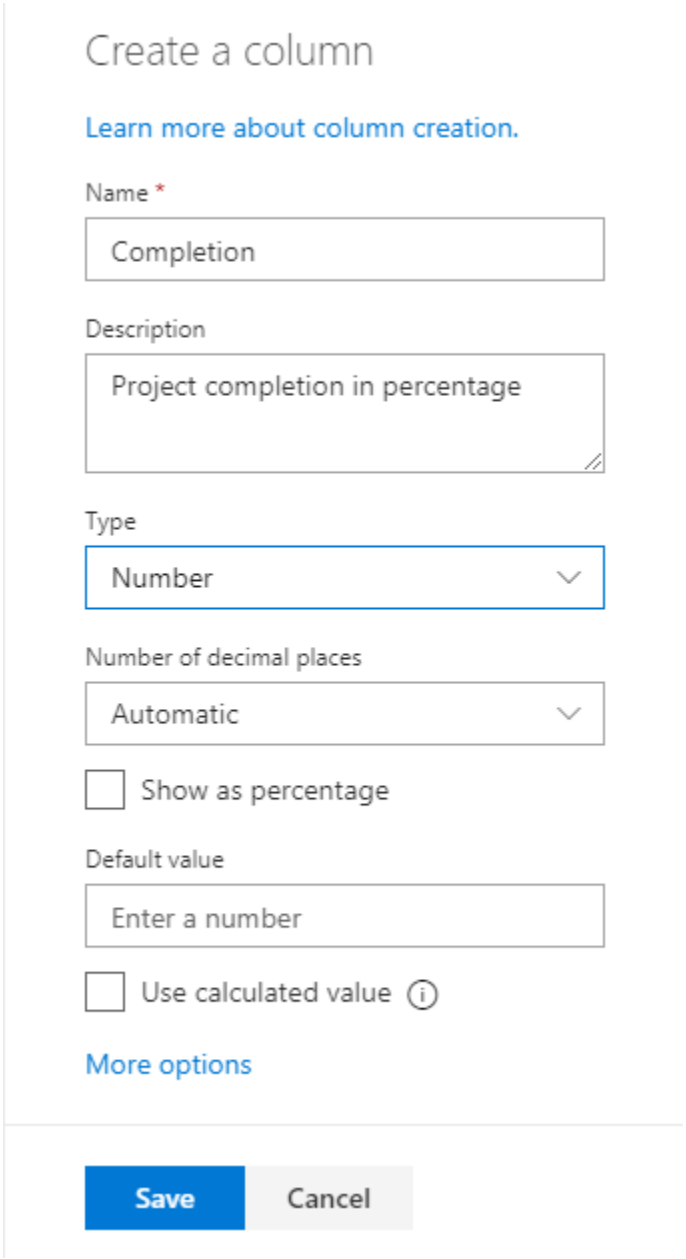
1. Open SharePoint site
2. From site contents create new list named "Projects"



3. Click “Add column” to add a number field



4. Name it as **Completion**



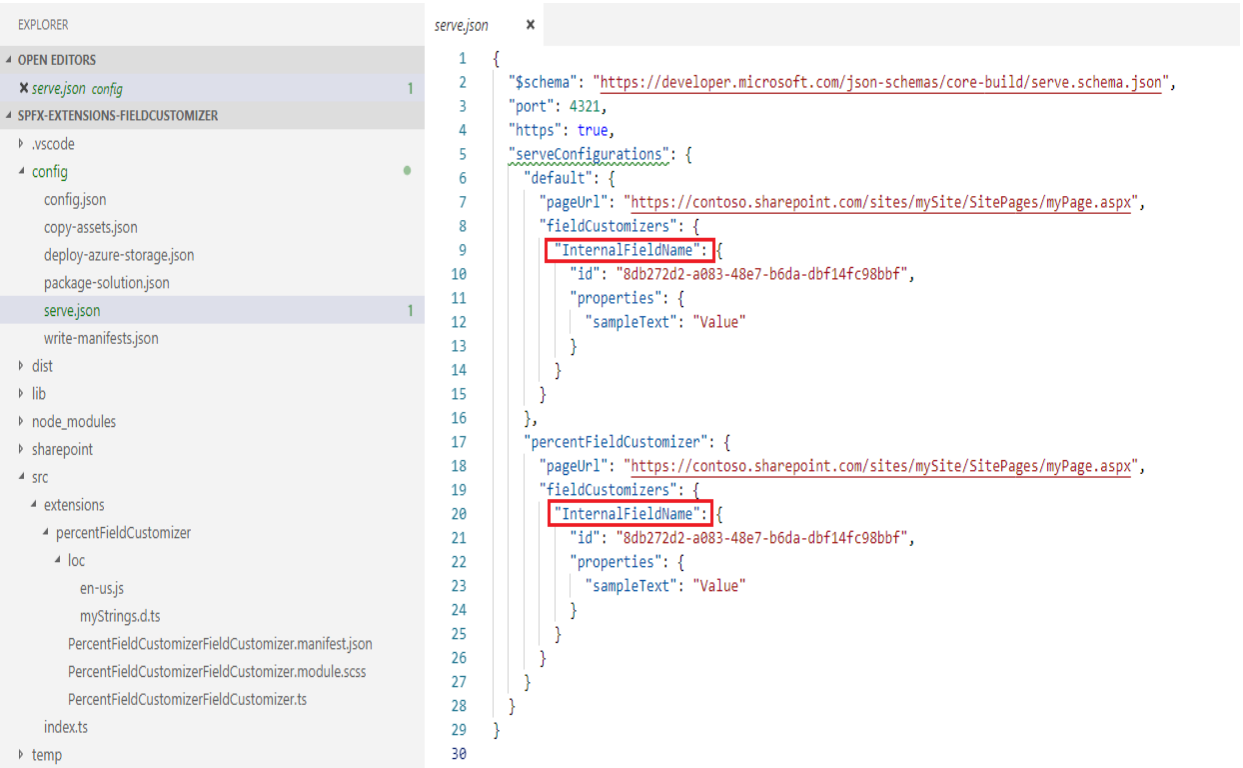
5. Click **Save**
6. Add some test data to the list

Projects

Title	Completion
Cold Fusion	20
Honeycomb	60
Liberation	75
Phoenix	45
Topaz	100
Whistler	56

Update the Solution for Field changes

1. Open serve.json file under config folder. Below is the default content.



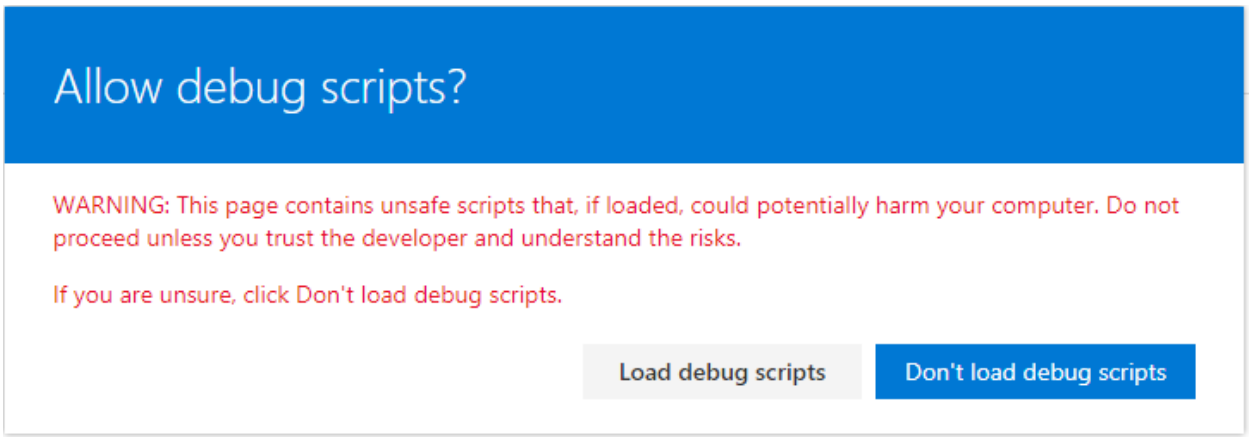
2. Update the InternalFieldName attribute with the name of our field, i.e., Completion.

```
{
  "$schema": "https://developer.microsoft.com/json-schemas/core-
build/serve.schema.json",
  "port": 4321,
  "https": true,
  "serveConfigurations": {
    "default": {
      "pageUrl":
"https://contoso.sharepoint.com/sites/mySite/SitePages/myPage.aspx",
      "fieldCustomizers": {
        "Completion": {
          "id": "8db272d2-a083-48e7-b6da-dbf14fc98bbf",
          "properties": {
            "sampleText": "Value"
          }
        }
      }
    },
    "percentFieldCustomizer": {
      "pageUrl":
"https://contoso.sharepoint.com/sites/mySite/SitePages/myPage.aspx",
      "fieldCustomizers": {
        "Completion": {
          "id": "8db272d2-a083-48e7-b6da-dbf14fc98bbf",
          "properties": {
            "sampleText": "Value"
          }
        }
      }
    }
  }
}
```

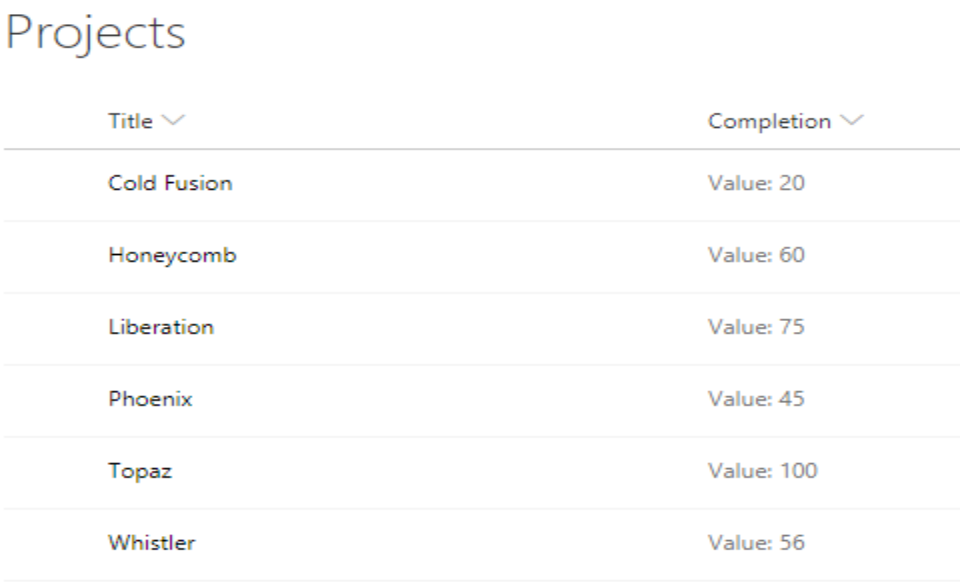
3. In the command prompt, type below command to run the extension.

```
gulp serve
```

4. Accept loading of debug manifests by clicking “Load debug scripts”.



5. The list view should display the formatted Completion column as below.



Apply Field Customization

1. Navigate back to the solution.
2. Open PercentFieldCustomizerFieldCustomizer.module.scss file from "\src\extensions\percentFieldCustomizer\" folder and update the css.

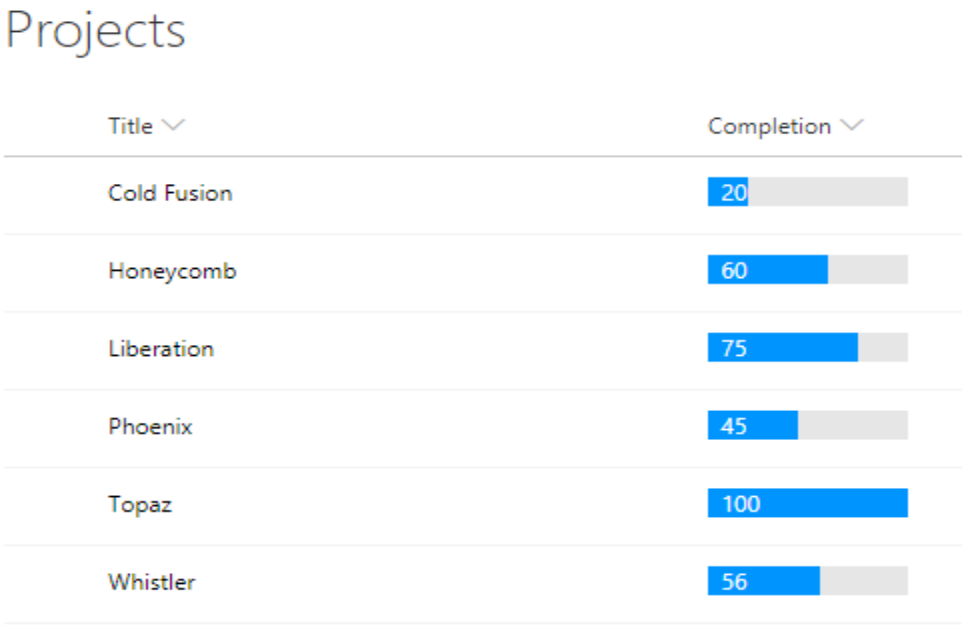
```
.PercentFieldCustomizer {
  .cell {
    background-color: "[theme:themePrimary, default:#e5e5e5]";
    display: 'inline-block';
  }
  .full {
    background-color: #e6e6e6;
    width: 100px;
```

```
    }
}
```

3. Open PercentFieldCustomizerFieldCustomizer.ts file from "\src\extensions\percentFieldCustomizer\" folder.
4. Update the onRenderCell method.

```
public onRenderCell(event: IFieldCustomizerCellEventParameters): void {
    // Use this method to perform your custom cell rendering.
    event.domElement.classList.add(styles.cell);
    event.domElement.innerHTML = `
            <div class='${styles.PercentFieldCustomizer}'>
                <div class='${styles.full}'>
                <div style='width: ${event.fieldValue}px;
background:#0094ff; color:#ffffff'>
                      ${event.fieldValue}
                </div>
                </div>
            </div>`;
}
```

5. Make sure the gulp serve is running. Refresh the SharePoint list – Projects.



The Completion field is now customized with the progress completion using field customizer.

Summary

The Field customizer SharePoint Framework extension helps to modify the representation of the field in SharePoint list. This is an alternative to JS Link in the modern SharePoint sites.

Chapter 23: ListView Command Set Overview

Overview

SharePoint Framework (SPFx) Extensions are client side components which allows extending the SharePoint user experience. In this chapter, we will explore the ListView Command Set of SharePoint extensions.

Brief about Field Customizer

ListView Command Set allows to extend command surfaces of SharePoint to add new actions. It supports toolbar and context menu.

In the classic SharePoint, we used to add the new actions to SharePoint list by implementing custom actions. In the modern SharePoint, the ListView Command Set helps to implement these scenarios.

Create SPFx Solution

1. Open command prompt. Create a directory for SPFx solution

```
md spfx-extensions-listviewcommandset
```

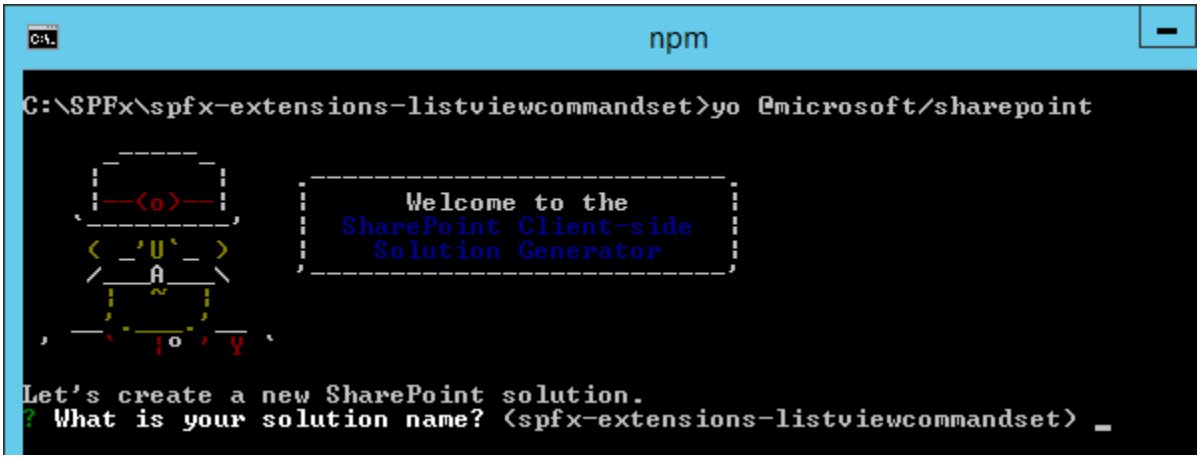
2. Navigate to above created directory

```
cd spfx-extensions-listviewcommandset
```

3. Run Yeoman SharePoint Generator to create the solution

```
yo @microsoft/sharepoint
```

4. Yeoman generator will present you with the wizard by asking questions about the solution to be created.



Solution Name: Hit enter to have default name (spfx-extensions-listviewcommandset in this case) or type in any other name for your solution.
Selected choice: Hit enter

Target for component: Here we can select the target environment where we are planning to deploy the client webpart i.e. SharePoint Online or SharePoint OnPremise (SharePoint 2016 onwards).
Selected choice: SharePoint Online only (latest)

Place of files: We may choose to use the same folder or create a subfolder for our solution.
Selected choice: Same folder

Deployment option: Selecting Y will allow the app to deployed instantly to all sites and will be accessible everywhere.
Selected choice: N (install on each site explicitly)

Type of client-side component to create: We can choose to create client side webpart or an extension.
Selected choice: Extension

Type of client-side extension to create: We can choose to create Application customizer, Field customizer, or ListView Command Set.
Selected choice: ListView Command Set

Command Set name: Hit enter to select the default name or type in any other name.
Selected choice: ModalDialog

Command Set description: Hit enter to select the default description or type in any other value.
Selected choice: Displays modal dialog using listview command set extension

5. Yeoman generator will perform scaffolding process to generate the solution. The scaffolding process will take significant amount of time.

6. Once the scaffolding process is completed, lock down the version of project dependencies by running below command

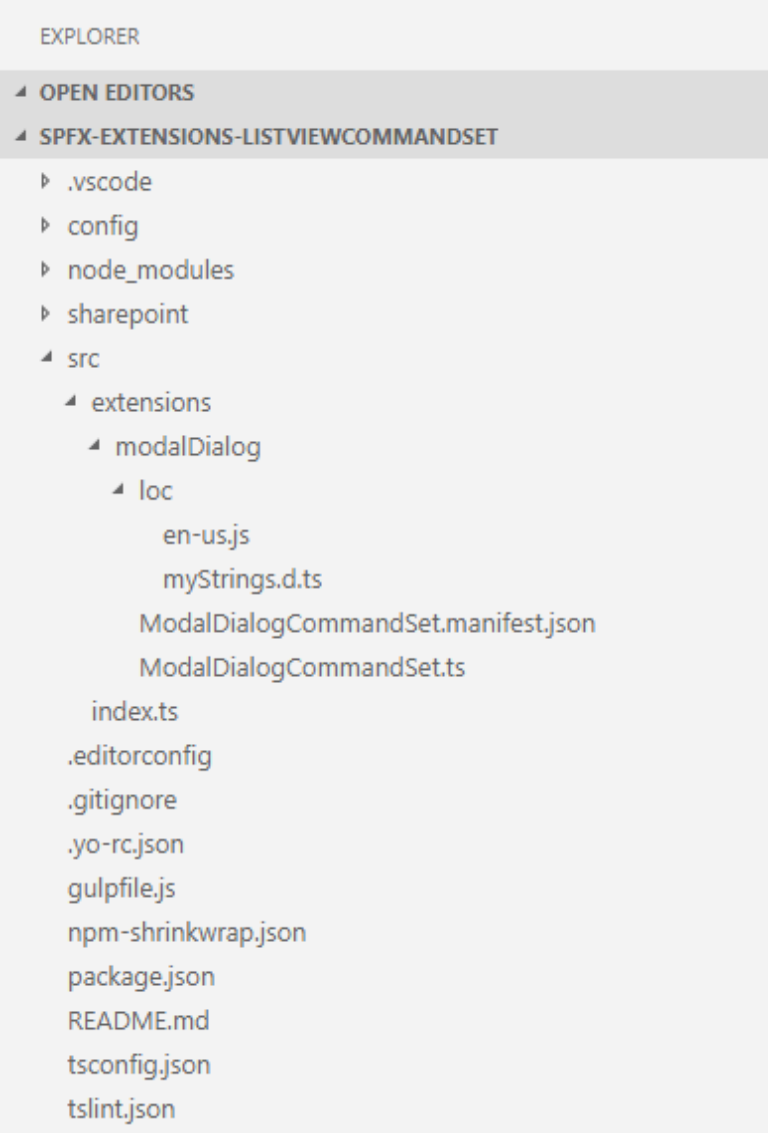
```
npm shrinkwrap
```

7. In the command prompt type below command to open the solution in code editor of your choice.

```
code .
```

Solution Structure

The solution structure is similar to client-side web parts with similar configuration options.



The file ModalDialogCommandSet.manifest.json inside the folder "\src\extensions\modalDialog\" defines the extension type and unique identifier for the solution. Please note down the id. We will need it later for debugging purpose.

```
{
  "$schema": "https://developer.microsoft.com/json-schemas/spfx/command-set-extension-manifest.schema.json",

  "id": "78c7b88e-c176-4694-b95d-1b371279b6e8",
  "alias": "ModalDialogCommandSet",
```

```
  "componentType": "Extension",
  "extensionType": "ListViewCommandSet",

  // The "*" signifies that the version should be taken from the package.json
  "version": "*",
  "manifestVersion": 2,

  // If true, the component can only be installed on sites where Custom Script
is allowed.
  // Components that allow authors to embed arbitrary script code should set
this to true.
  // https://support.office.com/en-us/article/Turn-scripting-capabilities-on-
or-off-1f2c515f-5d7e-448a-9fd7-835da935584f
  "requiresCustomScript": false,

  "items": {
    "COMMAND_1": {
      "title": { "default": "Command One" },
      "iconImageUrl": "icons/request.png",
      "type": "command"
    },
    "COMMAND_2": {
      "title": { "default": "Command Two" },
      "iconImageUrl": "icons/cancel.png",
      "type": "command"
    }
  }
}
```

Implement Field Customizer

Open ModalDialogCommandSet.ts under "\src\extensions\modalDialog\" folder. The class has below important methods:

- **onInit()** event occurs before the page DOM is ready. It returns promise to perform asynchronous operations. onListViewUpdated() is not invoked until this promise is resolved.
- **onListViewUpdated()** event occurs separately for each command. The default implementation is as below

```
public onListViewUpdated(event:
IListViewCommandSetListViewUpdatedParameters): void {
    const compareOneCommand: Command = this.tryGetCommand('COMMAND_1');
    if (compareOneCommand) {
```

```
      // This command should be hidden unless exactly one row is
selected.
      compareOneCommand.visible = event.selectedRows.length === 1;
    }
  }
```

tryGetCommand helps to get the Command object, which is a representation of the command in UI.

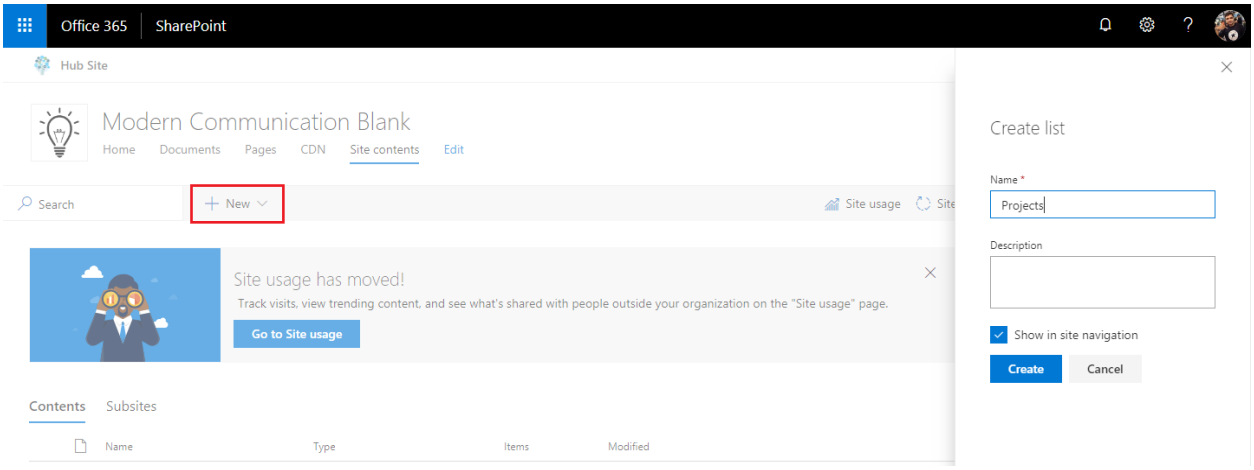
- **onExecute()** method defines what happens when a command is executed. The default implementation is as below

```
public onExecute(event: IListViewCommandSetExecuteEventParameters): void
{
    switch (event.itemId) {
      case 'COMMAND_1':
        Dialog.alert(`${this.properties.sampleTextOne}`);
        break;
      case 'COMMAND_2':
        Dialog.alert(`${this.properties.sampleTextTwo}`);
        break;
      default:
        throw new Error('Unknown command');
    }
  }
```

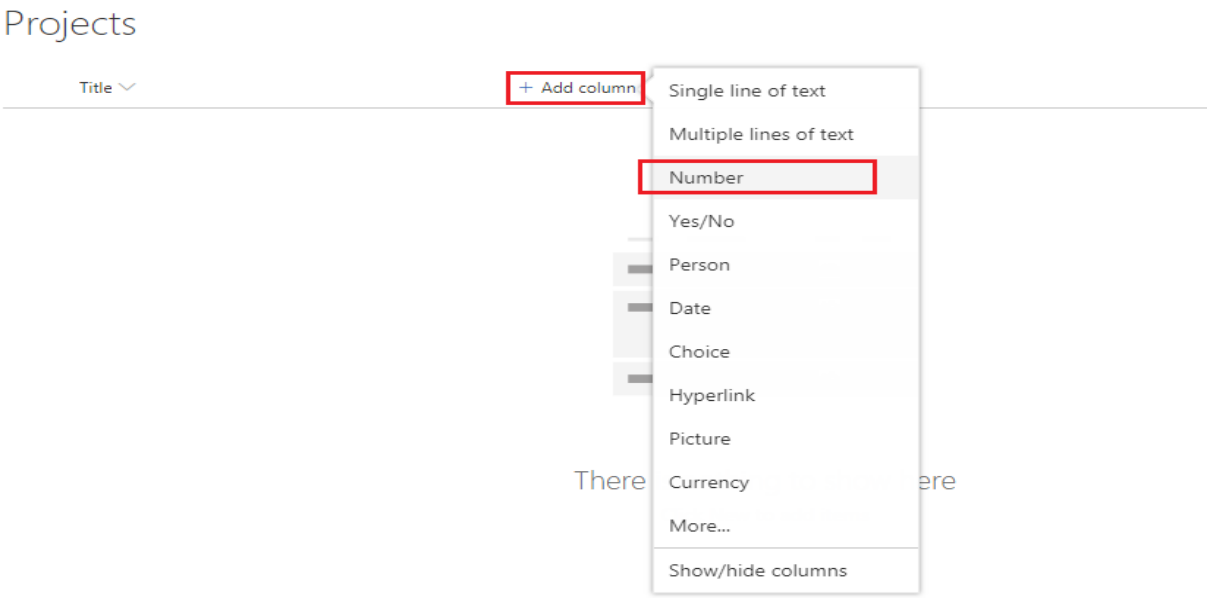
Debug Field Customizer

The SharePoint local workbench now cannot be used to test the field customizer as we will need an actual SharePoint site to create needed list and fields.

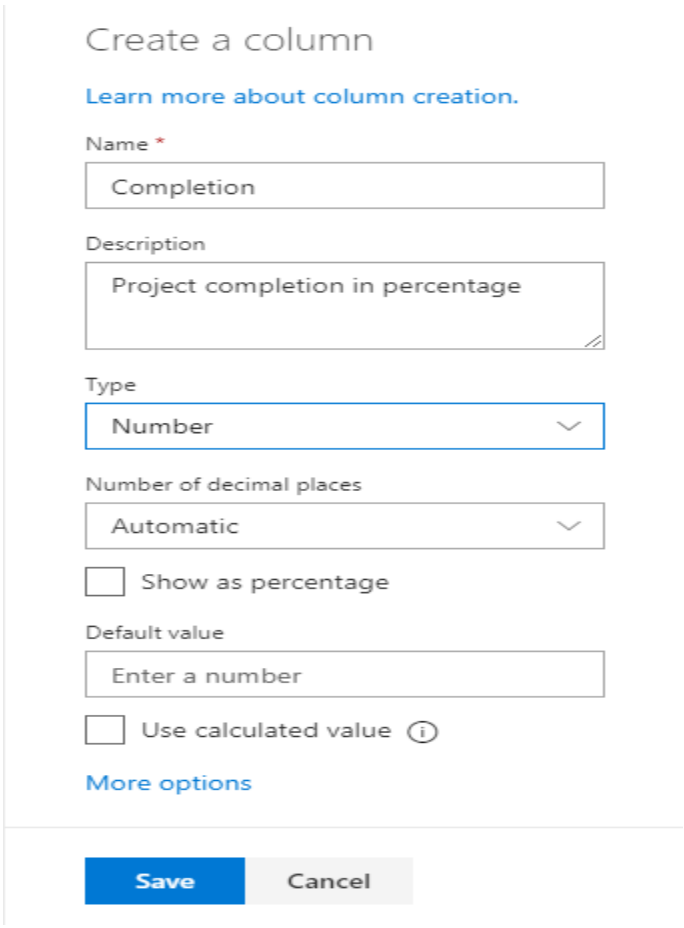
1. Open SharePoint site.
2. From site contents create new list named “Projects”.



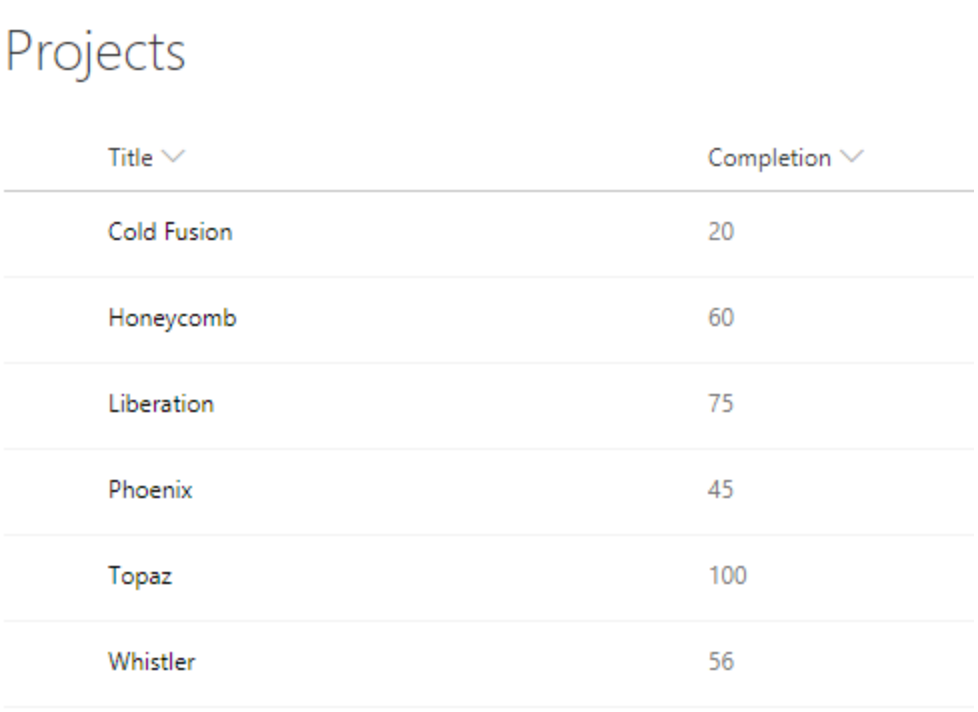
3. Click “Add column” to add a number field.



4. Name it as **Completion.**



5. Click **Save.**
6. Add some test data to the list.



Projects

Title	Completion
Cold Fusion	20
Honeycomb	60
Liberation	75
Phoenix	45
Topaz	100
Whistler	56

Update the Solution for Field changes

1. Open serve.json file under config folder. Update PageUrl to the url of list we created in the previous step.

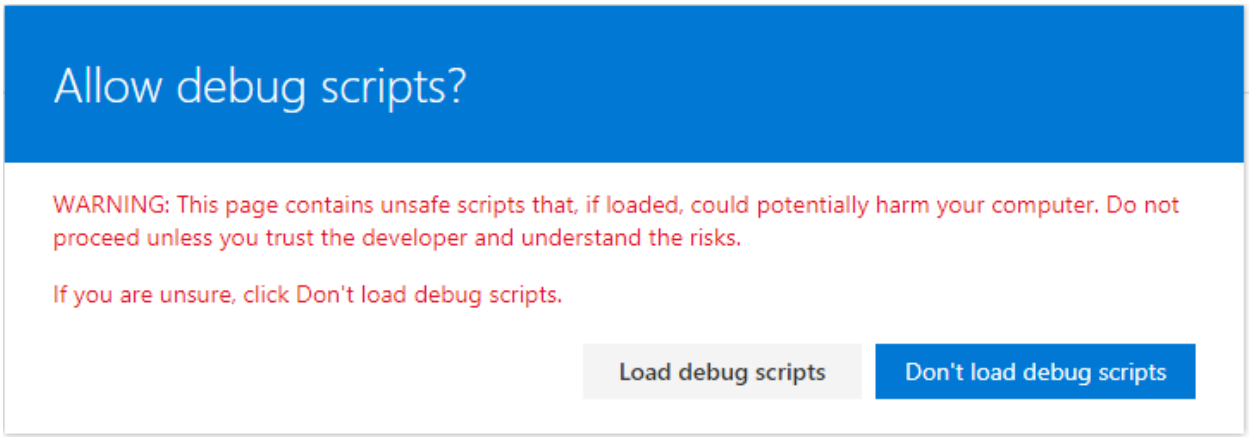
```
{
  "$schema": "https://developer.microsoft.com/json-schemas/core-
build/serve.schema.json",
  "port": 4321,
  "https": true,
  "serveConfigurations": {
    "default": {
      "pageUrl":
"https://contoso.sharepoint.com/sites/ModernCommunicationBlank/Lists/Projects/A
llItems.aspx",
      "customActions": {
        "78c7b88e-c176-4694-b95d-1b371279b6e8": {
          "location": "ClientSideExtension.ListViewCommandSet.CommandBar",
          "properties": {
            "sampleTextOne": "One item is selected in the list",
            "sampleTextTwo": "This command is always visible."
          }
        }
      }
    },
```

```
    "modalDialog": {
      "pageUrl":
"https://contoso.sharepoint.com/sites/ModernCommunicationBlank/Lists/Projects/A
llItems.aspx",
      "customActions": {
        "78c7b88e-c176-4694-b95d-1b371279b6e8": {
          "location": "ClientSideExtension.ListViewCommandSet.CommandBar",
          "properties": {
            "sampleTextOne": "One item is selected in the list",
            "sampleTextTwo": "This command is always visible."
          }
        }
      }
    }
  }
}
```

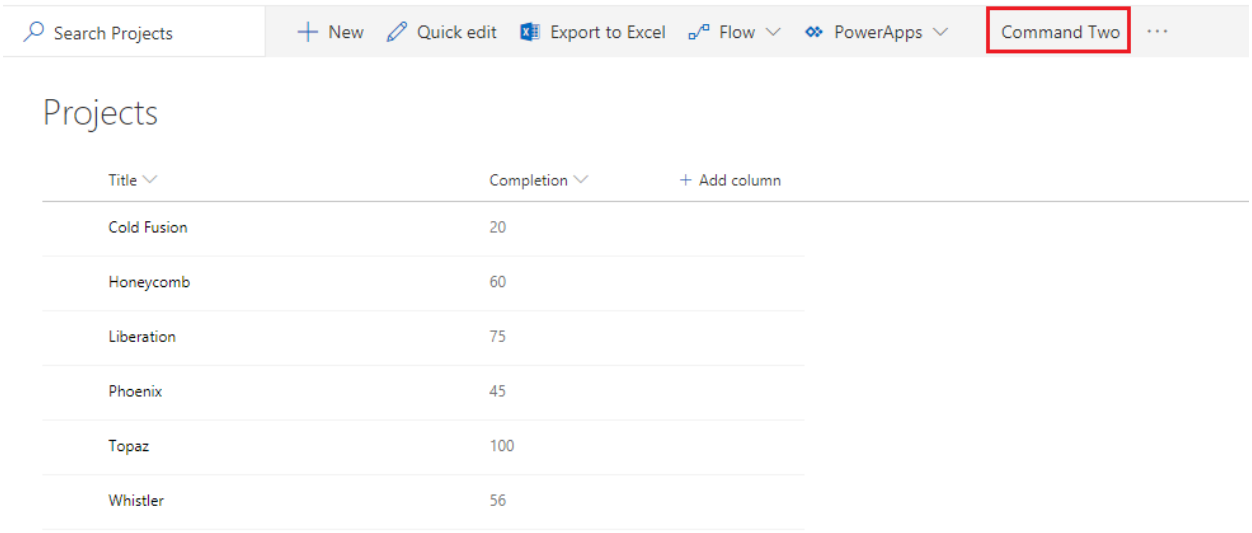
2. In the command prompt, type below command to run the extension.

```
gulp serve
```

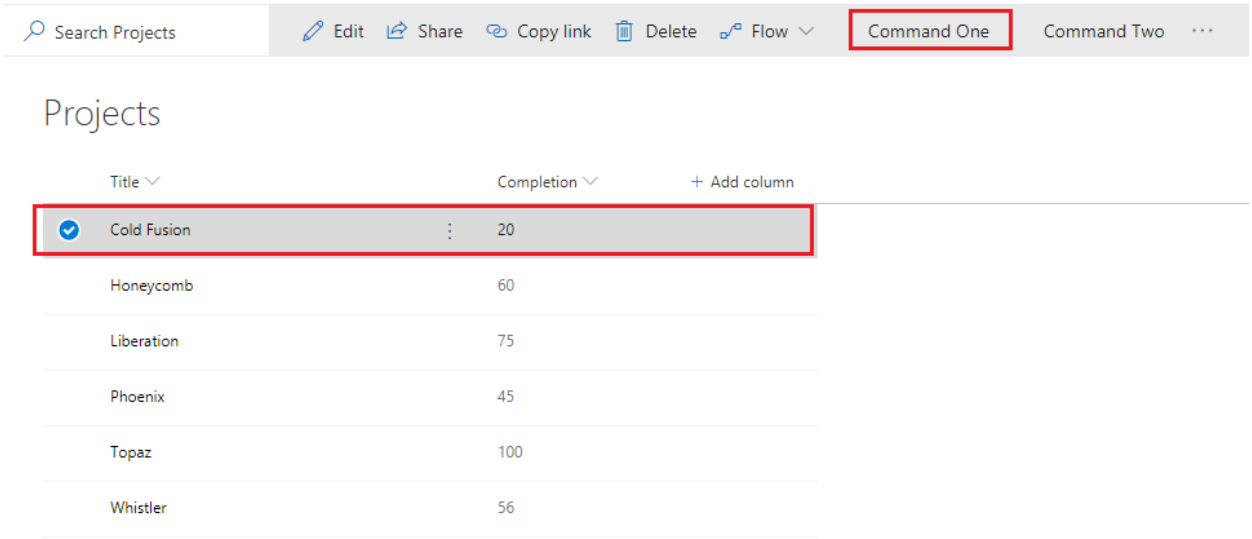
3. Accept loading of debug manifests by clicking “Load debug scripts”.



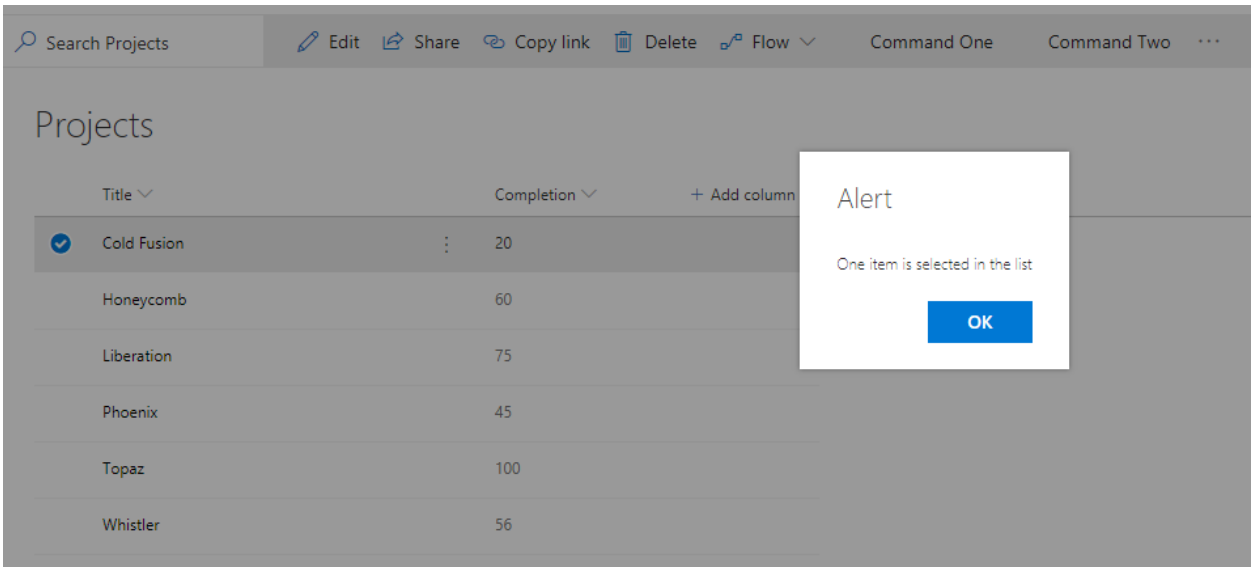
4. The Command Two button should appear in the toolbar.



5. "Command One" button is not visible until you select any list item.



6. Click "Command One" button, it will display an alert.

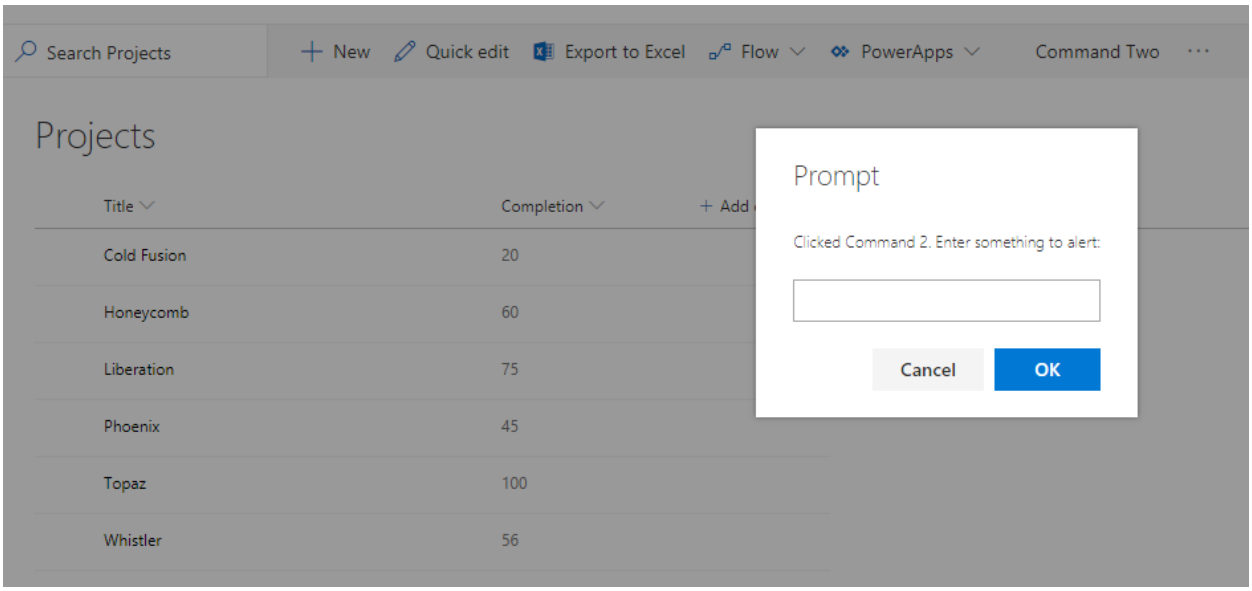


Apply List View Command Set Customization

1. Open ModalDialogCommandSet.ts file from "\src\extensions\modalDialog\" folder.
2. Update onExecute method.

```
public onExecute(event: IListViewCommandSetExecuteEventParameters): void
{
    switch (event.itemId) {
      case 'COMMAND_1':
        Dialog.alert(`Clicked ${this.properties.sampleTextOne}`);
        break;
      case 'COMMAND_2':
        Dialog.prompt(`Clicked ${strings.Command2}. Enter something to
alert:`).then((value: string) => {
          Dialog.alert(value);
        });
        break;
      default:
        throw new Error('Unknown command');
    }
  }
```

3. Make sure the gulp serve is running. Refresh the SharePoint list – Projects.



The ListView Command Set is now customized to show the prompt.

Summary

ListView Command Set SharePoint Framework extension helps to extend the toolbar of SharePoint list. This is an alternative to custom actions in the modern SharePoint sites.

Recommendations

- Learn TypeScript!
- Use SPHttpClient to connect to SharePoint
- HttpClient for other API's
- Use frameworks and libraries that already has typings
- Office UI Fabric available for consistent styling

Resources

- SPFx Overview
  https://dev.office.com/sharepoint/docs/sharepoint-framework-overview
- SPFx Tutorials
  http://aka.ms/spfx-tutorials
- Build your first webpart
  https://dev.office.com/sharepoint/docs/spfx/web-parts/get-started/build-a-hello-world-web-part
- SharePoint Framework API
  https://dev.office.com/sharepoint/reference/spfx/sharepoint-framework-reference-overview
- Get an introduction to the SharePoint Framework
  https://channel9.msdn.com/Events/Ignite/2016/BRK2114-TS
- SharePoint PnP Community
  http://aka.ms/sppnp-community
  http://aka.ms/spdev-docs

The Final Word

SharePoint Framework is the future of SharePoint. The directions from Microsoft is to use the SPFx. I hope this book has helped you to get started your journey with SPFx. Thanks for sticking with me on this journey, and hopefully we'll cross paths again in the future.