

JavaScript Injection and Remote Provisioning



Agenda

- Enabling Scripting in SharePoint 2016
- Understanding JavaScript Injection
- JSOM Programming
- Remote Provisioning using CSOM
- Designing MDS-enabled Pages
- JSLink and Client-side Rendering



Scripting Capabilities in SharePoint Online

- SharePoint has powerful scripting features
 - It's powerful when used by the good guys
 - It's powerful when used by the bad guys
 - SharePoint Online disables scripting by default
- The default scripting capabilities **enabled** for
 - All sites in SharePoint On-premises
- The default scripting capabilities **disabled** for
 - Personal sites in SharePoint Online
 - Self-service created sites in SharePoint Online
 - Root site collection of the tenant in SharePoint Online



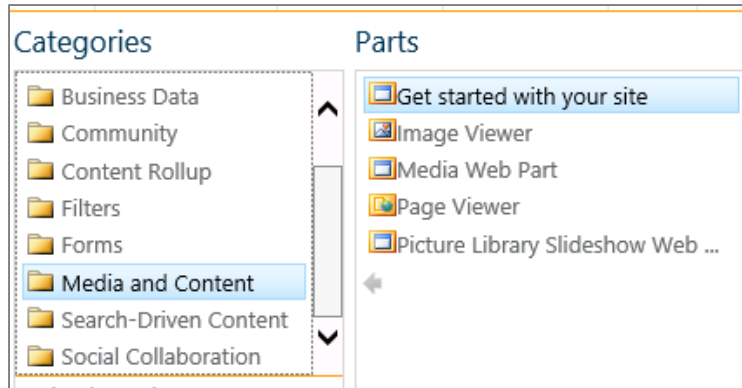
Features Affected with Scripting Disabled

- When scripting is disabled...
 - Many links removed from Site Settings page
 - SharePoint Designer capabilities reduced
 - You cannot edit master pages or page layouts
 - You cannot edit theme for current site
 - Many Web Parts are missing (e.g. Script Editor)
 - Users cannot upload .aspx files to document libraries
- Scripting must be enabled at the site level
 - Can be done by configuring SPO tenancy policy
 - Can be done using PowerShell or CSOM

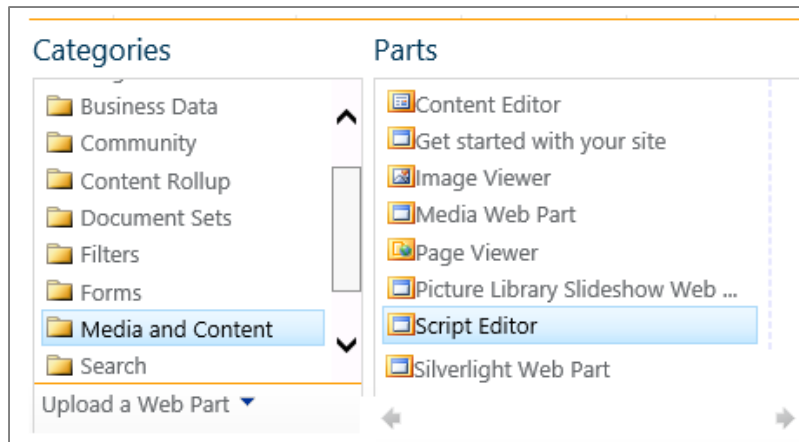


Effects of Scripting Being Disabled

- Media and Content Web Parts (scripting disabled)

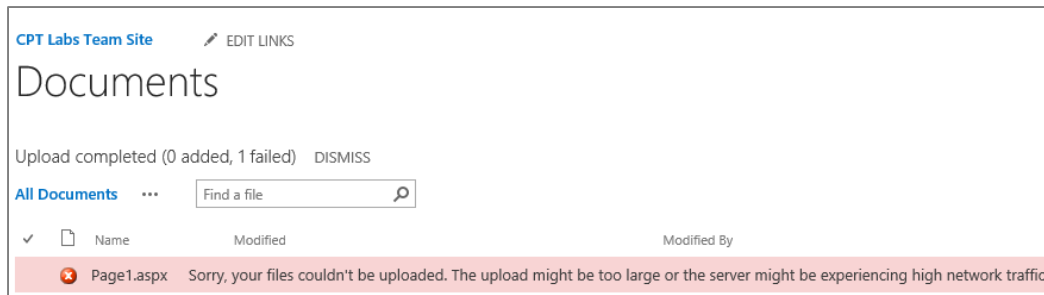


- Media and Content Web Parts (scripting enabled)

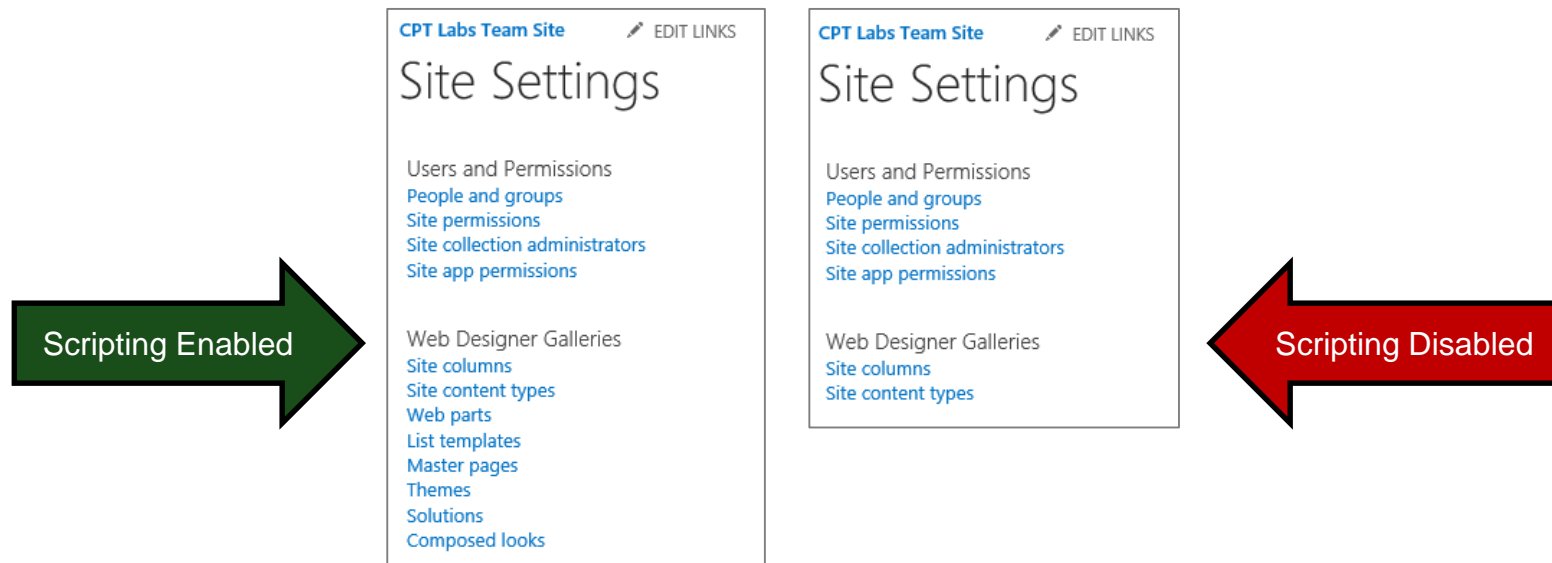


More Effects of Scripting Being Disabled

- You cannot upload a .ASPX file to a document library

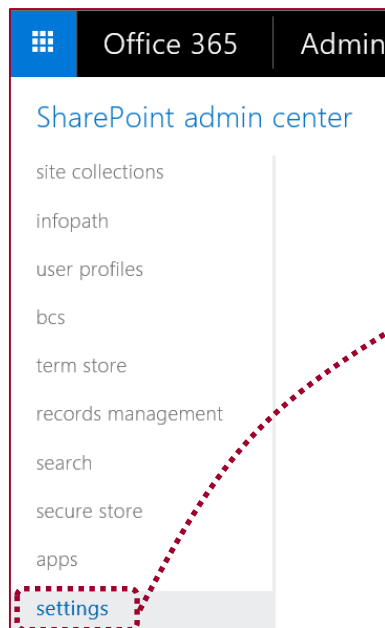


- Many Administrative Links removed from Site Settings page



Enabling Scripting in SharePoint Admin Center

- Settings configurable in SharePoint admin center
 - Sets policy for sites created in future
 - Sets policy for existing sites created within tenancy
 - Can take up to 24 hours to propagate changes to existing sites



Custom Script

Control whether users can run custom script on personal sites and self-service created sites.
Note: changes to this setting might take up to 24 hours to take effect.

- ☐ Prevent users from running custom script on personal sites
- ☒ Allow users to run custom script on personal sites
- ☐ Prevent users from running custom script on self-service created sites
- ☒ Allow users to run custom script on self-service created sites

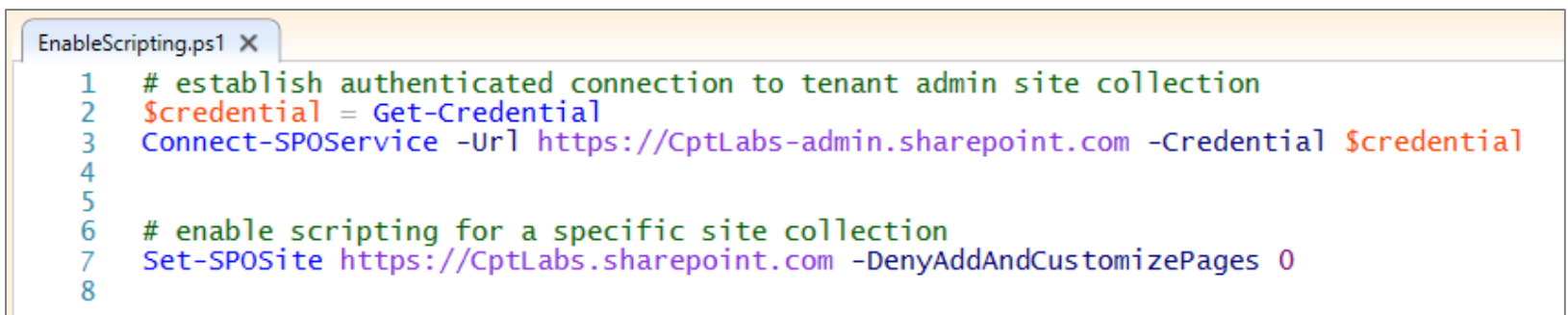


Enabling Scripting using PowerShell

- Site scripting setting can be enabled using PowerShell
 - Use set-sposite cmdlet to update denyAddAndCustomizePages
 - Changes take affect immediately

- PowerShell syntax

`Set-SPOsite <_YOUR_SITE_URL_> -DenyAddAndCustomizePages 0`



```
1 # establish authenticated connection to tenant admin site collection
2 $credential = Get-Credential
3 Connect-SPOService -Url https://CptLabs-admin.sharepoint.com -Credential $credential
4
5
6 # enable scripting for a specific site collection
7 Set-SPOSite https://CptLabs.sharepoint.com -DenyAddAndCustomizePages 0
8
```



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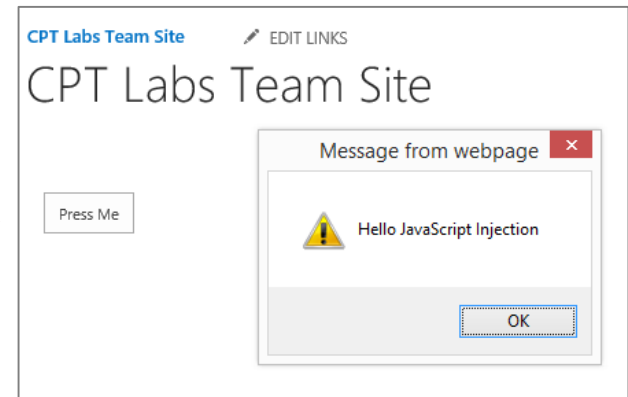
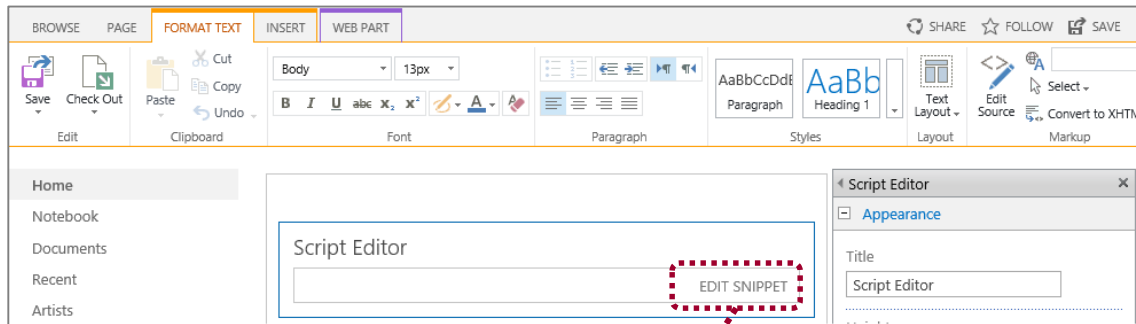
JavaScript Injection

- JavaScript injection based on central concept...
 1. upload custom JavaScript code to SharePoint Online
 2. execute code using identity and permissions of current user
- Approaches for using JavaScript injection
 - Script Editor Web Part
 - Uploading Custom pages and JavaScript files
 - Use remote provisioning to deploy files to target site
- Why create solutions using JavaScript Injection?
 - Provides more flexibility than SharePoint add-in model
 - Poses fewer constraints than SharePoint add-in model



Script Editor Web Part

- Allows user to add custom script logic in ad-hoc fashion





DEMO

Adding Custom Site Logic using the Script Editor Web Part

Creating and Uploading Custom Pages

- Uploading Custom Pages
 - Scripting must be enabled for target SPO site
 - Page file must be ASPX file (HTML files do not work)
 - Page can be uploaded to any document library
 - Page can link to same master page as other site pages
 - Page can link to custom CSS files and JavaScript files
- What about the SharePoint sites running in MDS mode?
 - Minimal Download Strategy (MDS) affects how pages run
 - MDS-enabled pages run in MDS mode through start.aspx
 - MDS mode redirects unsupported pages back to non-MDS URLs



Adding a Script Link for jQuery

- SharePoint does not load jQuery library
 - It must be explicitly for Script Editor Web Part

```
<div>
  <input id="cmdPressMe" value="Press Me" type="button" />
</div>

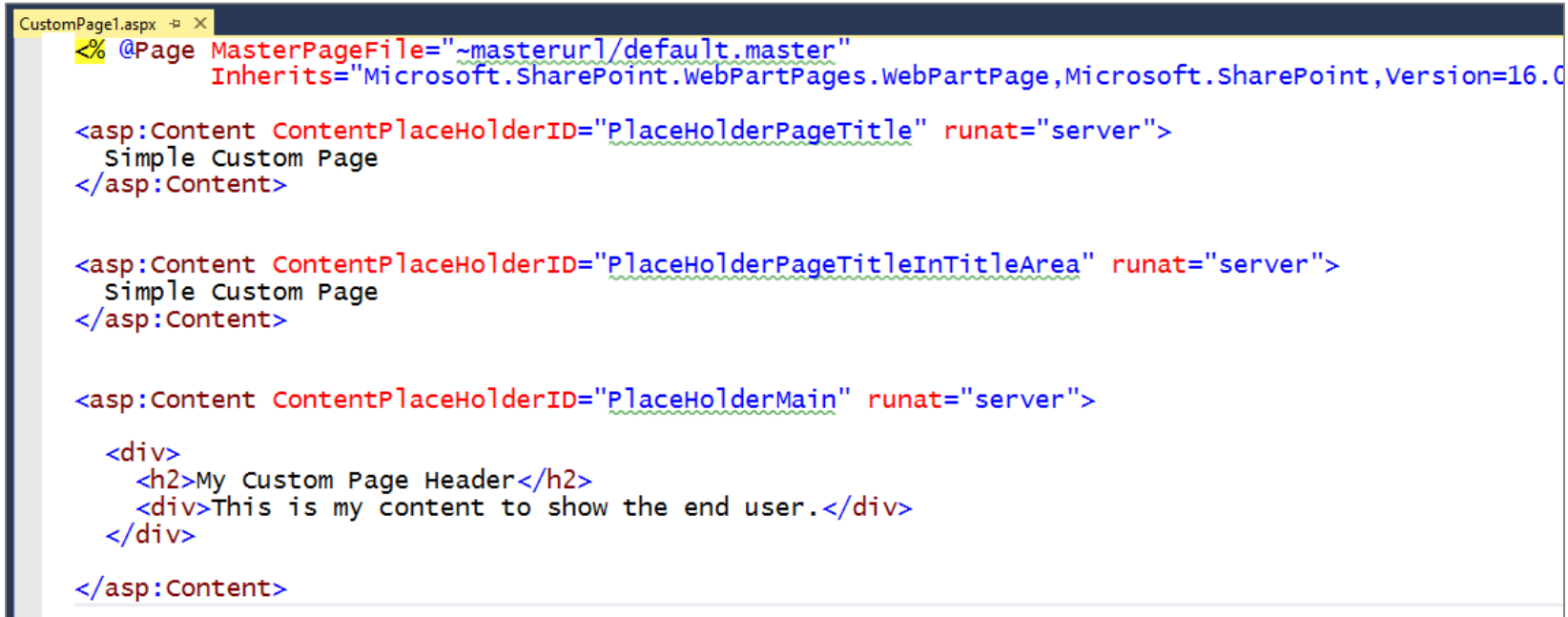
<!-- add script link to jQuery library-->
<script src="https://code.jquery.com/jquery-2.1.4.js"></script>

<script language="JavaScript" >
  // add jQuery document ready event handler
  $(function () {
    $("#cmdPressMe").click(function () {
      alert('Hello JavaScript Injection - This is working!')
    });
  });
</script>
```



Creating a Simple Site Pages for SPO

- Custom pages should link to current site's master page
 - Set `MasterPageFile` to dynamic token `~masterurl.default.master`
- Custom Page should inherit from `webPartPage`
 - Required to work correctly with Minimal Download Strategy feature
 - Required if you want to add support for Web Parts



```
CustomPage1.aspx
<% @Page MasterPageFile="~masterurl/default.master"
      Inherits="Microsoft.SharePoint.WebPartPages.WebPartPage,Microsoft.SharePoint,Version=16.0" %>

<asp:Content ContentPlaceHolderID="PlaceHolderPageTitle" runat="server">
    Simple Custom Page
</asp:Content>

<asp:Content ContentPlaceHolderID="PlaceHolderPageTitleInTitleArea" runat="server">
    Simple Custom Page
</asp:Content>

<asp:Content ContentPlaceHolderID="PlaceHolderMain" runat="server">
    <div>
        <h2>My Custom Page Header</h2>
        <div>This is my content to show the end user.</div>
    </div>
</asp:Content>
```


Creating a Simple Site Pages for SPO

- Essential SharePoint Master Page Placeholders
 - PlaceholderPageTitle
 - PlaceholderPageTitleInTitleArea
 - PlaceholderMain

The diagram illustrates the mapping between the ASP.NET code for a custom SharePoint page and its rendered output. Red dashed boxes highlight the placeholders in the code, and red dashed arrows point from these boxes to the corresponding elements in the rendered page.

Code (CustomPage1.aspx):

```
<% @Page MasterPageFile="~masterurl/default.master"
Inherits="Microsoft.SharePoint.WebPartPages.WebPartPage,Microsoft.SharePoint,Version=16.0" %>

<asp:Content ContentPlaceHolderID="PlaceholderPageTitle" runat="server">
    Simple Custom Page
</asp:Content>

<asp:Content ContentPlaceHolderID="PlaceholderPageTitleInTitleArea" runat="server">
    Simple Custom Page
</asp:Content>

<asp:Content ContentPlaceHolderID="PlaceholderMain" runat="server">
    <div>
        <h2>My Custom Page Header</h2>
        <div>This is my content to show the end user.</div>
    </div>
</asp:Content>
```

Rendered Page:

The rendered page shows the following structure:

- Page Title:** Simple Custom Page (mapped from PlaceholderPageTitle)
- Page Title In Title Area:** Simple Custom Page (mapped from PlaceholderPageTitleInTitleArea)
- Main Content Area:**
 - My Custom Page Header (mapped from the h2 tag in PlaceholderMain)
 - This is my content to show the end user. (mapped from the div content in PlaceholderMain)

Adding Scripting to a Custom Page

- Adding scripts and links using PlaceholderAdditionalPagehead

```
<asp:Content ContentPlaceHolderID="PlaceholderAdditionalPageHead" runat="server">

  <script src="https://code.jquery.com/jquery-2.1.4.js" ></script>

  <script>

    $(function () {
      $("#getSiteProperties").click(onGetSiteProperties);
      $("#getLists").click(onGetLists);
    });

    function onGetSiteProperties()...

    function onGetLists()...

  </script>
</asp:Content>

<asp:Content ContentPlaceHolderID="PlaceholderMain" runat="server">

  <div>
    <button id="getSiteProperties" type="button" >Get Site Properties</button>
    <button id="getLists" type="button" >Get Lists</button>
  </div>

  <div id="content_box" />

</asp:Content>
```



Programming the SharePoint REST API

```
function onGetSiteProperties() {  
    var urlRest = "../_api/web/?$select=Id,Title,Url";  
    $.ajax({  
        url: urlRest,  
        method: "GET",  
        headers: { "accept": "application/json;odata=verbose" }  
    }).then(function (data) {  
        $("#content_box")  
            .empty()  
            .append($("<ul>"))  
            .append($("<li>").text("ID: " + data.d.Id))  
            .append($("<li>").text("Title: " + data.d.Title))  
            .append($("<li>").text("Url: " + data.d.Url))  
    });  
}
```

Get Site Properties

Get Lists

- ID: 9bc612a2-9df4-44aa-8342-a0f87eb79379
- Title: CPT Labs Team Site
- Url: <https://cptlabs.sharepoint.com>

```
function onGetLists() {  
    var urlRest = "../_api/web/lists/?$filter=(Hidden eq false)";  
    $.ajax({  
        url: urlRest,  
        method: "GET",  
        headers: { "accept": "application/json;odata=verbose" }  
    }).then(function (data) {  
        var lists = data.d.results;  
        var listOfLists = $("<ul>");  
        for (var i = 0; i < lists.length; i++) {  
            listOfLists.append($("<li>").text(lists[i].Title) );  
        }  
        $("#content_box").empty().append(listOfLists);  
    });  
}
```

Get Site Properties

Get Lists

- CustomPages
- Documents
- Form Templates
- MicroFeed
- Site Assets
- Site Pages
- Style Library



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JavaScript Object Model (JSOM)

- SharePoint's Client-side JavaScript API
 - Provides equivalent to CSOM available to .NET code
 - Provides extra functionality for browser-based apps
 - Automatic authentication – no ability to impersonate
 - Requires execution within valid SharePoint context
- Core JSOM libraries
 - MicrosoftAjax.js
 - SP.Runtime.js
 - SP.js



The _spPageContextInfo Variable

- _spPageContextInfo
 - Culture/Locale information
 - Server-relative URL for site
 - Absolute URL for Site
 - Current page relative URL
 - Pages ListID
 - Web Title
 - Web UI Version

Scope	Watch
+ ↺	
▼ _spPageContextInfo: Object	
alertsEnabled: true	
allowSilverlightPrompt: "True"	
clientServerTimeDelta: 2640	
crossDomainPhotosEnabled: true	
currentCultureName: "en-US"	
currentLanguage: 1033	
currentUICultureName: "en-US"	
env: "Prod"	
isAppWeb: false	
isSiteAdmin: true	
layoutsUrl: "_layouts/15"	
pageListId: "{16c8a1fd-3b20-4ad9-bfa8-80372c210a0a}"	
pagePersonalizationScope: 1	
serverRequestPath: "/Lists/Customers/AllItems.aspx"	
siteAbsoluteUrl: "https://cptlabs.sharepoint.com"	
siteClientTag: "0\$16.0.4524.1212"	
siteServerRelativeUrl: "/"	
systemUserKey: "i:0h.f membership 10033fff93ace105@live.com"	
tenantAppVersion: "259279818"	
▶ updateFormDigestPageLoaded: Wed Oct 14 2015 13:50:35 GMT-0400 (Eastern	
userId: 10	
userLoginName: "student@cptlabs.onmicrosoft.com"	
webAbsoluteUrl: "https://cptlabs.sharepoint.com"	
webLanguage: 1033	
webLogoUrl: "https://cptlabs.sharepoint.com/CPT/content/AppIcon.png"	
▶ webPermMasks: Object	
webServerRelativeUrl: "/"	
webTemplate: "1"	
webTitle: "CPT Labs"	
webUIVersion: 15	

The ctx Variable

- ListData on ListViews
 - ListGuid, ListTitle, ListUrl
 - Row collection property
 - Column values
 - ContentTypeId
 - FSObjType (0=ListItem, 1=Folder)
 - displayFormUrl
 - editFormUrl
 - newFormUrl
 - ListSchema
 - IsDocLib
 - Field Information
 - LocaleID
 - PagePath



```
Scope Watch
+ ↺
▶ _spPageContextInfo: Object
▼ ctx: a
  AllowGridMode: true
  ▶ BasePermissions: Object
  BaseViewID: 1
  CascadeDeleteWarningMessage: null
  ContentTypesEnabled: false
  ControlMode: 4
  CurrentCultureName: "en-US"
  CurrentItem: null
  CurrentItemIdx: -1
  CurrentLanguage: 1033
  CurrentSelectedItems: null
  CurrentUICultureName: "en-US"
  CurrentUserId: 10
  CurrentUserIsSiteAdmin: true
  EnableMinorVersions: false
  ExternalDataList: false
  HasRelatedCascadeLists: 0
  HttpPath: "https://cptlabs.sharepoint.com/_vti
  HttpRoot: "https://cptlabs.sharepoint.com"
  IsAppWeb: false
  IsClientRendering: true
  LastSelectableRowIdx: null
  ▶ ListData: Object
    ListDataJSONItemsKey: "Row"
  ▶ ListSchema: Object
    ListTemplateType: 105
    ListTitle: "Customers"
    ModerationStatus: 0
```


Using SharePoint JavaScript Libraries


- Many SharePoint library files use lazy loading
 - Based on script-on-demand (SOD)
 - SPO library files downloaded using `ExecuteOrDelayUntilScriptLoaded`

```
<asp:Content ContentPlaceHolderID="PlaceHolderAdditionalPageHead" runat="server">
  <script src="https://code.jquery.com/jquery-2.1.4.js" ></script>
  <script>
    // delay script execution until SOD file has downloaded
    ExecuteOrDelayUntilScriptLoaded(initializePage, "sp.js");

    function initializePage() {
      // create variables to track CSOM objects
      var context = SP.ClientContext.get_current();
      var user = context.get_web().get_currentUser();
      // use jQuery Document Ready event to call to CSOM and load user
      $(function () {
        context.load(user);
        context.executeQueryAsync(onDisplayUserInformation, onError);
      });
      // update page with user information
      function onDisplayUserInformation() {
        var htmlTable = $("<table>");
        htmlTable.append(createTableRow("ID:", user.get_id()));
        htmlTable.append(createTableRow("Title:", user.get_title()));
        htmlTable.append(createTableRow("Email:", user.get_email()));
        htmlTable.append(createTableRow("Login Name", user.get_loginName()));
        htmlTable.append(createTableRow("Is Site Admin:", user.get_isSiteAdmin()));
        $("#content_box").empty().append(htmlTable);
      }

      function createTableRow(name, value) {
        return $("<tr>").append($("<td>").text(name)).append($("<td>").text(value));
      }

      function onError(err, err_args) {
        alert('Failed to get user name. Error:' + err_args.get_message());
      }
    }
  </script>
```

 CPT Labs Team Site [EDIT LINKS](#)

Current User Info

ID:	9
Title:	CPT Student
Email:	Student@CptLabs.onmicrosoft.com
Login Name	i:0#.f membership student@cptlabs.onmicrosoft.com
Is Site Admin:	true

[Home](#)
[Notebook](#)
[Documents](#)
[Recent](#)
[CustomPages](#)
[Site Contents](#)



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Deploying Custom Pages

- Several approaches can be used to deploy custom pages
 - Upload pages to document library using browser
 - Upload pages to document library using Windows Explorer
 - Upload pages to document library using SharePoint Designer
 - Upload pages to document library using custom installer program
- Creating custom installer program benefits
 - Automates copying files to target SharePoint site
 - Eliminates copy-by-hand approach that is error-prone and tedious
 - Provides opportunity for more than just copying files
 - Provides opportunity to use CSOM for remote provisioning



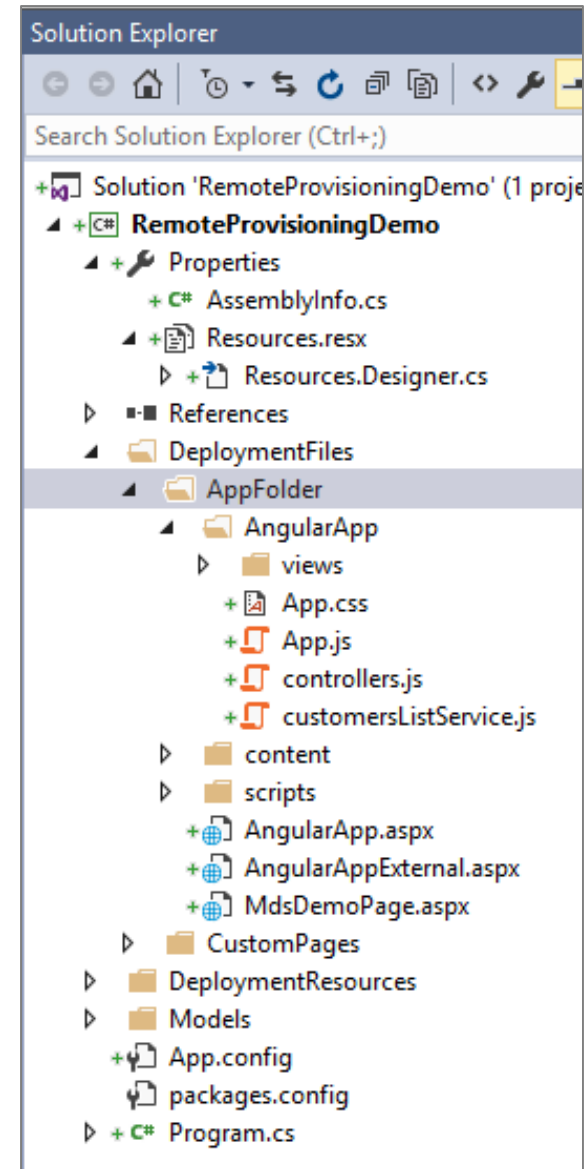
Remote Provisioning using CSOM

- What can you do to a SPO site using CSOM?
 - Upload custom ASPX pages and JavaScript files
 - Add navigation nodes on the top navigation bar
 - Create child sites, lists and document libraries
 - Create site columns, content types and term sets
 - Create user custom actions and script links



Remote Provisioning Demo Console App

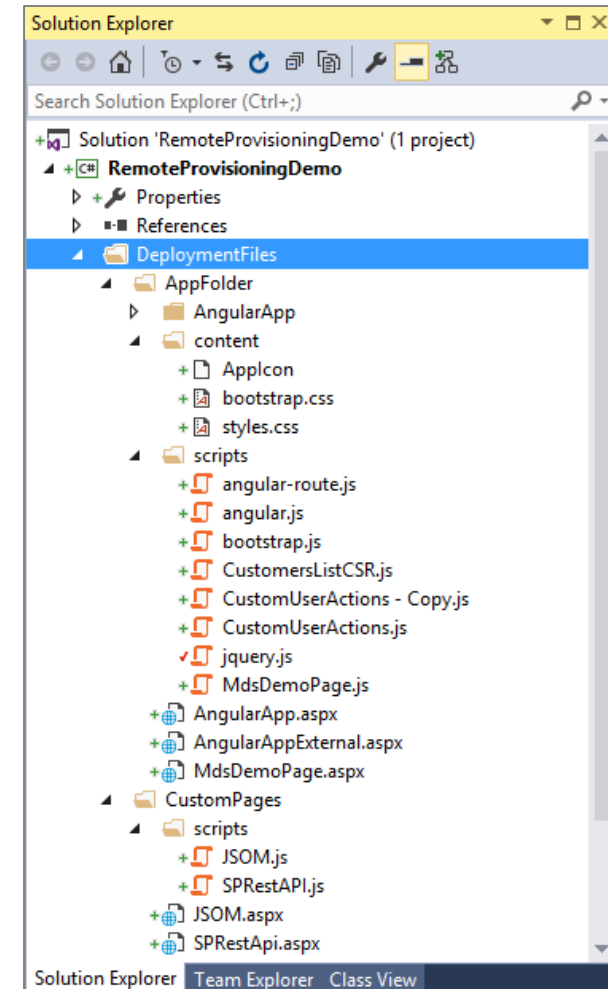
- What does this sample app demonstrate?
 - Connects to an SPO site
 - Creates private folder at root of site
 - Uploads custom pages, scripts and style sheets
 - Sets Alternate CSS URL for the current site
 - Registers ScriptLinks for jQuery and custom script
 - Adds custom actions to site Actions menu
 - Creates and populates sample Customer list
 - Embeds an Angular app into SharePoint UX
 - Uses JSLink and custom client-side rendering



Uploading Pages and Scripts using CSOM

- Where can you upload custom pages and scripts?
 - Master Page Gallery
 - Style Library
 - Standard document library
 - New folder created at site root
- Sample CSOM Code for uploading file

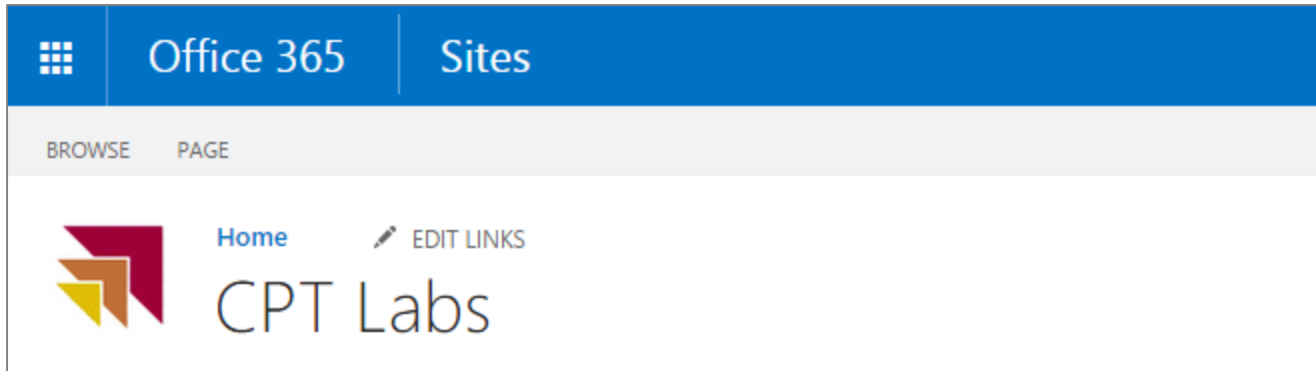
```
static void UploadToAppRootFolder(string path, byte[] content) {  
    string filePath = AppRootFolderAbsolutePath + path;  
    Console.WriteLine("Uploading to App Root Folder: " + path);  
    FileCreationInformation fileInfo = new FileCreationInformation();  
    fileInfo.Content = content;  
    fileInfo.Overwrite = true;  
    fileInfo.Url = filePath;  
    File newFile = AppRootFolder.Files.Add(fileInfo);  
    clientContext.ExecuteQuery();  
}
```



AlternateCssUrl and Site Icon

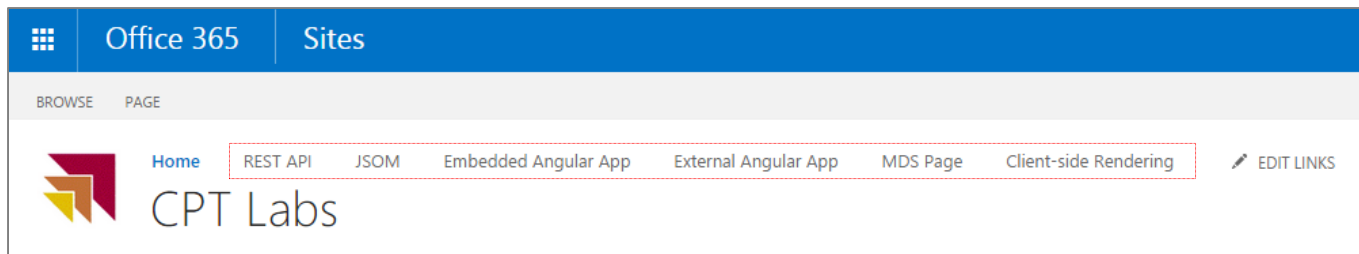
- Adding styling to an SPO Site
 - AlternateCssUrl links one style sheet to all pages in SPO site
 - SiteLogoUrl used to substitute custom site icon

```
static void SetAlternateCssAndSiteIcon() {  
    site.AlternateCssUrl = AppRootFolderAbsoluteUrl + "content/styles.css";  
    site.SiteLogoUrl = AppRootFolderAbsoluteUrl + "content/AppIcon.png";  
    site.Update();  
    clientContext.ExecuteQuery();  
}
```



Creating Top Nav Nodes

- CSOM allows you to create Top Nav Nodes
 - Provides easy way to provide navigation to custom pages



```
static void CreateTopNavNode(string title, string path) {
    string nodeUrl = site.Url + path;
    NavigationNodeCreationInformation newNode = new NavigationNodeCreationInformation();
    newNode.IsExternal = false;
    newNode.Title = title;
    newNode.Url = nodeUrl;
    newNode.AsLastNode = true;
    TopNavNodes.Add(newNode);
    clientContext.ExecuteQuery();
}

static void ConfigureTopNav() {
    DeleteAllTopNavNodes();
    AddHomeTopNavNode();
    CreateTopNavNode("REST API", "/CustomPages/SPRestAPI.aspx");
    CreateTopNavNode("JSOM", "/CustomPages/JSOM.aspx");
    CreateTopNavNode("Embedded Angular App", "/CPT/AngularApp.aspx");
    CreateTopNavNode("External Angular App", "/CPT/AngularAppExternal.aspx");
    CreateTopNavNode("MDS Page", "/CPT/MdsDemoPage.aspx");
    CreateTopNavNode("Client-side Rendering", "/Lists/Customers");
}
```



Adding ScriptLinks to Site

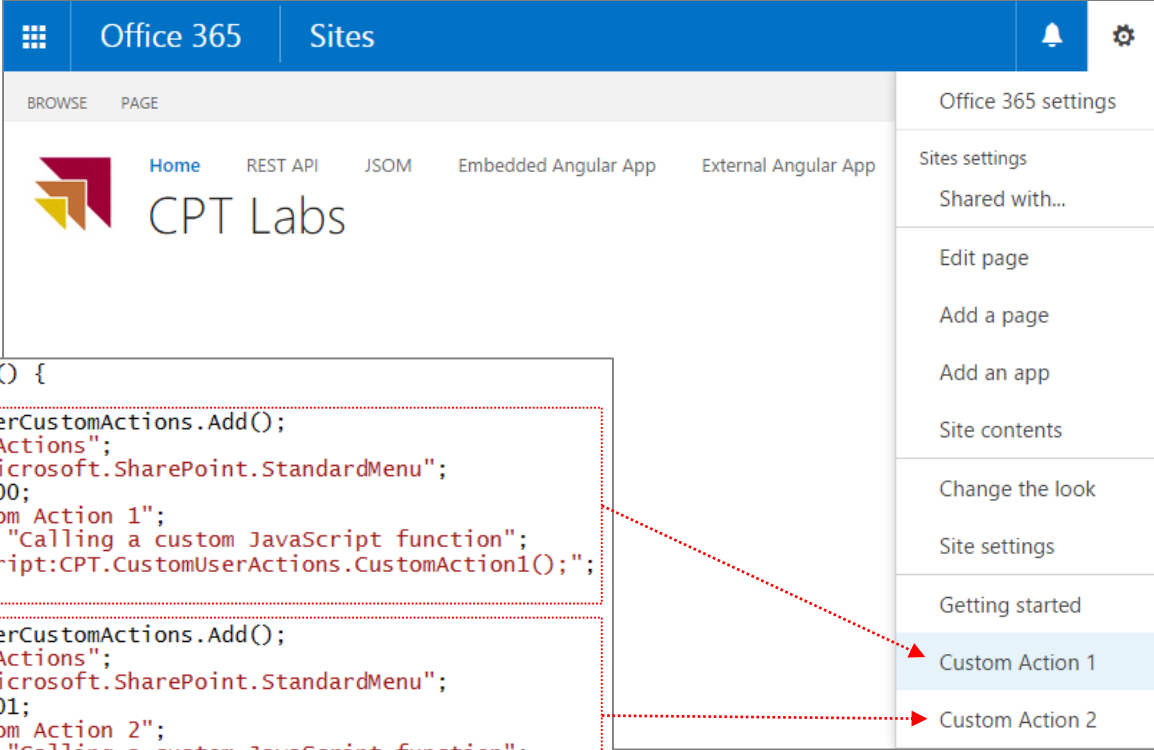
- ScriptLink added to site as UserCustomAction
 - Provides easy way to link all pages in site to common script file
 - Does not require modification to site's master page
 - Can be used to load common JavaScript libraries (e.g. jQuery)
 - Can be used to load custom scripts

```
static void CreateScriptLinks() {  
    // Register ScriptLink for jQuery  
    UserCustomAction customAction1 = site.UserCustomActions.Add();  
    customAction1.Title = "jQuery";  
    customAction1.Location = "ScriptLink";  
    customAction1.ScriptSrc = "~SiteCollection/CPT/scripts/jquery.js";  
    customAction1.Sequence = 10;  
    customAction1.Update();  
  
    // Register ScriptLink for custom javascript file  
    UserCustomAction customAction2 = site.UserCustomActions.Add();  
    customAction2.Title = "CustomUserActions";  
    customAction2.Location = "ScriptLink";  
    customAction2.ScriptSrc = "~SiteCollection/CPT/scripts/CustomUserActions.js";  
    customAction2.Sequence = 11;  
    customAction2.Update();  
  
    clientContext.ExecuteQuery();  
}
```



Adding Custom Actions to the SiteActions Menu

- Adding menu commands to SiteActions menu



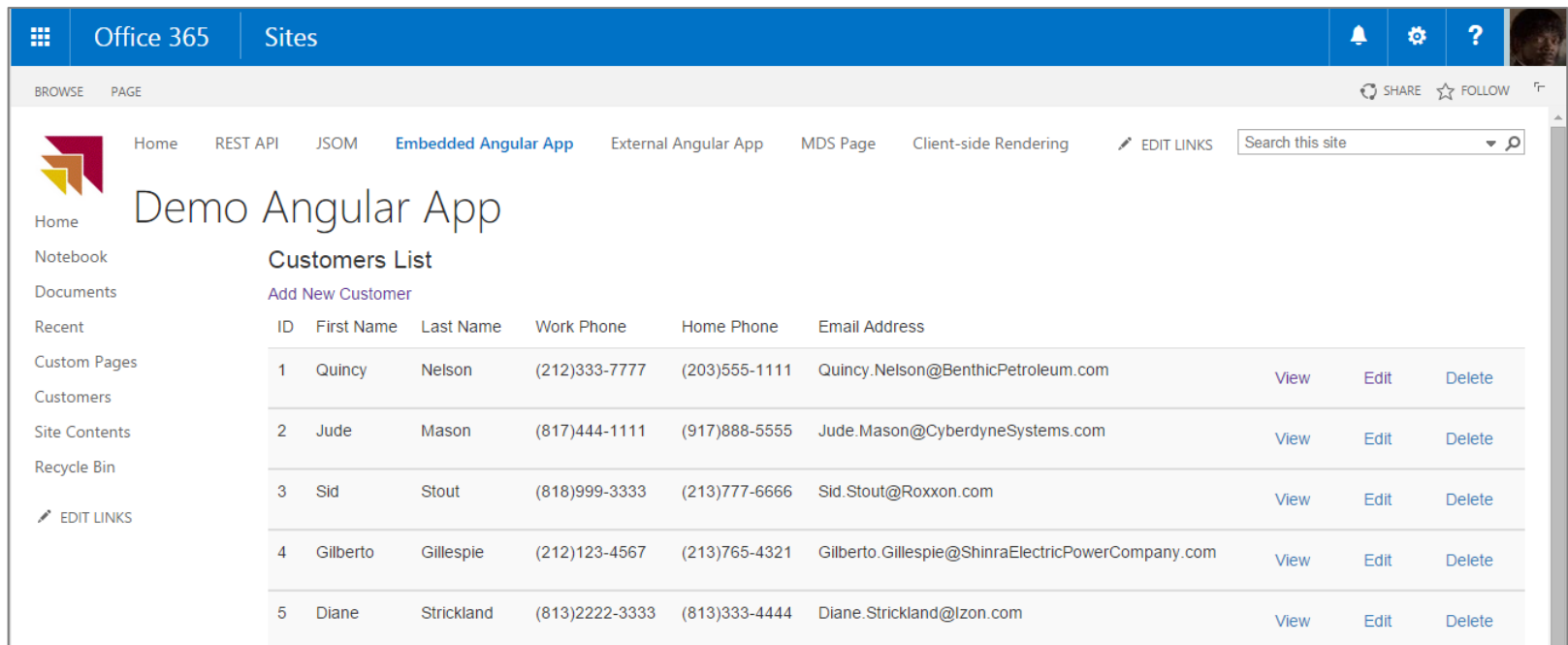
The screenshot shows a SharePoint site titled "CPT Labs" with a blue header bar containing "Office 365" and "Sites". The main navigation bar includes "BROWSE" and "PAGE" tabs. The site content area displays the "CPT Labs" logo and several links: "Home", "REST API", "JSOM", "Embedded Angular App", and "External Angular App". On the right side, the "Office 365 settings" menu is open, showing a list of options. Two custom actions, "Custom Action 1" and "Custom Action 2", are visible at the bottom of the menu. Red dotted lines connect the custom action definitions in the code block to their respective entries in the settings menu.

```
static void CreateCustomSiteActions() {  
    var siteActionsCommand1 = site.UserCustomActions.Add();  
    siteActionsCommand1.Group = "SiteActions";  
    siteActionsCommand1.Location = "Microsoft.SharePoint.StandardMenu";  
    siteActionsCommand1.Sequence = 1000;  
    siteActionsCommand1.Title = "Custom Action 1";  
    siteActionsCommand1.Description = "Calling a custom JavaScript function";  
    siteActionsCommand1.Url = "javascript:CPT.CustomUserActions.CustomAction1()";  
    siteActionsCommand1.Update();  
  
    var siteActionsCommand2 = site.UserCustomActions.Add();  
    siteActionsCommand2.Group = "SiteActions";  
    siteActionsCommand2.Location = "Microsoft.SharePoint.StandardMenu";  
    siteActionsCommand2.Sequence = 1001;  
    siteActionsCommand2.Title = "Custom Action 2";  
    siteActionsCommand2.Description = "Calling a custom JavaScript function";  
    siteActionsCommand2.Url = "javascript:CPT.CustomUserActions.CustomAction2()";  
    siteActionsCommand2.Update();  
  
    clientContext.ExecuteQuery();  
}
```



Embedding an Angular App

- Angular apps can be injected using remote provisioning
 - Angular App can be embedded in SharePoint UU
 - Angular App can be designed external to SharePoint UI



The screenshot shows a SharePoint site interface. The top navigation bar includes 'Office 365' and 'Sites'. The main header area contains a search bar and a navigation menu with links: Home, REST API, JSOM, **Embedded Angular App**, External Angular App, MDS Page, and Client-side Rendering. The left sidebar lists site components: Home, Notebook, Documents, Recent, Custom Pages, Customers, Site Contents, and Recycle Bin. The main content area displays a 'Customers List' table with columns: ID, First Name, Last Name, Work Phone, Home Phone, and Email Address. Below the table are 'View', 'Edit', and 'Delete' links for each row. A link 'Add New Customer' is also present.

ID	First Name	Last Name	Work Phone	Home Phone	Email Address	
1	Quincy	Nelson	(212)333-7777	(203)555-1111	Quincy.Nelson@BenthicPetroleum.com	View Edit Delete
2	Jude	Mason	(817)444-1111	(917)888-5555	Jude.Mason@CyberdyneSystems.com	View Edit Delete
3	Sid	Stout	(818)999-3333	(213)777-6666	Sid.Stout@Roxxon.com	View Edit Delete
4	Gilberto	Gillespie	(212)123-4567	(213)765-4321	Gilberto.Gillespie@ShinraElectricPowerCompany.com	View Edit Delete
5	Diane	Strickland	(813)2222-3333	(813)333-4444	Diane.Strickland@Izon.com	View Edit Delete





DEMO

Remote Provisioning Demo Console App

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- Designing MDS-enabled Pages
 - JSLink and Client-side Rendering



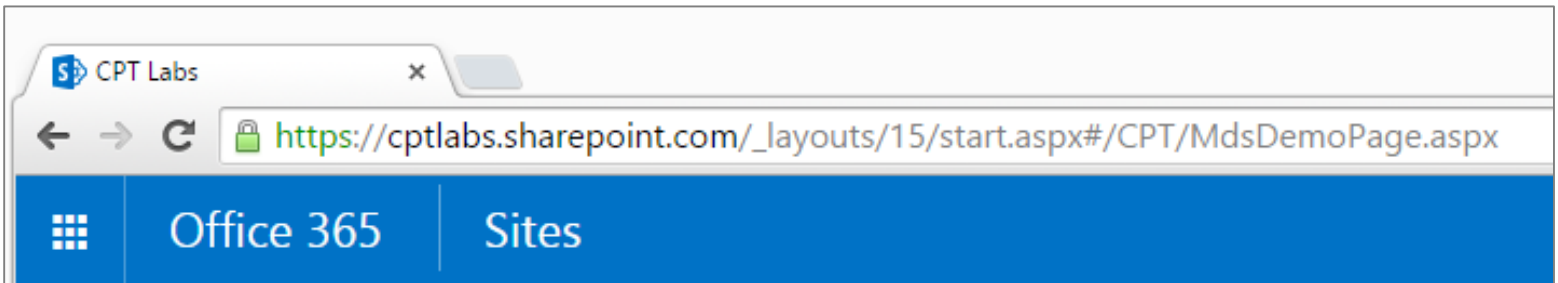
Minimal Download Strategy (MDS)

- MDS creates SPA architecture for SharePoint site
 - First page request loads MDS environment
 - Page transitions involve AJAX request for page deltas
 - Significantly complicates JavaScript programming
 - Incorrect code results in double page processing
- When do you have to deal with MDS?
 - MDS enabled by default on Team sites
 - MDS can be disabled on Team sites
 - MDS not supported on Publishing Sites

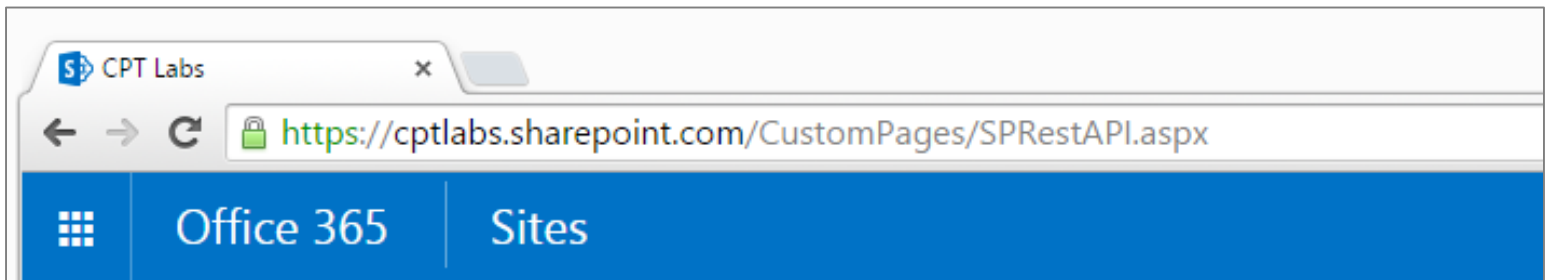


Page URLs in MDS Mode

- When a site has MDS feature enabled...
 - MDS-enabled pages processed using MDS URLs



- Pages not supporting MDS redirected to non-MDS URLs



Using the SharePoint:ScriptLink Control

- When designing pages for MDS mode
 - Do not use script tags because they break MDS mode
 - Use the SharePoint:ScriptLink control instead
 - Link to JavaScript files uploaded inside to the site

```
MdsDemoPage.aspx  X
<%@ Assembly Name="Microsoft.SharePoint,Version=16.0.0.0,Culture=neutral,PublicKeyToken=71e9
<% @Page MasterPageFile="~masterurl/default.master"
    Inherits="Microsoft.SharePoint.WebPartPages.WebPartPage" %>

<asp:Content ContentPlaceHolderID="PlaceHolderAdditionalPageHead" runat="server">
    <SharePoint:ScriptLink ID="Ajax" Name="MicrosoftAjax.js" runat="server" />
    <SharePoint:ScriptLink ID="jQuery" Name="~site/CPT/scripts/jquery.js" runat="server" />
    <SharePoint:ScriptLink ID="App" Name="~site/CPT/scripts/MdsDemoPage.js" runat="server" />
</asp:Content>

<asp:Content ContentPlaceHolderID="PlaceHolderPageTitleInTitleArea" runat="server">
    MDS Demo Page
</asp:Content>

<asp:Content ContentPlaceHolderID="PlaceHolderMain" runat="server">
    <div>
        <button id="getSiteProperties" type="button" >Get Site Properties</button>
        <button id="getLists" type="button" >Get Lists</button>
    </div>
    <div id="content_box" />
</asp:Content>
```



What Happens When in MDS Mode?

- On the first page load
 - Processing occurs just like non-MDS page load – all events fire
- On subsequent MDS page transitions
 - JavaScript files are not reparsed
 - Inline code does not execute
 - jQuery document ready event handler does not run
 - SharePoint load event handler does not run
 - MDS performs garbage collection to purge global variables



MDS Garbage Collection

- MDS performs garbage collection
 - Global variables are purged during page transitions
 - MDS garbage collection prevents memory bloat
 - MDS garbage collection requires your attention
- Creating global variables that survive garbage collections
 - Create global variable by registering it as an ASP.NET namespace

```
// create global variable with standard JavaScript approach
var CptCanary = window.CptCanary || {};
CptCanary.greeting = "tweet, tweet";

// create global variable by registering namespace with ASP.NET AJAX
Type.registerNamespace("CPT");
CPT.greeting = "Hi, I can live across MDS page transitions";
```



Managing MDS and Non-MDS Page Loads

```
// create global variable by registering namespace with ASP.NET AJAX
Type.registerNamespace("CPT");

CPT.MdsDemoPage = function () {
    console.log("executing main MdsDemoPage function");

    var initializeMDS = function ()...;

    var onMdsAfter = function (source, args)...;

    var registerEventHandlers = function ()...

    var onGetSiteProperties = function ()...

    var onGetLists = function ()...

    // public interface
    return {
        initializeMDS: initializeMDS,
        registerEventHandlers: registerEventHandlers
    };
}();

if (typeof asyncDeltaManager !== 'undefined') {
    console.log("Initialize page in MDS mode");
    CPT.MdsDemoPage.initializeMDS();
}
else {
    console.log("Initialize page in standard (non-MDS) mode");
    $(CPT.MdsDemoPage.registerEventHandlers);
}
```



Understanding MDS Events

- MDS events occur during page transitions
 - Request Initialized
 - Begin Request
 - End Request
- `asyncDeltaManager` used to add event handlers
 - `add_initializeRequest`
 - `add_beginRequest`
 - `add_endRequest`



Handling MDS Events on Page Transitions

```
if (typeof asyncDeltaManager !== 'undefined') {  
    console.log("Initialize page in MDS mode");  
    CPT.MdsDemoPage.initializeMDS();  
}  
else {  
    console.log("Initialize page in standard (non-MDS) mode");  
    $(CPT.MdsDemoPage.registerEventHandlers);  
}
```

```
var initializeMDS = function () {  
    console.log("executing initializeMDS function");  
    if (CPT.MdsDemoPage.MdsEnabled == undefined) {  
        // add handler for MDS page transitions  
        asyncDeltaManager.add_endRequest(onMdsAfter);  
        // set variable to indicate event handler has been registered  
        CPT.MdsDemoPage.MdsEnabled = true;  
    }  
};  
  
var onMdsAfter = function (source, args) {  
    console.log("onMdsAfter handler executing");  
    var currentPage = source._currentUrl;  
    console.log("current url: " + currentPage);  
    var currentPageIsMdsDemoPage = (currentPage.indexOf("MdsDemoPage.aspx") > -1);  
    if (currentPageIsMdsDemoPage) {  
        registerEventHandlers();  
    }  
};  
  
var registerEventHandlers = function () {  
    console.log("registerEventHandlers executing");  
    // register event handlers  
    $("#getSiteProperties").click(onGetSiteProperties);  
    $("#getLists").click(onGetLists);  
}
```

Agenda

- ✓ Enabling Scripting in SharePoint 2016.
- ✓ Understanding JavaScript Injection
- ✓ JSOM Programming
- ✓ Remote Provisioning using CSOM
- ✓ Designing MDS-enabled Pages
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Attaching Custom Scripts using JSLink

- JSLink property can attach custom script to
 - List Views
 - List Forms (e.g. New / Edit / Display forms)
 - List View Web Parts and List Form Web Parts
 - Site Columns and Content Types

```
string listTitle = "Customers";
string listUrl = "Lists/Customers";

// delete document library if it already exists
ExceptionHandlingScope scope = new ExceptionHandlingScope(clientContext);
using (scope.StartScope()) {
    using (scope.StartTry()) {
        site.Lists.GetByTitle(listTitle).DeleteObject();
    }
    using (scope.StartCatch()) { }
}

ListCreationInformation lci = new ListCreationInformation();
lci.Title = listTitle;
lci.Url = listUrl;
lci.TemplateType = (int)ListTemplateType.Contacts;
listCustomers = site.Lists.Add(lci);
listCustomers.OnQuickLaunch = true;
listCustomers.Update();

// attach JSLink script to default view for client-side rendering
listCustomers.DefaultView.JSLink = AppRootFolderRelativeUrl + "scripts/CustomersListCSR.js";
listCustomers.DefaultView.Update();
listCustomers.Update();
clientContext.Load(listCustomers);
clientContext.Load(listCustomers.Fields);
clientContext.ExecuteQuery();
```



Custom Client-side Rendering (CSR)

```
CustomersListCSR.js
<global>
"use strict";

// determine path to the current script
var pathToThisScript = _spPageContextInfo.siteServerRelativeUrl +
    "CPT/scripts/CustomersListCSR.js";

// Register function named RegisterTemplate to execute on MDS events
RegisterModuleInit(pathToThisScript, RegisterTemplate);

// call RegisterTemplate when site not running in MDS mode
RegisterTemplate();

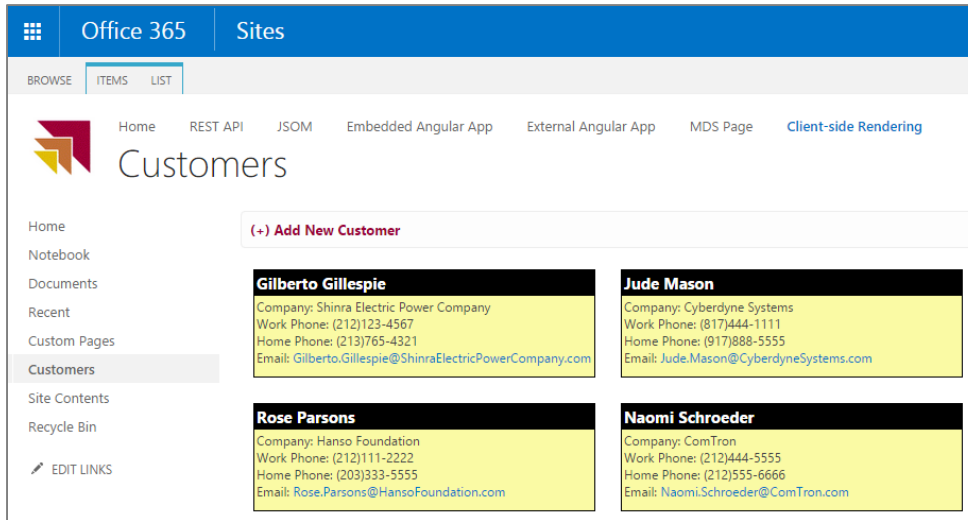
function RegisterTemplate() {
    // create new custom template object
    var overrideCtx = {};
    overrideCtx.ListTemplateType = 105;
    overrideCtx.OnPreRender = onPreRender;
    overrideCtx.OnPostRender = onPostRender;
    overrideCtx.Templates = {};
    overrideCtx.Templates.Header = customHeader;
    overrideCtx.Templates.Item = customItem;

    // register custom template with SharePoint Template Manager
    SPCClientTemplates.TemplateManager.RegisterTemplateOverrides(overrideCtx);
}

function customHeader(ctx) ...
function customItem(ctx) ...
function onPreRender(ctx) ...
function onPostRender(ctx) ...
```



Implementing Custom Rendering Logic



```
function RegisterTemplate() {  
  // create new custom template object  
  var overrideCtx = {};  
  overrideCtx.ListTemplateType = 105;  
  overrideCtx.OnPreRender = onPreRender;  
  overrideCtx.OnPostRender = onPostRender;  
  overrideCtx.Templates = {};  
  overrideCtx.Templates.Header = customHeader;  
  overrideCtx.Templates.Item = customItem;  
  
  // register custom template with SharePoint Template Manager  
  SPCClientTemplates.TemplateManager.RegisterTemplateOverrides(overrideCtx);  
}
```

```
function customHeader(ctx) {  
  return "<div class='csrHeaderDiv'>" +  
    "<a href='" + ctx.newFormUrl + "' >(+) Add New Customer</a>" +  
    "</div>";  
}
```

```
function customItem(ctx) {  
  var itemHTML = "<div class='csrCustomerBlock' >" +  
    "<div class='csrCustomerBlockHeader' >" +  
      ctx.CurrentItem.FirstName + " " + ctx.CurrentItem.Title +  
    "</div>" +  
    "<div class='csrCustomerBlockBody' >" +  
      "Company: " + ctx.CurrentItem.Company +  
      "<br/>" +  
      "Work Phone: " + ctx.CurrentItem.WorkPhone +  
      "<br/>" +  
      "Home Phone: " + ctx.CurrentItem.HomePhone +  
      "<br/>" +  
      "Email: " + ctx.CurrentItem.Email +  
    "</div>" +  
    "</div>";  
  
  return itemHTML;  
}
```

Summary

- ✓ Enabling Scripting in SharePoint 2016.
- ✓ Understanding JavaScript Injection
- ✓ JSOM Programming
- ✓ Remote Provisioning using CSOM
- ✓ Designing MDS-enabled Pages
- ✓ JSLink and Client-side Rendering

