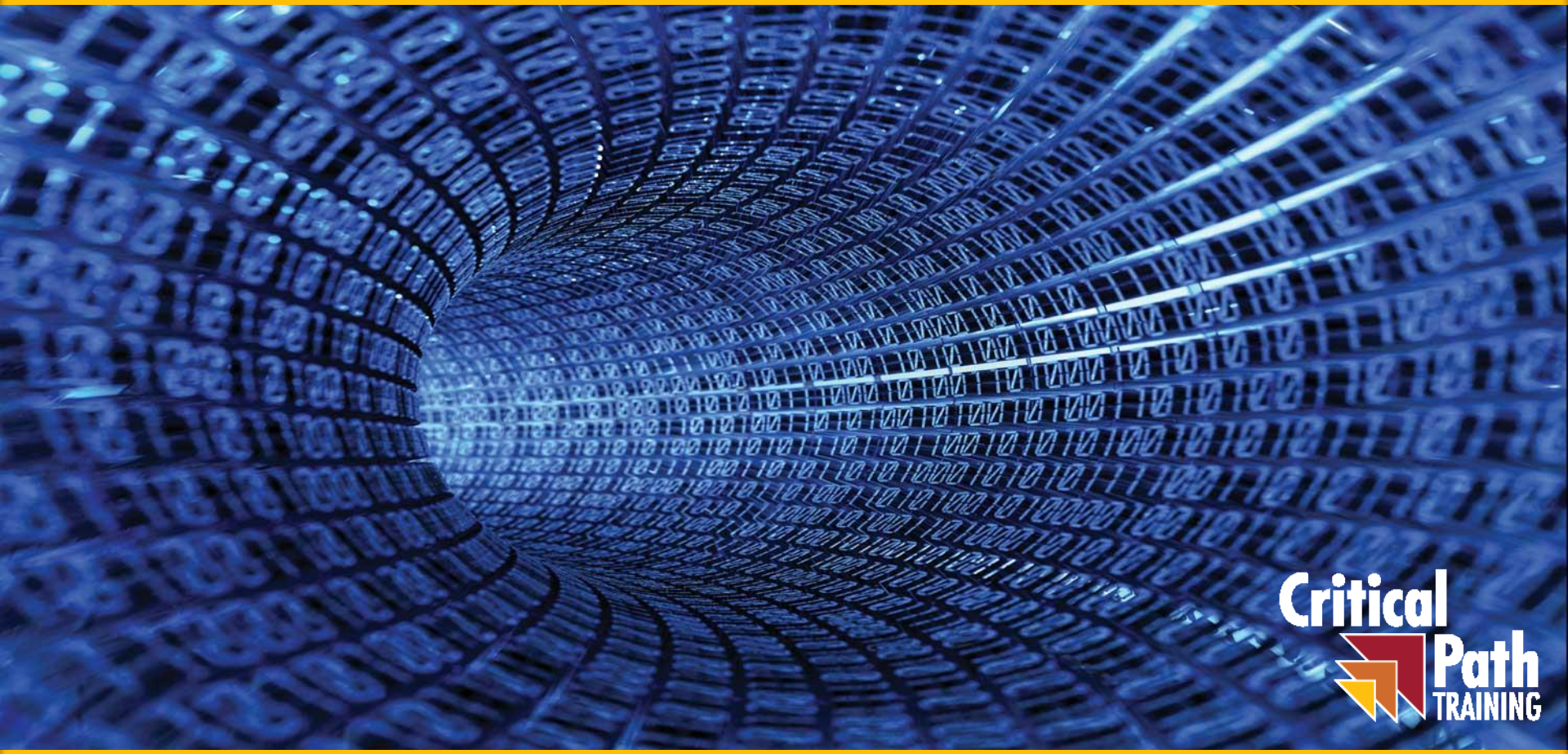
Developing Custom Solutions for SharePoint Online



Agenda

- SharePoint Online Development Strategies
- Understanding Modern Team Site and Modern Pages
- Programming the Client-side Object Model (CSOM)
- Creating Site Columns, Content Types and Lists
- JavaScript Injection and the SharePoint REST API

Evolution of the SharePoint Platform

- Farm Solutions
- ~~Sandboxed Solutions~~
- SharePoint Add-ins
- JavaScript Injection
- SharePoint Framework (SPFx)

SharePoint App Add-in Model

- SharePoint 2013 introduced new development model
  - Originally introduced as "SharePoint App" model
  - Marketing folks renamed "SharePoint App" to "SharePoint Add-in"

- Add-in model designed to replace farm solutions
  - Add-ins designed to supported SPO and SharePoint on-premises
  - Add-in code not allowed to run on SharePoint host server
  - Add-in talks to SharePoint using REST and CSOM
  - Add-in authenticates and establishes add-in identity
  - Add-in has permissions independent of user
  - Add-ins deployed to catalogs using publishing scheme

APIs used by SharePoint Add-ins

- SharePoint REST API
  - Commonly used with client-side JavaScript code
  - Good fit when developing SharePoint-hosted add-ins
  - Accessible to any type of client on any platform
- Client-side Object Model (CSOM)
  - Commonly used with server-side C# code
  - Good fit when developing provider-hosted add-ins
  - Good fit when creating desktop clients (e.g. Console app)
  - Used to perform remote provisioning in SPO sites

JavaScript Injection

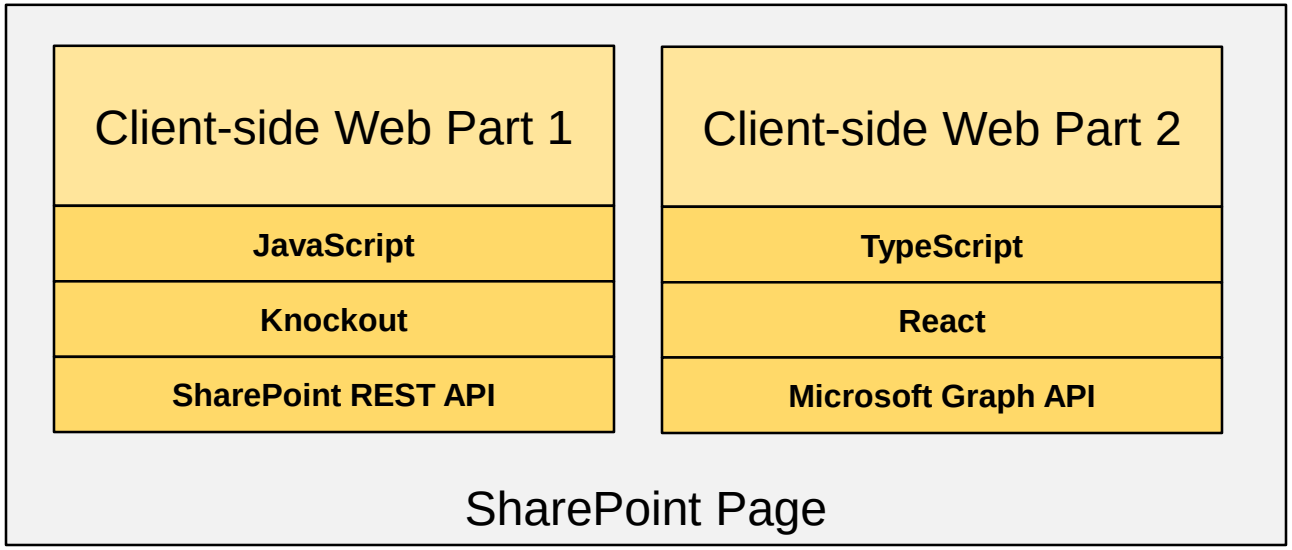
- JavaScript injection based on central concept…
  1. upload custom JavaScript code to SharePoint Online
  2. execute code using identity and permissions of current user
- Approaches for using JavaScript injection
  - Script Editor Web Part
  - Adding JavaScript code behind SharePoint site pages
  - Full-blown Visual Studio project development
- Why create solution using JavaScript Injection?
  - Provides more flexibility than SharePoint add-in model
  - Poses fewer constraints than SharePoint add-in model

Remote Provisioning

- Remote provisioning in SPO
  - Use CSOM to create SPO site elements
  - Recommended over SharePoint solutions & features
- What can you create with Remote Provisioning
  - New child sites, lists and document libraries
  - Site columns, content types and remote event receivers
  - New pages with custom JavaScript logic
  - User custom actions with custom JavaScript logic

The SharePoint Framework (SPFx)

- Development model based on pages and web parts
  - Based on client-side development with JavaScript or TypeScript
  - Code runs with authenticated identity of current user
  - Easy access to SharePoint and Office 365 content and data
  - Developer tools designed to support cross-platform development
  - Great support for targeting mobile devices



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DEMO
Looking at Modern Pages

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Why Client Object Model (CSOM)?

- Advantages of CSOM over the REST API
  - Strongly-typed programming
  - Format Digest managed automatically
  - Higher productivity when writing C# or VB
  - Provides ability to batch requests to web server
  - CSOM provides functionality beyond REST APIs
- CSOM more preferable on server-side
  - CSOM isn't great fit for JavaScript apps

Supported CSOM Functionality

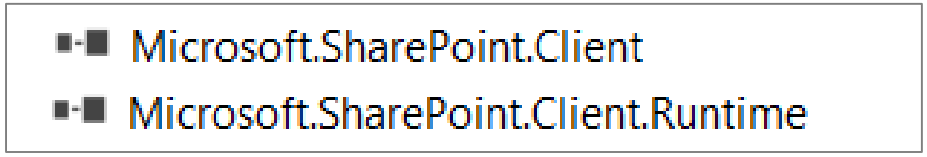
- What can you do with CSOM?
  - Work within a specific site collection
  - Read and modify site properties
  - Create site columns and content types
  - Create lists, items, views and list types
  - Register remote event handlers
  - Create folder and upload and download files
  - Add web part and web part pages
  - Create new site collections

CSOM Growth in SharePoint 2013

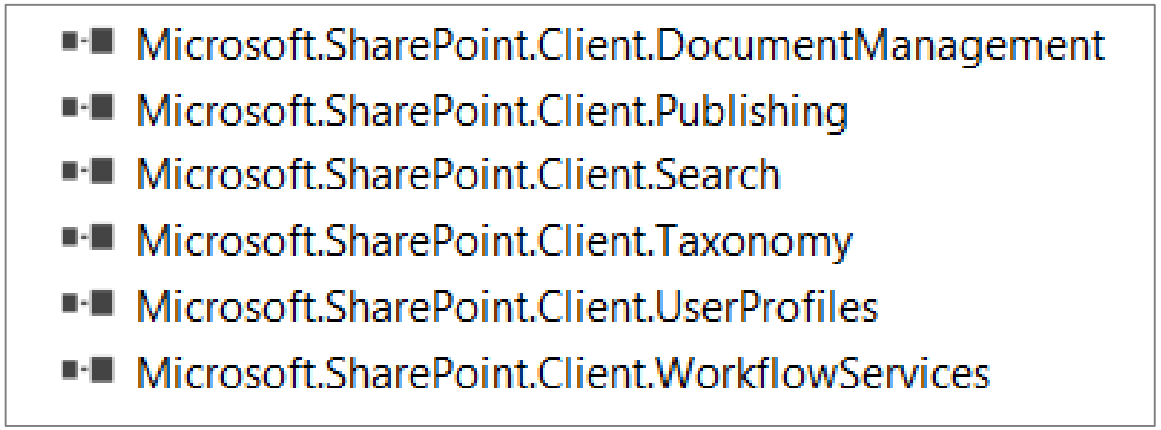
- New APIs introduced with SharePoint Server
  - User Profiles
  - Search
  - Taxonomy
  - Publishing
  - Workflow
  - Business Data Connectivity

CSOM in SharePoint Online

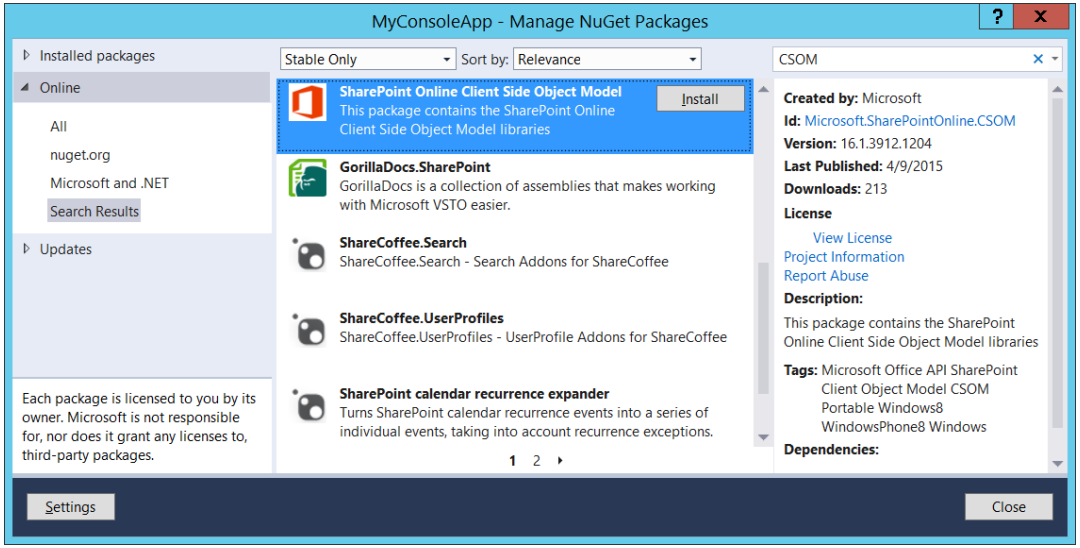
- CSOM Assemblies for SharePoint Foundation
  - Version 15 intended for SharePoint 2013 On-premises
  - Version 16.0 intended for SharePoint 2016 On-premises
  - Version 16.1 (or greater) intended for SharePoint Online

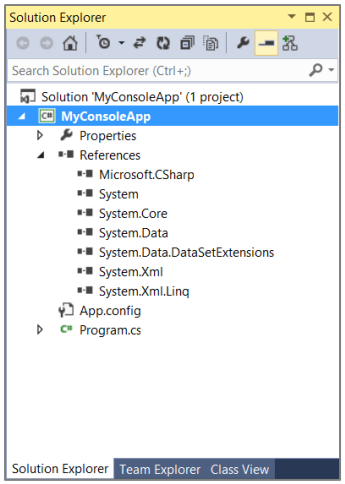


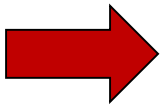
- CSOM Assemblies for SharePoint Server

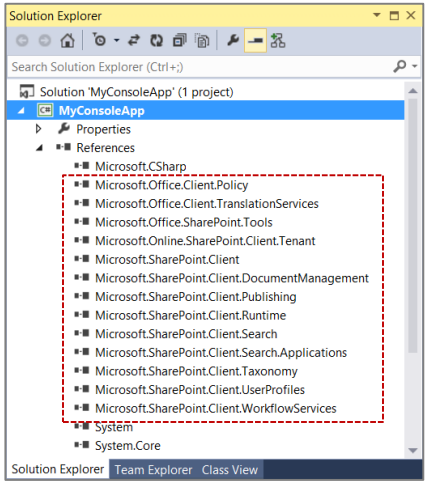


SPO CSOM NuGet Package



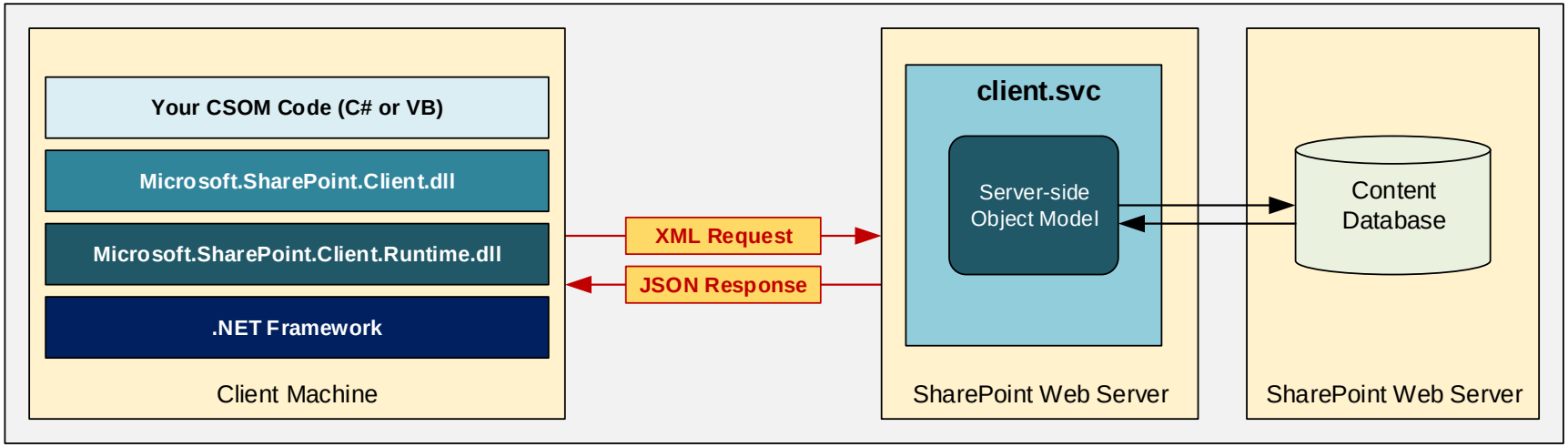






CSOM Architecture

- CSOM Objects act as client-side proxies
  - CSOM uses Windows Communication Foundation (WCF)
  - CSOM Runtime layer handles WCF calls behind scenes
  - Request body contains XML document of instructions
  - Response returned in JavaScript Object Nation (JSON)



ClientContext

- CSOM coding starts with ClientContext
  - Provides connection to SharePoint site
  - Provides access to site and site collection
  - Provides authentication behavior
  - Provides ExecuteQuery method to call server

```
string siteUrl = "http://intranet.wingtip.com";

ClientContext clientContext = new ClientContext(siteUrl);
```

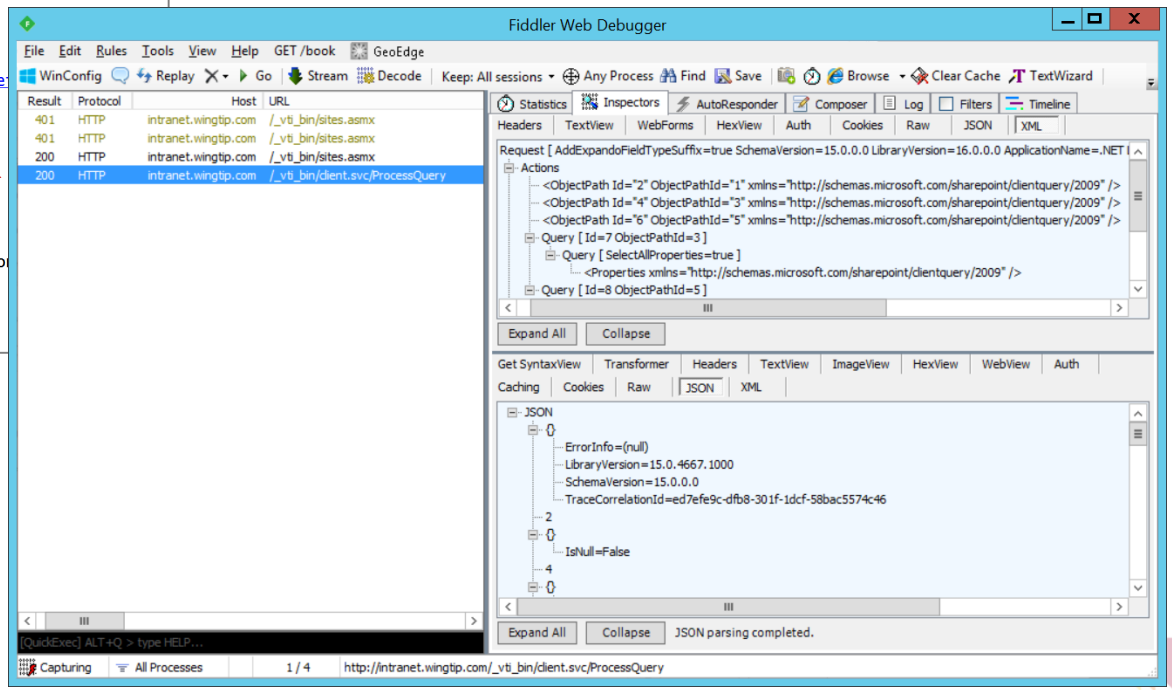
Hello CSOM

```
using System;
using Microsoft.SharePoint.Client;

namespace HelloCSOM {
  class Program {
    static void Main() {

      ClientContext clientContext = new ClientContext("http://intranet.wingtip.com");

      Site siteCollection = clientContext.Site;
      Web site = clientContext.Web;

      clientContext.Load(siteCollection);
      clientContext.Load(site);

      clientContext.ExecuteQuery();

      Console.WriteLine("The site collection URL is " + siteCollection.Url);
      Console.WriteLine("The site title is " + site.Url);
    }
  }
}
```

Inspecting CSOM Calls with Fiddler

- `ExecuteQuery` triggers call to SharePoint web server
  - CSOM calls made behind the scenes using WCF
  - CSOM calls target `/_vti_bin/client.svc/ProcessQuery`
  - Can be helpful to inspect CSOM calls using Fiddler Web Debugger

```
using System;
using Microsoft.SharePoint.Client;

namespace HelloCSOM {
  class Program {
    static void Main() {

      ClientContext clientContext = new ClientContext("http://intrane

      Site siteCollection = clientContext.Site;
      Web site = clientContext.Web;

      clientContext.Load(siteCollection);
      clientContext.Load(site);

      clientContext.ExecuteQuery();

      Console.WriteLine("The site collection URL is " + siteCollectio
      Console.WriteLine("The site title is " + site.Url);
    }
  }
}
```



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- ✓ CSOM Fundamentals
- ➢ User and App Authentication
- CSOM Code Optimization
- Remote Exception Handling
- Creating Content Types and Lists

User Authentication (On-premises)

```
string siteUrl = "http://intranet.wingtip.com";
ClientContext clientContext = new ClientContext(siteUrl);

// set up authentication credentials
string userName = @"WINGTIP\Administrator";
string userPassword = "Password1";
clientContext.Credentials = new NetworkCredential(userName, userPassword);

// get title of the target site
Web site = clientContext.Web;
clientContext.Load(site);

// call across network
clientContext.ExecuteQuery();

// display title
Console.WriteLine(site.Title);
```

User Authentication (SPO)

```
string siteUrl = "https://SharepointConfessions.sharepoint.com";
ClientContext clientContext = new ClientContext(siteUrl);

string userName = "tedp@sharepointconfessions.onmicrosoft.com";
string userPassword = "PinkieDoo@42";
// convert password to SecureString format
SecureString secureUserPassword = new SecureString();
foreach (char c in userPassword.ToCharArray()) {
  secureUserPassword.AppendChar(c);
}

// create SharePointOnlineCredentials object to authenticate
clientContext.Credentials =
    new SharePointOnlineCredentials(userName, secureUserPassword);

// get title of the target site
Web site = clientContext.Web;
clientContext.Load(site);

// call across network
clientContext.ExecuteQuery();

// display title
Console.WriteLine(site.Title);
```

Authentication with TokenHelper

- On-premises with S2S

```
string hostWebUrl = Request.QueryString["SPHostUrl"];
Uri hostWebUri = new Uri(hostWebUrl);
WindowsIdentity userIdentity = Request.LogonUserIdentity;

ClientContext clientContext =
  TokenHelper.GetS2SClientContextWithWindowsIdentity(hostWebUri, userIdentity);
```

- In SharePoint Online with OAuth

```
string hostWebUrl = Request.QueryString["SPHostUrl"];
string remoteWebUrl = Request.Url.Authority;

string contextTokenString = TokenHelper.GetContextTokenFromRequest(Request);

ClientContext clientContext =
  TokenHelper.GetClientContextWithContextToken(hostWebUrl, contextTokenString, remoteWebUrl);

return clientContext;
```

Authentication with SharePointContext

- SharePointContext simplifies your code
  - Automatically tracks SharePoint query string variables
  - Abstracts away issues for OAuth vs S2S
  - Provides four ways to create ClientContext

```
SharePointContext spContext =
  SharePointContextProvider.Current.GetSharePointContext(HttpContext);

// create ClientContext to access host web with [app + user] credentials
ClientContext clientContext1 = spContext.CreateUserClientContextForSPHost();

// create ClientContext to access host web with app-only credentials
ClientContext clientContext2 = spContext.CreateAppOnlyClientContextForSPHost();

// create ClientContext to access app web with [app + user] credentials
ClientContext clientContext3 = spContext.CreateAppOnlyClientContextForSPAppWeb();

// create ClientContext to access app web with app-only credentials
ClientContext clientContext4 = spContext.CreateUserClientContextForSPAppWeb();
```

ClientContext Usage Pattern

- ClientContext is a disposable object
  - Should be disposed after you are done using it
  - Common to use within `using` statement

```
[SharePointContextFilter]
public ActionResult Index() {

  var spContext = SharePointContextProvider.Current.GetSharePointContext(HttpContext);

  using (ClientContext clientContext = spContext.CreateUserClientContextForSPHost()) {
    // work with ClientContext inside using statement
    Web site = clientContext.Web;
    clientContext.Load(site);
    clientContext.ExecuteQuery();
    ViewBag.HostWebTitle = site.Title;
    ViewBag.HostWebUrl = site.Url;
  }
  return View();
}
```

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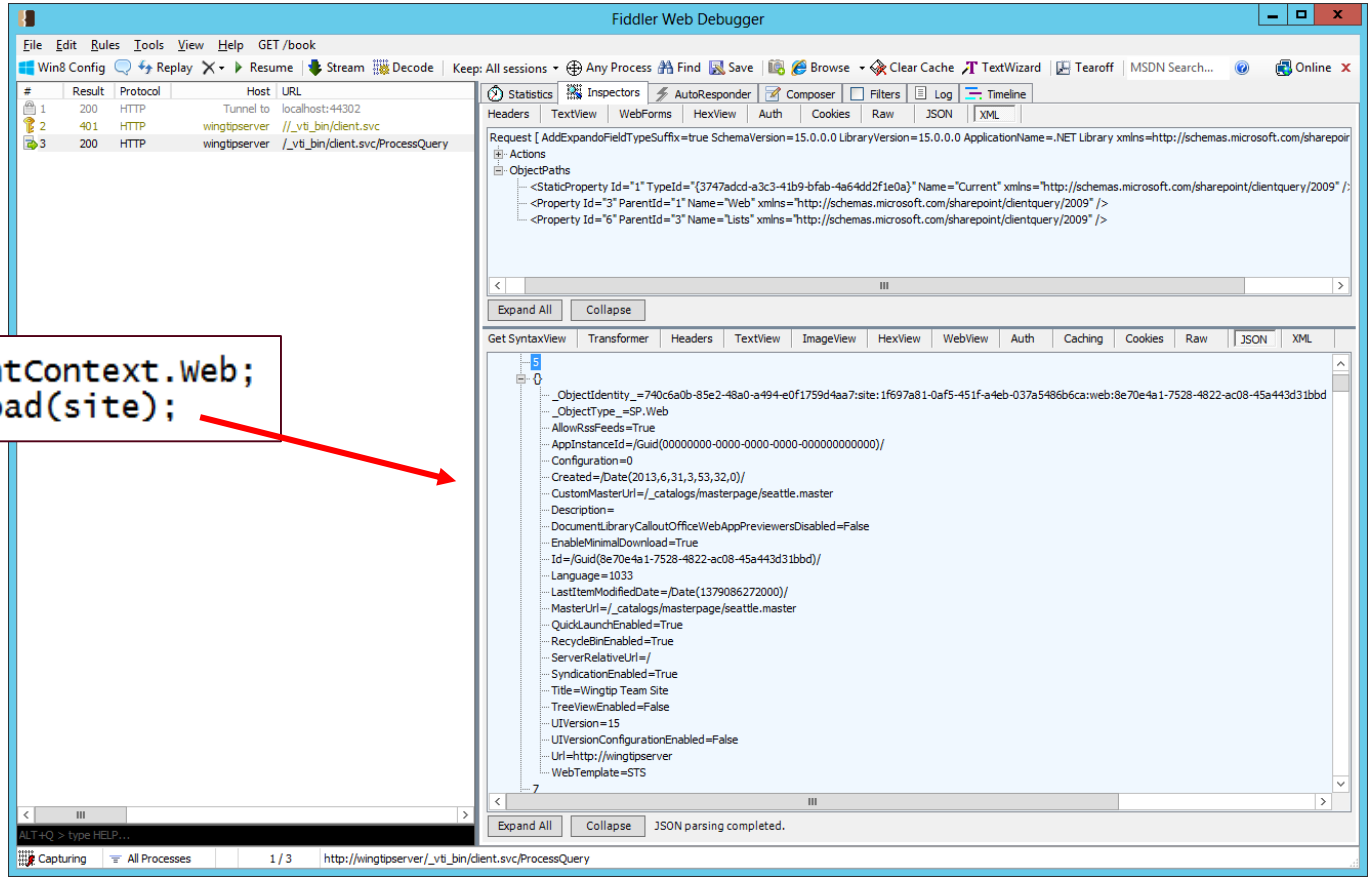
What's Wrong with This Code?

```
  Web site = clientContext.Web;
  clientContext.Load(site);
  clientContext.Load(site.Lists);

  clientContext.ExecuteQuery();

  string html = "<h2>List in host web</h2>";

  html += "<ul>";

  foreach (var list in site.Lists) {
    if (list.Hidden != true) {
      html += "<li>" + list.Title + "</li>";
    }
  }

  html += "</ul>";

  WriteContentToPage(html);
}
```

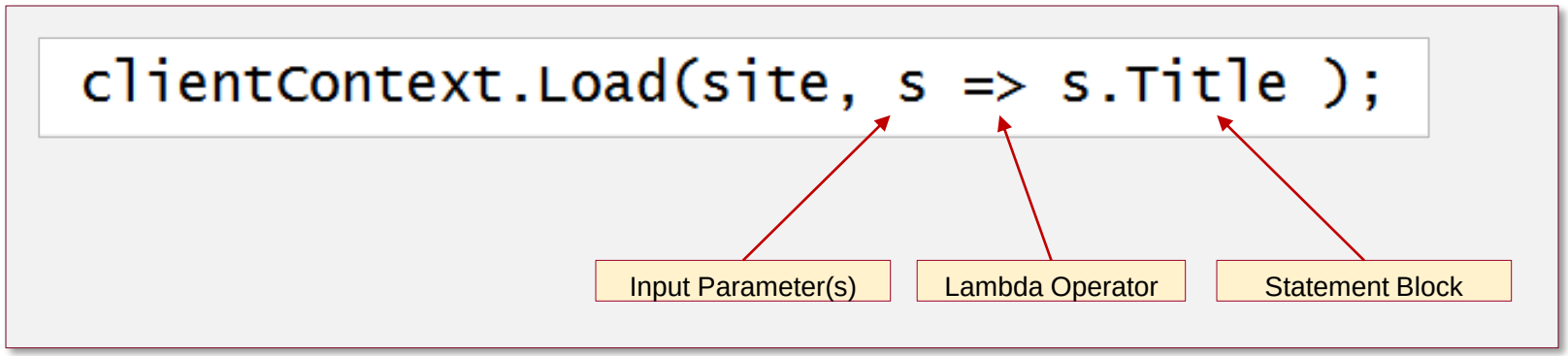
Inspecting CSOM Calls using Fiddler

```
Web site = clientContext.Web;
clientContext.Load(site);
```



Coding with Lambda Expressions

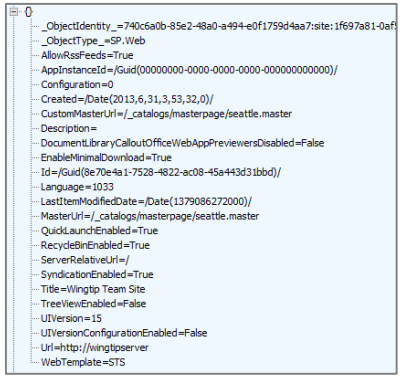
- C# supports the use of lambda expressions
  - Syntax Introduced as part of LINQ with .NET 3.5
  - Can (and should) be used with CSOM
- Lambda expression is anonymous function
  - It defines a parameter list and a function body



Using Lambda Expressions

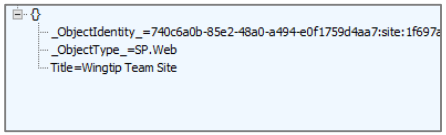
- Loading an object populates all scalar property values
  - Can result in inefficient use of network bandwidth

```
Web site = clientContext.Web;
clientContext.Load(site);
clientContext.ExecuteQuery();
```



- Lambda expressions can be used to optimize
  - You can indicate which properties you want populated

```
Web site = clientContext.Web;
clientContext.Load(site, s => s.Title);
clientContext.ExecuteQuery();
```



Using Where() and Include()

- Where lets you pass filter criteria to server

```
// instead of this
clientContext.Load(site.Lists);

// use this instead
clientContext.Load(site.Lists, lists => lists.Where(list => !list.Hidden));
```

- Include lets you pick fields on item in a collection

```
// indicate which list properties you want to populate for each list
clientContext.Load(site.Lists,
                   lists => lists.Include(list => list.Title, list => list.DefaultViewUrl));
```

- Syntax is powerful but tricky to read and write

```
ListCollection Lists = clientContext.Web.Lists;
clientContext.Load(Lists, lists => lists.Where(list => !list.Hidden)
                                        .Include(list => list.Title,
                                                 list => list.DefaultViewUrl));

clientContext.ExecuteQuery();
```

Check Whether List Exists

- How do you determine if a list already exists
  - CSOM doesn't provide simple approach
  - Query for the list by it's title or URL
  - Check to see if match list exists

```
Web site = clientContext.Web;
ListCollection listCollection = clientContext.Web.Lists;
clientContext.Load(listCollection,
                   lists => lists.Include(list => list.Title)
                                 .Where(list => list.Title == "Customers"));

clientContext.ExecuteQuery();

bool listDoesNotExist = (listCollection.Count == 0);

if (listDoesNotExist) {
  // create customers list if it does not exist
}
```

Retrieving Data using LoadQuery

- LoadQuery can be used instead of Load
  - Allows you to write LINQ query expressions

```
ClientContext clientContext = new ClientContext("http://intranet.wingtip.com");

ListCollection Lists = clientContext.Web.Lists;

// retrieve standard lists that are not hidden
IQueryable<List> query = from list in Lists
                         where (list.Hidden == false) && (list.BaseType == 0)
                         select list;

var queryResults = clientContext.LoadQuery(query);
clientContext.ExecuteQuery();

foreach (List list in queryResults) {
  Console.WriteLine(list.Title);
}
```

Retrieving with a CamlQuery

```
ClientContext clientContext = new ClientContext("http://intranet.wingtip.com");

List list = clientContext.Web.Lists.GetByTitle("Customers");
CamlQuery query = new CamlQuery();
query.ViewXml =
  @"<View>
      <Query>
        <Where>
          <BeginsWith>
            <FieldRef Name='FirstName' />
            <Value Type='Text'>B</Value>
          </BeginsWith>
        </Where>
        <OrderBy>
          <FieldRef Name='Title' />
        </OrderBy>
      </Query>
      <ViewFields>
        <FieldRef Name='FirstName'/>
        <FieldRef Name='Title' />
        <FieldRef Name='WorkPhone' />
      </ViewFields>
    </View>";

ListItemCollection queryResults = list.GetItems(query);
clientContext.Load(queryResults);
clientContext.ExecuteQuery();

foreach (ListItem item in queryResults) {
  Console.WriteLine(item["Title"] + ", " + item["FirstName"] + " - " + item["WorkPhone"]);
}
```

Batching Commands

```
private void CreateCustomers(ClientContext clientContext, int customerCount, int batchSize) {
  List list = clientContext.Web.Lists.GetByTitle("Customers");

  int batchCount = 0;
  foreach (var customer in CustomerFactory.GetCustomerList(customerCount, false)) {
    batchCount += 1;
    var lici = new ListItemCreationInformation();
    ListItem item = list.AddItem(new ListItemCreationInformation());
    item["FirstName"] = customer.FirstName; item["Title"] = customer.LastName;
    item["Company"] = customer.Company; item["WorkPhone"] = customer.WorkPhone;
    item["HomePhone"] = customer.HomePhone; item["Email"] = customer.EmailAddress;
    item.Update();
    // call ExecuteQuery only when reaching batch size
    if (batchCount == batchSize) {
      clientContext.ExecuteQuery();
      batchCount = 0;
    }
  }
  // make sure all items have been committed
  if (batchCount > 0) {
    clientContext.ExecuteQuery();
  }
}
```

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Consider the following code…

```
ClientContext clientContext =
  new ClientContext("http://intranet.wingtip.com");

clientContext.Web.Lists.GetByTitle("List1").DeleteObject();
clientContext.Web.Lists.GetByTitle("List2").DeleteObject();

try {
  clientContext.ExecuteQuery();
}
catch(ServerException ex) {
  Console.WriteLine(ex.GetType().ToString());
  Console.WriteLine(ex.Message);
  Console.WriteLine(ex.ServerErrorCode);
  Console.WriteLine(ex.ServerErrorTraceCorrelationId);
}
```

Remote Exception Handling

```
ClientContext clientContext =
  new ClientContext("http://intranet.wingtip.com");

ExceptionHandlingScope scope = new ExceptionHandlingScope(clientContext);

using (scope.StartScope()) {
  using (scope.StartTry()) {
    // perform operations
  }
  using (scope.StartCatch()) {
    // handle error
  }
  using (scope.StartFinally()) {
    // add cleanup code
  }
}

// execute batch with remote exception handling
clientContext.ExecuteQuery();
```

General Usage

```
ClientContext clientContext =
  new ClientContext("http://intranet.wingtip.com");

// attempt first operation
ExceptionHandlingScope scope1 = new ExceptionHandlingScope(clientContext);
using (scope1.StartScope()) {
  using (scope1.StartTry()) {
    clientContext.Web.Lists.GetByTitle("List1").DeleteObject();
  }
  using (scope1.StartCatch()) { /* do nothing */ }
}

// attempt second operation
ExceptionHandlingScope scope2 = new ExceptionHandlingScope(clientContext);
using (scope2.StartScope()) {
  using (scope2.StartTry()) {
    clientContext.Web.Lists.GetByTitle("List2").DeleteObject();
  }
  using (scope2.StartCatch()) { /* do nothing */ }
}

// execute batch with remote exception handling
clientContext.ExecuteQuery();
```

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- ➢ Creating Content Types and Lists

Creating a List

```
Web site = clientContext.Web;
clientContext.Load(site);

// create and initialize ListCreationInformation object
ListCreationInformation listInformation = new ListCreationInformation();
listInformation.Title = "Announcements";
listInformation.Url = "Lists/Announcements";
listInformation.QuickLaunchOption = QuickLaunchOptions.On;
listInformation.TemplateType = (int)ListTemplateType.Announcements;

// Add ListCreationInformation to lists collection and return list object
List list = site.Lists.Add(listInformation);

// modify additional list properties and update
list.OnQuickLaunch = true;
list.EnableAttachments = false;
list.Update();

// send command to server to create list
clientContext.ExecuteQuery();
```

Checking Whether List Already Exists

```
Web site = clientContext.Web;
clientContext.Load(site);

string listTitle = "Announcements";

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

// create and initialize ListCreationInformation object
ListCreationInformation listInformation = new ListCreationInformation();
listInformation.Title = listTitle;
listInformation.Url = "Lists/Announcements";
listInformation.QuickLaunchOption = QuickLaunchOptions.On;
listInformation.TemplateType = (int)ListTemplateType.Announcements;

// Add ListCreationInformation to lists collection and return list object
List list = site.Lists.Add(listInformation);

// modify additional list properties and update
list.OnQuickLaunch = true;
list.EnableAttachments = false;
list.Update();

// send command to server to create list
clientContext.ExecuteQuery();
```

Creating List Items

```
ListItemCreationInformation lici = new ListItemCreationInformation();

var item1 = list.AddItem(lici);
item1["Title"] = "SharePoint introduces new app model";
item1["Body"] = "<div>Developers wonder what happened to solutions.</div>";
item1["Expires"] = DateTime.Today.AddYears(10);
item1.Update();

var item2 = list.AddItem(lici);
item2["Title"] = "All SharePoint developers must now learn JavaScript";
item2["Body"] = "<div>Some developers are more excited then others.</div>";
item2["Expires"] = DateTime.Today.AddYears(1);
item2.Update();

var item3 = list.AddItem(lici);
item3["Title"] = "CSOM programming is super fun";
item3["Body"] = "<div>Just ask my mom.</div>";
item3["Expires"] = DateTime.Today.AddDays(7);
item3.Update();

clientContext.ExecuteQuery();
```

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- JavaScript Injection and the SharePoint REST API

Creating Site Columns - Part 1

```
static Field CreateSiteColumn(string fieldName, string fieldDisplayName, string fieldType) {

  Console.WriteLine("Creating " + fieldName + " site column...");

  // delete existing field if it exists
  try {
    Field fld = site.Fields.GetByInternalNameOrTitle(fieldName);
    fld.DeleteObject();
    clientContext.ExecuteQuery();
  }
  catch { }

  string fieldXML = @"<Field Name='" + fieldName + "' " +
                             "DisplayName='" + fieldDisplayName + "' " +
                             "Type='" + fieldType + "' " +
                             "Group='Wingtip' > " +
                    "</Field>";

  Field field = site.Fields.AddFieldAsXml(fieldXML, true, AddFieldOptions.DefaultValue);
  clientContext.Load(field);
  clientContext.ExecuteQuery();
  return field;
}
```

Creating Site Columns - Part 2

```
fieldProductCode = CreateSiteColumn("ProductCode", "Product Code", "Text");
fieldProductCode.EnforceUniqueValues = true;
fieldProductCode.Indexed = true;
fieldProductCode.Required = true;
fieldProductCode.Update();
clientContext.ExecuteQuery();
clientContext.Load(fieldProductCode);
clientContext.ExecuteQuery();

fieldProductDescription =
  clientContext.CastTo<FieldMultiLineText>(CreateSiteColumn("ProductDescription", "Product Description", "Note"));
fieldProductDescription.NumberOfLines = 4;
fieldProductDescription.RichText = false;
fieldProductDescription.Update();
clientContext.ExecuteQuery();

fieldProductListPrice =
  clientContext.CastTo<FieldCurrency>(CreateSiteColumn("ProductListPrice", "List Price", "Currency"));
fieldProductListPrice.MinimumValue = 0;
fieldProductListPrice.Update();
clientContext.ExecuteQuery();

fieldProductCategory =
  clientContext.CastTo<TaxonomyField>(CreateSiteColumn("ProductCategory", "Product Category", "TaxonomyFieldType"));
fieldProductCategory.SspId = localTermStoreID;
fieldProductCategory.TermSetId = termSetId;
fieldProductCategory.AllowMultipleValues = false;
fieldProductCategory.Update();
clientContext.ExecuteQuery();

fieldProductColor =
  clientContext.CastTo<FieldMultiChoice>(CreateSiteColumn("ProductColor", "Product Color", "MultiChoice"));
string[] choicesProductColor = { "White", "Black", "Grey", "Blue", "Red", "Green", "Yellow" };
fieldProductColor.Choices = choicesProductColor;
fieldProductColor.Update();
clientContext.ExecuteQuery();
```

Creating Content Types - Part 1

```
static ContentType CreateContentType(string contentTypeName, string baseContentType) {

  DeleteContentType(contentTypeName);

  ContentTypeCreationInformation contentTypeCreateInfo = new ContentTypeCreationInformation();
  contentTypeCreateInfo.Name = contentTypeName;
  contentTypeCreateInfo.ParentContentType = site.ContentTypes.GetById(baseContentType); ;
  contentTypeCreateInfo.Group = "Wingtip";
  ContentType ctype = site.ContentTypes.Add(contentTypeCreateInfo);
  clientContext.ExecuteQuery();
  return ctype;

}

static void DeleteContentType(string contentTypeName) {
  try {
    foreach (var ct in site.ContentTypes) {
      if (ct.Name.Equals(contentTypeName)) {
        ct.DeleteObject();
        Console.WriteLine("Deleting existing " + ct.Name + " content type...");
        clientContext.ExecuteQuery();
        break;
      }
    }
  }
  catch { }
}
```

Creating Content Types - Part 2

```
ctypeProduct = CreateContentType("Product", "0x01");

// add site columns
FieldLinkCreationInformation fieldLinkProductCode = new FieldLinkCreationInformation();
fieldLinkProductCode.Field = fieldProductCode;
ctypeProduct.FieldLinks.Add(fieldLinkProductCode);
ctypeProduct.Update(true);

FieldLinkCreationInformation fieldLinkProductDescription = new FieldLinkCreationInformation();
fieldLinkProductDescription.Field = fieldProductDescription;
ctypeProduct.FieldLinks.Add(fieldLinkProductDescription);
ctypeProduct.Update(true);

FieldLinkCreationInformation fieldLinkProductListPrice = new FieldLinkCreationInformation();
fieldLinkProductListPrice.Field = fieldProductListPrice;
ctypeProduct.FieldLinks.Add(fieldLinkProductListPrice);
ctypeProduct.Update(true);

FieldLinkCreationInformation fieldLinkProductCategory = new FieldLinkCreationInformation();
fieldLinkProductCategory.Field = fieldProductCategory;
ctypeProduct.FieldLinks.Add(fieldLinkProductCategory);
ctypeProduct.Update(true);

FieldLinkCreationInformation fieldLinkProductColor = new FieldLinkCreationInformation();
fieldLinkProductColor.Field = fieldProductColor;
ctypeProduct.FieldLinks.Add(fieldLinkProductColor);
ctypeProduct.Update(true);

clientContext.ExecuteQuery();
```

Creating List with Content Type

```
ListCreationInformation listInformationProducts = new ListCreationInformation();
listInformationProducts.Title = "Products";
listInformationProducts.Url = "Lists/Products";
listInformationProducts.QuickLaunchOption = QuickLaunchOptions.On;
listInformationProducts.TemplateType = (int)ListTemplateType.GenericList;
listProducts = site.Lists.Add(listInformationProducts);
listProducts.OnQuickLaunch = true;
listProducts.Update();

clientContext.Load(listProducts);
clientContext.Load(listProducts.ContentTypes);
clientContext.ExecuteQuery();

// configure list to use custom content type
listProducts.ContentTypesEnabled = true;
listProducts.ContentTypes.AddExistingContentType(ctypeProduct);
ContentType existing = listProducts.ContentTypes[0]; ;
existing.DeleteObject();
listProducts.Update();
clientContext.ExecuteQuery();

// add custom site columns to default veiw of list
View viewProducts = listProducts.DefaultView;
viewProducts.ViewFields.Add("ProductCode");
viewProducts.ViewFields.Add("ProductListPrice");
viewProducts.ViewFields.Add("ProductCategory");
viewProducts.ViewFields.Add("ProductColor");
viewProducts.Update();

clientContext.ExecuteQuery();
```

Creating a Document Library

```
ListCreationInformation listInformationProductImages = new ListCreationInformation();
listInformationProductImages.Title = "Product Images";
// make sure to set URL to root of site - not in /Lists folder
listInformationProductImages.Url = "ProductImages";
listInformationProductImages.QuickLaunchOption = QuickLaunchOptions.On;
listInformationProductImages.TemplateType = (int)ListTemplateType.PictureLibrary;
listProductImages = site.Lists.Add(listInformationProductImages);
listProductImages.OnQuickLaunch = true;
listProductImages.Update();

clientContext.ExecuteQuery();
```

Uploading Files to a Library

- Create a utility upload function with common CSOM code

```
static void UploadProductImage(byte[] imageContent, string imageFileName) {
  Console.WriteLine("  uploading " + imageFileName);
  FileCreationInformation fileInfo = new FileCreationInformation();
  fileInfo.Content = imageContent;
  fileInfo.Overwrite = true;
  fileInfo.Url = listProductImagesUrl + imageFileName;
  File newFile = listProductImages.RootFolder.Files.Add(fileInfo);
  clientContext.ExecuteQuery();
}
```

- Call function passing file name and byte array

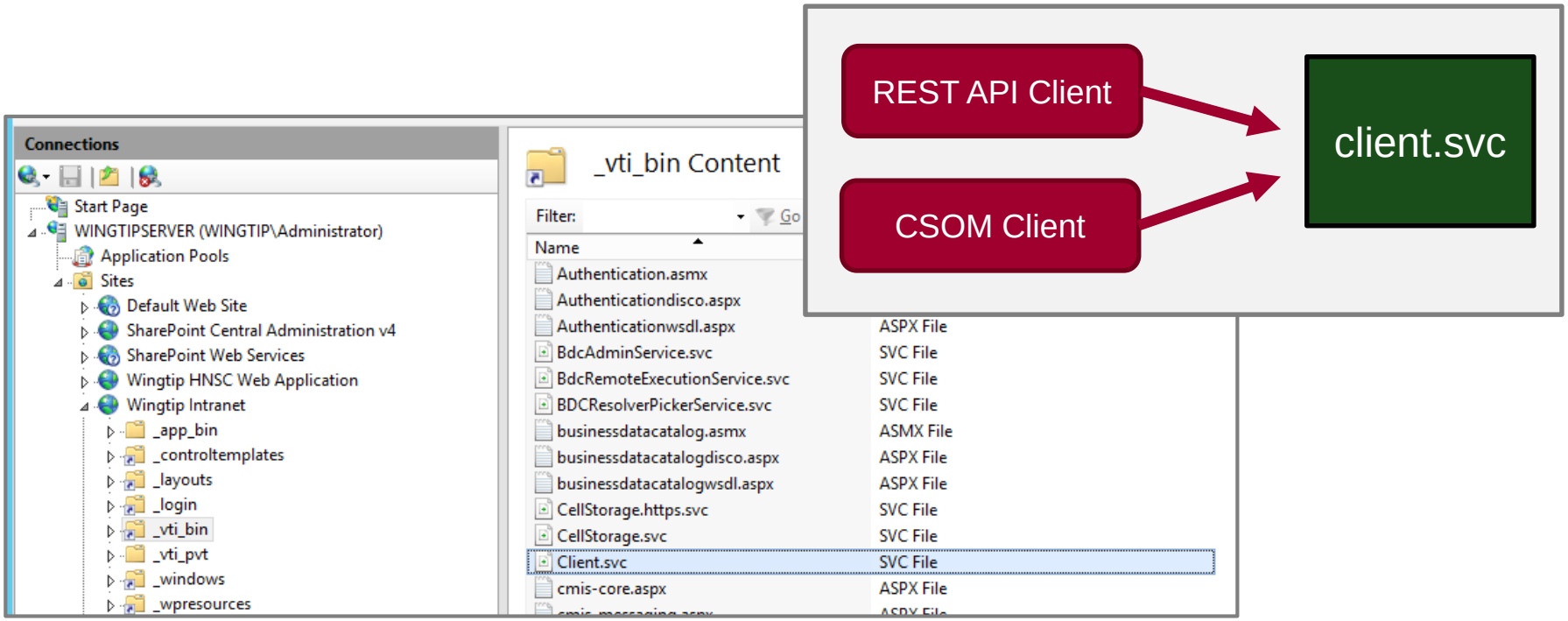
```
UploadProductImage(Properties.Resources.WP0001, "WP0001.jpg");
UploadProductImage(Properties.Resources.WP0002, "WP0002.jpg");
UploadProductImage(Properties.Resources.WP0003, "WP0003.jpg");
UploadProductImage(Properties.Resources.WP0004, "WP0004.jpg");
UploadProductImage(Properties.Resources.WP0005, "WP0005.jpg");
UploadProductImage(Properties.Resources.WP0006, "WP0006.jpg");
UploadProductImage(Properties.Resources.WP0007, "WP0007.jpg");
UploadProductImage(Properties.Resources.WP0008, "WP0008.jpg");
UploadProductImage(Properties.Resources.WP0009, "WP0009.jpg");
UploadProductImage(Properties.Resources.WP0010, "WP0010.jpg");
```

Agenda

- ✓ SharePoint Online Development Strategies
- ✓ Understanding Modern Team Site and Modern Pages
- ✓ Programming the Client-side Object Model (CSOM)
- ✓ Creating Site Columns, Content Types and Lists
- ➢ JavaScript Injection and the SharePoint REST API

SharePoint REST API Architecture

- REST API entry point is client.svc
  - In SharePoint 2010, client.svc only used by CSOM
  - In SharePoint 2013, client.svc used by CSOM and REST API



SharePoint REST URLs and the _api Alias

- SharePoint REST API provides _api alias
  - The **_api** alias maps to **_vti_bin/client.svc**
  - Alias used to make SharePoint REST API URLs cleaner
  - Alias serves to decouple URLs from underlying architecture
- This URL works but it is not recommended
  - **http://intranet.wingtip.com/_vti_bin/client.svc/web**
- SharePoint REST API URLs should be created with _api
  - **http://intranet.wingtip.com/_api/web**

Anatomy of a SharePoint REST URL

- SharePoint REST made up of three parts
  - Base URI

    `http://intranet.wingtip.com/_api`
  - Target SharePoint Object

    `web`
  - Query String Parameter options

    `?$select=Id,Title,MasterUrl`

```
http://intranet.wingtip.com/_api/web/?$select=Id,Title,MasterUrl
```

Mapping SharePoint Objects to URLs

SharePoint Object	Object mapping
Site Collection	`site`
Site	`web`
Lists collection	`web/lists`
List by ID	`web/lists(guid'402cd788-9c5c-4931-92d6-09f18efb368c')`
List by Title	`web/lists/getByTitle('Customers')`
List property	`web/lists/getByTitle('Customers')/Title`
List items collection	`web/lists/getByTitle('Customers')/items`
List item	`web/lists/getByTitle('Customers')/items(1)`
List item property	`web/lists/getByTitle('Customers')/items(1)/FirstName`

OData Support in SPO and SharePoint 2013

- SharePoint Online supports ODATA version v4.0
  - SPO supports OData v4.0 and OData v3.0
- What about SharePoint 2013 On-premises farms?
  - SharePoint 2013 supports for ODATA v3.0 by default
  - PowerShell script must be run on farm to enable ODATA v4.0
  - Some SharePoint 2013 on-premises farms will only support v3
- Should you program using ODATA v4.0 or ODATA v3.0?
  - If you are only targeting SharePoint Online, use ODATA v4.0
  - If you want to support all SharePoint 2013 farms, use ODATA v3.0

ODATA Formats and the Accept Header

- OData v3 only supports OData verbose format

```
accept: application/json;odata=verbose
```

- OData v4 supports also minimal metadata format

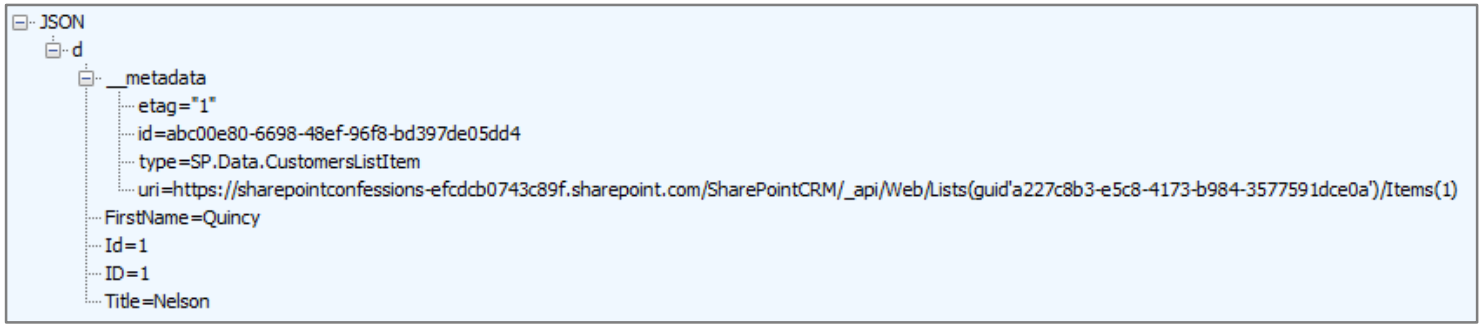
```
accept: application/json
accept: application/json;odata=minimalmetadata
```

- OData v4 also support no metadata format

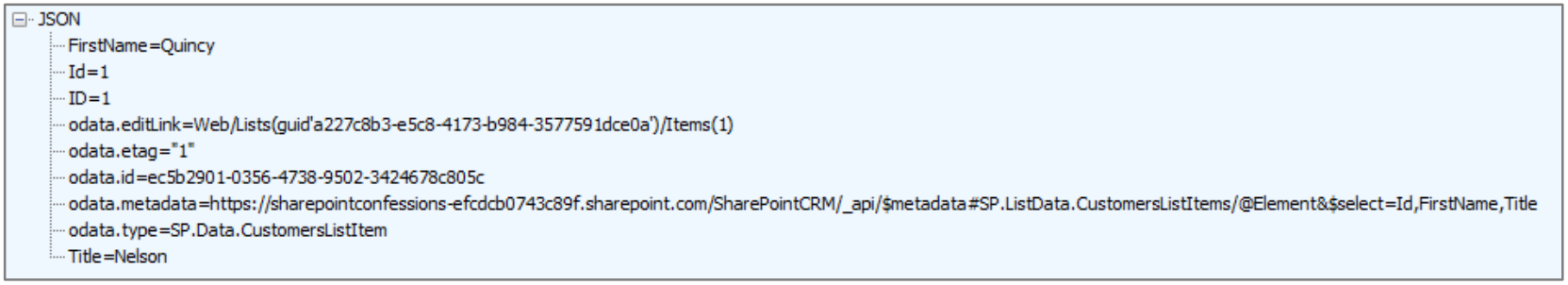
```
accept: application/json;odata=nometadata
```

Comparing JSON Formats

- When using **application/json;odata=verbose**



- When using **application/json** or **application/json;odata=minimalmetadata**



- When using **application/json;odata=nometadata**

Summary

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