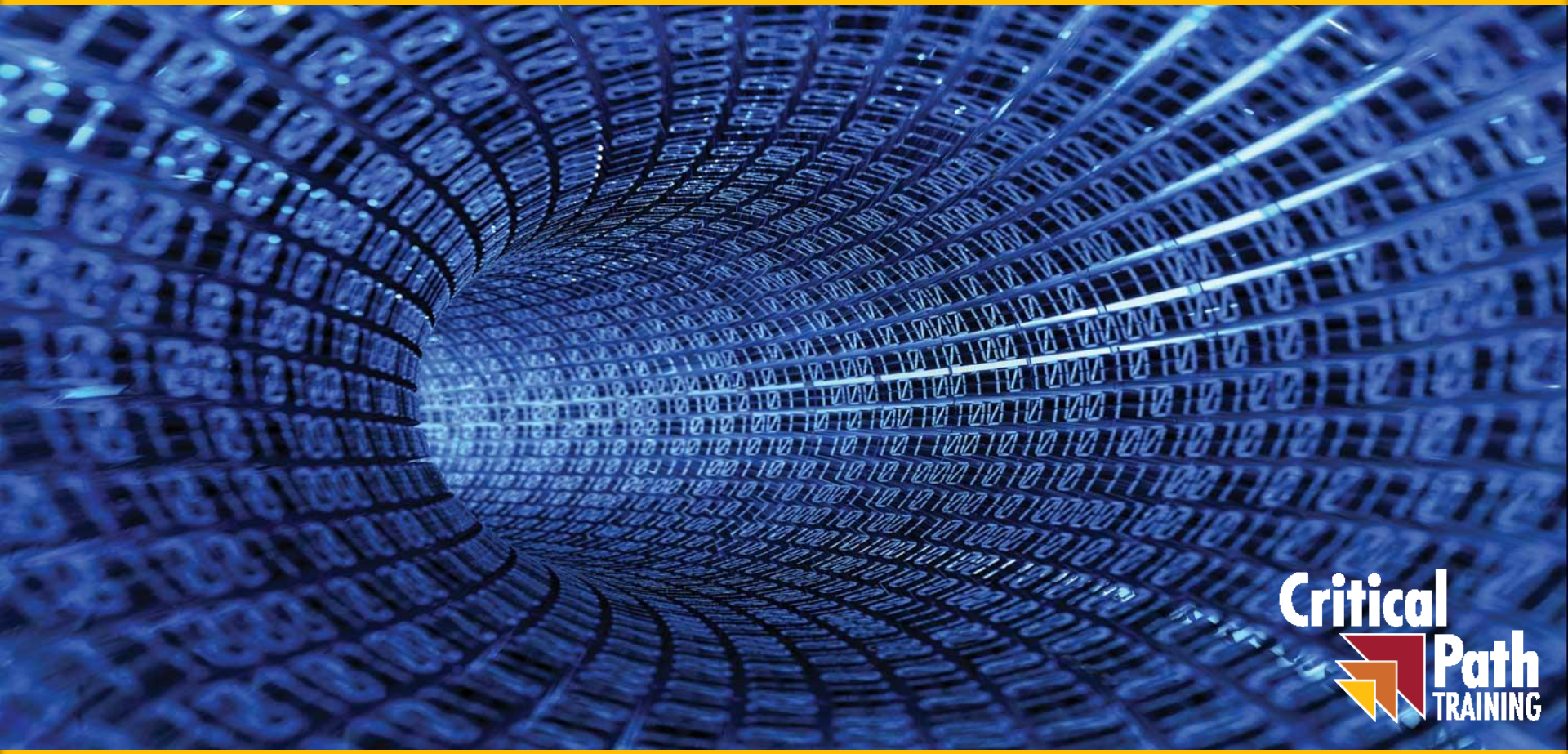
# Programming the SharePoint REST API



# Agenda

- The SharePoint REST API
- Creating REST URIs for SharePoint Objects
- Consuming OData Results from SharePoint
- Paging SharePoint List Items
- Adding and Updating Items

# RESTful Web Services

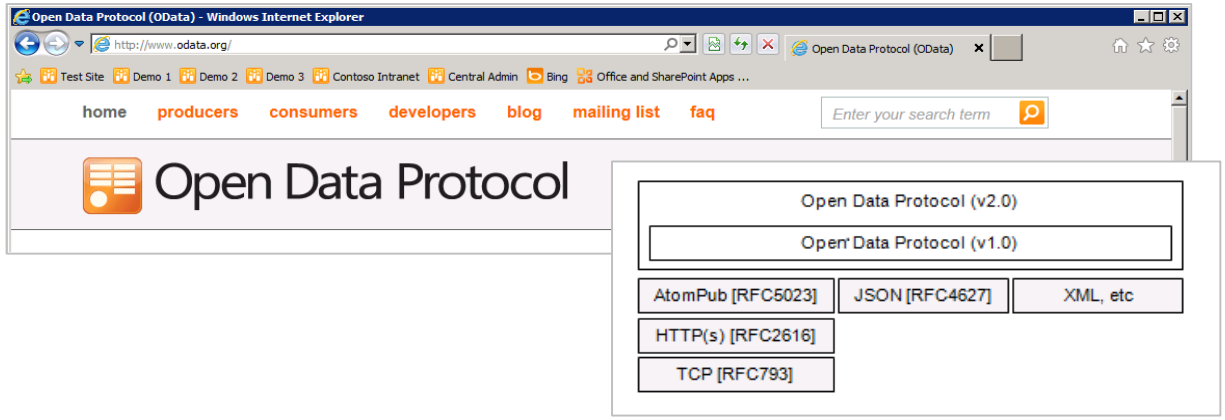
- RESTful Web Service
  - implemented using the principles of REST
  - REST URI = [base URI] + [resource path] + [query options]
  - Calls based on standard HTTP verbs (**GET**, **POST**, **PUT**, **DELETE**)
  - Passes data to and from client using representations
  - Can be designed to implement custom APIs and/or standard APIs

- Data passed across network using representations
  - Representations model resources – but they're different
  - Based on common formats: HTML, XML, ATOM and JSON
  - Based on specific Internet media types

# OData Primer

- What is OData?
  - A standardized REST API interface for common CRUD operations
  - Defined by Open Data Protocol specification
  - OData services becoming more popular on Internet (e.g. NetFlix)
  - SharePoint 2010 introduced a REST API for dealing with list items
  - SharePoint 2013 introduces new and expanded REST API

for an excellent resource go to
**http://www.odata.org**



# OData Query Option Parameters

- **$select**
  - http://services.odata.org/OData/OData.svc/Products?$select=Price,Name
- **$filter**
  - http://services.odata.org/OData/OData.svc/Products?$filter=startswith(CompanyName, 'Alfr')
- **$orderby**
  - http://services.odata.org/OData/OData.svc/Products?$orderby=Rating
- **$top**
  - http://services.odata.org/OData/OData.svc/Products?$top=5
- **$skip**
  - http://services.odata.org/OData/OData.svc/Products?$skip=5
  - http://services.odata.org/OData/OData.svc/Products?$skip=5&$top=5
- **$expand**
  - http://services.odata.org/OData/OData.svc/Categories?$expand=Products

# Using the $filter Parameter

| | | |
|---|---|---|
| Logical Operators | | |
| Eq | Equal | `/Suppliers?$filter=Address/City eq 'Las Vegas'` |
| Ne | Not equal | `/Suppliers?$filter=Address/City ne 'London'` |
| Gt | Greater than | `/Products?$filter=Price gt 20` |
| Ge | Greater than or equal | `/Products?$filter=Price ge 10` |
| Lt | Less than | `/Products?$filter=Price lt 20` |
| Le | Less than or equal | `/Products?$filter=Price le 100` |
| And | Logical and | `/Products?$filter=Price le 200 and Price gt 3.5` |
| Or | Logical or | `/Products?$filter=Price le 3.5 or Price gt 200` |
| Not | Logical negation | `/Products?$filter=not endswith(Description,'milk')` |
| Arithmetic Operators | | |
| Add | Addition | `/Products?$filter=Price add 5 gt 10` |
| Sub | Subtraction | `/Products?$filter=Price sub 5 gt 10` |
| Mul | Multiplication | `/Products?$filter=Price mul 2 gt 2000` |
| Div | Division | `/Products?$filter=Price div 2 gt 4` |
| Mod | Modulo | `/Products?$filter=Price mod 2 eq 0` |
| Grouping Operators | | |
| ( ) | Precedence grouping | `/Products?$filter=(Price sub 5) gt 10` |

# $filter Parameter String Functions

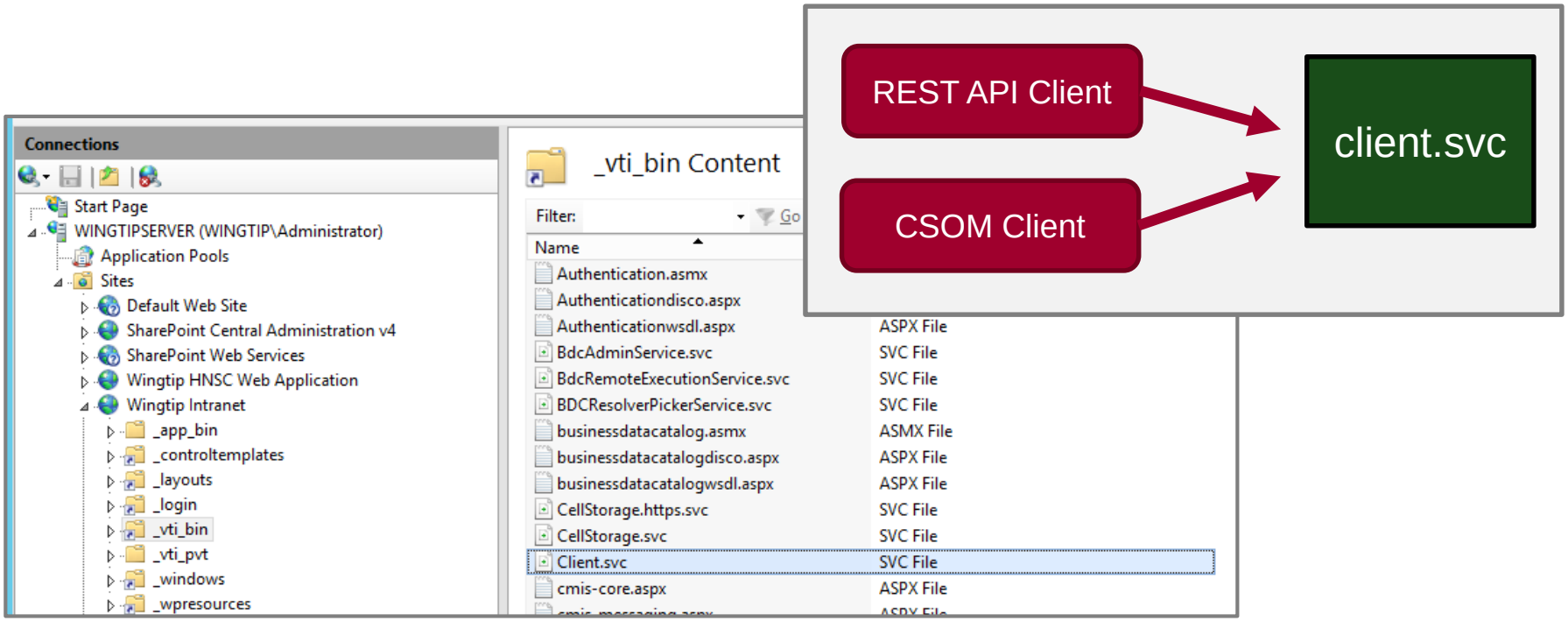
| String Functions | |
|---|---|
| bool substringof(string po, string p1) | Customers?$filter=substringof('Alfreds', CompanyName) eq true |
| bool endswith(string p0, string p1) | Customers?$filter=endswith(CompanyName, 'Futterkiste') eq true |
| bool startswith(string p0, string p1) | Customers?$filter=startswith(CompanyName, 'Alfr') eq true |
| int length(string p0) | Customers?$filter=length(CompanyName) eq 19 |
| int indexof(string p0, string p1) | Customers?$filter=indexof(CompanyName, 'lfreds') eq 1 |
| string replace(string p0, string find, string replace) | Customers?$filter=replace(CompanyName, ' ', '') eq 'AlfredsFutterkiste' |
| string substring(string p0, int pos) | Customers?$filter=substring(CompanyName, 1) eq 'lfreds Futterkiste' |
| string substring(string p0, int pos, int length) | Customers?$filter=substring(CompanyName, 1, 2) eq 'lf' |
| string tolower(string p0) | Customers?$filter=tolower(CompanyName) eq 'alfreds futterkiste' |
| string toupper(string p0) | Customers?$filter=toupper(CompanyName) eq 'ALFREDS FUTTERKISTE' |
| string trim(string p0) | Customers?$filter=trim(CompanyName) eq 'Alfreds Futterkiste' |
| string concat(string p0, string p1) | Customers?$filter=concat(concat(City, ', '), Country) eq 'Berlin, Germany' |

# Remote Communications with SharePoint

- In SharePoint 2003 and SharePoint 2007
  - SOAP-based web services (e.g. Lists.asmx)
- In SharePoint 2010
  - Client-side Object Model (CSOM)
  - REST API for list items accessible through **ListData.svc**
- In SharePoint 2013
  - Expanded CSOM Support
  - New SharePoint REST API replaces **ListData.svc**
- In SharePoint 2016
  - REST API improved with greater support for ODATA 4.0

# 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

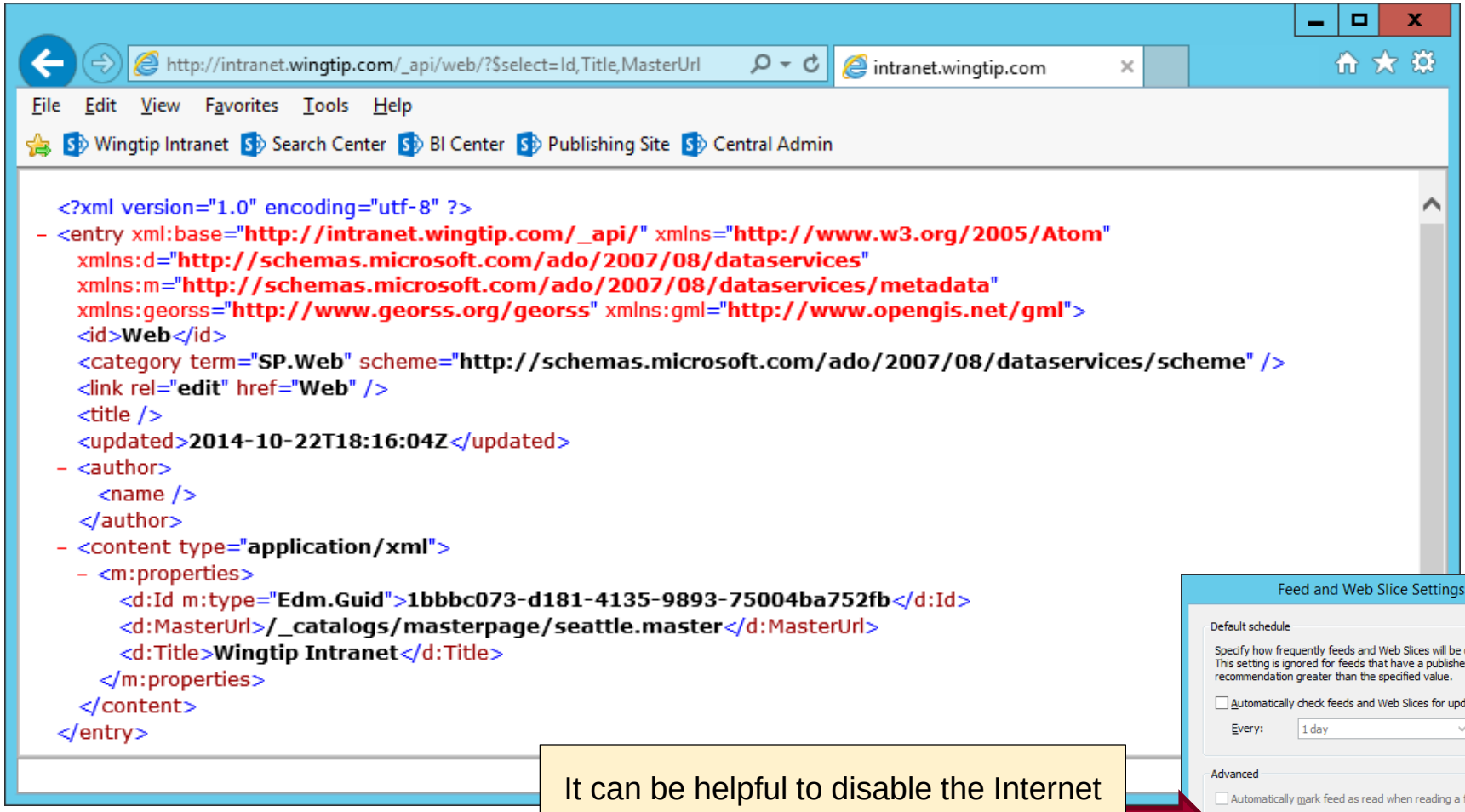
    `?$select=Id,Title,MasterUrl`

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

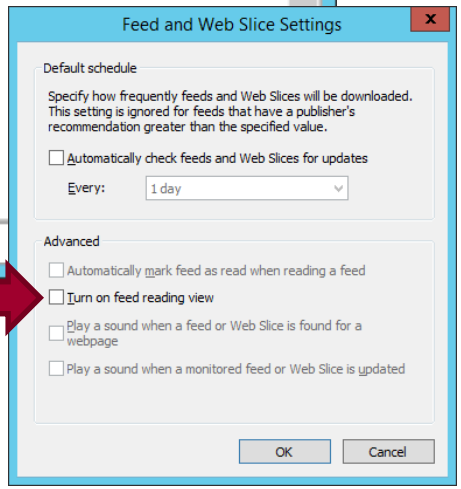
# Mapping SharePoint Objects to URLs

| 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` |

# Testing REST Calls Through the Browser




It can be helpful to disable the Internet Explorer option feed reading view



# OData Support in SharePoint 2016

- SharePoint Online supports ODATA v4.0
  - OData v4.0 support added in December of 2014
- SharePoint 2013 On-premises supports ODATA v3.0
  - SharePoint 2013 OOB only supports verbose metadata format
  - PowerShell script must be run to enable all ODATA formats
- SharePoint 2016 On-premises supports ODATA v4.0
  - SharePoint 2016 OOB supports all ODATA formats

# ODATA Formats and the Accept Header

- Verbose (aka Full Metadata)

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

- Minimal Metadata

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

- No Metadata

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

# Agenda

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# Service Root URI of the App Web

- Creating the App Web's Service Root URI
  - Use URL relative to **Pages** folder

```
var restURI = "../_api/web/?$select=Id,Title,Url"
```

  - Use URL created from **SPAppWebUrl** query string parameter

```
var restURI = getQueryStringParameter("SPAppWebUrl") +
              "/_api/web/?$select=Id,Title,Url"
```

  - Use URL created from **_spPageContextInfo.webAbsoluteUrl**

```
var restURI = _spPageContextInfo.webAbsoluteUrl +
              "/_api/web/?$select=Id,Title,Url"
```

# Reliable URIs for SharePoint REST Calls

- For the app web

```
var restURI = "../_api/web/?$select=Id,Title,Url"
```

- For the host web

```
var restURI = "../_api/SP.AppContextSite(@target)/web/" +
              "?$select=Id,Title,Url" +
              "&@target='" + getQueryStringParameter("SPHostUrl") + "'";
```

# Agenda

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# Querying a List in the App Web

```
var getCustomers = function () {

  var requestUri = "../_api/web/lists/getByTitle('Customers')/items" +
                   "?$select=ID,FirstName,Title,Company,WorkPhone,HomePhone,Email" +
                   "&$orderby=Title,FirstName";

  // send call across network
  return $.ajax({
    url: requestUri,
    headers: { "accept": "application/json;odata=verbose" }
  });

};
```

# Querying for Lists within the Host Web

```
var getLists = function () {

  var requestUri = "../_api/SP.AppContextSite(@target)/web/lists/" +
                   "?$filter=(Hidden eq false) and (BaseType eq 0)" +
                   "&$select=Id,Title, ItemCount, EntityTypeName, ListItemEntityTypeFullName" +
                   "&@target='" + hostWebUrl + "'";

  return $.ajax({
    url: requestUri,
    type: "GET",
    headers: { "accept": "application/json;odata=verbose" }
  });

};
```

# Using the $expand Query Option

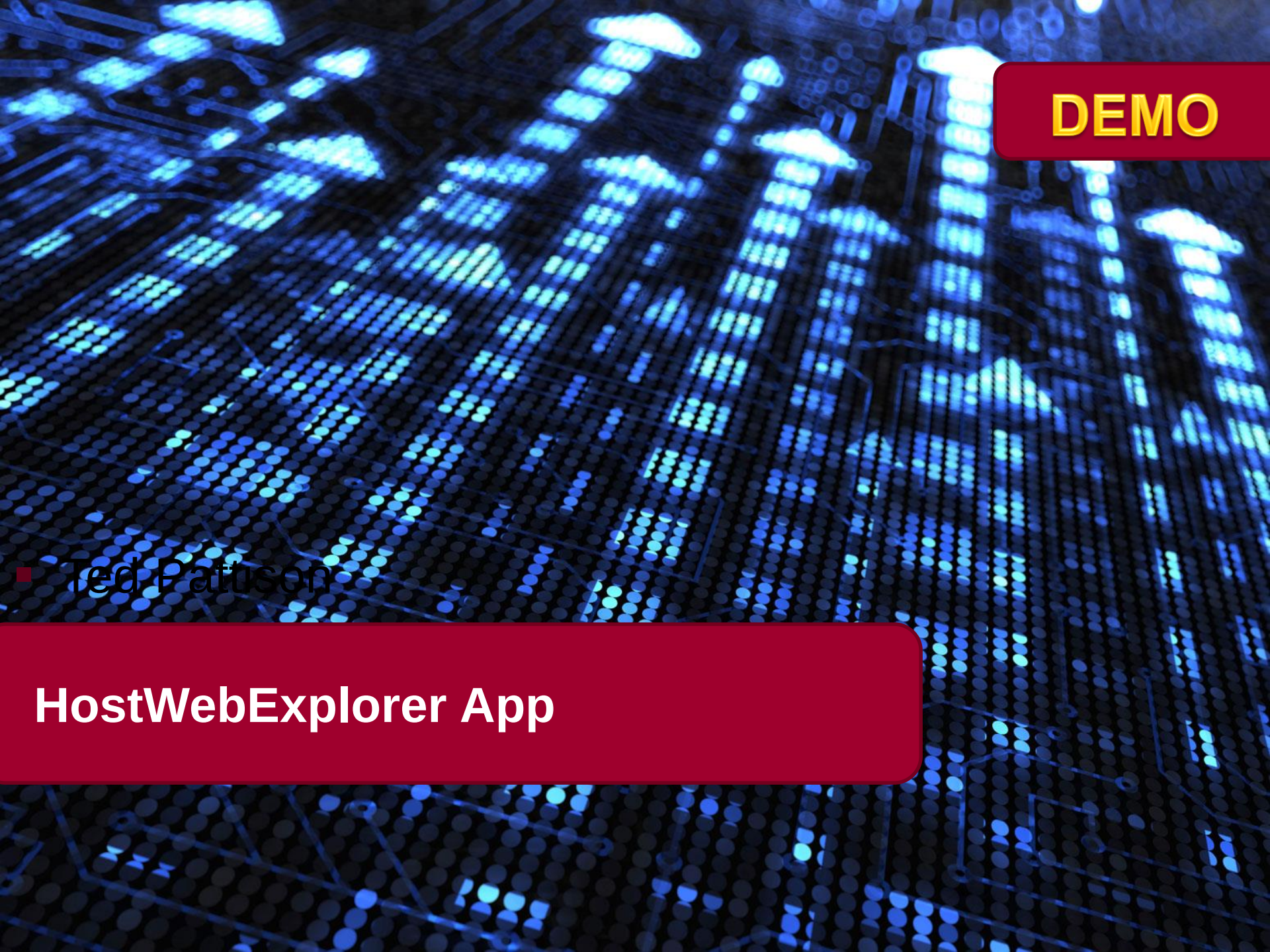
- **$expand** used to create more efficient code
  - Deferred content held back by default
  - **$expand** used to retrieve results with deferred content
  - Effectively reduces round trips

```
var getSiteGroups = function () {

  var requestUri = "../_api/SP.AppContextSite(@target)/web/siteGroups/" +
                   "?$expand=Users" +
                   "&@target='" + hostWebUrl + "'";;

  return $.ajax({
    url: requestUri,
    type: "GET",
    headers: { "accept": "application/json;odata=verbose" },
  });

};
```


DEMO
Ted Pattison
HostWebExplorer App

# Agenda

- ✓ Creating REST URIs for SharePoint Objects
- ✓ Consuming OData Results from SharePoint
- ➢ Paging SharePoint List Items
- • Adding and Updating Items

# Paging with SharePoint Lists

- SharePoint does not support **$skip** for list items
  - You cannot create typical OData paging scheme with a SharePoint list
- What do you do instead?
  - Create a custom paging scheme using **$filter**
  - Create a paging scheme using **$skiptoken**


DEMO
Paging with SharePoint List Items

# Agenda

- ✓ The SharePoint REST API
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# Updating SharePoint Objects

- All write operations must pass valid request digest value
- You must include type metadata for inserts & updates
- Sometimes you must pass ETags for updates & deletes

# Understanding the Request Digest

- All SharePoint write operations require Request Digest
  - Provides security mechanism to protect again replay attacks
  - Request digest known to SharePoint old timers as “Form Digest”
  - SharePoint adds request digest element with ID **__REQUESTDIGEST**
  - Request digest value passed using **X-RequestDigest** header

```
var requestHeaders = {
  "accept": "application/json;odata=verbose",
  "X-RequestDigest": $("#__REQUESTDIGEST").val()
}
```

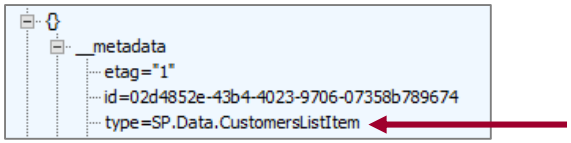
# Caching the Request Digest

- Request digest queried using **/_api/contextinfo**

```
Wingtip.Customers.DataAccess = function () {

  var requestDigest;

  var initialize = function () {

    var deferred = $.ajax({
      url: "../_api/contextinfo",
      type: "POST",
      headers: { "accept": "application/json;odata=verbose" }
    })

    deferred.then(function (data) {
      requestDigest = data.d.GetContextWebInformation.FormDigestValue
    });

  }
```

# Working with List Item Type Metadata

- Each SharePoint list has a unique type for its list items




- **type** value must be passed with all inserts and updates

```
var customerData = {
  __metadata: { "type": "SP.Data.CustomersListItem" },
  Title: LastName,
  FirstName: FirstName,
  Company: Company,
  WorkPhone: WorkPhone,
  HomePhone: HomePhone,
  Email: Email
};
```

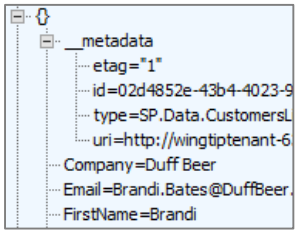
- **type** discoverable using **ListItemEntityTypeFullName** property

# Adding a SharePoint List Item

```
var addCustomer = function (FirstName, LastName, Company, WorkPhone, HomePhone, Email) {

  var requestUri = "../_api/web/lists/getByTitle('Customers')/items";

  var requestHeaders = {
    "accept": "application/json;odata=verbose",
    "X-RequestDigest": $("#__REQUESTDIGEST").val()
  }

  var customerData = {
    __metadata: { "type": "SP.Data.CustomersListItem" },
    Title: LastName,
    FirstName: FirstName,
    Company: Company,
    WorkPhone: WorkPhone,
    HomePhone: HomePhone,
    Email: Email
  };

  var requestBody = JSON.stringify(customerData);

  return $.ajax({
    url: requestUri,
    type: "POST",
    contentType: "application/json;odata=verbose",
    headers: requestHeaders,
    data: requestBody,
  });

};
```

# ETags and Optimistic Concurrency

- OData v2 requires items to carry ETags
  - ETag is integer value in that it identities version of item
  - ETag is automatically incremented with each update




- ETag use to support for optimistic concurrency control
  - ETag works to eliminate the “lost update” scenario
  - ETag must be tracked in order to post updates in most scenarios

```
// store item metadata values into hidden controls
$("#customer_id").val(data.d.ID);
$("#etag").val(data.d.__metadata.etag);
```

# ETags and the If-Match Header

- Update and Delete operations require If-Match Header
  - Allows you to pass ETag value during an update
  - Update fails if ETag value changed due to update by other user

```
var requestHeaders = {
  "accept": "application/json;odata=verbose",
  "X-HTTP-Method": "MERGE",
  "X-RequestDigest": $("#__REQUESTDIGEST").val(),
  "If-Match": ETag
}
```

- You can pass wildcard (*) value inside If-Match Header
  - Done to disable optimistic concurrency control
  - This is commonly done with delete operations

```
var requestHeaders = {
  "accept": "application/json;odata=verbose",
  "X-RequestDigest": $("#__REQUESTDIGEST").val(),
  "If-Match": "*"
}
```

# Updating a SharePoint List Item

```
var updateCustomer = function (Id, FirstName, LastName, Company, WorkPhone, HomePhone, Email, ETag) {

  var requestUri = "../_api/web/lists/getByTitle('Customers')/items(" + Id + ")";

  var requestHeaders = {
    "accept": "application/json;odata=verbose",
    "X-HTTP-Method": "MERGE",
    "X-RequestDigest": $("#__REQUESTDIGEST").val(),
    "If-Match": ETag
  }

  var customerData = {
    __metadata: { "type": "SP.Data.CustomersListItem" },
    Title: LastName,
    FirstName: FirstName,
    Company: Company,
    WorkPhone: WorkPhone,
    HomePhone: HomePhone,
    Email: Email
  };

  var requestBody = JSON.stringify(customerData);

  return $.ajax({
    url: requestUri,
    type: "POST",
    contentType: "application/json;odata=verbose",
    headers: requestHeaders,
    data: requestBody,
  });

};
```

# Deleting a SharePoint List Item

```
var deleteCustomer = function (Id) {

  var requestUri = "../_api/web/lists/getByTitle('Customers')/items(" + Id + ")";

  var requestHeaders = {
    "accept": "application/json;odata=verbose",
    "X-RequestDigest": $("#__REQUESTDIGEST").val(),
    "If-Match": "*"
  }

  return $.ajax({
    url: requestUri,
    type: "DELETE",
    headers: requestHeaders,
  });

};
```


DEMO
Exploring the SharePointCRM App

# Summary

- ✓ The SharePoint REST API
- ✓ Creating REST URIs for SharePoint Objects
- ✓ Consuming OData Results from SharePoint
- ✓ Paging SharePoint List Items
- ✓ Adding and Updating Items