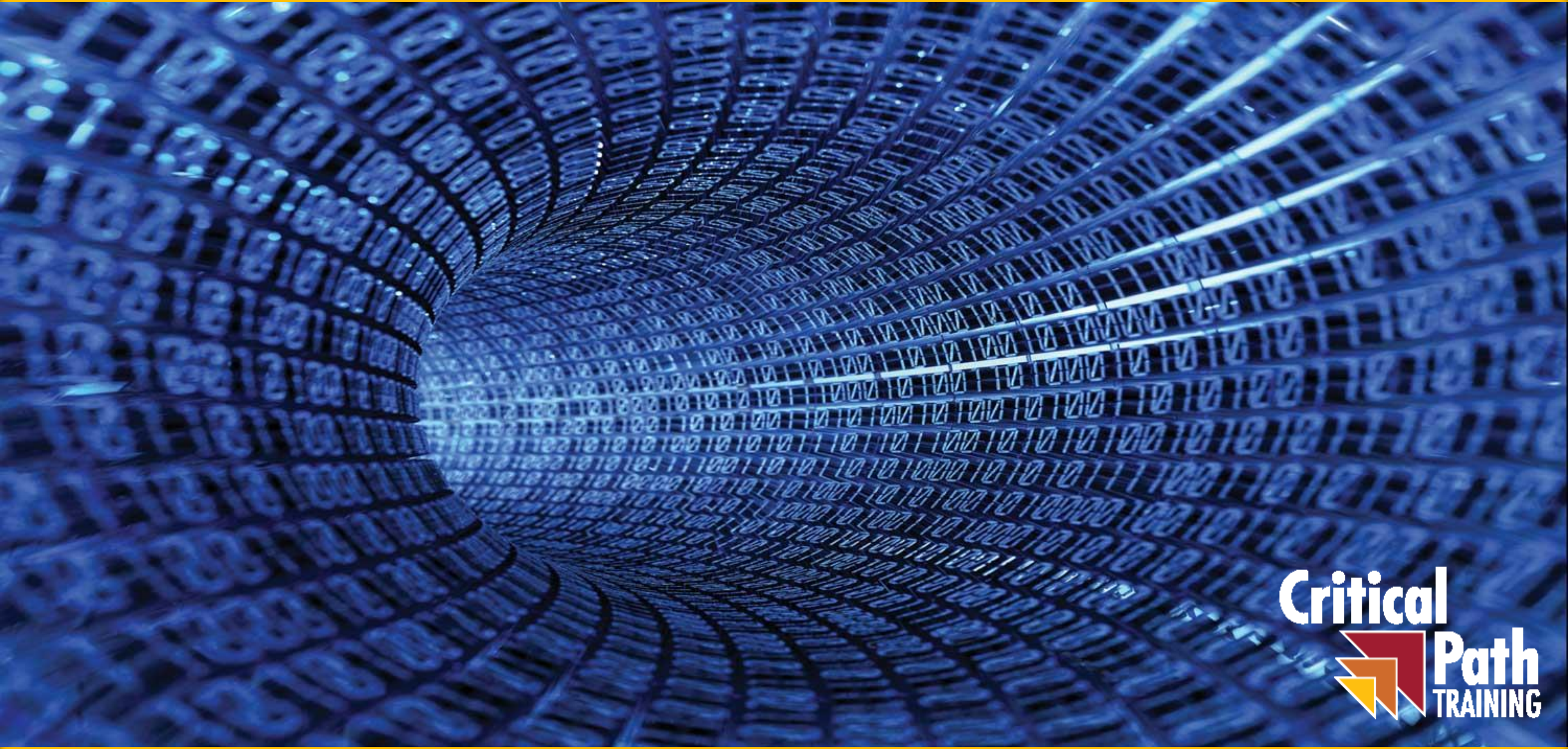
# Programming with the Microsoft Graph API



## Agenda

- Overview of Microsoft Graph API
- Constructing URLs for the Microsoft Graph API
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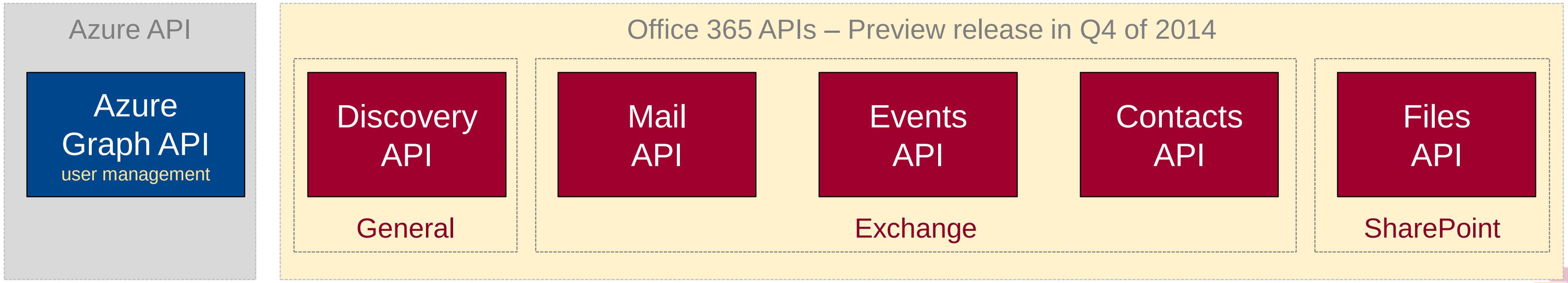
- Programming SPFx Webparts using MSGraphClient
- Granting Microsoft Graph API Permissions

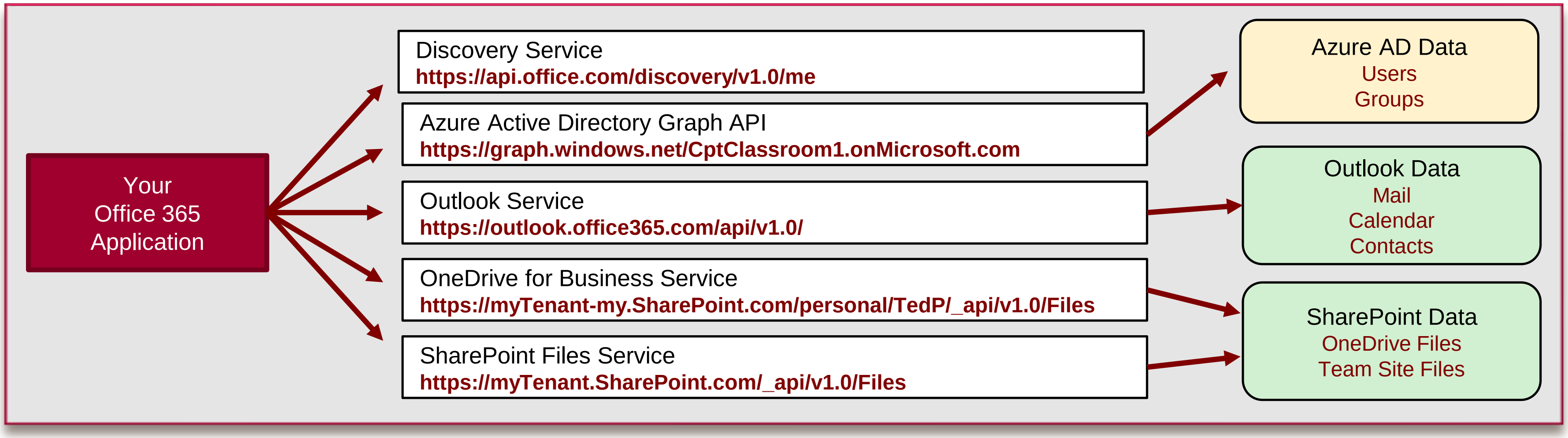
# Microsoft Released Office 365 APIs in 2014

- Office 365 APIs created for accessing data in Office 365
  - Implemented as RESTful services based on ODATA version 4.0
  - Provides authentication and authorization based on OAuth 2.0
  - Provides extra authentication support for OpenID Connect
- Open standards provide wide range of accessibility
  - Many choices for tools, languages and development platforms
  - Microsoft has created Office 365 SDKs for specific platforms
- Office 365 APIs set the stage for the Microsoft Graph API
  - Microsoft Graph API created to simplify accessing Office 365



# Office 365 API Endpoint in Initial Release

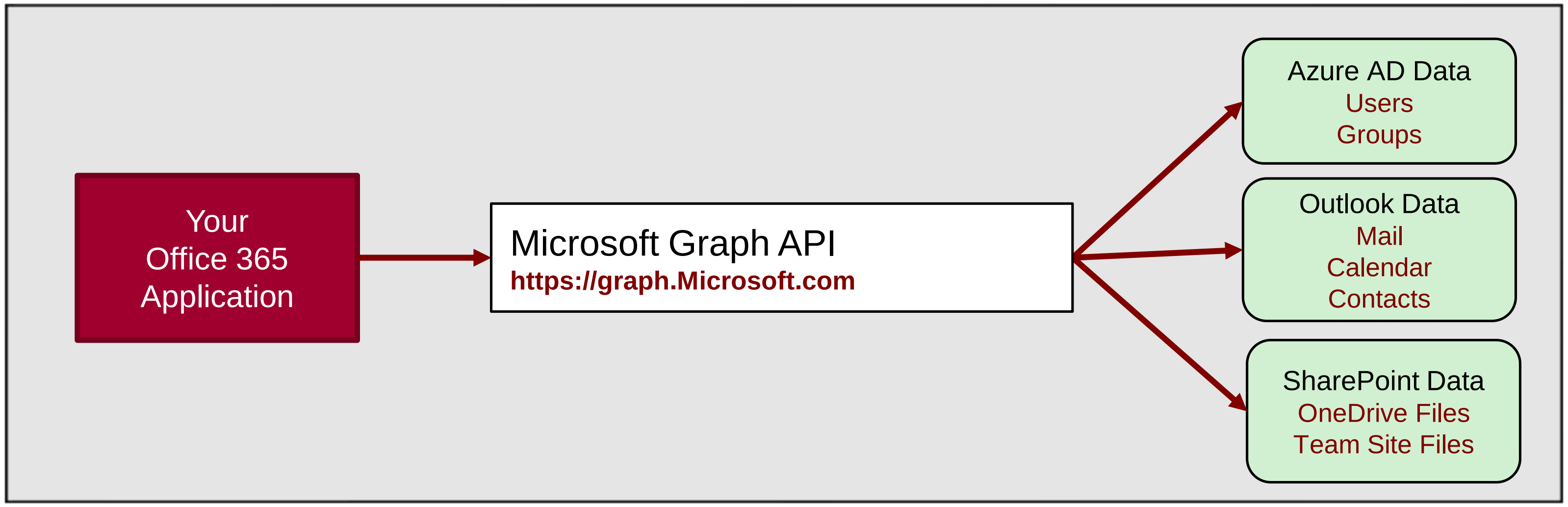
- Azure Endpoints
  - Azure Graph API
- Office 365 API Endpoints
  - Outlook service
  - OneDrive for Business Service
  - SharePoint Files Service
  - Discovery Services



Your Office 365 Application
Discovery Service
https://api.office.com/discovery/v1.0/me
Azure Active Directory Graph API
https://graph.windows.net/CptClassroom1.onMicrosoft.com
Outlook Service
https://outlook.office365.com/api/v1.0/
OneDrive for Business Service
https://myTenant-my.SharePoint.com/personal/TedP/_api/v1.0/Files
SharePoint Files Service
https://myTenant.SharePoint.com/_api/v1.0/Files
Azure AD Data
Users
Groups
Outlook Data
Mail
Calendar
Contacts
SharePoint Data
OneDrive Files
Team Site Files

# The Microsoft Graph API

- Designed as a single, more-comprehensive service
  - Abstracts away divisions between AD, Exchange and SharePoint
  - No need to discover endpoints using the Discovery Service
  - You can acquire and cache a single access token per user



## What Does It Do?

- Single resource that proxies multiple Microsoft services
- Allows for easy traversal of objects and relationships
- Simplifies token acquisition and management
- Eliminates the need to traditional discovery
  - It does this by using "me" and "myorganization"

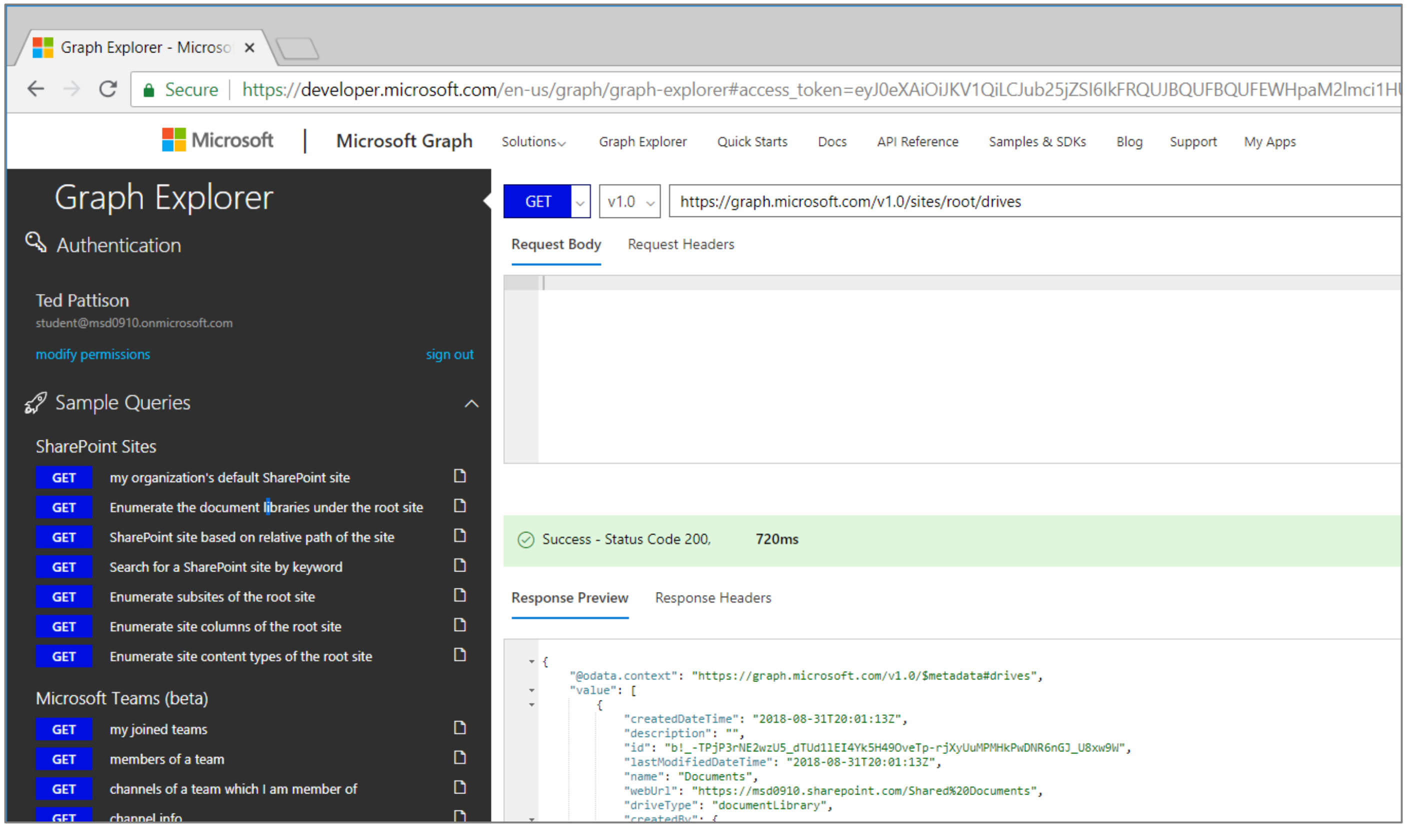
## Universal Access

- Direct REST API
  - Any platform
  - Any language
  - Any framework

- Native SDKs
  - Utilize framework & platform specific implementations
  - Abstracts the details of building & processing requests over HTTP
  - .NET, iOS, Android, PhP, Ruby, JavaScript, etc.

# The Graph Explorer

- Graph Explorer used to execute calls into Microsoft Graph API
  - Great place to discover what he API can do
  - https://developer.microsoft.com/en-us/graph/graph-explorer



SharePoint Sites

GET my organization's default SharePoint site
GET Enumerate the document libraries under the root site
GET SharePoint site based on relative path of the site
GET Search for a SharePoint site by keyword
GET Enumerate subsites of the root site
GET Enumerate site columns of the root site
GET Enumerate site content types of the root site

Microsoft Teams (beta)

GET my joined teams
GET members of a team
GET channels of a team which I am member of
GET channel info

GET v1.0 https://graph.microsoft.com/v1.0/sites/root/drives

Success - Status Code 200, 720ms

```
{
    "@odata.context": "https://graph.microsoft.com/v1.0/$metadata#drives",
    "value": [
        {
            "createdDateTime": "2018-08-31T20:01:13Z",
            "description": "",
            "id": "b!_-TPjP3rNE2wzU5_dTUd1lEI4Yk5H49OveTp-rjXyUuMPMHkPwDNR6nGJ_U8xw9W",
            "lastModifiedDateTime": "2018-08-31T20:01:13Z",
            "name": "Documents",
            "webUrl": "https://msd0910.sharepoint.com/Shared%20Documents",
            "driveType": "documentLibrary",
            "createdBy": {
```

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# Calling the Graph API

```
https://graph.microsoft.com
/{version}/{resource}/{id}/{property}?{query-parameters}
```

HTTP verbs dictate the request intent: GET | POST | PATCH | PUT | DELETE

- Version: `/v1.0` or `/beta`
- Resource: `/users`, `/groups`, `/sites`, `/drives`, `/devices`, `more…`
- Member from collection: `/users/AAA`
- Property: `/users/AAA/department`
- Traverse to related resources via navigations: `/users/AAA/events`
- Query parameters: `/users/AAA/events?$top=5`

```
  Format results: $select | $orderby
  Control results: $filter | $expand
  Paging: $top | $skip | $skiptoken
```

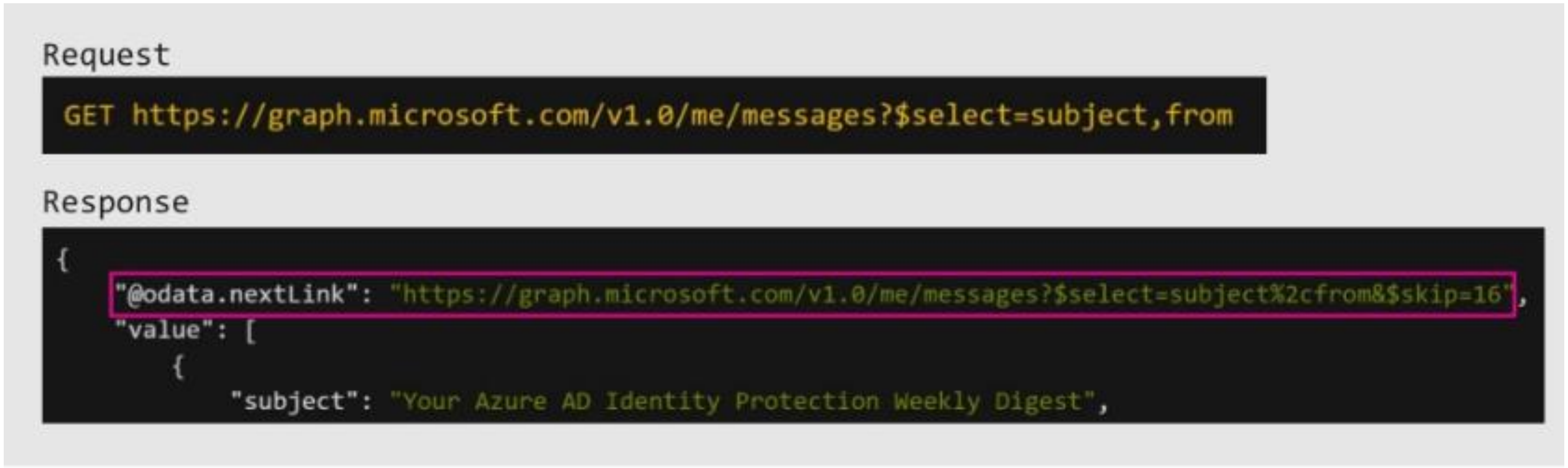
## Pagination

Graph uses server-side page size limits

When querying collections, Graph may return the results in many pages

Always expect an `@odata.nextLink` property in the response

Contains the URL to the next page



Request

```
GET https://graph.microsoft.com/v1.0/me/messages?$select=subject,from
```

Response

```
{
    "@odata.nextLink": "https://graph.microsoft.com/v1.0/me/messages?$select=subject%2cfrom&$skip=16",
    "value": [
        {
            "subject": "Your Azure AD Identity Protection Weekly Digest",
```

1. Always handle the possibility that the responses are paged in nature

2. Follow the `@odata.nextLink` to obtain the next page of results

3. Final page will not contain an `@odata.nextLink` property

4. Treat the entire URL as an opaque string

## Querying data | Use filters

Choose the records your app really needs and no more

Don't send unnecessary data over the wire

Tip

Use **$filter**

GET https://graph.microsoft.com/v1.0/users?
$filter=department eq 'Sales' & $select=givenName,mail

## POST/PATCH/PUT | no response required

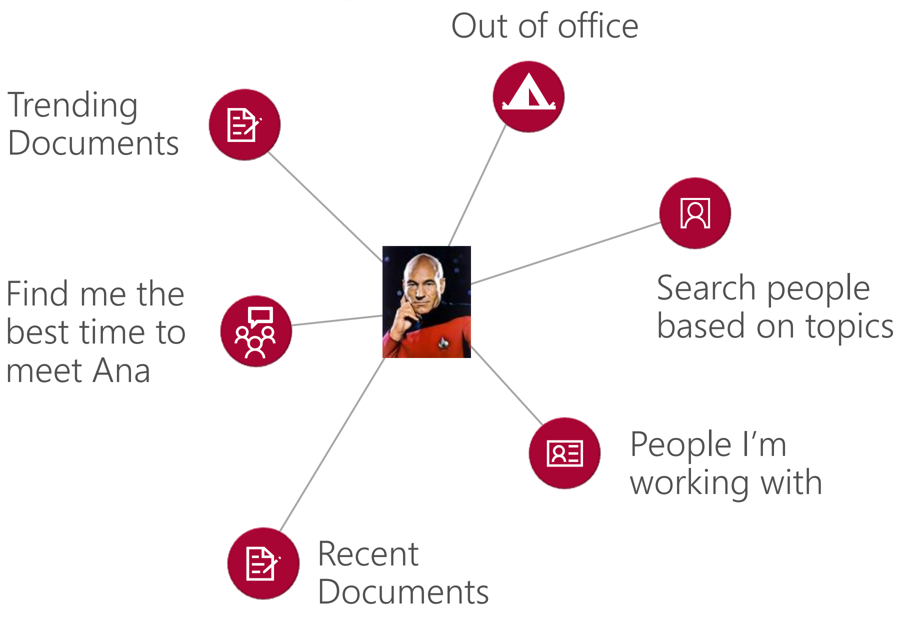
If your code doesn't need to get a response, then opt out

Don't send unnecessary data over the wire

Tip
Use HTTP
**Prefer return=minimal**
request header

# With Microsoft Graph

## Get insights based on activities



```
GET /me/insights/trending
"value" : [
  {"name": "presentation.pptx", …},
  {"name": "forecast.xlsx", …}
]

GET /me/drive/recent
"value" : [
  {"name": "guidelines.pptx", …},
  {"name": "budget.xlsx", …}
]

GET people/?$search="topic: planning"
"value" : [
  {"displayName": "Data", …},
  {"displayName": "Worf", …},
]

POST: /me/findMeetingTimes
{
  "attendees": [
    {
      "type": "required",
      "emailAddress": {
        "address": "riker@contoso.com"
      }
  ],
  "meetingDuration": "2h"
}
```

## Read data from existing SharePoint site

GET https://graph.microsoft.com/beta/sites/
{siteId}/lists/{listId}/items?expand=columnSet

```
{ "value":[ {
    "createdBy": { "user" : {"id":"d54e4cdd-d2ca-4c39-bfa5-35895bca12f0","displayName":"John"}},
    "createdDateTime":"2017-09-20T08:16:21Z",
    "eTag":"1610ac6a-24f6-4458-9733-1e5977c63caa,1",
    "id":"1610ac6a-24f6-4458-9733-1e5977c63caa",
    "lastModifiedBy":{"user":{"id":"d54e4cdd-d2ca-4c39-bfa5-35895bca12f0","displayName":"John"}},
    "lastModifiedDateTime":"2017-09-0T08:16:21Z",
    "webUrl":"https://site.sharepoint.com/sites/mysite/Lists/mytasks/1_.000",
    "listItemId":1,
    "columnSet":{
      "Title":"Project Upgrade: Use the Microsoft Graph",
      "Description":"Set up group for new technologies.",
      "id":"1",
      ...
 } }]}
```

## OneDrive + Excel Services

```
GET https://graph.microsoft.com/v1.0/me/drive/
              root/search(q='.xlsx')?select=name,id,webUrl


GET https://graph.microsoft.com/1.0/me/drive/

       items/<id>/workbook/worksheets


GET https://graph.microsoft.com/beta/me/drive/

              items/{itemId}/workbook/worksheets('Time')/
              range(address='a2:d4')
```

## Update Excel Timesheet Data

```
PATCH https://graph.microsoft.com/beta/me/drive/
     items/{itemId}/workbook/worksheets('Sheet1')/
     range(address='a2:b2')
{
  "values": [ ["September", "200.0"] ],
  "valueTypes": [ ["String", "Double"] ],
}
```

## New Capabilities

- Traversal of relationships
- Query parameters
- Batching - preview
- Notifications - users & groups - preview
- Track changes - GA
- Extensions - GA

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## Microsoft Graph JavaScript SDK

- Microsoft Graph is accessible via REST API & various SDKs

- Client-side solutions can leverage the JavaScript SDK
  - https://github.com/microsoftgraph/msgraph-sdk-javascript
  - Requires initialization with an Azure AD provided OAuth2 access token to create the client

## Initializing the Microsoft Graph JS SDK

```
var client = MicrosoftGraph.Client.init({
  authProvider: (done) => {
    done(null, access_token);
  }
});

client
  .api('/me')
  .get((err, res) => {
    console.log(res);
  });
```

## Microsoft Graph TypeScript Type Declarations

- Use the Microsoft Graph JavaScript SDK in TypeScript applications
- TypeScript type declarations introduce strong types and documentation to client-side projects
    - https://github.com/microsoftgraph/msgraph-typescript-typings

# Microsoft Graph TypeScript Type Declarations

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

// init Microsoft Graph client

client
  .api('/me')
  .get((error: any, user: MicrosoftGraph.User, rawResponse?: any) => {
    console.log('name: ', user.displayName);
    console.log('email: ', user.displmailayName);
    console.log('phone: ', user.businessPhones[0]);
    });
  });
```

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## SharePoint Online User Already Authenticated

- Users in SharePoint Online & Office 365 are already authenticated
    - SharePoint Online has same Azure AD dependency as Microsoft Graph
    - Users login to Office 365 with their Work & School account (Azure AD)
- Calls to the Microsoft Graph are proxied through SharePoint Online
    - Eliminates the need for creation of a separate Azure AD application
    - Does not bypass any permission / scope requirements
    - Can only access business entities, not consumer entities

## Calling Services from Client-side Code

- Calling a secured service requires the acquisition of token
  - Authenticate and get authorized in Azure AD application
  - Interactive login & programmatic acquisition of access token

- Client-side components cannot do the same
  - Components cannot securely do this across domains seamlessly
  - Can’t store application ID’s and secrets client side
  - Require an authentication prompt with a popup or redirection

# SPFx Includes Microsoft Graph Client

- MSGraphClient: Microsoft Graph Client fpr SPFx
  - Abstracts the token acquisition from the SPFx development
  - Wraps the Microsoft Graph JavaScript SDK line

```
let graphClient: MSGraphClient =
    this.context.serviceScope.consume(MSGraphClient.serviceKey);
```

## SPFx Proxy Calls through Existing Application

- SharePoint Online already has an Azure AD application
  - Client-side solutions in SharePoint Online call the SharePoint REST API in the same domain
  - No extra authentication required
  - Provided these tenants have granted the necessary scopes, SharePoint will call the Microsoft Graph
  - Responses from the Microsoft Graph are returned back to the client-side application

- Permission requests to Azure AD applications
  - Only SharePoint Online tenant administrators can [grant|reject] permission requests
  - Approved permissions are available to all client-side solutions in a tenant

## SPFx Solutions Declare Permission Requests

```
// package-solution.json
{
  "$schema": "https://developer.microsoft.com/json-schemas/spfx-build/package-solution.schema.json",
  "solution": {
    "name": "ms-graph-sp-fx-client-side-solution",
    "id": "dfb230b7-4f61-431f-9b65-a34e83922663",
    "version": "1.0.0.0",
    "includeClientSideAssets": true,
    "webApiPermissionRequests": [
      { "resource": "Microsoft Graph", "scope": "User.ReadBasic.All” },
      { "resource": "Microsoft Graph", "scope": "Calendars.Read” },
      { "resource": "Microsoft Graph", "scope": "Tasks.Read” }
    ]
  },
  "paths": {
    "zippedPackage": "solution/ms-graph-sp-fx.sppkg"
  }
}
```

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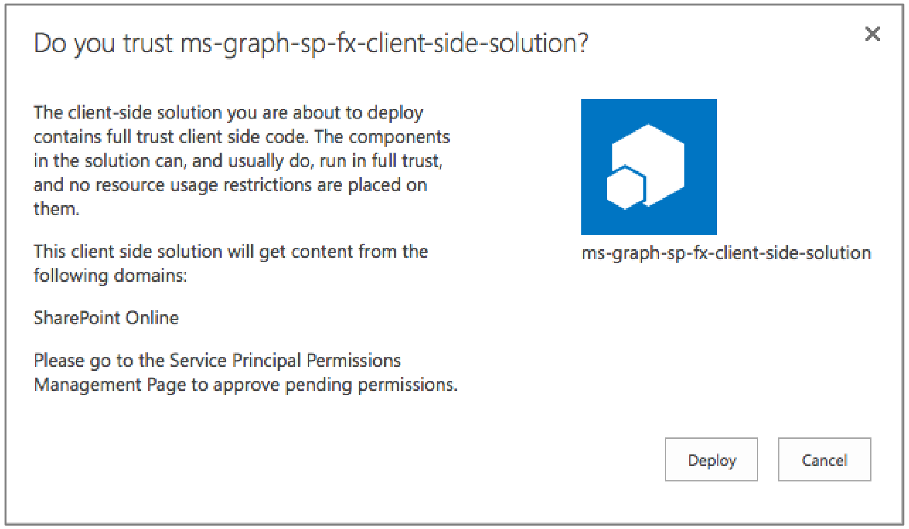
# Add Package to SharePoint App Catalog

- Extra note in dialog notifies of additional step required
- While application can be installed in SharePoint sites, it does not have the permissions granted that it needs to access Azure AD protected resources



Do you trust ms-graph-sp-fx-client-side-solution?

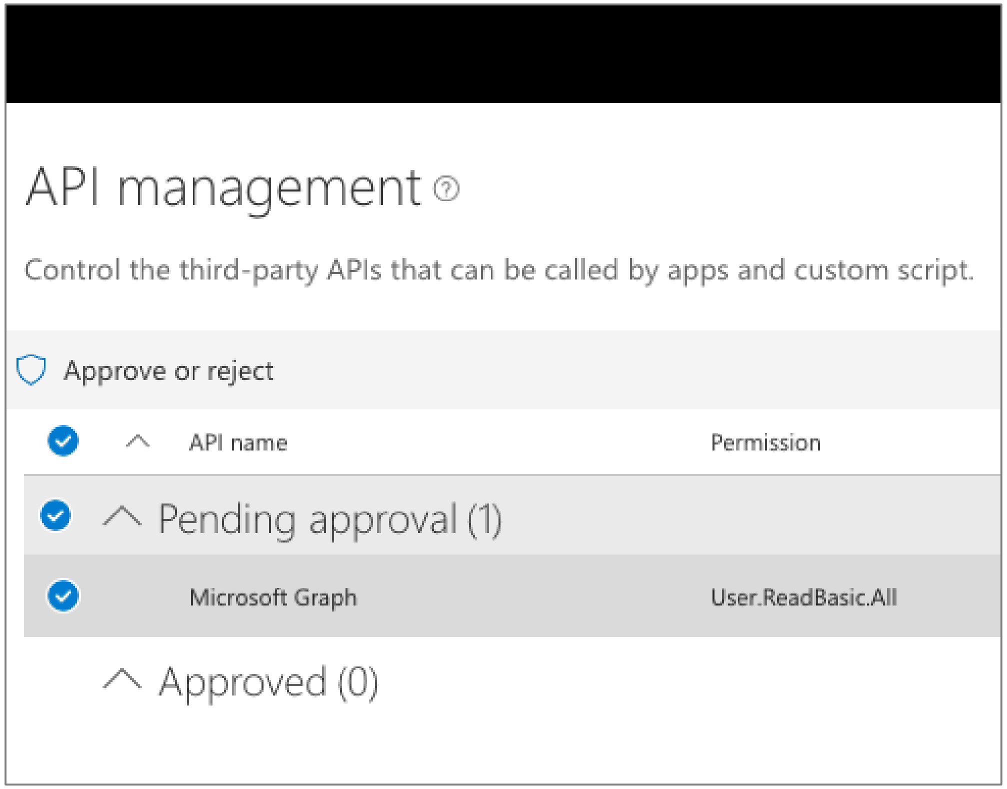
The client-side solution you are about to deploy contains full trust client side code. The components in the solution can, and usually do, run in full trust, and no resource usage restrictions are placed on them.

This client side solution will get content from the following domains:

SharePoint Online

Please go to the Service Principal Permissions Management Page to approve pending permissions.

# Approve / Reject with SharePoint Online API Management Page

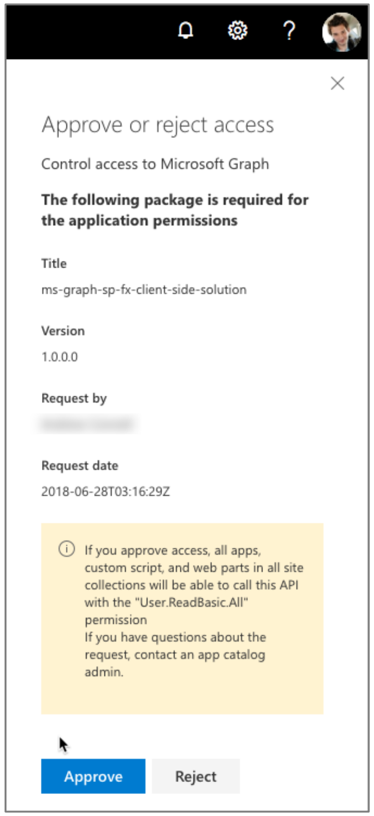


API management

Control the third-party APIs that can be called by apps and custom script.

Approve or reject

| | API name | Permission |
|---|---|---|
| ✓ | Pending approval (1) | |
| ✓ | Microsoft Graph | User.ReadBasic.All |
| | Approved (0) | |



Approve or reject access

Control access to Microsoft Graph

**The following package is required for the application permissions**

**Title**
ms-graph-sp-fx-client-side-solution

**Version**
1.0.0.0

**Request by**
[redacted]

**Request date**
2018-06-28T03:16:29Z

If you approve access, all apps, custom script, and web parts in all site collections will be able to call this API with the "User.ReadBasic.All" permission
If you have questions about the request, contact an app catalog admin.

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