

Unlocking the Power of Microsoft 365 with SAS Code

A programming approach for OneDrive,
SharePoint, Teams

Chris Hemedinger, Director of SAS User Engagement

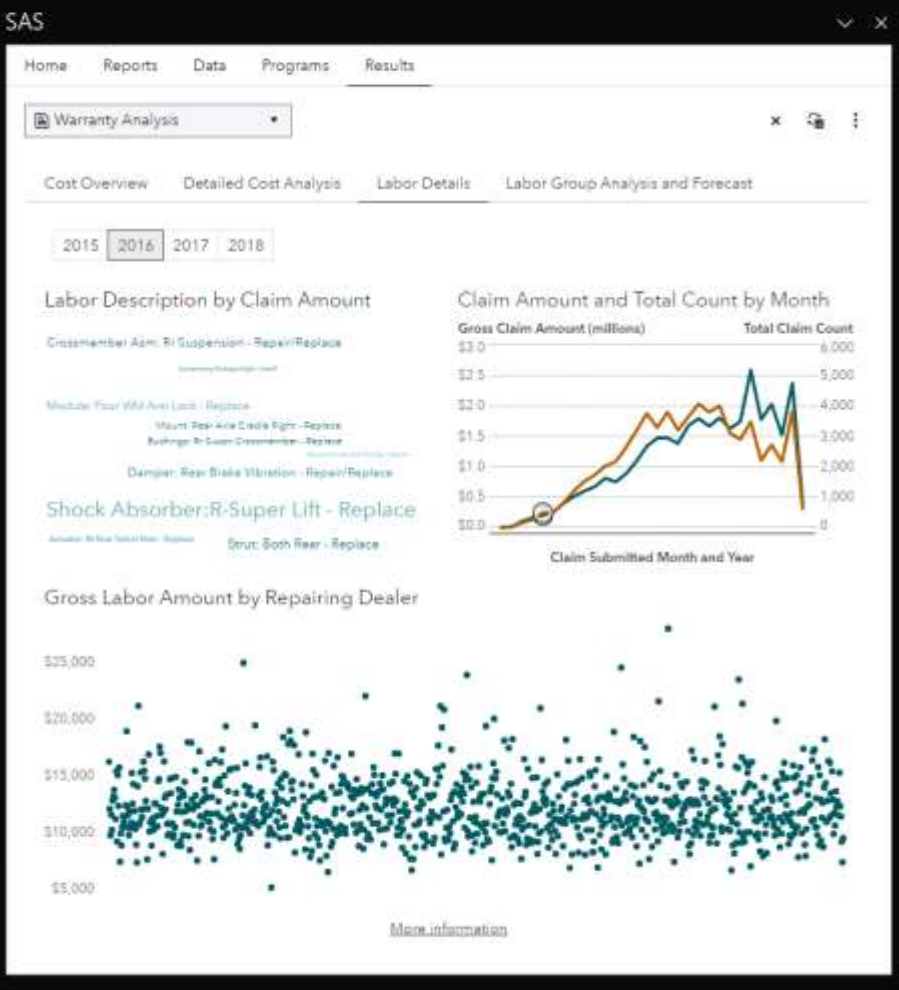
What we're talking about: a code-centric approach

Run from your favorite SAS editor or in batch

```
1 onedrive-examples.sas
2
3 /* Initiate an API session, getting a new access token for use with */
4 /* the MS Graph API. */
5 %InitSessionMS365;
6
7 /*
8  * At this point we have a valid access token and we can start using the API.
9  */
10
11 /* Create an output data set that shows my OneDrive drives */
12 %ListMyDrives(out=drives);
13
14 /*
15  * If you have multiple drives you can filter
16  * the set with a where clause on the name value.
17  * Note that the system may track additional drives behind-the-scenes, so
18  * don't assume you have just one!
19  */
20
21 In my case, the main drive is labeled "Documents".
22
23 /* store the ID value for the drive in a macro variable */
24 proc sql noprint;
25   select id into: driveId from drives where driveDisplayName="Documents";
26 quit;
27
28 /* LIST TOP LEVEL FOLDERS/FILES */
29
30 /* special macro to pull ALL items from root folder */
31 /* Note that the APIs return only 200 items at a time */
32 /* This macro will iterate through multiple times to get the full */
33 /* collection. */
34 %ListFolderItems(driveId=&driveId, folderId=root, out=work.paths);
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Obs	name	size	webUrl
1	AppData	0	https://sasoffice365-my.sharepoint.com/personal/chris_hemedinger_sas...
2	Apps	0	https://sasoffice365-my.sharepoint.com/personal/chris_hemedinger_sas...
3	Archive	82546741	https://sasoffice365-my.sharepoint.com/personal/chris_hemedinger_sas...
4	Attachments	100908	https://sasoffice365-my.sharepoint.com/personal/chris_hemedinger_sas...
5	bits&bobs	20351	https://sasoffice365-my.sharepoint.com/personal/chris_hemedinger_sas...
6	Communities		
7	CSM		
8	CSM-update-March2023.tscproj		
9	CustomerPresentations		
10	Desktop		
11	Documents		

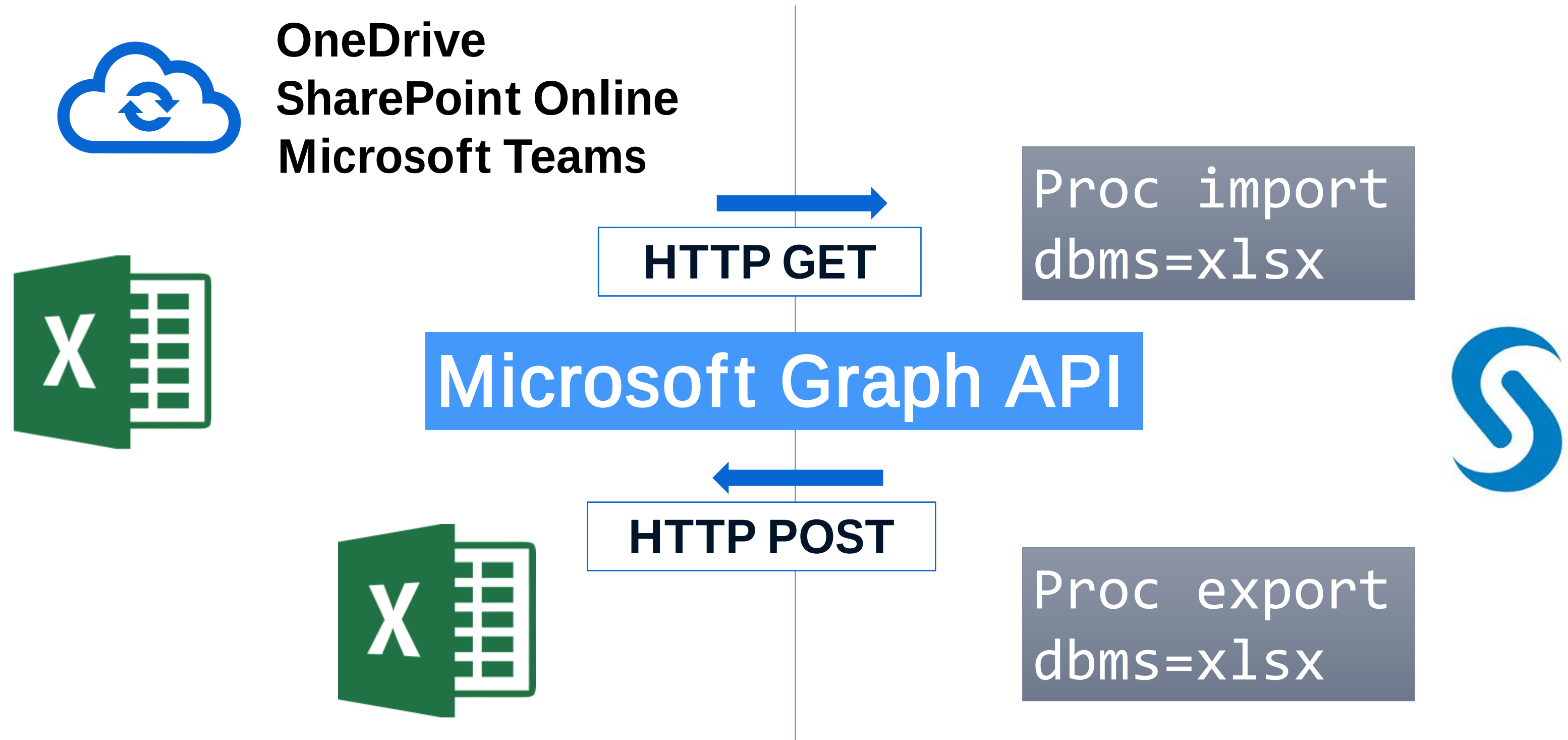
claim_attribute_1	seller_attribute_5	product_attribute_1	product_attribute_2	product_attribute_3	product_attribute_4	product_attribute_5	customer_attribute_1	x_pos
Type 6	283 G1	XE	110 Zeus	2016	USA	8 cy		
Type 6	417 A1	XE	122 Zeus	2018	USA	8 cy		
Type 6	178 A1	XE	99 Titan	2016	USA	8 cy		
Type 6	127 Z3	XE	122 Zeus	2016	USA	8 cy		
Type 6	246 D1	XE	110 Zeus	2018	USA	4 cy		
Type 6	283 E1	XE	110 Zeus	2016	USA	4 cy		
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Type 6	216 C1	XE	110 Zeus	2016	USA	4 cy		
Type 6	49 I1	XE	110 Zeus	2016	USA	4 cy		
Type 6	410 E1	XE	110 Zeus	2016	USA	4 cy		
Type 6	216 C1	XE	110 Zeus	2016	USA	4 cy		
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Type 6	312 G1	XE	110 Zeus	2016	USA	8 cy		
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Type 6	171 B1	XE	110 Zeus	2017	USA	8 cy		
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Type 6	79 I1	XE	110 Zeus	2015	CANADA	4 cy		
Type 6	140 G1	XE	110 Zeus	2016	USA	4 cy		
Type 6	140 G1	XE	110 Zeus	2016	USA	4 cy		
Type 6	274 F1	XE	110 Zeus	2016	USA	6 cy		
Type 6	106 D1	XE	110 Zeus	2018	CANADA	4 cy		
Type 6	82 E1	XE	110 Zeus	2016	CANADA	8 cy		
Type 6	91 G1	XE	110 Zeus	2015	CANADA	4 cy		
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Type 6	100 E1	XE	110 Zeus	2016	CANADA	4 cy		
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For UI only, there is SAS for Microsoft 365 in SAS Viya

SAS and Microsoft 365

More collaboration, more moving parts



Use case: Microsoft Power Automate flows

Example: employee onboarding email triggered by SAS-to-Excel

```
8  /* Pull employee/user profile data */
9  PROC SQL;
10 CREATE TABLE WORK.RecentEmps AS
11 SELECT datepart(intnx('dtweek',t2.regdate,0,'b')) as WeekOf format=date9.,
12        t1.worker_no as EmployeeId,
13        t2.login as Login,
14        t2.regdate AS RegistrationDate,
15        t1.email,
16        t1.division_nm as Division,
17        t1.work_location_nm as Location
18 FROM COMM.COMMUNITIES_EMPORG t1
19      INNER JOIN COMM.COMMUNITIES_ALLUSERSV2 t2 ON (t1.user_uid = t2.user_uid)
20        WHERE t2.regdate >= intnx('dtday',datetime(),-30)
21              ORDER BY t2.regdate DESC;
22 QUIT;
23
24 /* Create XLSX file */
25 %let outfile=%sysfunc(getoption(WORK))/employees-to-onboard.xlsx;
26
27 proc export data=recentemps
28   file="&outfile."
29   replace
30   dbms=XLSX;
31   sheet="Onboard";
32 run;
```

SharePoint

Search this library

Communities

Private group

New

Edit in grid view

Open

Share

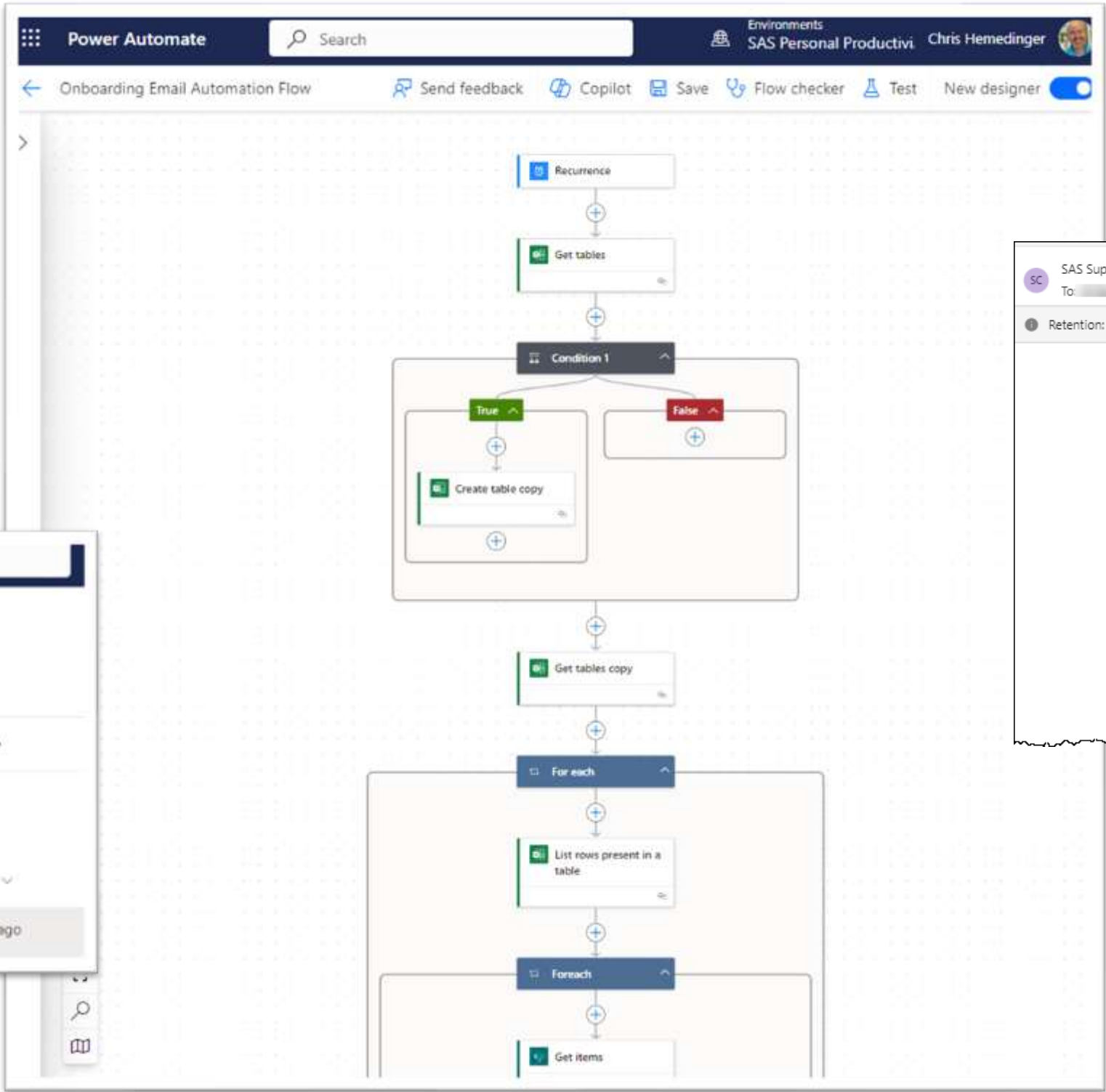
Documents > General > EmployeeOnboarding

Name

Modified

employees-to-onboard.xlsx

18 minutes ago



SAS Support Communities <communities@sas.com>

To: [redacted]

Retention: EX-3YR-DELETE (3 years) Expires: Thu 2027-07-22 1:00 PM

Hi [redacted] F, start reaping the benefits of membership!

You joined the [SAS Support Communities](#), so you're automatically a hero! Explore the ways participation will help you do your best work:

- Increase customer satisfaction as you introduce them to first-rate peer-to-peer support in our forums.
- Experience fewer distractions as users who'd ordinarily ping YOU with run-of-the-mill usage questions find your wisdom among a growing stash of helpful answers.
- Write one community post and Google searches will find it repeatedly.
- Write better code as you observe discussions between users and [product improvement](#) [Brainstorming](#) [Suggestions](#) [Feedback](#)



Use case: Report on collection of Excel files

Read folder of XLSX files from SharePoint; summarize in SAS

Name	Modified	Modified By
01.09.24 Diving Deeper How to Make VMware Perform With SAS.xlsx	January 18	Alice Yuan
01.18.24 How to Develop Better Forecasts With SAS Visual Forecasting.xlsx	January 23	Alice Yuan
01.23.24 AI-Driven SAS Transformation - Generating Insights for the Custo...	January 23	Alice Yuan
01.25.24 What's New How does SAS Viya Integrate with My Fav...	January 31	Alice Yuan
01.30.24 Hav...		
02.08.24 Disc...		
02.13.24 How...		
02.22.24 Divi...		
02.27.24 Tips...		
03.05.24 Con...		
03.15.24 Boo...		
03.21.24 How...		

```
/* Known SharePoint Library and Folder to pull from */
%let LIBRARYID = b!4iXFB...vxCi0KePhhnPKKAMeDjano1TZkroxIMENqF;
%let FOLDERID = 01J5TY55...XB;

%listFolderItems(driveId=&libraryId., folderId=&folderId., out=work.paths);

%let destinationPath = %sysfunc(getoption(WORK))/src;

data _toDownload;
  set paths(keep=name id);
  length libraryId $ 100 folderId $ 50 destinationPath $ 300;
  libraryId = "&libraryid.";
  folderId = "&folderid.";
  destinationPath = "&destinationPath.";
run;

/* Download ALL .xlsx files in the folder */
data _null_;
  set _toDownload;
  call execute(catt('%nrstr( %downloadFile(driveId=',libraryId,
    ', folderId=',folderId,
    ', sourceFilename=',%str(name),
    ', destinationPath=',destinationPath,');)'));
run;
```

	webinar	attended_count	minutes_avg	rating_avg	rating_count	recommend_avg	recommend_count
1	01.09.24 Diving Deeper How to Make VMware Perform With SAS.xlsx		39.53	4.14	28	4.86	28
2	01.18.24 How to Develop Better Forecasts With SAS Visual Forecasting.xlsx		52.50	3.73	22	4.41	22
3	02.08.24 Discover the Possibilities SAS Visual Studio Code Extension.xlsx		48.56	3.97	33	4.59	34
4	02.13.24 How Do I Use SAS Intelligent Decisioning to Its Full Potential.xlsx		44.39	3.92	12	4.36	11
5	02.22.24 Diving Deeper How Many Ways Can You Join SAS Tables.xlsx		52.35	3.92	63	4.56	63
6	02.27.24 Tips and Tricks- Improve Forecast Accuracy Using Interactive Model...		51.30	3.83	12	4.10	10
7	03.05.24 Coming Soon SAS Viya Workbench.xlsx		47.18	3.62	37	4.47	36
8	03.15.24 Boosting Retail CPG Profits Are Your Promotions Optimized.xlsx		25.92	4.25	4	4.75	4
9	03.26.24 Enhance Forecasting Accuracy with Time-Series Segmentation and ...		41.92	3.71	24	4.52	23
10	04.02.24 How Do I Clean My Data Using SAS Programming.xlsx		54.04	3.77	192	4.53	187
11	04.09.24 Why Do I Need SAS Intelligent Decisioning and SAS Model Manage...		47.25	3.55	20	4.26	19
12	04.25.24 From Zero to SAS Using SAS Studio to Summarize and Manipulate ...		47.55	3.82	50	4.53	51
	Deep Learning for Personalized Pricing and Reve...		49.88	3.90	10	4.56	9
	Line AI Project Workflows.xlsx		38.66	5.00	1	5.00	1
	S Optimization.xlsx		49.63	4.00	12	4.58	12
	o Create Reports Quickly in SAS Visual Analytics.xl...		42.90	4.00	15	4.13	15
	ata Matters Building Efficient Foundations.xlsx		46.03	3.67	46	4.51	43

PROC HTTP and the JSON Libname engine

Your keys to using the Microsoft APIs from within SAS

```
filename resp temp;
proc http
url="https://graph.microsoft.com/v1.0/me"
  oauth_bearer="&access_token"
  out=resp;
run;

libname me JSON fileref=resp;
proc print data=me.root;
run;
```

Obs	ordinal_root	_odata_context	displayName	givenName	jobTitle	mail	mobilePhone	officeLocation	p
1	1	https://graph.microsoft.com/v1.0/\$metadata#users/\$entity	Chris Hemedinger	Chris	Director, SAS User Engagement			U5132	

Learn the Microsoft Graph APIs

And use Microsoft Graph Explorer to test and build API calls

[Microsoft Graph API doc](#)

Version

Microsoft Graph REST API v1.0

Filter by title

API v1.0 reference

Overview

Users

Groups

Applications

Calendars

Change notifications

Compliance

Cross-device experiences

Customer booking

Device and app management

Education

Extensions

External data connections

Files

Identity and access

Mail

Notes

People and workplace intelligence

Download PDF

Microsoft Graph REST API v1.0 endpoint reference

Article • 05/15/2024 • 12 contributors

Feedback

In this article

Common use cases

Call the v1.0 endpoint

Microsoft Graph beta endpoint

What's new

Related content

Welcome to Microsoft Graph REST API reference for the v1.0 endpoint.

API sets on the v1.0 endpoint (https://graph.microsoft.com/v1.0) have reached general availability (GA), and have gone through a rigorous review-and-feedback process with customers to meet practical, production needs. Updates to APIs on this endpoint are additive in nature and don't break existing app scenarios.

Common use cases

The power of Microsoft Graph lies in easy navigation of entities and relationships across different services exposed on a single Microsoft Graph REST endpoint.

[Microsoft Graph Explorer](#)

Graph Explorer

Tenant SAS

GET v1.0 https://graph.microsoft.com/v1.0/me/drive/sharedWithMe Run query

No resource was found matching this query

Request body Request headers Modify permissions Access token

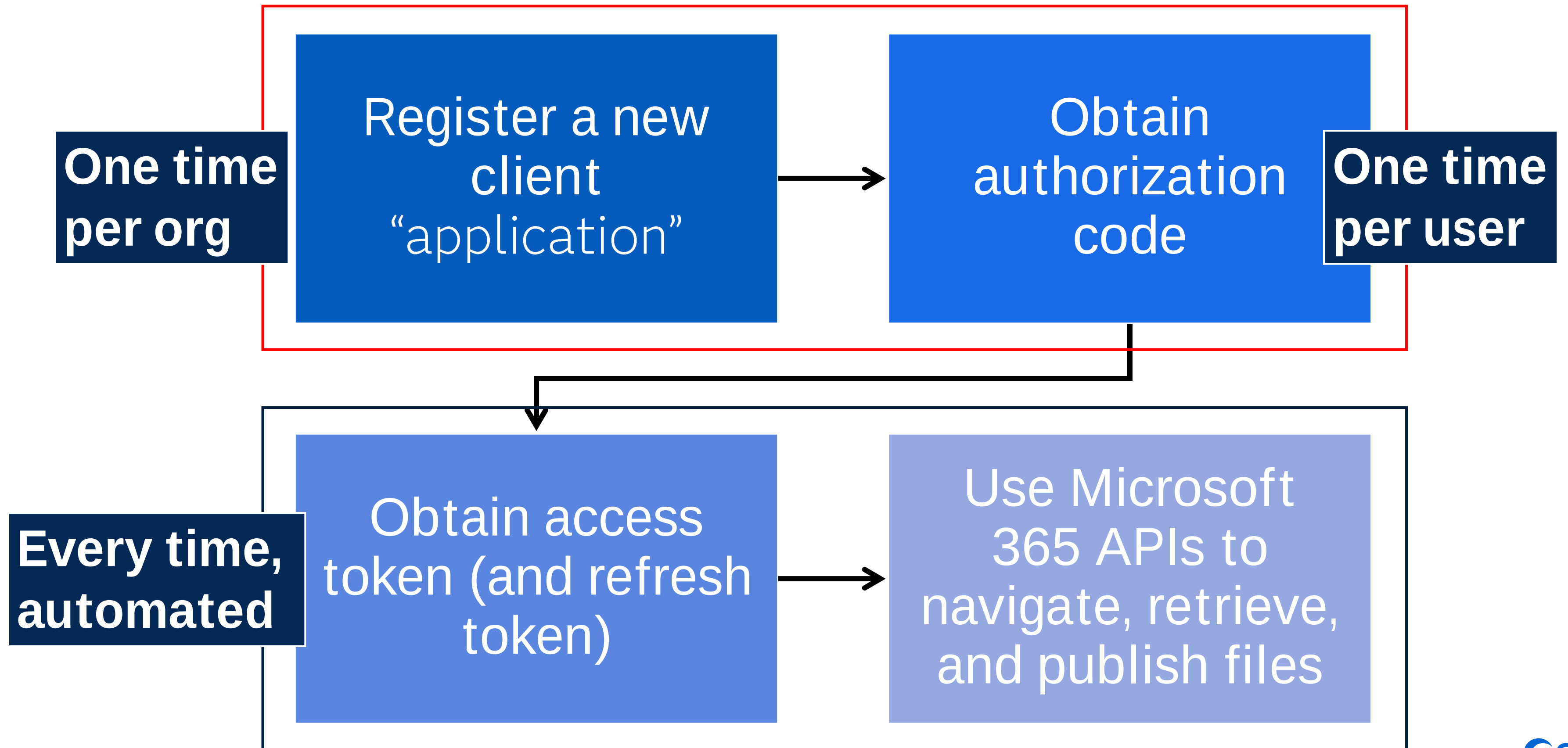
OK - 200 - 2360 ms

Response preview Response headers Code snippets Toolkit component

```
{
  "createdDateTime": "2022-11-21T17:40:51Z",
  "id": "01XNKR6V660SZMHWJXCBDYRL54SPTNMLKJ",
  "lastModifiedDateTime": "2024-07-30T16:52:21Z",
  "name": "UsingGitWithSAS_Dec2022.pptx",
  "webUrl": "https://sasoffice365-my.sharepoint.com/personal/...asp?...E6D62D49%7D&file=UsingGitWithSAS_Dec2022.pptx&emOpen=1",
  "size": 3378343,
  "lastModifiedBy": {
    "user": {
      "email": "Chris.Hemeding@sas.com",
      "id": "01XNKR6V660SZMHWJXCBDYRL54SPTNMLKJ",
      "displayName": "Chris Hemeding"
    }
  },
  "file": {
    "mimeType": "application/vnd.openxmlformats-officedocument.presentationml.presentation",
    "hashes": {}
  },
  "fileSystemInfo": {
    "createdDateTime": "2022-11-21T17:40:51Z",
    "lastModifiedDateTime": "2024-07-30T16:52:21Z"
  }
}
```



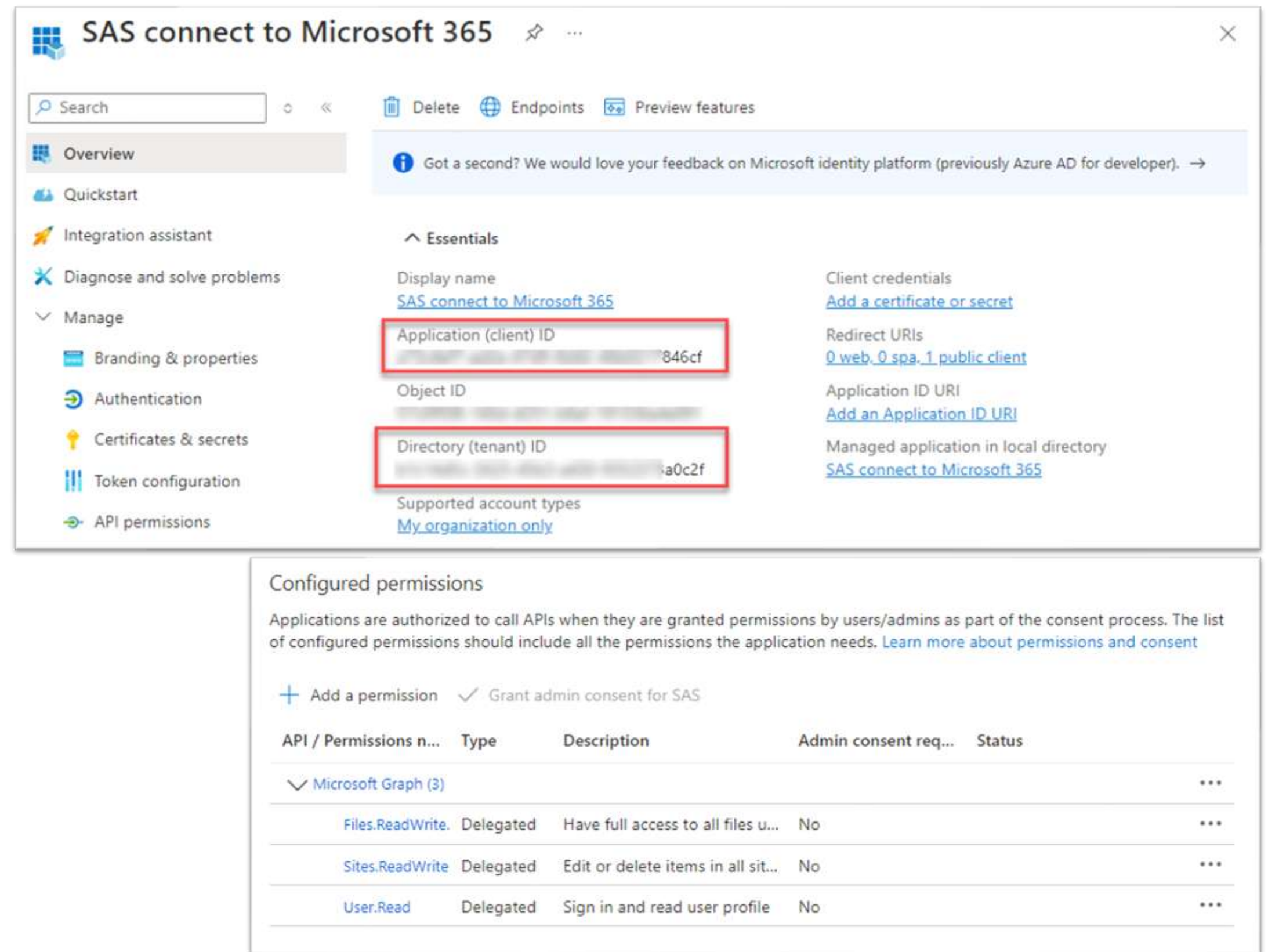
Connecting SAS to Microsoft 365



Register a client app

In portal.azure.com

- One registered app can serve all users in the org
- Consider permissions needed up front
- You may need help from your IT to get an app registered
- “client ID” and “tenant ID” will be needed for connection



SAS connect to Microsoft 365

Search [] Delete Endpoints Preview features

Overview Quickstart Integration assistant Diagnose and solve problems Manage Branding & properties Authentication Certificates & secrets Token configuration API permissions

Got a second? We would love your feedback on Microsoft identity platform (previously Azure AD for developer). →

Essentials

Display name: [SAS connect to Microsoft 365](#)

Application (client) ID: **846cf**

Object ID: []

Directory (tenant) ID: **a0c2f**

Supported account types: [My organization only](#)

Client credentials: [Add a certificate or secret](#)

Redirect URIs: [0 web, 0 spa, 1 public client](#)

Application ID URI: [Add an Application ID URI](#)

Managed application in local directory: [SAS connect to Microsoft 365](#)

Configured permissions

Applications are authorized to call APIs when they are granted permissions by users/admins as part of the consent process. The list of configured permissions should include all the permissions the application needs. [Learn more about permissions and consent](#)

+ Add a permission ✓ Grant admin consent for SAS

API / Permissions n...	Type	Description	Admin consent req...	Status
▼ Microsoft Graph (3)				
Files.ReadWrite	Delegated	Have full access to all files u...	No	...
Sites.ReadWrite	Delegated	Edit or delete items in all sit...	No	...
User.Read	Delegated	Sign in and read user profile	No	...

Obtain an authorization code

```
{
  "tenant_id": "7ee95434-72a2-4469-891e-aa584912124e",
  "client_id": "c777c2bc-5d9b-4955-806d-a9d26755c65e",
  "redirect_uri": "https://login.microsoftonline.com/common/oauth2/nativeclient",
  "resource" : "https://graph.microsoft.com"
}
```

```
%let codepath = C:\Projects\GitHub\sas-microsoft-graph-api;
%include "&codepath./ms-graph-macros.sas";
```

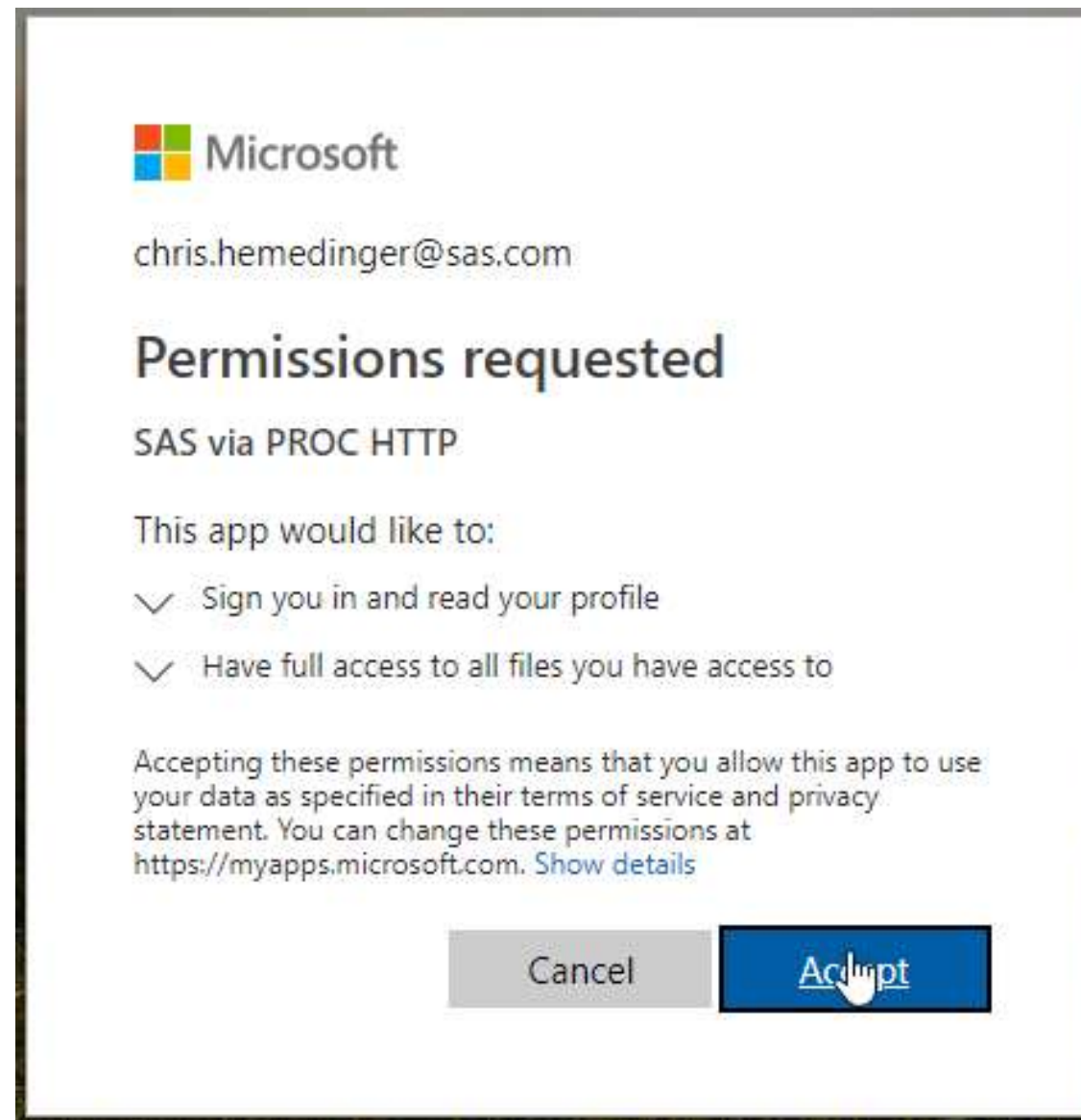
```
%let cfg = u:\Projects\ms365;
%initConfig(configPath=&cfg);
```

```
%generateAuthUrl();
```

```
642      %generateAuthUrl();
Paste this URL into your web browser:
-- START -----
https://login.microsoft.com/b1c14d5c-3625-45b3-a430-9552373a0c2f/oauth2/authorize?client
om
---END -----
```

Permissions, then copy auth code

Grant permissions



Consult with IT for permissions

Need admin approval

Sign in with your account

Sign in with your account needs permission to access resources in your organization that only an admin can grant. Please ask an admin to grant permission to this app before you can use it.

[Have an admin account? Sign in with that account](#)

[Return to the application without granting consent](#)



Obtain an auth code (generate token.json)

```
/* Note: this code can be quite long -- 700+ characters. */
%let auth_code=PASTE-YOUR-AUTH-CODE-HERE;

/*
    Now that we have an authorization code we can get the access token
    This step will write the token.json file that we can use in our
    production programs.
*/
%get_access_token(&auth_code.);
```

ALTERNATIVE: A PowerShell script to help

sas-microsoft-graph-api / examples / ms-graph-api-test.ps1

Code

Blame

107 lines (87 loc) · 3.77 KB



```
1  # Use this script to
2  # It's useful to test
3  # The script will generate
4  # It requires a config file
5  # {
6  #   "tenant_id": "your-tenant-id"
7  #   "client_id": "your-client-id"
8  #   "redirect_uri": "http://localhost:8080"
9  #   "resource": "https://graph.microsoft.com/.default"
10 # }
11
12 # Usage:
13 # 1. Create a config file
14 # 2. Run this script
15 # 3. Follow the prompts
16
```

Example usage:

```
./ms-graph-api-test.ps1 -ConfigPath c:\Projects\MS365\config.json
```



where `config.json` is an existing file that is formatted exactly as described earlier in this documentation, with your tenant ID, application (client) ID, etc.

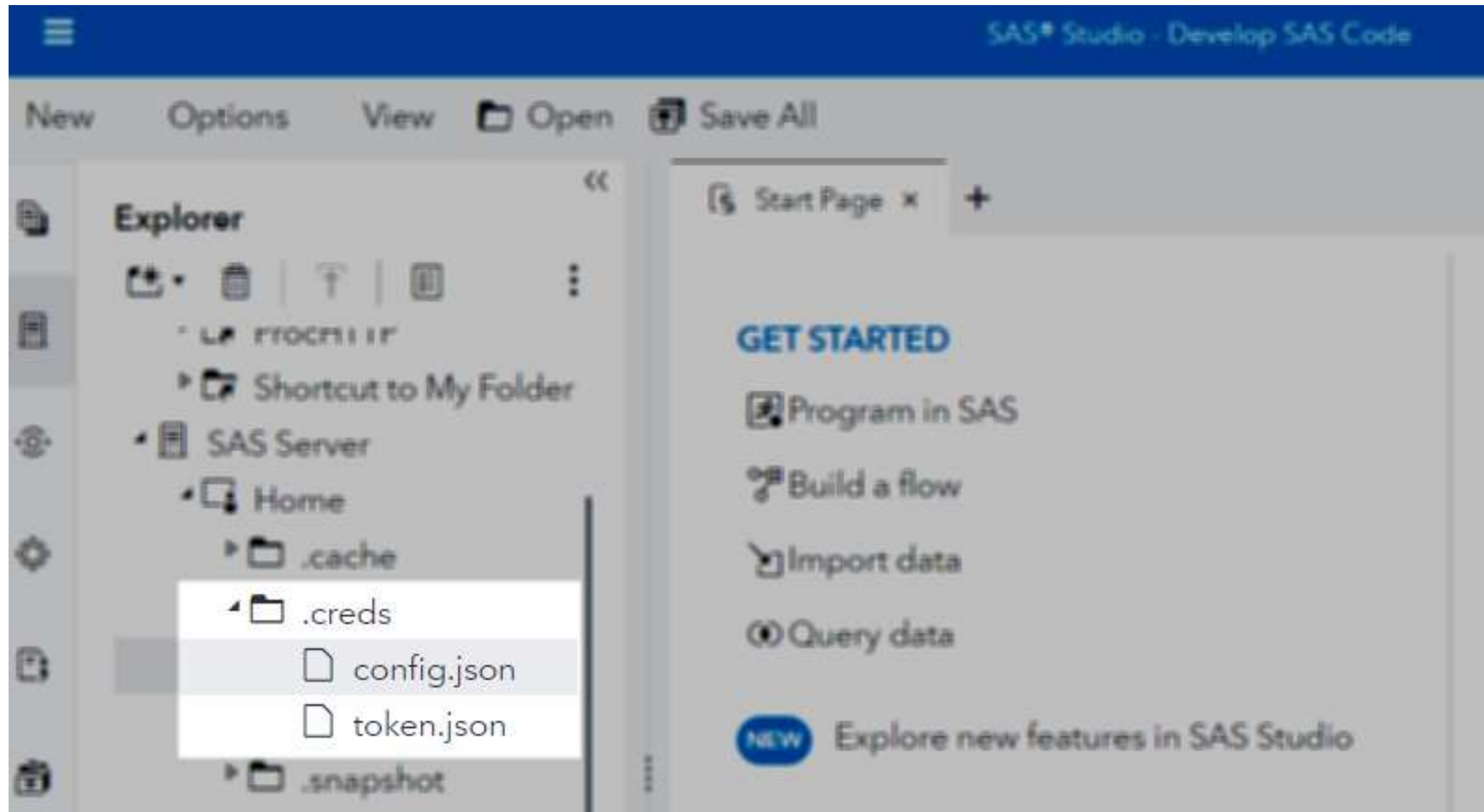
The script will launch a browser session to authenticate to your Microsoft 365 environment and generate an access code. It may display a consent prompt to access your app. When complete, copy the *complete* resulting URL from the browser address window and paste into the PowerShell command console as prompted.

If the test is successful, you will see two results:

- The output of the /me API call will be displayed in your PowerShell command console, verifying that you can successfully call the Microsoft Graph API.
- A new `token.json` file will be created in the same path as your `config.json` file. You can actually use this token file as-is, and copy it to your SAS environment in the same secure location as `config.json`. When you use the macros to `%initSessionMS365;`, the process will read the refresh token and use it to get an active access token.

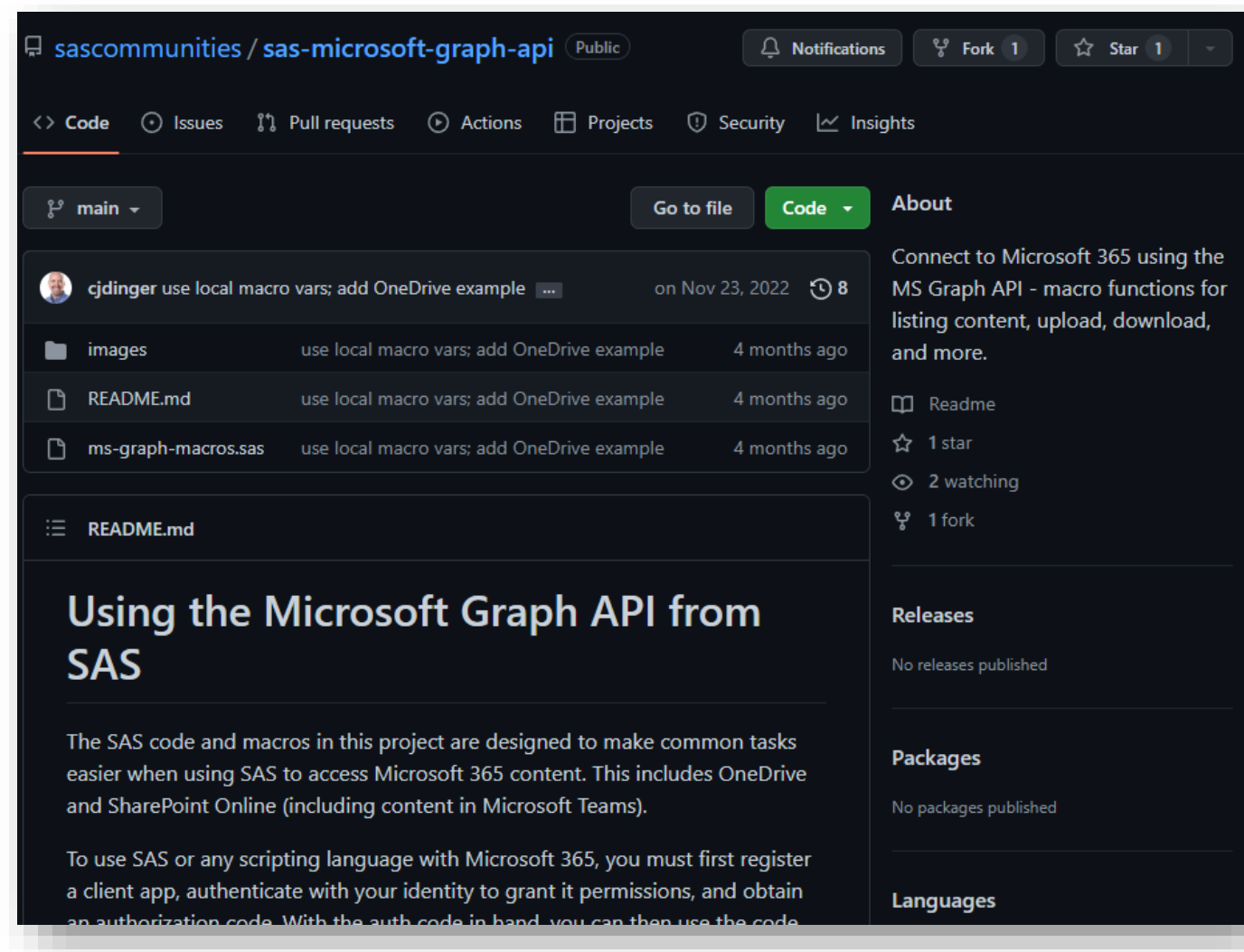
If things don't work and you see errors, you'll have some troubleshooting steps to follow.

Managing your credentials



SAS macros to help

Find them at <https://github.com/sascommunities/sas-microsoft-graph-api>



- Help with auth code
- Obtain access token to connect
- List OneDrive root, folders, files
- List SharePoint site folders, files
- Download files
- Upload files (including large files)
- PowerShell for auth/testing



Demo

Use helper macros for common tasks

All within [ms-graph-macros.sas](#)

Initialize connection/token	%initializeSessionM365
List OneDrive contents	%listMyDrives %listFolderItems
List SharePoint folders	%listSiteLibraries %listFolderItems
Upload a file from SAS to SharePoint	%uploadFile
Download a file from SharePoint to SAS	%downloadFile

Initialize session with Microsoft 365

```
/* initiate an API session, getting a new access token for use with */  
/* the MS Graph API. */  
%initSessionMS365;
```

M365: Refreshing access token for M365

NOTE: 200 OK

NOTE: PROCEDURE HTTP used (Total process time):

real time 0.90 seconds

cpu time 0.00 seconds

M365: Reading token info from C:\Projects\ms-graph-examples\token.json

NOTE: Libref OAUTH was successfully assigned as follows:

Engine: JSON

Physical Name: C:\Projects\ms-graph-examples\token.json

M365: Token expires on 01APR2024:14:47:27

List SharePoint libraries for a site/team

```
%let siteHost = mytenant.sharepoint.com;
%let sitePath = /sites/Communities;

%ListSiteLibraries(siteHost=&siteHost.,sitepath=&sitePath.,out=libs);
proc sql noprint;
  select id into: libraryId from libs where name="Documents";
quit;

%ListFolderItems(driveId=&libraryId., folderId=root, out=work.paths);
```

	 name	 size	 webUrl
1	Blogs	3973360	https://sasoffice365.sharepoint.com/sites/Communities/Shared%20Documents/...
2	General	33433192...	https://sasoffice365.sharepoint.com/sites/Communities/Shared%20Documents/...
3	Responsive	806449	https://sasoffice365.sharepoint.com/sites/Communities/Shared%20Documents/...
4	SAS Explore 2023	0	https://sasoffice365.sharepoint.com/sites/Communities/Shared%20Documents/...
5	Spam	8844486	https://sasoffice365.sharepoint.com/sites/Communities/Shared%20Documents/...
6	Experience 2030.pdf	1714735	https://sasoffice365.sharepoint.com/sites/Communities/Shared%20Documents/...
7	header.png	187750	https://sasoffice365.sharepoint.com/sites/Communities/Shared%20Documents/...
8	How to Use Influencers Within Communities to Increase Data and Analytics Ad...	161462	https://sasoffice365.sharepoint.com/sites/Communities/Shared%20Documents/...

Download a document from SharePoint

```
%downloadFile(driveId=&driveId.,  
  folderId=&folder.,  
  sourceFilename=ScoreCard2022.xlsx,  
  destinationPath=c:\temp);  
  
/* Downloaded an Excel file into SAS? Now we can PROC IMPORT if we want */  
proc import file="c:\temp\ScoreCard2022.xlsx"  
  out=xldata  
  dbms=xlsx replace;  
run;
```

NOTE: Download file HTTP result - 200 OK

NOTE: File downloaded to c:\temp\ScoreCard2022.xlsx, 18860 bytes

NOTE: The import data set has 11 observations and 18 variables.

Upload a file to a SharePoint folder

```
%uploadFile(driveId=&driveId., folderId=&folder.,  
sourcePath=C:/Users/Downloads,  
sourcefilename=pi-sculpture.mp4);
```

NOTE: Uploading C:/Users/Downloads/pi-sculpture.mp4, file size of 95137282 bytes.

NOTE: Splitting C:/Users/Downloads/pi-sculpture.mp4 into 73 parts

```
1  + %uploadFileChunk(uploadURL =  
%superq(uploadURL),chunkFile=../Prc2/chunk_0001.dat,byteRange=bytes 0-1310719/95137282);  
...  
73 + %uploadFileChunk(uploadURL =  
%superq(uploadURL),chunkFile=../Prc2/chunk_0001.dat,byteRange=bytes 94371840-95137281/95137282);
```

NOTE: Upload segment bytes 94371840-95137281/95137282, HTTP result - 201 Created

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Using SAS with Microsoft 365 (OneDrive, Teams, and SharePoint)

112

By [Chris Hemedinger](#) on [The SAS Dummy](#) | July 9, 2020

Topics | [Programming Tips](#)

If your work environment is like ours here at SAS, you're seeing more of your data and applications move to the cloud. It's not yet a complete replacement for having local files on your desktop machine, but with cloud storage and apps -- like Microsoft OneDrive -- I can now access my work documents from any browser and any device, including my smartphone. I can update now my spreadsheets while waiting in the dentist office. Oh joy.

For those of us who use SAS to read and create Microsoft Excel documents, cloud-based files can add an extra wrinkle when we automate the process. It also adds some exciting possibilities! The Microsoft 365 suite offers APIs to discover, fetch, and update our documents using code. In this article, I'll show you how to use SAS programs to reach into your Microsoft OneDrive (or SharePoint Online) cloud to read and update your files. **Note:** All of this assumes that you already have a Microsoft 365 account -- perhaps provisioned by your IT support team -- and that you're using it to manage your documents.

Using SAS® With Microsoft 365: A Programming Approach - Q&A, Slides, and On-Demand Recording

Started: Jul-29-2021 | Modified: Apr-10-2023 | Views: 4,090

 [SAS_Microsoft365_AtE_Mar2023.pdf](#) 

Join SAS expert Chris Hemedinger as he shows you how to use SAS programs to reach into your Microsoft OneDrive and SharePoint cloud to read and update your files using the REST APIs in Microsoft Office 365 and the HTTP procedure in SAS.

[Watch the webinar](#)



You will learn:

- How to register a new application in your Microsoft Office 365 account.
- Authentication and access using OAuth2.
- How to use SAS to explore your document folders in OneDrive and SharePoint and import into SAS data sets.
- How to use SAS to create new documents in OneDrive and SharePoint.
- How to send rich messages to your teammates in Microsoft Teams.

Additional resources

- [Using SAS with Microsoft 365 -- SharePoint, OneDrive, Microsoft Teams](#) (blog)
- [How to publish to a Microsoft Teams channel using SAS](#) (blog)
- [GitHub project with helper macros for connecting, listing content, and download/upload files](#) (code)
- [GitHub folder with Microsoft 365/OneDrive macros](#) (code)

Q & A

