

Using SAS with Microsoft 365

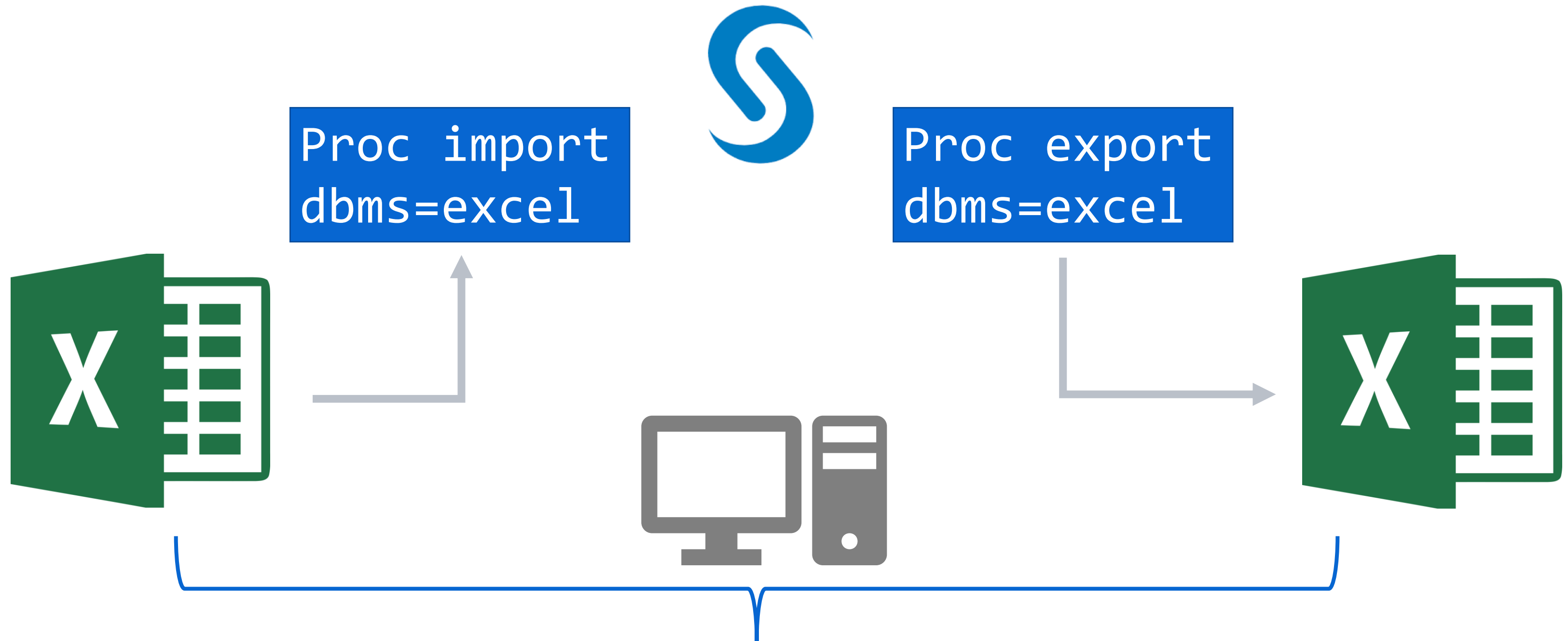
A Programming Approach

Chris Hemedinger, Director of SAS User Engagement



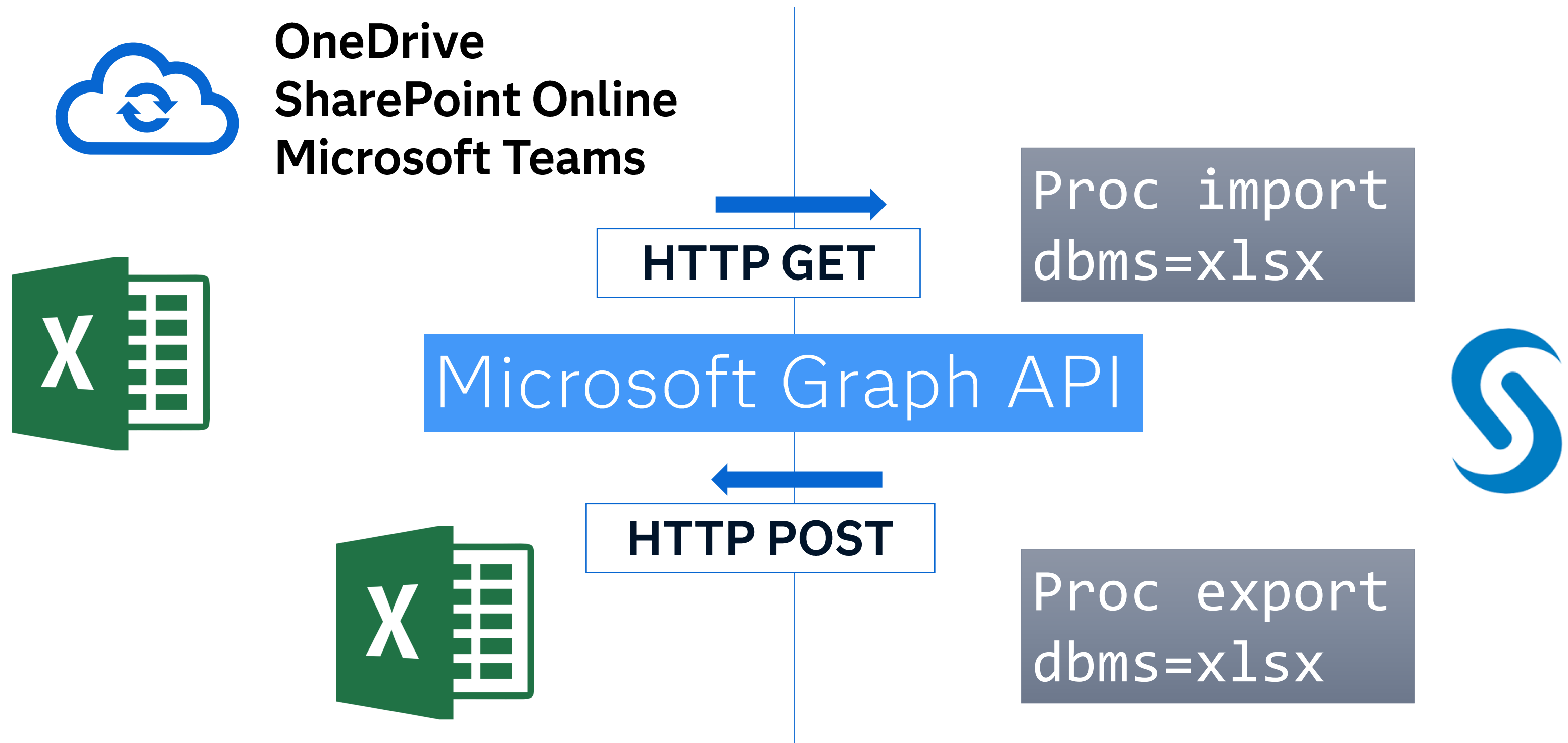
SAS and Microsoft Office

Simpler times, pre-Cloud



SAS and Microsoft 365

More collaboration, more moving parts



More than Excel: Microsoft Graph APIs

Use the documentation and the Microsoft Graph Explorer tool

The image shows two overlapping browser windows. The background window is the Microsoft Graph documentation page for 'List children of a drive'. The foreground window is the Microsoft Graph Explorer tool, which is running a GET request to the endpoint `https://graph.microsoft.com/v1.0/me/drive/root/children`. The response preview shows a JSON array of drive items, including an 'AppData' folder.

Microsoft Graph REST API v1.0

Filter by title

- Overview of Microsoft Graph
- Authentication and authorization
- Use the API
- Migrate
- Use SDKs
- Use the toolkit
- Resources
- API v1.0 reference
 - Overview
 - Users
 - Groups
 - Applications
 - Calendars
 - Change notifications
 - Compliance
 - Cross-device experiences

List children of a drive

Article • 08/04/2022 • 3 minutes to read • 13 contributors

Namespace: microsoft.graph

Return a collection of `DriveItems` in the `children` relationship of a `Drive`.

`DriveItems` with a non-null `folder` or `package` facet can be used to filter the results.

Permissions

One of the following permissions is required to call this endpoint. For more information, see [Permissions](#).

Permission type	Permissions (from least to most restrictive)
Delegated (work or school account)	Files.Read, Files.ReadWrite, Files.ReadWrite.All, Sites.Read.All, Sites.ReadWrite.All
Delegated (personal Microsoft account)	Files.Read, Files.ReadWrite, Files.ReadWrite.All
Application	Files.Read.All, Files.ReadWrite.All

Graph Explorer

GET v1.0 https://graph.microsoft.com/v1.0/me/drive/root/children

Request body Request headers Modify permissions Access token

OK - 200 - 742ms

Response preview

```
{
  "@odata.context": "https://graph.microsoft.com/v1.0/$metadata#users('3c83f2ce-bd68-4368-a9f1-bf8dfe0c722c')/drive/root/children",
  "value": [
    {
      "createdDateTime": "2022-02-22T20:24:13Z",
      "eTag": "\"{A9AB498A-FF12-4035-9334-EB7658EB0E27},2\"",
      "id": "01XNKR6V4KJGV2SEX7GVAJGNHLOZN6WDRH",
      "lastModifiedDateTime": "2022-02-22T20:23:58Z",
      "name": "AppData",
      "webUrl": "https://sasoffice365-my.sharepoint.com/personal/chris_hemedinger_sas_com/Documents/AppData",
      "cTag": "\"{A9AB498A-FF12-4035-9334-EB7658EB0E27},0\"",
      "size": 0,
      "createdBy": {
        "user": {
          "email": "Chris.Hemedinger@sas.com",
          "id": "3c83f2ce-bd68-4368-a9f1-bf8dfe0c722c",
          "displayName": "Chris Hemedinger"
        }
      },
      "lastModifiedBy": {
```



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	

Connecting SAS to Microsoft 365

One time

Register a new client
“application”



Obtain
authorization
code

**Each time,
automated**

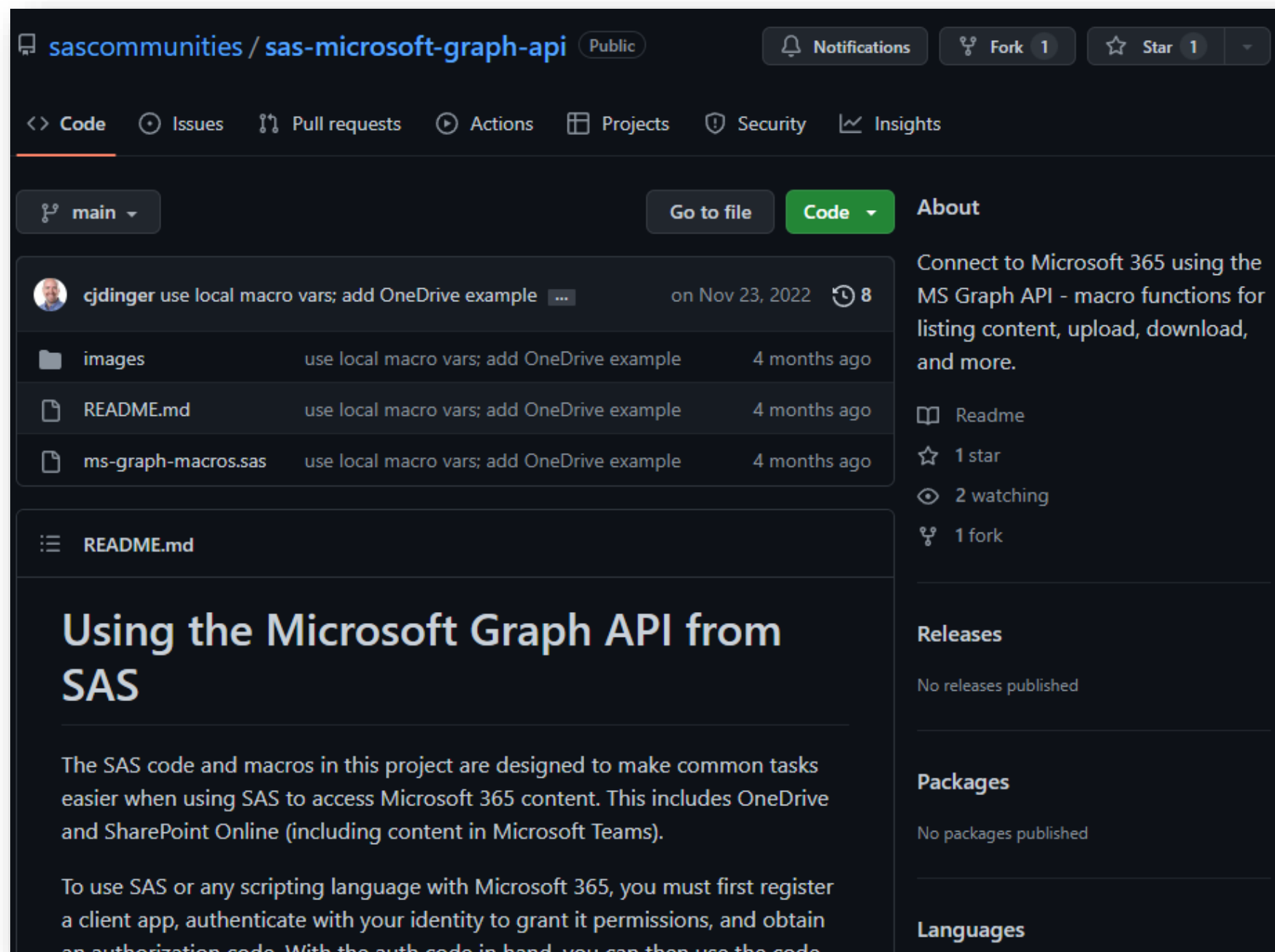
Obtain access
token (and refresh
token)



Use Microsoft
365 APIs to
navigate, retrieve,
and publish files

SAS macros to help

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



The screenshot shows the GitHub repository page for 'sascommunities / sas-microsoft-graph-api'. The repository is public and has 1 fork and 1 star. The main branch is 'main'. The repository description is 'Connect to Microsoft 365 using the MS Graph API - macro functions for listing content, upload, download, and more.' The repository contains a folder 'images' and files 'README.md' and 'ms-graph-macros.sas', all updated 4 months ago. The README.md file is open, showing the title 'Using the Microsoft Graph API from SAS' and the following text: 'The SAS code and macros in this project are designed to make common tasks easier when using SAS to access Microsoft 365 content. This includes OneDrive and SharePoint Online (including content in Microsoft Teams). To use SAS or any scripting language with Microsoft 365, you must first register a client app, authenticate with your identity to grant it permissions, and obtain an authorization code. With the auth code in hand, you can then use the code'.

- 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)

1. Register a client app

portal.azure.com/#home

Microsoft Azure Search resources, services, and docs (G+)

Azure services

- Create a resource
- App registrations**
- Azure Active Directory
- Virtual machines
- App Services
- Quickstart Center
- Storage accounts
- SQL databases
- Azure Cosmos DB

More services

Resources

Recent Favorite

Name	Type	Last Viewed
mrg-sas-communities	Resource group	5 months ago

See all

Navigate

- Subscriptions
- Resource groups
- All resources
- Dashboard

1. Register a client app (New reg)

Microsoft Azure Search resources, services, and docs (G+/)

Home > App registrations

+ New registration Endpoints Troubleshooting Refresh Download Preview features Got feedback?

Starting June 30th, 2020 we will no longer add any new features to Azure Active Directory Authentication Library (ADAL) and Azure AD Graph. We will continue to provide technical support and security updates but we will no longer provide feature updates. Applications will need to be upgraded to Microsoft Authentication Library (MSAL) and Microsoft Graph. [Learn more](#)

All applications Owned applications Deleted applications

Start typing a display name or application (client) ID to filter these r... Add filters

2 applications found

Display name	Application (client) ID	Created on	Certificates & secrets
sc SAS connect to Microsoft 365	a73c4ef7-ad2e-47d9-8d42-46b0217846cf	7/8/2020	-
sv SAS via PROC HTTP	273f8d63-a2ea-4dab-8370-784737105475	11/7/2018	-

1. Register a client app (Name and account type)

Microsoft Azure Search resources, services, and docs (G+)

Home > App registrations >

Register an application

* Name

The user-facing display name for this application (this can be changed later).

SAS connect to Microsoft 365 ✓

Supported account types

Who can use this application or access this API?

- Accounts in this organizational directory only (SAS only - Single tenant)
- Accounts in any organizational directory (Any Azure AD directory - Multitenant)
- Accounts in any organizational directory (Any Azure AD directory - Multitenant) and personal Microsoft accounts (e.g. Skype, Xbox)
- Personal Microsoft accounts only

[Help me choose...](#)

Redirect URI (optional)

We'll return the authentication response to this URI after successfully authenticating the user. Providing this now is optional and it can be changed later, but a value is required for most authentication scenarios.

[By proceeding, you agree to the Microsoft Platform Policies](#)

Register

1. Register a client app (Properties)


The screenshot shows the Microsoft Azure portal interface. At the top, there is a navigation bar with the Microsoft Azure logo and a search bar. Below the navigation bar, the breadcrumb path is 'Home > App registrations > SAS connect to Microsoft 365'. The main content area is divided into a left-hand navigation pane and a main content area. The left-hand navigation pane has several sections: 'Overview', 'Quickstart', 'Integration assistant', 'Manage', and 'Support + Troubleshooting'. Under the 'Manage' section, 'Authentication' and 'API permissions' are highlighted with red boxes. The main content area shows the 'Essentials' section for the application 'SAS connect to Microsoft 365'. It lists various properties and their values, such as 'Display name', 'Application (client) ID', 'Object ID', 'Directory (tenant) ID', 'Supported account types', 'Client credentials', 'Redirect URIs', 'Application ID URI', and 'Managed application in local directory'. At the bottom of the main content area, there is a section titled 'Build your application with the Microsoft identity platform' with a sub-header 'Get Started' and a link to 'Documentation'.

1. Register a client app (redirect URI)

Platform configurations




Depending on the platform or device this application is targeting, additional configuration may be required such as redirect URIs, specific authentication settings, or fields specific to the platform.

+ Add a platform

^ Mobile and desktop applications Quickstart Docs 

Redirect URIs

The URIs we will accept as destinations when returning authentication responses (tokens) after successfully authenticating users. The redirect URI you send in the request to the login server should match one listed here. Also referred to as reply URLs. [Learn more about Redirect URIs and their restrictions](#)

- <https://login.microsoftonline.com/common/oauth2/nativeclient> 
- https://login.live.com/oauth20_desktop.srf (LiveSDK) 
- <msala73c4ef7-ad2e-47d9-8d42-46b0217846cf://auth> (MSAL only) 

[Add URI](#)

1. Register a client app (Permissions)

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 name	Type	Description	Admin consent req...	Status
Microsoft Graph (3)				...
Files.ReadWrite.All	Delegated	Have full access to all files user can access	No	...
Sites.ReadWrite.All	Delegated	Edit or delete items in all site collections	No	...
User.Read	Delegated	Sign in and read user profile	No	...

To view and manage consented permissions for individual apps, as well as your tenant's consent settings, try [Enterprise applications](#).

NOTE: Your organization might require Admin consent to register an app and its permissions!

Store your App ID, Tenant ID in a config file

The screenshot shows the Azure portal interface for an application named "SAS connect to Microsoft 365". The left sidebar contains navigation options: Overview, Quickstart, Integration assistant, Manage (with sub-items: Branding & properties, Authentication, Certificates & secrets, Token configuration, API permissions, Expose an API), Delete, Endpoints, and Preview features. The main content area displays the application's configuration under the "Essentials" section. Key fields include: Display name (SAS connect to Microsoft 365), Application (client) ID, Object ID, Directory (tenant) ID, and Supported account types (My organization only). On the right, there are links for Client credentials (Add a certificate or secret), Redirect URIs (0 web, 0 spa, 1 public client), Application ID URI (Add an Application ID URI), and Managed application in local directory (SAS connect to Microsoft 365).

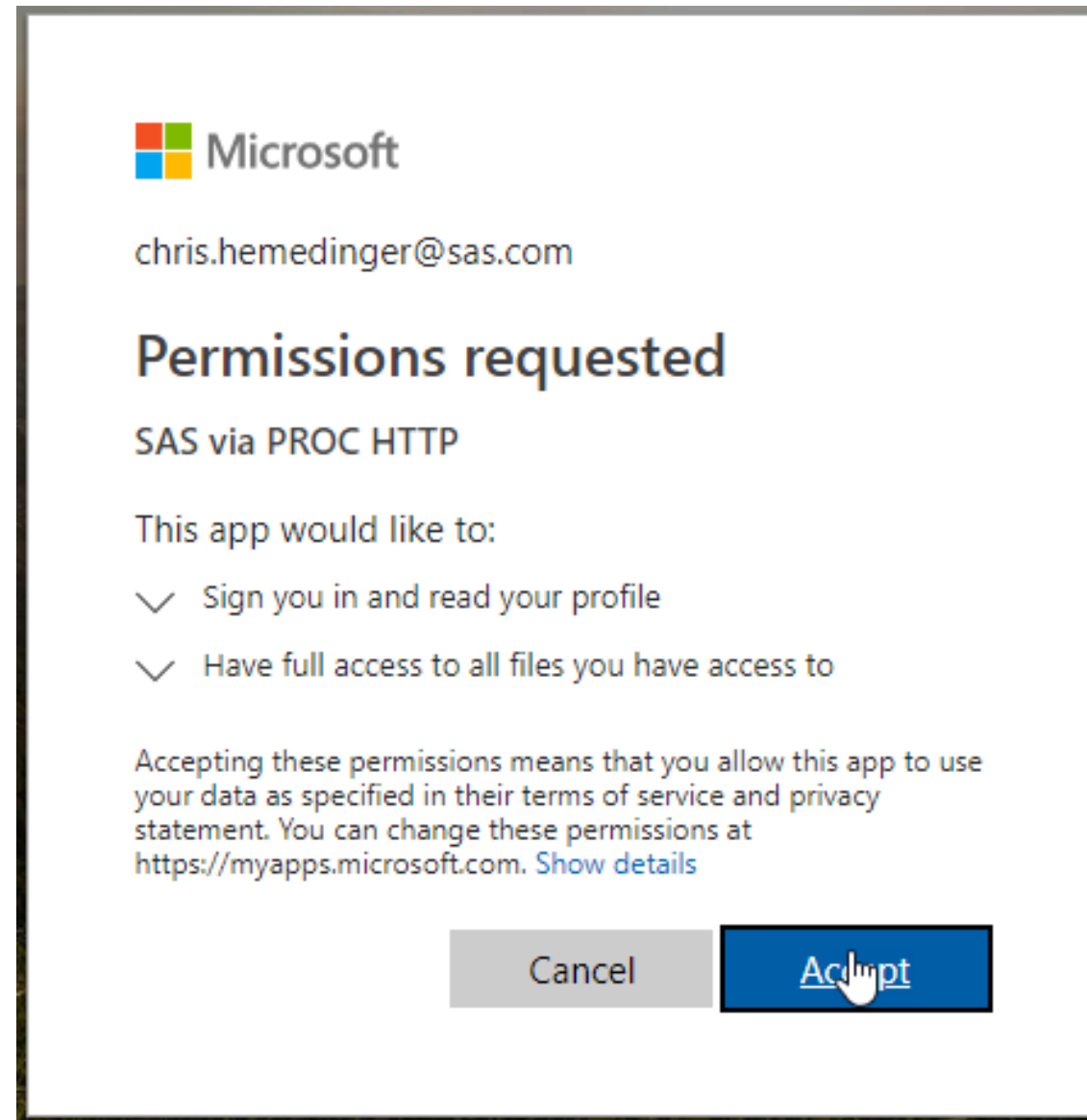
```
{  
  "tenant_id": "7ee95434-72a2-4469-891e-aa584912124e",  
  "client_id": "c777c2bc-5d9b-4955-806d-a9d26755c65e",  
  "redirect_uri": "https://login.microsoftonline.com/common/oauth2/nativeclient",  
  "resource" : "https://graph.microsoft.com"  
}
```

2. Obtain an auth code (auth URL)

```
%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?clientom  
om  
--- END -----
```


2. Obtain an auth code (grant permission, copy code)



Microsoft
chris.hemedinger@sas.com

Permissions requested

SAS via PROC HTTP

This app would like to:

- ✓ Sign you in and read your profile
- ✓ Have full access to all files you have access to

Accepting these permissions means that you allow this app to use your data as specified in their terms of service and privacy statement. You can change these permissions at <https://myapps.microsoft.com>. [Show details](#)

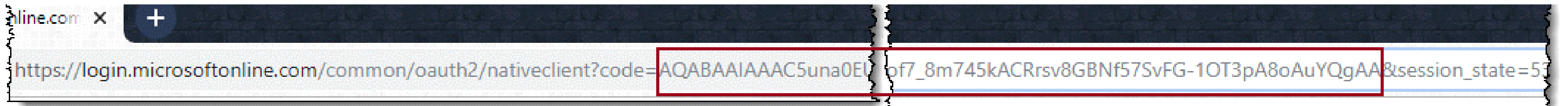
Cancel **Accept**

Need admin approval

[Redacted] 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](#)

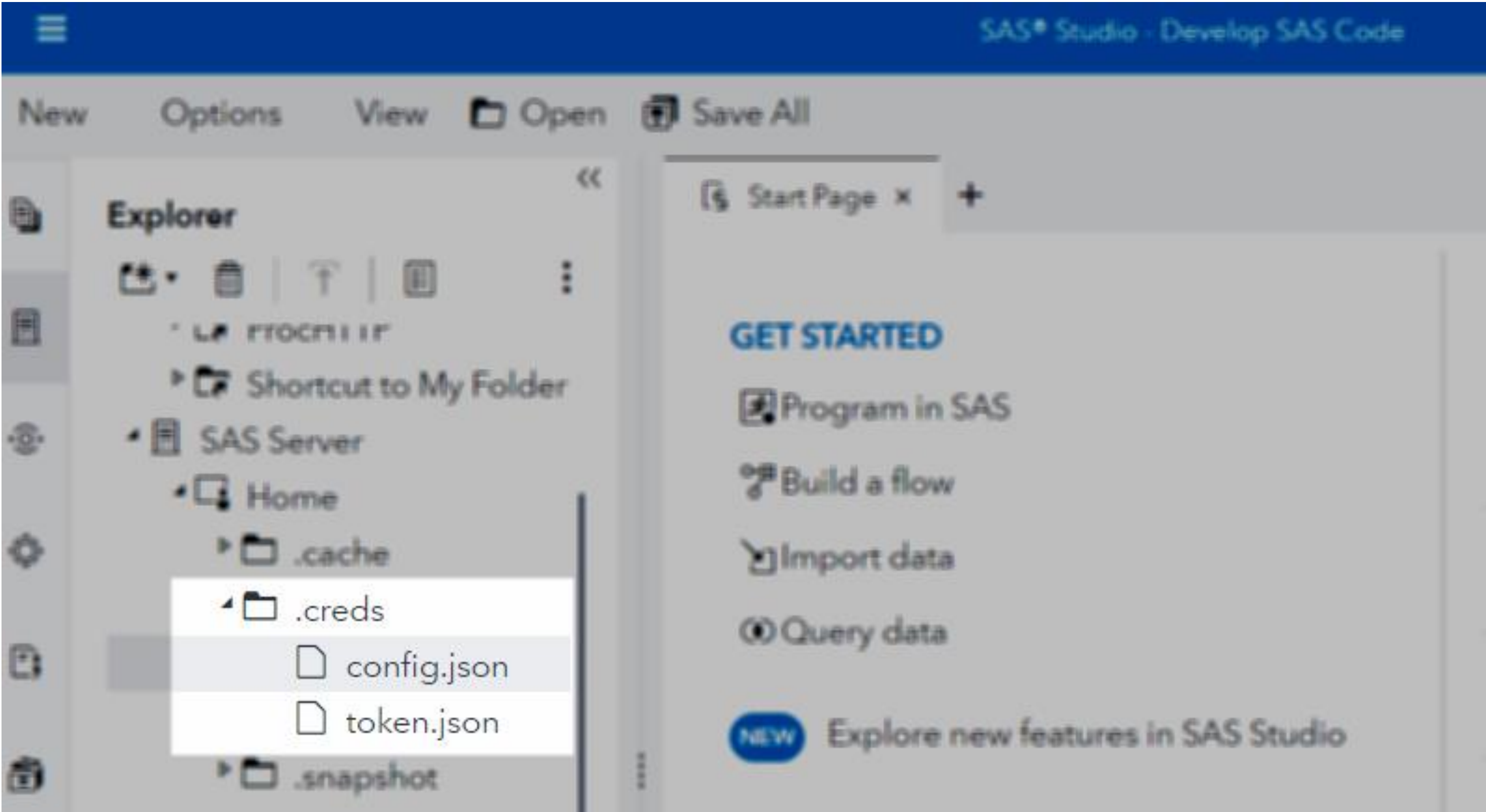


2. Obtain an auth code (generate token.json)

```
/* 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.);
```

Managing your credentials



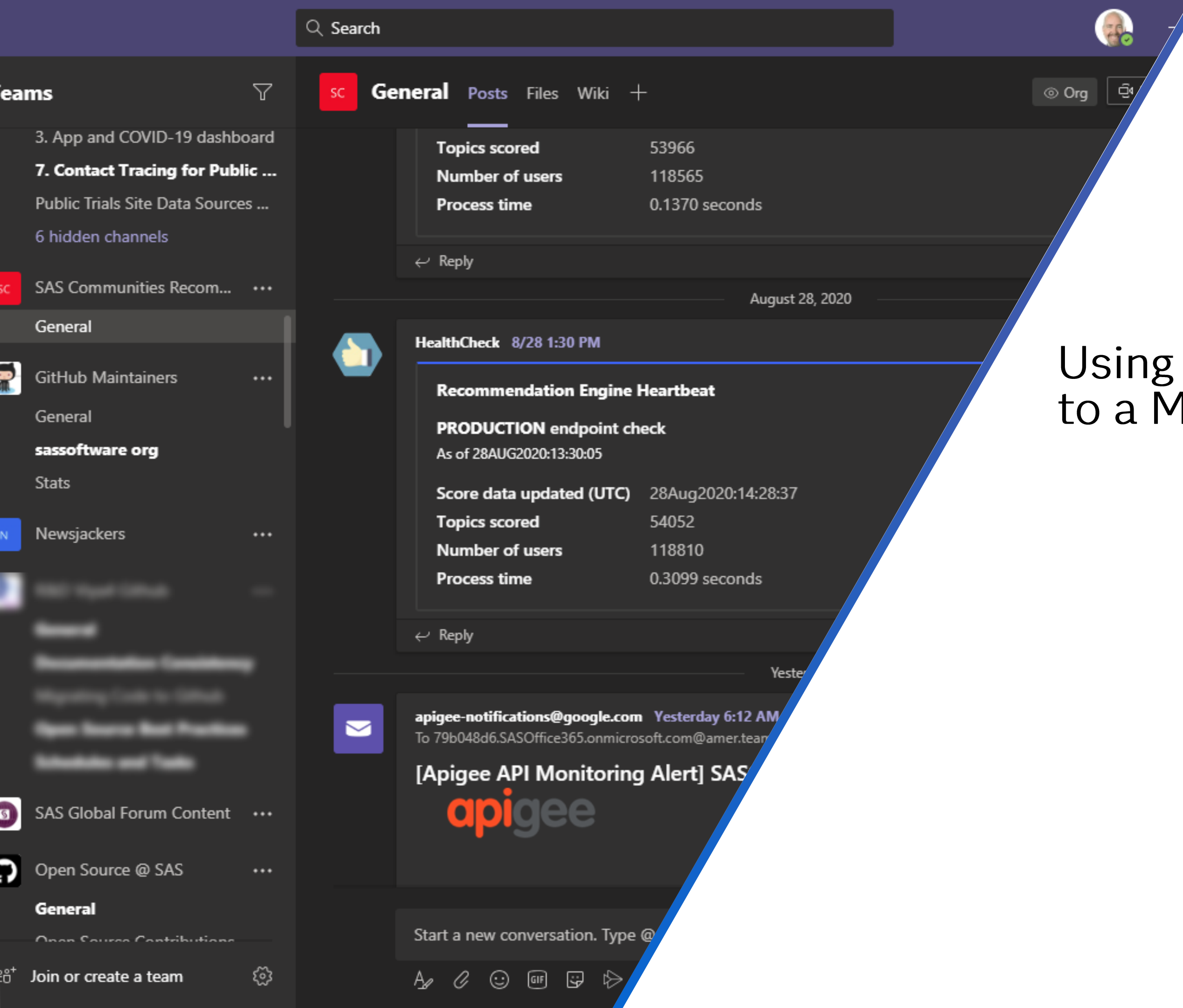
Use helper macros for common tasks

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

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

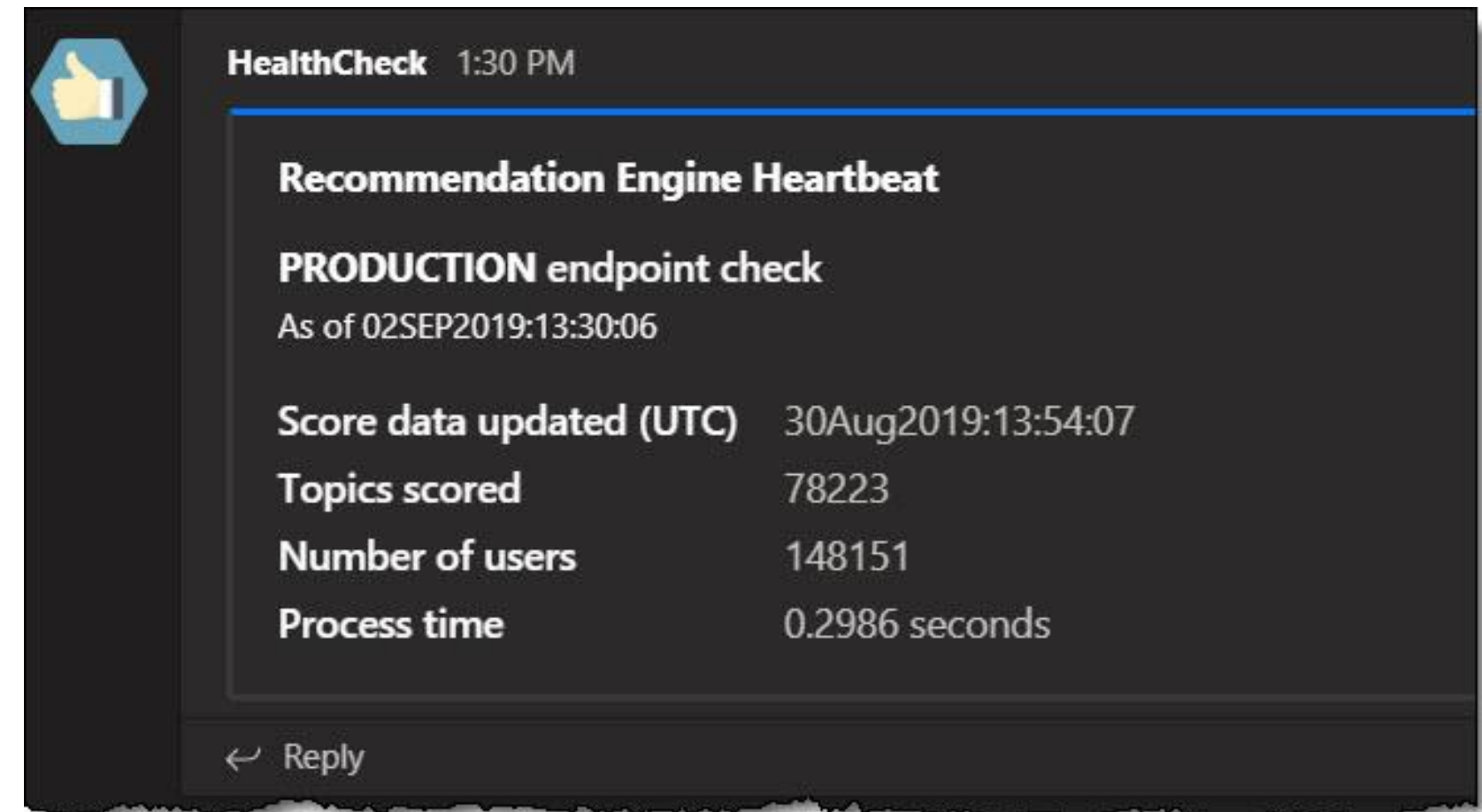
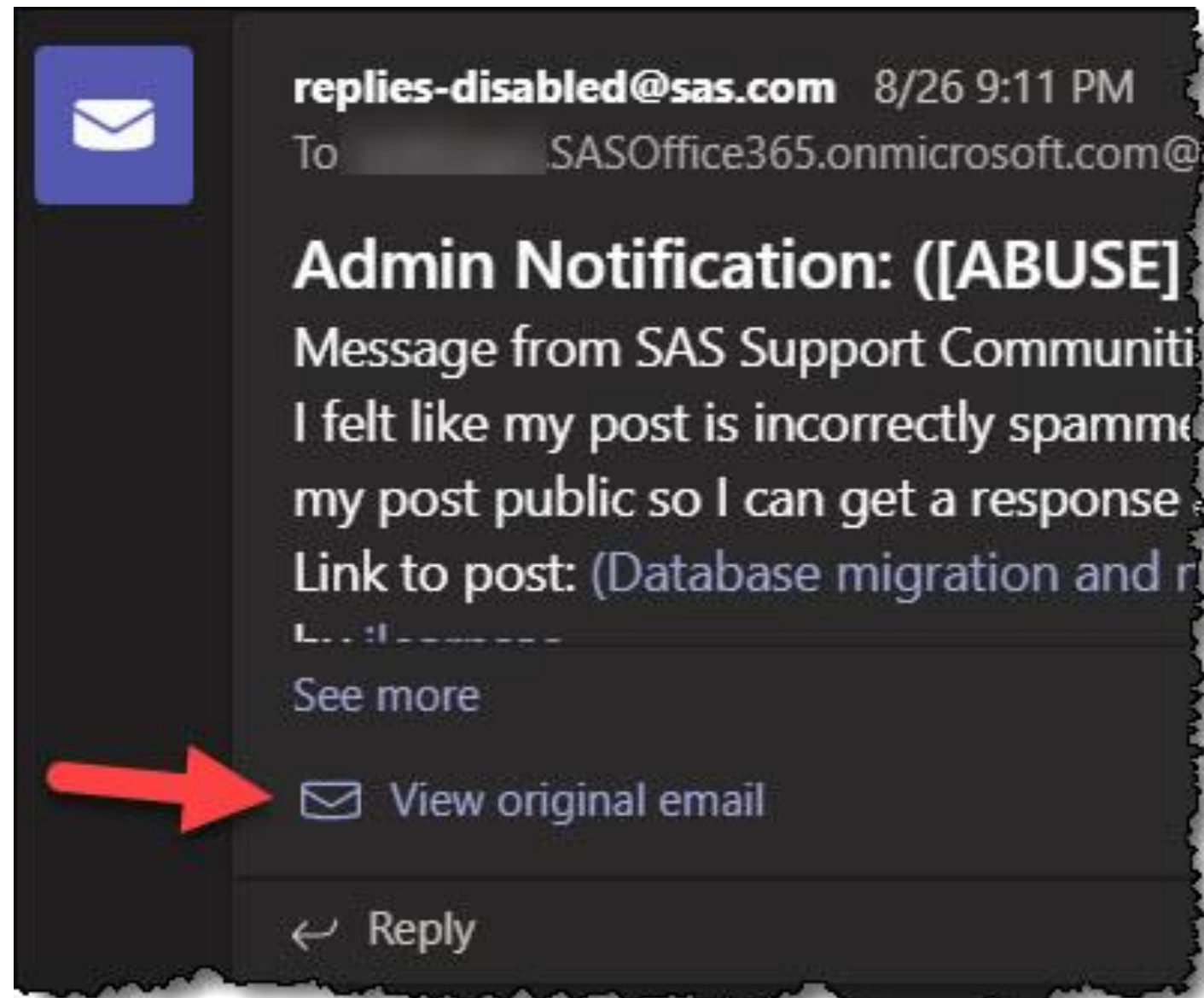
DEMO





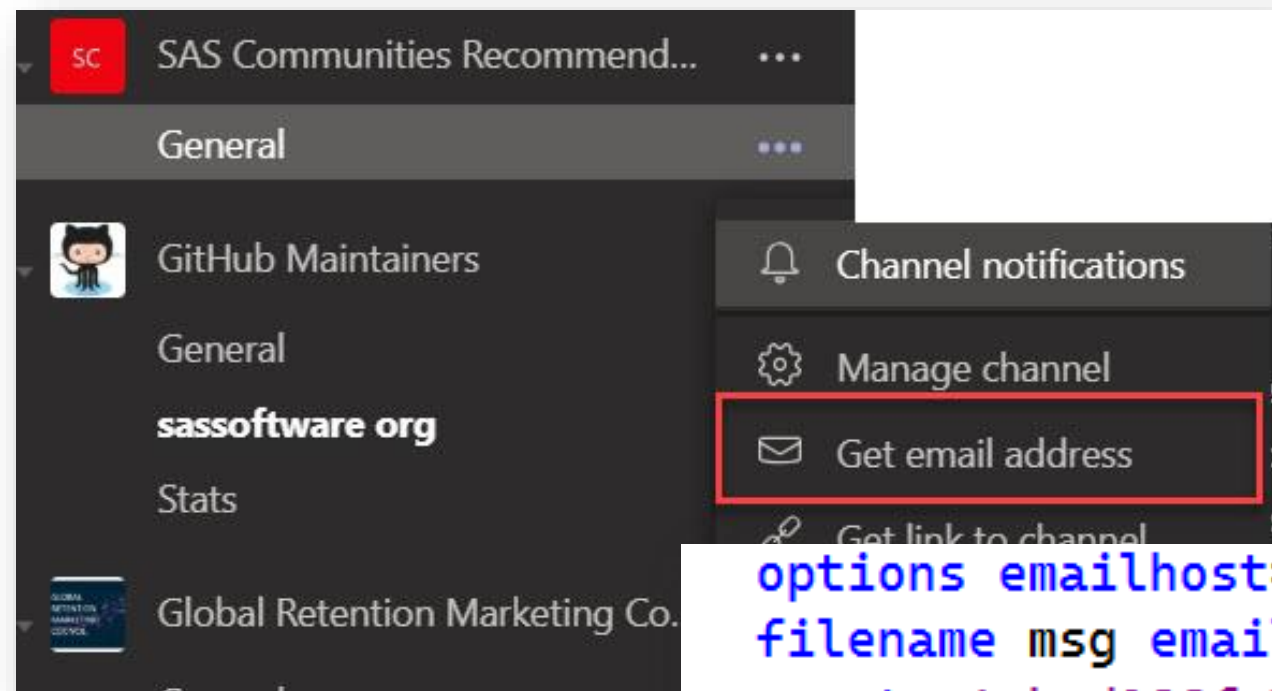
Using SAS to Send Messages to a Microsoft Teams Channel

Two methods: Email and Incoming Webhook



E-mail to a channel from SAS

Using FILENAME EMAIL

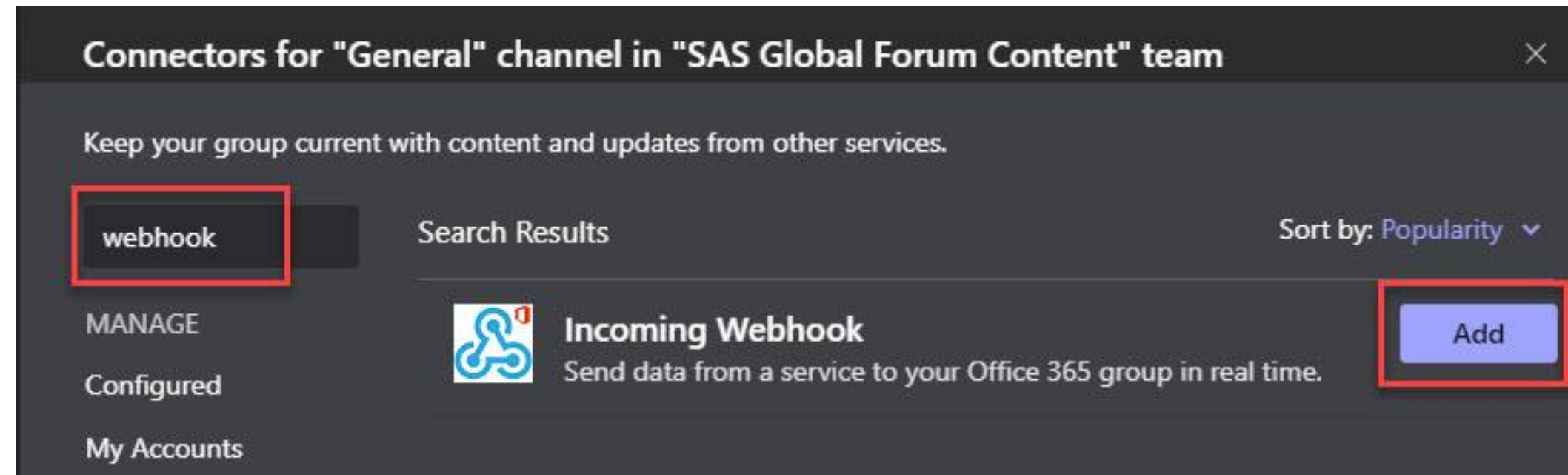
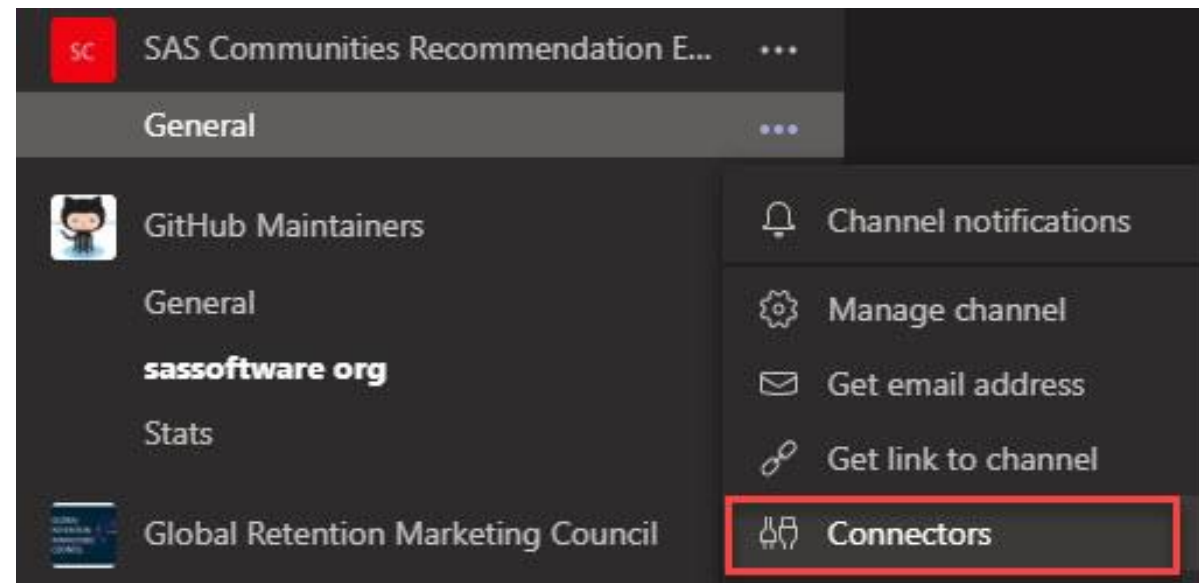


```
options emailhost='mailhost.company.com' emailsys=smtp;
filename msg email
  to='abcd123f.TenantOffice365.onmicrosoft.com@amer.teams.ms'
  FROM = "Communities Bot <communities@sas.com>"
  subject="&group. members: &toaddcount. INVITED on &SYSDATE."
  content_type='text/html'
;
ods html(id=email)
  file=msg (title="&group. report")
  style=dove;

  title "The following new users were INVITED to the &group. Group (&SYSDATE.)";
proc print data=candidates;
run;
ods html (id=email) close;
```

Incoming Webhook for rich messages

Using PROC HTTP



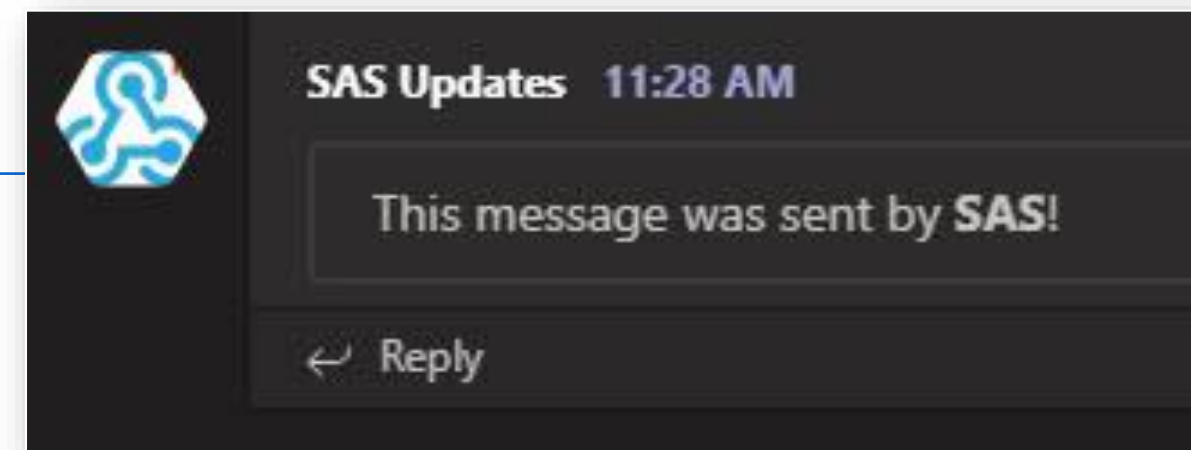
Copy the URL below to save it to the clipboard, then select Save. You'll need this URL when you go to the service that you want to send data to your group.

<https://outlook.office.com/webhook/d2bl>



Sending a simple message

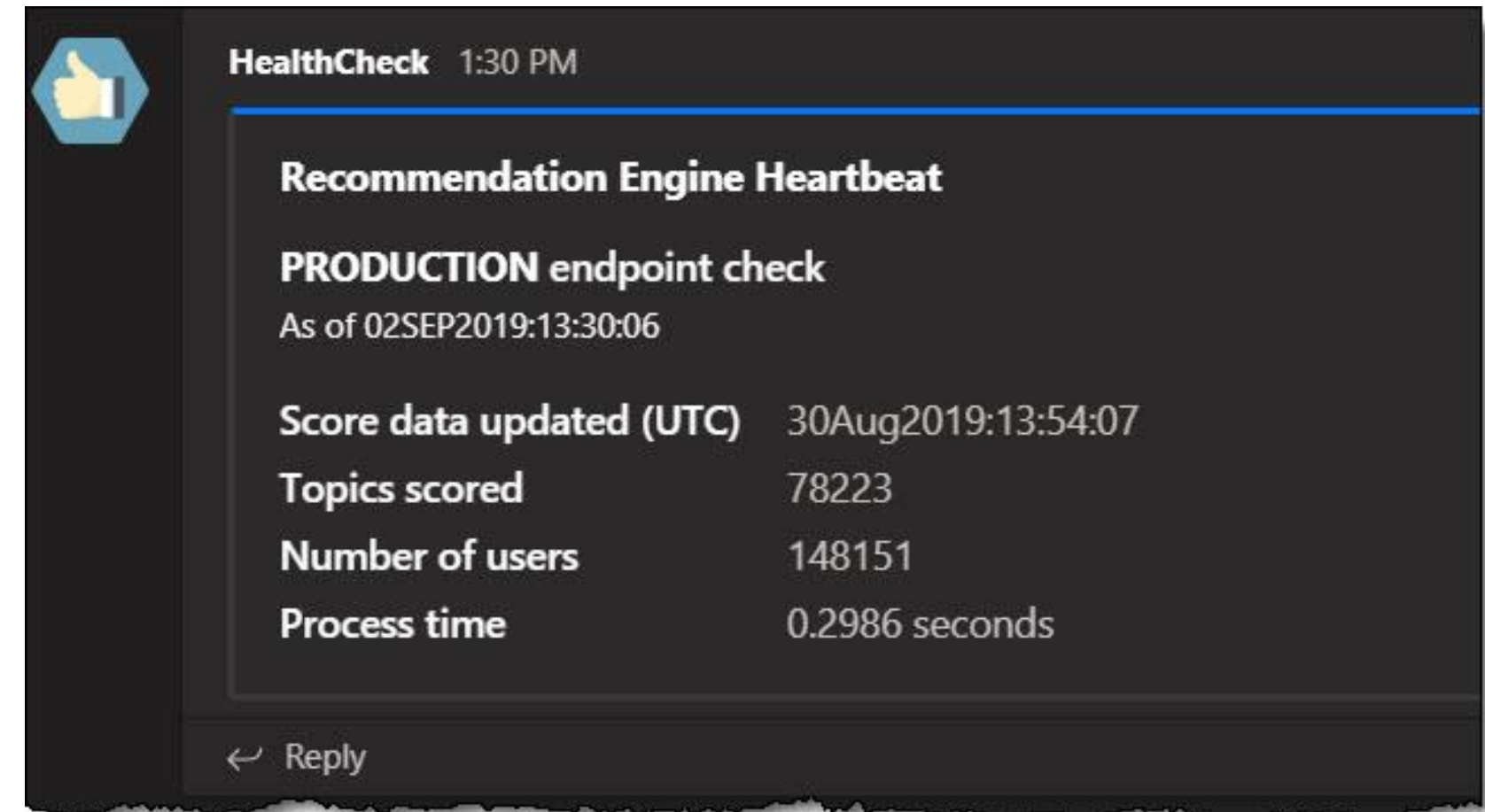
```
filename resp temp;
options noquotelenmax;
proc http
  /* Substitute your webhook URL here */
  url="https://outlook.office.com/webhook/your-unique-webhook-address-it-is-very-long"
  method="POST"
  in=
  '{
    "$schema": "http://adaptivecards.io/schemas/adaptive-card.json",
    "type": "AdaptiveCard",
    "version": "1.0",
    "summary": "Test message from SAS",
    "text": "This message was sent by **SAS**!"
  }'
  out=resp;
run;
```



Sending a more complex message

Design a Message Card

```
{
  "@type": "MessageCard",
  "@context": "https://schema.org/extensions",
  "summary": "Recommendation Engine Health Check",
  "themeColor": "#0075FF",
  "sections": [
    {
      "startGroup": true,
      "title": "***Recommendation Engine Heartbeat***",
      "activityImage": "",
      "activityTitle": "***PRODUCTION** endpoint check",
      "activitySubtitle": "As of 05SEP2019:13:10:30",
      "facts": [
        {
          "name": "Score data updated (UTC)",
          "value": "05Sep2019:13:30:06"
        },
        {
          "name": "Topics scored",
          "value": "78378"
        },
        {
          "name": "Number of users",
          "value": "148686"
        },
        {
          "name": "Process time",
          "value": "2.0373 seconds"
        }
      ]
    }
  ]
}
```



Generate with PROC JSON

Learning more about SAS and Microsoft 365

blogs.sas.com/sasdummy/tag/microsoft-office-365

Using SAS with Microsoft OneDrive and SharePoint Online

33

By [Chris Hemedinger](#) on [The SAS Dummy](#) | November 29, 2018

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 Office 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 Office 365 account -- perhaps provisioned by your IT support team -- and that you're using it to manage your documents.

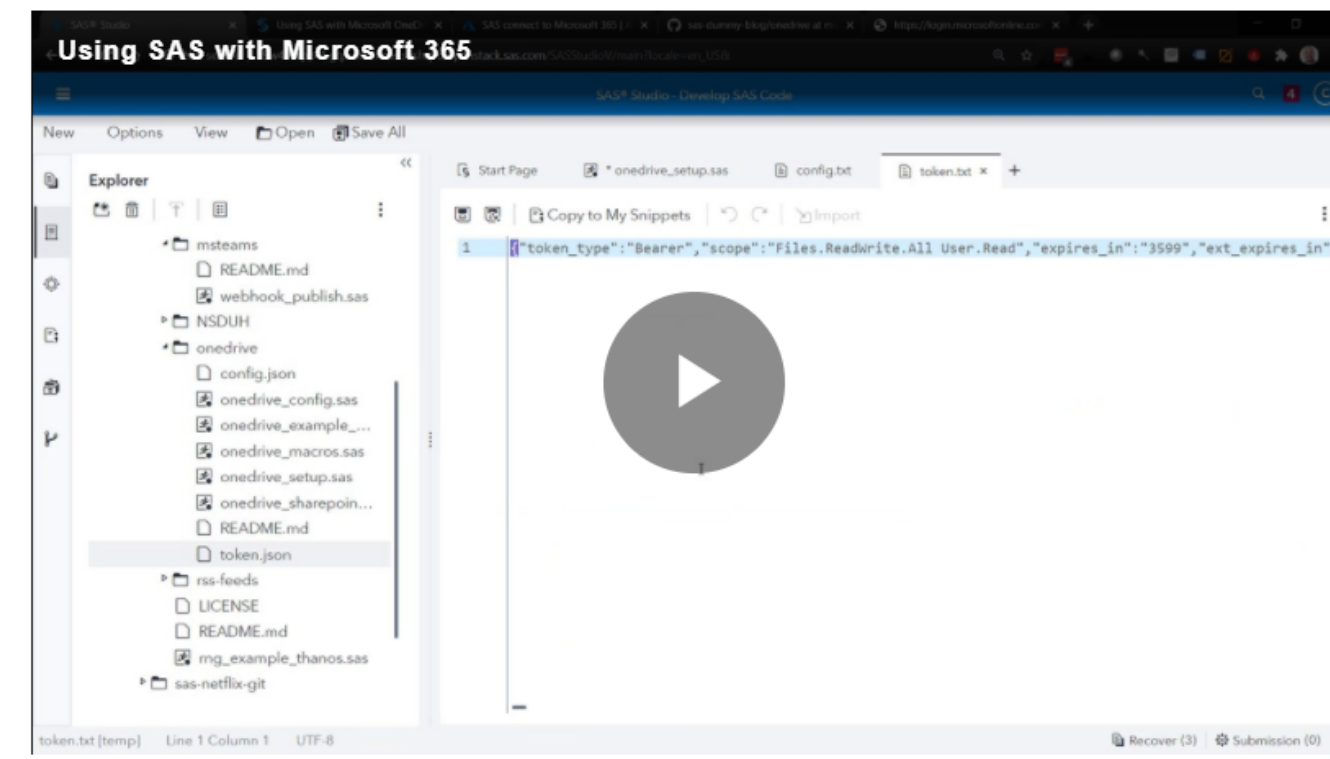
How to use SAS to access Microsoft 365

ChrisHemedinger

Posted 07-08-2020 04:39 PM (2557 views)

Many of us are now using cloud-based productivity tools like Microsoft Office 365, hosted in Microsoft Azure. And some of us are using SAS software in the cloud, too. 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 video, I show you how to use SAS programs to reach into your Microsoft OneDrive, Microsoft Teams and SharePoint cloud to read and update your files. The approach relies on the REST APIs in Microsoft Office 365 and on the HTTP procedure in SAS.



Q & A

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