Navigating Microsoft Graph API with PowerShell

TODAY'S

Speakers

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- github.com/bwya77

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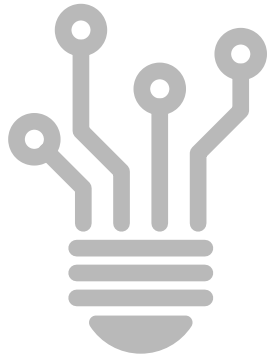
- Senior IT Consultant at Porcaro Stolarek Mete Partners, LLC
- I write automations
- github.com/theitrx

TODAY'S

Agenda



What is Microsoft Graph API
- Overview of Microsoft Graph API
- Benefits of knowing Graph
- What applications or automations can you make with Graph

Graph vs PSSession
- Connection difference
- Output object and format
- Authentication

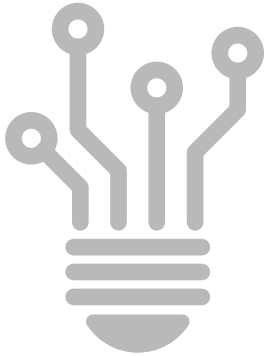
Authenticate to Graph API
- Grant Types
- Requesting a token
- Needed request Body

Manipulating Graph Data
- Using query parameters
- Converting to other output formats
- Pagination

Reporting Using Graph API
- Creating reports using ReportHTML
- Creating alerts from reports

Other Use Cases
- Send message to teams
- Uploading to OneDrive
- Creating a Sharepoint List

WHAT IS AN API



Wikipedia

“An Application Programming Interface (API) is a set of functions, procedures, methods or classes used by computer programs to request services from the operating system, software libraries or any other service providers running on the computer. A computer programmer uses the API to make application programs.”
– Wikipedia.com

Techtarget

“An application program interface (API) is code that allows two software programs to communicate with each other.”
– Techtarget.com

ELI5
“It's a way for 2 different computer programs to speak to each other. The API is the list of commands that the program understands.”
- r/brainflakes

WHAT IS REST API

REpresentational State Transfer API

Uses HTTP Methodologies

- GET – Retrieve a resource
- PUT – Replace a resource with a new one
- POST – Create a resource
- DELETE – Delete or remove a resource
- PATCH – Update a resource

Client – Server Model

- Client – Application initiating the request
- Server – Serving the request

Output Formats

- XML
- CSV
- JSON

OVERVIEW OF MICROSOFT GRAPH API

WHAT IS MICROSOFT GRAPH

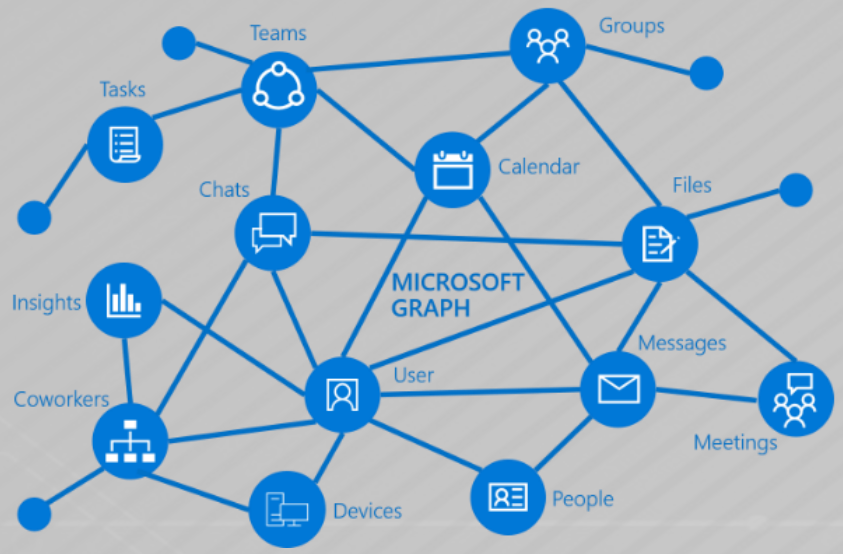
Is a REST API, a unified endpoint

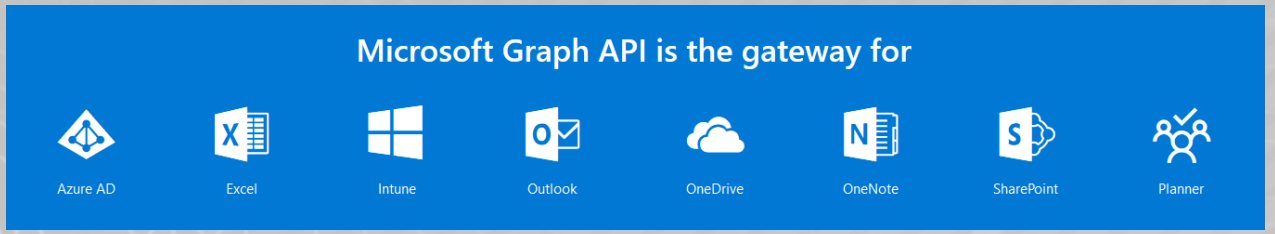
That gives you access to

- Azure AD
- Excel
- Intune
- Outlook
- Onedrive
- Sharepoint
- Planner
- ..and More!

And you can

- Generate reports and audit data
- Perform hundreds of tasks programmatically
- Build automations or apps
- ..and more!



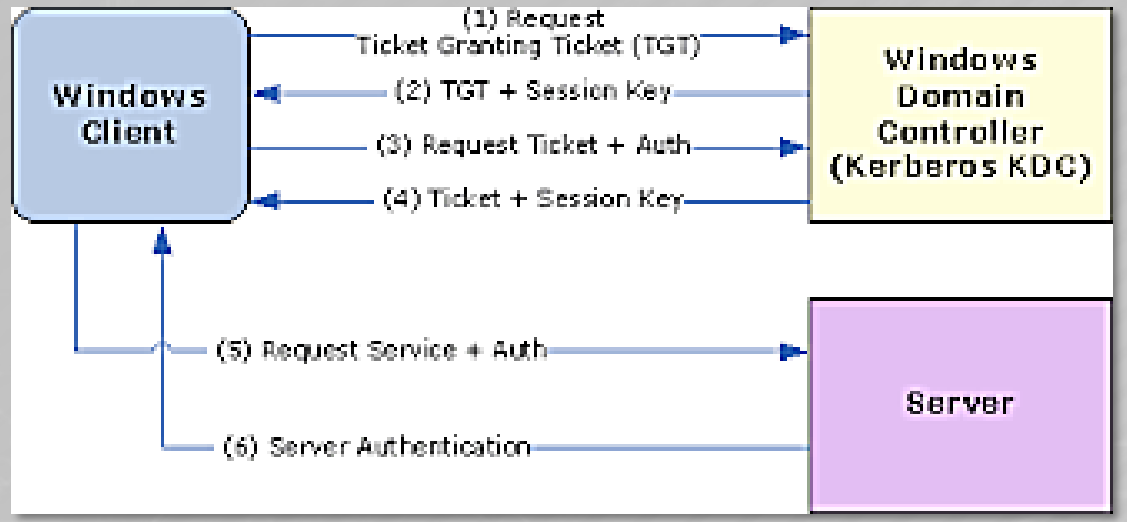


GRAPH VS PSSESSION

AUTHENTICATION

PSSESSION

- Uses Active Directory or Local Account Creds
  - Username
  - Password
- Types
  - CredSSP
  - Kerberos
  - Digest
- PSCredential Object

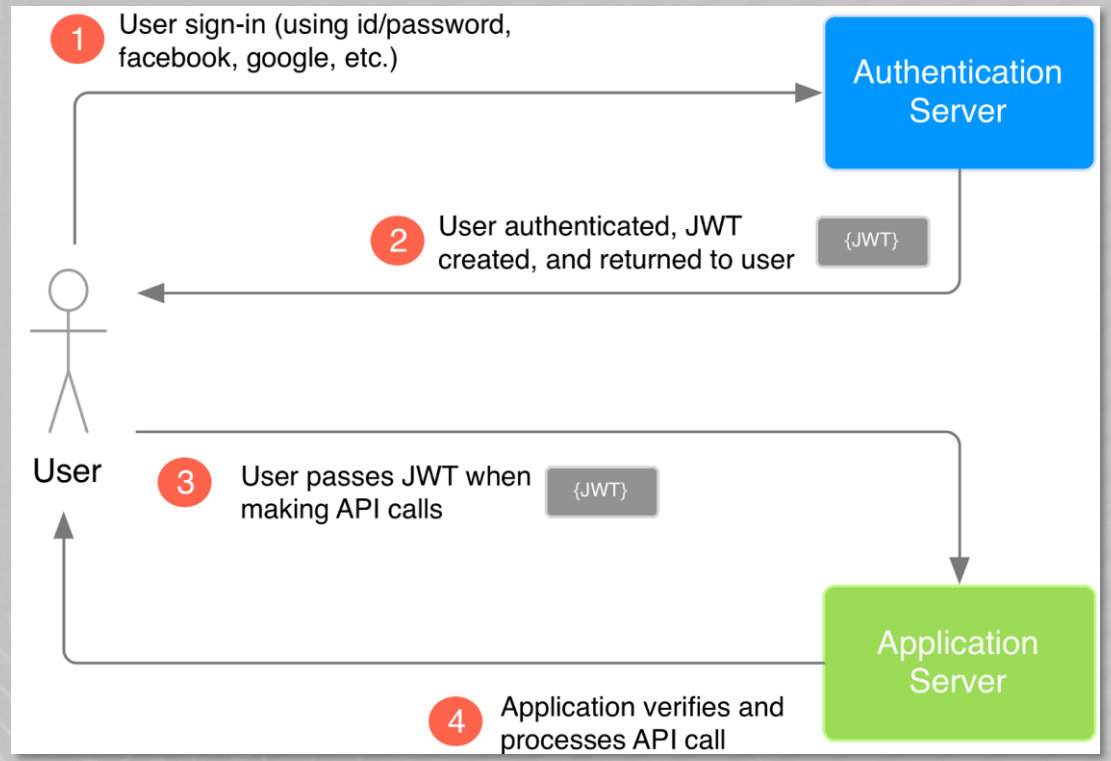


GRAPH VS PSSESSION

AUTHENTICATION

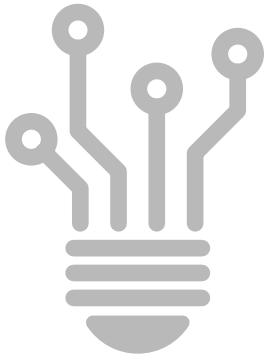
GRAPH API

- HTTP
  - Azure AD Application
    - Application ID
    - Application Secret
  - Microsoft / Azure AD Account
    - Username
    - Password
  - JSON Web Token
  - Authentication code
  - Device code



GRAPH VS PSSESSION

COMMAND AND OUTPUT TYPES



GRAPH API

- Port Requirements: TCP:443(HTTPS)
- Commands
  - Invoke-RestMethod
    - PSCustomObject
    - JSON
    - CSV
  - Invoke-WebRequest
    - JSON
    - CSV

PSSESSION

- Port Requirement: TCP: 5985(HTTP) or 5986 (HTTPS)
- WINRM
- Commands
  - Invoke-Command
    - Deserialized Object
  - Enter-PSSession
    - Object is intact

AUTHENTICATE TO GRAPH API

OBJECTS YOU NEED

Azure AD Application

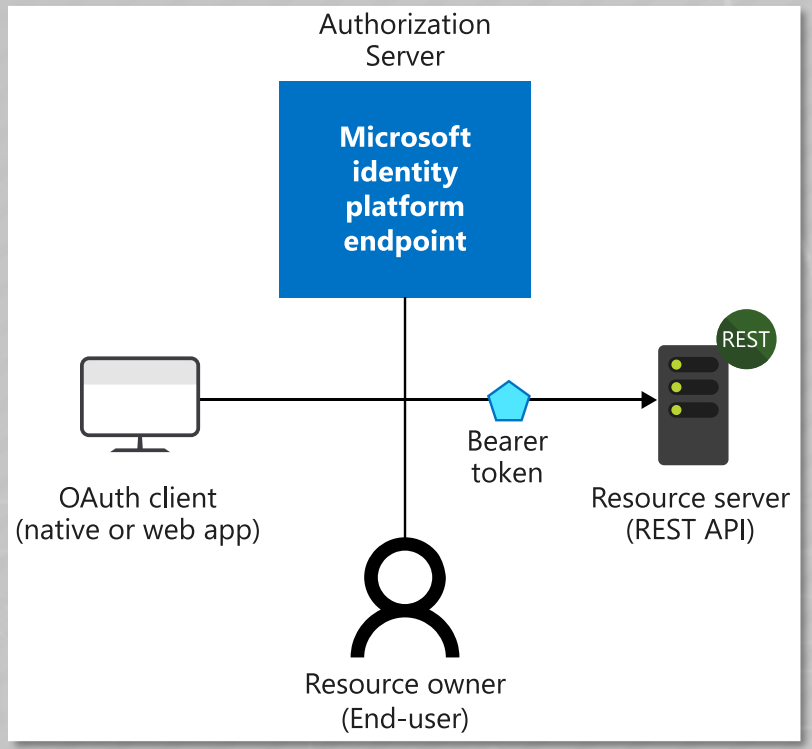
- Needed to Acquire an Access Token
- Application (client) ID
- Application (client) Secret
- Directory (tenant) ID
- Permissions
- User or Admin Consent
- AAD User Account Credentials (Some Endpoints)

Access Token

- Needed to Access Graph API
- JSON Web Token (JWT)

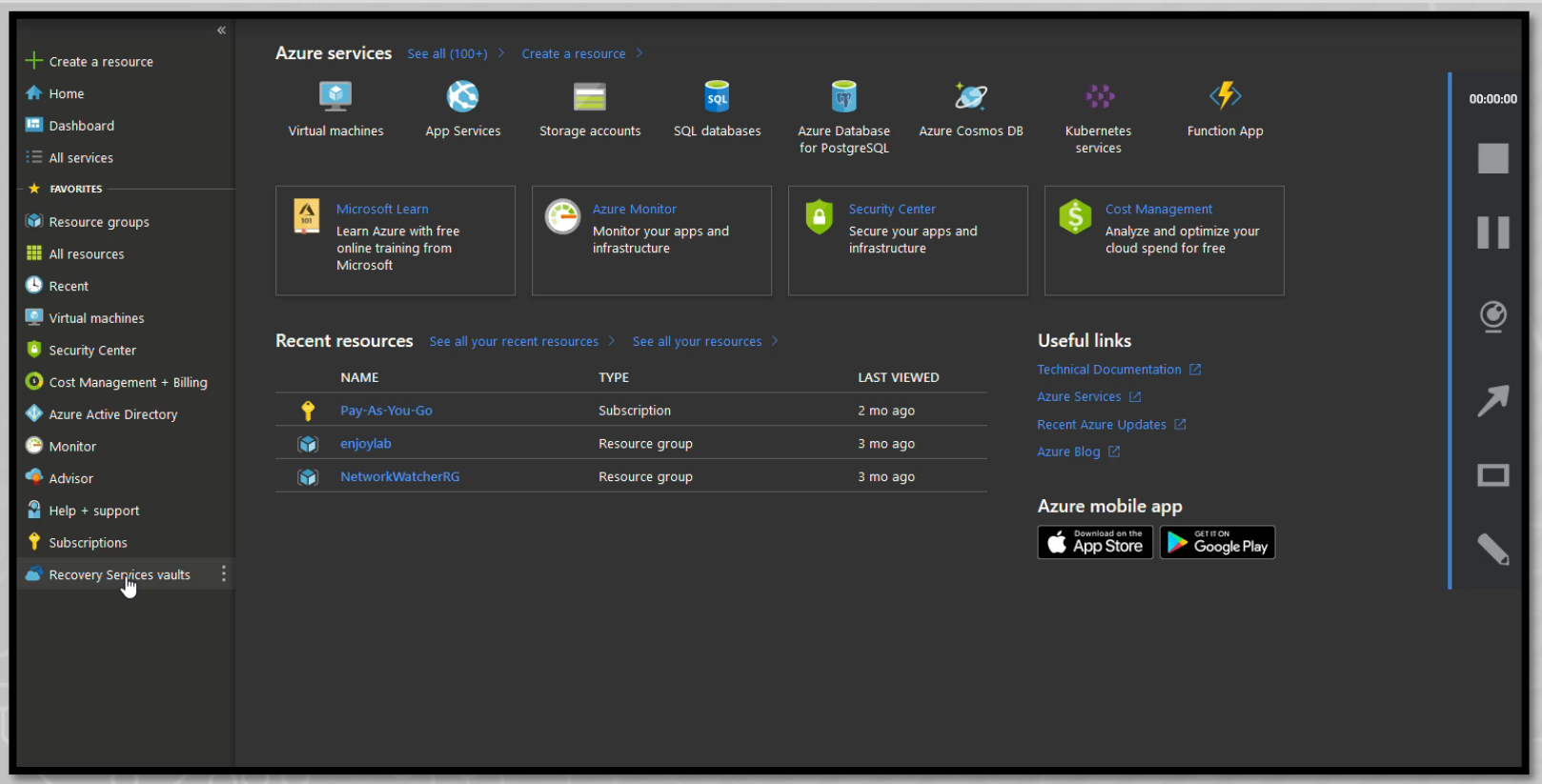
Graph API Endpoint

- Where you will send your request
- https://graph.microsoft.com/v1.0/
- https://graph.microsoft.com/beta/
- Format
  - https://graph.Microsoft.com
    /{version}
    /{resource}
    /{id}
    /{property}
    /{query-parameters}



AUTHENTICATE TO GRAPH API

Azure AD Application

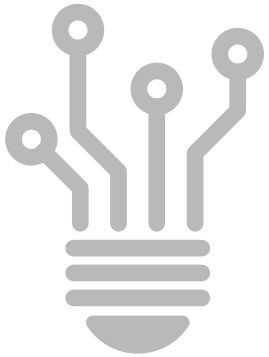


Azure AD Application

- Application (client) ID
- Application (client) Secret
- Directory (tenant) ID
- Permissions
- User or Admin Consent
- Azure AD User Account Credentials

AUTHENTICATE TO GRAPH API

Azure AD Application



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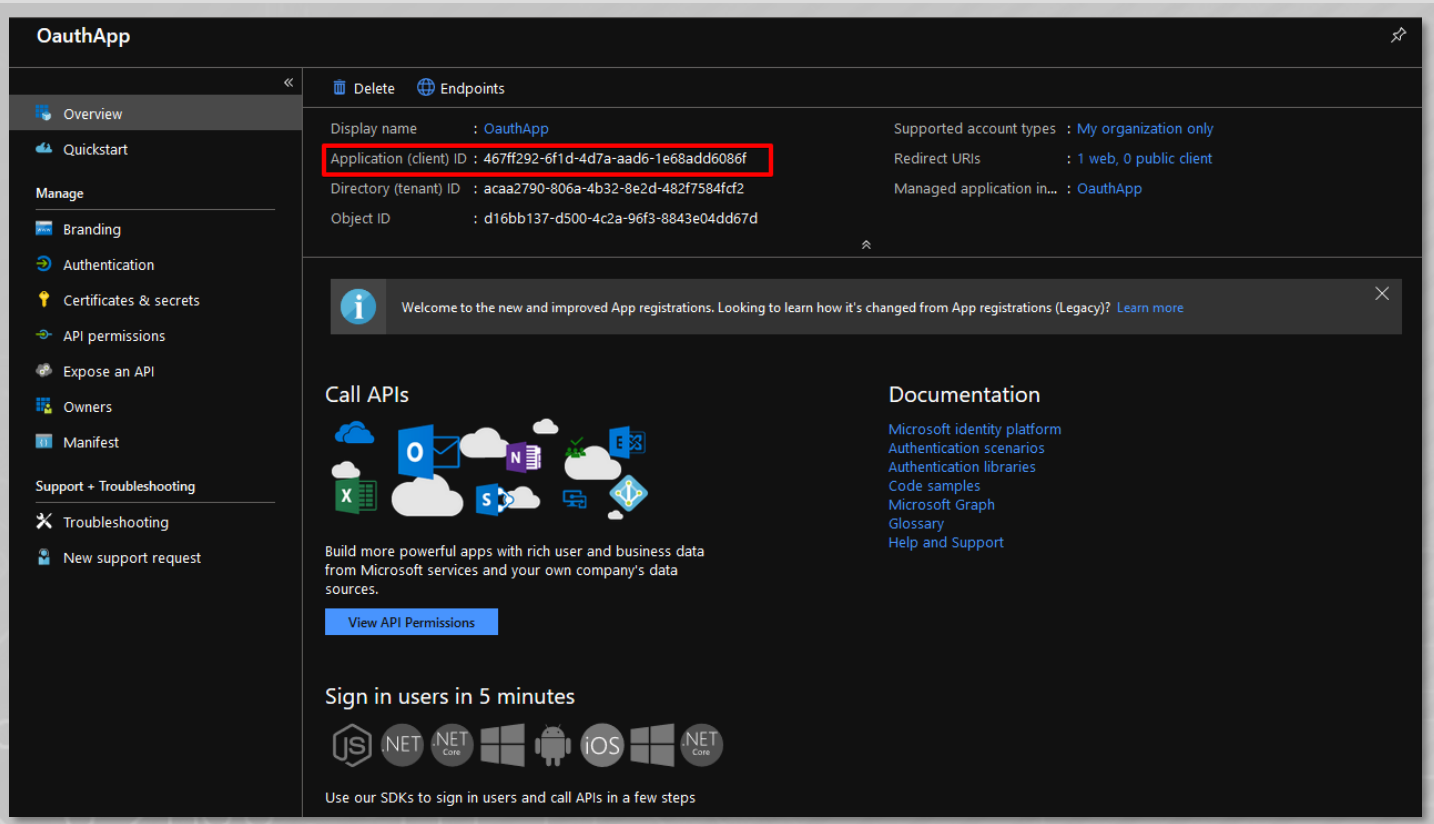

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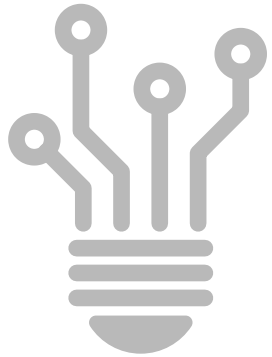

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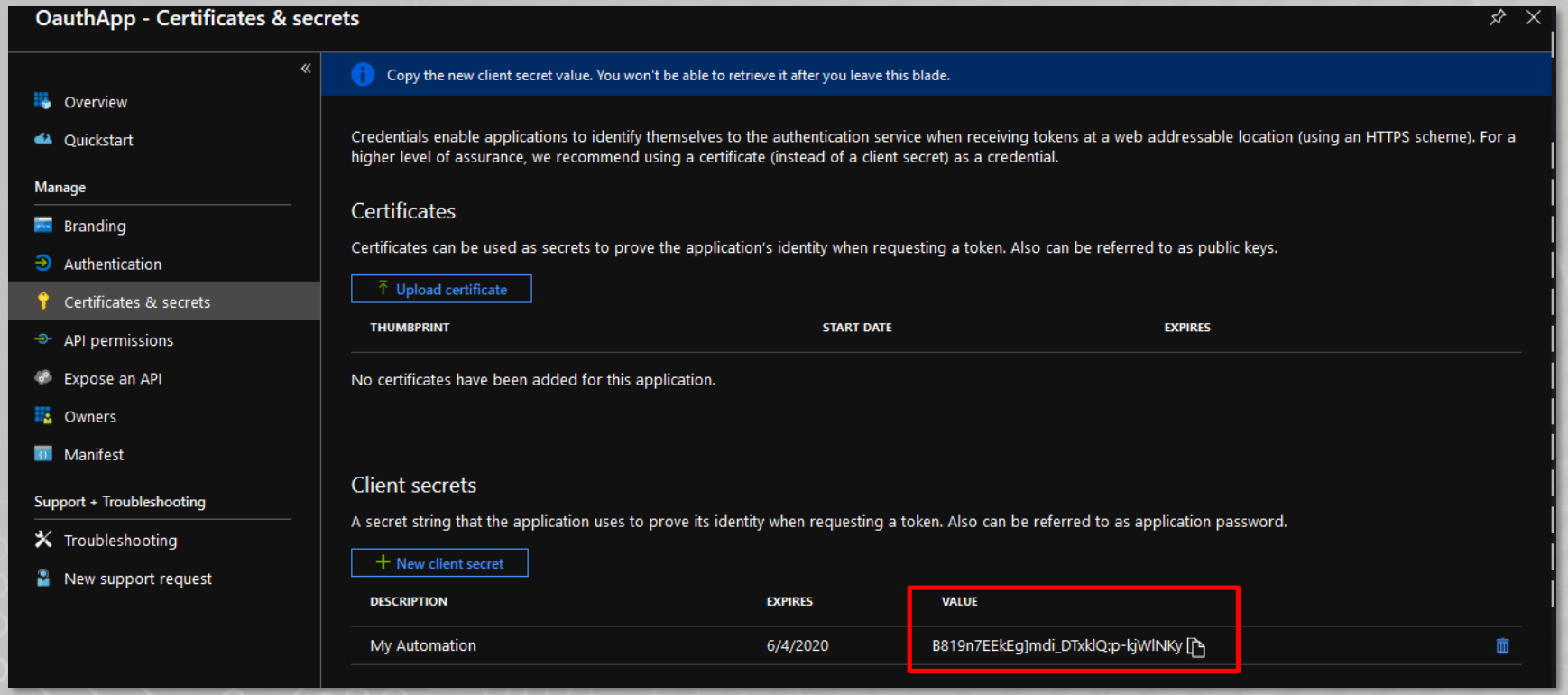
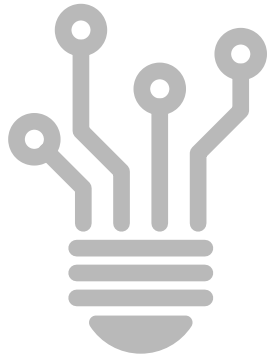


AUTHENTICATE TO GRAPH API

Azure AD Application



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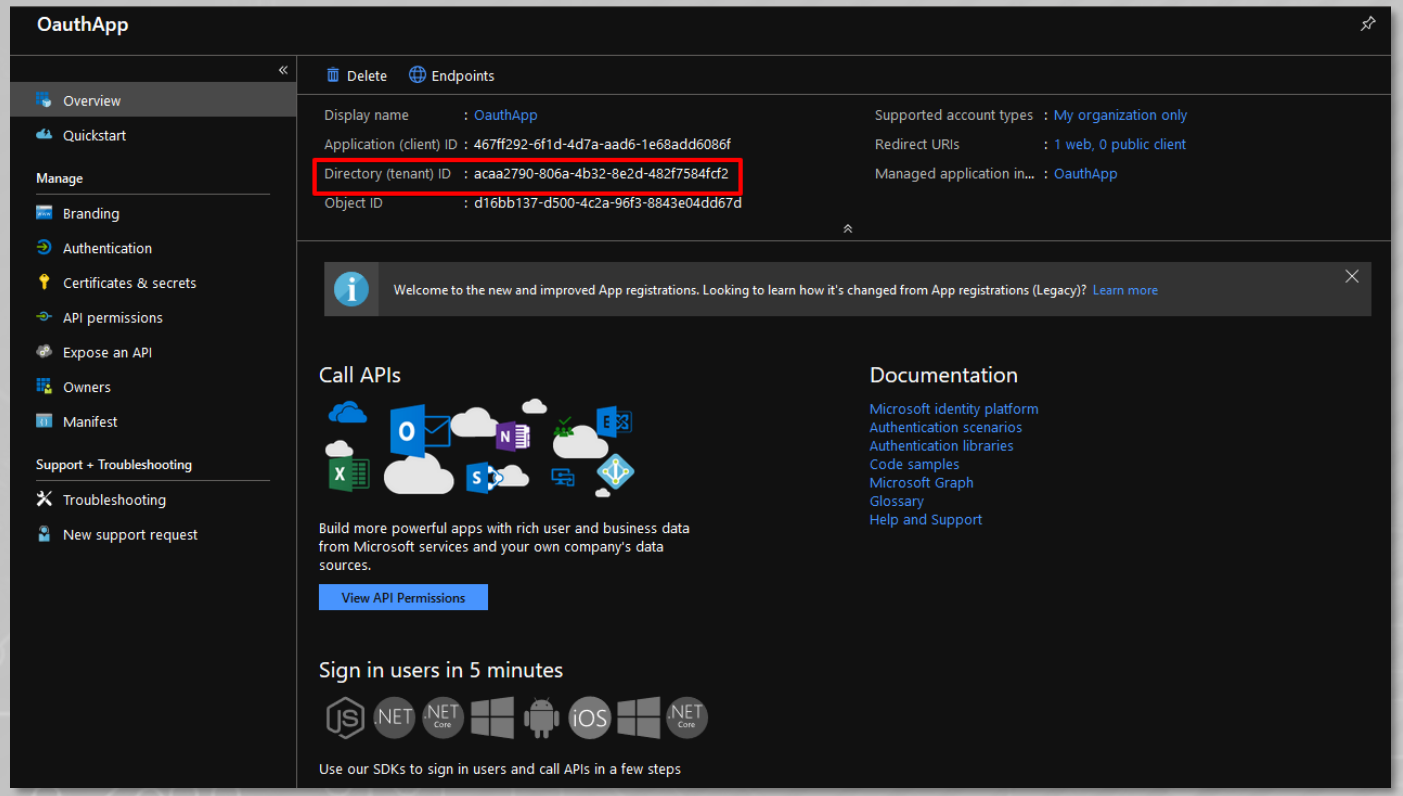

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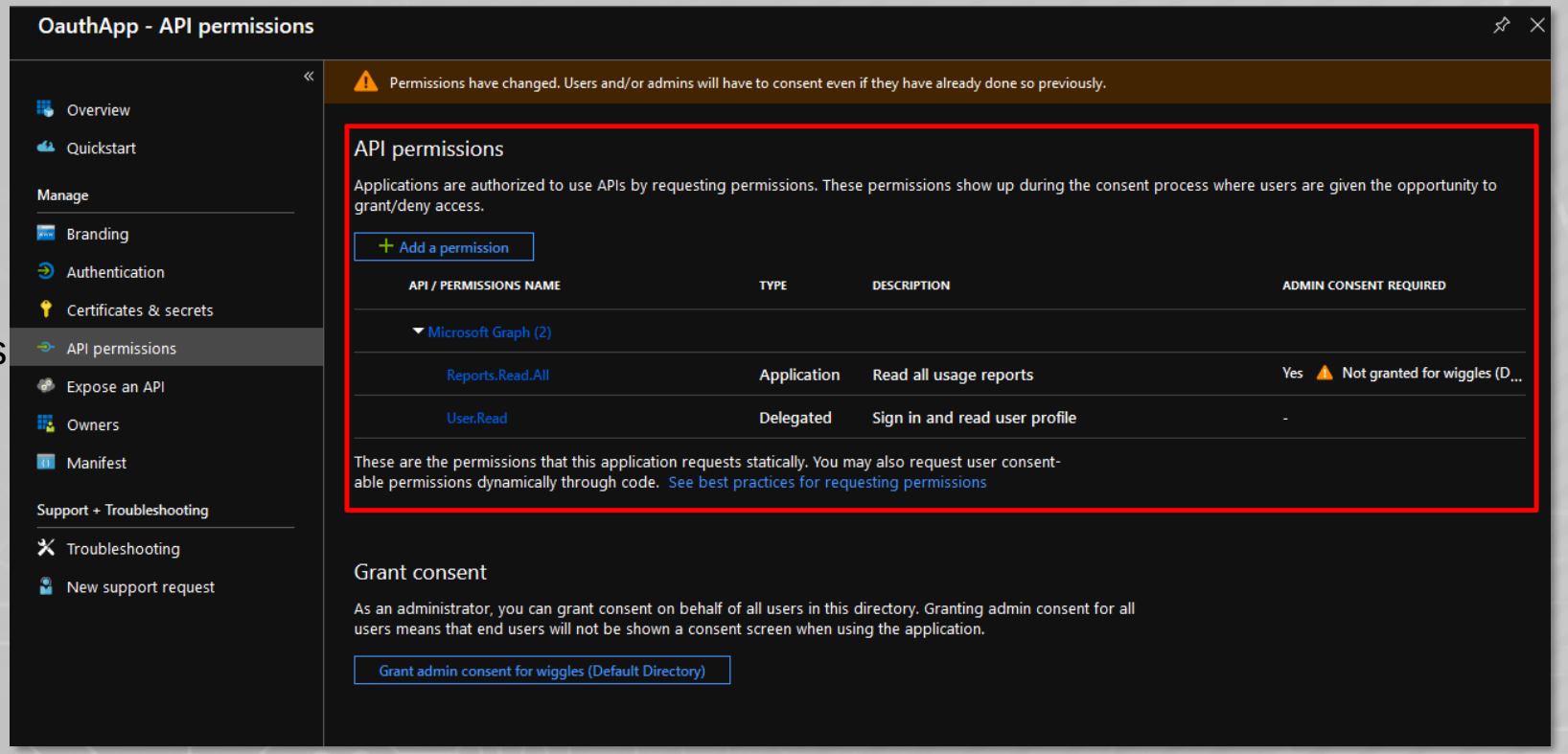

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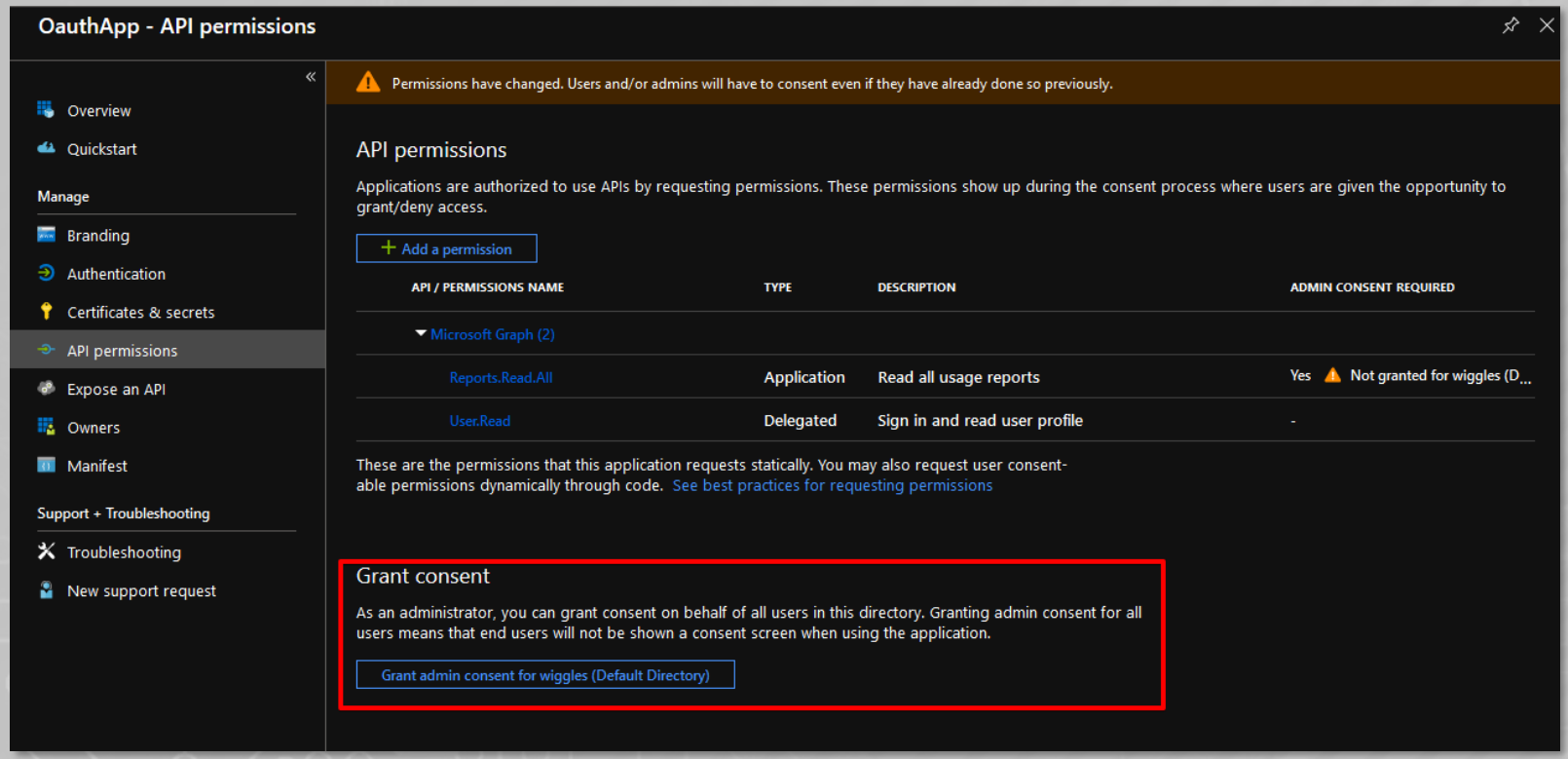


AUTHENTICATE TO GRAPH API

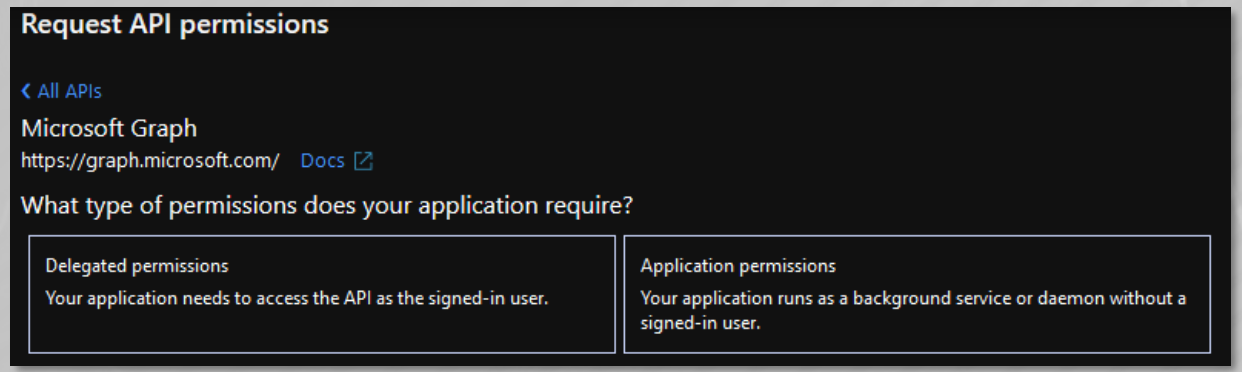
APP PERMISSIONS

Delegated

- Resources that need user context
  - E.g. Sending email or message to teams
- Needs user or admin consent

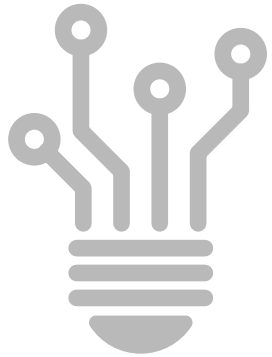
Application

- App-only – without a user
- Best for daemon apps
- Only admin can consent



Permission type	Permissions (from least to most privileged)
Delegated (work or school account)	Reports.Read.All
Delegated (personal Microsoft account)	Not supported.
Application	Reports.Read.All

USER AUTH | ADMIN CONSENT



USER

- https://login.microsoftonline.com
  /{tenant}
  /oauth2
  /v2.0
  /authorize
  ?client_id={client ID}
  &response_type=code
  &redirect_uri={Redirect URL in the Azure app}
  &scope=https://graph.Microsoft.com
  /.{permission.code} offline_access

ADMIN

- https://login.microsoftonline.com
  /{tenant}
  /adminconsent
  ?client_id={client ID}
  &redirect_uri={Redirect URL in the Azure app}

AUTHENTICATE TO GRAPH API

Access Token

Access Token

- Needed to Access Graph API
- JSON Web Token (JWT)
- https://login.microsoftonline.com
  /{Tenant ID | “common”}
  /oauth2
  /v2.0
  /token

```
$ReqHeader = @{
        Authorization = "Bearer  $Token"
}
```

JWT String

eyJ0eXAiOiJKV1QiLCJub25jZSI6IkFRQUJBQUFBQUFEQ29NcGpKWHJ4VHE5Vkc5dGUtN0ZYc1ZaUzhybVZkbE1yVWZkLTE4dXB3VUdIQXZBRm4xeEpJSGZERmgzdl9kZFZnYnR0TXdmTE5YU20yeTRlSlVmRFdmVEdud2hKQVBNSk5aS05KR2JBMUNBQSIsImFsZyI6IlJTMjU2IiwieDV0IjoiSEJ4bDltQWU2Z3hhdkNrY29PVTJUSHNETmEwIiwia2lkIjoiSEJ4bDltQWU2Z3hhdkNrY29PVTJUSHNETmEwIn0.eyJhdWQiOiJodHRwczovL2dyYXBoLm1pY3Jvc29mdC5jb20vIiwiaXNzIjoiaHR0cHM6Ly9zdHMud2luZG93cy5uZXQvNWJmYTkzNGMtYmNhOS00NGM1LTkwYTQtZDlhMzZjZmUxMmMwLyIsImlhdCI6MTU1OTY5OTU0MiwibmJmIjoxNTU5Njk5NTQyLCJleHAiOjE1NTk3MDM0NDIsImFpbyI6IjQyWmdZTWlZdk92ODVMTHFPUG1ONzZPK2hMVXVBUUE9IiwiYXBwX2Rpc3BsYXluYW1lIjoiTzM2NVVzYWdlUmVwb3J0IiwiYXBwaWQiOiI4NzQyZGQ2ZS1kMTg2LTQ1YzQtODQ3ZS1lMmI2MjlmYWUwMjAiLCJhcHBpZGFjciI6IjEiLCJpZHAiOiJodHRwczovL3N0cy53aW5kb3dzLm5ldC81YmZhOTM0Yy1iY2E5LTQ0YzUtOTBhNC1kOWEzNmNmZTEyYzAvIiwib2lkIjoiNjM5Y2M1OWQtOGUxMC00MWM4LWE5YTAtZDliMDQ2MTA5YzE2IiwicmgiOiIwLiAVXNlci5SZWFkV3JpdGUuQWxsIiwiTm90ZXMuUmVhZC5BbGwiLCJEaXJlY3RvcnkuUmVhZC5BbGwiLCJVc2VyLlJlYWQuQWxsIiwiQXVkaXRMb2cuUmVhZC5BbGwiLCJSZXBvcnRzLlJlYWQuQWxsIl0sInN1YiI6IjYzOWNjNTlkLThlMTAtNDFjOC1hOWEwLWQ5YjA0NjEwOWMxNiIsInRpZCI6IjVlZme5MzRjLWJjYTktNDRjNS05MGE0LWQ5YTM2Y2ZlMTJjMCIsInV0aSI6Ii1Yd1M1Wi1veTAyckQyV250MENxQUEiLCJ2ZXIiOiIxLjAiLCJ4bXNfdGNkdCI6MTM1NTE3ODc4MH0.hg3G-A2D-Pa9mUVElnOIcaq6IyWCsrGBCVr3c_laZReeulo9mbn86S1XICup_JQu-mj01XLyxjxmTJ1RhMNatisbK9z-n3J80-WSVVkGYfi671Czp18VgQQHVdXzpERi0S1a_lNSz4wy_XvPwAWk4fWsK2GBjqNIIGFX82UPKeRLwfv4JJg5wn2RBYv4Ep7vVnYyvQ2zIGrEBQmTV2Zl5TPnsP_t9y84cPfMS5AOp6DOnc-ar-A1qBE6RrLfhjMGSZfJ7dsyl_vmIsqVnmy0MtbmtEBF-5Lh1-romumfDmj9MusiguS296dbyfTns_ev9IChOAmJL7XCQxl0y-9wLw

Payload


```
{
 "aud": "https://graph.microsoft.com/",
 "iss": "https://sts.windows.net/5bfa934c-bca9-44c5-90a4-d9a36cfe12c0/",
 "iat": 1559699542,
 "nbf": 1559699542,
 "exp": 1559703637,
 "aio": "42ZgYMiYvOv85LLqOPmN76O+hLUuAQA=",
 "app_displayname": "O365UsageReport",
 "appid": "8742dd6e-d186-45c4-847e-e2b629fae020",
 "appidacr": "1",
 "idp": "https://sts.windows.net/5bfa934c-bca9-44c5-90a4-d9a36cfe12c0/",
 "oid": "639cc59d-8e10-41c8-a9a0-d9b046109c16",
 "roles": [
  "User.ReadWrite.All",
  "Directory.ReadWrite.All",
  "Sites.ReadWrite.All",
  "Notes.Read.All",
  "Directory.Read.All",
  "User.Read.All",
  "AuditLog.Read.All",
  "Reports.Read.All"
 ],
 "sub": "639cc59d-8e10-41c8-a9a0-d9b046109c16",
 "tid": "5bfa934c-bca9-44c5-90a4-d9a36cfe12c0",
 "uti": "-XwS5Z-oy02rD2Wnt0CqAA",
 "ver": "1.0",
 "xms_tcdt": 1355178780,
 "jti": "e142669a-e3a6-4c34-b0a8-ddbc84826a6a"
}
```

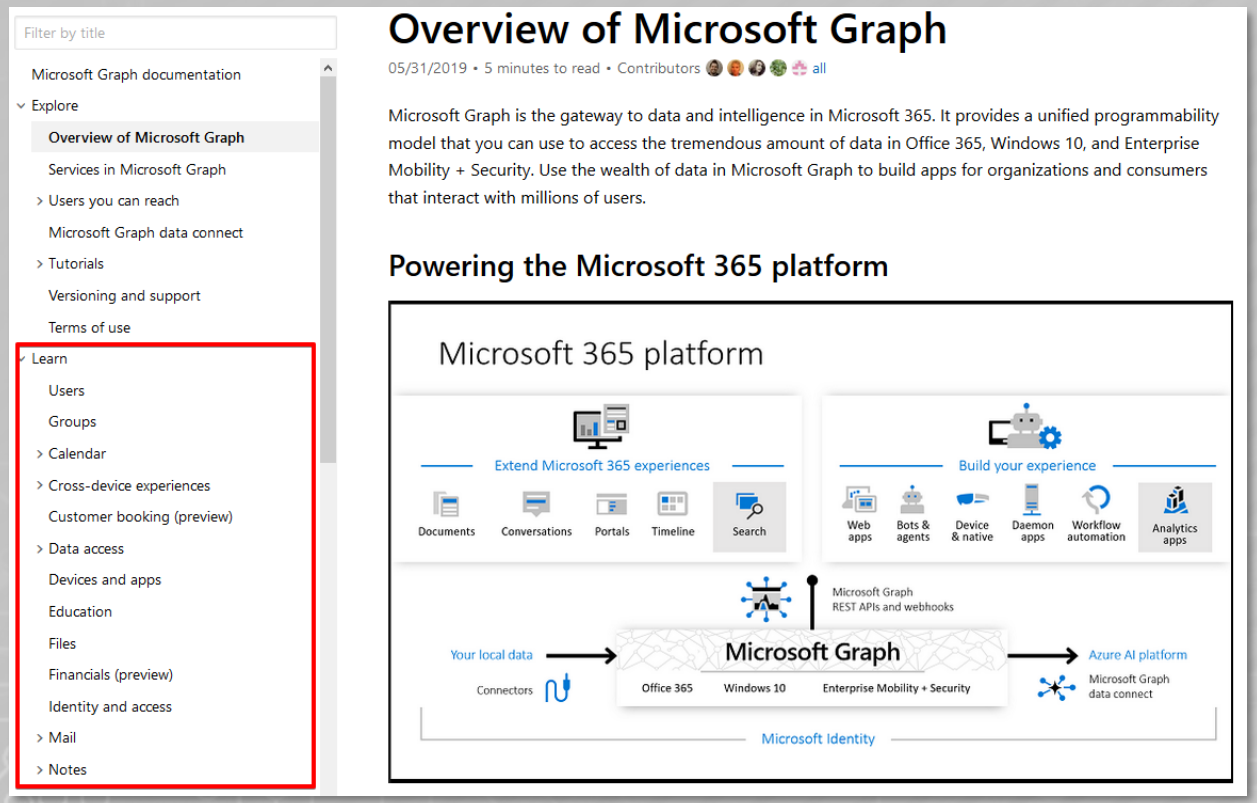
API Endpoint

How to Know the Endpoint?

- https://docs.microsoft.com
  /graph
  /overview

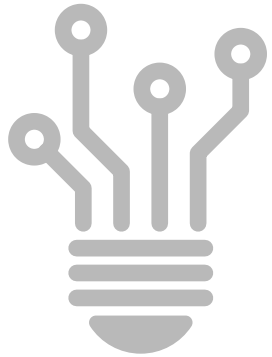
Examples:
https://graph.microsoft.com/v1.0

- Reports - /reports/
- Audit Logs - /auditLogs/
- Onedrive - /me/drive/
- Mail Drafts - /me/mailfolders('Drafts')/
- Sharepoint - /sites/



AUTHENTICATE TO GRAPH API

GRANT TYPES



Client_Credentials

- Best used for daemon apps
- Uses Azure AD App only for authentication
- Application permissions are used
- No user context
- Needs admin consent for permissions

Password

- Contains user context
- Needs AAD user creds
- Creates a refresh token (Scope: Offline_Access)
- Does not support web based authentication

Authorization_Code

- Best used for web or mobile applications
- Contains user context
- Supports modern authentication methods

Device_Code

- Best used when no HTML based authentication is available locally
- Supports modern authentication methods

Refresh_Token

- Needs the refresh token to generate a new token.
- Refresh token is can be reused for 90 days

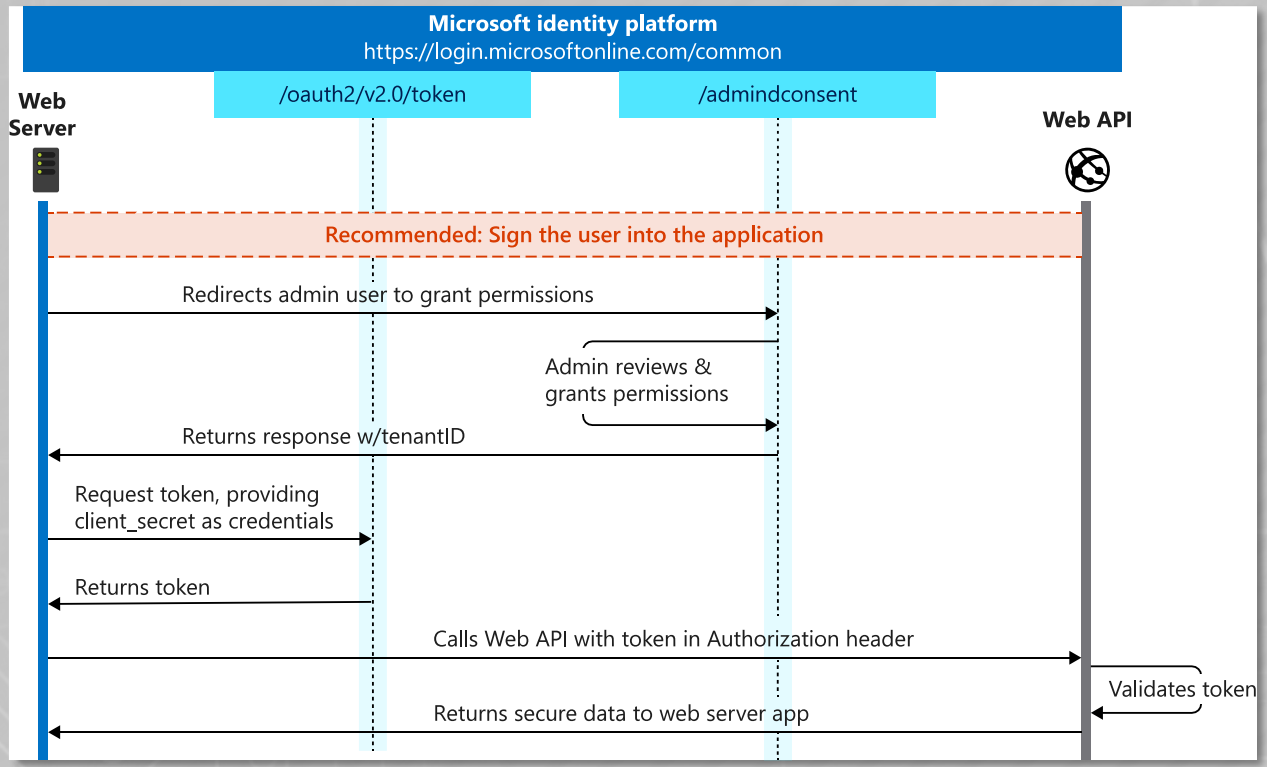
AUTHENTICATE TO GRAPH API

GRANT TYPES

Client_Credentials

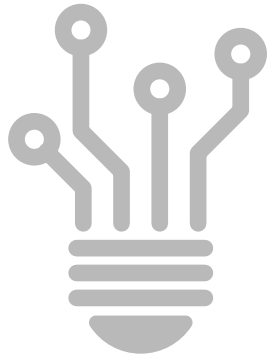
Required POST Body:

- Grant_Type = Client_Credentials
- Client_ID = “{Azure App Client ID}”
- Client_Secret = “{Azure App Client Secret}”
- Scope = https://graph.microsoft.com/.default



CLIENT CREDENTIAL - STITCHING THE COMPONENTS

REQUESTING TOKEN



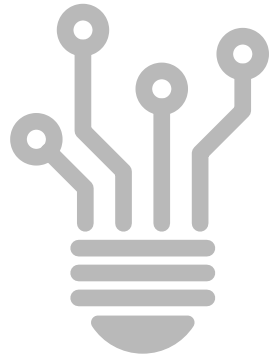
```powershell
$ReqTokenBody = @{
    Grant_Type    = "client_credentials"
    Scope         = "https://graph.microsoft.com/.default"
    client_Id     = "8742dd6[redacted]-e2b629fae020"
    Client_Secret = "Kqtv[redacted]y@vFBG7ol.wuSgJLz050"
}

$TokReqRes = Invoke-RestMethod -Uri "https://login.microsoftonline.com/[redacted].onmicrosoft.com/oauth2/v2.0/token" -Method POST -Body $ReqTokenBody
$TokReqRes

```

PROBLEMS DEBUG CONSOLE OUTPUT TERMINAL 2: PowerShell Integrate

```
token_type expires_in ext_expires_in access_token
---------- ---------- -------------- ------------
Bearer           3600           3600 eyJ0eXAiOiJKV1QiLCJub25jZSI6IkFRQUJBQUFBQUFEQ29NcGpKWHJ4VHE5Vkc5dGUtN0ZYU25SbU51R092M2V4aEphQXQwVXB6RFBaaUZGTHFGcFlNU054dXllWDVBenB6VUpFQnl...
```

CLIENT CREDENTIAL - STITCHING THE COMPONENTS

TOKEN RESULT



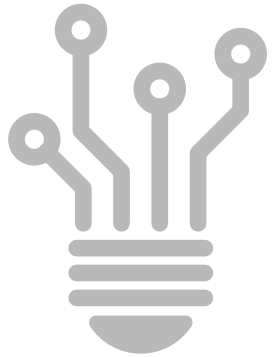
```
40
41  $TokReqRes = Invoke-RestMethod -Uri "https://login.microsoftonline.com/          .onmicrosoft.com/oauth2/v2.0/token" -Method POST -Body $ReqTokenBody
42
43  $ReqHeader = @{
44      Authorization = "Bearer $($TokReqRes.access_token)"
45  }
46  $ReqHeader
47
```

PROBLEMS 3 DEBUG CONSOLE OUTPUT TERMINAL 2: PowerShell Integrate

```
Name                           Value
----                           -----
Authorization                  Bearer eyJ0eXAiOiJKV1QiLCJub25jZSI6IkFRQUJBQUFBQUFEQ29NcGpKWHJ4VHE5Vkc5dGUtN0ZYV1ZqWDhORmQ1b01aVWJKY2toM2xOMllDS0IxTUdVaEMtYlJYWHBoMktBRWVTR1k1c2...
```

CLIENT CREDENTIAL - STITCHING THE COMPONENTS

SENDING TO GRAPH



```powershell
$ReqHeader = @{
    Authorization = "Bearer $($TokReqRes.access_token)"
}

Invoke-RestMethod -Uri "https://graph.microsoft.com/v1.0/reports/getEmailActivityCounts(period='D7')" -Method Get -Headers $ReqHeader
```

PROBLEMS DEBUG CONSOLE OUTPUT TERMINAL 2: PowerShell Integrate

```
ï»¿Report Refresh Date,Send,Receive,Read,Report Date,Report Period
2019-06-05,14715,65235,66543,2019-06-05,7
2019-06-05,15618,68313,81099,2019-06-04,7
2019-06-05,13953,64074,77666,2019-06-03,7
2019-06-05,752,15121,5329,2019-06-02,7
2019-06-05,1024,16598,7494,2019-06-01,7
2019-06-05,14043,61285,58427,2019-05-31,7
2019-06-05,15397,62812,64265,2019-05-30,7
```

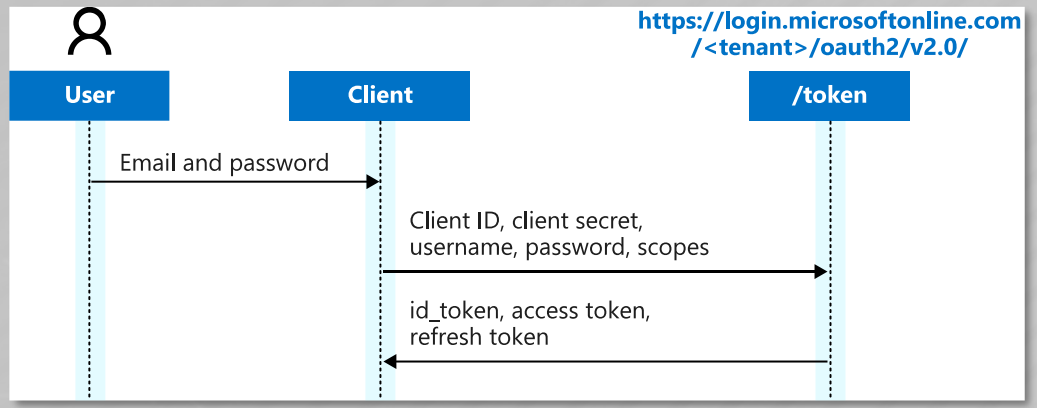
AUTHENTICATE TO GRAPH API

GRANT TYPES

Password

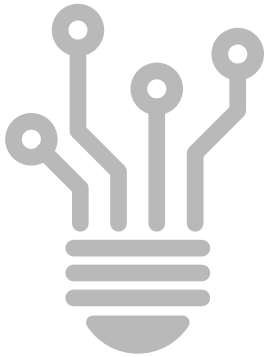
Required POST Body:

- Grant_Type = Password
- Client_ID = “{Azure App Client ID}”
- Client_Secret = “{Azure App Client Secret}”
- Username = “{Username}”
- Password = “{Password}”
- Scope = https://graph.microsoft.com/{permission.code}



PASSWORD - STITCHING THE COMPONENTS

REQUESTING TOKEN



```
30  $ReqTokenBody = @{
31      Grant_Type    = "Password"
32      client_Id     = "8742dd6[redacted]B47e-e2b629fae020"
33      Client_Secret = "KqtvmBoat.v[y([redacted]SgJLz050"
34      Username      = "cloud[redacted].onmicrosoft.com"
35      Password      = "gUu[redacted]bIGS\"
36      Scope         = "https://graph.microsoft.com/Reports.Read.All"
37  }
38
39
40
41  $TokReqRes = Invoke-RestMethod -Uri "https://login.microsoftonline.com/[redacted].onmicrosoft.com/oauth2/v2.0/token" -Method POST -Body $ReqTokenBody
42  $TokReqRes
43
```

```
PROBLEMS 3   DEBUG CONSOLE   OUTPUT   TERMINAL                    2: PowerShell Integrate

access_token    : eyJ0eXAiOiJKV1QiLCJub25jZSI6IkFRQUJBQUFBQUFEQ29NcGpKWHJ4VHE5Vkc5dGUtN0ZYeVY1Q3BpV1dDNDFlbGgzQXF3bDRmZTlsb2RVWHJvODF6alFzcDFySll0eVNCWW16NEU2RFREMzVnN3ZmbVY0WWZ0bD
                  U2ak5QYnoxbXdsdFdPTzRvY2lBQSIsImFsZyI6IlJTMjU2IiwieDV0IjoiQ3RmUUM4TGUtOE5zQzdvQzJ6UWtacGNyZk9jIiwia2lkIjoiQ3RmUUM4TGUtOE5zQzdvQzJ6UWtacGNyZk9jIn0.eyJhdWQiOiJodHRw
                  czovL2dyYXBoLm1pY3Jvc29mdC5jb20iLCJpc3MiOiJodHRwczovL3N0cy53aW5kb3dzLm5ldC81YmZhOTM0Yy1iY2E5LTQ0YzUtOTBhNC1kOWEzNmNmZTEyYzAvIiwiaWF0IjoxNTU5OTU4NzkxLCJuYmYiOjE1NT
```

AUTHENTICATE TO GRAPH API

GRANT TYPES

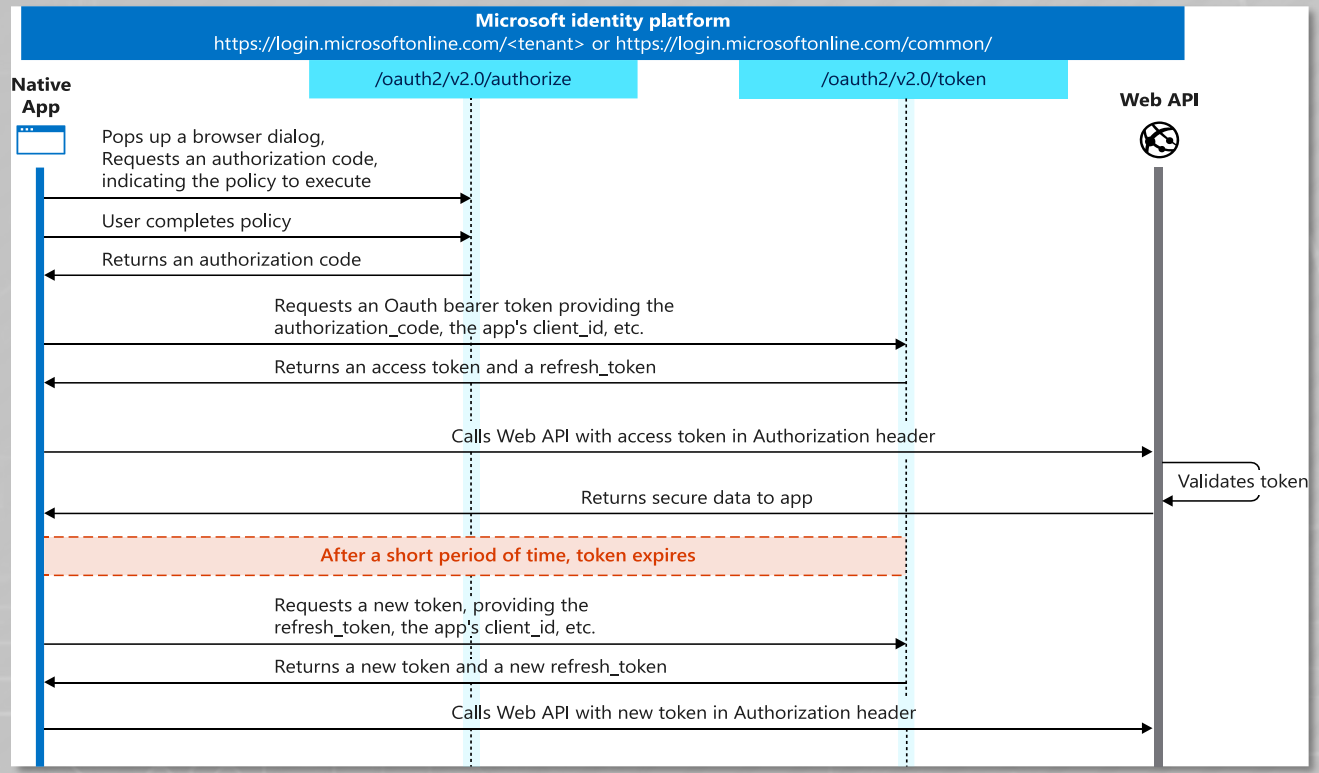
Authorization_Code

Auth Request URL:

- https://login.microsoftonline.com/{tenantID}/oauth2/v2.0/authorize?client_id={clientID}&redirect_uri={RedirectURI}&scope={Scope}&response_type=code

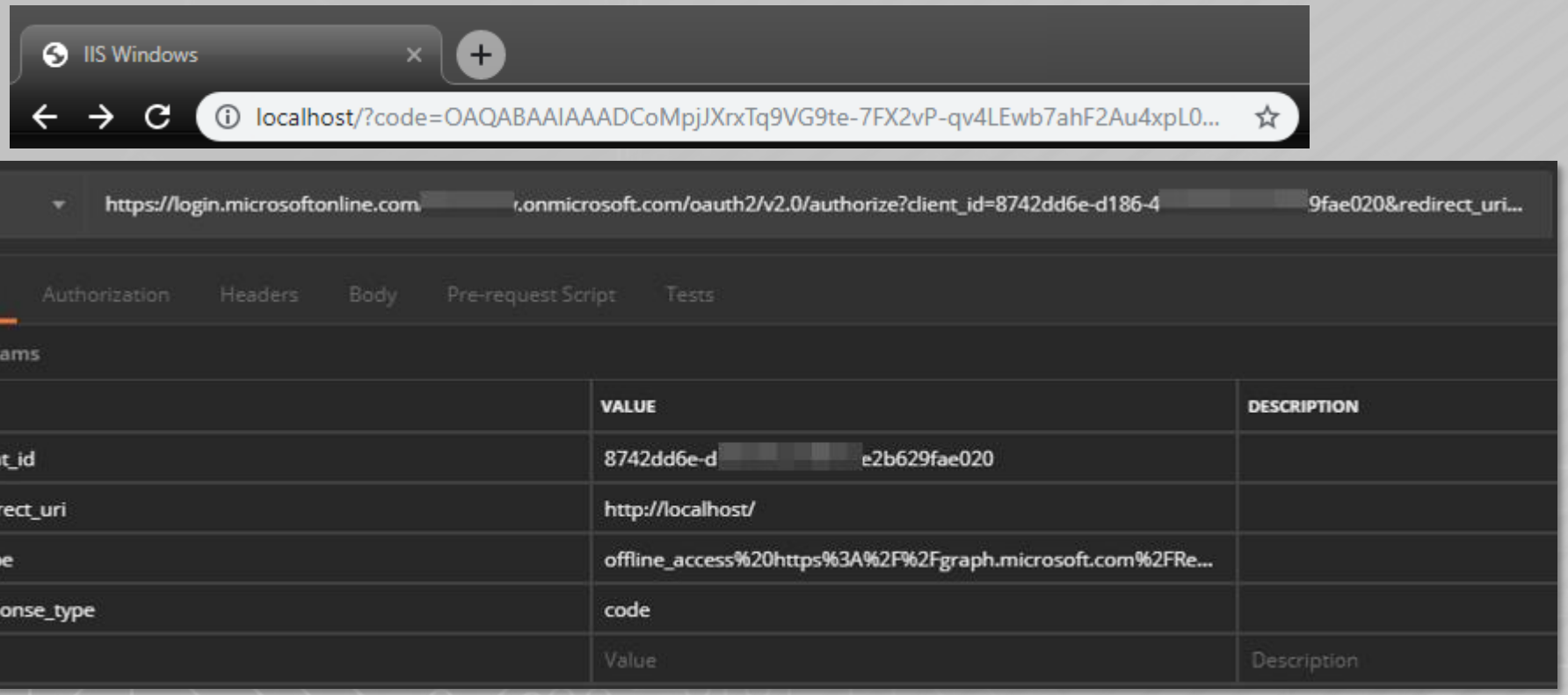
Token Request POST Body:

- Grant_Type = Authorization_Code
- Client_ID = “{ClientID}”
- Client_Secret = “{Client Secret}”
- Scope = https://graph.microsoft.com/{permission.code}
- Code = “{Authorization Code}”
- Redirect_Uri = {Redirect URI in the Azure App}



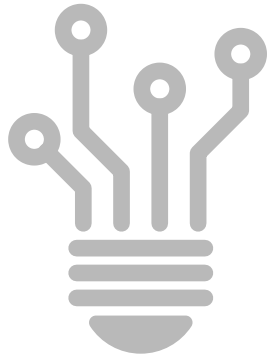
AUTHORIZATION CODE - STITCHING THE COMPONENTS

AUTHORIZATION



AUTHORIZATION CODE - STITCHING THE COMPONENTS

REQUESTING TOKEN



```
12  $AuthCode = "OAQABAAIAAADCoMpjJXrxTq9VG9te-7FXBF_jU73IqFoHuAZlOcmbg_BV7t8q40qVmz_Ft9j3VpLYQKk_0HOjl63HL1ygPARHwu0QgHmzur-8jN-SenbaHjuoN5kVgfcHuRDILtnUXdBxHIq
13
14  $ReqTokenBody = @{
15      Grant_Type    = "Authorization_Code"
16      Scope         = "https://graph.microsoft.com/Reports.Read.All"
17      redirect_uri  = "http://localhost/"
18      client_Id     = "8742dd6                    e2b629fae020"
19      Client_Secret = "KqtvmBoat          ol.wuSgJLz050"
20      code          = $AuthCode
21  }
22
23  $TokReqRes = Invoke-RestMethod -Uri "https://login.microsoftonline.com/          .onmicrosoft.com/oauth2/v2.0/token" -Method POST -Body $ReqTokenBody
24  $TokReqRes
```

PROBLEMS 3 DEBUG CONSOLE OUTPUT TERMINAL 2: PowerShell Integrate

```
expires_in     : 3600
ext_expires_in : 3600
access_token   : eyJ0eXAiOiJKV1QiLCJub25jZSI6IkFRQUJBQUFBQUFEQ29NcGpKWHJ4VHE5Vkc5dGUtN0ZYWEFjdk9wcFFuZUNuRFdPbTRLLTZHeXdjdUgwUUNwZzNsWFB2TFQ4UGNkTnRCenljbkVwYkROczd3VGI5T2RuT0JzR1
                 djQkVHV2JBOWVtaFpCZG9sdXlBQSIsImFsZyI6IlJTMjU2IiwieDV0IjoiQ3RmUUM4TGUtOE5zQzdvQzJ6UWtacGNyZk9jIiwia2lkIjoiQ3RmUUM4TGUtOE5zQzdvQzJ6UWtacGNyZk9jIn0.eyJhdWQiOiJodHRw
```

AUTHENTICATE TO GRAPH API

GRANT TYPES

Device_Code

Auth Request POST Body:

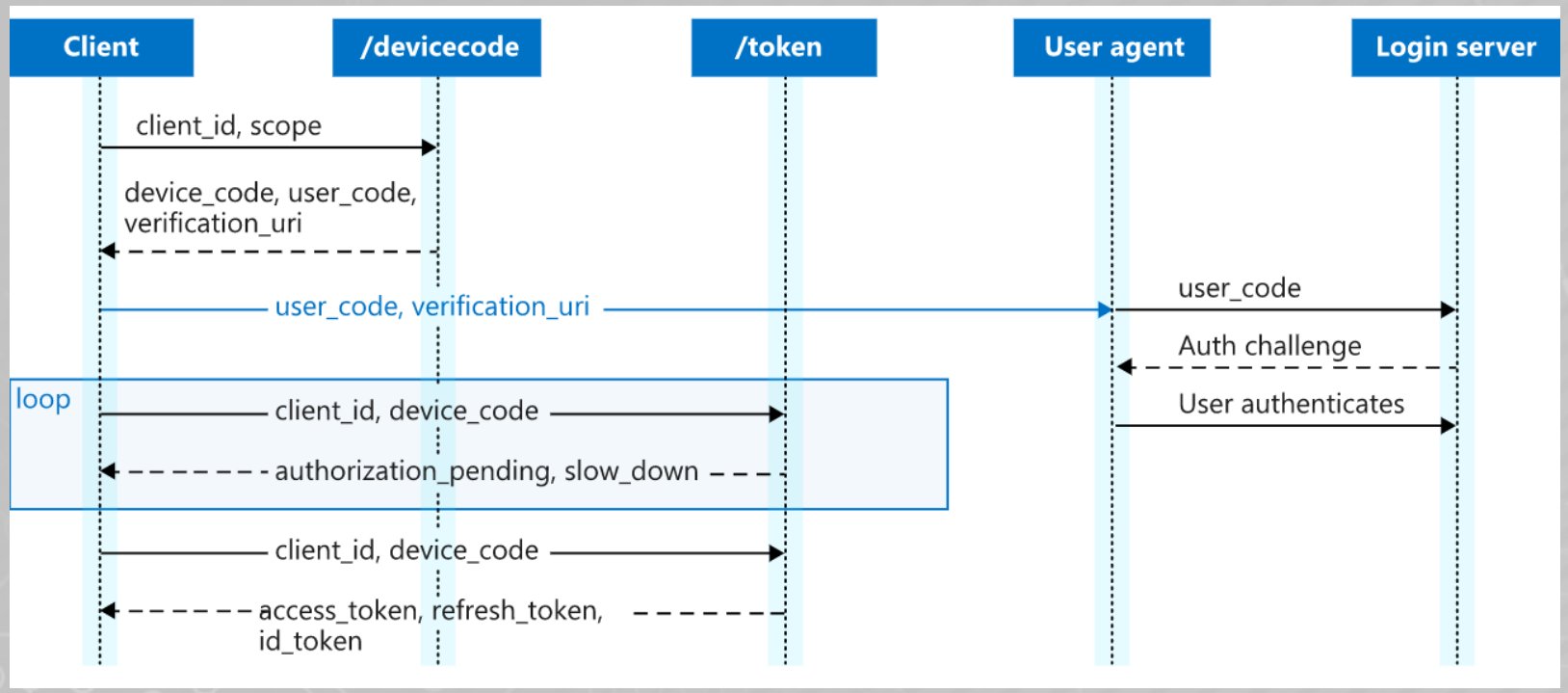
- Client_ID = “{Azure App Client ID}”
- Code = “{Device Code}”

Send to:

- https://login.microsoftonline.com/{tenant}/oauth2/v2.0/devicecode

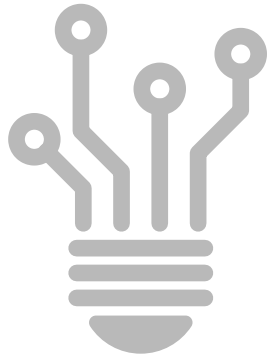
Token Request POST Body:

- Grant_Type = “Device_Code”
- Client_ID = “{Azure App Client ID}”
- Code = “{Device Code}”



DEVICE CODE - STITCHING THE COMPONENTS

AUTHORIZATION REQUEST



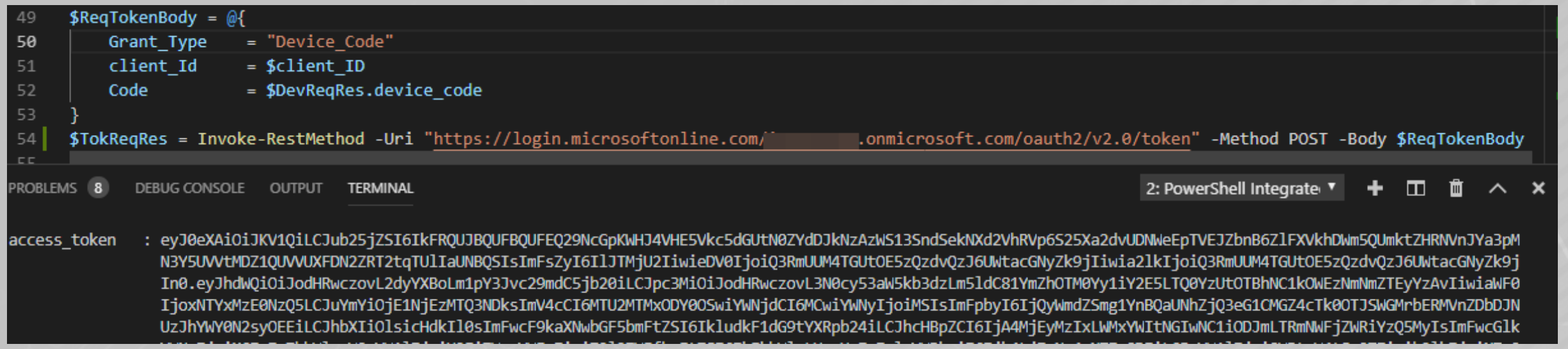
```
43  $DevReqBody = @{
44      Client_ID = $Client_ID
45      Scope     = "user.read offline_access Reports.Read.All"
46  }
47  $DevReqRes = Invoke-RestMethod -Uri "https://login.microsoftonline.com/          .onmicrosoft.com/oauth2/v2.0/devicecode" -Body $DevReqBody
48
```

PROBLEMS 8 DEBUG CONSOLE OUTPUT TERMINAL 2: PowerShell Integrate

```
user_code        : A2N7MXSQG
device_code      : AAQABAAEAAADCoMpjJXrxTq9VG9te-7FXAPhMPEKwy8Lj6hx13JO3kaXmoUjUEKHadRzw7x1Ej2bKtwlkq6EhhaywNgkJKG_dWJDla_dZ7fMCETTw4KrI21lCEHOUA
                   LC-BgM0Tnc4P2GJnTmEP0MrH5bmSnyNDAgk6_TpEkhTpyGNsxCIHw3TJiAA
verification_uri : https://microsoft.com/devicelogin
expires_in       : 900
interval         : 5
message          : To sign in, use a web browser to open the page https://microsoft.com/devicelogin and enter the code A2N7MXSQG to authenticate.
```

DEVICE CODE - STITCHING THE COMPONENTS

REQUESTING TOKEN



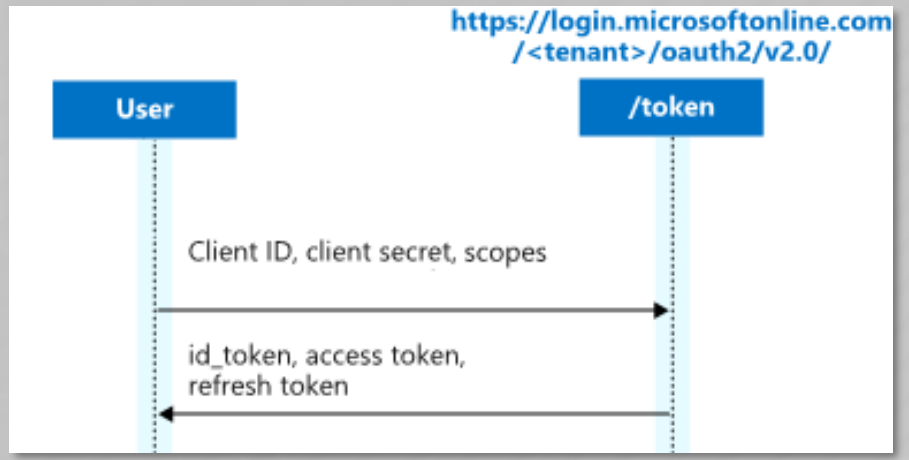
AUTHENTICATE TO GRAPH API

GRANT TYPES

Refresh_Token

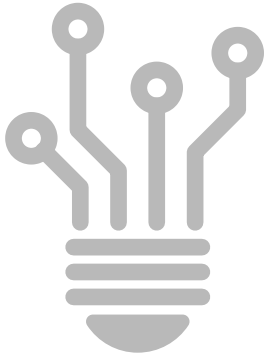
Required POST Body:

- Grant_Type = Refresh_Token
- Client_ID = “{Azure App Client ID}”
- Client_Secret = “{Azure App Client Secret}”
- Refresh_Token = “{Refresh Token}”
- Redirect_URI = “{Redirect URI}”
- Scope = https://graph.microsoft.com/{permission.code}



REFRESH TOKEN - STITCHING THE COMPONENTS

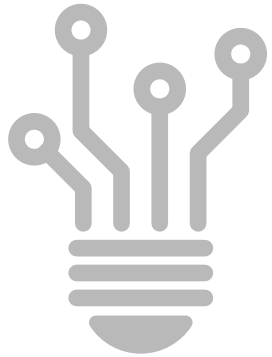
REQUESTING TOKEN



```
access_token  : eyJ0eXAiOiJKV1QiLCJub25jZSI6IkFRQUJBQUFBQUFEQ29NcGpKWHJ4VHE5Vkc5dGUtN0ZYQm1mRmZHNkJnVGQ4MDMzU3k1QmZTUUtTUmg2UERXNHhBMWZJRzNXNTl2bFQ5WUFoaXludTAwV2hFSVNaeFlsTERHaD
                UtQVl2ckhRREJNeXE3UkZaaVNBQSIsImFsZyI6IlJTMjU2IiwieDV0IjoiQ3RmUUM4TGUtOE5zQzdvQzJ6UWtacGNyZk9jIiwia2lkIjoiQ3RmUUM4TGUtOE5zQzdvQzJ6UWtacGNyZk9jIn0.eyJhdWQiOiJodHRw
                czovL2dyYXBoLm1pY3Jvc29mdC5jb20iLCJpc3MiOiJodHRwczovL3N0cy53aW5kb3dzLm5ldC81YmZhOTM0Yy1iY2E5LTQ0YzUtOTBhNC1kOWEzNmNmZTEyYzAvIiwiaWF0IjoxNTU5OTU3NTgzLCJuYmYiOjE1NT
                k5NTc1ODMsImV4cCI6MTU1OTk2MTQ4MywiYWNjdCI6MCwiYWNyIjoiMSIsImFpbyI6IkFTUUEyLzhMQUFBQTZ4UGNnOGFiZVNpNlBHazYrR3NLK1RyTVl0MmU2SHJ3NUZxYWhtVG85Q1U9IiwiYW1yIjpbInB3ZCJd
                LCJhcHBfZGlzcGxheW5hbWUiOiJPMzY1VXNhZ2VSZXBvcnQiLCJhcHBpZCI6Ijg3NDJkZDZlLWQxODYtNDVjNC04NDdlLWUyYjYyOWZhZTAyMCIsImFwcGlkYWNyIjoiMSIsImZhbWlseV9uYW1lIjoiU2FiZWxsYW
                5vIiwiZ2l2ZW5fbmFtZSI6IkFkbWluLUpvUyIsImlwYWRkciI6Ijk4LjIyNy4xNTIuODEiLCJuYW1lIjoiQWRtaW4tSm9TIiwib2lkIjoiNTc0ZDBlMWEtYWYwNi00YmJhLWI5NzUtZTc2ZmIxZDA2MzZjIiwib25w
                cmVtX3NpZCI6IlMtMS01LTIxLTE0MTcwMDEzMzMtMTQ4MjQ3NjUwMS03MjUzNDU1NDMtNDc5OTciLCJwbGF0ZiI6IjMiLCJwdWlkIjoiMTAwM0JGRkRBRDIyMjFBQSIsInNjcCI6IkRpcmVjdG9yeS5BY2Nlc3NBc1
                VzZXIuQWxsIERpcmVjdG9yeS5SZWFkLkFsbCBEaXJlY3RvcnkuUmVhZFdyaXRlLkFsbCBGaWxlcy5SZWFkIE1haWwuUmVhZCBNYWlsLlJlYWQuU2hhcmVkIE1haWwuUmVhZFdyaXRlIE1haWwuUmVhZFdyaXRlLlNo
                YXJlZCBNYWlsLlNlbmQgTWFpbC5TZW5kLlNoYXJlZCBNYWlsYm94U2V0dGluZ3MuUmVhZCBNYWlsYm94U2V0dGluZ3MuUmVhZFdyaXRlIFJlcG9ydHMuUmVhZC5BbGwgVXNlci5SZWFkIFVzZXIuUmVhZFdyaXRlLkFsbCBw
                Nlci5SZWFkQmFzaWMuQWxsIFVzZXIuUmVhZFdyaXRlIFVzZXIuUmVhZFdyaXRlLkFsbCBwcm9maWxlIG9wZW5pZCBlbWFpbCIsInNpZ25pbl9zdGF0ZSI6WyJrbXNpIl0sInN1YiI6Imo2TTA4cjdOOHY0M1NUUHRP
                Si1VTWQ5U000bFFXdm5Gc2tLV2dqaDhhM3MiLCJ0aWQiOiI1YmZhOTM0Yy1iY2E5LTQ0YzUtOTBhNC1kOWEzNmNmZTEyYzAiLCJ1bmlxdWVfbmFtZSI6IkFkbWluLUpvU0BpbnZlbmVyZ3lsbGMuY29tIiwidXBuIj
                oiQWRtaW4tSm9TQGludmVuZXJneWxsYy5jb20iLCJ1dGkiOiJqY0FSSnBSa1UwS0ZoMjhOQWZ0YUFBIiwidmVyIjoiMS4wIiwid2lkcyI6WyI2MmU5MDM5NC02OWY1LTQyMzctOTE5MC0wMTIxNzcxNDVlMTAiXSwi
                eG1zX3N0Ijp7InN1YiI6Im8zaFVUZE9aZHFmS2FKWE9icmJKWkNKVnlmeTY2X19PWEJFcXBjVG5VX00ifSwieG1zX3RjZHQiOjEzNTUxNzg3ODB9.eu_aESvMPtiVwTPYGU704IoUQPdNPeB-rFahP-lF4gIyOkEkU
                gtRNHb5S-3d151qvE-SCAY4F6J7V5V2eNYfZvpphf61U-SOQEfF8M-Wguo_4MhjF3b4rUxTLP43fEnKCFWXEeNDkCzL8TrLflfN8yj_AIma2jwj3Nx74u_psQ37dvpMJiP7k6KeHKvjCi-2YHMCCfMS7-3kXReFWJ8
                SflMqOLLXG63ofXvbftT-Zy7VtYG_u_pvEH07lapJgQtHA6s3Mykt-ionsavVvTLw2Y4pwalidMkUNkSzVBrmQal-r_z0xdyKhpV6I1n6a-SxKTgiEMFqIrNF1uaarHQzzA
refresh_token : OAQABAAAAAADCoMpjJXrxTq9VG9te-7FXBrbRiWJwFopprD9e0pLl-_mHoJKIWpQy4xIVLB85xtzJwE5mjDnaRLvv0ImRQFHYyEJu4dxeVJFKyF2B-rKXQIC2xzKxB3haLj6KUWuQIj2heC9UnC_LRwDM7RGOyd76T
                c0zhnfiGUliVPguOg1yzDCVjloCXROmrMRyoXdP1Vu8BYpjW_vTNgddO2FezVuMI3zkTCAIn_LtzYFhqrpnYpGTQw6XM8go08BD04heDCsZoU60QAMk8gjMZelqtMdg3mQcRv1dytOXqXC1YnwIVaGU7Rj603jhijI
                AjGnQFSojUPDJuhpuAr6YGdwXCJC73cla3rI_4NmCvmFrJPxxfoVFiDtwJUDGjsYkMvwvJXjbg1z6qw_5Zvy0GOsJaOvXirV2hRGpgtJrXyihorR8haFwtmkJSos-qRbnHL36kKwV1W5QmkcPBcRl1p0Tt8VskNH-J
```

REFRESH TOKEN - STITCHING THE COMPONENTS

REQUESTING TOKEN

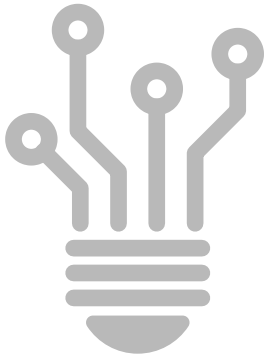


```
31  $ReqTokenBody = @{
32      Grant_Type    = "Refresh_Token"
33      client_Id     = "8742[redacted]4-847e-e2b629fae020"
34      Client_Secret = "KqtvmBoat[redacted]wuSgJLz050"
35      Refresh_TOken = $TokReqRes.refresh_token
36  }
37
38
39  $TokReqRes = Invoke-RestMethod -Uri "https://login.microsoftonline.com/[redacted].onmicrosoft.com/oauth2/v2.0/token" -Method POST -Body $ReqTokenBody
40  $TokReqRes
```

PROBLEMS 3 DEBUG CONSOLE OUTPUT TERMINAL 2: PowerShell Integrate

```
access_token   : eyJ0eXAiOiJKV1QiLCJub25jZSI6IkFRQUJBQUFBQUFEQ29NcGpKWHJ4VHE5Vkc5dGUtN0ZYQm1mRmZHNkJnVGQ4MDMzU3k1QmZTUUtTUmg2UERXNHhBMWZJRzNXNTl2bFQ5WUFoaXludTAwV2hFSVNaeFlsTERHaD
                 UtQVl2ckhRREJNeXE3UkZaaVNBQSIsImFsZyI6IlJTMjU2IiwieDV0IjoiQ3RmUUM4TGUtOE5zQzdvQzJ6UWtacGNyZk9jIiwia2lkIjoiQ3RmUUM4TGUtOE5zQzdvQzJ6UWtacGNyZk9jIn0.eyJhdWQiOiJodHRw
                 czovL2dyYXBoLm1pY3Jvc29mdC5jb20iLCJpc3MiOiJodHRwczovL3N0cy53aW5kb3dzLm5ldC81YmZhOTM0Yy1iY2E5LTQ0YzUtOTBhNC1kOWEzNmNmZTEyYzAvIiwiaWF0IjoxNTU5OTU3NTgzLCJuYmYiOjE1NT
```

DEMO – BRAD



Questions / Open Discussion

HELPING YOU THRIVE THROUGH TECHNOLOGY AND TALENT

P S M PORCARO STOLAREK METE PARTNERS, LLC