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# Getting Up to Speed with Microsoft Graph Development

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# Who are you?

## Looking for...

- Building apps to access M365 user and org data

- Reducing complexity of learning 50+ APIs

- Managing permissions to these data sources

# About Me

Principal PM, Microsoft Graph

Microsoft 365 Dev / Admin, Azure Dev

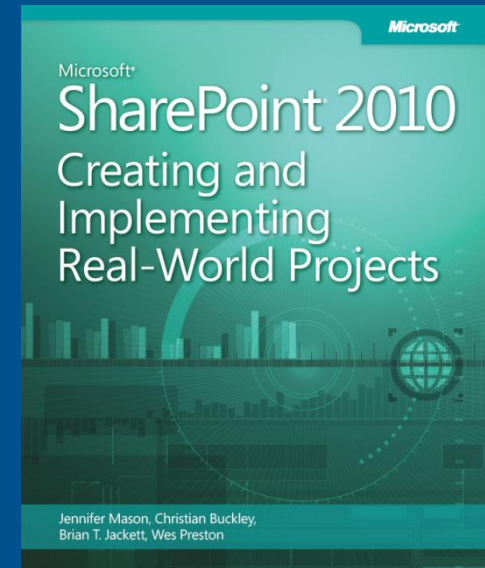
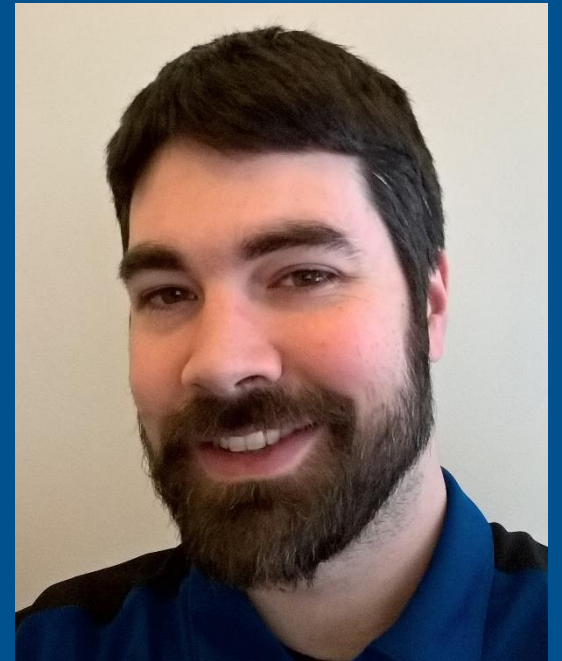
Organizer

- Microsoft Graph TAP
- #30DaysMSGraph

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Is this how you view  
learning Microsoft Graph?

Microsoft  
Graph





Let's embark on this  
journey together...



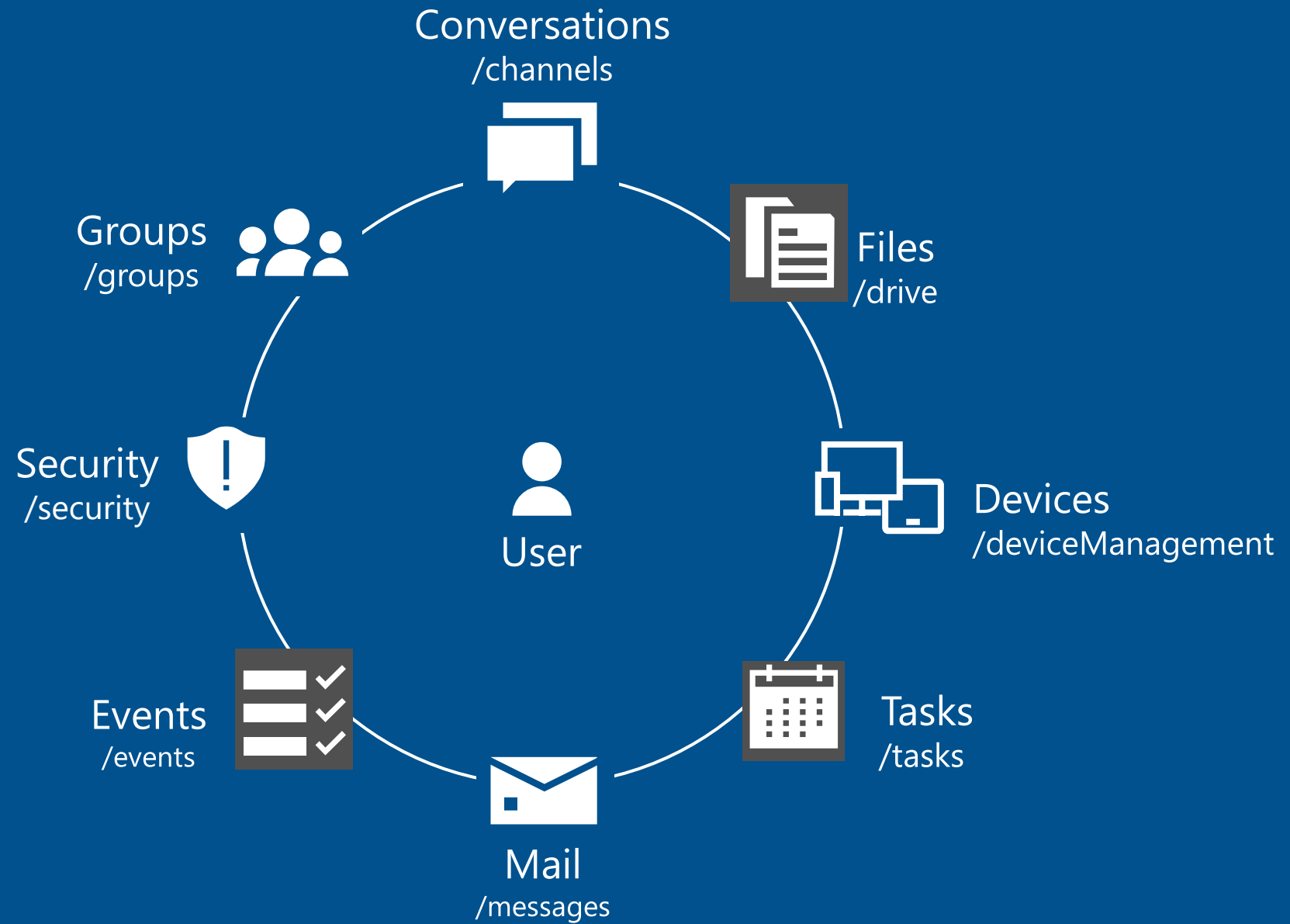
# Agenda

Microsoft  
Graph

Azure AD  
Apps

SDKs and  
Toolkit

Demos





# Microsoft Graph Overview

Access user, group, and organizational data

## Extend Microsoft 365 experiences



Documents



Conversations



Portals



Timeline



Search

## Build your experience



Web apps



Bots & agents



Device & native



Daemon apps



Workflow automation



Analytics apps

Microsoft Graph API



## Microsoft 365



Users



Chats



Files



Devices



Mail



Alerts



Events



Security



Search



Events



# Request Syntax

`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/james`
- Property: `/users/james/department`
- Traverse to related resources via navigations: `/users/james/events`
- Query parameters: `/users/james/events?$top=5`
  - Format results: `$select` | `$orderby`
  - Control results: `$filter` | `$expand`
  - Paging: `$top` | `$skip` | `$skiptoken`

# Graph Documentation

Microsoft Graph Documentation

<https://aka.ms/graph>

How to: Update Graph documentation

<https://aka.ms/HowToUpdateMSFTDocs>



# Graph Explorer - <https://aka.ms/ge>

The screenshot shows the Microsoft Graph Explorer interface. The top navigation bar includes the title 'Graph Explorer', a tenant selector 'Tenant Contoso', and a user profile 'MA'. The left sidebar contains a search bar and a list of sample queries under the 'Getting Started (8)' section, including 'my profile', 'my profile (beta)', 'my photo', 'my mail', 'all the items in my drive', 'items trending around me', 'my manager', and 'my To Do task lists'. The main area is divided into two tabs: 'Request body' and 'Response preview'. The 'Request body' tab is active, showing a URL bar with 'https://graph.microsoft.com/v1.0/me', a dropdown for 'GET', and a dropdown for 'v1.0'. Below the URL bar are buttons for 'Modify permissions' and 'Access token'. The 'Response preview' tab is also visible, showing buttons for 'Code snippets', 'Toolkit component', and 'Adaptive cards'. The 'Run query' button is located in the top right corner of the main area.

Graph Explorer

Tenant Contoso MA

Sample queries Resources

Search sample queries

See more queries in the [Microsoft Graph API Reference docs](#).

Getting Started (8)

- GET my profile
- GET my profile (beta)
- GET my photo
- GET my mail
- GET all the items in my drive
- GET items trending around me
- GET my manager
- GET my To Do task lists

Applications (8)

Batching (2)

Compliance (beta) (10)

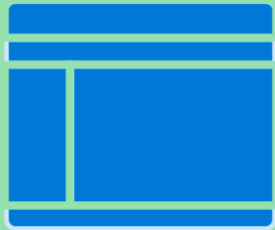
GET v1.0 https://graph.microsoft.com/v1.0/me

Run query

Request body Request headers Modify permissions Access token

Response preview Response headers Code snippets Toolkit component Adaptive cards Expand

# Demos



Graph Explorer



Azure AD Portal



Postman +  
Access Tokens



Visual Studio  
Code

# Agenda

Microsoft  
Graph

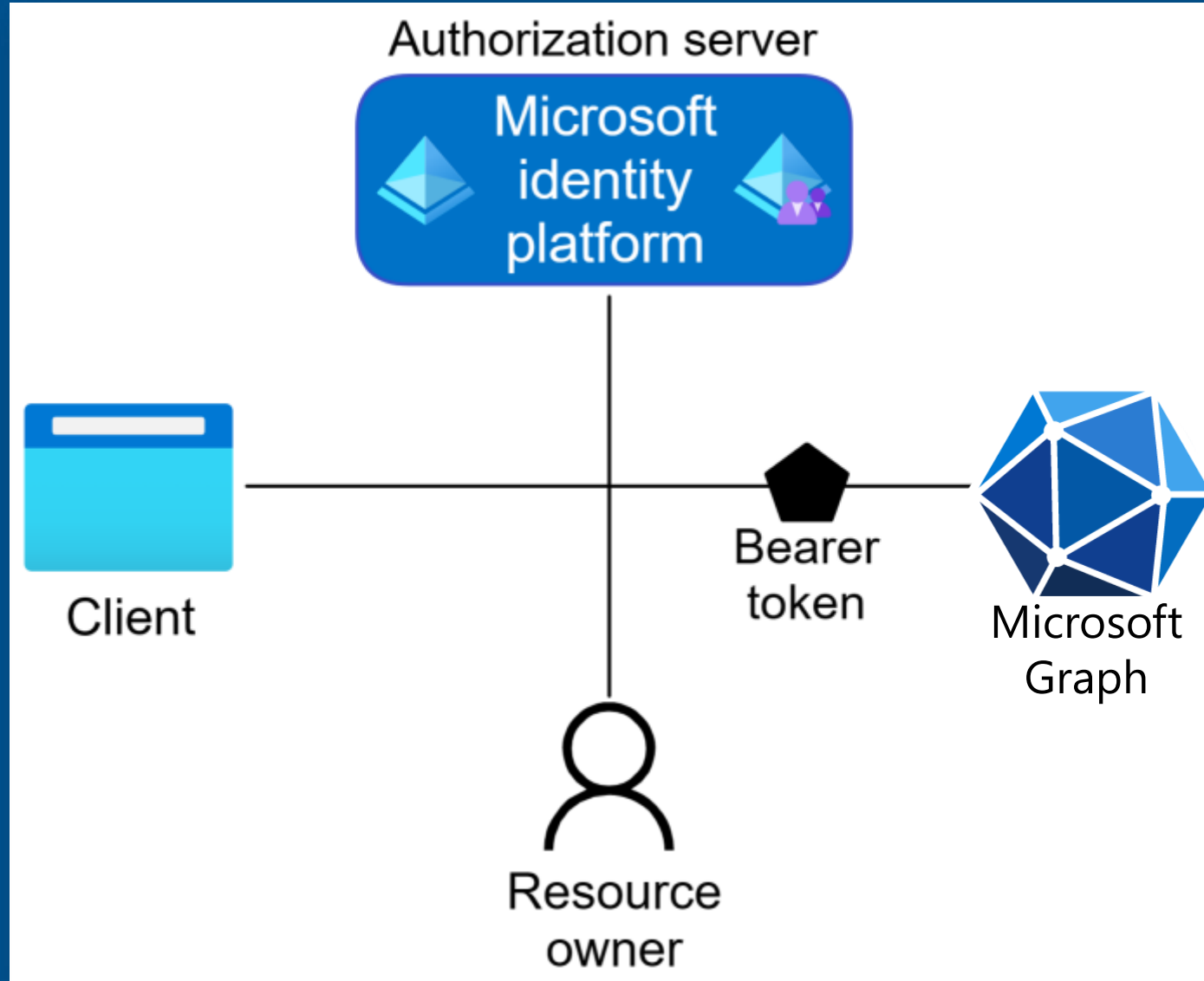
Azure AD  
Apps

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Toolkit

Demos



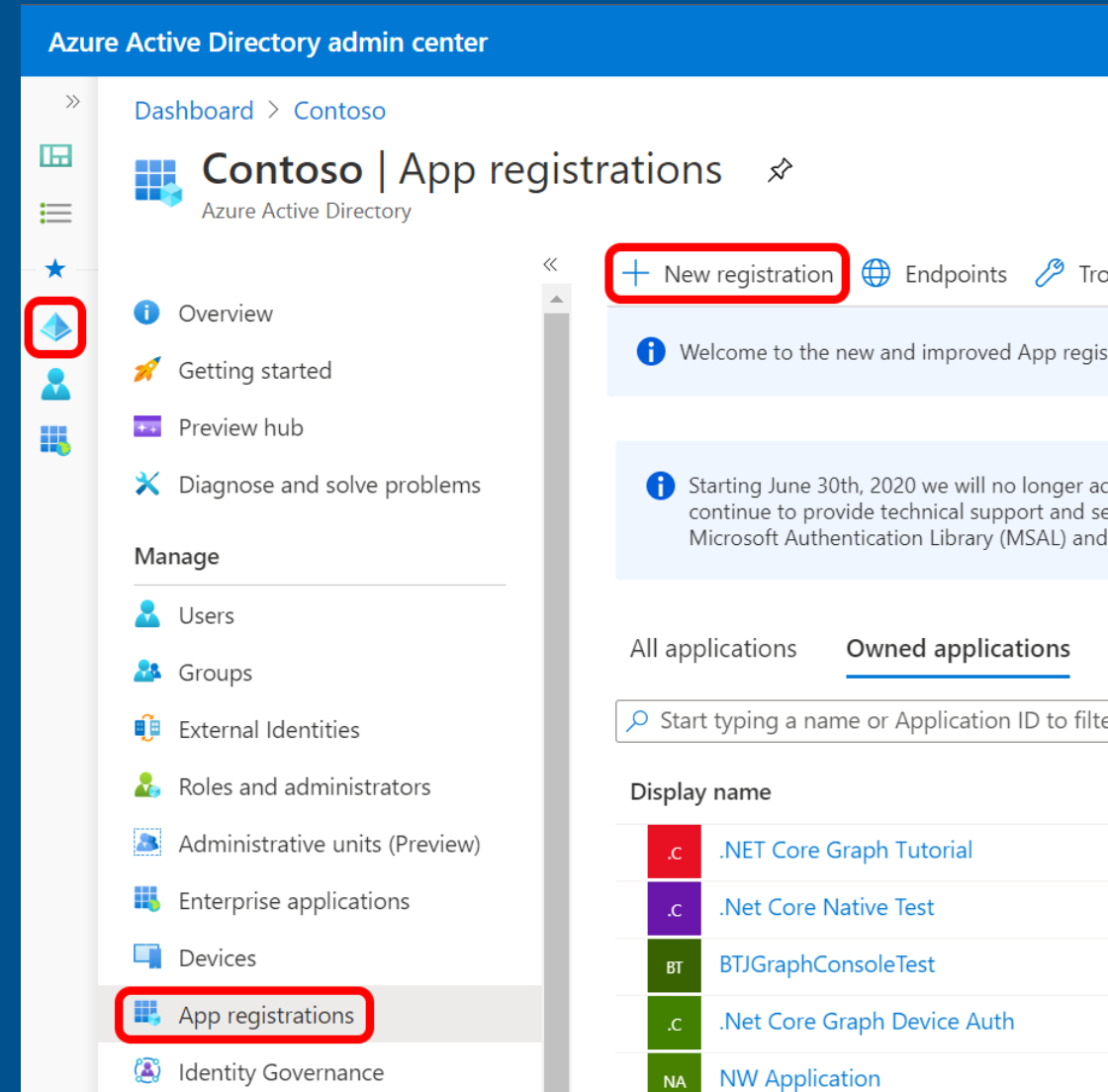
# Microsoft Graph Authentication



# Application Registration

- Application ID URI
- Reply URL and Redirect URI
- Application ID (Client ID)
- Key (Client Secret)

<https://aka.ms/AppRegistrations>



The screenshot displays the Azure Active Directory admin center interface. The top navigation bar shows 'Azure Active Directory admin center' and 'Dashboard > Contoso'. The main heading is 'Contoso | App registrations'. A red box highlights the 'New registration' button in the top right corner. Another red box highlights the 'App registrations' link in the left-hand navigation menu. The right-hand pane shows a list of applications under the 'Owned applications' tab. The list includes applications with display names like '.NET Core Graph Tutorial', '.Net Core Native Test', 'BTJGraphConsoleTest', '.Net Core Graph Device Auth', and 'NW Application'.

Display name
.NET Core Graph Tutorial
.Net Core Native Test
BTJGraphConsoleTest
.Net Core Graph Device Auth
NW Application

# Microsoft APIs



## Microsoft Graph

Take advantage of the tremendous amount of data in Office 365, Enterprise Mobility + Security, and Windows 10. Access Azure AD, Excel, Intune, Outlook/Exchange, OneDrive, OneNote, SharePoint, Planner, and more through a single endpoint.



### Azure Communication Services

Rich communication experiences with the same secure CPaaS platform used by Microsoft Teams



### Azure Rights Management Services

Allow validated users to read and write protected content



### Azure Service Management

Programmatic access to much of the functionality available through the Azure portal



### Data Export Service for Microsoft Dynamics 365

Export data from Microsoft Dynamics CRM organization to an external destination



### Dynamics 365 Business Central

Programmatic access to data and functionality in Dynamics 365 Business Central



### Dynamics CRM

Access the capabilities of CRM business software and ERP systems



### Flow Service

Embed flow templates and manage flows



### Intune

Programmatic access to Intune data



### Office 365 Management APIs

Retrieve information about user, admin, system, and policy actions and events from Office 365 and Azure AD activity logs



### OneNote

Create and manage notes, lists, pictures, files, and more in OneNote notebooks



### Power BI Service

Programmatic access to Dashboard resources such as Datasets, Tables, and Rows in Power BI



### SharePoint

Interact remotely with SharePoint data



### Skype for Business

Integrate real-time presence, secure messaging, calling, and conference capabilities



### Universal Print

Programmatic access to create and manage printer and print job resources



### Yammer

Access resources in the Yammer web interface (e.g. messages, users, groups etc.)

## More Microsoft APIs



### Azure Batch

Schedule large-scale parallel and HPC applications in the cloud



### Azure Cosmos DB

Fast NoSQL database with open APIs for any scale.



### Azure Data Catalog

Programmatic access to Data Catalog resources to register, annotate and search data assets



### Azure Data Explorer

Perform ad-hoc queries on terabytes of data to build near real-time and complex analytics solutions



### Azure Data Explorer (with Multifactor Authentication)

Perform ad-hoc queries on terabytes of data to build near real-time and complex analytics solutions



### Azure Data Lake

Access to storage and compute for big data analytic scenarios



### Azure DevOps

Integrate with Azure DevOps and Azure DevOps server



### Azure Import/Export

Programmatic control of import/export jobs



### Azure Key Vault

Manage your key vaults as well as the keys, secrets, and certificates within your Key Vaults



### Azure Maps

Create location-aware web and mobile applications using simple and secure geospatial services, APIs, and SDKs in Azure.



### Azure Purview

Unified data governance service that helps you manage and govern your on-premises, multi-cloud, and software-as-a-service (SaaS) data



### Azure Quantum

Programmatic access to create and manage jobs in Azure Quantum



### Azure Storage

Secure, massively scalable object and data lake storage for unstructured and semi-structured data



### Customer Insights

Create profile and interaction models for your products



### Dynamics ERP

Programmatic access to Dynamics ERP data



### PowerApps Runtime Service

Powerful data storage, modeling, security and integration capabilities



### Speech

Create powerful speech-enabled features using speech to text and text to speech conversion



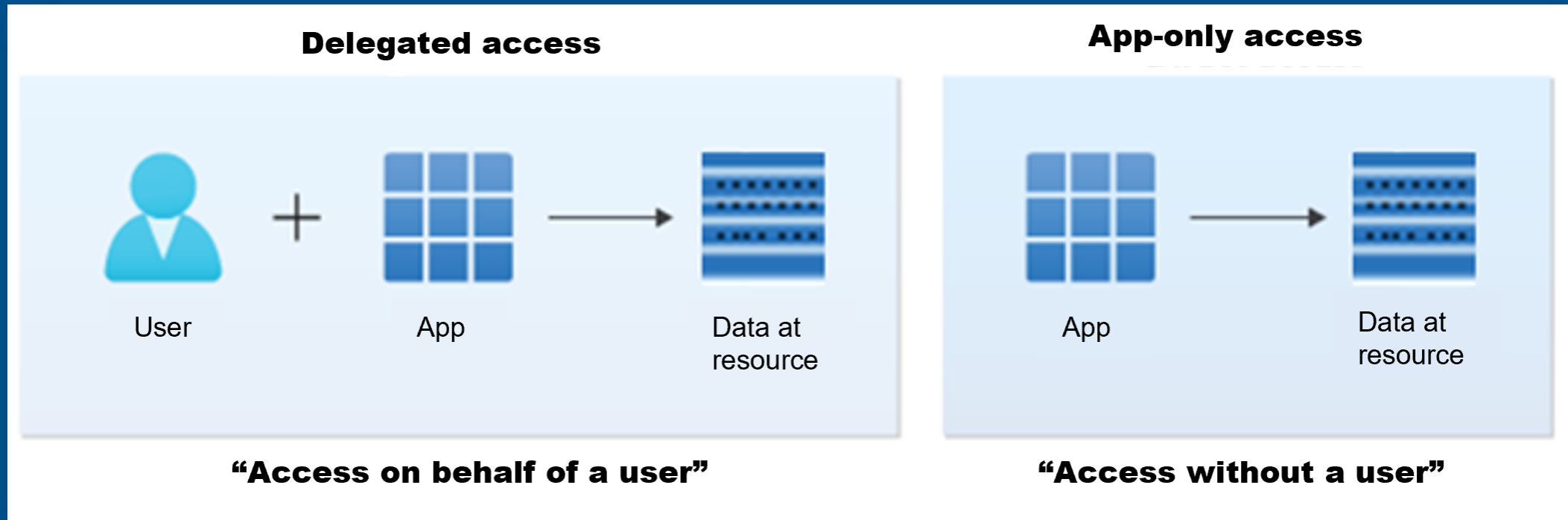
### Windows Push Notification Services (WNS)

Integrate with Windows Push Notification Services (WNS) to send toast, tile, badge, and raw updates from your own cloud service to your app client on the Windows platform.



# Types of permissions

- Microsoft Identity Platform defines two kinds of permissions
  - Delegated permissions
  - Application (app-only) permissions



# Application Registration – Permissions

Format

Resource.Operation.Constraint

- Ex. User.Read.All

## ▼ Microsoft Graph (4)

[Mail.ReadWrite](#)

Delegated

Read and write access to user mail

[Sites.ReadWrite.All](#)

Application

Read and write items in all site collections (pr...

[User.Read](#)

Delegated

Sign in and read user profile

[User.Read.All](#)

Application

Read all users' full profiles

# Application Registration – Consent

- Static user consent
- Dynamic user consent
- Admin consent



admin@mod01.onmicrosoft.com

## Permissions requested

Graph explorer

[App info](#)

This app would like to:

- ✓ Maintain access to data you have given it access to
- ✓ Read and write all OneNote notebooks that you can access
- ✓ Edit or delete items in all site collections
- ✓ Read and update your profile
- ✓ Read all users' basic profiles
- ✓ Read and write access to your mail
- ✓ Have full access to your calendars
- ✓ Have full access of your contacts
- ✓ Have full access to all files you have access to
- ✓ Create, read, update and delete your tasks and projects
- ✓ Read your relevant people list
- ☐ Consent on behalf of your organization

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



# Client secret vs Certificate key

Azure Active Directory admin center

Dashboard > Contoso | App registrations > .Net Core Native Test

## .Net Core Native Test | Certificates & secrets

Search

Got feedback?



Credentials enable confidential applications to identify themselves to the authentication service when receiving tokens at a web addressable location (using an HTTPS scheme). For a higher level of assurance, we recommend using a certificate (instead of a client secret) as a credential.

Application registration on certificates, secrets and federated credentials can be found in the tabs below.

**Certificates (0)** **Client secrets (1)** Federated credentials (0)

A secret string that the application uses to prove its identity when requesting a token. Also can be referred to as application password.

+ New client secret

Description	Expires	Value ⓘ	Secret ID
Password uploaded on Mon Dec 27 2...	12/27/2023	v8-*****	bae5cbb7-a702-4f6e-ad86-651a1fa1...  

# OAuth 2.0 Authentication Flows

## Delegated permissions

- Authorization code (with PKCE)
- Implicit grant
- Integrated Windows authentication
- Device Code
- On-behalf-of

## Application permissions

- Client credentials grant

# Access Tokens

- Base64 encoded JWT (JSON Web Token)

- Decoded

Decoded Token

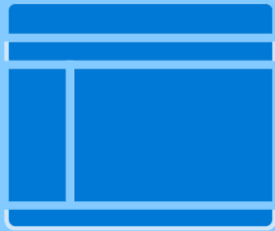
Claims

```
{
  "typ": "JWT",
  "nonce": "AQABAAAAAC5una0EUFgTIF8ElaxtWjTSk6Y9jfW4IaS10Ud-F68Qyuh11Jf3knhS6-SNet6GGIbLSe4owyWd3m7Xg4IbVNftuYcJ1UpDH8yLQapMgOXPSAA",
  "alg": "RS256",
  "x5t": "wULmYfsqdQuWtV_-hxVtDJJZM4Q",
  "kid": "wULmYfsqdQuWtV_-hxVtDJJZM4Q"
}.{
  "aud": "https://graph.microsoft.com",
  "iss": "https://sts.windows.net/11111111-1111-1111-1111-111111111111/",
  "iat": 1541378331,
  "nbf": 1541378331,
  "exp": 1541382231,
  "aio": "42RgYLhnP+OXutu2Hz//LD037+wZDQA=",
  "app_displayname": "BTJ-GraphPostmanTest",
  "appid": "11111111-1111-1111-1111-111111111111",
  "appidacr": "1",
  "idp": "https://sts.windows.net/11111111-1111-1111-1111-111111111111/",
  "oid": "11111111-1111-1111-1111-111111111111",
  "roles": [
    "Calendars.Read"
  ],
  "sub": "11111111-1111-1111-1111-111111111111",
  "tid": "11111111-1111-1111-1111-111111111111",
  "uti": "0wey_Yf5o0SM7_xC4_M9AA",
  "ver": "1.0",
  "xms_tcdt": 1506318668
}.[Signature]
```

eyJhdWQiOiJ1bWVudC5una0EUFgTIF8ElaxtWjTSk6Y9jfW4IaS10Ud-F68Qyuh11Jf3knhS6-SNet6GGIbLSe4owyWd3m7Xg4IbVNftuYcJ1UpDH8yLQapMgOXPSAA",  
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RwczovL3N0bYXQiOiJ1bWVudC5una0EUFgTIF8ElaxtWjTSk6Y9jfW4IaS10Ud-F68Qyuh11Jf3knhS6-SNet6GGIbLSe4owyWd3m7Xg4IbVNftuYcJ1UpDH8yLQapMgOXPSAA",  
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# Demos



Graph Explorer



Azure AD Portal



Postman +  
Access Tokens



Visual Studio  
Code

# Agenda

Microsoft  
Graph

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Apps

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Toolkit

Demos

# Microsoft Graph SDKs

Simplify building apps

- Retry logic
- Error handling
- Transparent authentication
- Payload compression
- ...and more





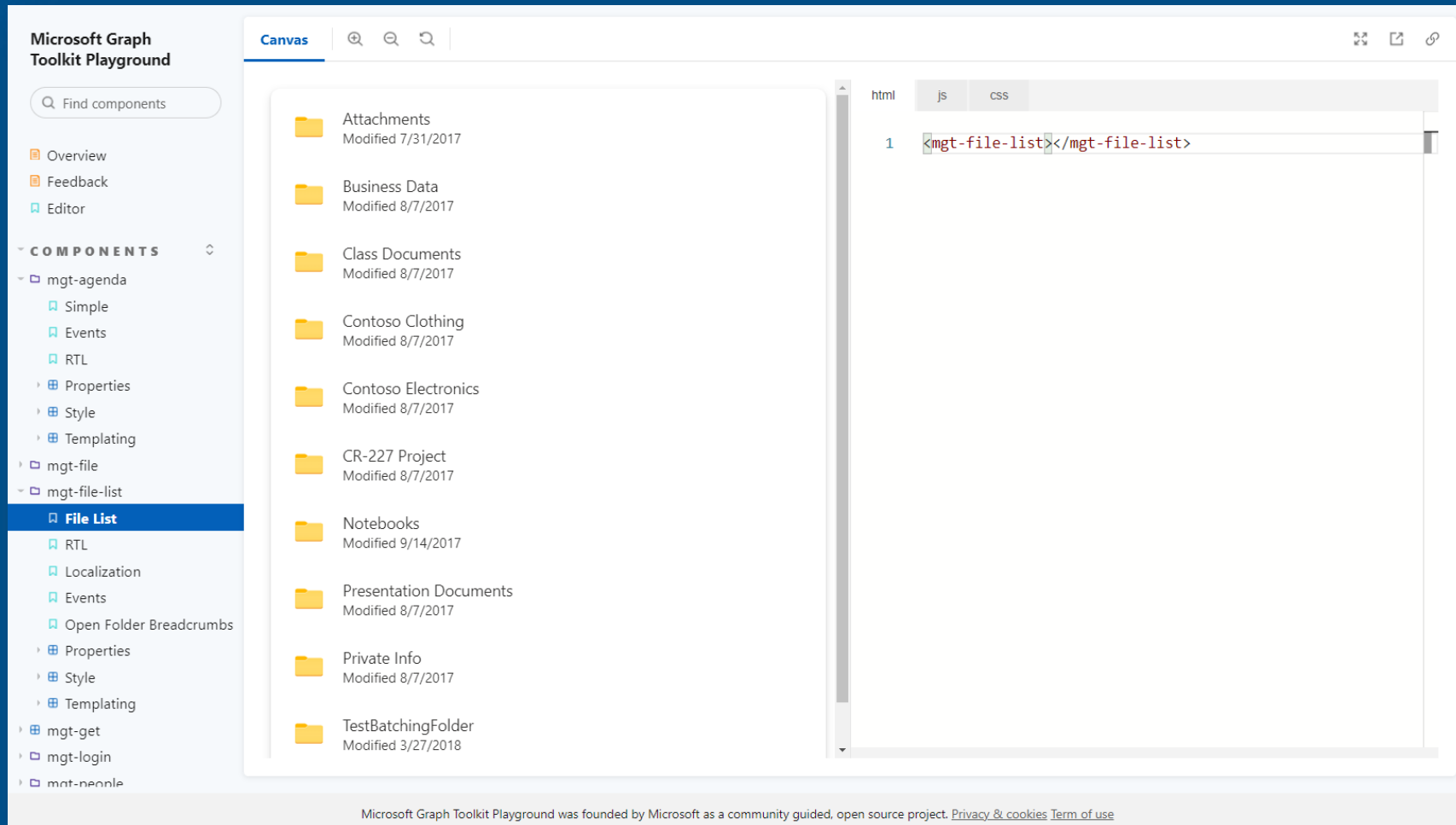
# Microsoft Graph Toolkit



The Microsoft Graph Toolkit is a collection of reusable, framework-agnostic components and authentication providers for accessing and working with Microsoft Graph. The components are fully functional, customizable, and work with any web framework and on all modern browsers.

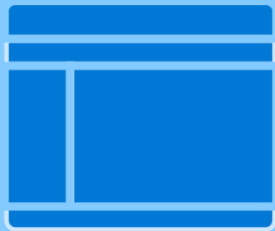
# Explore Graph Toolkit

- <https://aka.ms/mgt/dev>



# Demos

<https://aka.ms/GraphPostman>



Graph Explorer



Azure AD Portal

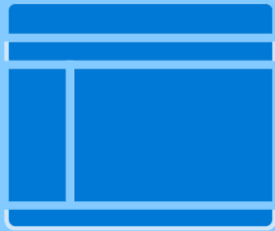


Postman +  
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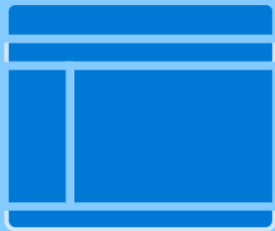
Postman +  
Access Tokens



Visual Studio  
Code

# Demos

<https://github.com/microsoftgraph/msgraph-dotnet-interactive-extension>



Graph Explorer



Azure AD Portal



Postman +  
Access Tokens



Visual Studio  
Code



Microsoft Graph Extension for Polygot Notebooks

**BONUS!**

# In Review: Session Objectives and Takeaways

## Session Objectives:

- Overview Microsoft Graph
- Azure AD applications and permissions
- SDKs and Graph Toolkit

## Key Takeaways:

- Graph Explorer and Postman for easy testing
- Use SDKs when possible





# Submit session feedback



# Q&A

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Credits:

Icons from Microsoft Azure  
Cloud and Enterprise Symbol / Icon Set  
from <http://aka.ms/azureicons>

