

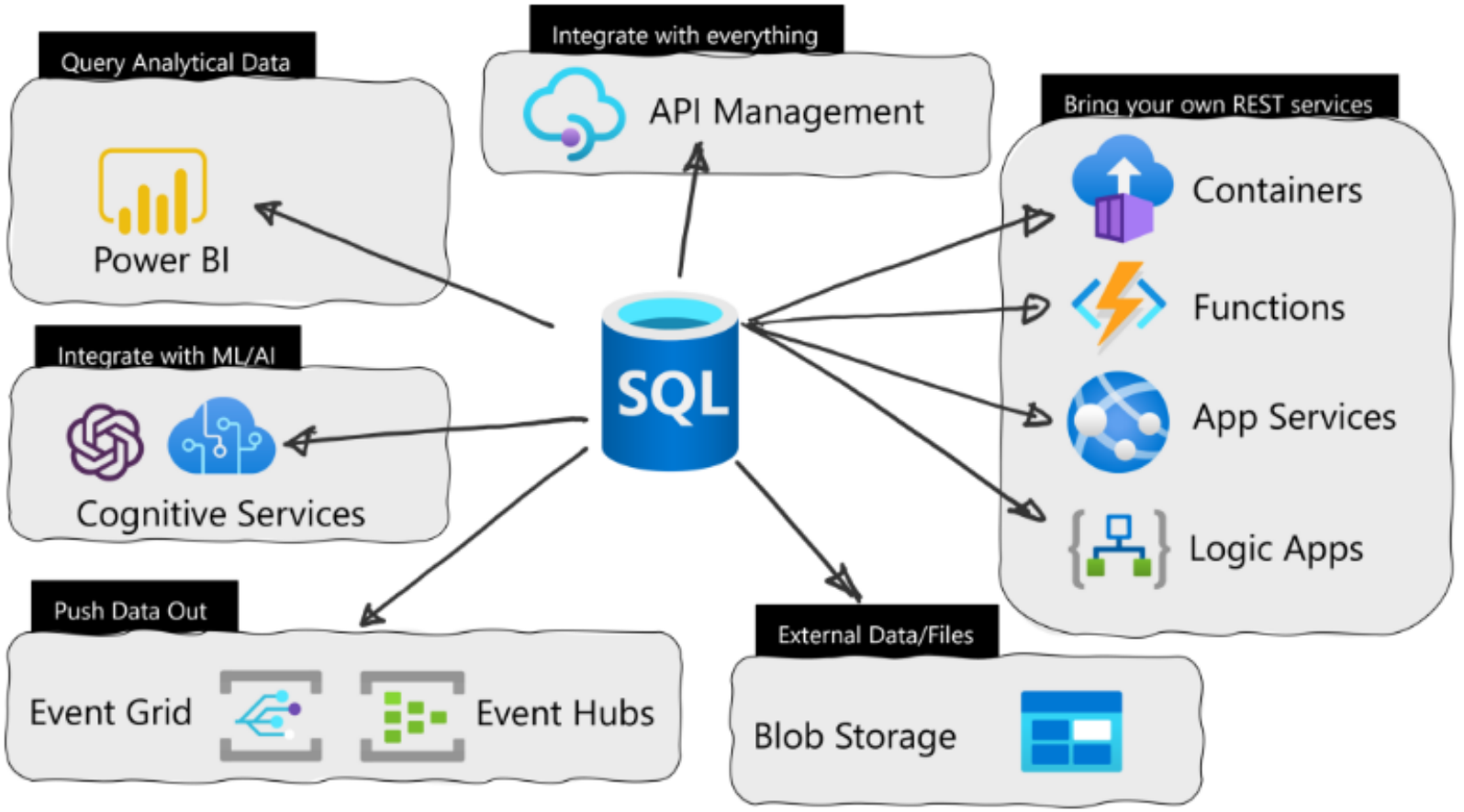
Using APIs in Azure SQL Server

Imke Feldmann

- Freelance Consultant
- www.TheBIccountant.com
- PBI Forum: @ImkeF
- @TheBIccountant
- ImkeFeldmann
- Imke Feldmann



Overview



Source: Summer 2023 Update for Azure SQL DB REST Endpoint Invocation (microsoft.com)

Using APIs in Azure SQL Server

- sp_invoke_external_rest_endpoint"-stored procedure
- Read
- Write
- Trigger (Automations like Azure Function, Logic App or Flow)
- Works with selected APIs (all Microsoft)
  - Power BI Rest API
  - Graph API
  - Flow API
  - Azure Blob Storage
  - … much more

Agenda

- Sp_invoke_external_endpoints
- API
- Authentication
- Parsing results
- Creating JSON
- Azure API Management
- Pagination

Prerequisites

- Azure SQL Server
- Networking – Firewall Rules: Exception for Azure Service

Syntax

```
EXEC @returnValue = sp_invoke_external_rest_endpoint
  [ @url = ] N'url'
  [ , [ @payload = ] N'request_payload‘ ]                    (or: Body)
  [ , [ @headers = ] N'http_headers_as_json_array‘ ]         (record/object)
  [ , [ @method = ] 'GET' | 'POST' | 'PUT' | 'PATCH' | 'DELETE' | 'HEAD' ]
  [ , [ @timeout = ] seconds ]
  [ , [ @credential = ] credential ]
  [ , @response OUTPUT ]
```

JSON

- JavaScript Object Notation
- Data interchange format
- text

- 2 structures
  - name/value pair(s) (object, record)
    - Lookup value by name-part
  - (ordered) list of values (array, list)
    - Lookup value by position

Record/object

```
{
„Name“: „Anton“,
 „City“: „Berlin“,
 „Age“: 34
}
```

List/array

```
[10,
 20,
 30]
```

```
{
„Name“: „Anton“,
 „City“: „Berlin“,
 „Age“: 34,
 „Numbers“:
      [10, 20, 30]
}
```

API

- **A**pplication **P**rogramming **I**nterface
- Set of rules and protocols that allows one piece of software or program to interact with another

API Elements

- Requests
- Endpoints
- HTTP Methods
- Headers
- Request Body
- Query parameters
- Authentication

- Response
- 2xx: successful
- 4xx and 5xx: error

- Result format:
  - JSON
  - XML
  - Text

Methods

• GET	• Get data from the server, read only
• POST	• Creating new resources
• PUT	• Update existing resource
• PATCH	• Partially update existing resource
• DELETE	• Remove resource
• HEAD	• Like GET, but requesting headers instead of the actual data

Body:
- JSON
- XML
- form data

Authentication

Method	object	Elements		
		Headers	Query String	Flow
API Key	string			
Bearer Token	temp string			
Basic Authentication	encrypted string			
OAuth 2.0	temp string			

DEMO

THE BICCOUNTANT

Allowed Authentication/Credentials

- Query string
- Headers
- Database scoped credentials
- Identity as either:
  - Managed Identity (System Assigned)
  - HTTPEndpointHeaders
  - HTTPEndpointQueryString

System Assigned Managed Identity

- Azure SQL Server: Security -> Identity -> Status: On
- App named like the SQL Server (Service Principal)
- Create DATABASE SCOPED CREDENTIAL for each API
- Create USER FROM EXTERNAL PROVIDER
- Add user to DB_Owner
- Allow SP to access external endpoints
- Allow SP to use the scoped credentials

DEMO

THE BICCOUNTANT

System Assigned Managed Identity

- Power BI Service
  - Allow service principals to use Power BI APIs (Developer settings)
  - Dataset Execute REST API (Integration Settings)
- Add the service principal as admin to the workspace

- Limitations
  - RLS not supported
  - Result size (100k rows or 1 mio values)
  - …

DEMO

THE BICCOUNTANT

Handling JSON in SQL Server

		OutputType				
Category	InputType	scalar	object	array	relational data	boolean
Extraction	json					
Extraction	json					
Extraction	json					
Modification	json					
Construct	scalar & relational					
Construct	scalar & relational					
Metadata	json					
Metadata	json					
Construct	*relational data*					

DEMO

THE BICCOUNTANT

API Requirements – Graph API

- Assign roles to the SP with MS Graph Power Shell SDK
  - PS> Install-Module -Name Microsoft.Graph

- New-MgBetaServicePrincipalAppRoleAssignment
  - principalId
  - resourceId (also: servicePrincipalId)
  - appRoleId

Graph API – parameters for role assignment

- PrinicpalId (Azure Portal)
  - Azure AD -> Enterprise Applications -> **All** Applications -> „<YourAzureSQLServerName>“
- ResourceId (Azure Portal)
  - Azure AD -> Enterprise Applications -> **All** Applications -> „Microsoft Graph“
- AppRoleId (PowerShell)

```
Get-MgServicePrincipal -Filter "displayName eq 'Microsoft Graph'" -Property AppRoles |
Select -ExpandProperty appRoles |
Where-Object { $_.value -like 'tasks*' } |
Format-List
```

Graph API role assignment call

```
$params = @{
  "PrincipalId" =„xxx"
  "ResourceId" = „yyyyy"
  "AppRoleId" = „zzz"
}
New-MgServicePrincipalAppRoleAssignment -ServicePrincipalId ‚yyyyy' -BodyParameter $params |
  Format-List Id, AppRoleId, CreatedDateTime, PrincipalDisplayName, PrincipalId, PrincipalType, ResourceDisplayName
```

DEMO

THE BICCOUNTANT

Azure API Management

- 3rd party api gets an alias

  <name of the api management service>.**azure-api.net**

- To stay flexible and allow pagination, use /vx/{*path}

Limits of sp_invoke_external_rest_endpoint

- Content-types and accept headers
  - JSON
  - XML
  - text
- Payload size: 100 MB (UTF-8 encoded)
- URL length: 8 KB
- Headers size: 8 KB
- Throttling:
  - Max concurrent connections <= 10% worker threads
  - Max 150 workers
- Endpoints (Azure)

Thank you

https://sqlkonferenzeval.azurewebsites.net/165115436882666

