

DW-SFTIES API

MODERNIZING INTERFACING APPLICATIONS

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DRINKING WATER BRANCH



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OVERVIEW



Authentication



Breaking down the APIs



Options for Data Access

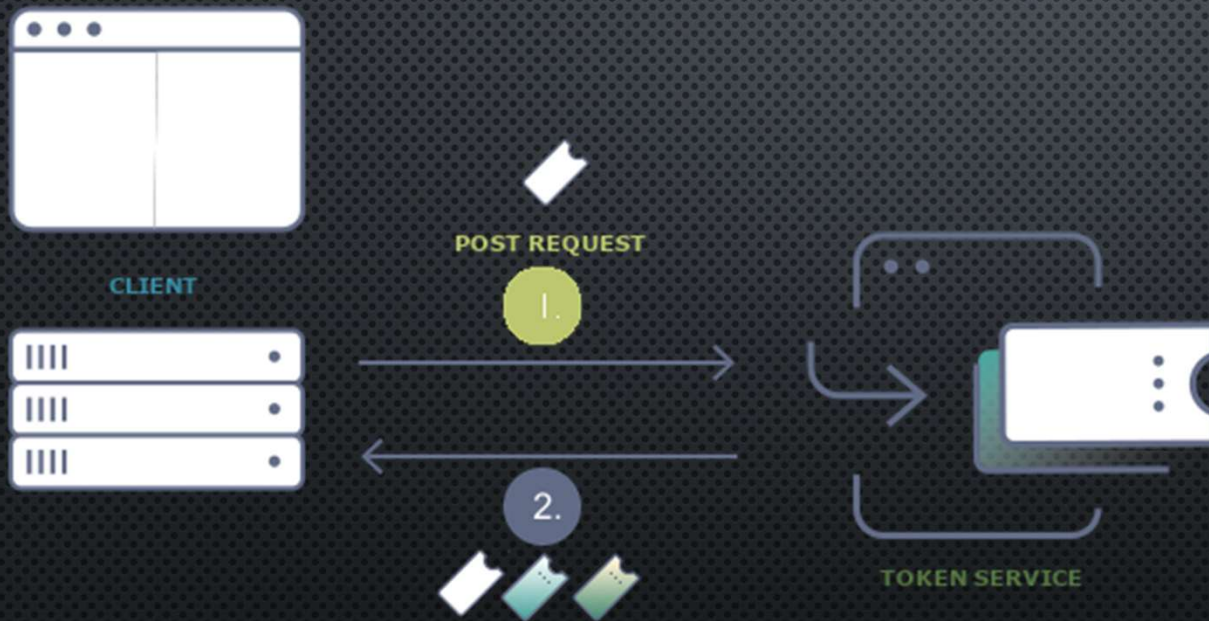


Reporting Tools



Updating Existing Applications

FETCHING A TOKEN FROM THE ENDPOINT



A **POST** request is sent to the token endpoint

The service validates the request and returns a response

Response includes id, access, and refresh tokens

FETCHING A TOKEN: THE POST REQUEST

URL: <https://dwsfties-uat-api.epa.gov/api/auth/realms/sdwismod/protocol/openid-connect/token>



HTTP Request Headers

Content-Type: application/x-www-form-urlencoded,



HTTP Request Body

grant_type: password

Username: <<client_id>>~NONMFA

Password: <<client_secret>>

DEMO

-FETCH A TOKEN-

AUTHENTICATION HIGHLIGHTS

- THIS AUTHENTICATION METHOD IS DESIGNED FOR MACHINE-TO-MACHINE AUTHENTICATION
- THE CLIENT_ID AND CLIENT_SECRET ARE ASSOCIATED WITH A SINGLE DW-SFTIES USER'S ACCOUNT
- AUTHENTICATION METHODS MAY STILL CHANGE BASED ON CONTINUED TESTING AND ADDITIONAL USE CASES IDENTIFIED FOR OTHER METHODS.

BREAKING DOWN THE APIS

PostgREST

- Direct to database
- Only supports **GET** requests (Read-only)
- Can perform queries directly on APIs
(<https://docs.postgrest.org/en/v12/references/api.html>)
- Returns an array of **JSON** objects

Microservices

- Separated into functional areas (e.g., inventory, legal entity, etc.)
- Supports all API operations
- **GET** request support multiple filters, pagination, and sorting
- Accepts and sends data via **JSON** response objects.

INTERACTING WITH THE APIS

- HTTP REQUEST TO API ENDPOINT
 - SPECIFIC TO THE API & OPERATION
 - MUST INCLUDE **AUTHORIZATION** HEADER WITH ACCESS TOKEN
 - OTHER HEADERS REQUIRED DEPENDING ON API
- API OPERATIONS
 - POST – CREATE NEW DATA (e.g., ADD A BASIC WATER SYSTEM)
 - GET – FETCH EXISTING DATA (e.g., GET ALL WATER SYSTEMS)
 - PUT – ADD OR UPDATE EXISTING DATA (REQUIRES ENTIRE MODEL)
 - PATCH – UPDATE EXISTING DATA (CAN INCLUDE PARTIAL DATA)
 - DELETE – DELETE EXISTING DATA*

THE HTTP REQUEST: POSTGREST

- PostgREST
 - Method(s) Supported: GET
 - URL: <https://dwsfties-uat-api.epa.gov:443/api/db/⟨⟨endpoint⟩⟩>
 - ⟨⟨endpoint⟩⟩ can be a single table or a complex query based on the PostgREST API documentation
 - Headers:
 - Authorization: Bearer ⟨⟨Access Token⟩⟩
 - Accept-Profile: dwp_⟨⟨primacy agency code⟩⟩ (e.g., dwp_al)
 - Accept: application/json
 - Range-Unit: items

THE HTTP REQUEST: MICROSERVICES

- Microservices
 - Method(s) Supported: Any
 - URL: `https://<<microservice_name>>.dwsfties-uat-api.epa.gov/<<microservice_name>>/<<endpoint>>`
 - Headers:
 - Authorization: Bearer <<Access Token>>
 - Accept: application/json
 - Request Body (Required for **PUT, POST, PATCH**)
 - Object information to be added or updated

DEMO

-FETCH DATA FROM API-

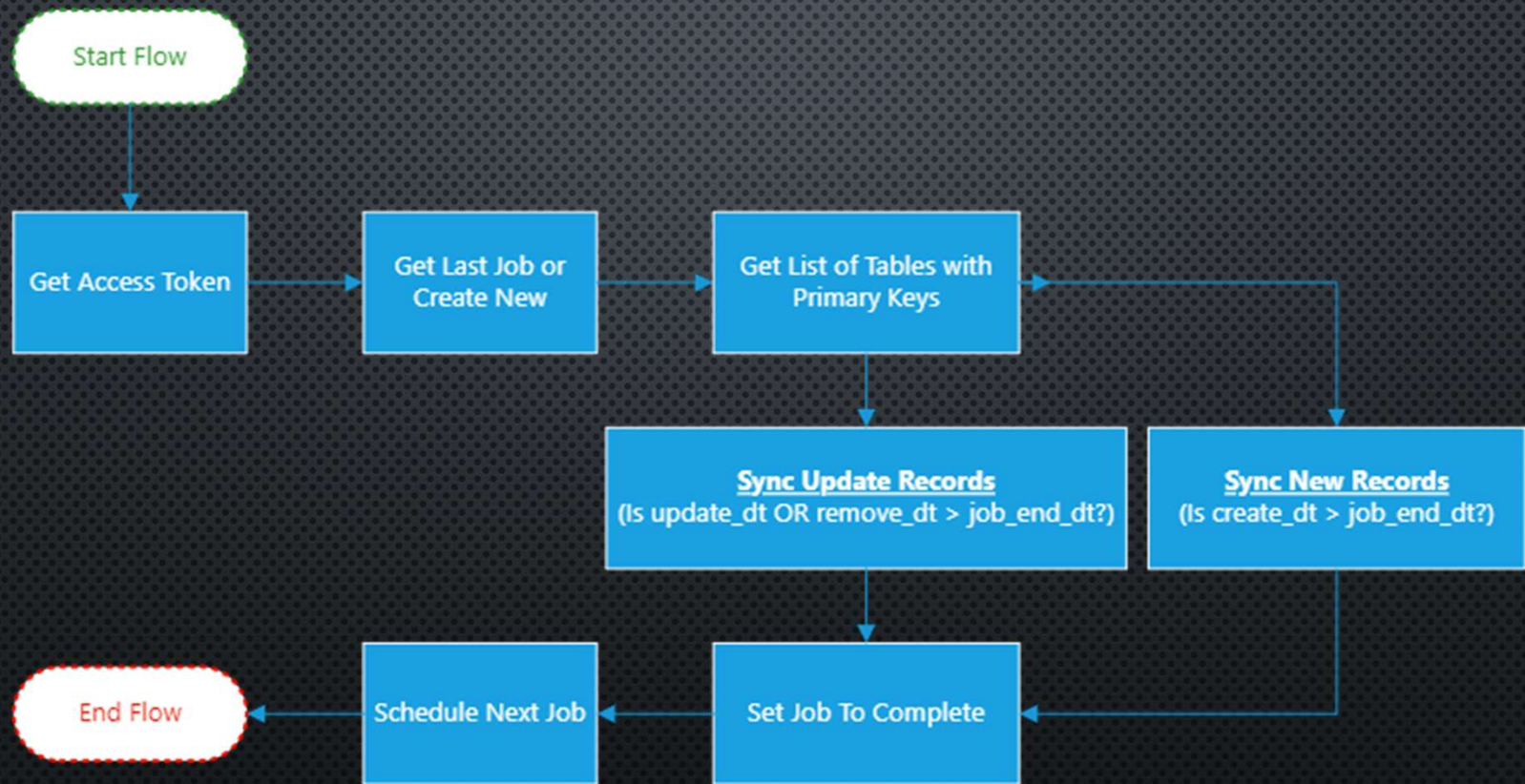
OPTIONS FOR DATA ACCESS

- DIRECT CONSUMPTION
- LOCAL DATA REPOSITORY
- HYBRID APPROACH

CREATING A LOCAL DATA REPOSITORY

1. CREATE A LOCAL DATABASE WITH HELPER TABLES
 - a. PROVIDED SCRIPTS SHOULD DO THE FOLLOWING:
 - i. CREATE THE DATABASE
 - ii. CREATE HELPER TABLES (JOBS TABLE AND REFERENCE TABLE WITH TABLE NAMES AND PK COLUMNS)
 - iii. CREATE STORAGE TABLES (ONE TABLE FOR EACH AVAILABLE ENDPOINT)
2. SET UP FLOW IN ETL TOOL OF CHOICE (APACHE NIFI USED DURING PILOT)
3. SCHEDULE FLOW TO RUN PERIODICALLY
4. ESTABLISH REPORTING/METRIC TO DETERMINE IF SYNCs ARE SUCCESSFUL

THE FLOW



COMMENTS ABOUT LOGIC

- ACCESS TOKEN
 - USES SAME POST REQUEST LOGIC PREVIOUS DISCUSSED
- JOBS
 - BASIC JOB RECORD RECORDING END DATE AND STATUS
 - AREA FOR IMPROVEMENT OR EXPANSION TO BETTER TRACK JOB SUCCESS/FAILURE
- SYNCING
 - ONE CALL IS MADE TO DETERMINE THE TOTAL RECORD COUNT
 - SUBSEQUENT CALLS MADE TO FETCH DATA
 - CURRENTLY SET AT 1000 RECORDS PER API REQUEST, RESULTING IN " $(\# \text{ OF RECORDS}/1000)+1$ " CALLS PER TABLE
- ADDITIONAL IMPROVEMENTS
 - CREATE A SEPARATE PROCESS TO ENSURE DATABASE STRUCTURE REMAINS SYNCED WITH DATA MODEL

REPORTING TOOLS

- ALABAMA'S DRINKING WATER HAS USED A VARIETY OF REPORTING TOOLS, INCLUDING ACCESS, CRYSTAL REPORTS, SSRS, POWER BI AND EXCEL
- MOVING FORWARD, POWER BI IS EXPECTED TO BE THE PRIMARY TOOL FOR REPORTING
- FOR THE PILOT, EFFORTS WERE MADE TO USE BOTH ACCESS AND POWER BI TO CREATE REPORTS FROM DW-SFTIES DATA

MICROSOFT ACCESS

- A PROOF OF CONCEPT WAS DEVELOPED IN ACCESS
- WRITTEN IN VBA AND USED THE XMLHTTPREQUEST OBJECT TO BOTH FETCH A TOKEN AND MAKE CALLS TO THE API.
- JSON RESPONSE WAS PARSED AND WRITTEN TO A TABLE
- THIS APPROACH NOT RECOMMENDED FOR ANYTHING OTHER THAN A MINIMAL AMOUNT OF DATA

POWER BI REPORTING

- SUPPORTS APIs OUT OF THE BOX
- 3 METHODS EXPLORED
 - PROVIDING A MANUAL ACCESS TOKEN
 - USING A FUNCTION TO RETRIEVE AN ACCESS TOKEN
 - CUSTOM CONNECTOR SOLUTION

The screenshot shows the 'From Web' dialog box in Power BI. The 'Advanced' tab is selected. The dialog contains the following elements:

- From Web** (Title bar)
- Basic Advanced (Radio buttons)
- URL parts ⓘ (Label)
- Two empty text input fields for URL parts.
- Add part (Button)
- URL preview (Label)
- A greyed-out text input field for URL preview.
- Command timeout (or, for web pages, wait time) in minutes (optional) (Label)
- One empty text input field for command timeout.
- HTTP request header parameters (optional) ⓘ (Label)
- Enter or select a value (Dropdown menu)
- One empty text input field for header parameters.
- Add header (Button)
- OK (Green button)
- Cancel (White button)

POWER BI CHALLENGES

- MANUAL ACCESS TOKEN
 - CONNECTION TO DATA SOURCE EXPIRES AFTER AND MUST BE MANUALLY REFRESHED
 - A CONNECTION TO EACH ENDPOINT MUST BE MADE INDIVIDUALLY
- USING A FUNCTION TO RETRIEVE A TOKEN
 - A CONNECTION TO EACH ENDPOINT MUST BE MADE INDIVIDUALLY
 - SECURITY CONCERNS WITH STORING CREDENTIALS IN THE FUNCTION OR EXTERNAL FILE
- CUSTOM CONNECTOR SOLUTION
 - HAD TO BE DEVELOPED FROM SCRATCH AS PART OF THE PILOT PROCESS
 - DOCUMENTATION CAN BE HARD TO FIND, AND TESTING CAN BE DIFFICULT
 - NOT CERTIFIED (REQUIRES RELAXATION OF POWER BI SECURITY)

BENEFITS OF THE CUSTOM CONNECTOR



Generalized design and minimal setup allows for easy sharing



Supports publishing to online workspace



Can connect to multiple endpoints from a single API at once



Credentials are stored by Power BI

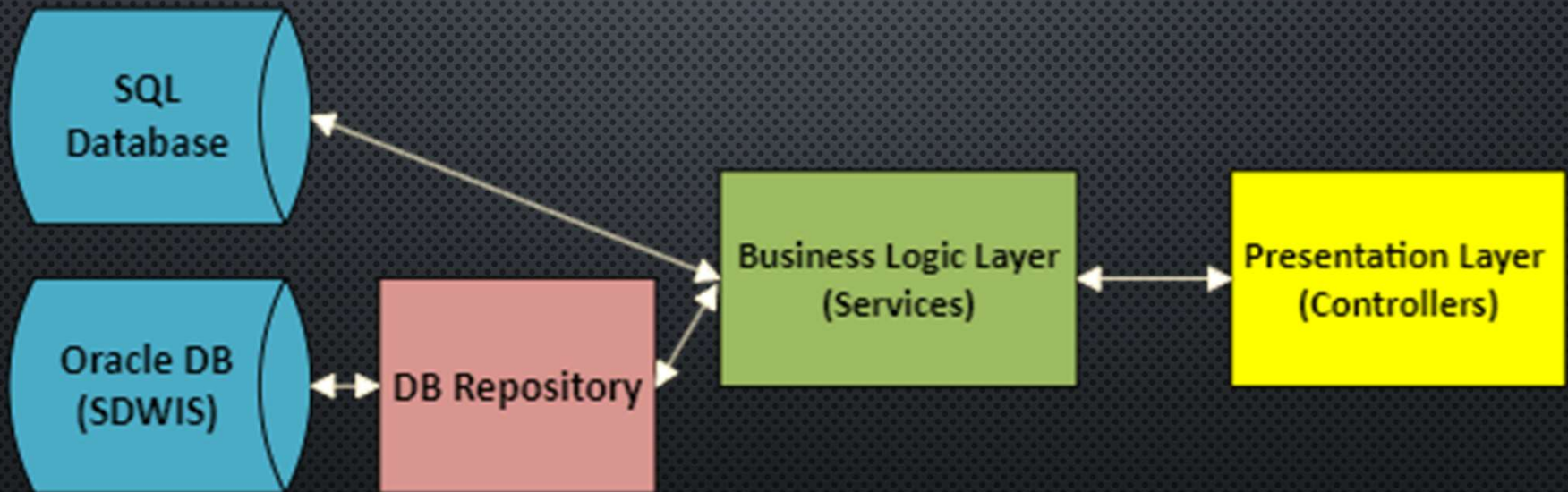
DEMO

-POWER BI CUSTOM CONNECTOR

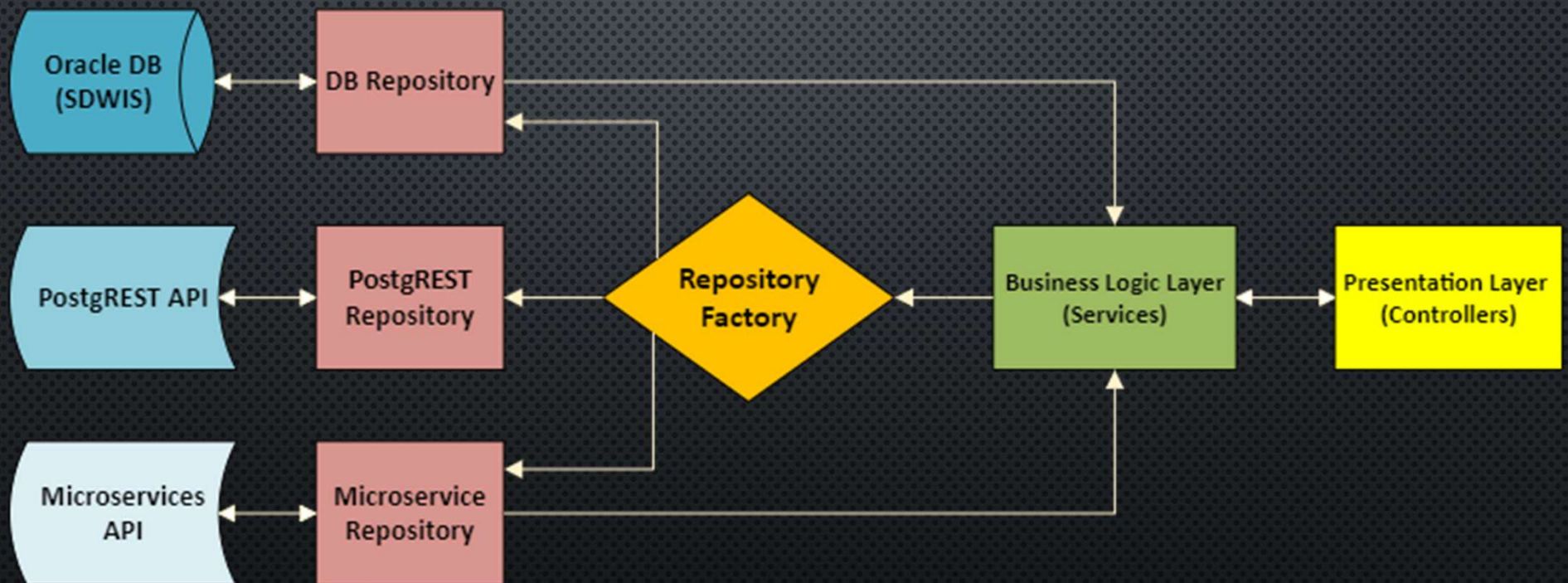
MODERNIZING AN EXISTING APPLICATION

- THINGS TO NOTE:
 - ADEM HAS IN-HOUSE IT STAFF, INCLUDING PROGRAMMERS, PRIMARILY DEVELOPING IN .NET
 - DRINKING WATER HAS DEVELOPED 1 PRIMARY APPLICATION (.NET CORE MVC):
 - EDWRS - USED PRIMARILY FOR SUBMISSION OF ANALYTICAL RESULTS AND DOCUMENTS
 - EMOR IS BEING DEVELOPED AS A MODULE WITHIN EDWRS AND A SEPARATE INTERNAL ADMINISTRATIVE DASHBOARD
 - WE UTILIZE ALL THE SDWIS/STATE ACCESSORY APPLICATIONS (DRINKING WATER WATCH, ETC.)

EXISTING APPLICATION FLOWS



UPDATED APPLICATION FLOW



DEMO

-APPLICATION SHOWCASE-

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