Azure Trailblazer Academy
Azure Data Factory (ADF) Lab

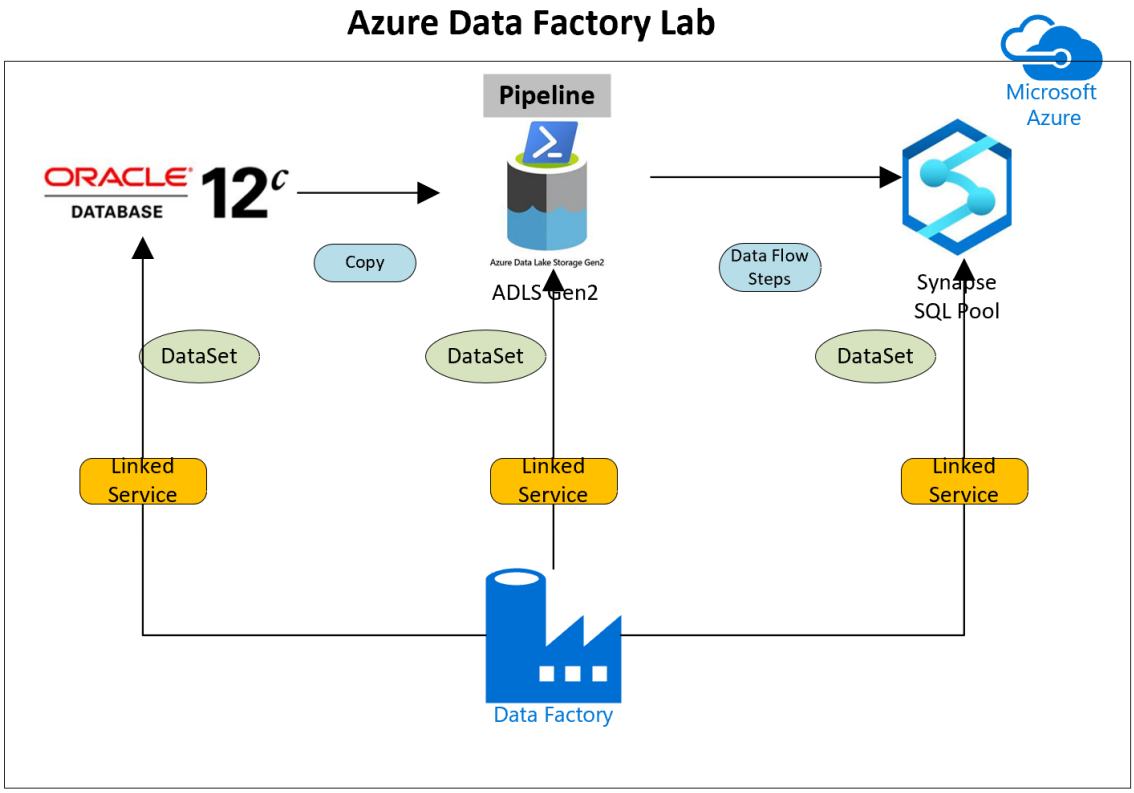
Overview

Azure Data Factory is a PaaS cloud-based ETL & data integration tool allows you to create data driven workflows in the cloud for orchestrating and automating data movement and data transformation.

It is a great tool to orchestrate big data and operationalize processes to refine these enormous stores of raw data into actionable business insights.

Lab Overview

This lab will help you gain the experience to ingest data from on-premises databases such as Oracle, SAP, Teradata, Hortonworks, DB2, SQL Server and Cloudera to Azure Data storage, databases and data warehouses services. It will showcase the steps to build a pipeline using ADF to ingest the data into ADLS GEN2 storage and secure the PII data using data transformation functions using the Data Flow activity and finally store the data in Synapse SQL Pool (Data warehouse) for building BI dashboards.



Pre-requisites

- Write Access to Azure Data Lake Storage Account (ADLS Gen2)
- Read Access to Sample HR schema in Oracle Database
- Write Access to Synapse SQL Pool Data warehouse

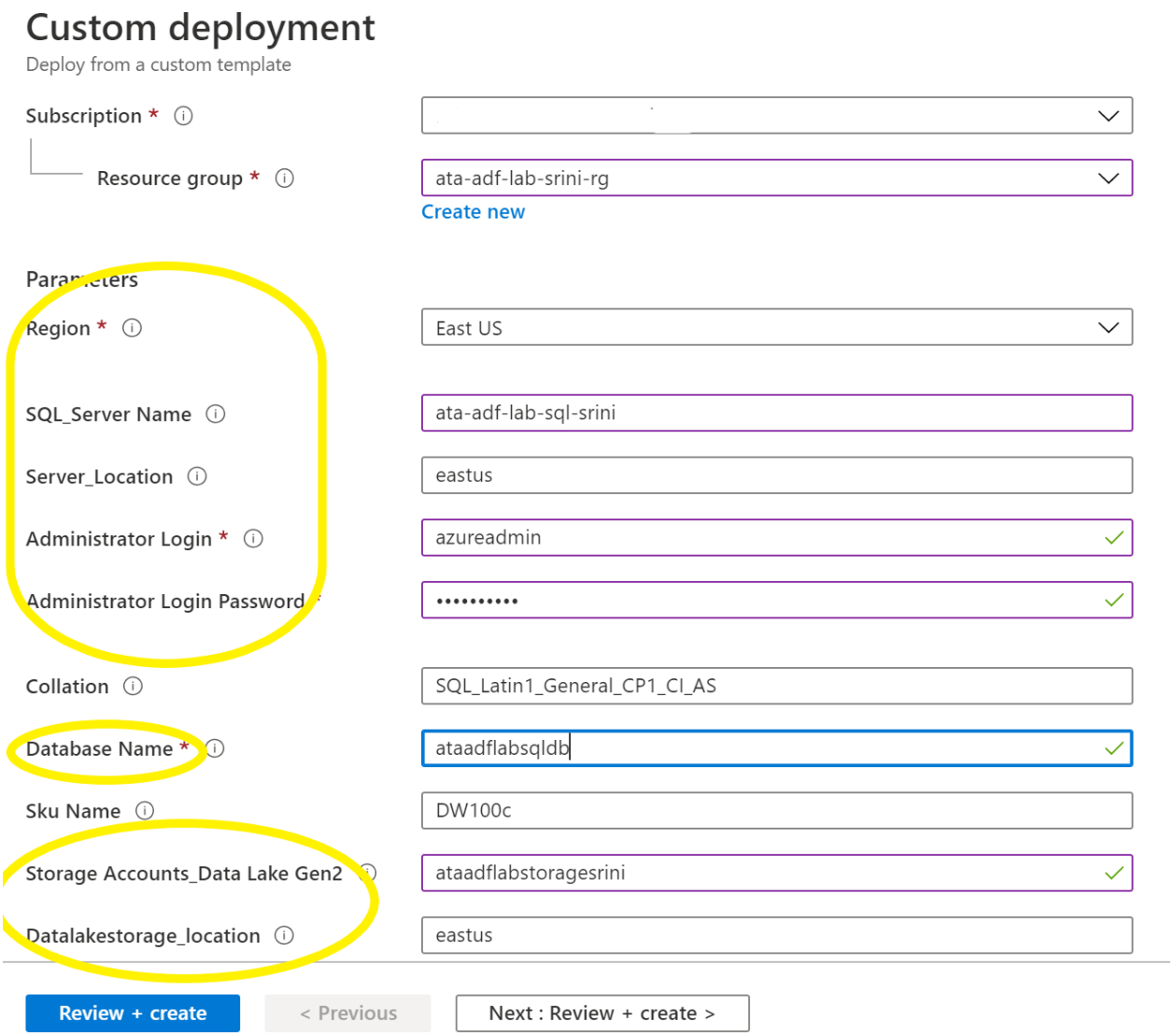
Automated Deployment

This automated deployment script will create thre required Azure srevices for this lab. Press the "*Deploy to Azure*" button below.

https://portal.azure.com/#create/Microsoft.Template/uri/https%3A%2F%2Fraw.githubusercontent.com%2Fmicrosoft%2FAzureTrailblazerAcademy%2Fmaster%2Fmonth2%2Flabs%2Flab_adf%2Fscripts%2Flab2_data_deployment.json

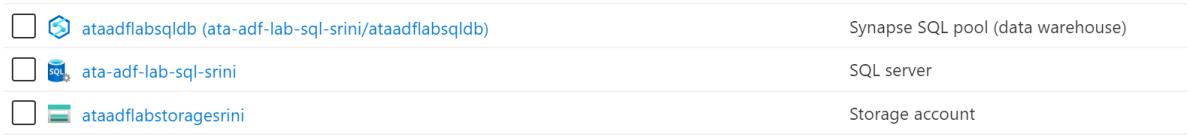
Enter the following information

- Subscription: Enter your subscription.
- Resource group: Select 'Create new' under Resource group.
  Enter: 'ata-adf-lab-<YourName>-rg'
- Region: Select 'East US'.
- SQL_Server Name: Enter 'ata-adf-lab-sql-<YourName>'
- Server_location: Enter 'eastus'



- AdministratorLogin: 'azureadmin'
- Administrator Login Password: 'Ataadf123!'
- Database Name: 'ataadflabsqldb'
- Storage_Accounts_Data Lake Gen2: 'ataadflabstorage<YourName>'
- Click on 'Review and Create'
- Click on 'Create'

Please check if it created the following services after successful deployment.



Temporary access to an Oracle database for completing this lab will be provided in the class.

Task List

- Task-1: Create Azure Data Factory Service
- Task-2: Create linked services
- Task-3: Create Copy Activity to ingest Oracle HR Employee data to Azure Storage
- Task-4: Create Data Flows to Transform Employee data and store it in Synapse SQL Analytics
- Task-5: Build a pipeline to connect Copy and Dataflow activities and Test the Execution

Task-1: Create Azure Data Factory Service

1. Provision an ADF service

- Type 'Data factories' in the search bar.
- Select 'Data factories' and select 'add' to create a new service

Provide the following info:

- Subscription: Make sure to select your subscription
- Select 'ata-adf-lab-<YourName>-rg', the resource group you have created with custom deployment.
- Name: 'ata-adf-lab-<YourName>'
- Location: select 'East US'
- Click the 'Next: Git configuration' button
- GIT configuration: check the 'Configure Git later' checkbox

Home > Data factories >

Create Data Factory

Changes on this step may reset later selections you have made. Review all options prior to deployment.

Basics | Git configuration | Networking | Tags | Review + create

Project details

Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription * : Microsoft Azure Internal Consumption BP

Resource group * : ata-adf-lab-brpham2-rg

Create new

Instance details

Region * : East US

Name * : ata-adf-lab-brpham2

Version * : V2

Review + create | < Previous | Next : Git configuration >

Home > Data factories >

Create Data Factory

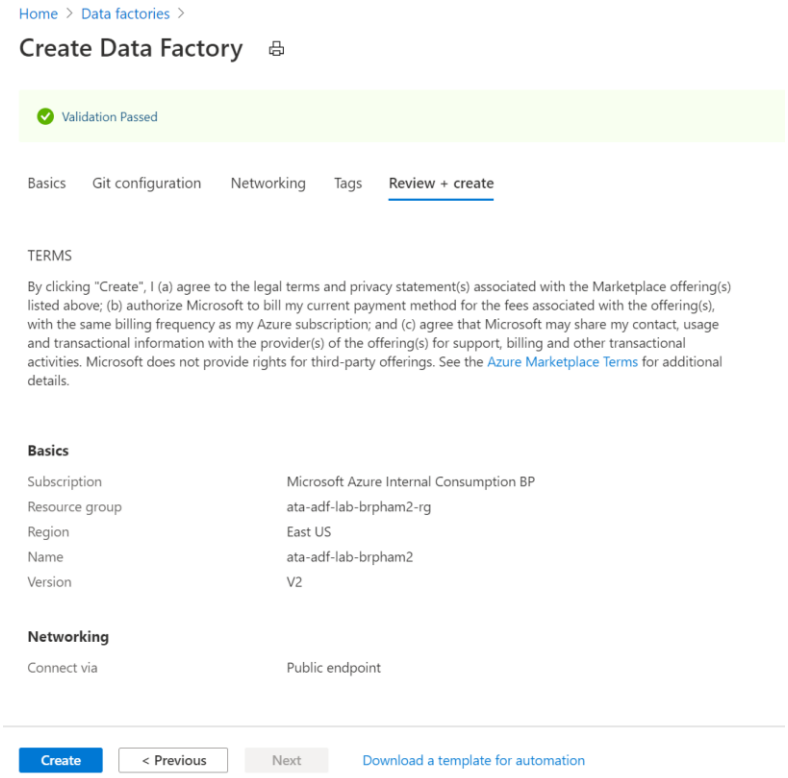
Basics | Git configuration | Networking | Tags | Review + create

Azure Data Factory allows you to configure a Git repository with either Azure DevOps or GitHub. Git is a version control system that allows for easier change tracking and collaboration.
Learn more about Git integration in Azure Data Factory

Configure Git later

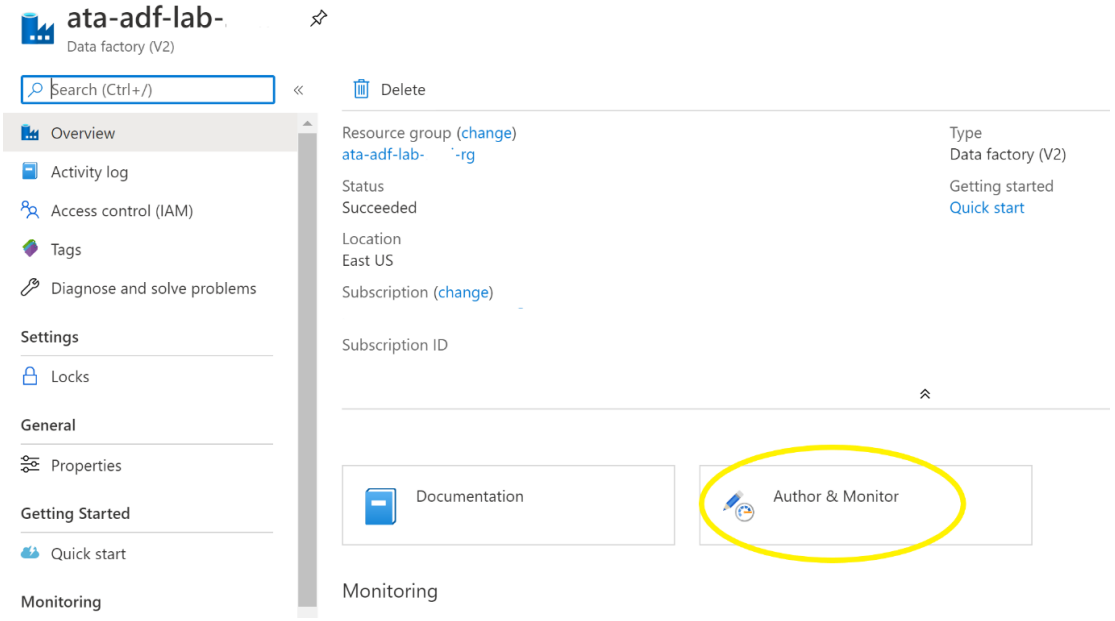
Review + create | < Previous | Next : Networking >

- Click on 'Create' button

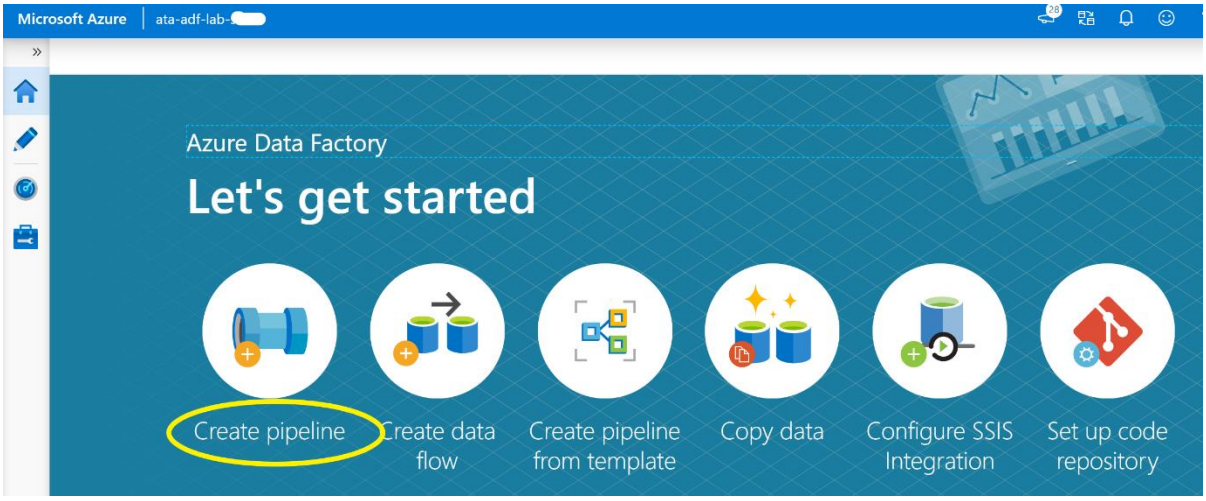


2. Open ADF Author Tool

- Select 'Go to resource' when it completes the deployment.
- Select 'Author & Monitor' in the middle of the screen.

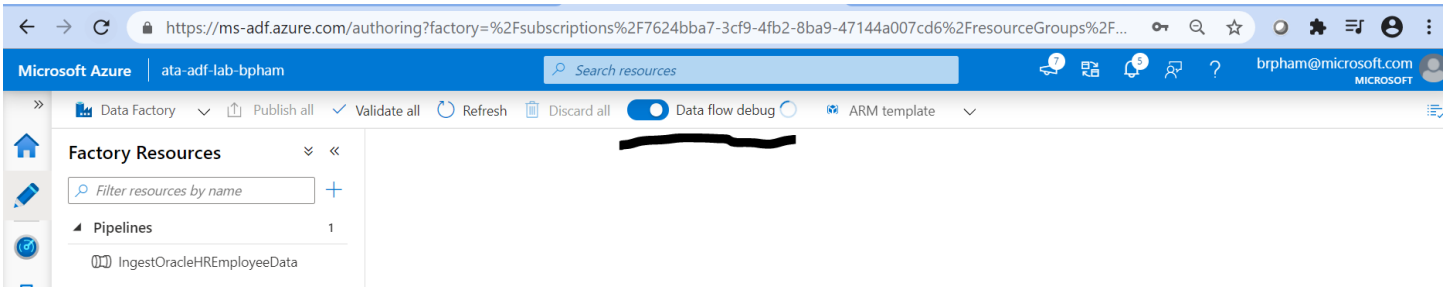


Opens up a new tab introducing the drag and drop interface to build pipelines.



Turn on Dataflow Debug functionality to test the modifications.

- To preview data, we need to turn on the '<u>data flow debug</u>' option

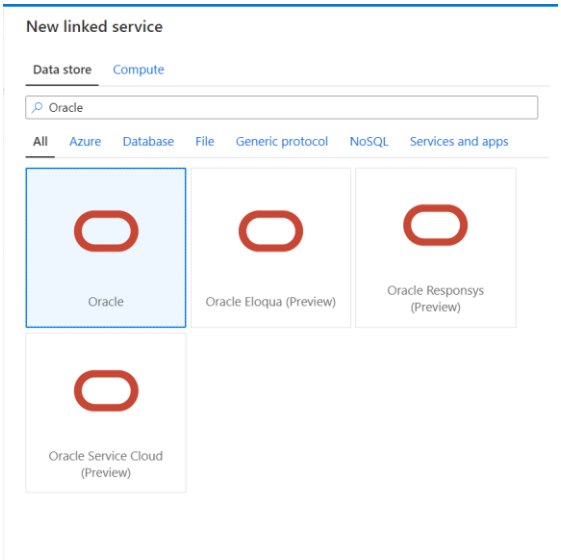


Task-2: Create linked services

You will be creating connection linked services to sync and source systems such as Oracle, Azure Data Lake Storage (ADLS) Gen2 and Synapse Analytics (formerly SQL DW) in this task.

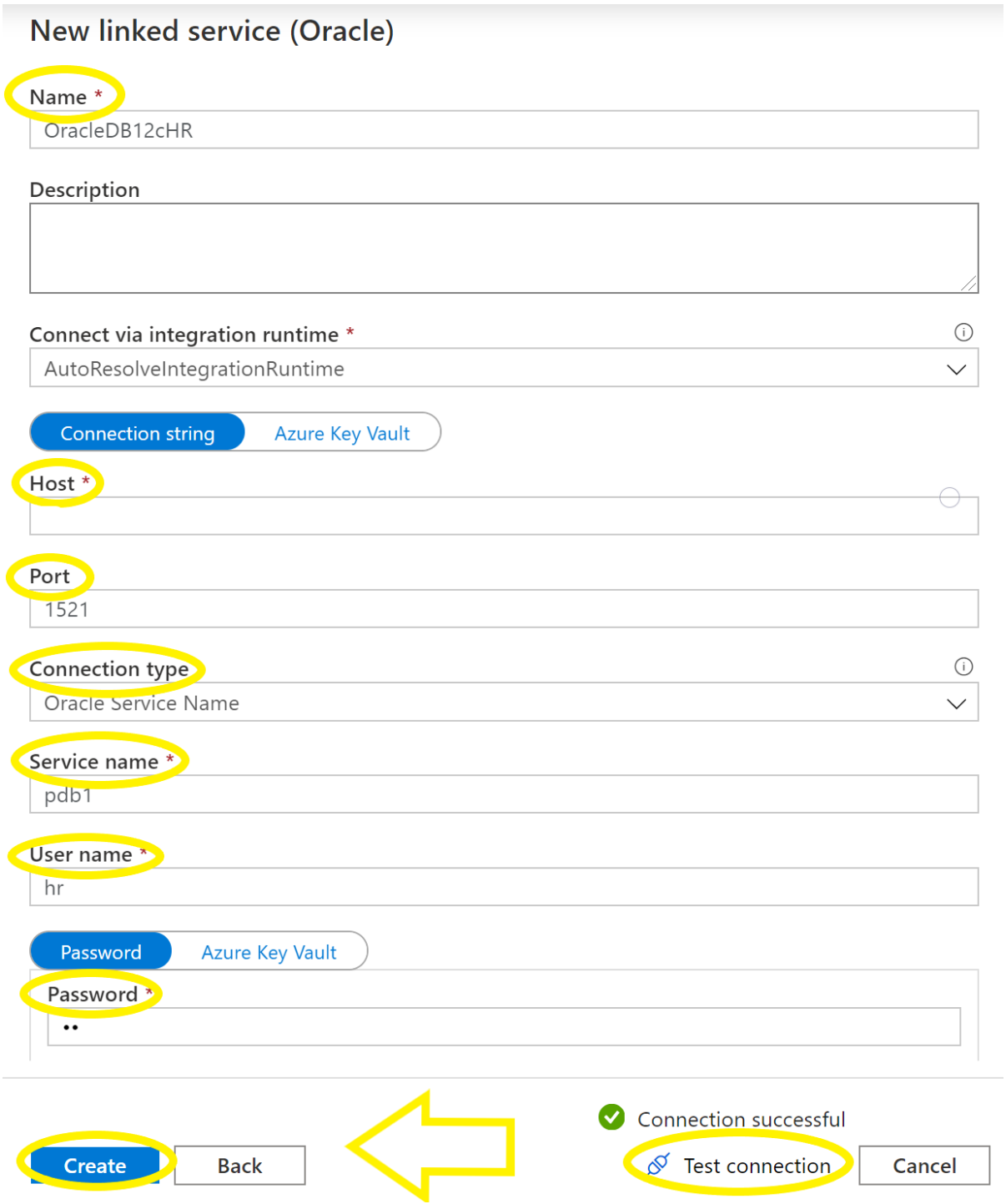
1. Create Oracle Linked Service

- Select Management hub (Toolbox) icon on the left and select 'Linked services' under 'Connections' section.
- Select '+ New' under Linked Services
- Search for 'Oracle' under 'Data Store' and select 'Oracle Database' and click on 'Continue'



Enter the following Oracle Connect Info:

- Name: Enter 'OracleDB12cHR'
- Leave the default 'Connection string' option
- Host: Enter Instructor provided server IP address – 40.84.58.15
- Port: 1521 (Default Oracle Port)
- Connection type: Select 'Oracle Service Name'
- Service name: '**nonpdb**'
- Username: hr
- Password: hr2

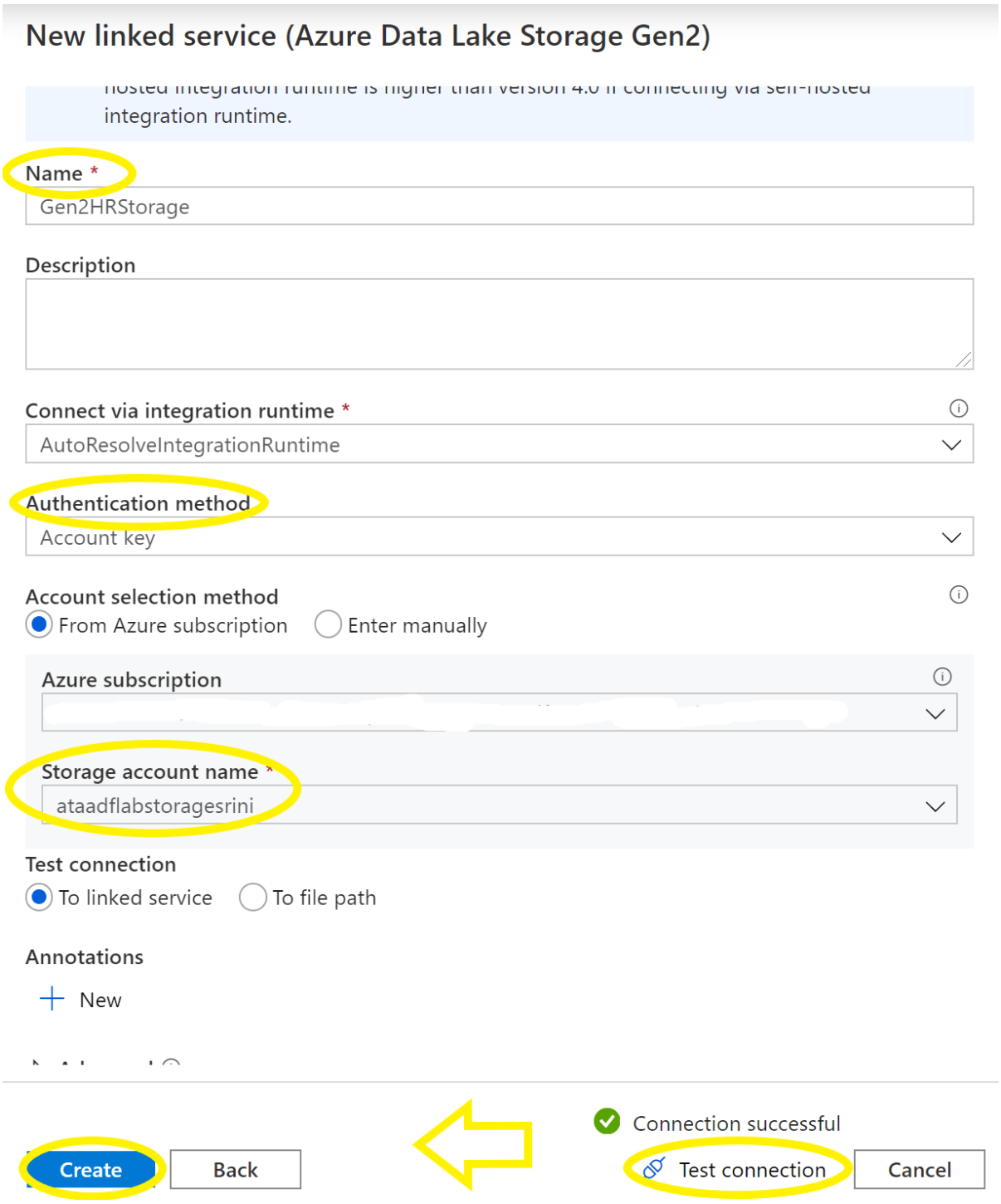


- Select 'test connection' to verify the successful connection
- Click on 'Create' button to create the Oracle linked service.

2. Create Azure Data Lake Storage (ADLS) Gen2 Linked Service

- Select 'New' under Linked Services
- Search for 'Gen2' under data store and select Azure Data Lake Storage Gen2 Click on 'Continue' and enter the following information:
- Name: Enter 'Gen2HRStorage'

- Authentication Method: Leave the default 'Account Key' selection
- Account Selection method: Leave the default 'From Azure subscription'
- Storage account name: select 'ataadflabstorage<YourName>'
- Click on 'Test connection' Click on 'Create' after successful connection to create the ADLS Gen2 storage linked service
- Click Create button



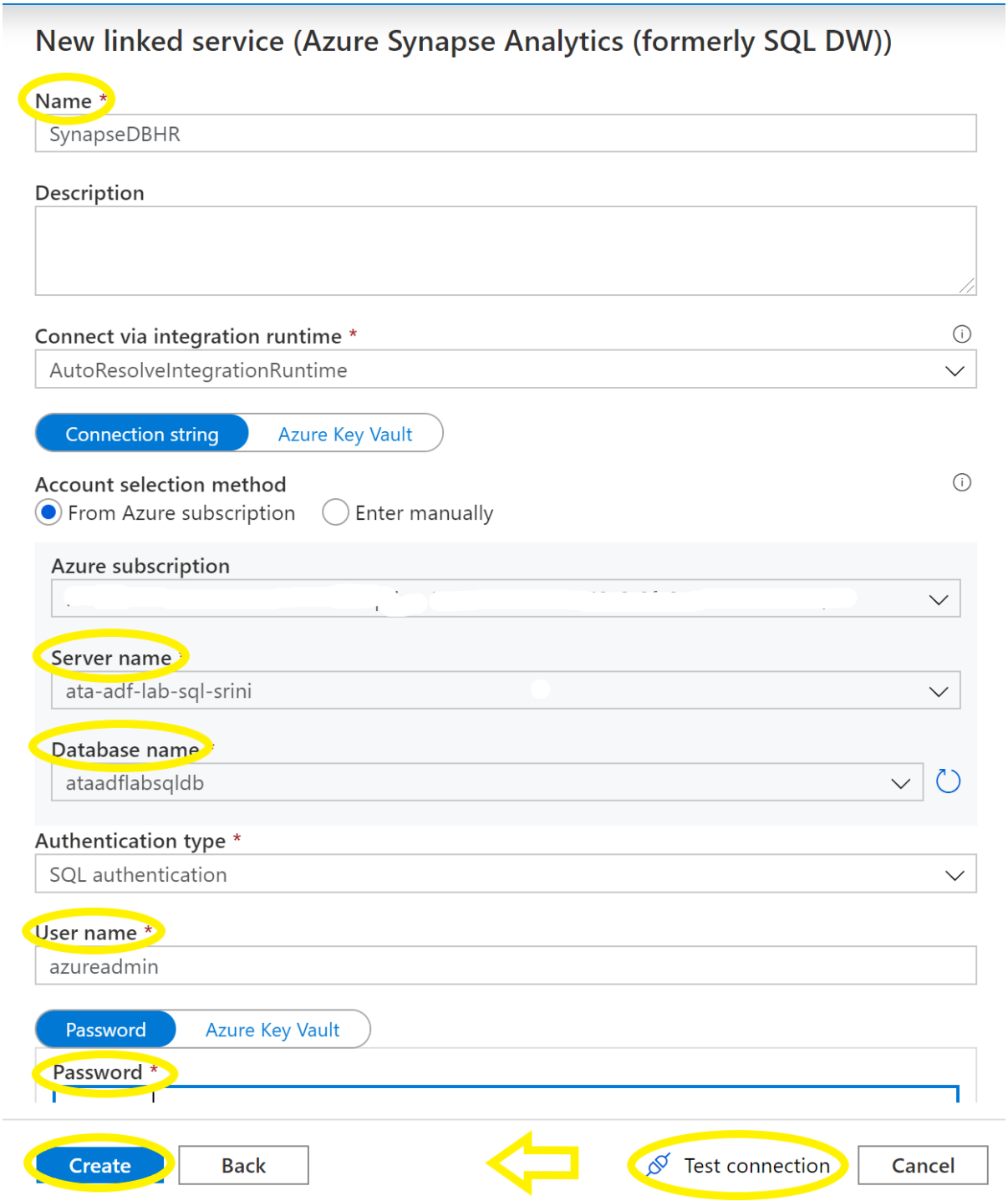
3. Create Synapse Analytics Linked Service

- Select 'New' under Linked Services
- Search for 'Synapse' under data store and select 'Azure Synapse Analytics (formerly SQL DW)'
- Click on 'Continue'

Enter the following info:

- Name: Enter 'SynapseDBHR'
- Server name: select 'ata-adf-lab-sql-<yourname>'
- Database name: select 'ataadflabsqldb'
- Username: enter 'azureadmin'
- Password: enter the default 'ataadf123!'
- Click on 'test connect' to test the connection.

Click on 'Create' after the successful connection to create the Synapse linked service



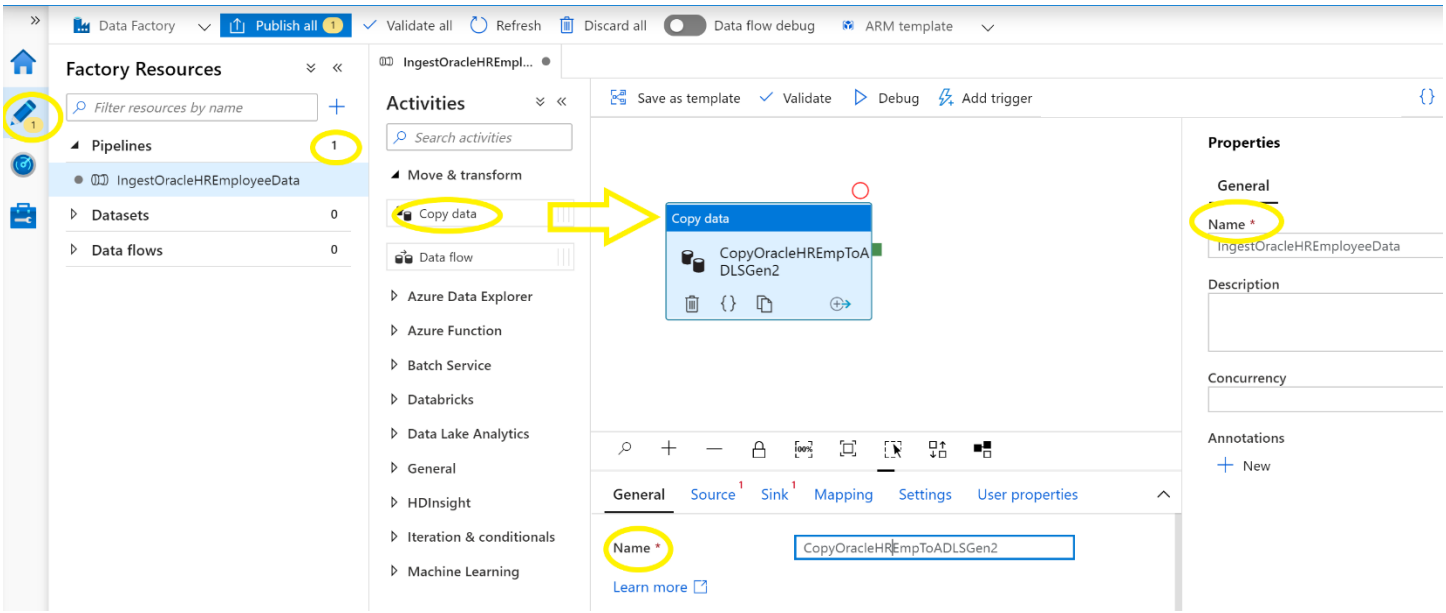
You have successfully created connection linked services to Oracle, ADLS Gen2 and Synapse SQL Pool.

Task-3: Create Copy Activity to ingest Oracle HR Employee data to Azure Storage

We have established the connection services to the source Oracle DB and the sink Azure Data Lake Storage, you will create a copy activity to ingest the data from Oracle to Azure Data Lake Storage in this task.

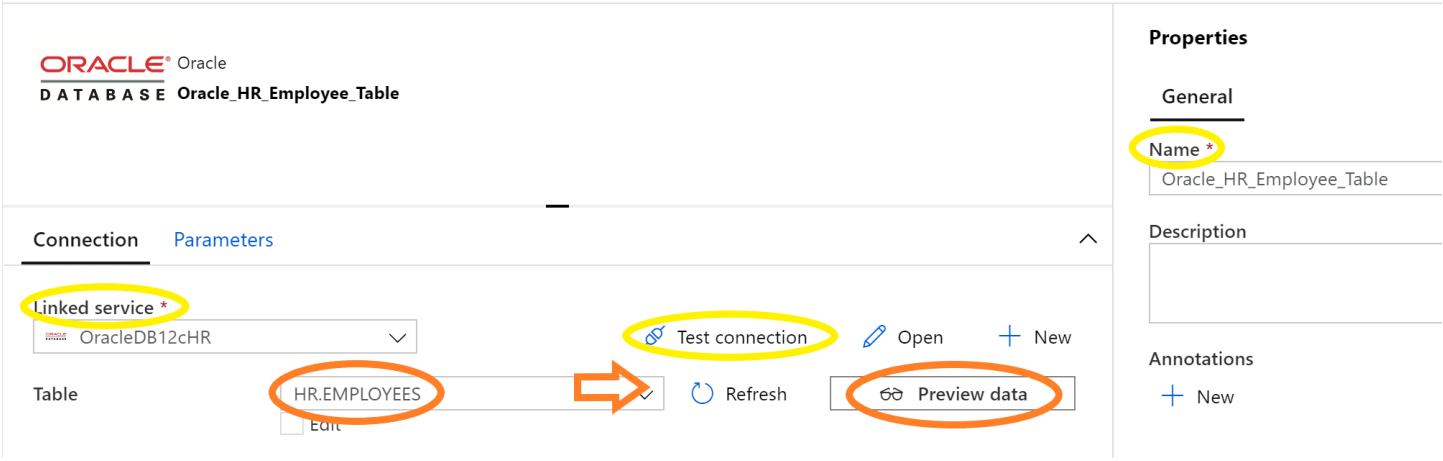
1. Select 'Pencil' icon on the left and select three dots next to pipelines to select 'new pipeline' action.

- Name the pipeline as 'IngestOracleHREmployeeData' under the properties section on the right side.
- Drag the 'Copy data' from 'Move & transform' section under 'Activities' list to the canvas in the middle of the screen.
- Name the copy activity as 'CopyOracleHREmpToGen2' below the canvas under the 'General' tab



2. Select 'Source' tab next to 'General' to define the source system.

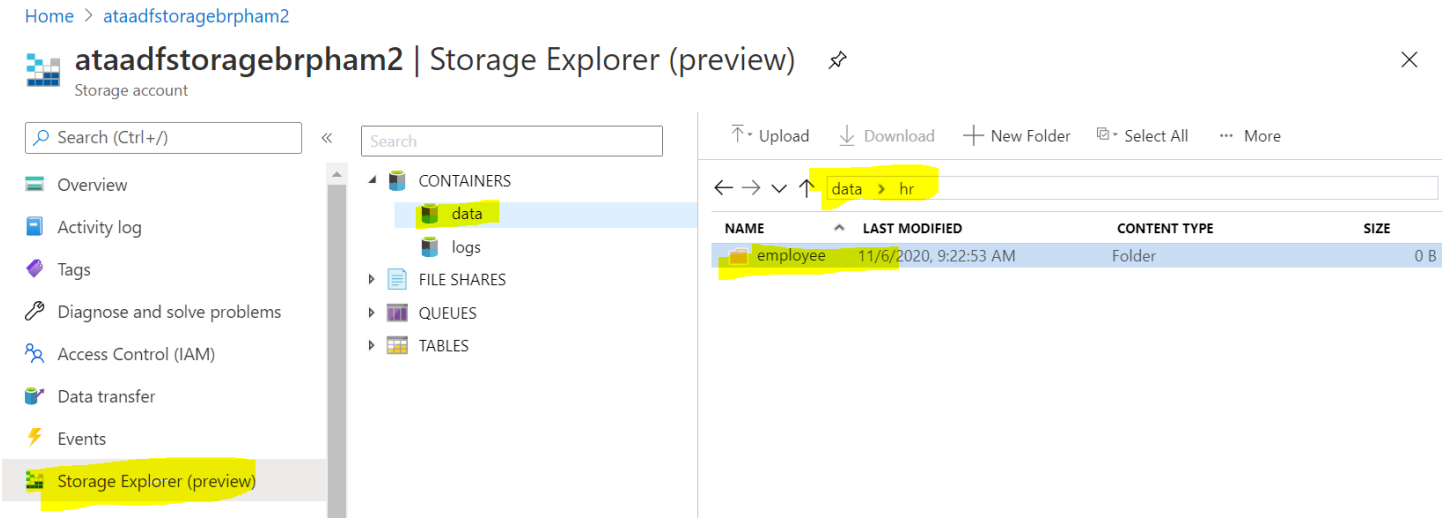
- Select 'New' to create a new source dataset
- Select 'Oracle database' as the data store after filtering with 'Oracle' and click on 'Continue'
- Select 'Open' to define the source dataset
- Name the dataset as 'Oracle_HR_Employee_table' under the properties section on the right side.
- Select the 'OracleDB12cHR' linked service and click on 'Test connection' to test the connectivity.
- Filter table list by typing 'hr.emp' and select 'HR.EMPLOYEES' table and select 'Preview data'.



Make sure you are able to see the employee folder

You will have to enter the file system and directory path

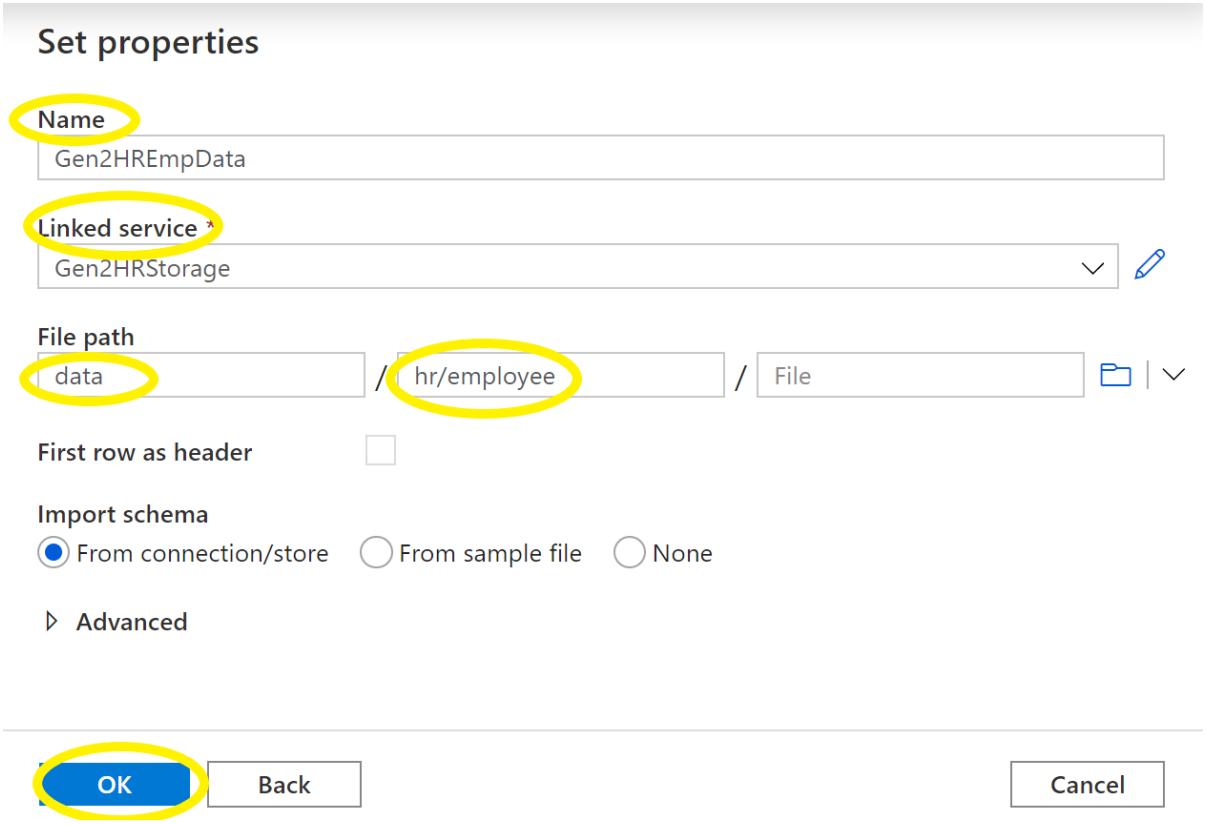
- First, we need to create the directory path in the Azure storage account. Leave this browser tab as is and switch to the Azure Services tab in the browser.
- **Access storage account and open up the 'storage explorer' to create 'hr' under 'data' file system and create 'employee' as a subfolder under 'hr' folder.**



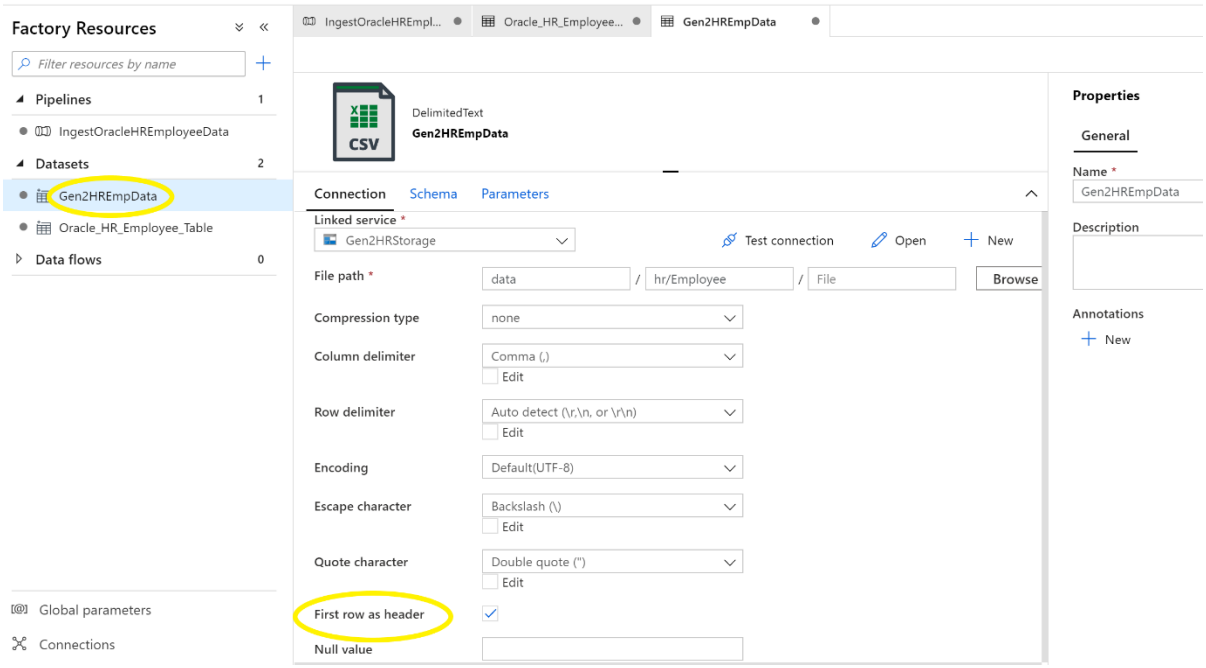
3. Select 'Sink' tab next to 'Source' to define the sink system

- Select 'New' to create a new sink data set
- Select 'Azure Data Lake Storage Gen2' as the data store after filtering with 'Gen2' and click on 'Continue'

- Select 'Open' to define the sink dataset
- Select 'Delimited Text' as the format and click on 'Continue'
- Name the dataset as 'Gen2HREmpData'
- Select the 'Gen2HRStorage' linked service.
- Enter File path below

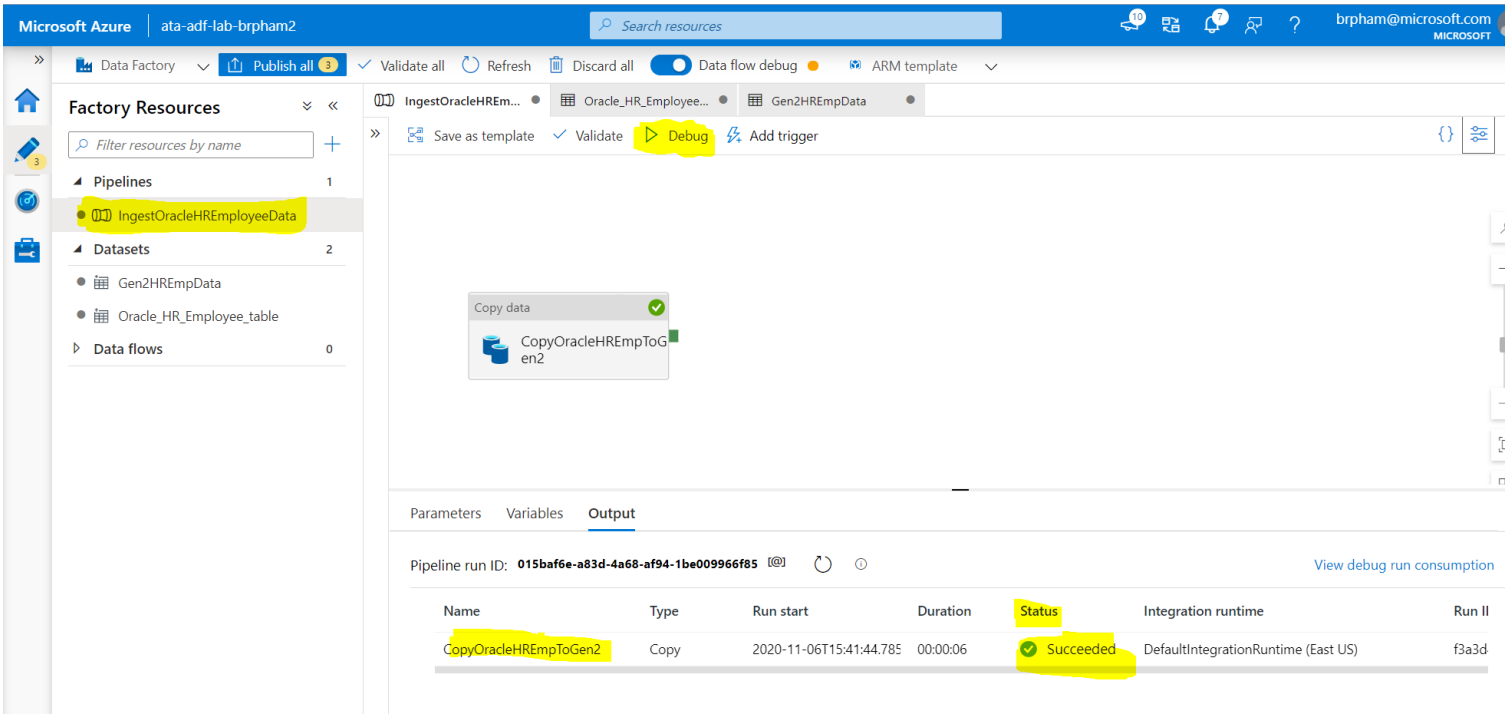


- Select 'Gen2HREmpData' under Datasets section on the left
- Check the 'First row as header' checkbox



5. Test the copy activity

- Select the 'IngestOracleHREmployeeData' under the Pipelines section
- Click on 'Debug' option just above the canvas.
- It will start the process and put it in the queue. Wait till it finishes.
- Check for the status and make sure it is successful

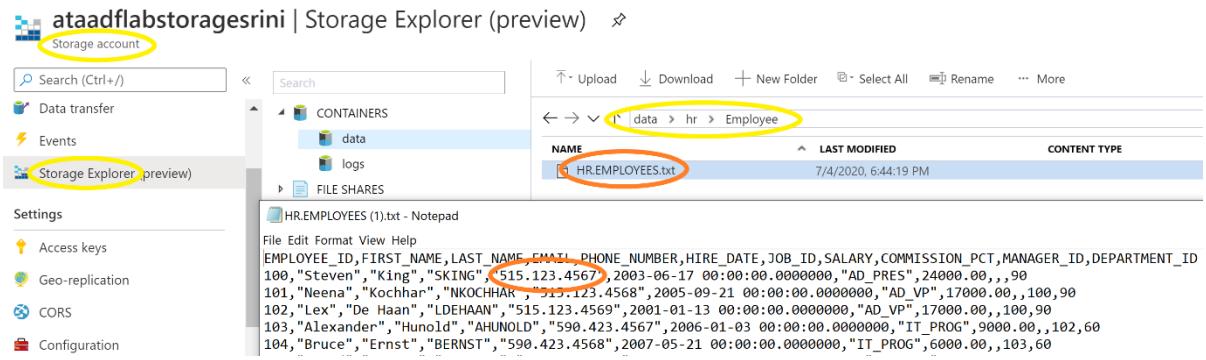


6. Verify the data ingestion in ADLS Gen2 storage.

Switch to Azure services tab and access the storage account.

- Open up the 'Storage Explorer' and access the data file system and drill down to 'hr' and 'employee' folder.
- Confirm the 'HR.EMPLOYEES.txt' file. Double click on the file to download and view the data.

You can see how the phone numbers are ingested as text. This is PII data and we should protect this data.

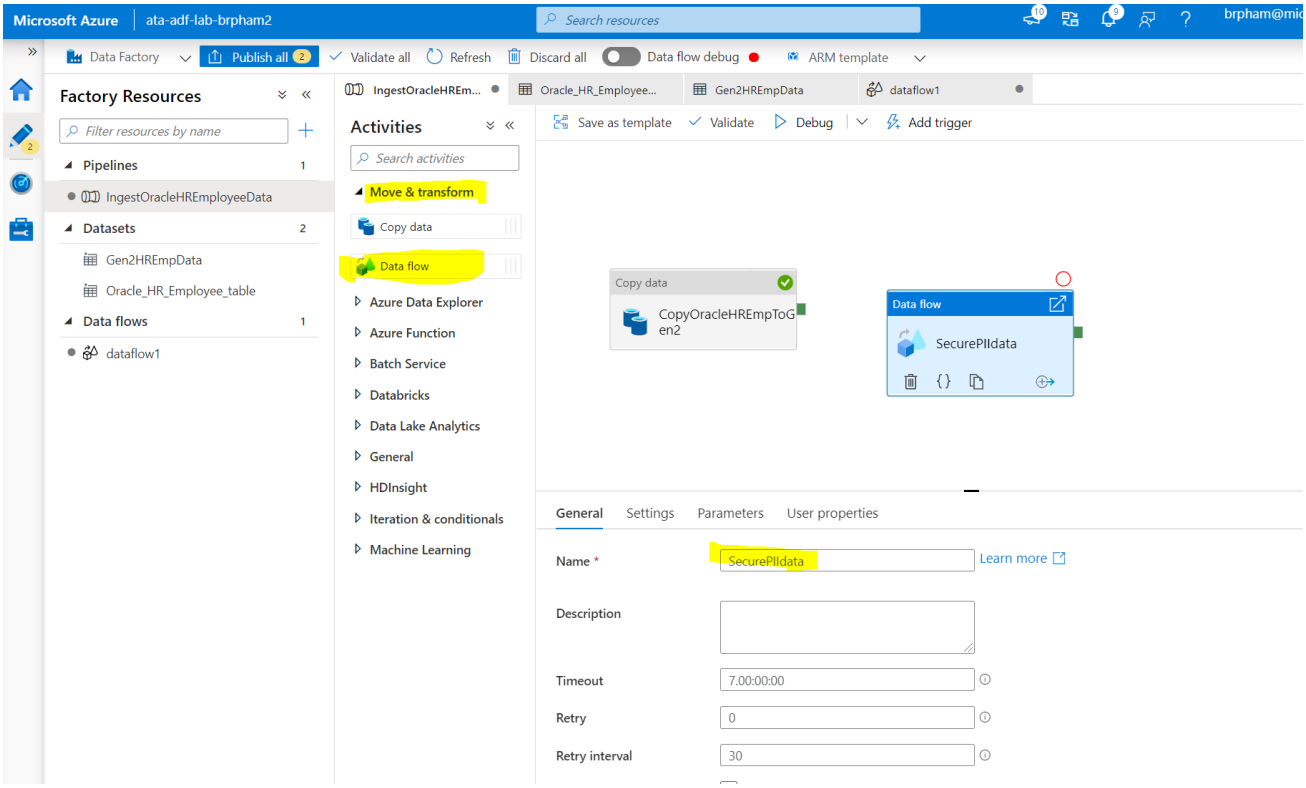


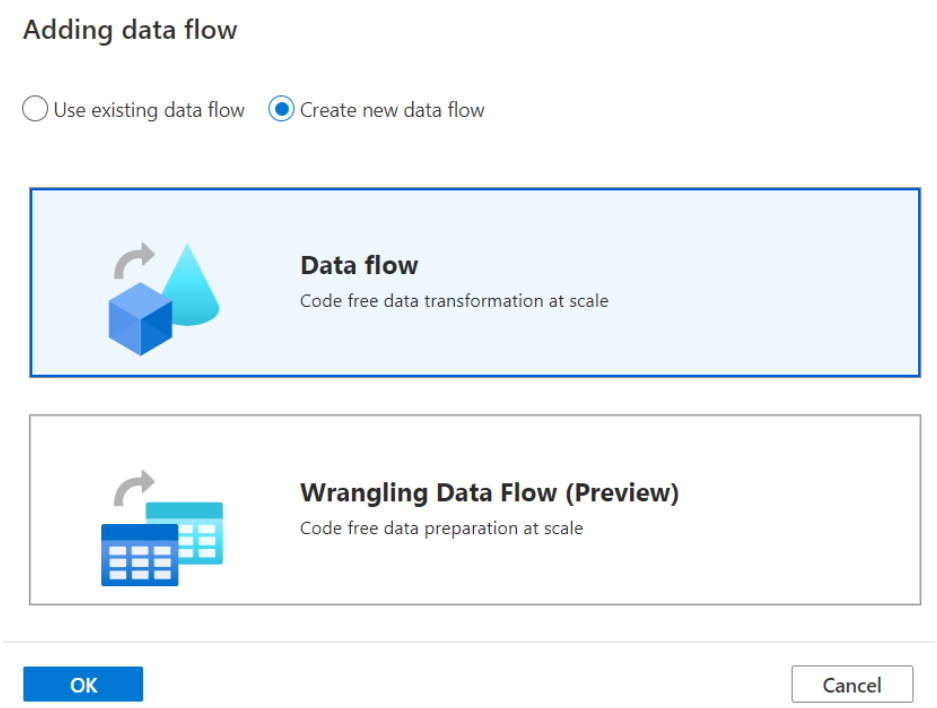
Task-4: Create Data flow to transform Employee data and store it in Synapse SQL Analytics

We have noticed the PII data we just ingested into ADLS Gen2 storage. You will secure the PII data using the Data flow functionality in this task.

1. Create Source data

- Drag and drop the data flow activity into the canvas from the 'Move &Transform' section.
- Select 'create new data flow' and select 'Data Flow' option and click on 'OK'.

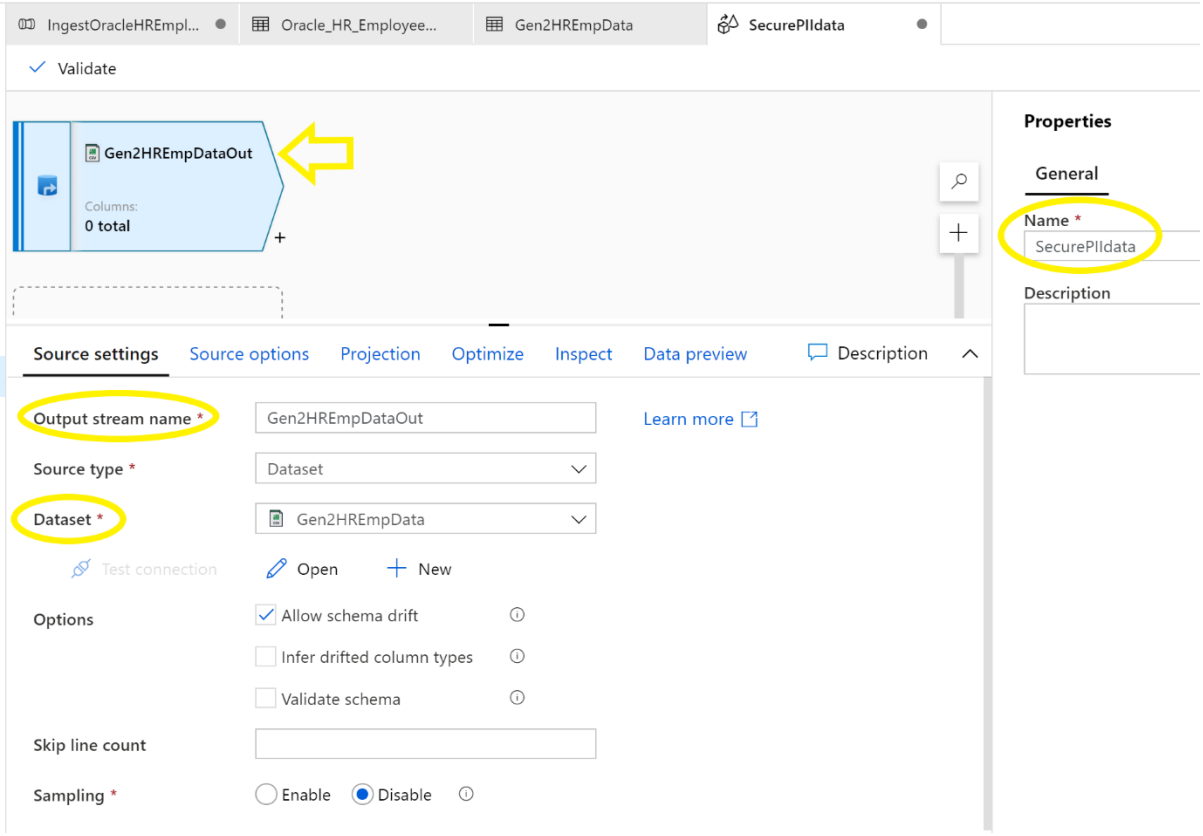




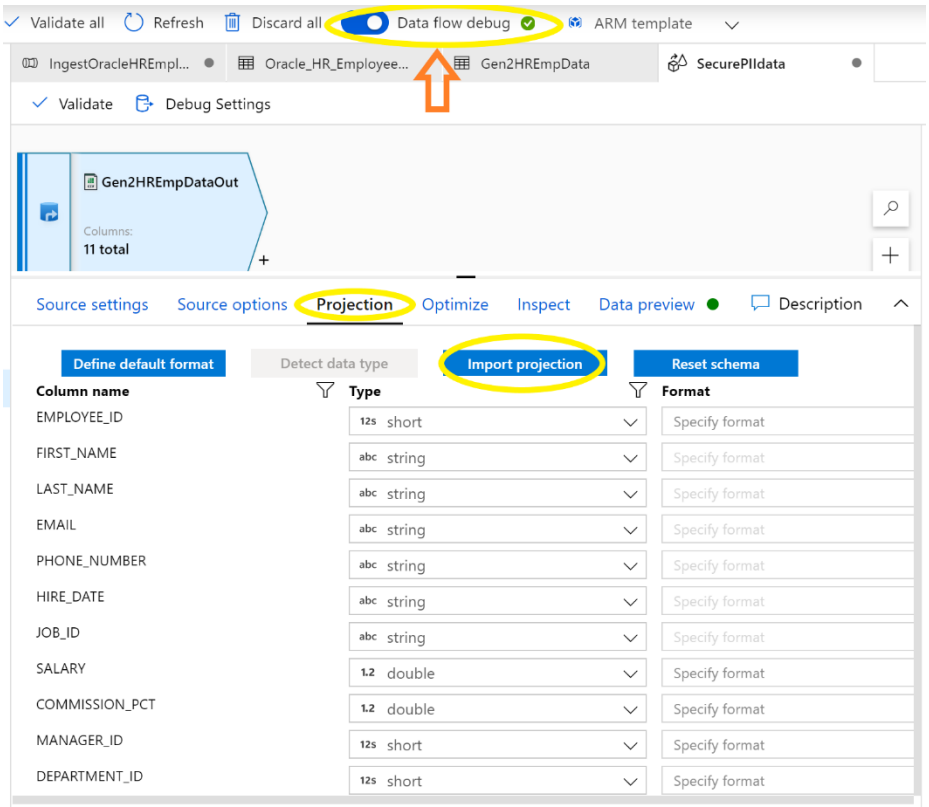
- Select "Source" data
- Name the data flow as 'SecurePIIdata'.

Provide the following information under 'Source settings' tab:

- Output stream name: Gen2HrEmpDataOut
- Source type - Select 'Dataset'
- Dataset - Select 'Gen2HREmpData'

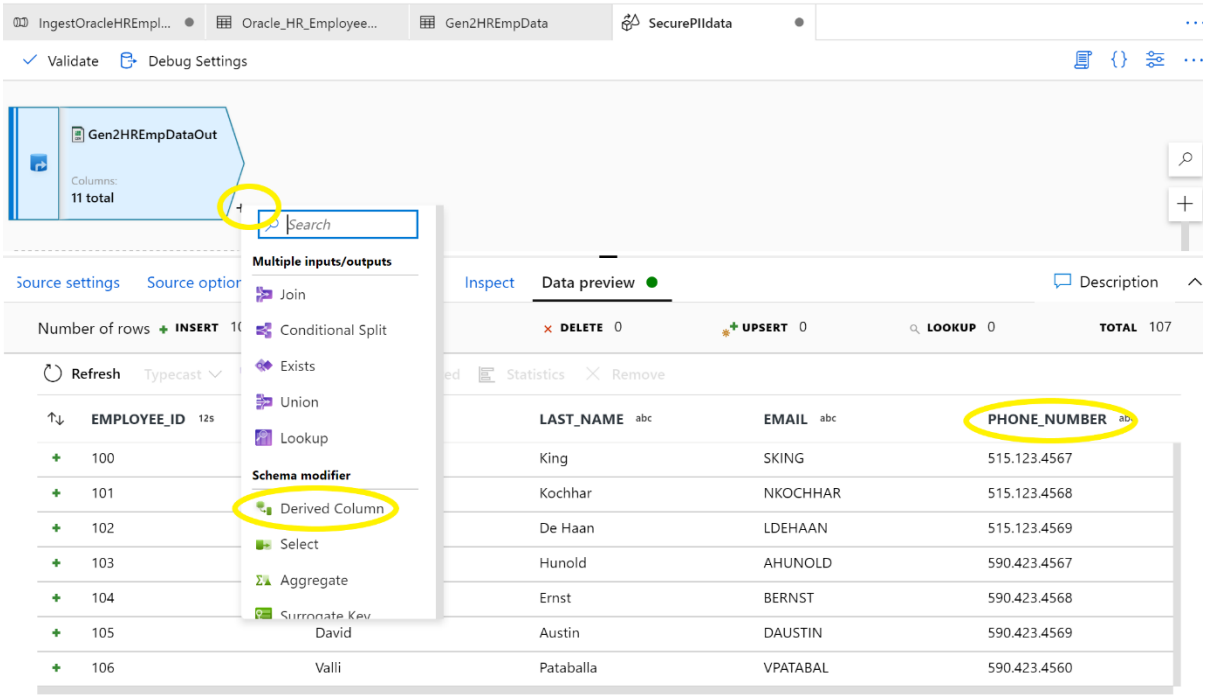


- To preview data, we need to turn on the dataflow debug option.
- Click on 'Import projections' in the 'Projection' tab to view all the columns. The 'Data flow debug' must be enabled for the 'Import projection' button to be active

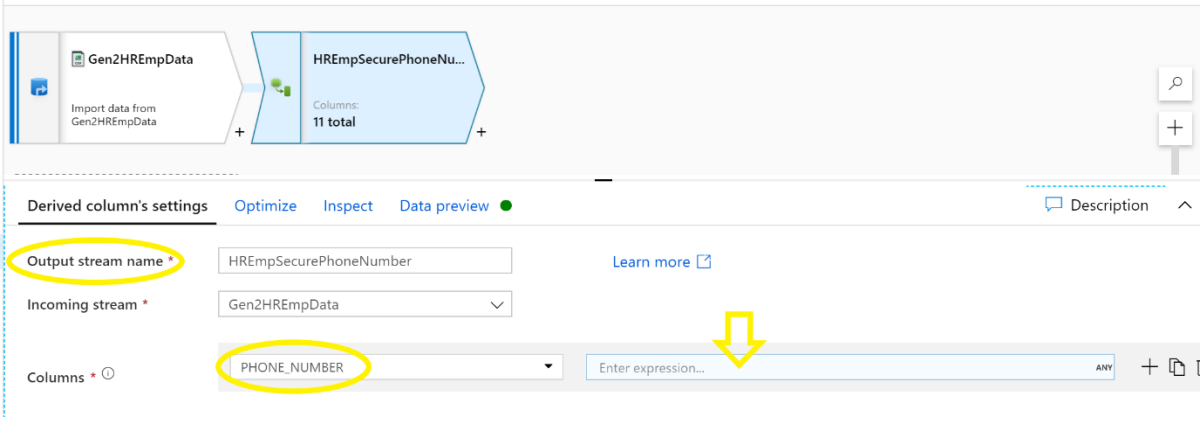


2. Create a data flow step to hash the first 6 digits of the phone number.

- Add another data flow step to secure the phone number by selecting '+' sign and select 'Derived Column' under 'Schema modifier' section.



- Name the data flow as 'HREmpSecurePhoneNumber'
- Select 'PHONE_NUMBER' column from the list
- Click on 'Enter Expression' textbox
- Click on 'Open expression builder'

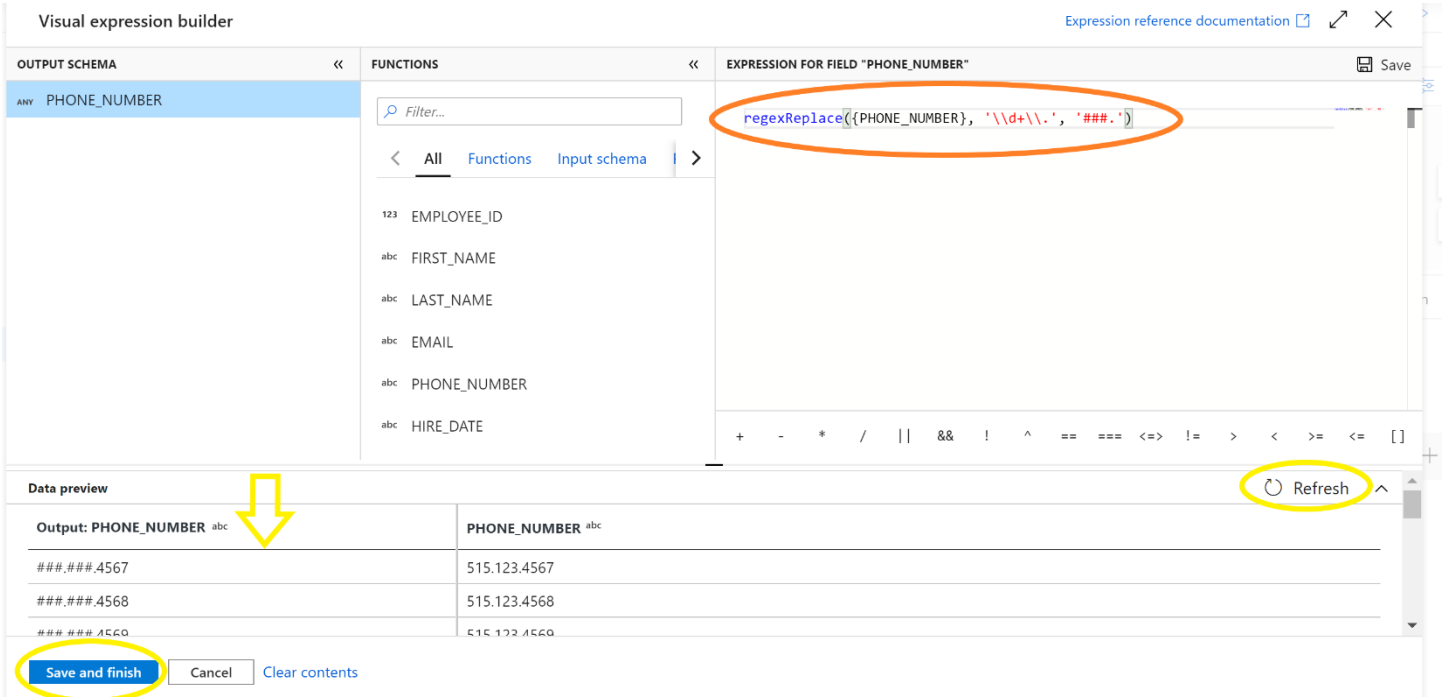


Write RegExpression to replace the digits before the '.' with '#' as shown in the picture:

```
regexReplace({PHONE_NUMBER}, '\\d+\\.', '###.')
```

- Click on 'Refresh' to verify the output of the function.

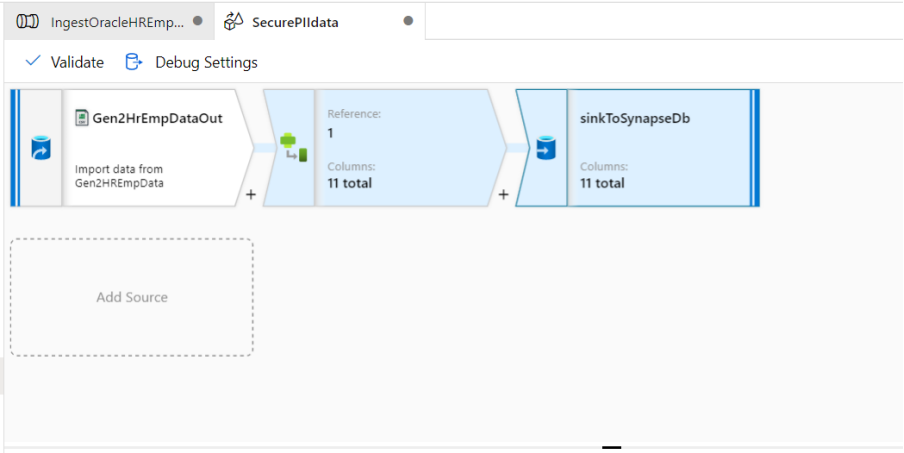
- Click 'Save and finish' button after you satisfy the result

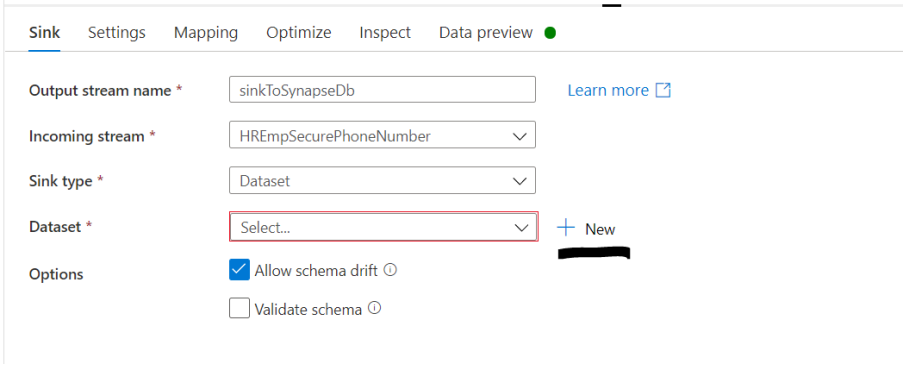


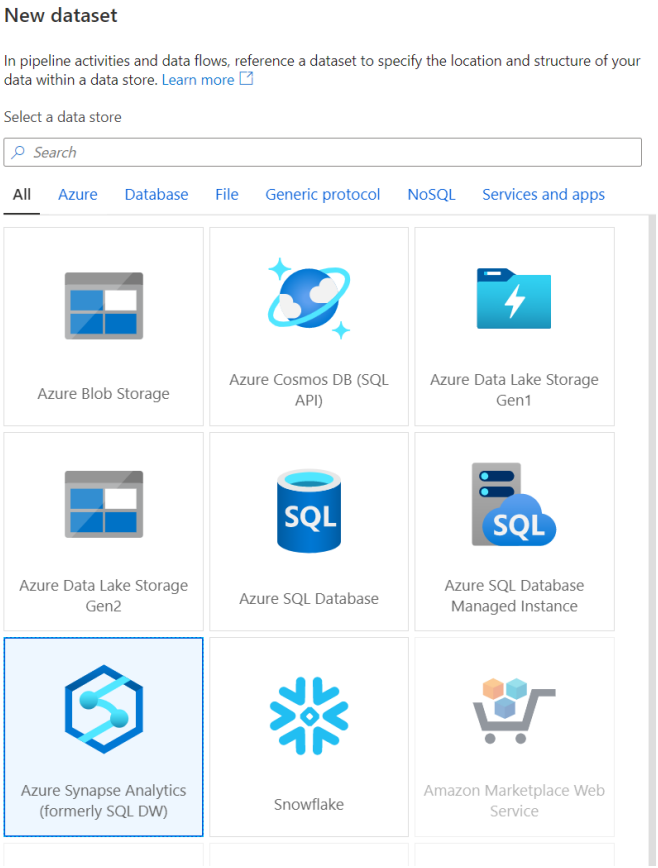
3. Create a data flow step to store the transformed data into Synapse SQL Pool.

We are now ready to output the transformed data into Synapse SQL Pool

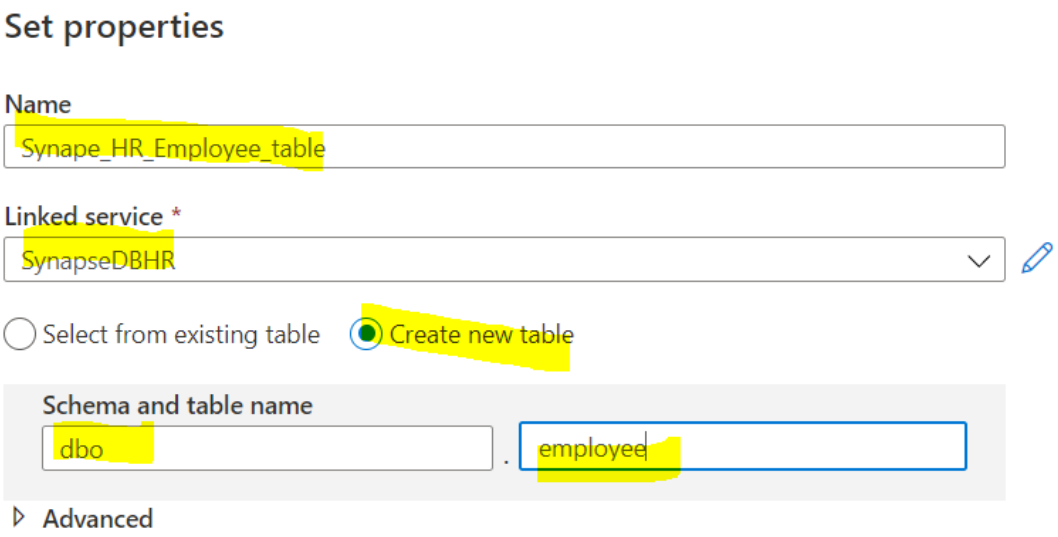
- Select '+' and select 'Sink' in the 'Destination' section. Last one in the list.
- Enter 'sinkToSynapseDb' for Output stream name
- Click the '+ New' next to Dataset to create new Azure Synapse Analytics (formerly SQL DW) dataset


IngestOracleHREmp...
SecurePIIdata
Validate
Debug Settings
Gen2HrEmpDataOut
Import data from Gen2HREmpData
Reference:
1
Columns:
11 total
sinkToSynapseDb
Columns:
11 total
Add Source

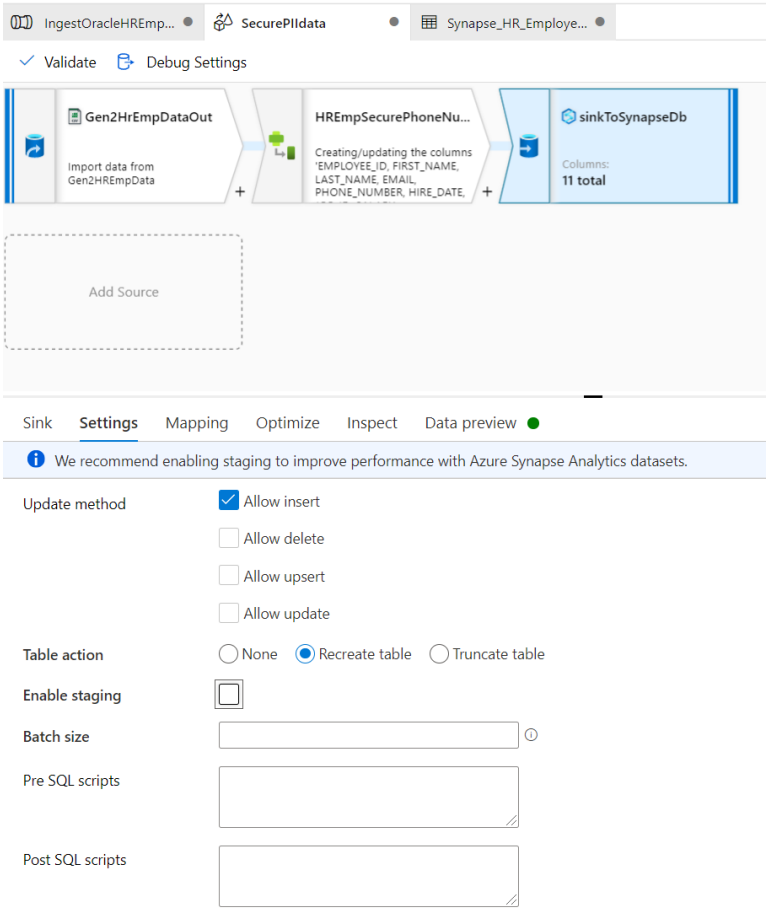

Sink
Settings
Mapping
Optimize
Inspect
Data preview
Output stream name *
sinkToSynapseDb
Learn more
Incoming stream *
HREmpSecurePhoneNumber
Sink type *
Dataset
Dataset *
Select...
New
Options
Allow schema drift
Validate schema


New dataset
In pipeline activities and data flows, reference a dataset to specify the location and structure of your data within a data store. Learn more
Select a data store
Search
All
Azure
Database
File
Generic protocol
NoSQL
Services and apps
Azure Blob Storage
Azure Cosmos DB (SQL API)
Azure Data Lake Storage Gen1
Azure Data Lake Storage Gen2
Azure SQL Database
Azure SQL Database Managed Instance
Azure Synapse Analytics (formerly SQL DW)
Snowflake
Amazon Marketplace Web Service

- For dataset name, enter 'Synape_HR_Employee_table'
- Select 'SynapseDBHR' Linked service
- Check the 'Create new table' radio button
- Check the 'Edit' and enter schema: dbo and table name: employee
- Click 'OK'



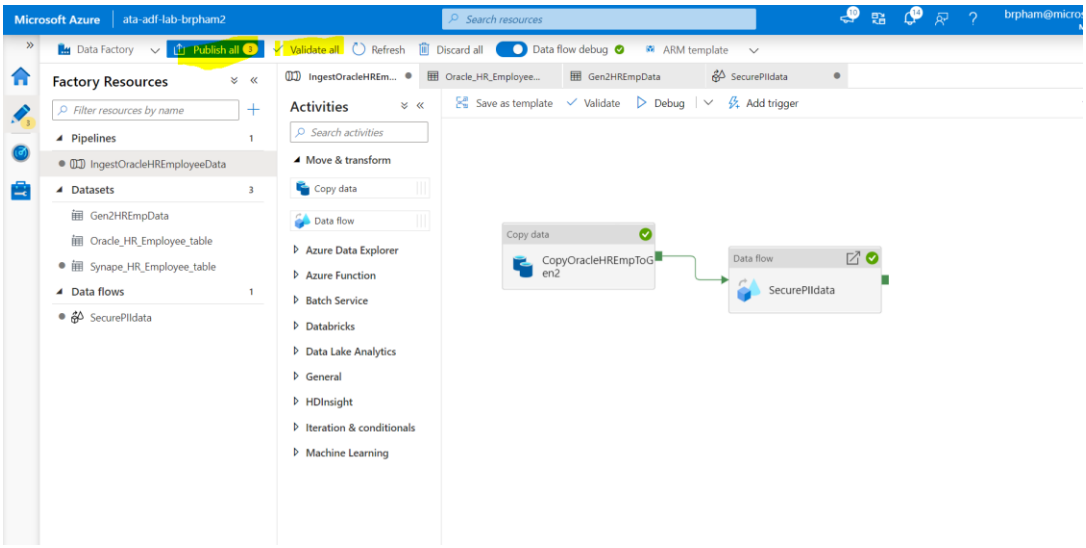
- Click the ‘Settings’ tab
- Check the ‘Recreate table’ radio button
- Uncheck the ‘Enable staging’ checkbox

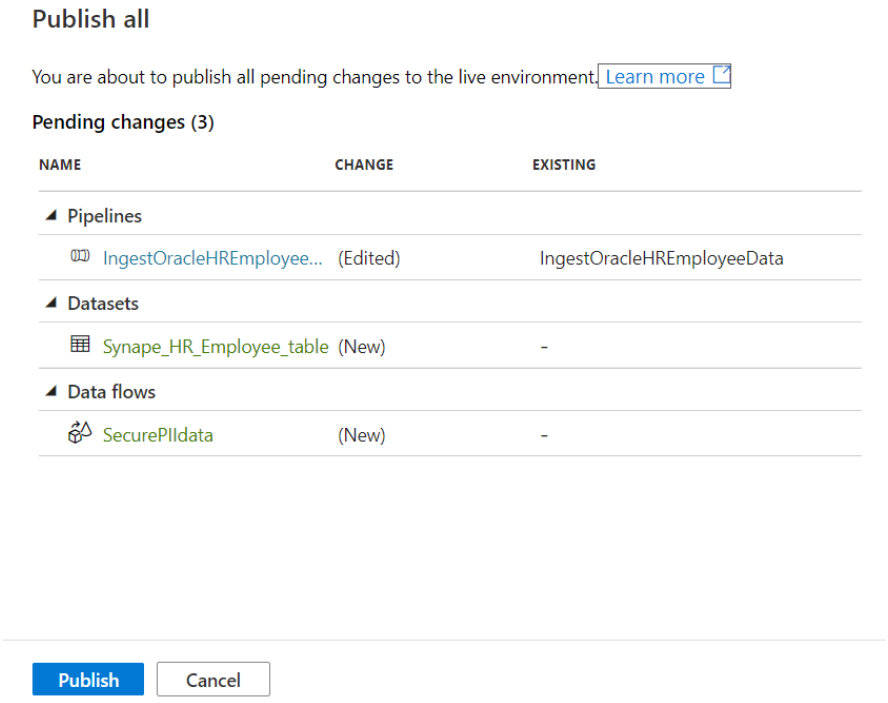


Task-5: Build a pipeline to connect Copy and Data flow activities and Test the Execution

We have a create copy activity to ingest the data from Oracle to Azure Data Lake Storage and Dataflow activity to secure PII data. You will connect both activities to build a pipeline to execute the end to end functionality.

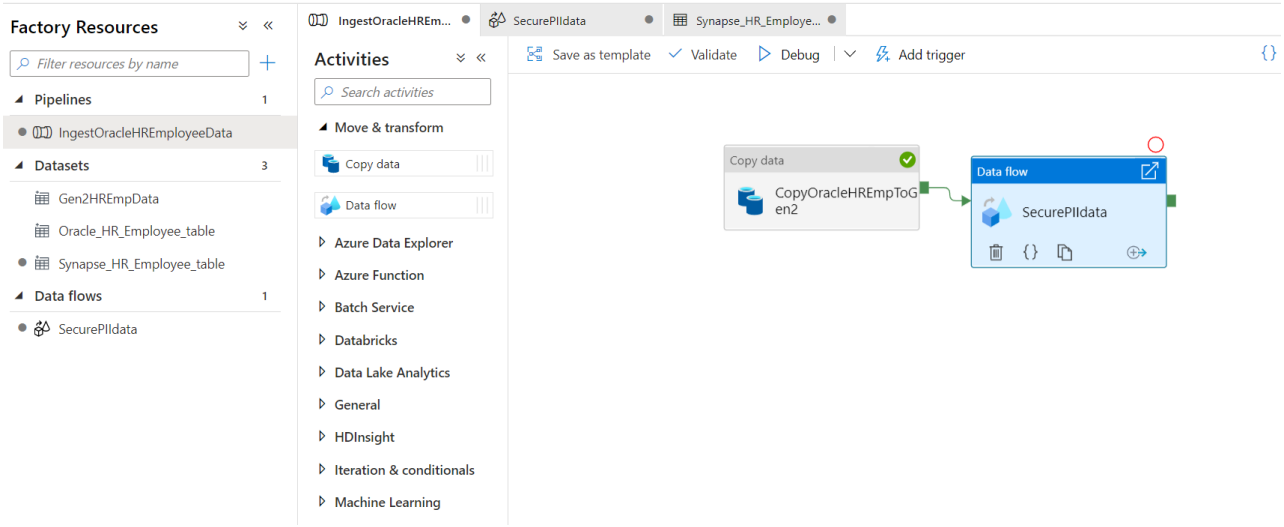
1. Connect the 'Copy data' activity with 'Data Flow' activity
2. Click on 'Validate all' to confirm that datasets, dataflow, and pipeline are valid
3. Click on 'Publish all' to publish the data factory artifacts to Azure Data Factory service



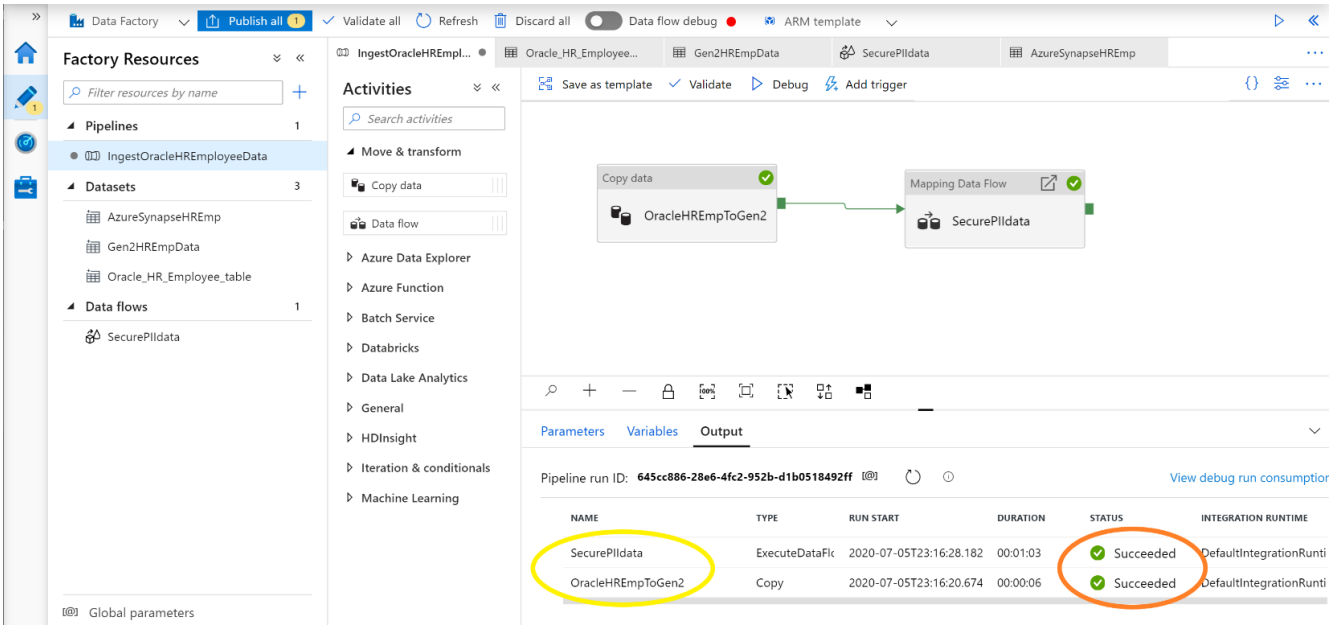


4. Trigger the pipeline execution.

- Click on 'Debug' to test the data transformation to secure the PII data and storing it to Synapse Analytics SQL database.

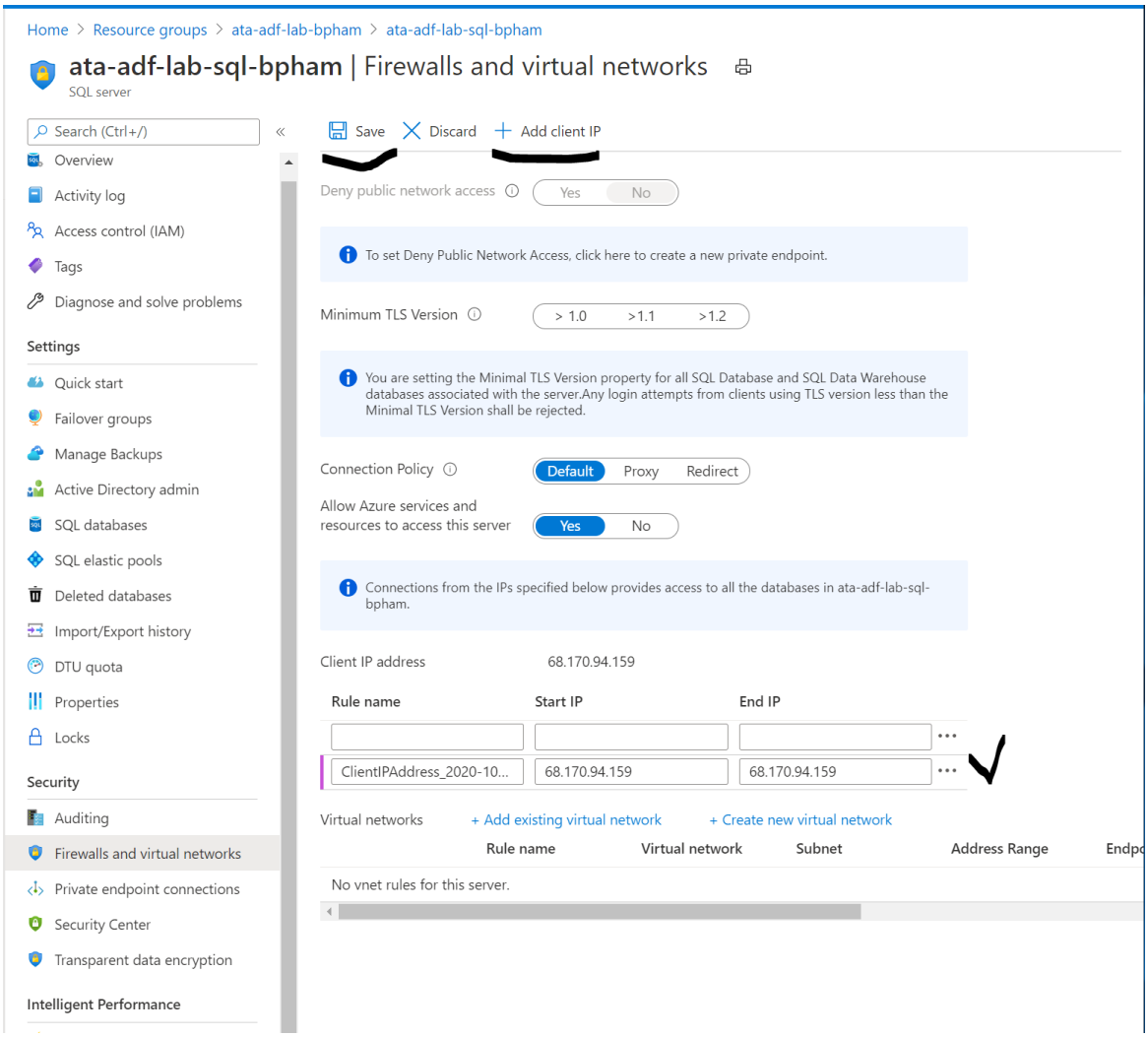


- Execution will be queued and wait till it finishes.

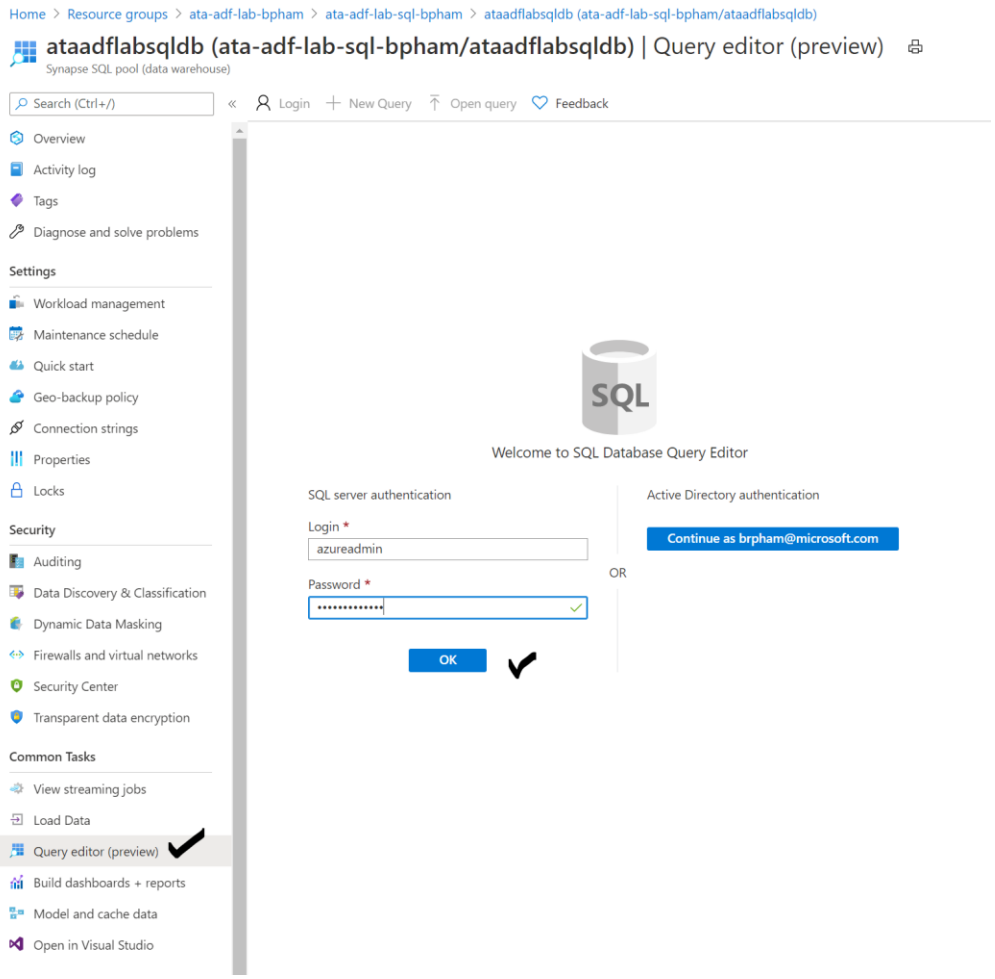


4. Verify the transformed data was inserted into Azure Synapse Analytics SQL Pool.

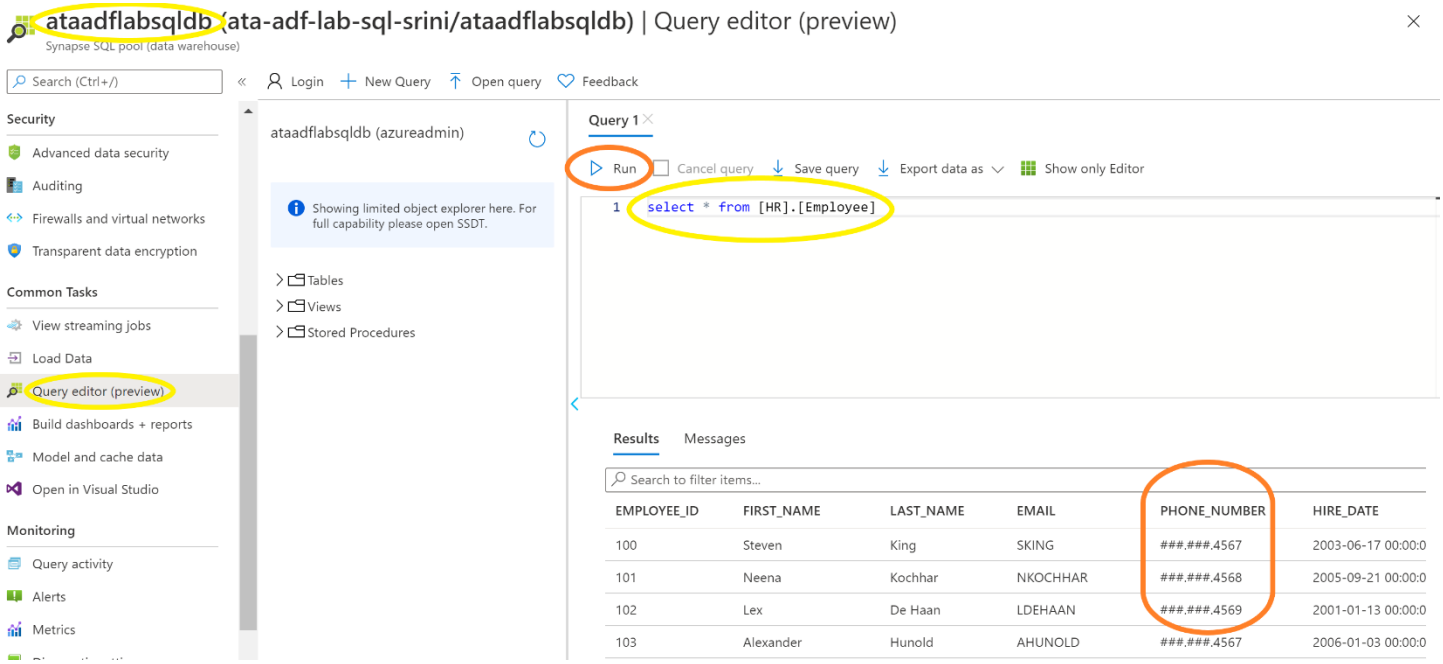
- Select 'Firewalls and virtual networks' from 'Security' section
- Click the '+ Add client IP'
- Click on 'Save' button after you added the rule.



- Switch to Azure Services and access the Synapse SQL Analytics to verify the employee data with secured phone numbers
- Select the Overview and scroll down to select the 'ataadflabsqldb' database
- Select the 'Query editor (preview)' from the 'Common Tasks' section
- Login with 'azureadmin' and password 'Ataadf123!'
- With successful login, you will see the tables and views.



- Enter 'select * from dbo.employee' and click the 'Run' button to view the ingested data from the Oracle database.
- You should see all the employee data with the secured phone number.



Congratulations!! You have successfully ingested the data from Oracle to Azure Data Lake Storage, transformed the data as per your needs such as securing the data and stored the data into Azure Synapse Analytics for your business analytics needs!!!