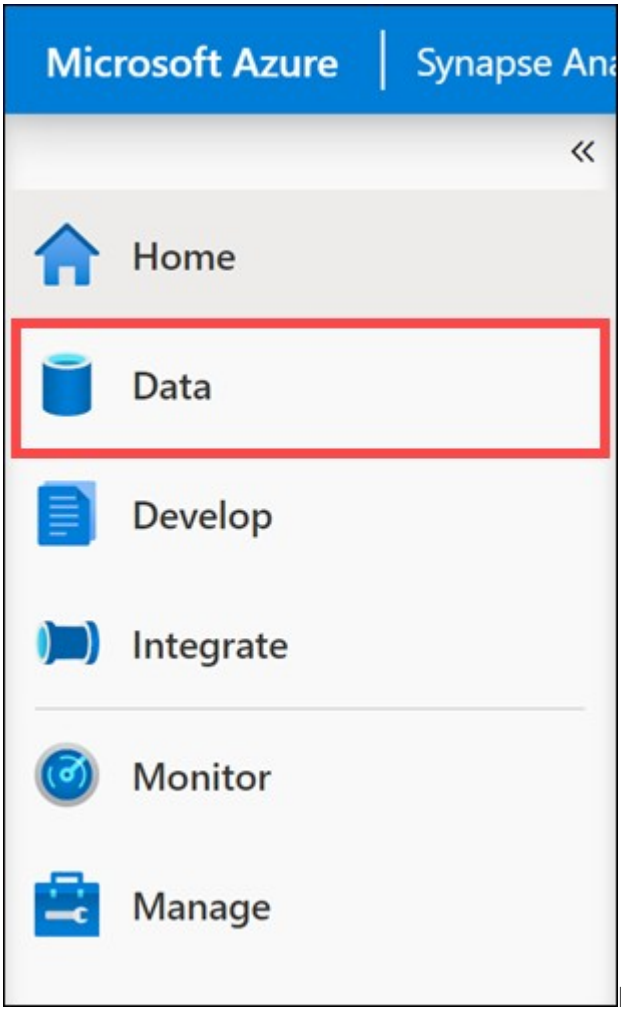
Exercise - Design and implement a Type 1 slowly changing dimension with mapping data flows

In this exercise, you create a Data flow for a Type 1 SCD using Azure Synapse dedicated SQL pool as the source and destination. This data flow could then be added to a Synapse Pipeline and run as part of the extract, transform, load (ETL) process.

Setup source and dimension table

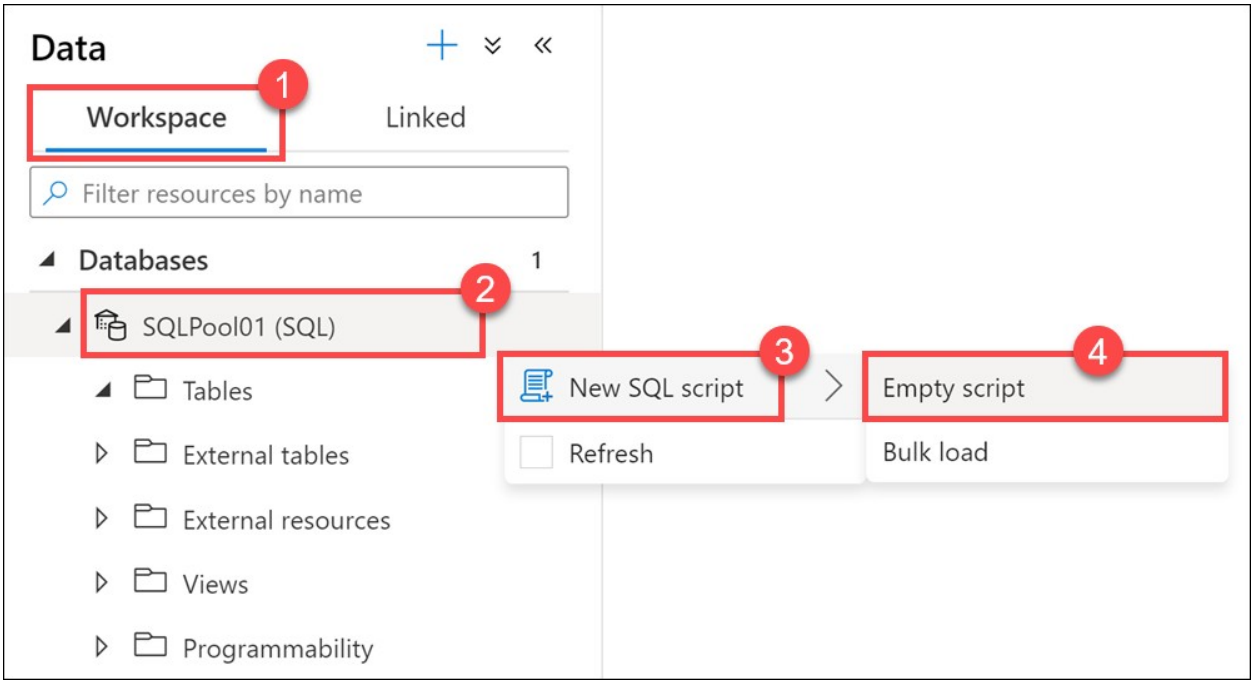
For this exercise you want to load a dimension table in Azure Synapse from source data that could be from many different system types, such as Azure SQL, Azure storage, etc. For this example you keep it simple by creating the source data in your Azure Synapse database.

1. From Synapse Studio, navigate to the **Data** hub.



Data hub

2. Select the Workspace tab (1), expand Databases, then right-click on SQLPool01 (2). Select New SQL script (3), then select Empty script (4).



The data hub is displayed with the context menus to create a new SQL script

3. Paste the following script into the empty script window, then select **Run** or hit `F5` to execute the query:

```
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```
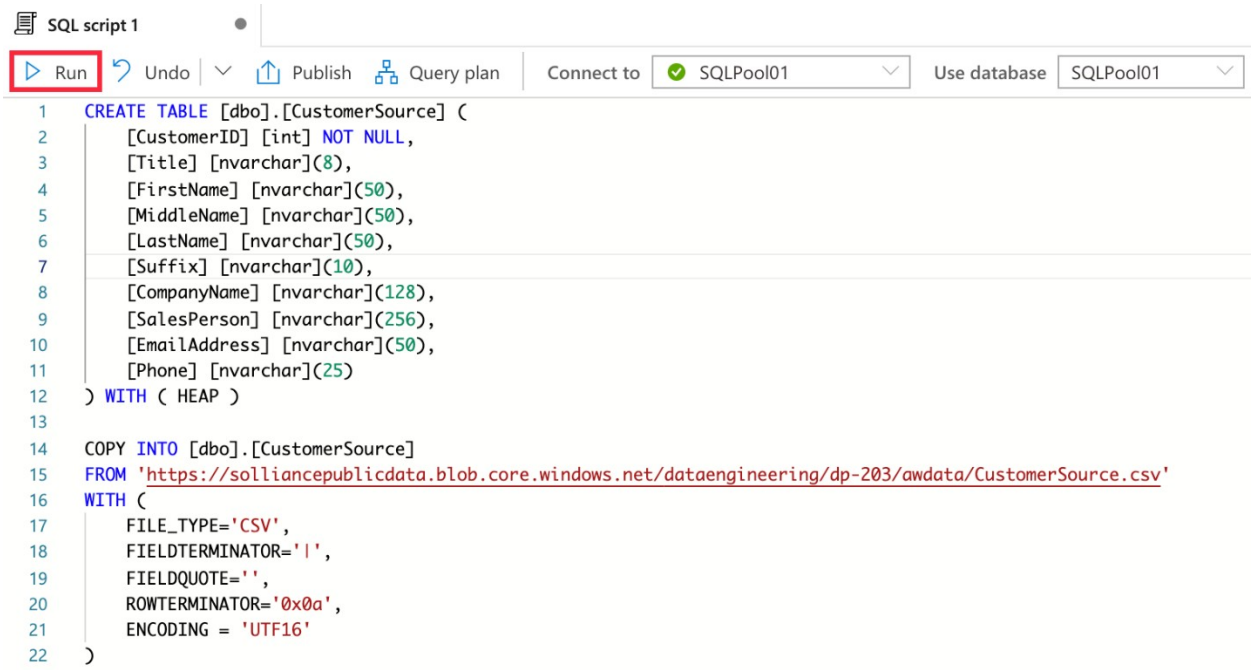

```sql
CREATE TABLE [dbo].[CustomerSource] (
    [CustomerID] [int] NOT NULL,
    [Title] [nvarchar](8),
    [FirstName] [nvarchar](50),
    [MiddleName] [nvarchar](50),
    [LastName] [nvarchar](50),
    [Suffix] [nvarchar](10),
    [CompanyName] [nvarchar](128),
    [SalesPerson] [nvarchar](256),
    [EmailAddress] [nvarchar](50),
    [Phone] [nvarchar](25)
) WITH ( HEAP )

COPY INTO [dbo].[CustomerSource]
FROM 'https://solliancepublicdata.blob.core.windows.net/dataengineering/dp-203/awdata/CustomerSource.csv'
WITH (
    FILE_TYPE='CSV',
    FIELDTERMINATOR='|',
    FIELDQUOTE='',
    ROWTERMINATOR='0x0a',
    ENCODING = 'UTF16'
)

CREATE TABLE dbo.[DimCustomer](
    [CustomerID] [int] NOT NULL,
    [Title] [nvarchar](8) NULL,
```

```
    [FirstName] [nvarchar](50) NOT NULL,
    [MiddleName] [nvarchar](50) NULL,
    [LastName] [nvarchar](50) NOT NULL,
    [Suffix] [nvarchar](10) NULL,
    [CompanyName] [nvarchar](128) NULL,
    [SalesPerson] [nvarchar](256) NULL,
    [EmailAddress] [nvarchar](50) NULL,
    [Phone] [nvarchar](25) NULL,
    [InsertedDate] [datetime] NOT NULL,
    [ModifiedDate] [datetime] NOT NULL,
    [HashKey] [char](66)
)
WITH
(
```

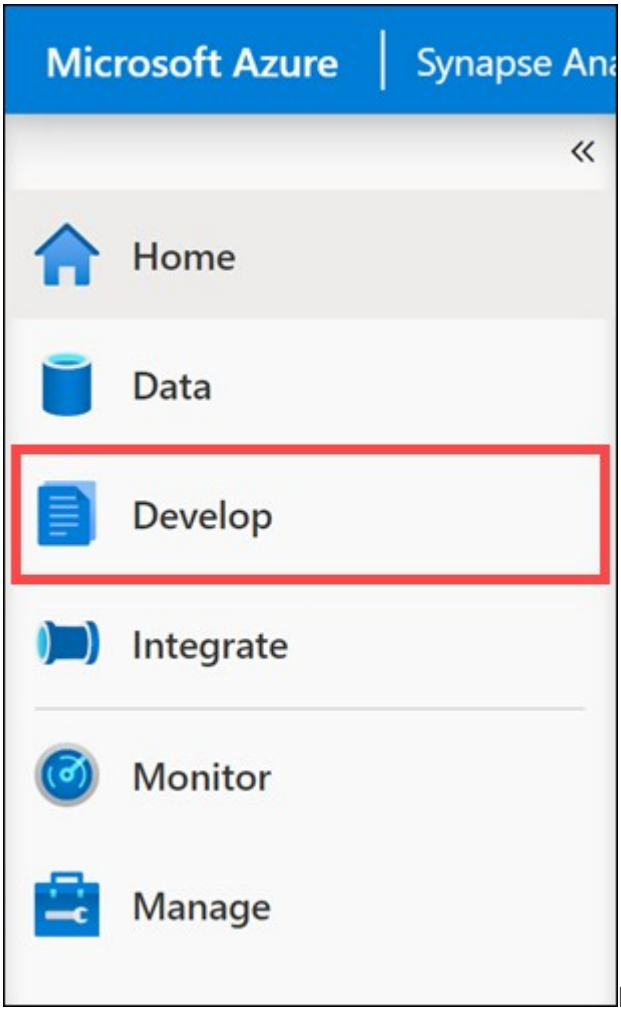


The script and Run button are both highlighted

Create a mapping data flow

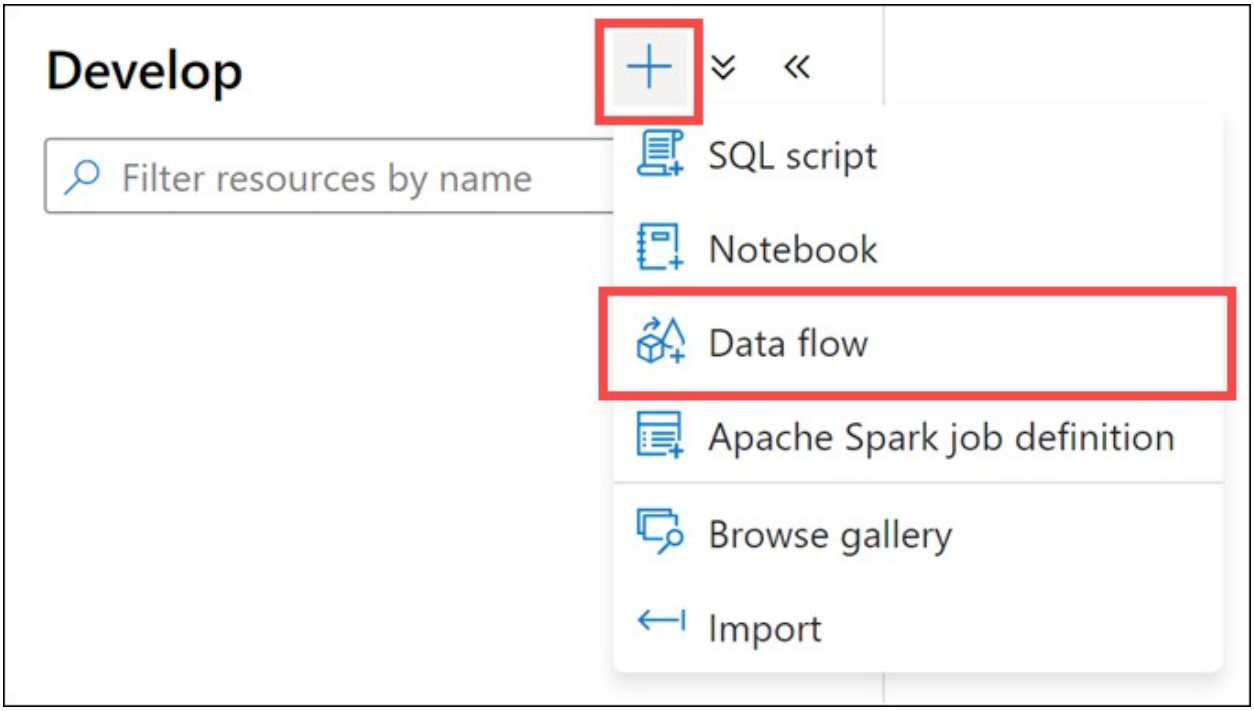
Mapping Data flows are pipeline activities that provide a visual way of specifying how to transform data, through a code-free experience.Next you will create a mapping data flow to create a Type 1 SCD.

1. Navigate to the **Develop** hub.



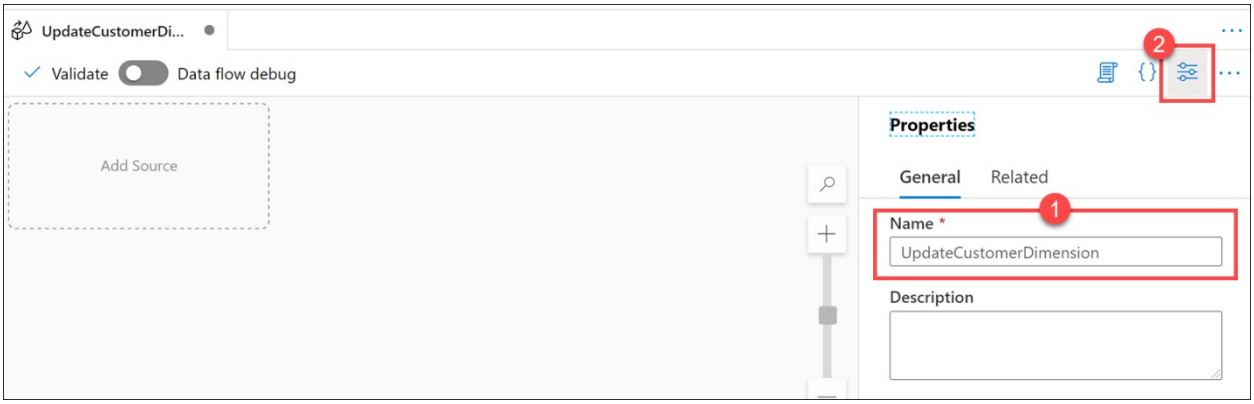
Develop hub

2. Select +, then select **Data flow**.



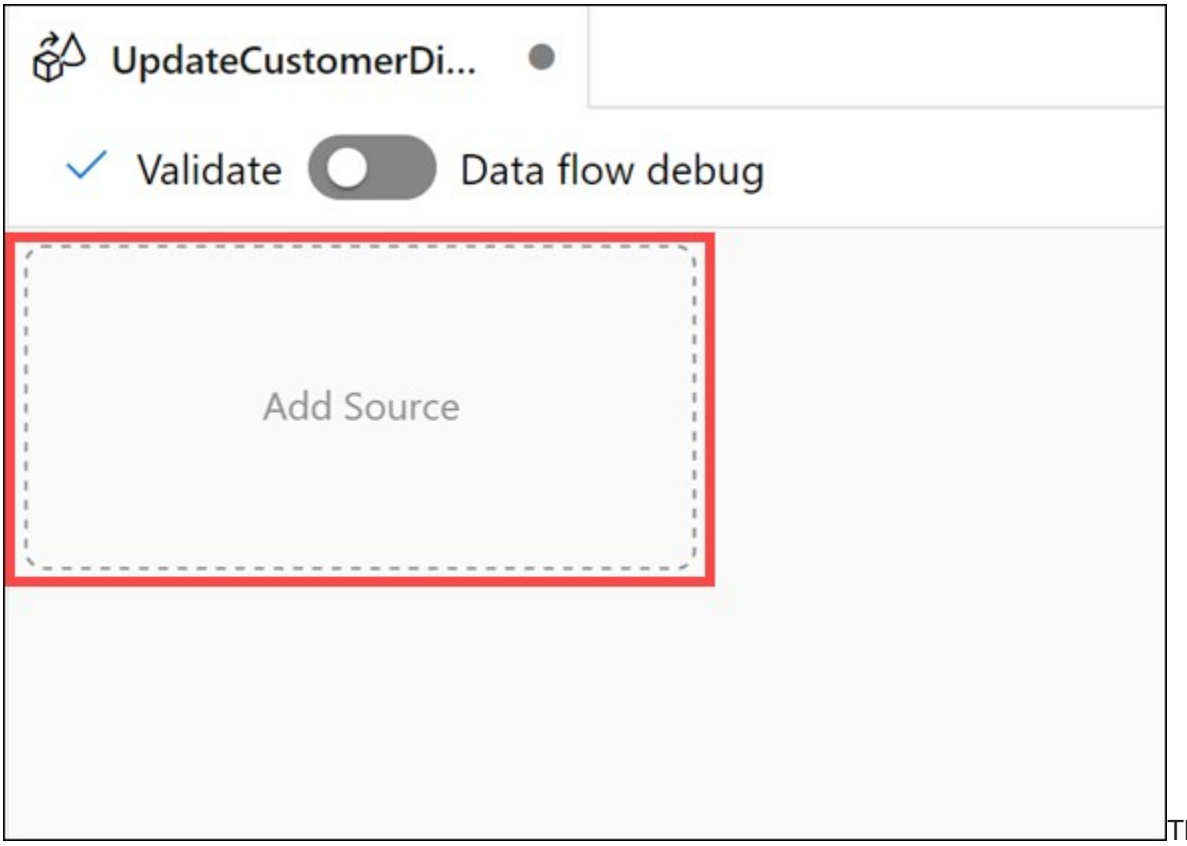
The plus button and data flow menu item are highlighted

3. In the properties pane of the new data flow, enter `UpdateCustomerDimension` in the Name field (1), then select the Properties button (2) to hide the properties pane.



The data flow properties pane is displayed

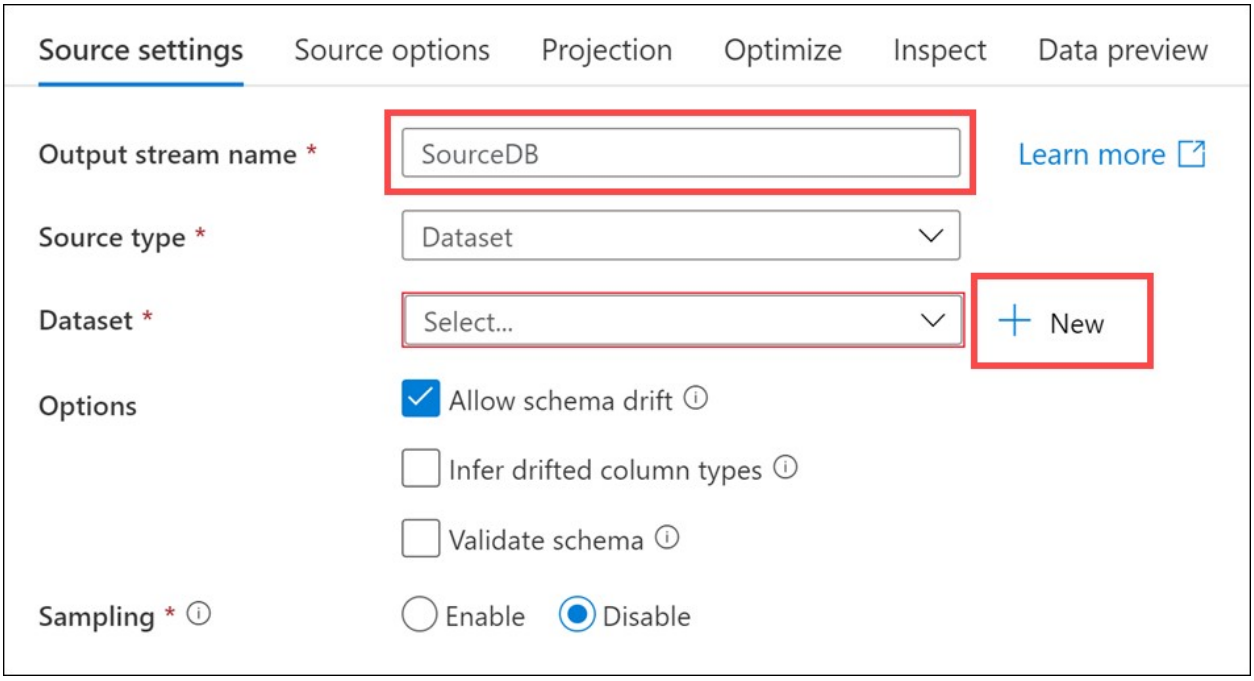
4. Select Add Source on the canvas.



The Add Source button is highlighted on the data flow canvas

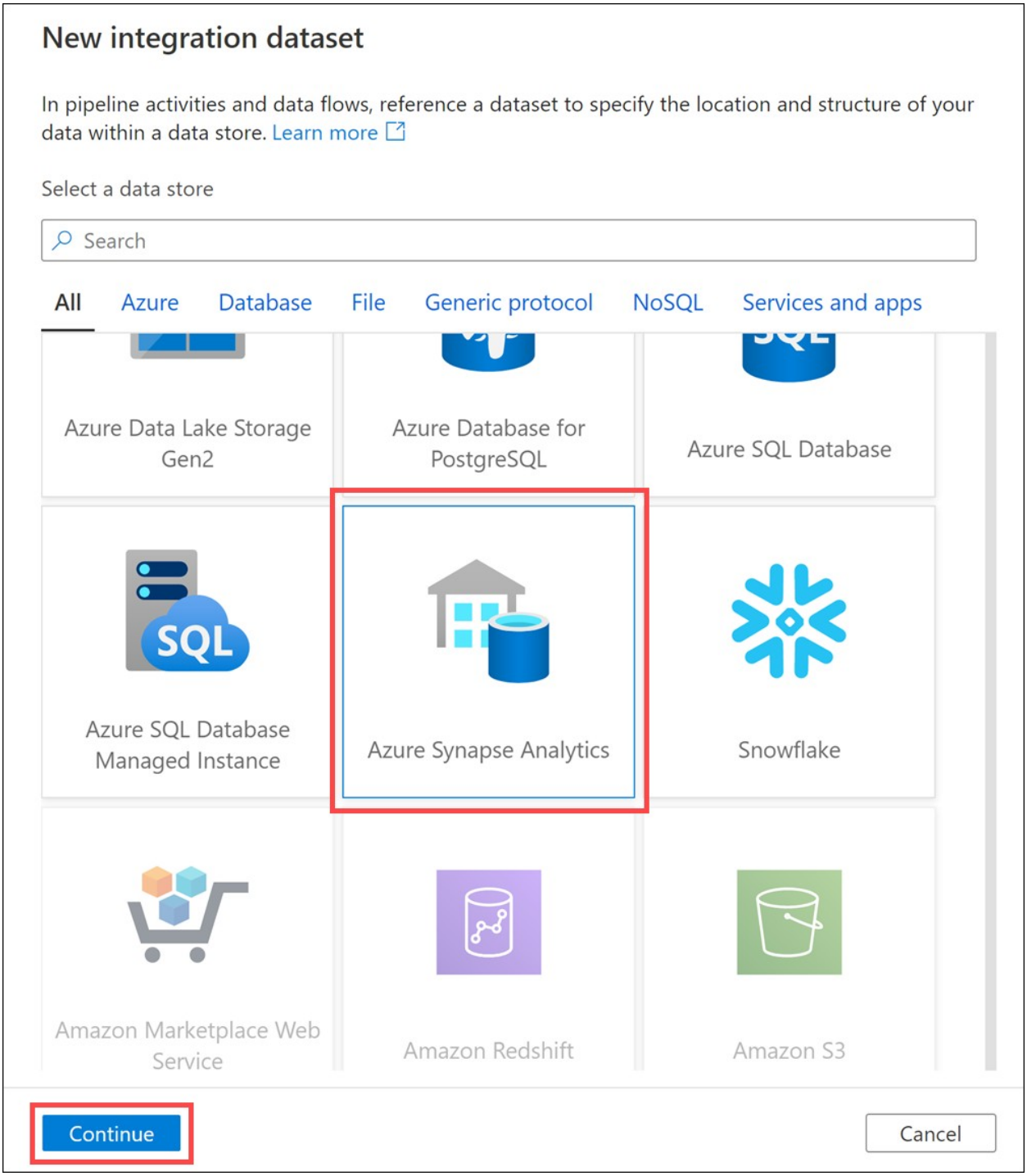
5. Under Source settings, configure the following properties:

- Output stream name: Enter **`SourceDB`**
- Source type: Select **`Dataset`**
- Options: Check **`Allow schema drift`** and leave the other options unchecked
- Sampling: Select **`Disable`**
- Dataset: Select **`+ New`** to create a new dataset



The New button is highlighted next to Dataset

6. In the new integration dataset dialog, select Azure Synapse Analytics, then select Continue.

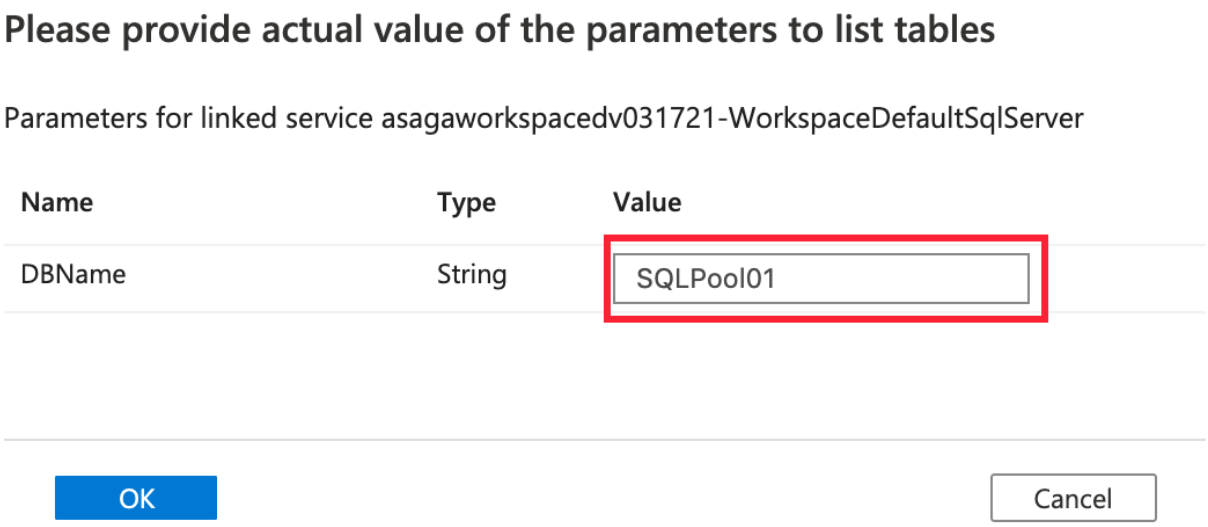


Azure Synapse Analytics and the Continue button are highlighted

7. In the dataset properties, configure the following:

- **Name**: Enter `CustomerSource`
- **Linked service**: Select the Synapse workspace linked service
- **Table name**: Select the **Refresh button** next to the dropdown

8. In the Value field, enter your SQL Pool name, then select OK.



The SQLPool01 parameter is highlighted

9. Select `dbo.CustomerSource` under Table name, select `From connection/store` under Import schema, then select OK to create the dataset.

Set properties

Name

CustomerSource

Linked service *

asagaworkspacedv031721-WorkspaceDefaultSqlServer

Connect via integration runtime *

AutoResolveIntegrationRuntime

Table name

dbo.CustomerSource

Edit

Import schema

From connection/store None

Advanced

OK Back Cancel

The form is completed as described

10 Select **Open** next to the `CustomerSource` dataset that you added.

Source settings Source options Projection Optimize Inspect Data preview

Output stream name * SourceDB Learn more

Source type * Dataset Inline

Dataset * CustomerSource Test connection Open New

Options Allow schema drift Infer drifted column types Validate schema

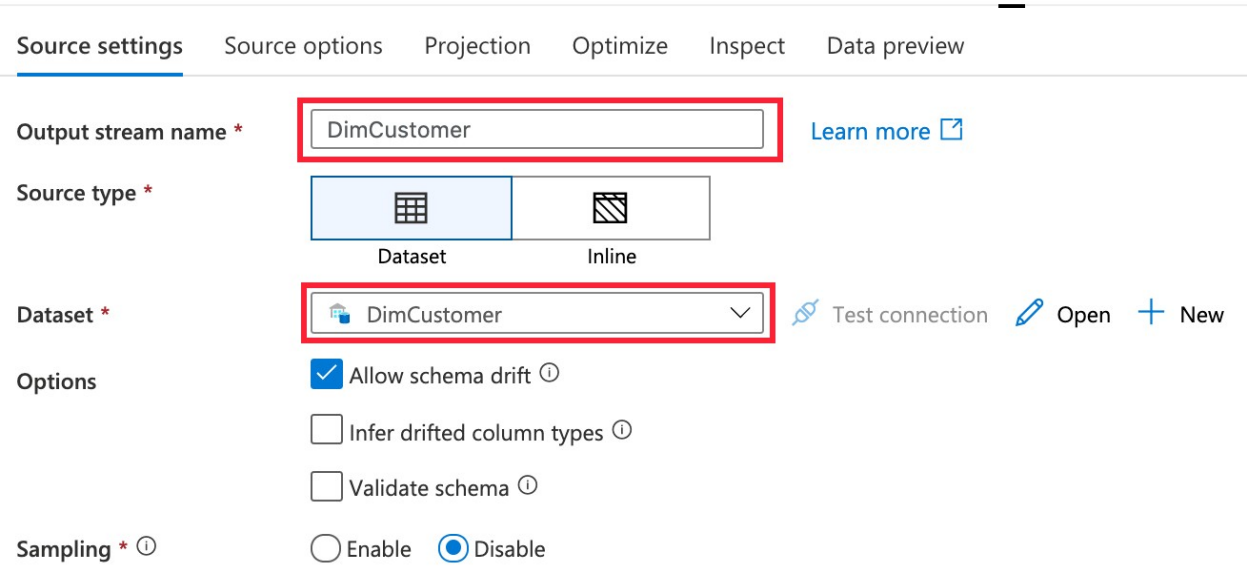
Sampling * Enable Disable

The open button is highlighted next to the new dataset

11. Enter your **SQL Pool** name in the **Value** field next to `DBName`.

12. In the data flow editor, select the **Add Source** box below the SourceDB activity. Configure this source as the **DimCustomer** table following the same steps used for CustomerSource.

- **Output stream name**: Enter DimCustomer
- **Source type**: Select `Dataset`
- **Options:** Check `Allow schema drift` and leave the other options unchecked
- **Sampling:** Select `Disable`
- **Dataset:** Select + **New** to create a new dataset. Use the Azure Synapse linked service and choose DimCustomer table. Be sure to set the DBName to your SQL Pool name.

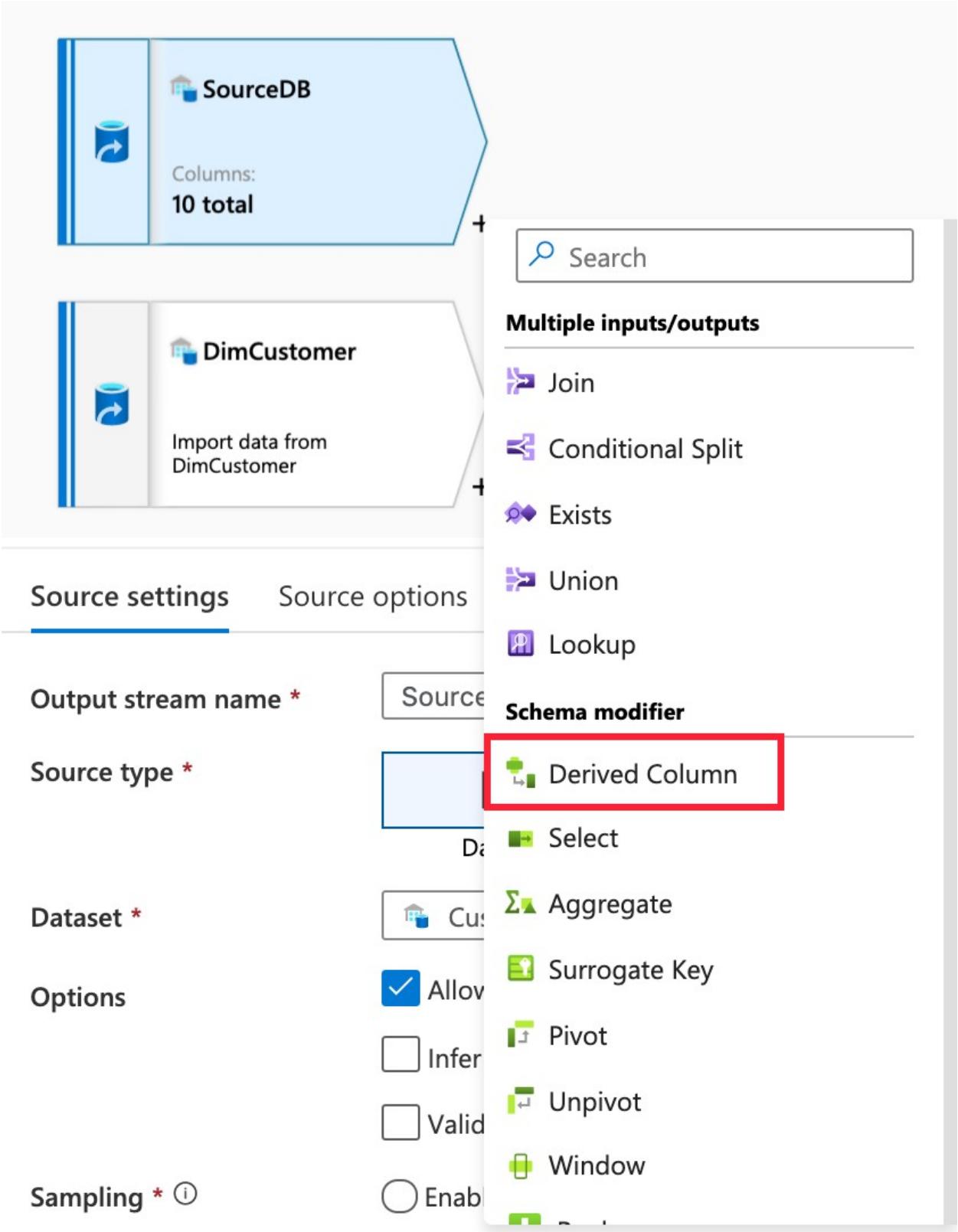


The Add Source, Output stream name, and Dataset name are highlighted in the Source settings

Add transformations to data flow

1. Select + to the right of the `SourceDB` source on the canvas, then select Derived Column.

2. Under Derived column's settings, configure the following properties:

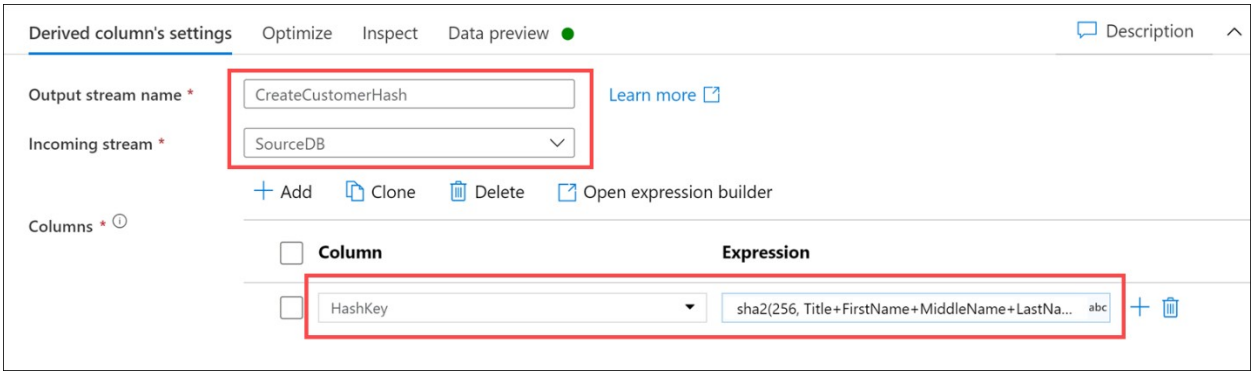


The plus button and derived column menu item are highlighted

- **Output stream name**: Enter `CreateCustomerHash`

- **Incoming stream**: Select `SourceDB`
- **Columns**: Enter the following:

Column	Expression	Description
Select `InsertedDate`	`iif(isNull(InsertedDate), currentTimestamp(), {InsertedDate})`	If the InsertedDate value is null, insert the current timestamp. Otherwise, use the InsertedDate value.
Select `ModifiedDate`	`currentTimestamp()`	Always update the ModifiedDate value with the current timestamp.



The Derived column's settings form is configured as described.

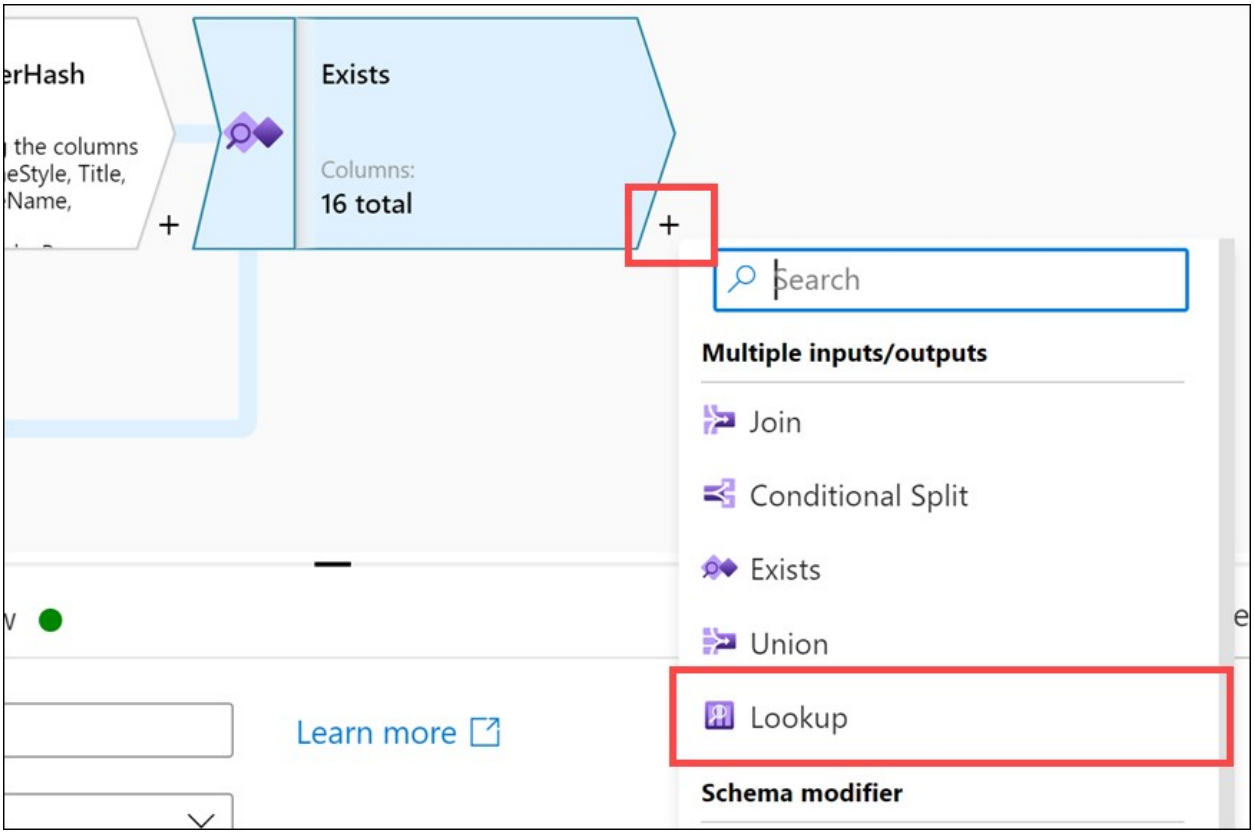
3. Select + to the right of the `CreateCustomerHash` derived column on the canvas, then select **Exists**.

4. Under `Exists settings`, configure the following properties:

- **Output stream name**: Enter `Exists`
- **Left stream**: Select `CreateCustomerHash`
- **Right stream**: Select `SynapseDimCustomer`
- **Exist type**: Select `Doesn't exist`
- **Exists conditions:** Set the following for Left and Right:

Left: CreateCustomerHash's column	Right: SynapseDimCustomer's column
`HashKey`	`HashKey`

5. Select + to the right of `Exists` on the canvas, then select **Lookup**.



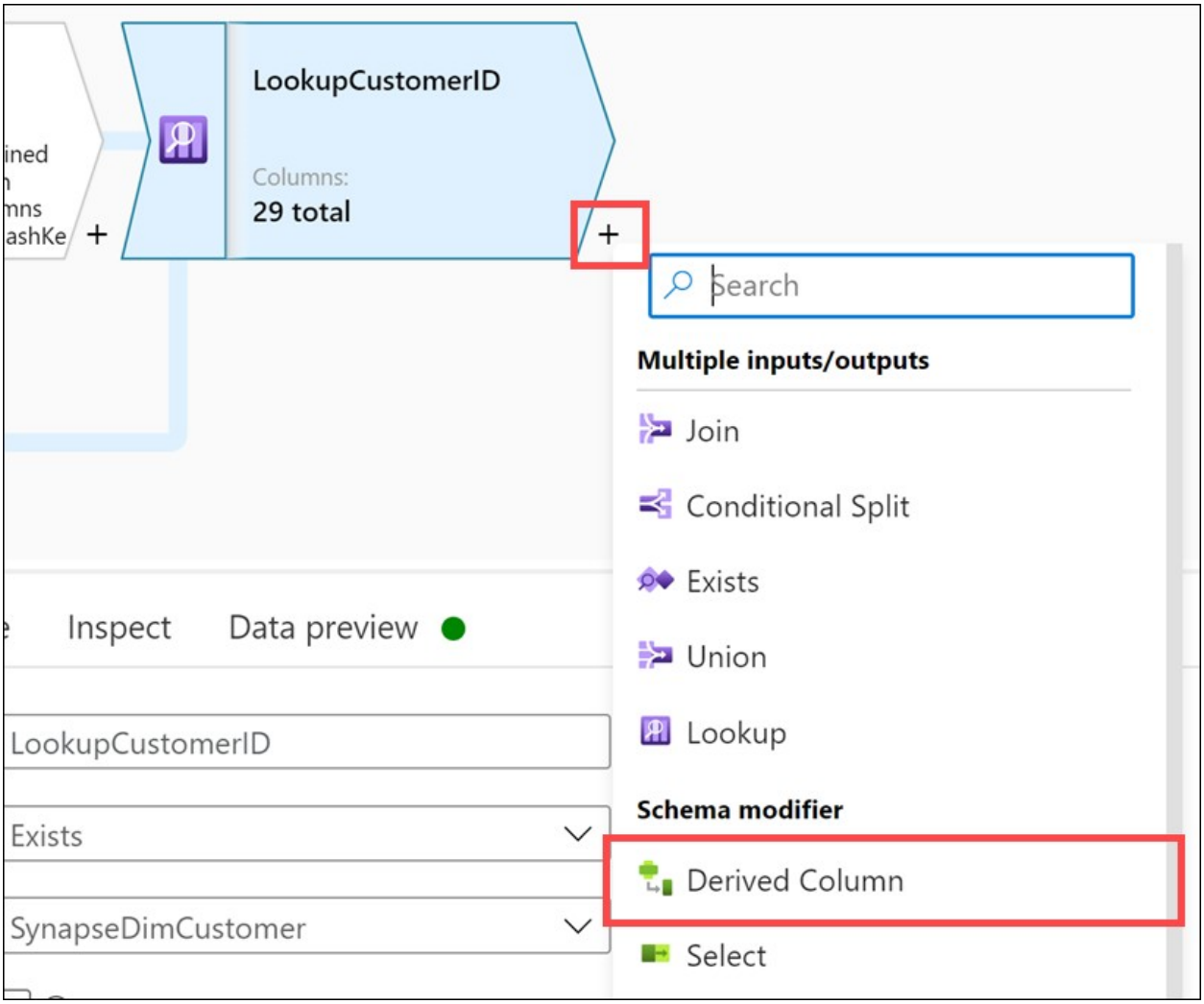
The plus button and lookup menu item are both highlighted

6. Under Lookup settings, configure the following properties:

- **Output stream name**: Enter `LookupCustomerID`
- **Primary stream**: Select `Exists`
- **Lookup stream:** Select `SynapseDimCustomer`
- **Match multiple rows:** Unchecked
- **Match on:** Select `Any row`
- **Lookup conditions**: Set the following for Left and Right:

Left: Exists's column	Right: SynapseDimCustomer's column
`CustomerID`	`CustomerID`

7. Select + to the right of `LookupCustomerID` on the canvas, then select Derived Column.



The plus button and derived column menu item are both highlighted.

8. Under `Derived column's settings`, configure the following properties:

- **Output stream name**: Enter `SetDates`
- **Incoming stream**: Select `LookupCustomerID`
- **Columns**: Enter the following:

Column	Expression	Description
Select `InsertedDate`	`iif(isNull(InsertedDate), currentTimestamp(), {InsertedDate})`	If the InsertedDate value is null, insert the current timestamp. Otherwise, use the InsertedDate value.
Select `ModifiedDate`	`currentTimestamp()`	Always update the ModifiedDate value with the current timestamp.

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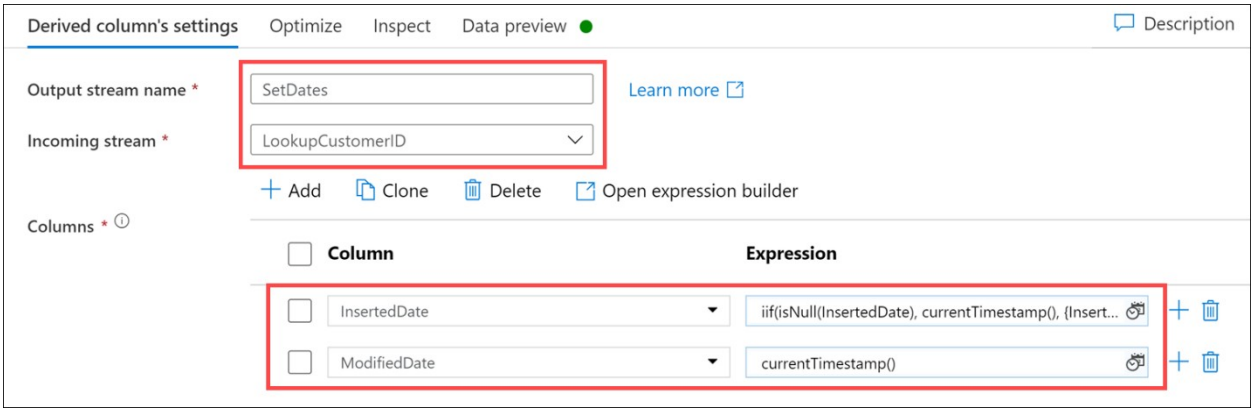
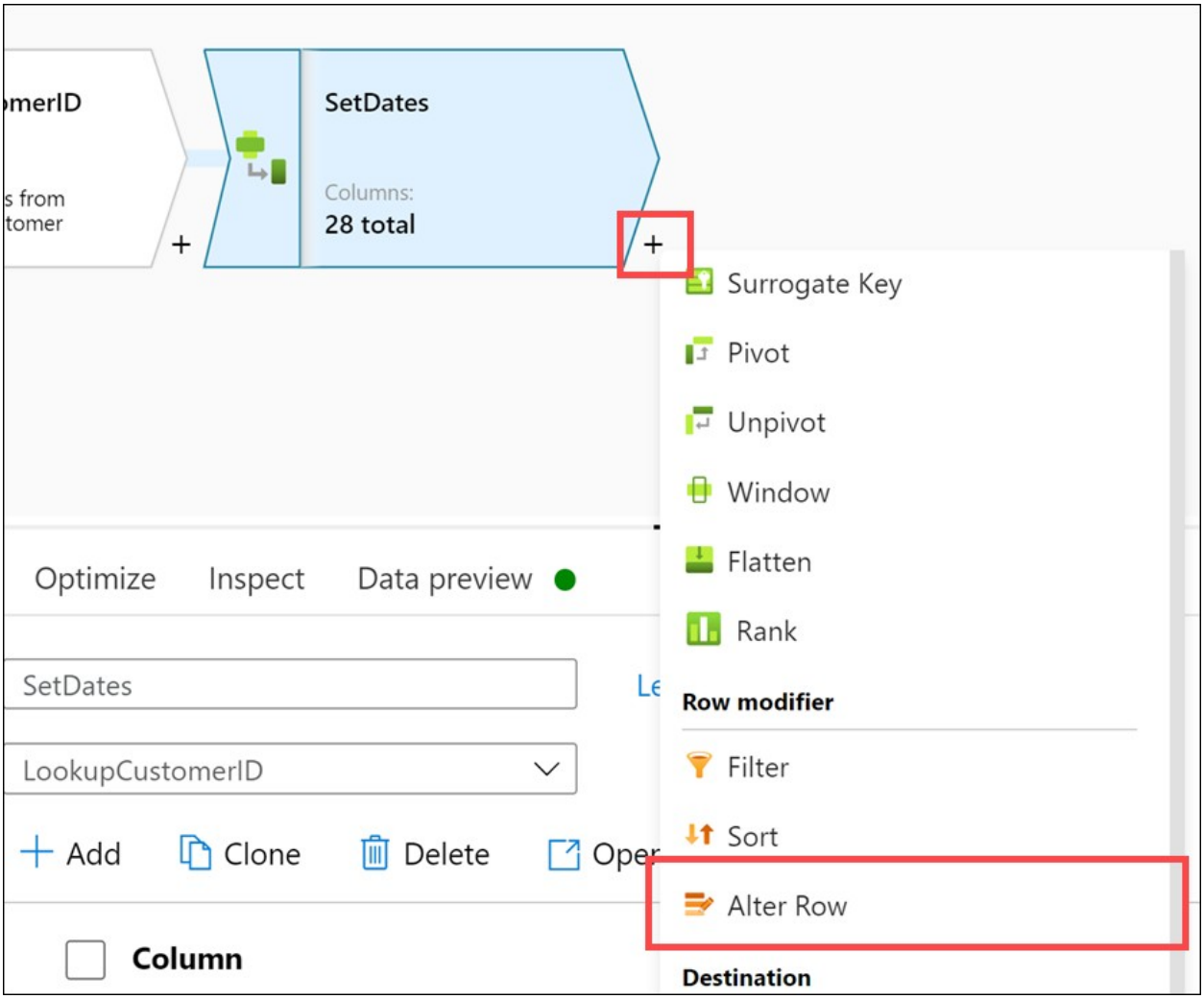


Another Derived column's settings form is configured as described.

Note: To insert the second column, select + **Add** above the Columns list, then select **Add column**.

9. Select + to the right of the **`SetDates`** derived column step on the canvas, then select **Alter Row**.

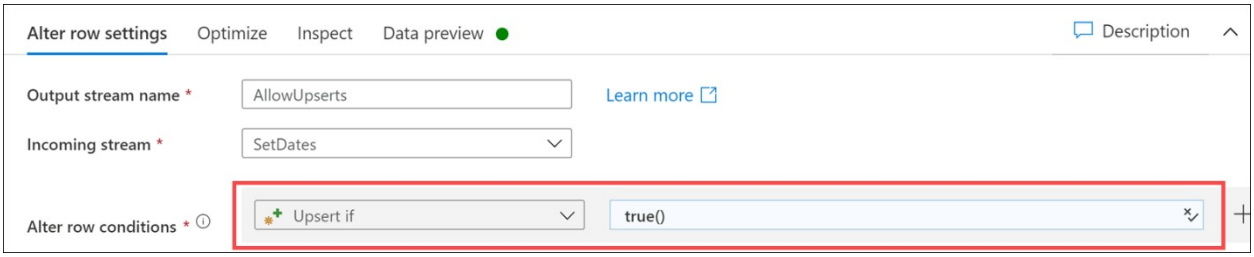


The plus button and alter row menu item are both highlighted.

10 Under `Alter row settings`, configure the following properties:

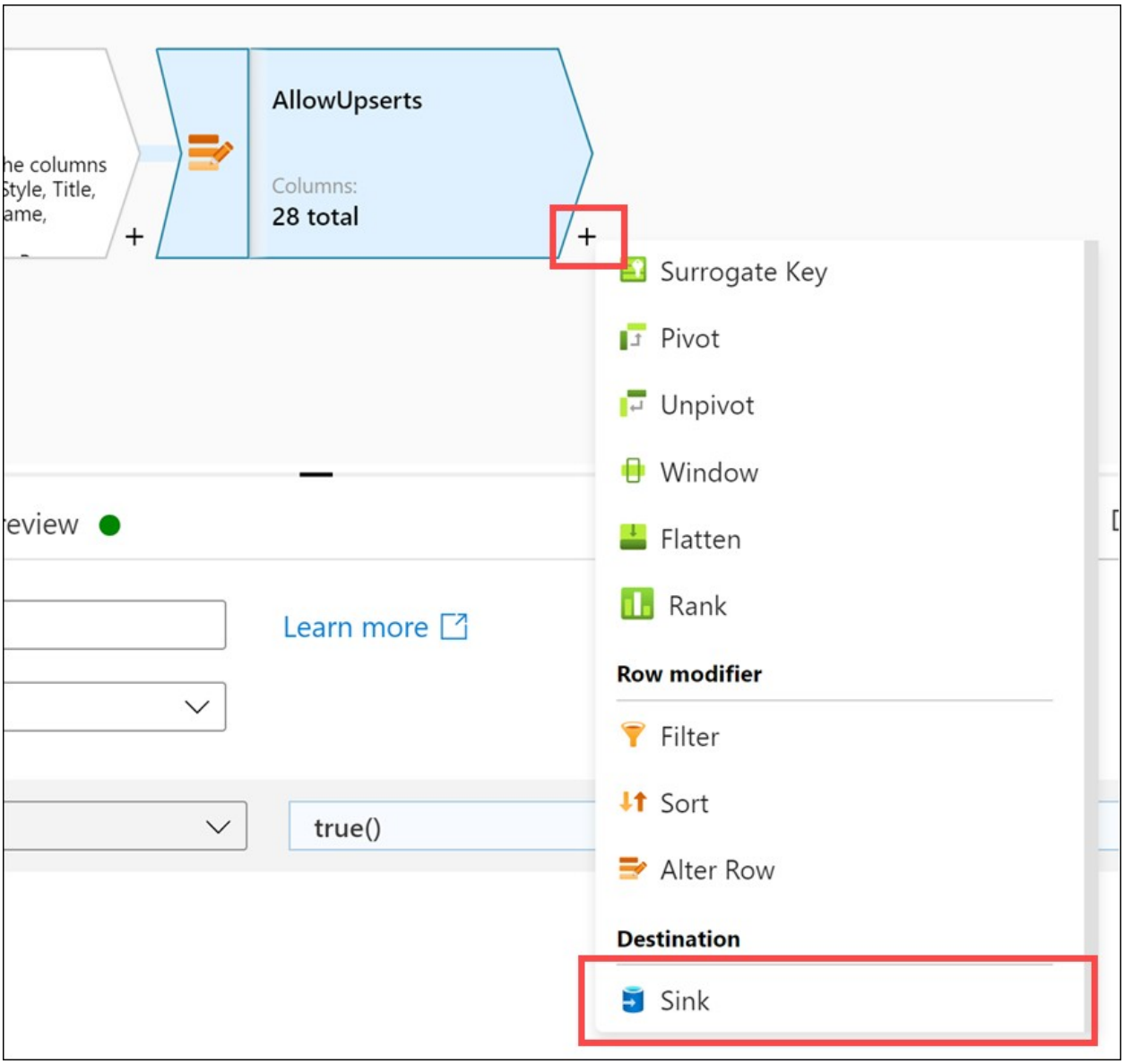
- **Output stream name**: Enter `AllowUpserts`
- **Incoming stream**: Select `SetDates`
- **Alter row conditions**: Enter the following:

Condition	Expression	Description
Select `Upsert if`	`true()`	Set the condition to true() on the Upsert if condition to allow upserts. This ensures that all data that passes through the steps in the mapping data flow will be inserted or updated into the sink.



The alter row settings form is configured as described.

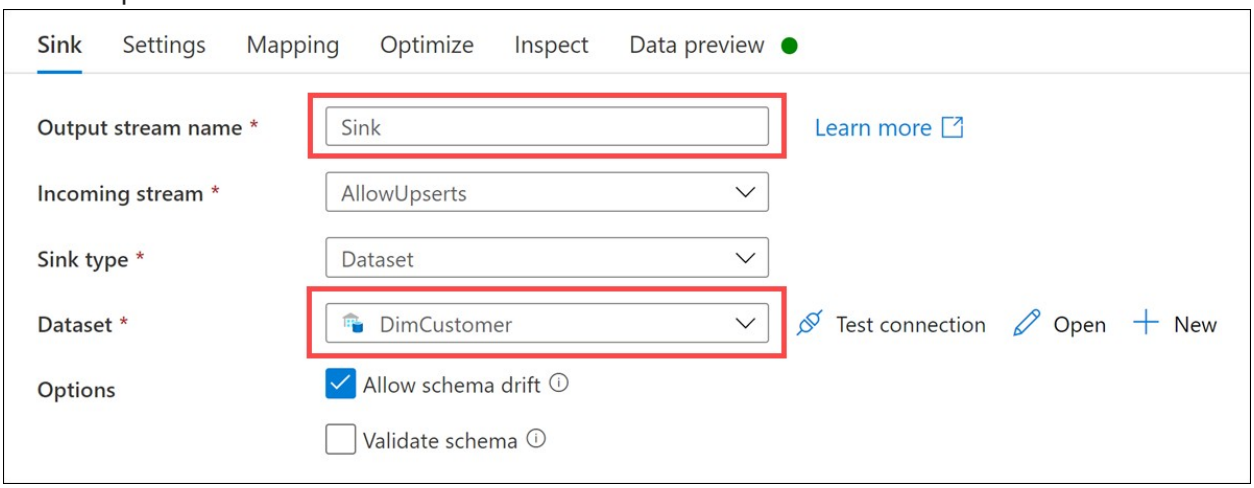
11. Select + to the right of the `AllowUpserts` alter row step on the canvas, then select **Sink**.



The plus button and sink menu item are both highlighted

12. Under `Sink`, configure the following properties:

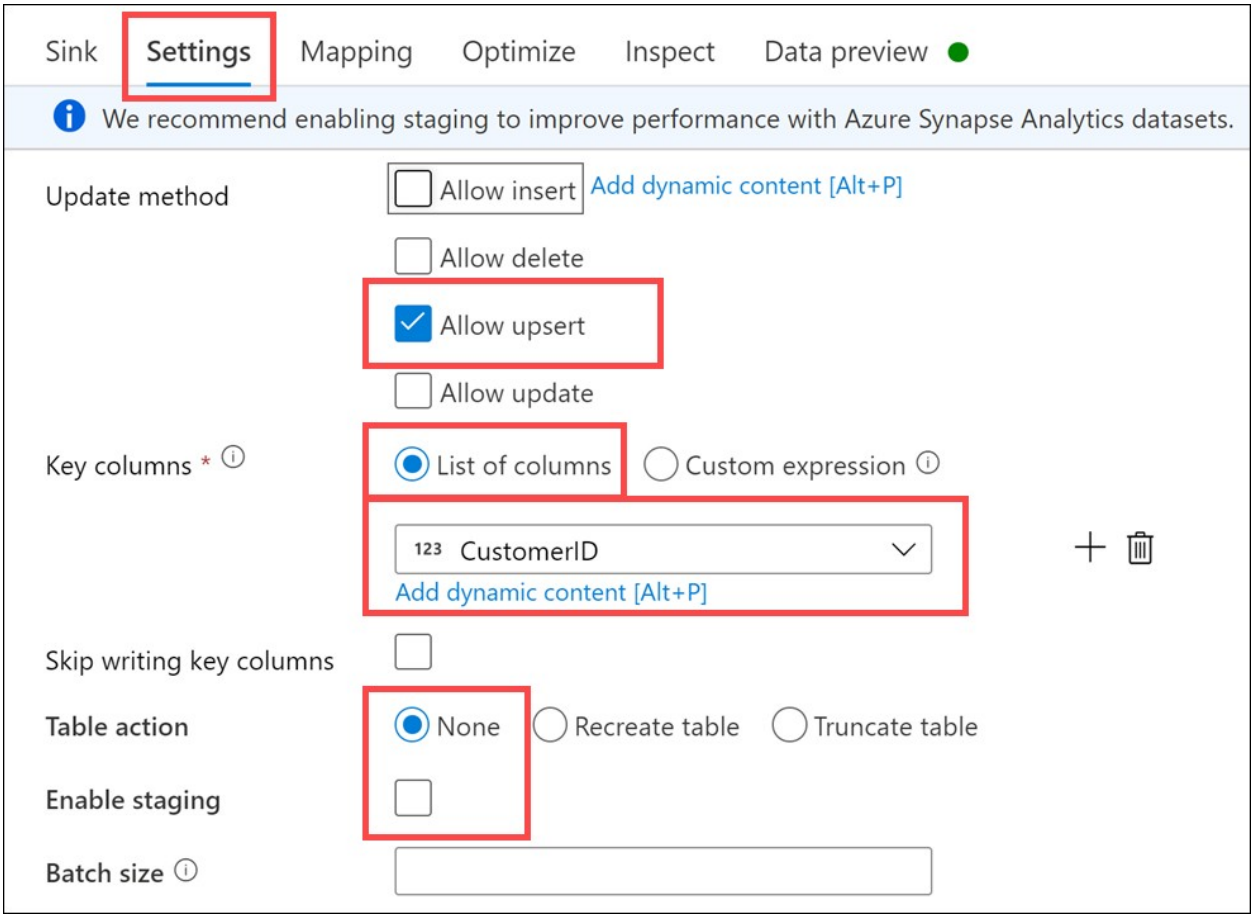
- Output stream name: Enter **`Sink`**
- Incoming stream: Select **`AllowUpserts`**
- Sink type: Select **`Dataset`**
- Dataset: Select **`DimCustomer`**
- Options: Check **`Allow schema drift`** and uncheck **`Validate schema`**



The sink properties form is configured as described

13. Select the Settings tab and configure the following properties:

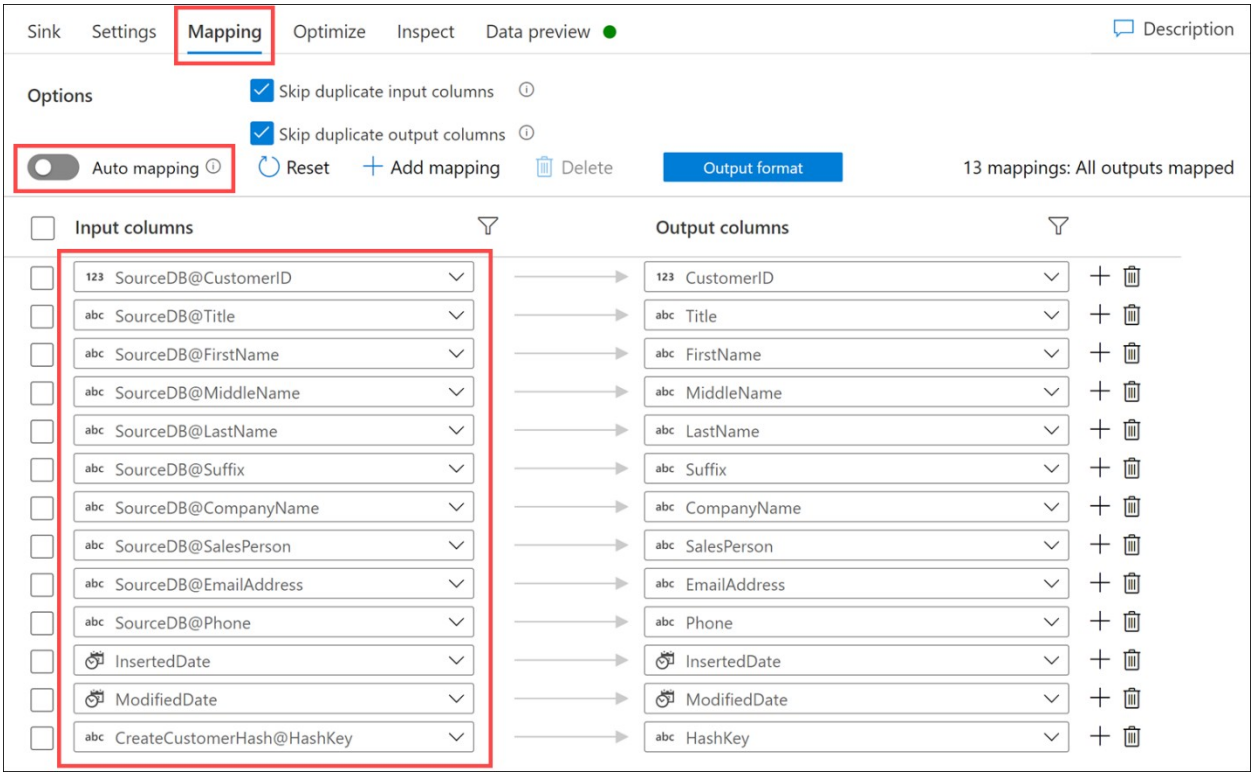
- **Update method**: Check **`Allow upsert`** and uncheck all other options
- **Key columns**: Select **`List of columns`**, then select **`CustomerID`** in the list
- **Table action**: Select **`None`**
- **Enable staging**: Unchecked



The sink settings are configured as described

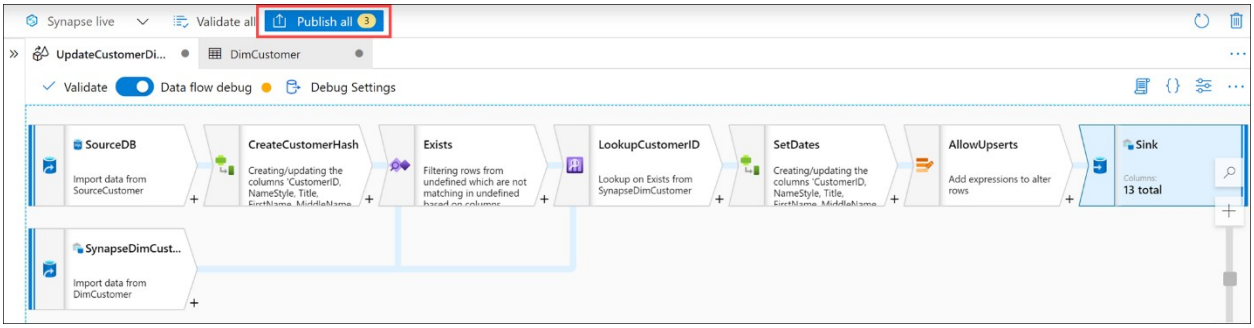
14. Select the **Mapping** tab, then uncheck **Auto mapping**. Configure the input columns mapping as outlined below:

Input columns	Output columns
SourceDB@CustomerID	CustomerID
SourceDB@Title	Title
SourceDB@FirstName	FirstName
SourceDB@MiddleName	MiddleName
SourceDB@LastName	LastName
SourceDB@Suffix	Suffix
SourceDB@CompanyName	CompanyName
SourceDB@SalesPerson	SalesPerson
SourceDB@EmailAddress	EmailAddress
SourceDB@Phone	Phone
InsertedDate	InsertedDate
ModifiedDate	ModifiedDate
CreateCustomerHash@HashKey	HashKey



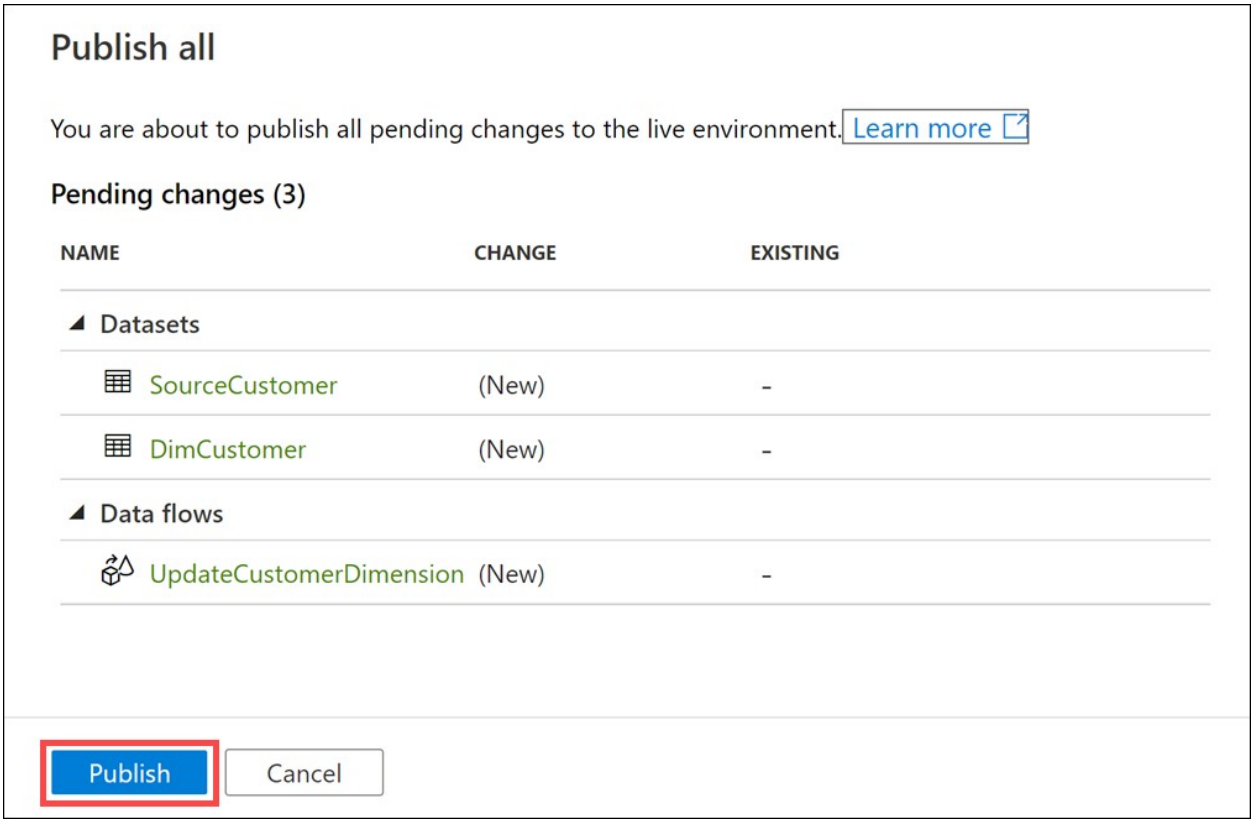
Mapping settings are configured as described

15. The completed mapping flow should look like the following. Select **Publish all** to save your changes.



The completed data flow is displayed and Publish all is highlighted.

16. Select **Publish**.



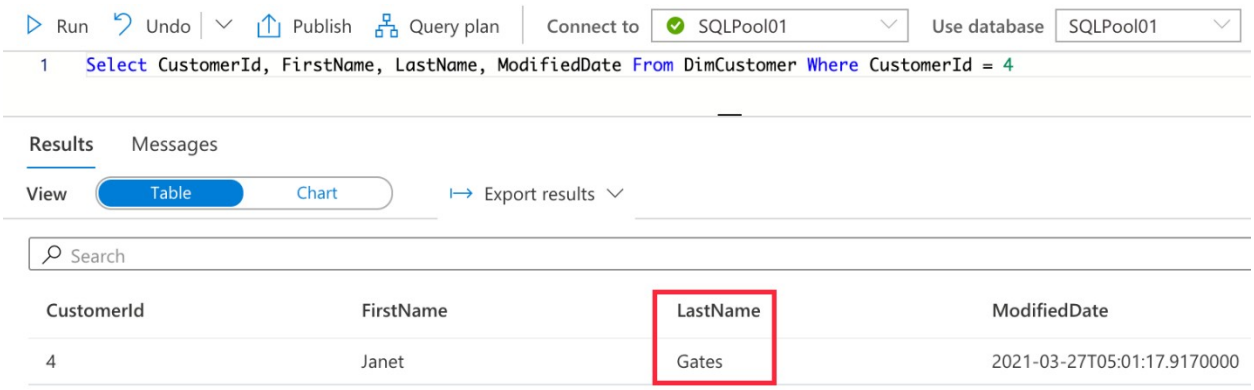
The publish button is highlighted

How to test the data flow

You have completed a Type 1 SCD data flow. If you choose to test it out you could add this data flow to a Synapse integration pipeline. Then you could run the pipeline once to do the initial load of the customer source data to the DimCustomer destination.

Each additional run of the pipeline will compare the data in the source table to what is already in the dimension table (using the HashKey) and only update records that have changed. In order to test this, you could update a record in the source table then run the pipeline again and verify the record updates in the dimension table.

Take the customer Janet Gates as an example. The initial load shows the `LastName` is Gates and the `CustomerId` is 4.

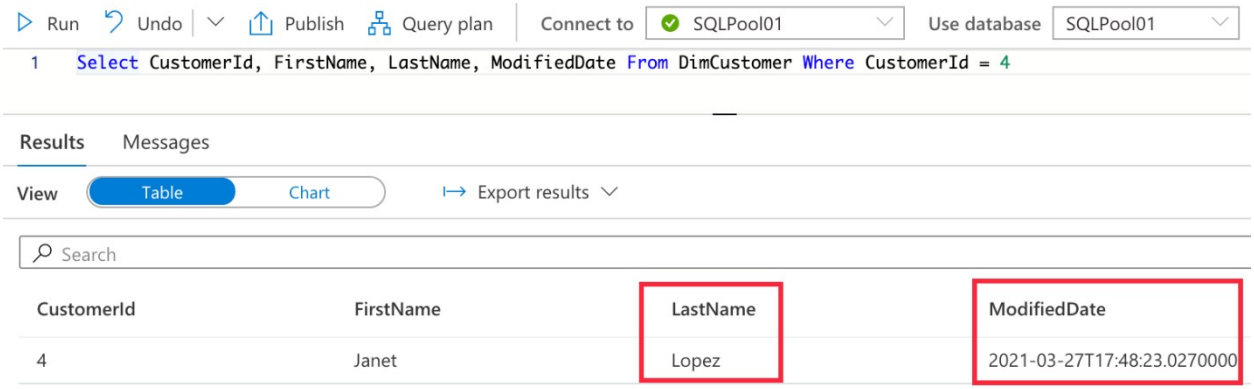


The script is displayed with the initial customer record.

Here is an example statement that would update the customer last name in the source table.

```
UPDATE [dbo].[CustomerSource]
SET LastName = 'Lopez'
WHERE [CustomerId] = 4
```

After updating the record and running the pipeline again, **DimCustomer** would show this updated data.



The script is displayed with the updated customer record.

The customer record successfully updated the `LastName` value to match the source record and updated the `ModifiedDate`, without keeping track of the old `LastName` value. That is the expected behavior for a Type 1 SCD. If history was required for the `LastName` field then you would modify the table and data flow to be one of the other SCD types you have learned.g