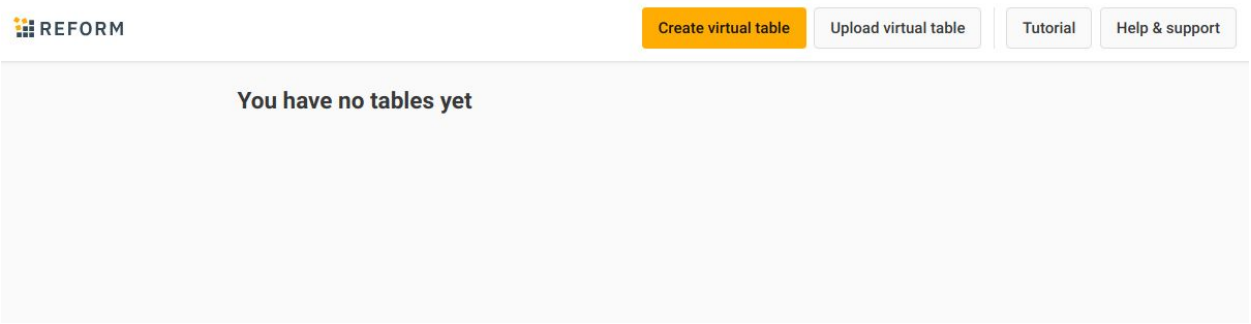
Ingesting JSON as analytic ready tables into SQL Server

The REFORM platform enables data analysts and engineers to access complex JSON data as tables. In many cases we want those tables to be accessible via Microsoft SQL Server. This guide will show you how this process can be easily automated. We start with a JSON API and via REFORM and Azure Data Factory we transform this data into a table in SQL Server.

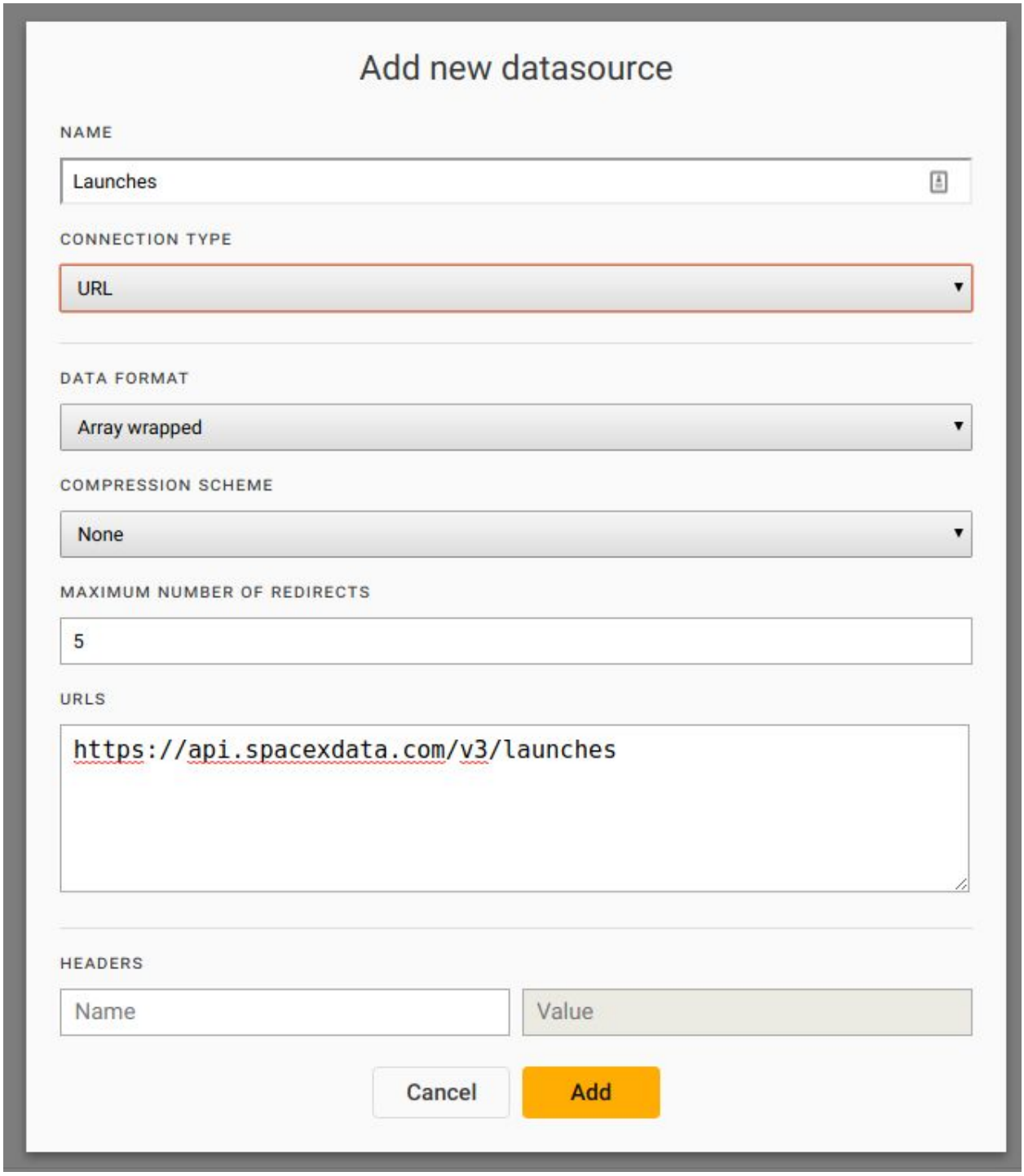
Creating a virtual table in REFORM

REFORM uses a concept called *Virtual Tables* to transform JSON-formatted data into tables. To create a virtual table we click the *Create virtual table* button on the REFORM homepage.

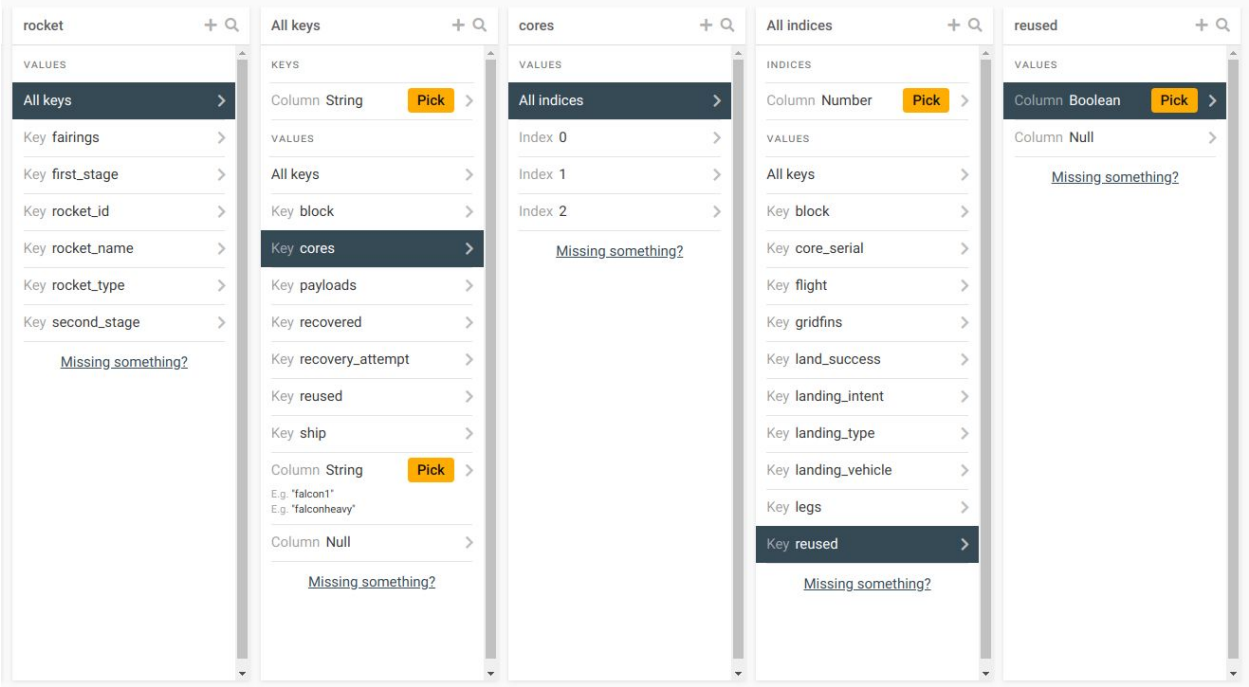


First step of virtual table creation is data source definition. REFORM provides connectors for cloud storage services such as S3, Wasabi or Azure. Additionally you can also load data from MongoDB or a public URL. In this case we want to ingest information about SpaceX launches and parts reuse for further analysis. This data is accessible via an API on a public URL: https://api.spacexdata.com/v3/launches.

To create a data source we click the plus icon in the *Data Sources* column. In the configuration windows we provide a unique name, select *URL* as the connection type and make sure that the data format is set to *Array wrapped*. REFORM also supports LDJSON. We enter the API endpoint URL into the *URLS* box and click the *Add* button.



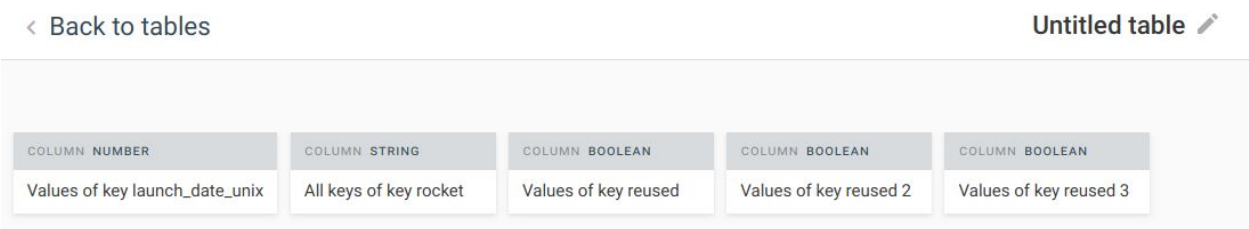
We can now browse the JSON data simply by clicking on desired keys or array indices. By clicking on the *Pick* button we can then add required values to the virtual table as columns.



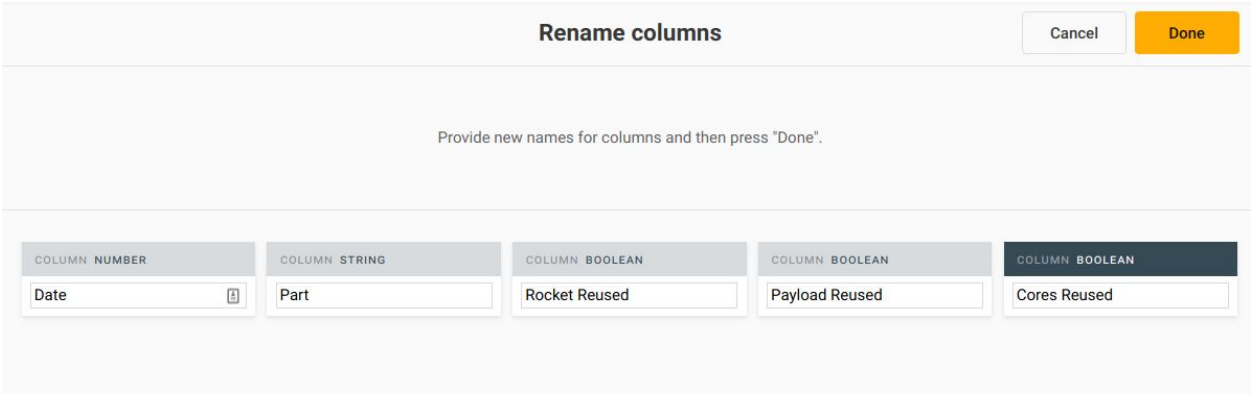
For our table, we want to pick the following:

- launches -> launch_date_unix -> Number (time of the launch as UNIX timestamp)
- launches -> rocket -> All keys -> String (all rocket component names present as JSON keys)
- launches -> rocket -> All keys -> cores -> All indices -> reused -> Boolean -> As Number -> Number (This gives us 1 or 0 depending on whether the core was reused or not)
- launches -> rocket -> All keys -> payloads -> All indices -> reused -> Boolean -> As Number -> Number (Was the payload reused?)
- launches -> rocket -> All keys -> reused -> Boolean -> As Number -> Number (Was any part of the vehicle reused?)

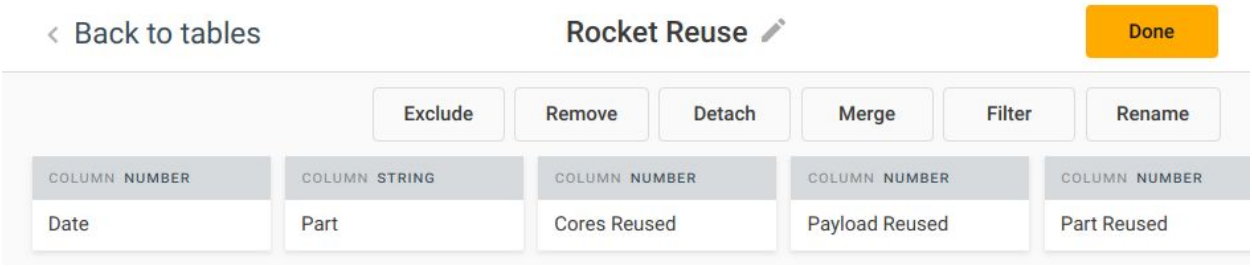
After the selection we can see the table structure at the bottom of the screen.



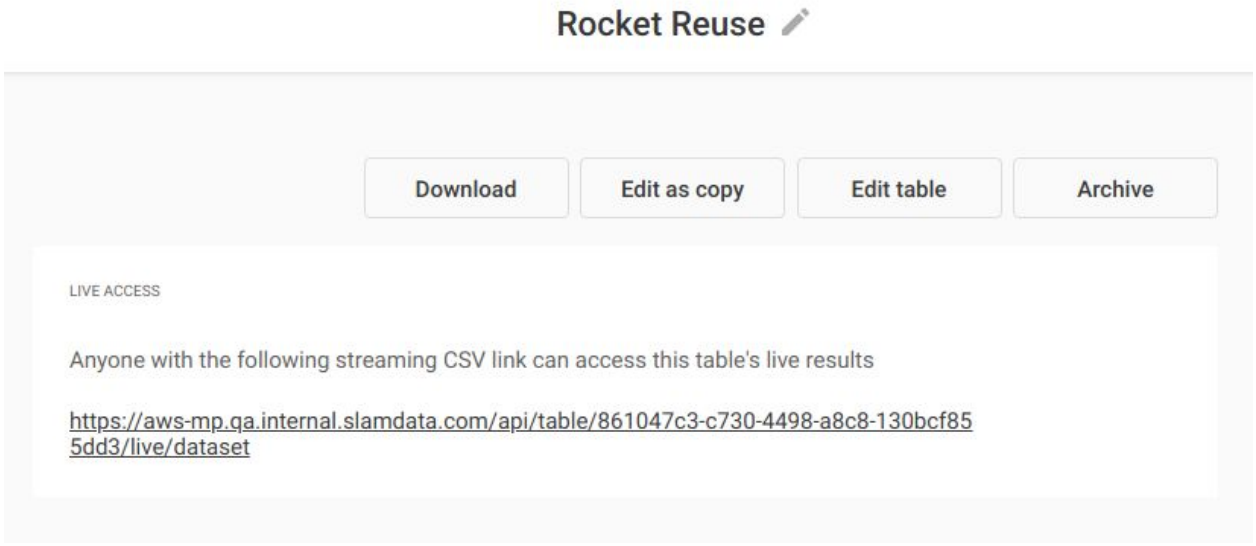
The *Rename* button opens a dialog allowing us to change the column names to something more descriptive. After we change the column names we click the *Done* button, that takes us back to the virtual table editor.



Finally we can change the name of the table itself and confirm the table definition by clicking on *Done.*



Once the virtual table is defined, we can access the live results as CSV using a sharing URL provided by REFORM.



Creating a MSSQL table

Before we can insert the data into SQL Server, we need to create a suitable table. We do this by running the following SQL command:

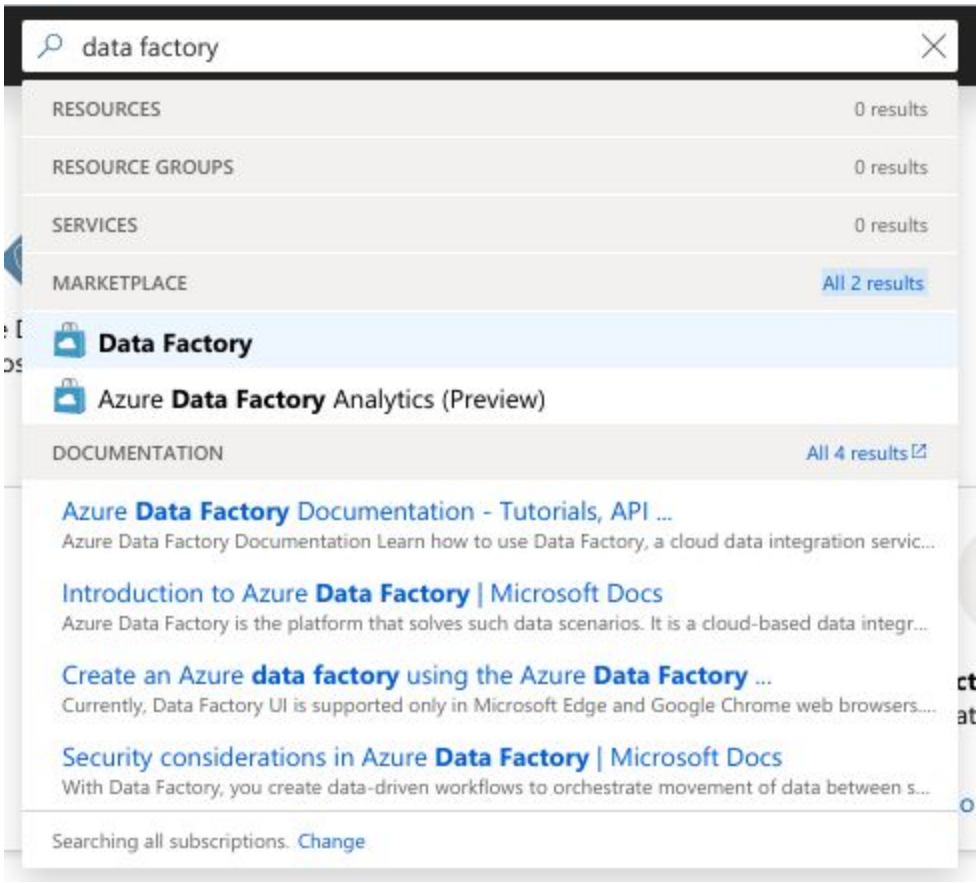
```
CREATE TABLE spacex (
   date int,
   part nvarchar(100),
   cores_reused bit,
   part_reused bit,
   payload_reused bit
)
```

Ingesting data using Azure Data Factory

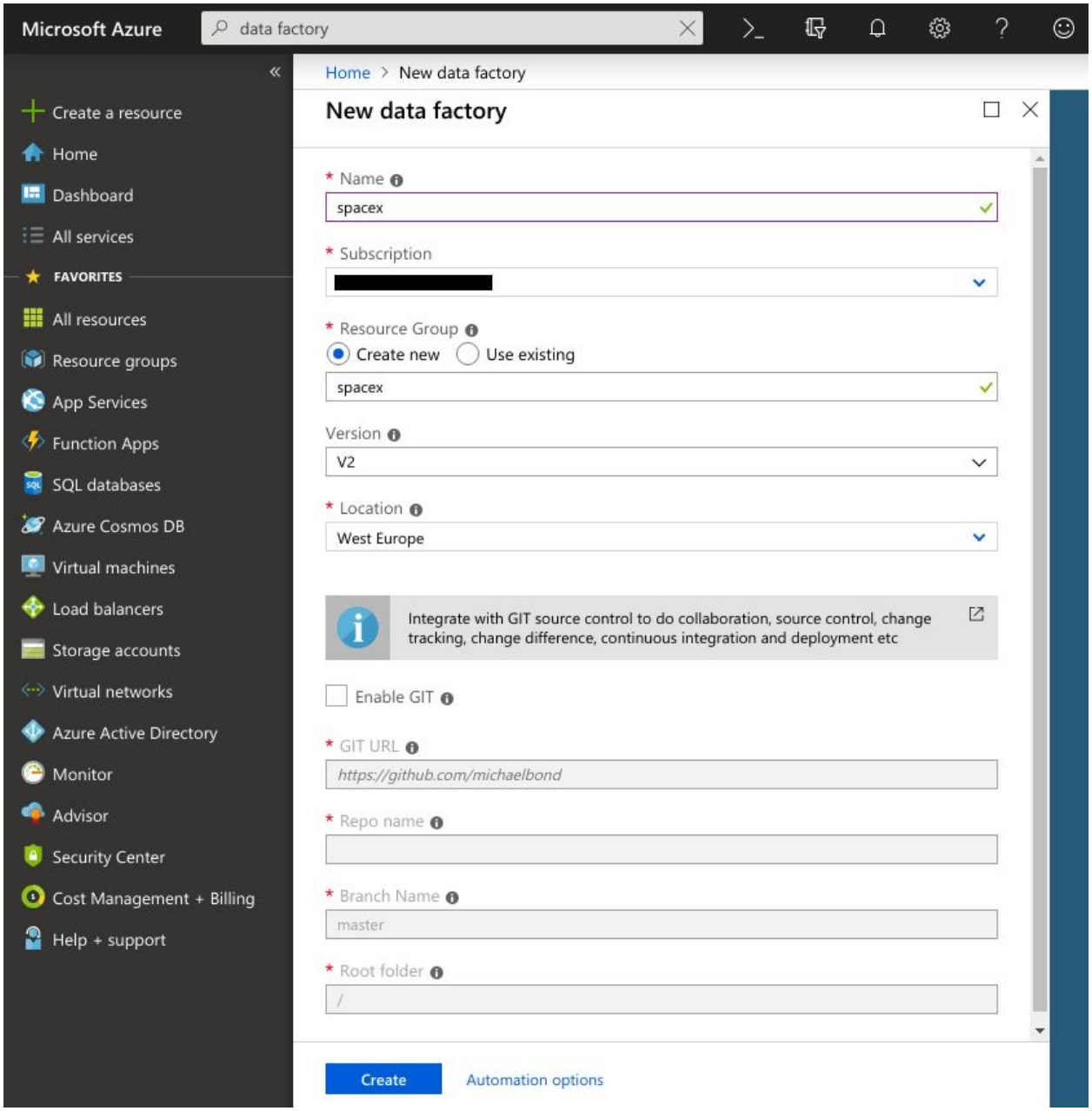
Azure Data Factory is a data integration tool developed by Microsoft. Besides many other great features, it provides a user-friendly way of moving data between multiple data sources. Although it is a part of Microsoft's Azure cloud, it is not limited to services hosted on the platform. You can use it easily with your on-premise services as well.

In this demo, we are storing our data in a Microsoft SQL Server database. But Azure Data Factory is not limited to this service. It also provides connectors for MySQL, PostgreSQL and many other popular solutions.

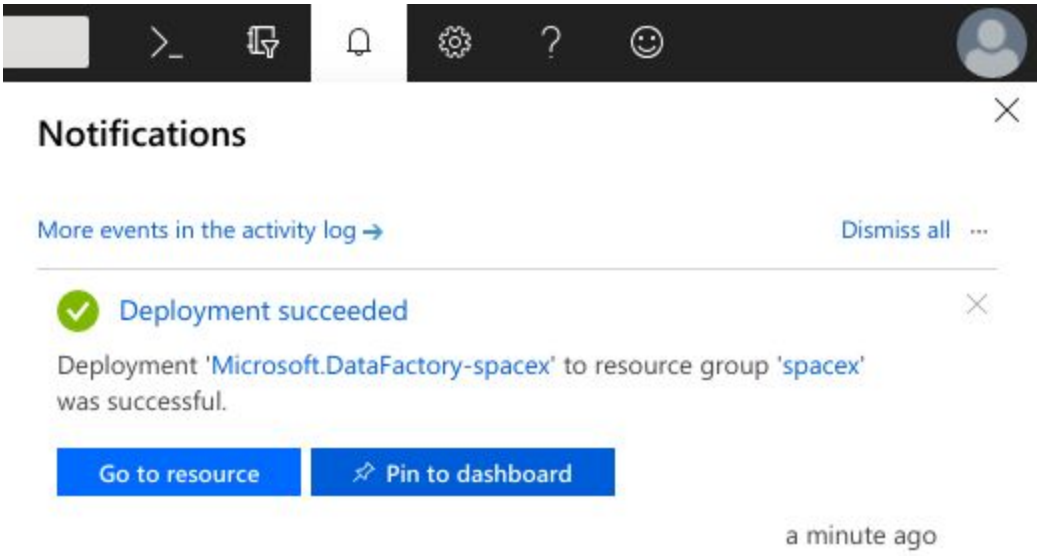
First we need to create a new data factory instance. To do this we log in into the Azure Portal and type "data factory" into the search bar. Then we select *Data Factory* from the list:



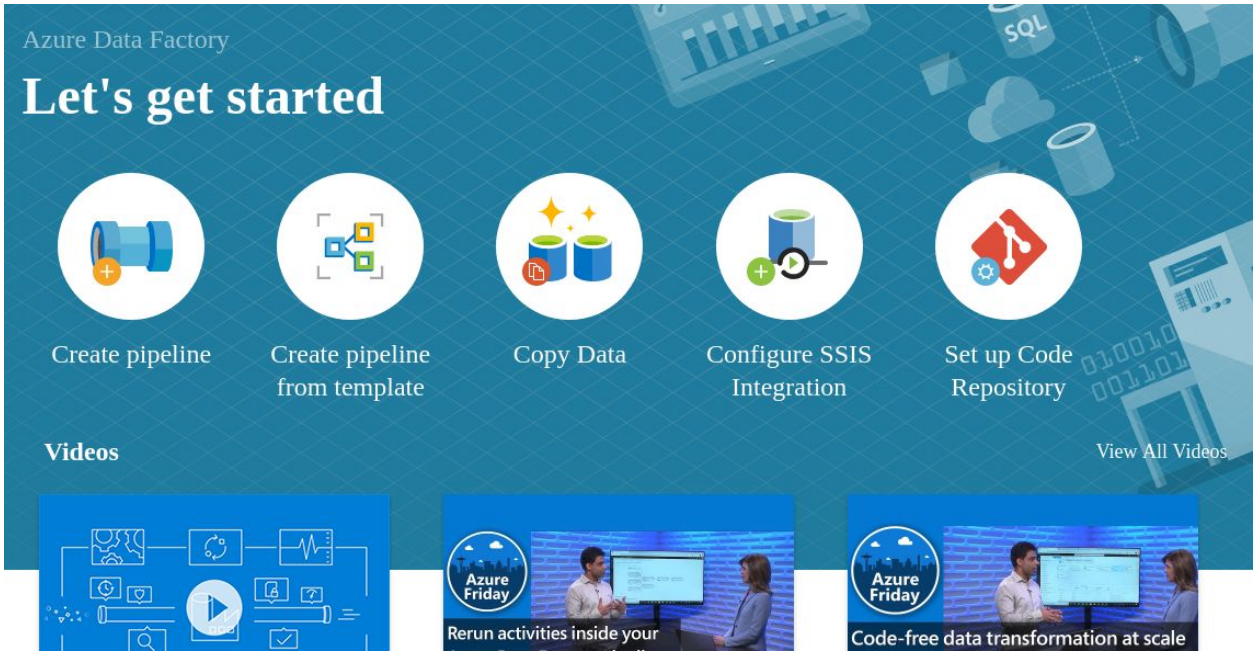
A form for creating new data factory shows up. We provide a name for our instance, select a suitable resource group and subscription plan. We are going to use the newer V2 version and choose a geographical location depending on our needs. GIT support is not required for our project. Finally, we click on the *Create* button to initialize our data factory.



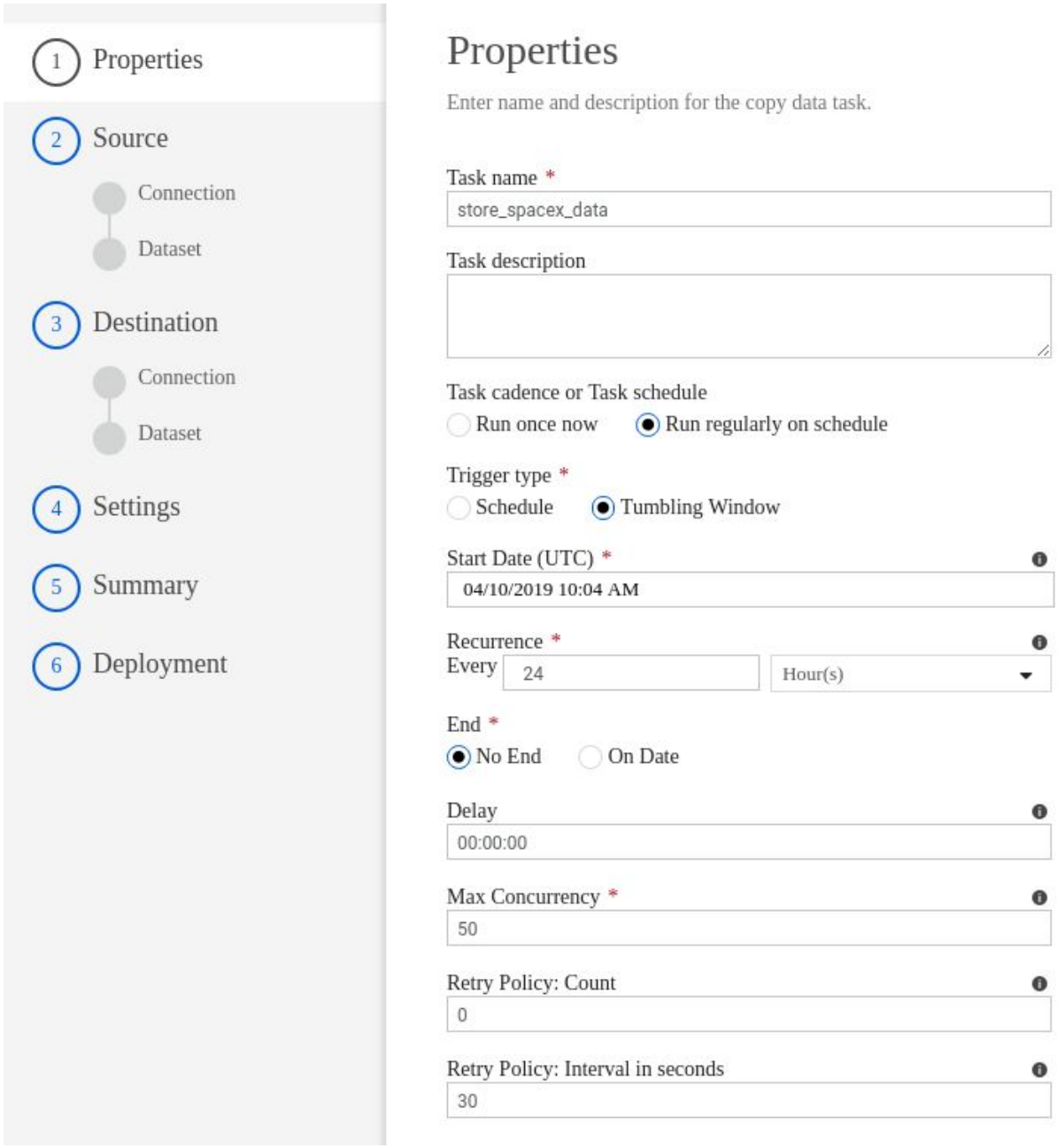
We are redirected to the dashboard and after a few seconds a notification about a successful deployment appears. To access the data factory resource, we can click the *Go to resource* button.



On the data factory screen we click the *Author and Monitor* button, which takes us to the data factory web interface. After the application loads, we choose the *Copy Data* option from the *Let's get started* screen.

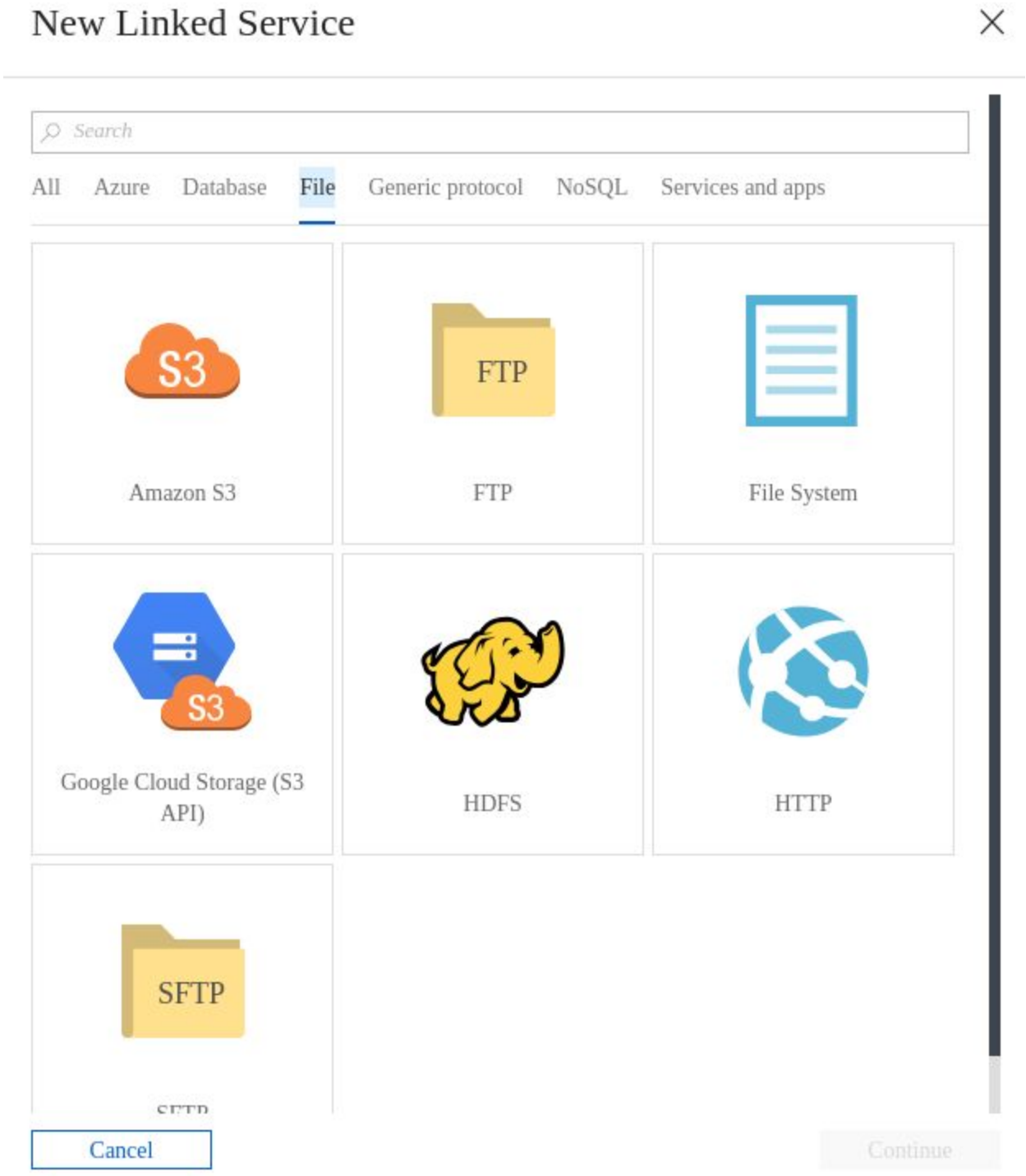


On the first screen of the *Copy Data* wizard we need to provide a unique name for the task. Optionally, we can set up a schedule. This will keep your SQL Server up to date with the latest data from the API. Once the schedule is set up in Data Factory REFORM will automatically provide most recent data when the process is executed.



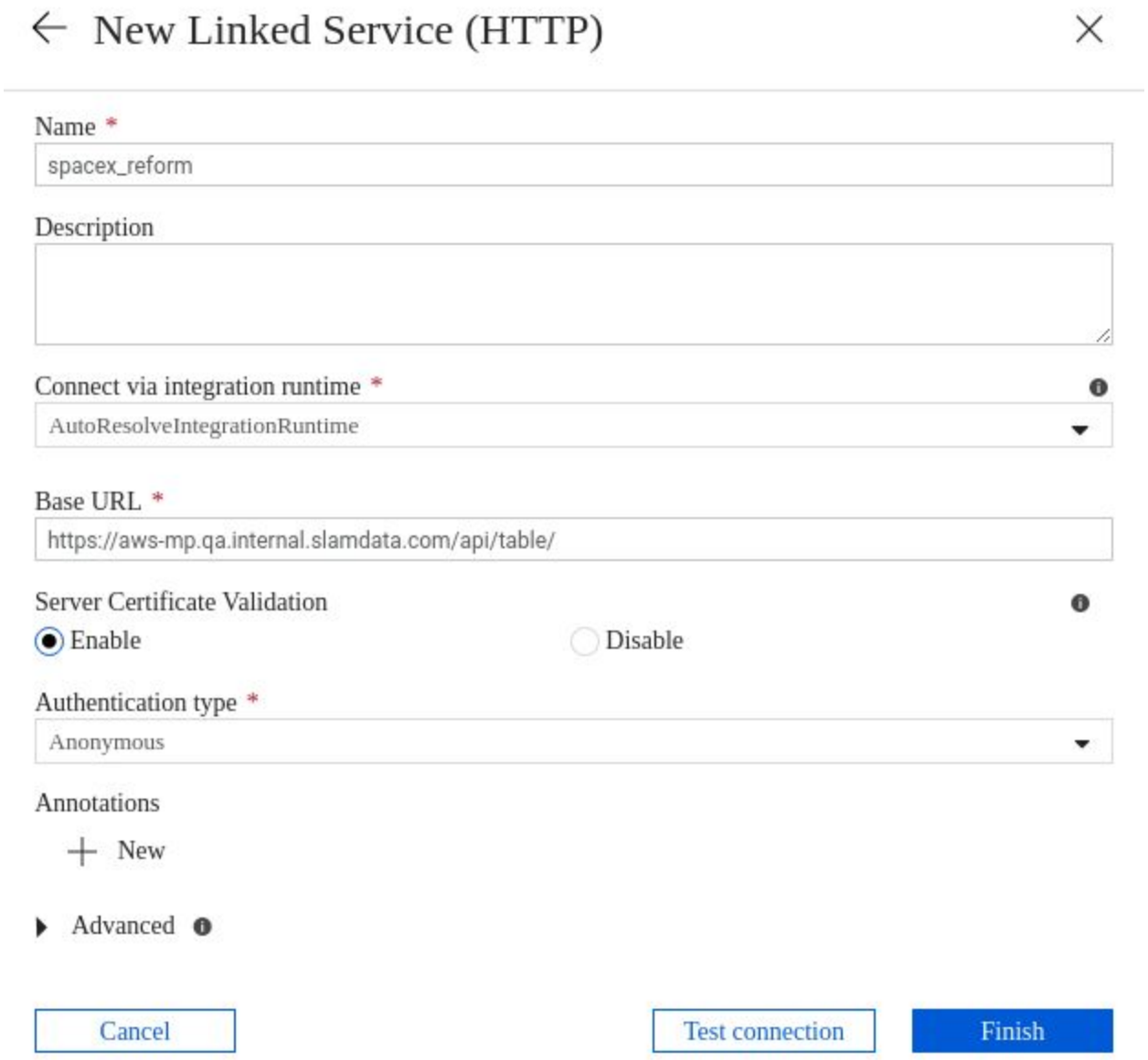
For the purposes of the guide, we are going to run the task just once, so we select the *Run once now* option and click *Next*.

Next, we need to define the data source. On the *Source Data Store* screen we click the + *Create New Connection* option. In the dialog, we switch to the *File* tab and then select the *HTTP* option.

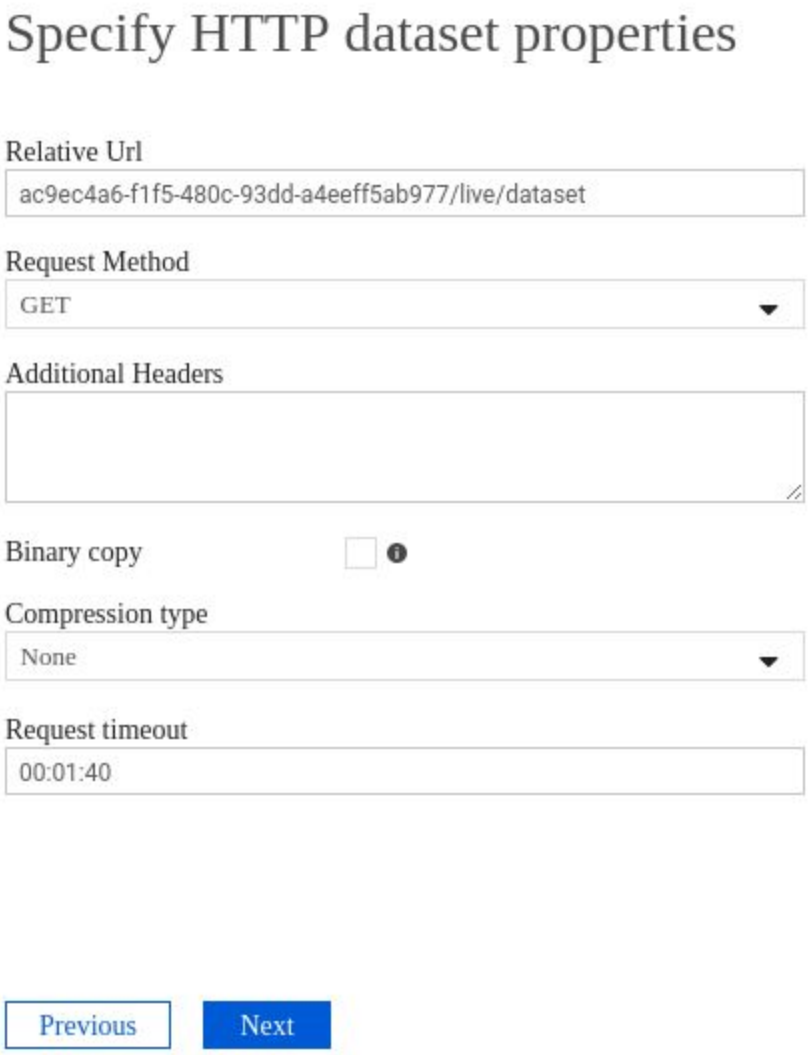


In the configuration we provide a unique name for the data source and most importantly enter the URL. If you are certain that you will be copying only one table, you can simply enter the whole URL as provided by Reform. Otherwise, it is a good idea to enter only the part that stays the same for all tables: *https://[reform-host].com/api/table/*.

We also change the authentication type to *Anonymous* and click the *Finish* button.



After our data source is defined, we can move on to the *Specify HTTP dataset properties* screen. Here we provide the relative URL. If you entered the whole table URL in the previous step, you can leave this field empty. However, if you followed our recommendation and entered only the unchanging part, now is the time to enter the table specific one. No other changes are needed on this screen, so we can just click *Next*.



We continue by setting up the file format. The default *JSON format* needs to be changed to *Text format*. The first row of the table contains column names, so we also check the *Column names in the first row* checkbox. Afterwards we should be able to see the data preview at the bottom of the screen.

File format settings

File format

Text format

Detect Text Format

Column delimiter

Comma (,)

Use custom delimiter

Row delimiter

Carriage Return + Line feed (\r\n)

Use custom delimiter

Skip line count

0

Column names in the first row

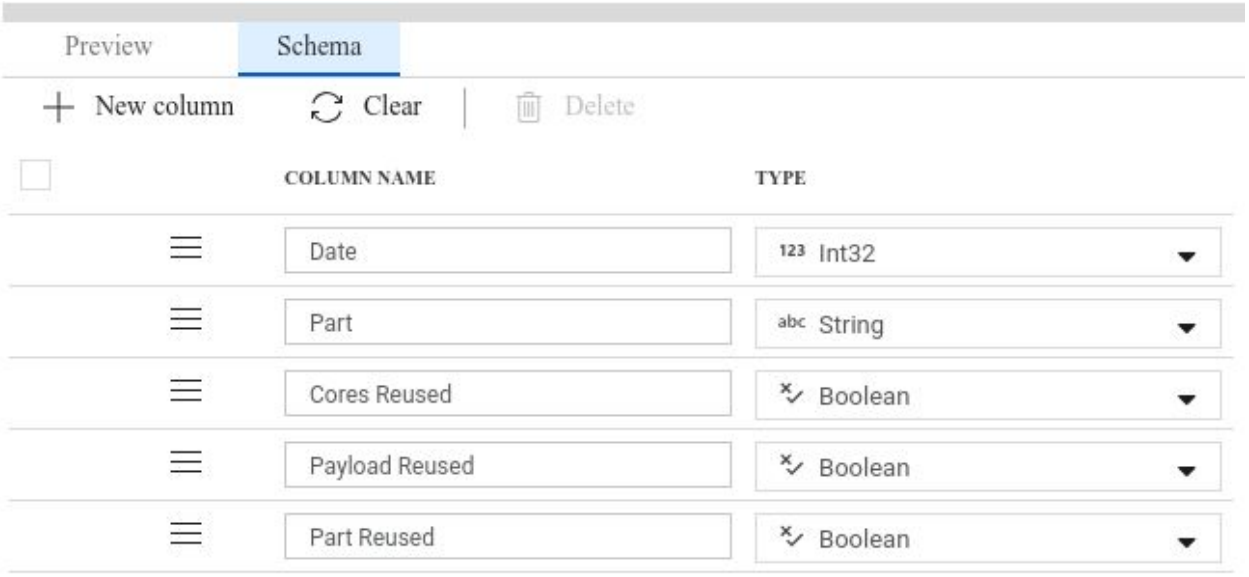
Advanced

Preview | Schema

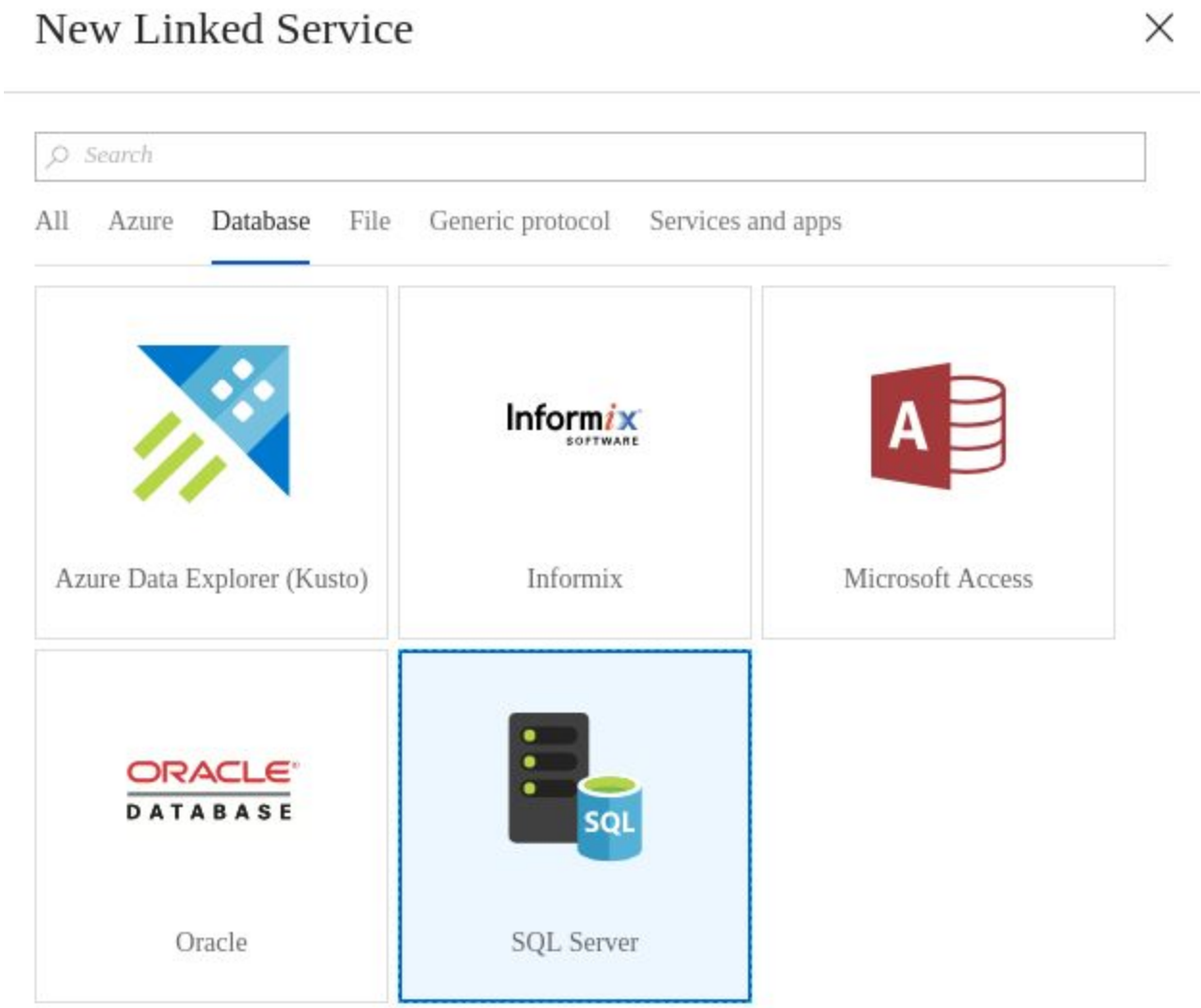
Date	Part	Cores Reused
1143239400	rocket_id	
1143239400	rocket_name	
1143239400	rocket_type	
1143239400	first_stage	0
1143239400	second_stage	
1143239400	fairings	
1174439400	rocket_id	

Previous Next

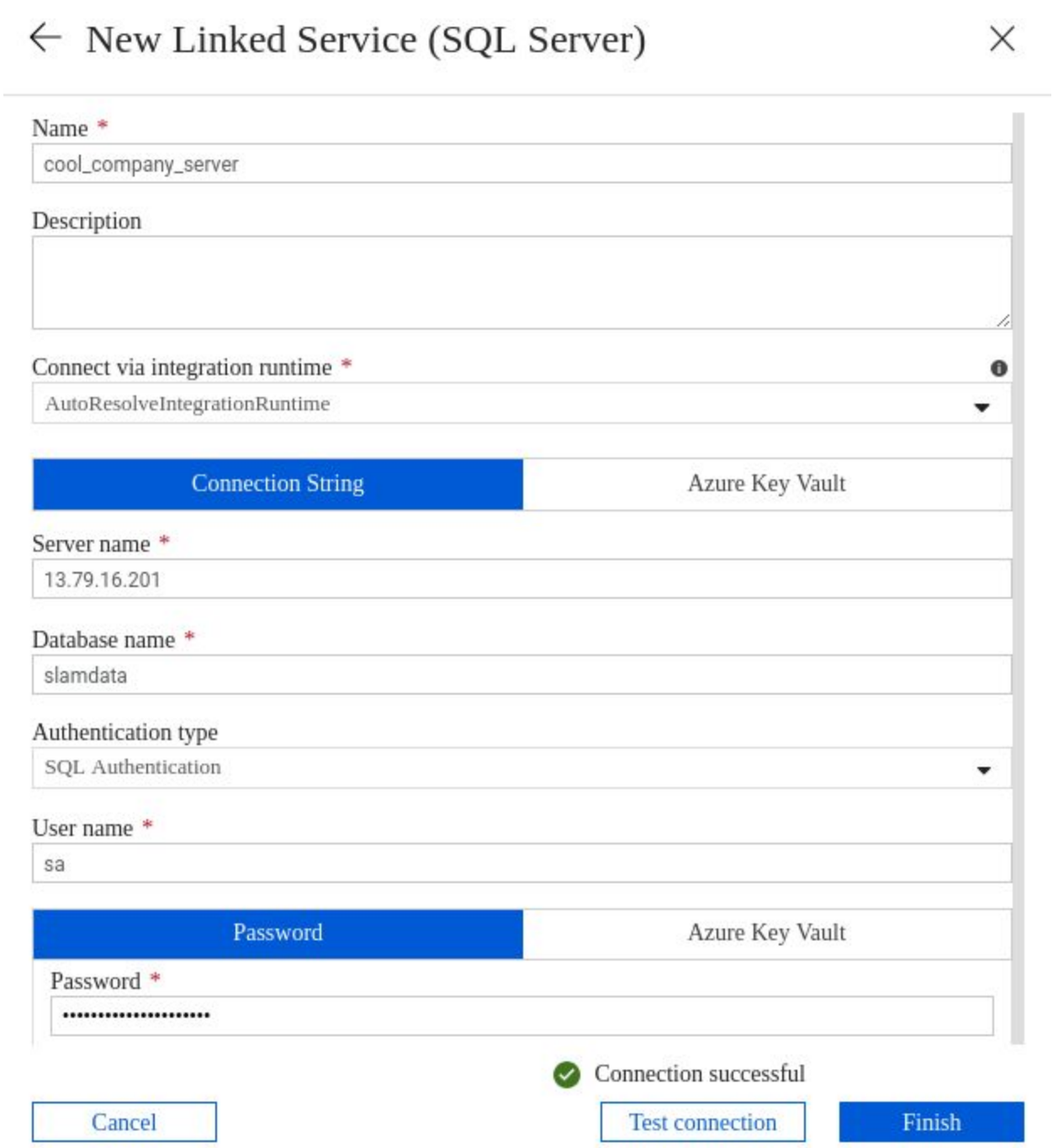
Now we switch to the *Schema* tab. Here we can define the data types of the columns. In our case, we perform just a few modifications - change the *flight_number* column to *Int16* and *launch_success* and *is_tentative* to *Boolean*. Then we continue to the next step by clicking on the *Next* button.



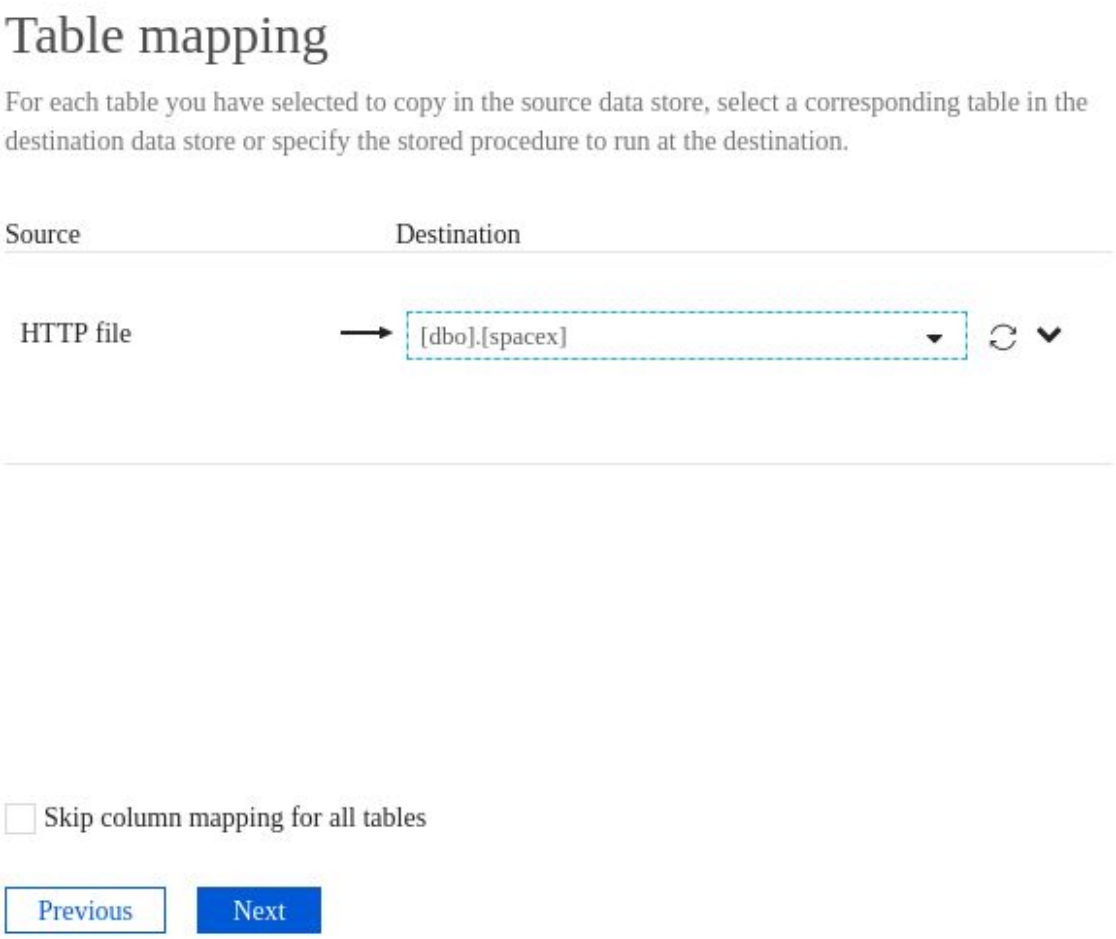
Now we need to define the destination connection. Similarly to the source data store, we start by clicking on the *+ Create New Connection* button. In this case we select the *SQL server* option under the *Database* tab.



Next, we enter all the information needed to create a connection: server name (IP address or domain name), database name, username and password. Just to be sure, we can verify the configuration by clicking on the *Test connection button*. If everything works, we click the *Finish* button.

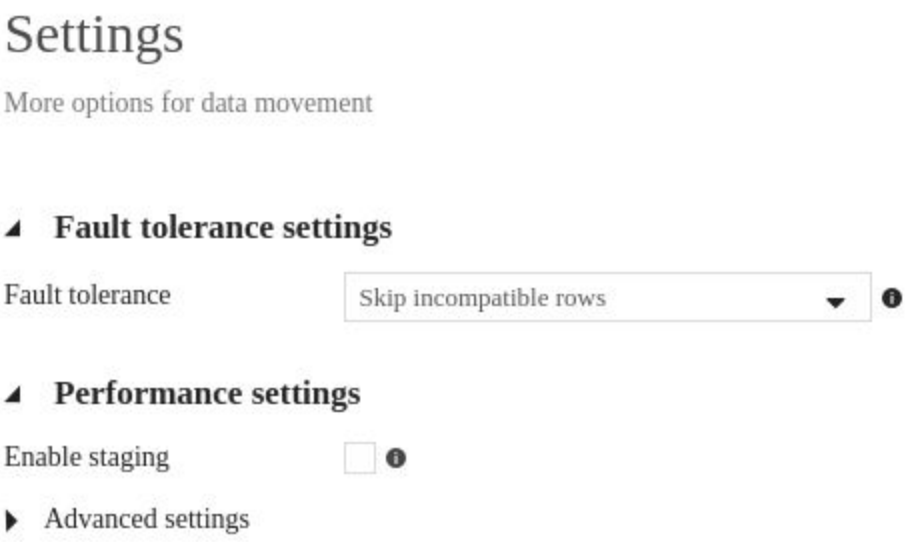


On the next screen we select the target table and click *Next*.



Next, we define how the CSV columns are mapped to the database table. For each database column we simple select the corresponding CSV column from the list. If the column names are the same for both, Data Factory is able to map everything automatically. After the mapping is defined, we can move on to the next step.

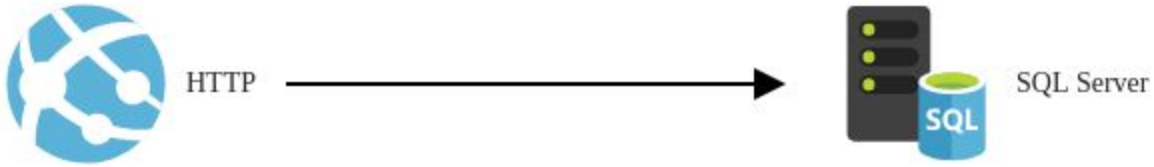
On the *Settings* screen we choose how to deal with incorrect rows. For our project, we want to *skip incompatible rows*.



Finally, on the *Summary* screen we can review all the settings and deploy the pipeline by clicking on the *Next* button.

Summary

You are running pipeline to copy data from HTTP to SQL Server.



Properties

Task name	copy_spacex_data_1
Task description	

Source

Connection name	spacex_reform
Dataset name	SourceDataset_nr8
Relative Url	ac9ec4a6-f1f5-480c-93dd-a4eeff5ab977/live/dataset
Request Method	GET

Destination

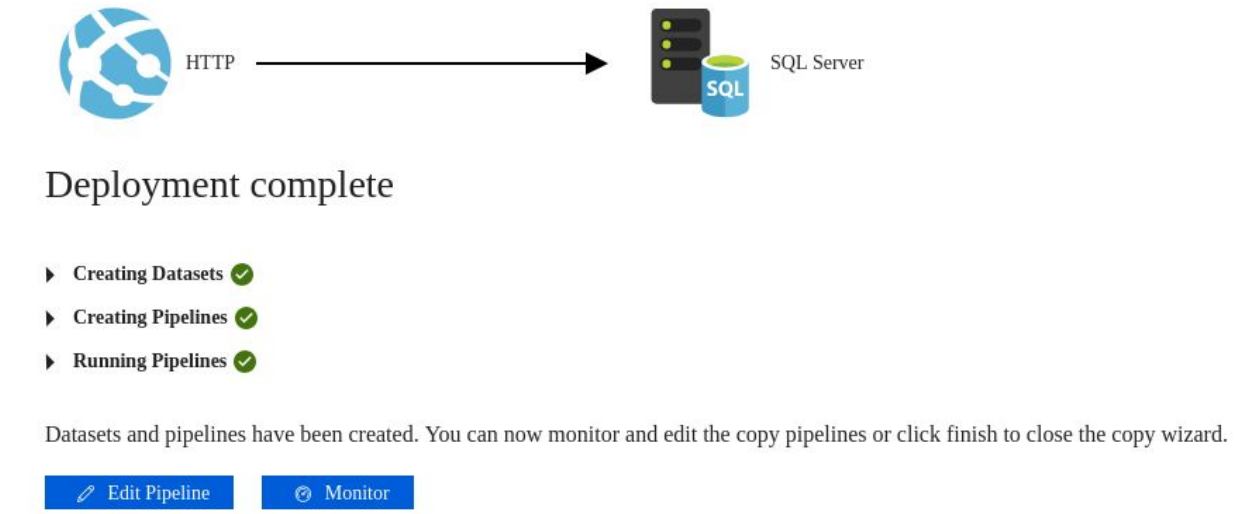
Connection name	cool_company_server
Dataset name	DestinationDataset_nr8
Table name	[dbo].[spacex]

Copy settings

Timeout	7.00:00:00
Retry	0
Retry interval	30
Secure output	false
Secure input	false

Previous Next

In our case, the pipeline executes immediately. We can monitor the progress by clicking on the *Monitor* button.



After the process finishes, we can verify that the data is indeed stored in our database as a table, for example with Azure Data Studio: