Lab 00: Prerequisites and Setup

Background and Goals

The labs in this Azure Data Factory Deep Dive workshop are intended to give you experience working with a number of key components and data sources that are commonly used in production solutions. Participation in each lab activity is optional, but in order to complete all the labs in this workshop, you will need to configure the following resources.

Prerequisites

Azure Subscription

If you do not have an Azure subscription, create a **free account** on https://azure.microsoft.com/free/ before you begin.

If you have an existing Azure subscription, ensure that you have **Service Administrator** or **Owner** level of access on the subscription. To view the permissions that you have in the subscription, in the Azure portal, select your username in the upper-right corner, click the ellipsis next to Switch directory, and then select *My Permissions*. If you have access to multiple subscriptions, select the appropriate subscription.

If you do not have Service Administrator or Owner level of access, we recommend that you create a free account. This is because some of the labs may not work if you can't create resources, assign permissions, or make modifications to the Azure Active Directory.

Whitelisted Preview of Azure Data Factory Mapping Data Flows

The Mapping Data Flows feature in Azure Data Factory is still in preview. To participate in these labs, you must sign up for the preview on http://aka.ms/dataflowpreview. Make sure you enter "**SQLBits**" as the Business Name, as this will speed up the approval process.

Local Machine

Currently, the Azure Data Factory UI is only supported in the **Microsoft Edge** and **Google Chrome** browsers. Ensure that you have one of these browsers installed.

We also recommend that you have the following applications installed locally:

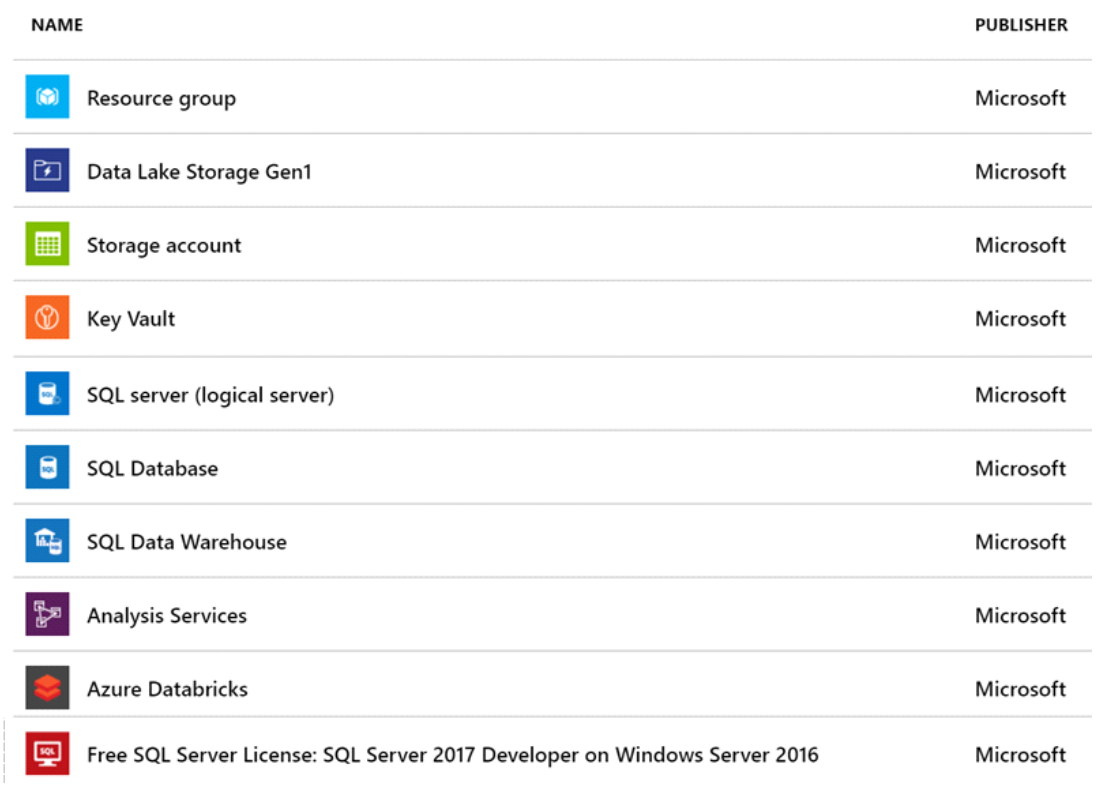
- **SQL Server Management Studio (SSMS)**: https://docs.microsoft.com/en-us/sql/ssms/download-sql-server-management-studio-ssms
- **SQL Server Data Tools (SSDT)**: https://docs.microsoft.com/en-us/sql/ssdt/download-sql-server-data-tools-ssdt
  Please note: Make sure you use the **standalone installer** that installs tools for SQL Server Integration Services
- **Azure Storage Explorer**: https://azure.microsoft.com/en-us/features/storage-explorer/

Setup: Configure Own Environment

Log into the Azure Portal (https://portal.azure.com/). You will create the following resources:

1. Resource Group
2. Azure Data Lake Storage Gen1
3. Azure Storage Account
4. Azure Key Vault
5. Azure SQL Server
6. Azure SQL Data Warehouse
7. Azure Analysis Services
8. Azure Databricks

9. Virtual Machine (Free SQL Server License: SQL Server 2017 Developer on Windows Server 2016) with AdventureWorksLT Demo Database



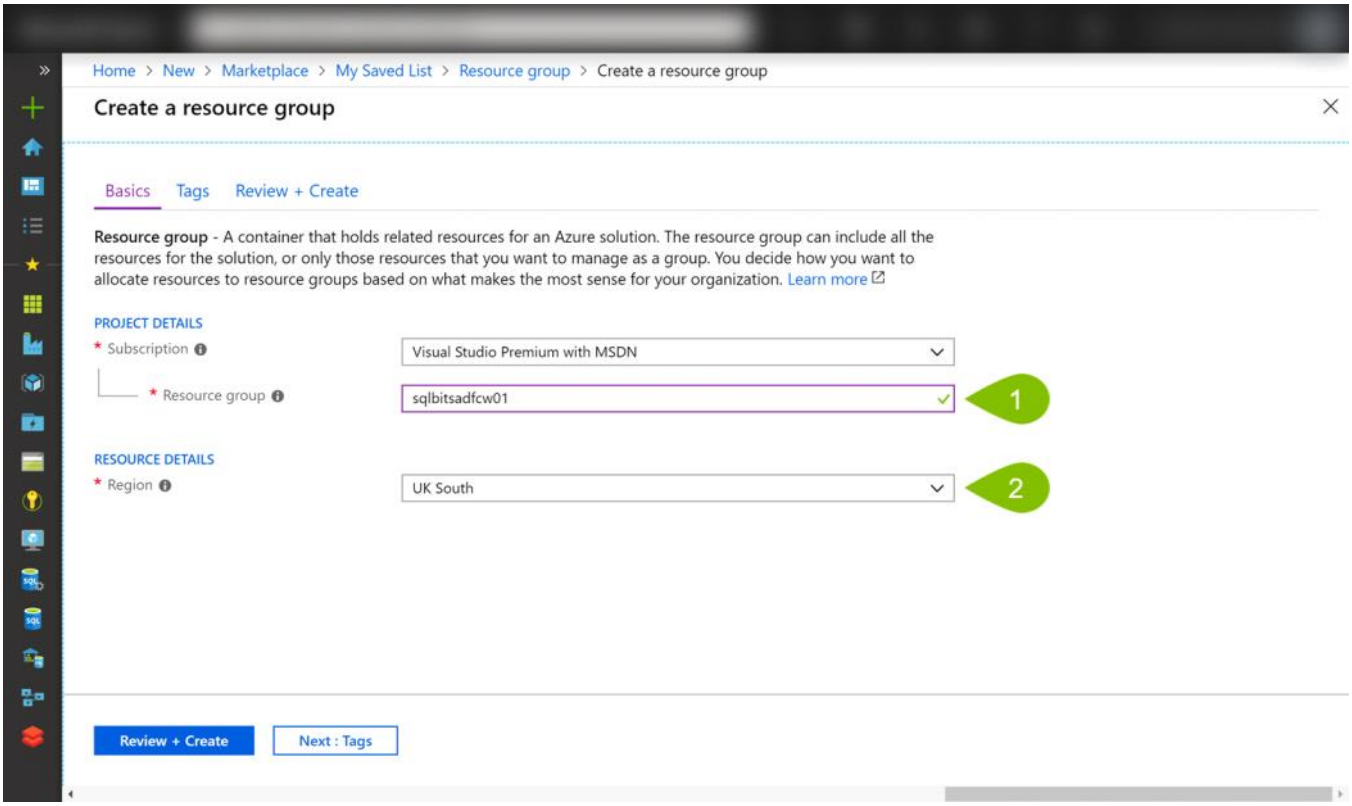
NAME	PUBLISHER
Resource group	Microsoft
Data Lake Storage Gen1	Microsoft
Storage account	Microsoft
Key Vault	Microsoft
SQL server (logical server)	Microsoft
SQL Database	Microsoft
SQL Data Warehouse	Microsoft
Analysis Services	Microsoft
Azure Databricks	Microsoft
Free SQL Server License: SQL Server 2017 Developer on Windows Server 2016	Microsoft

1. Create Resource Group

Resource Groups enable you to manage all your resources in an application together. All the remaining resources you create will be created in this Resource Group.

Step	Setting	Value	Notes
1	Resource Group	**sqlbitsadf*<999>***	The name of the Resource Group. Use the prefix **sqlbitsadf** followed by a **unique suffix** such as your initials and/or a number. Make note of this name as you will refer back to it frequently in later activities.
2	Region	**UK South**	Choose **UK South**. It is important to note that not all Azure resources can be created in each region, but we selected UK South because *most* of the resources exist within that region.

Unless specified above, use the default settings. It is not necessary to add any tags.

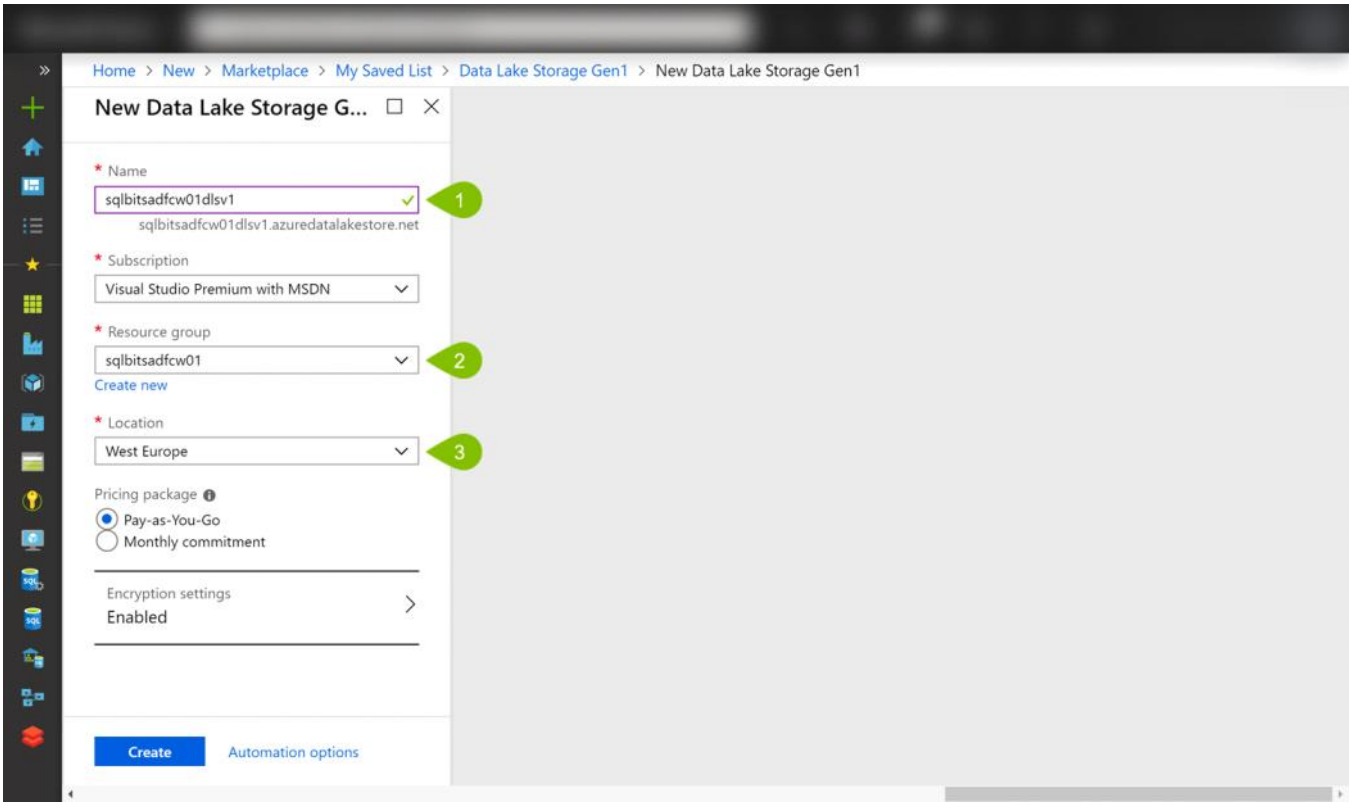


2. Create Azure Data Lake Storage Gen1

Please note: Azure Data Lake Storage *Gen2* is now generally available. For these labs, you will still use Azure Data Lake Storage *Gen1*. This is because not all Azure Data Factory activities fully support Gen2 yet.

Step	Setting	Value	Notes
1	Name	**sqlbitsadf<*999*>dlsv1**	Use the name of the Resource Group and add **dlsv1** as a suffix.
2	Resource Group	**sqlbitsadf<*999*>**	Choose the Resource Group you created in the first step.
3	Location	**West Europe**	This resource cannot be created in UK South, so choose **West Europe**.

Unless specified above, use the default settings.



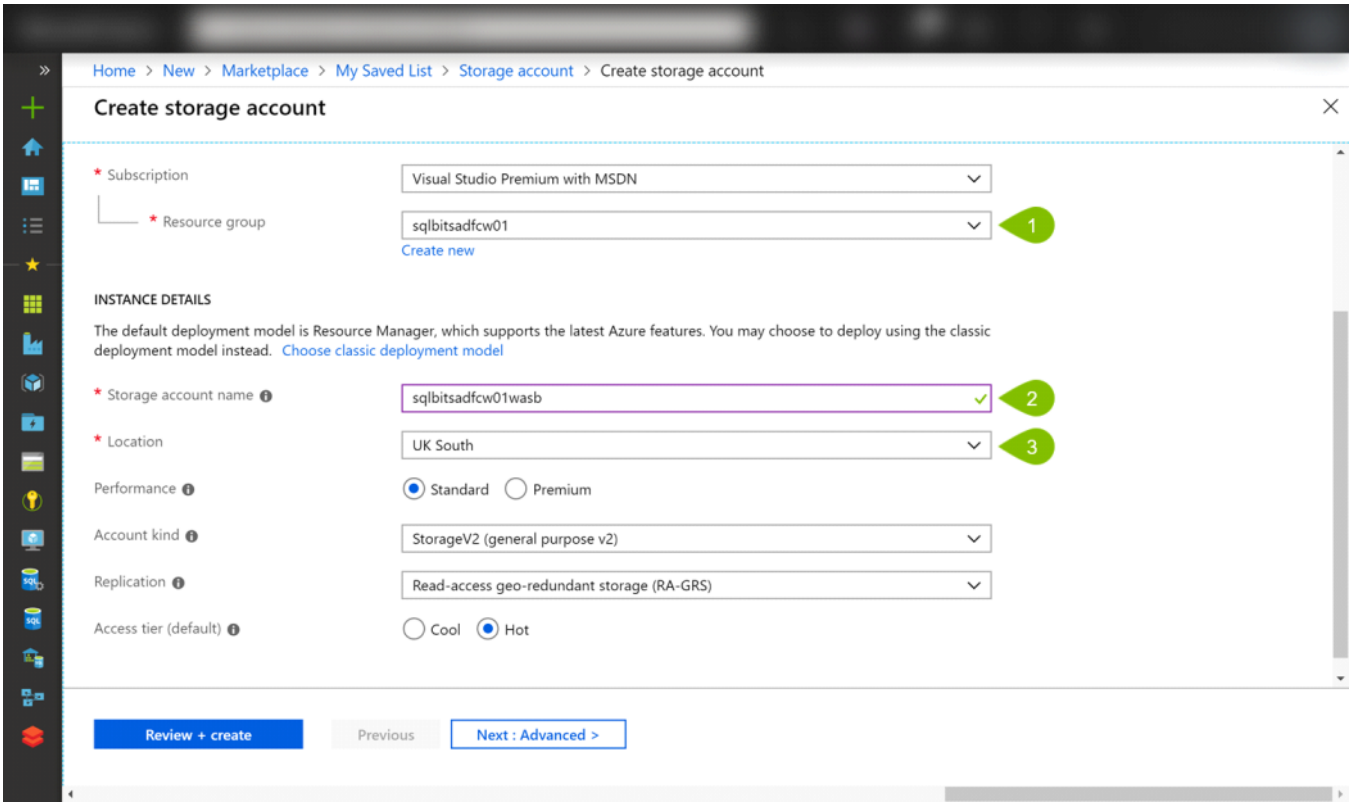
Additional information:
https://docs.microsoft.com/en-us/azure/data-lake-store/data-lake-store-get-started-portal

3. Create Azure Storage Account

Storage accounts allow you to store objects like blobs, files, and tables.

Step	Setting	Value	Notes
1	Resource Group	**sqlbitsadf<*999*>**	Choose the Resource Group you created in the first step.
2	Storage Account Name	**sqlbitsadf<*999*>wasb**	Use the name of the Resource Group and add **wasb** as a suffix.
3	Location	**UK South**	Choose **UK South**.

Unless specified above, use the default settings.



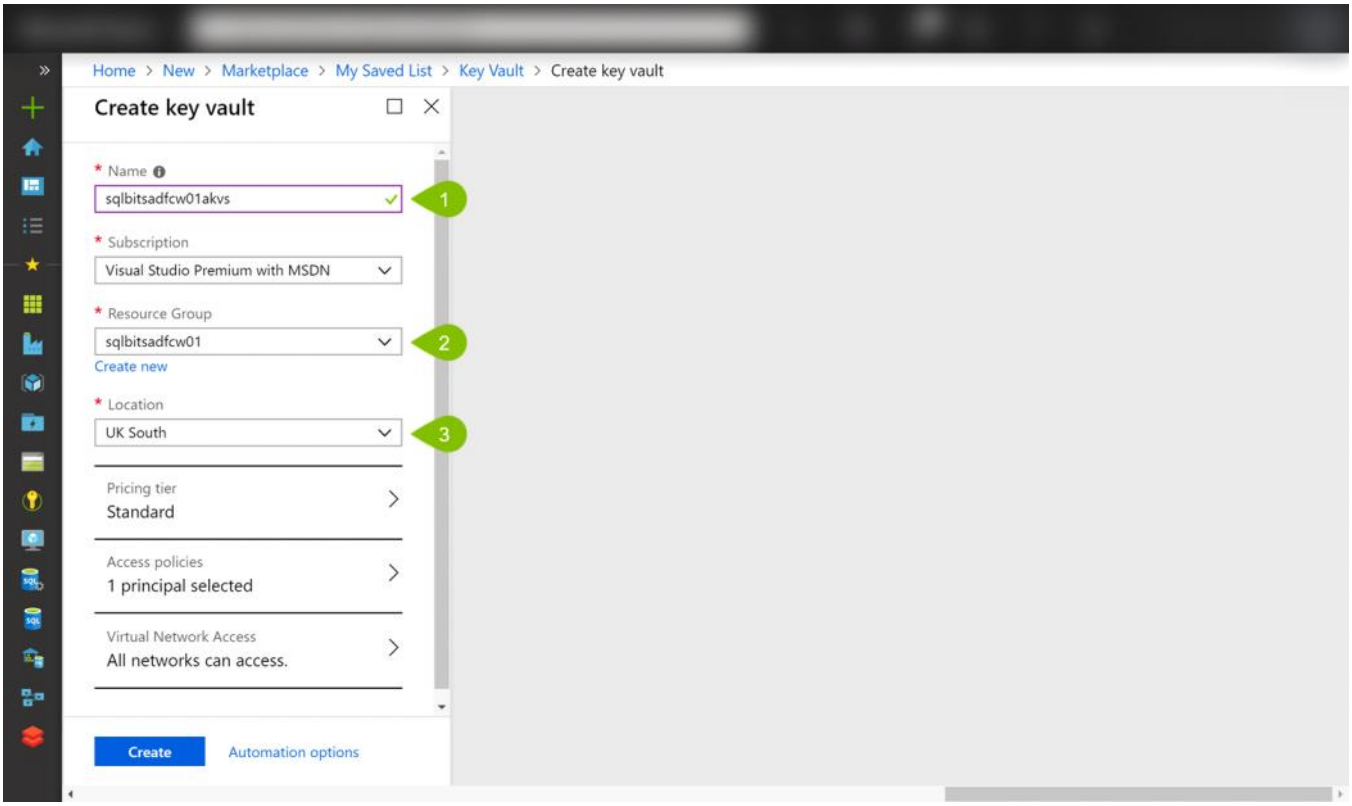
Additional information:
https://docs.microsoft.com/en-us/azure/storage/common/storage-quickstart-create-account?toc=%2Fazure%2Fstorage%2Fblobs%2Ftoc.json&tabs=azure-portal

4. Create Azure Key Vault

With Azure Key Vault, you can safely store objects like passwords and encryption keys.

Step	Setting	Value	Notes
1	Name	**sqlbitsadf<*999*>akvs**	Use the name of the Resource Group and add **akvs** as a suffix.
2	Resource Group	**sqlbitsadf<*999*>**	Choose the Resource Group you created in the first step.
3	Location	**UK South**	Choose **UK South**.

Unless specified above, use the default settings.



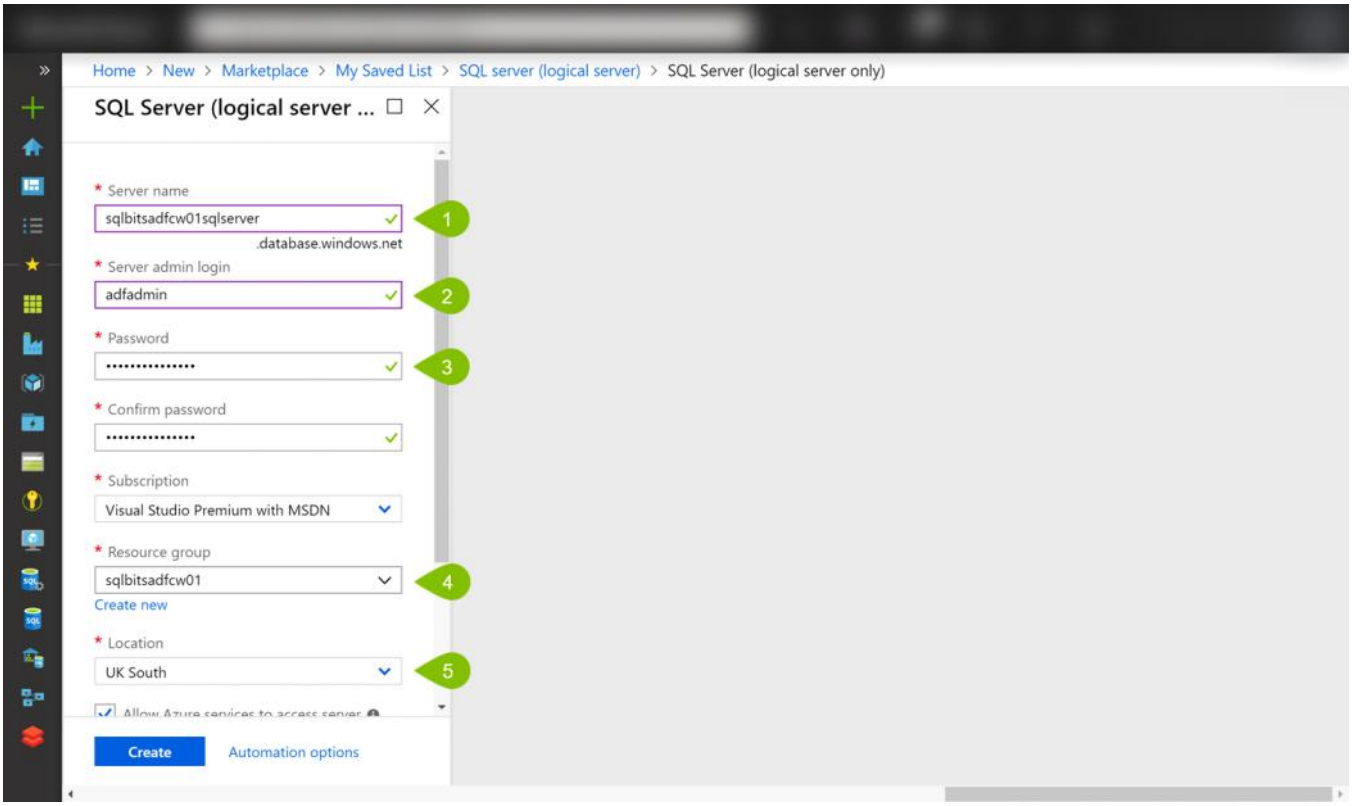
Additional information:
https://docs.microsoft.com/en-us/azure/key-vault/quick-create-portal

5. Create Azure SQL Server

The Azure SQL Server will host your SQL Database and SQL Data Warehouse.

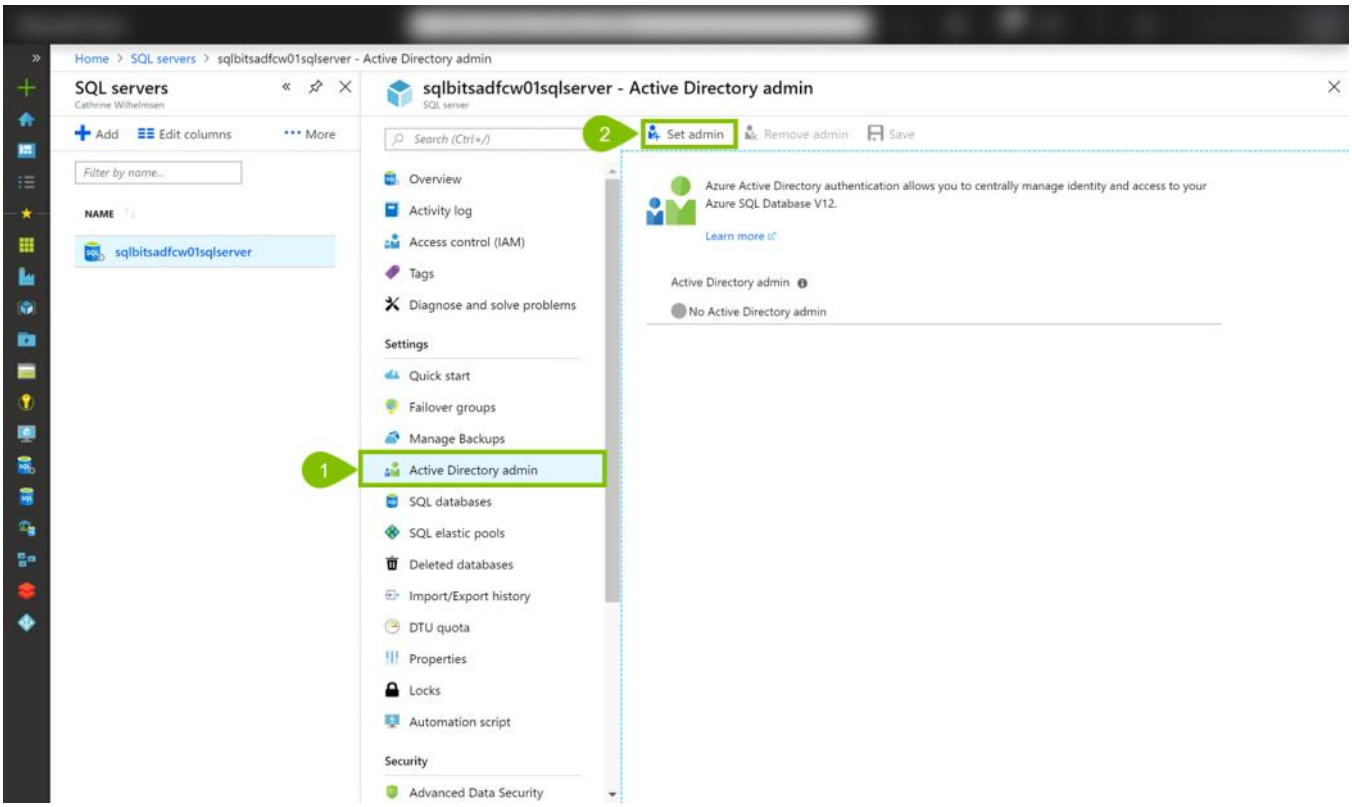
Step	Setting	Value	Notes
1	Server Name	**sqlbitsadf<*999*>sqlserver**	Use the name of the Resource Group and add **sqlserver** as a suffix.
2	SQL Admin Login	**adfadmin**	Pick a username, for example **adfadmin**
3	Password	**VeryStr0ngPassw0rd!**	Pick a password, for example **VeryStr0ngPassw0rd!**
4	Resource Group	**sqlbitsadf<*999*>**	Choose the Resource Group you created in the first step.
5	Location	**UK South**	Choose **UK South**.

Unless specified above, use the default settings.

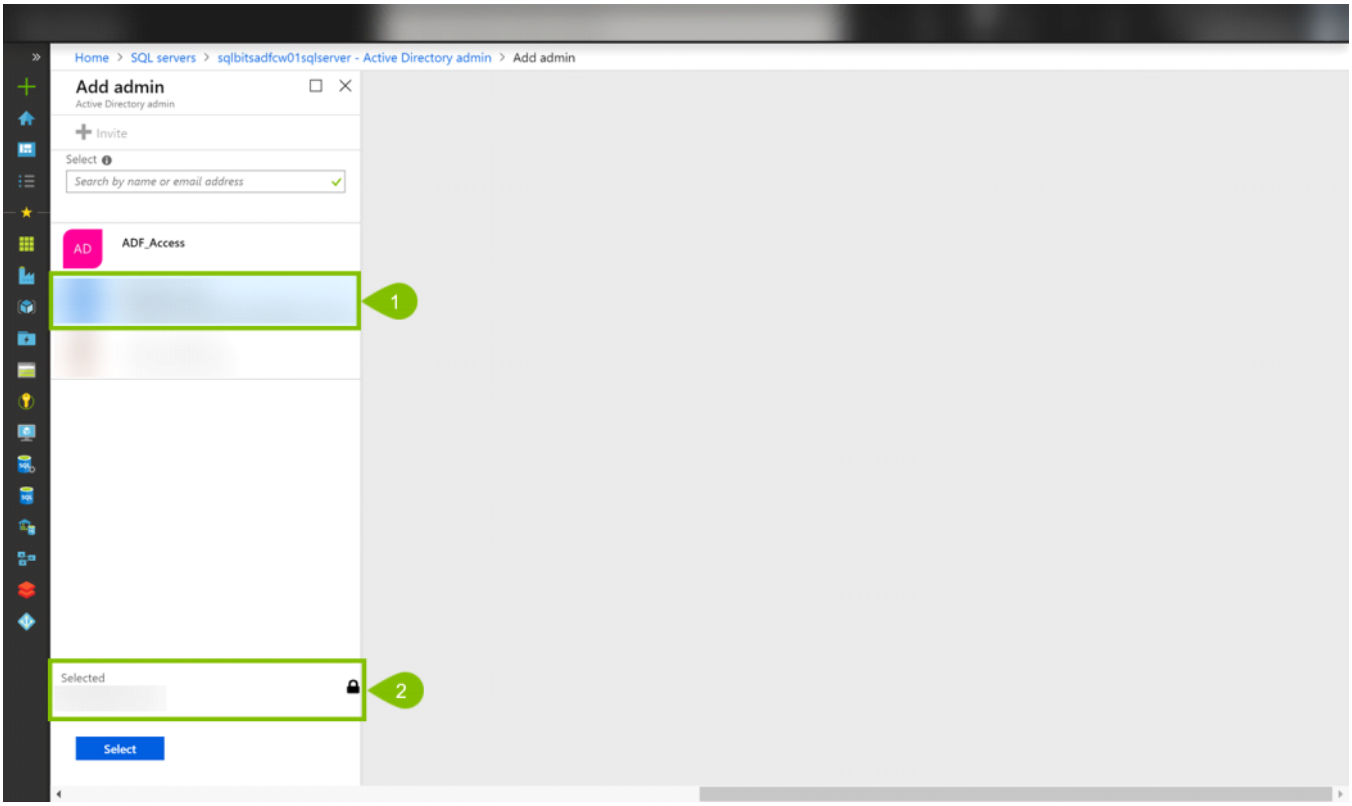


Add yourself as an Active Directory Admin of the Azure SQL Server

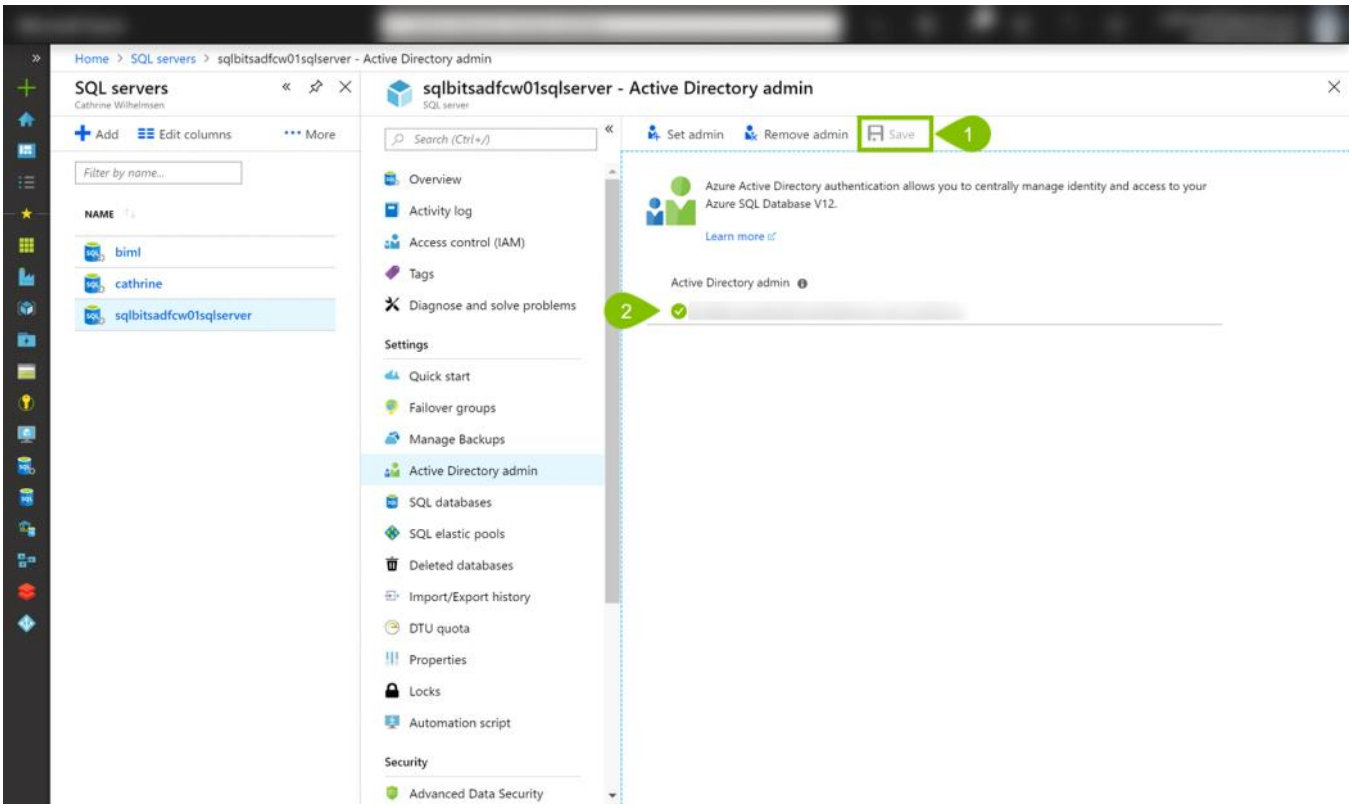
Click on **Active Directory Admin**, then **Set Admin**.



Select **your user**, then click **Select**.



Ensure that you **Save** the new Active Directory Admin and see the **green checkmark**.



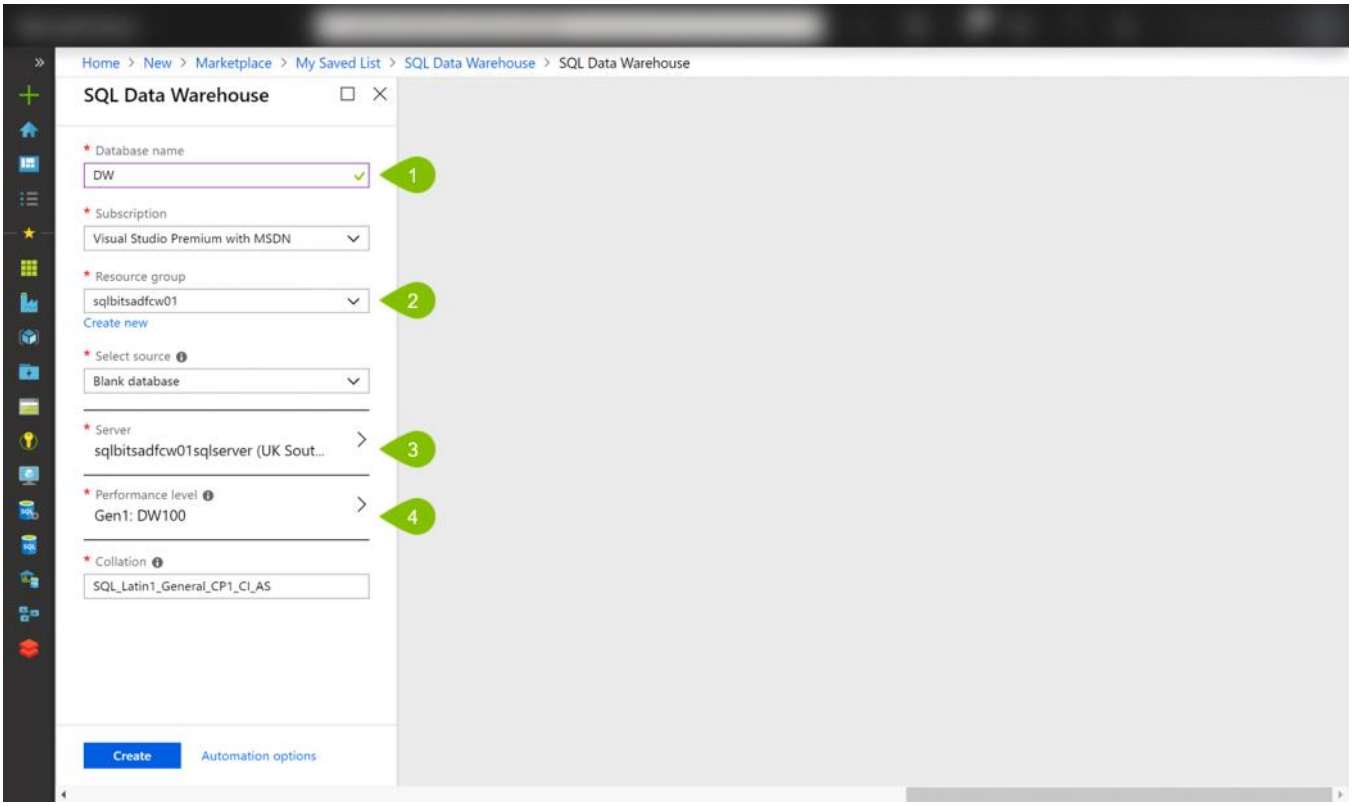
6. Create Azure SQL Data Warehouse

Create the Azure SQL Data Warehouse in the Azure SQL Server created in the previous step.

Please note: It is very important to ensure this resource is paused after creation, as it will incur costs if left running.

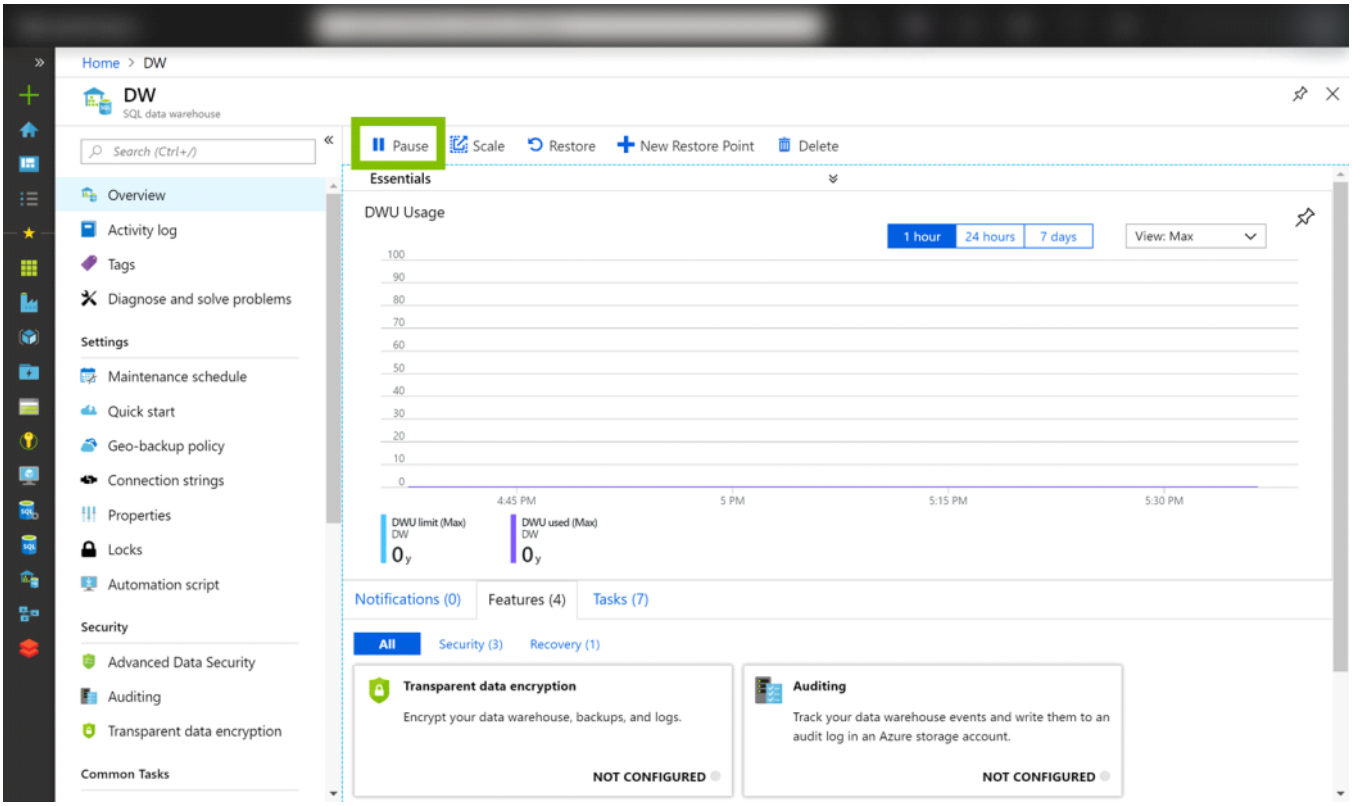
Step	Setting	Value	Notes
1	Database Name	**DW**	
2	Resource Group	**sqlbitsadf*<999>***	Choose the Resource Group you created in the first step.
3	Server	**sqlbitsadf*<999>*sqlserver**	Choose the SQL Server you created in the previous step.
4	Performance Level	**Gen1: DW100**	Change the default Gen2 DW1000c to the cheaper Gen1 DW100. (The cheapest Gen2 is not available by default in the UK South region.)

Unless specified above, use the default settings.



Additional information:
https://docs.microsoft.com/en-us/azure/sql-data-warehouse/create-data-warehouse-portal

Once the Azure SQL Data Warehouse has been deployed, pause it immediately.



Please note: It is very important to ensure this resource is paused after creation, as it will incur costs if left running.

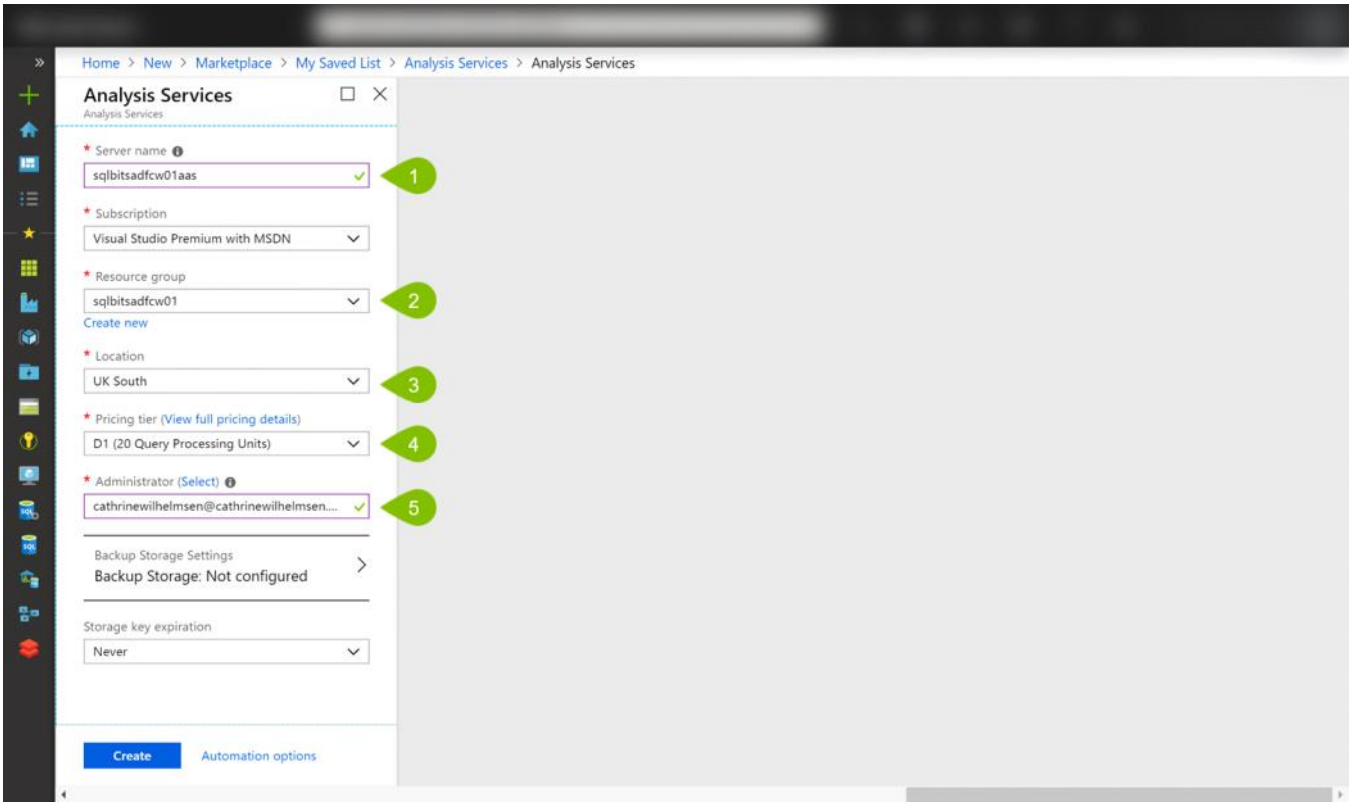
7. Create Azure Analysis Services

Azure Analysis Services integrates with many Azure services enabling you publish Tabular models to Azure.

Please note: It is very important to ensure this resource is paused after creation, as it will incur costs if left running.

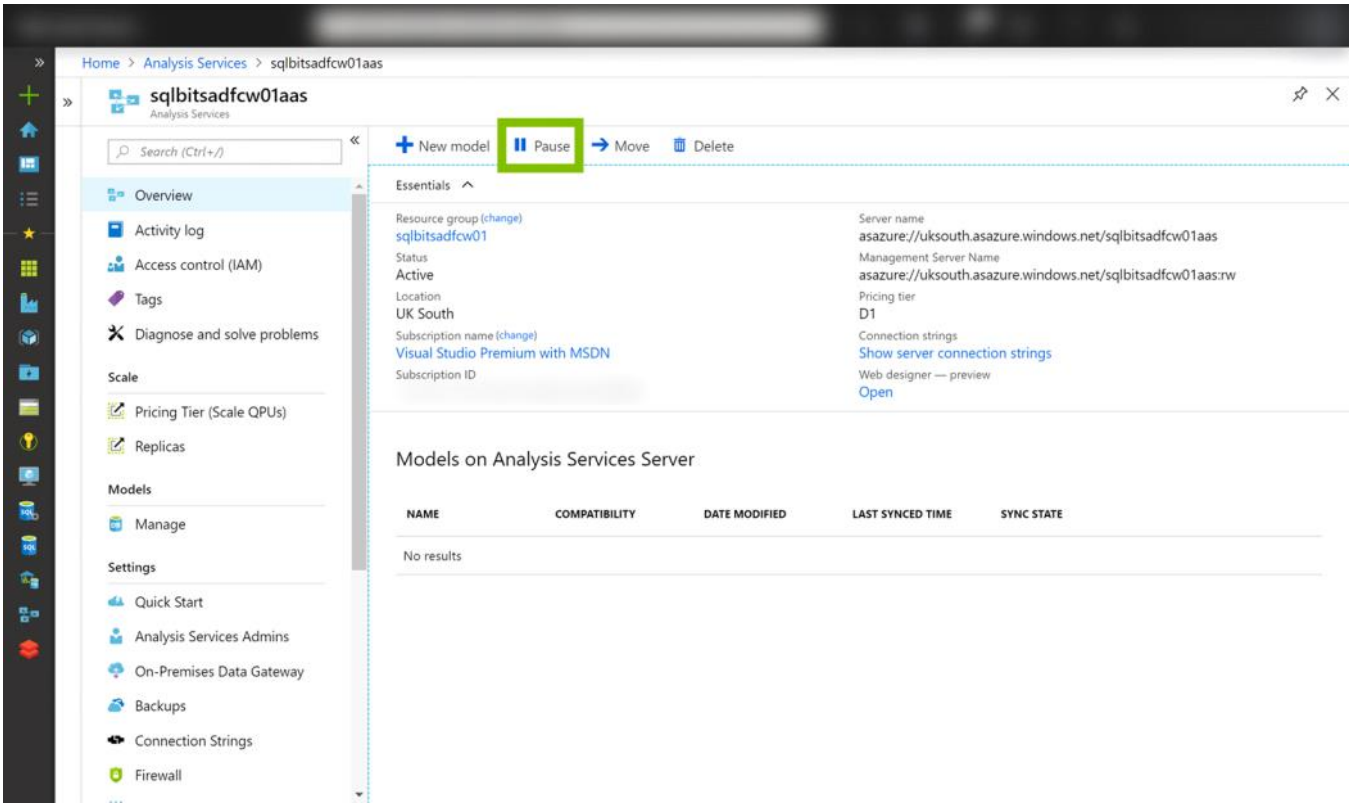
Step	Setting	Value	Notes
1	Server Name	**sqlbitsadf<*999*>aas**	Use the name of the Resource Group and add **aas** as a suffix.
2	Resource Group	**sqlbitsadf<*999*>**	Choose the Resource Group you created in the first step.
3	Location	**UK South**	Choose **UK South**.
4	Pricing Tier	**D1**	Choose **D1**.
5	Administrator	**<User>**	Choose your own user.

Unless specified above, use the default settings.



Additional information:
https://docs.microsoft.com/en-us/azure/analysis-services/analysis-services-create-server

Once the Azure Analysis Services has been deployed, pause it immediately.



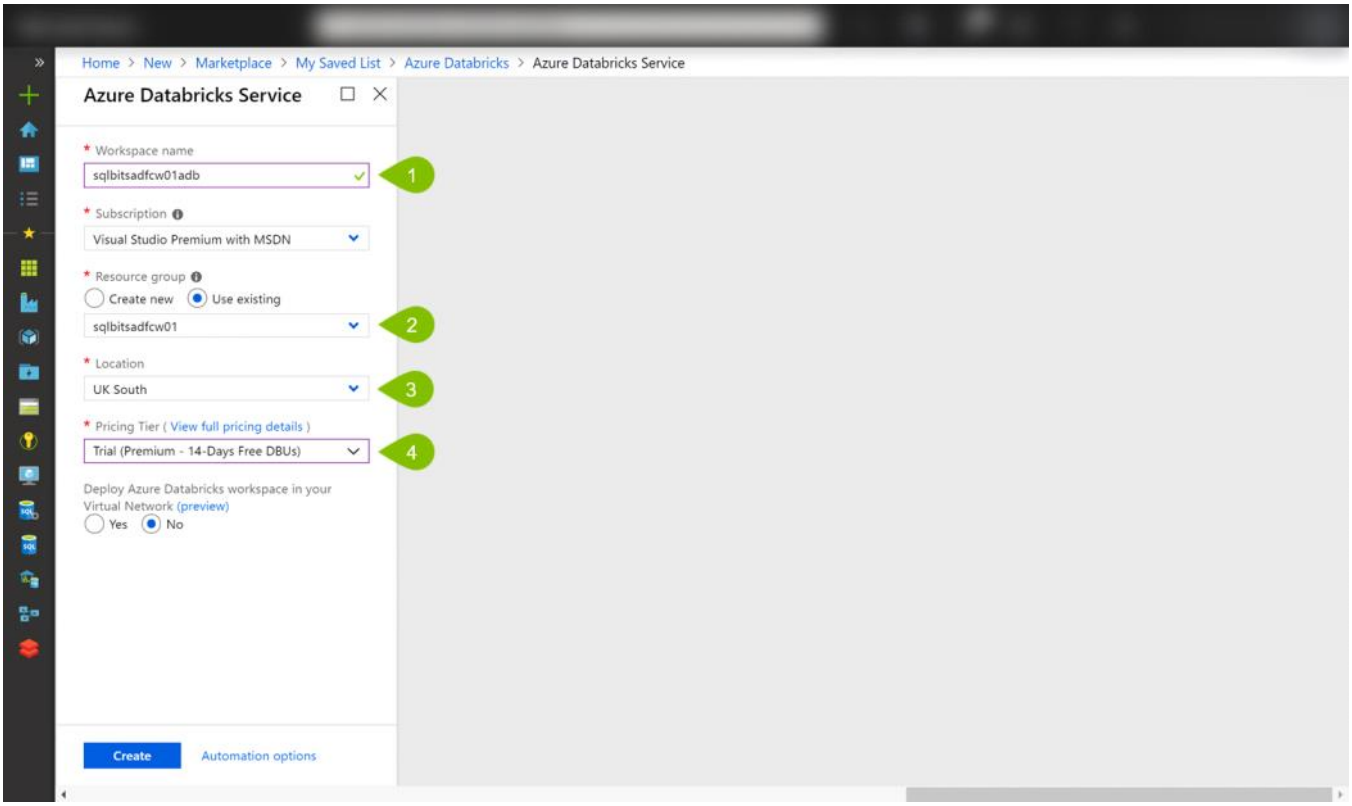
Please note: It is very important to ensure this resource is paused after creation, as it will incur costs if left running.

8. Create Azure Databricks Service

Azure Databricks is an Apache Spark-based analytics platform optimized for the Microsoft Azure cloud services platform.

Step	Setting	Value	Notes
1	Workspace Name	**sqlbitsadf*<999>*adb**	Use the name of the Resource Group and add **adb** as a suffix.
2	Resource Group	**sqlbitsadf*<999>***	Choose the Resource Group you created in the first step.
3	Location	**UK South**	Choose **UK South**.
4	Pricing Tier	**Trial (Premium - 14 Days Free)**	Choose **Trial (Premium - 14 Days Free DBUs)**. If this is no longer an option for you, choose **Standard**.

Unless specified above, use the default settings.



Additional information:
https://docs.azuredatabricks.net/getting-started/try-databricks.html

9. Create Virtual Machine (Free SQL Server License: SQL Server 2017 Developer on Windows Server 2016) with AdventureWorksLT Demo Database

Create a virtual machine with SQL Server 2017 and the AdventureWorksLT database that will act as your on-premises source.

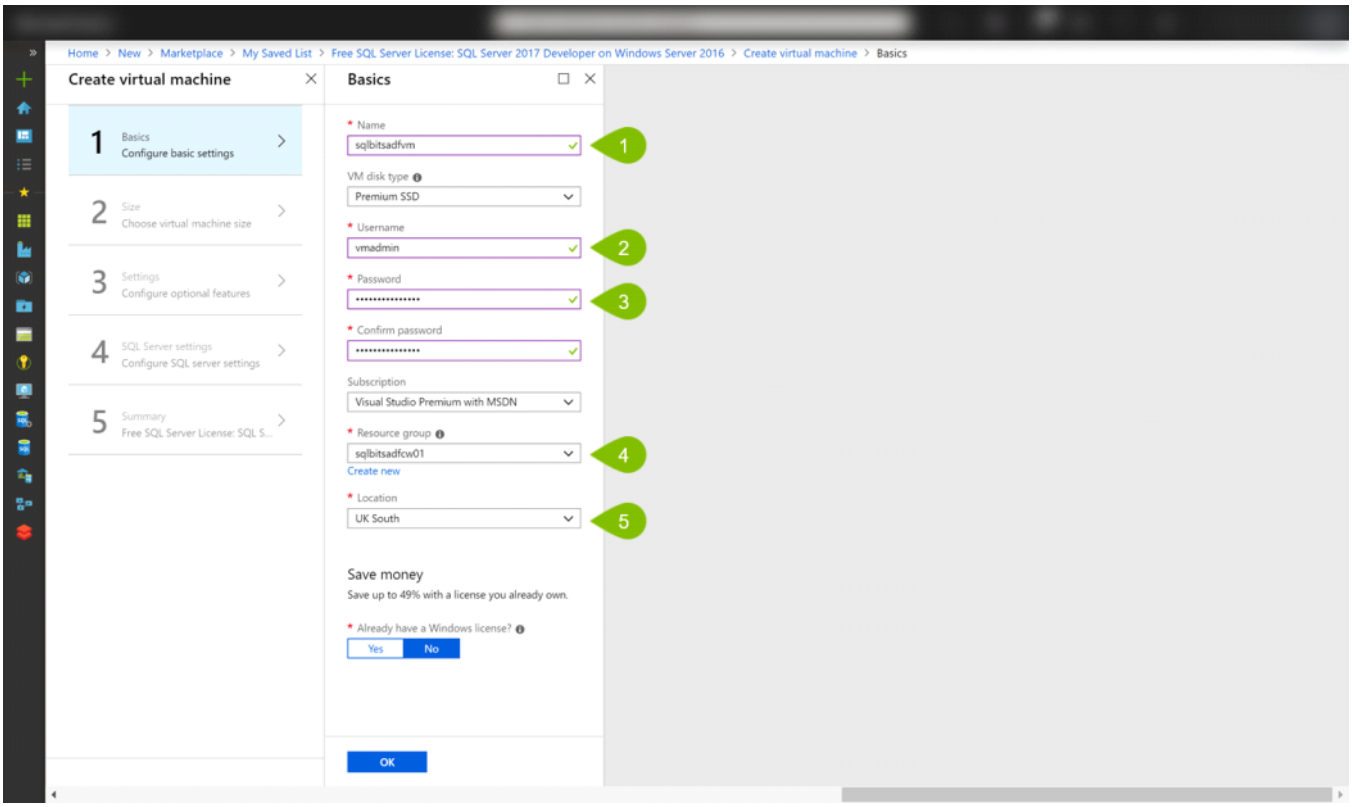
Please note: It is very important to ensure this resource is stopped after creation, as it will incur costs if left running.

This process consists of multiple parts.

Part 1: Basics

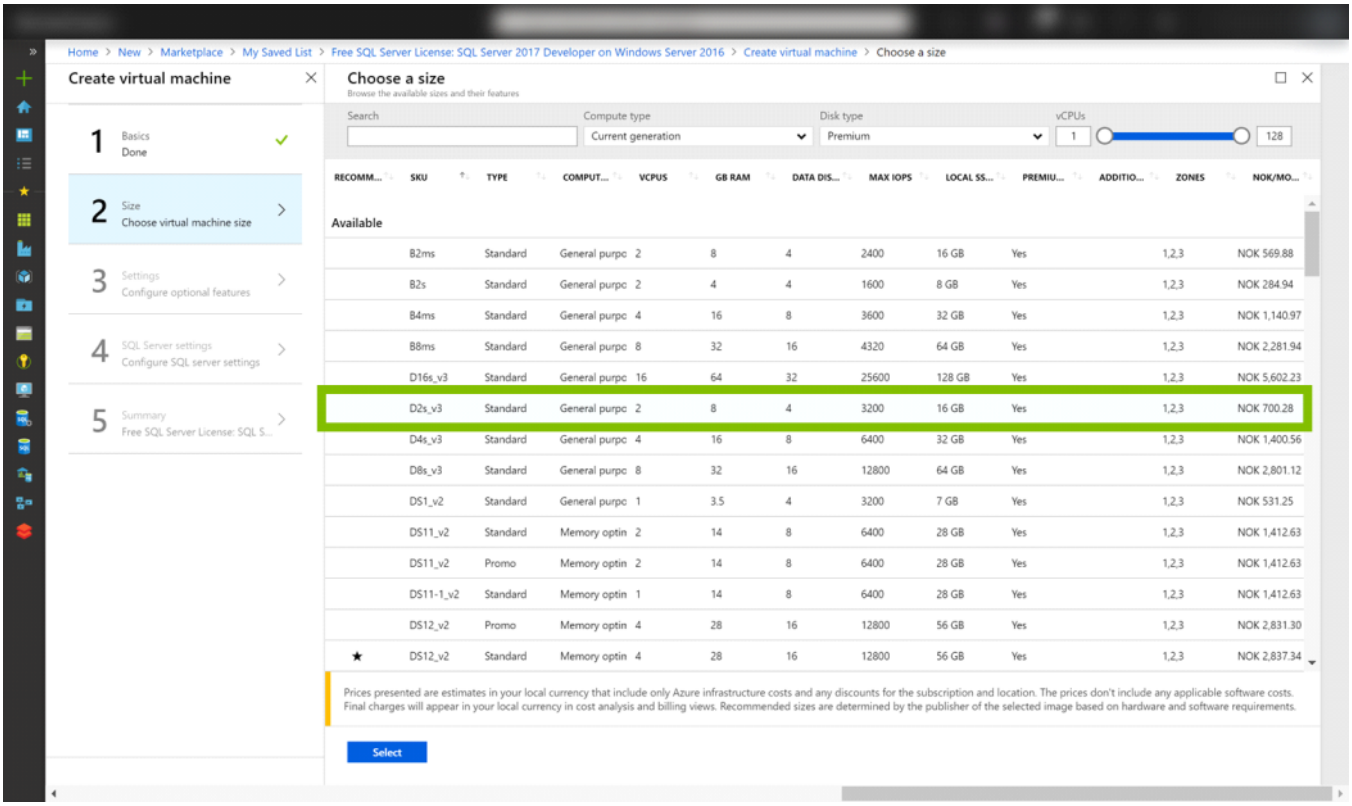
Step	Setting	Value	Notes
1	Name	**sqlbitsadfvm**	Please note that the name has to be between 1-15 characters, so you may not be able to use your chosen suffix.
2	Username	**vmadmin**	Pick a username, for example **vmadmin**
3	Password	**VeryStr0ngPassw0rd!**	Pick a password, for example **VeryStr0ngPassw0rd!**
4	Resource Group	**sqlbitsadf<*999*>**	Choose the Resource Group you created in the first step.
5	Location	**UK South**	Choose **UK South**.

Unless specified above, use the default settings.



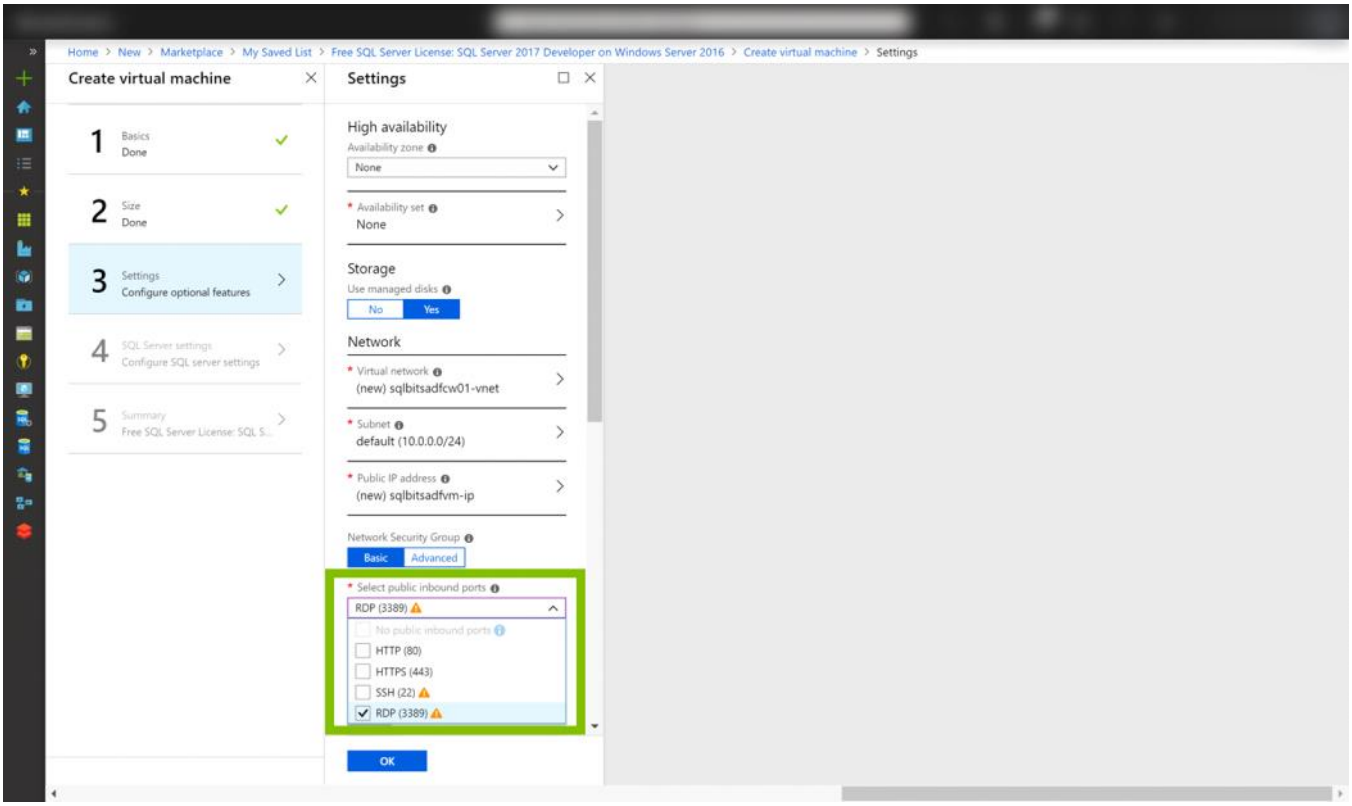
Part 2: Size

Choose **D2s_v3**.



Part 3: Settings

Select the **RDP** public inbound port. Keep all other defaults.

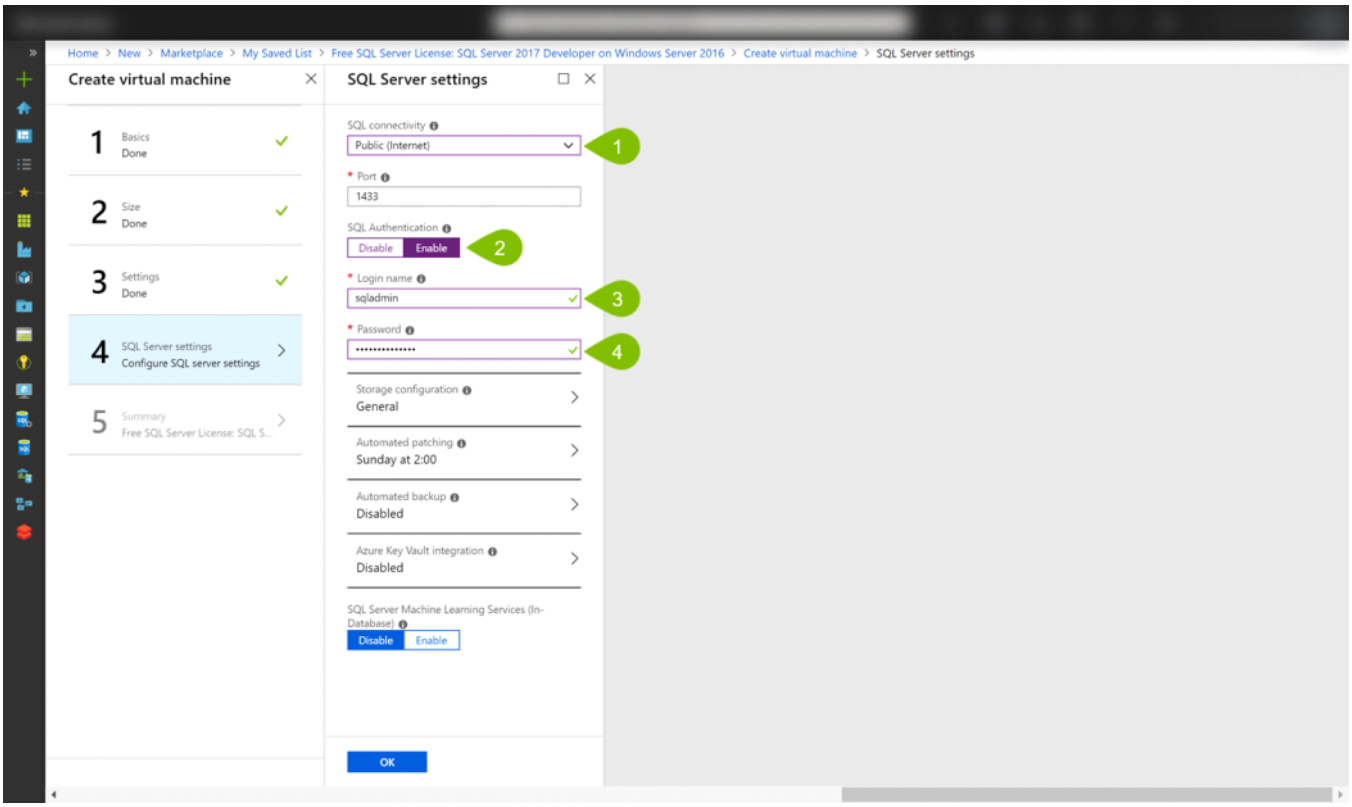


Part 4: SQL Server Settings

Enable public access using SQL authentication.

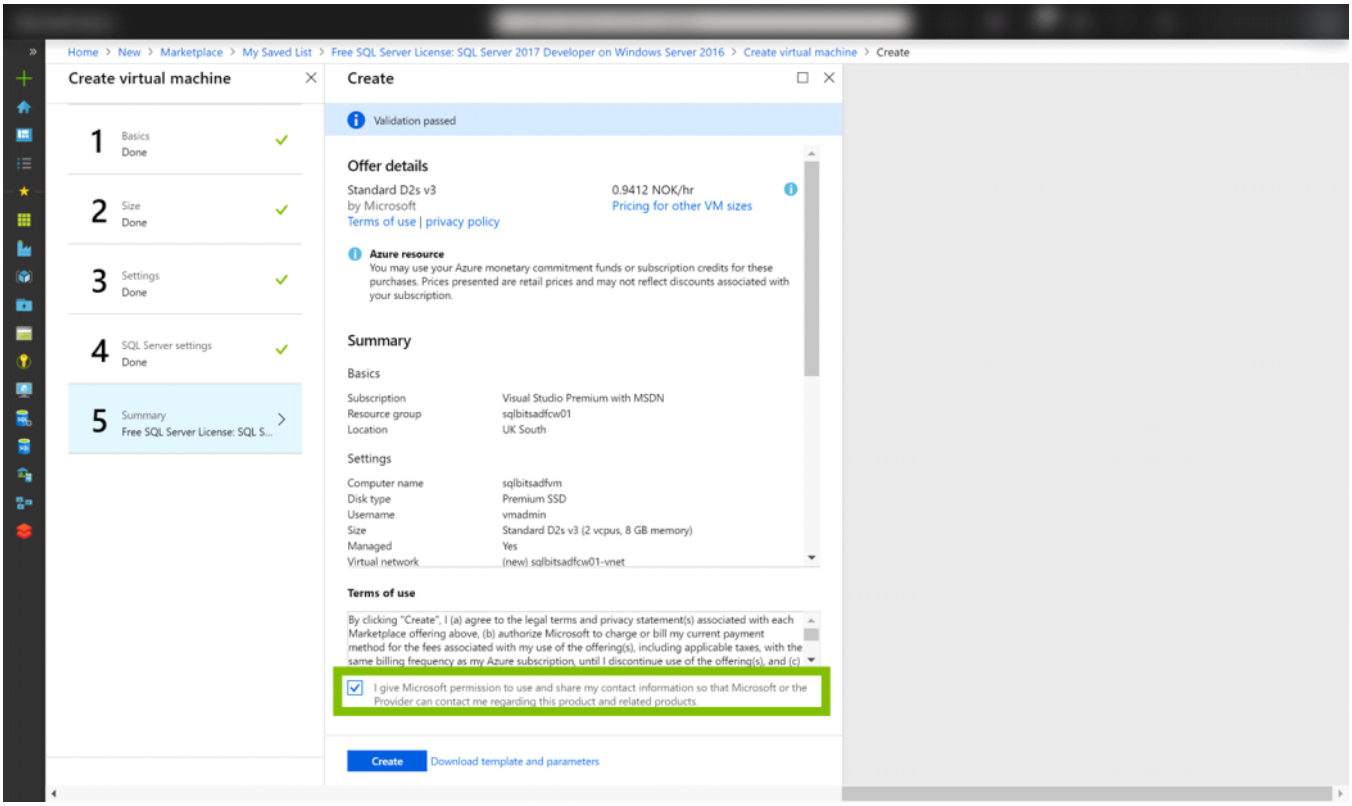
Step	Setting	Value	Notes

1	SQL Connectivity	**Public (Internet)**	We will be using this public setting to simplify demos.
2	SQL Authentication	**Enabled**	Choose the Resource Group you created in the first step.
3	Username	**sqladmin**	Pick a username, for example **sqladmin**
4	Password	**VeryStr0ngPassw0rd!**	Pick a password, for example **VeryStr0ngPassw0rd!**



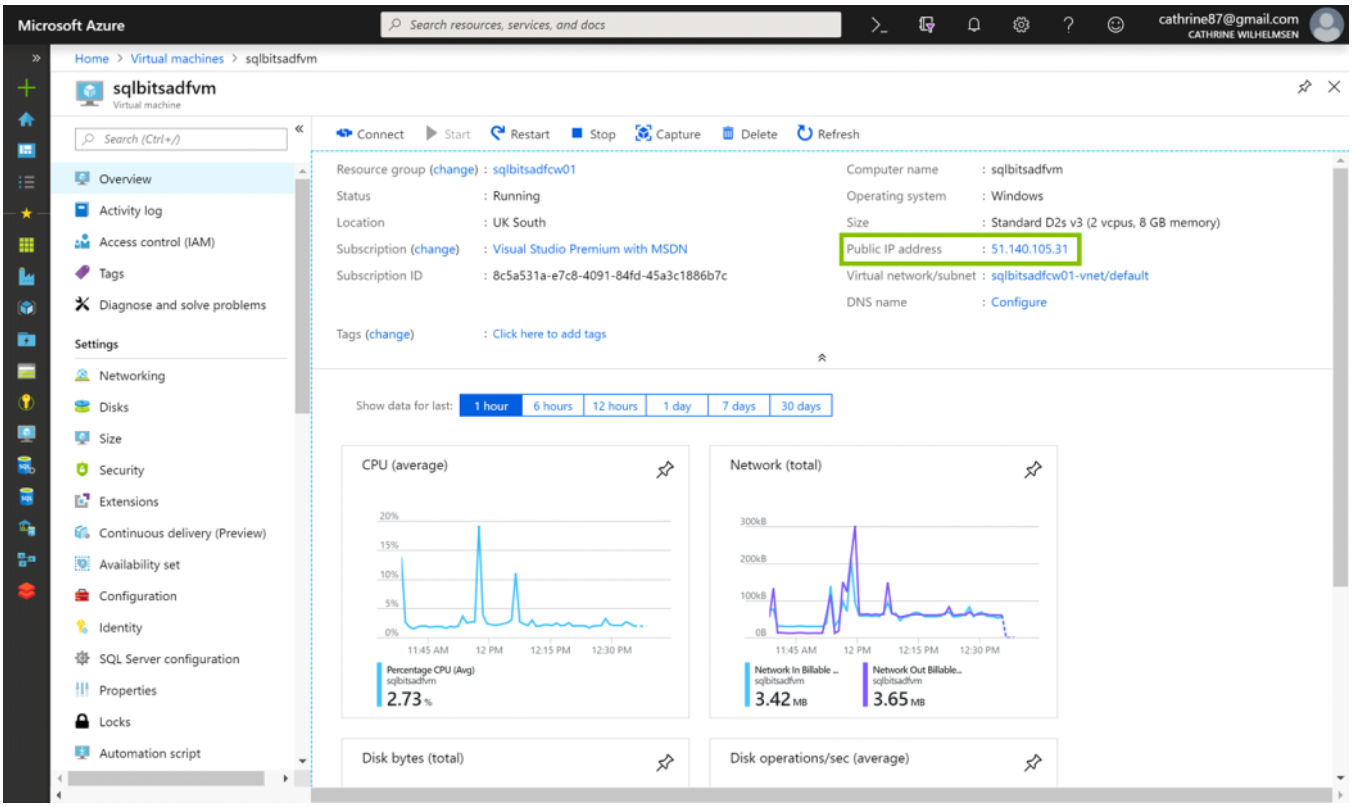
Part 5: Summary

Accept the terms of use and create the VM.

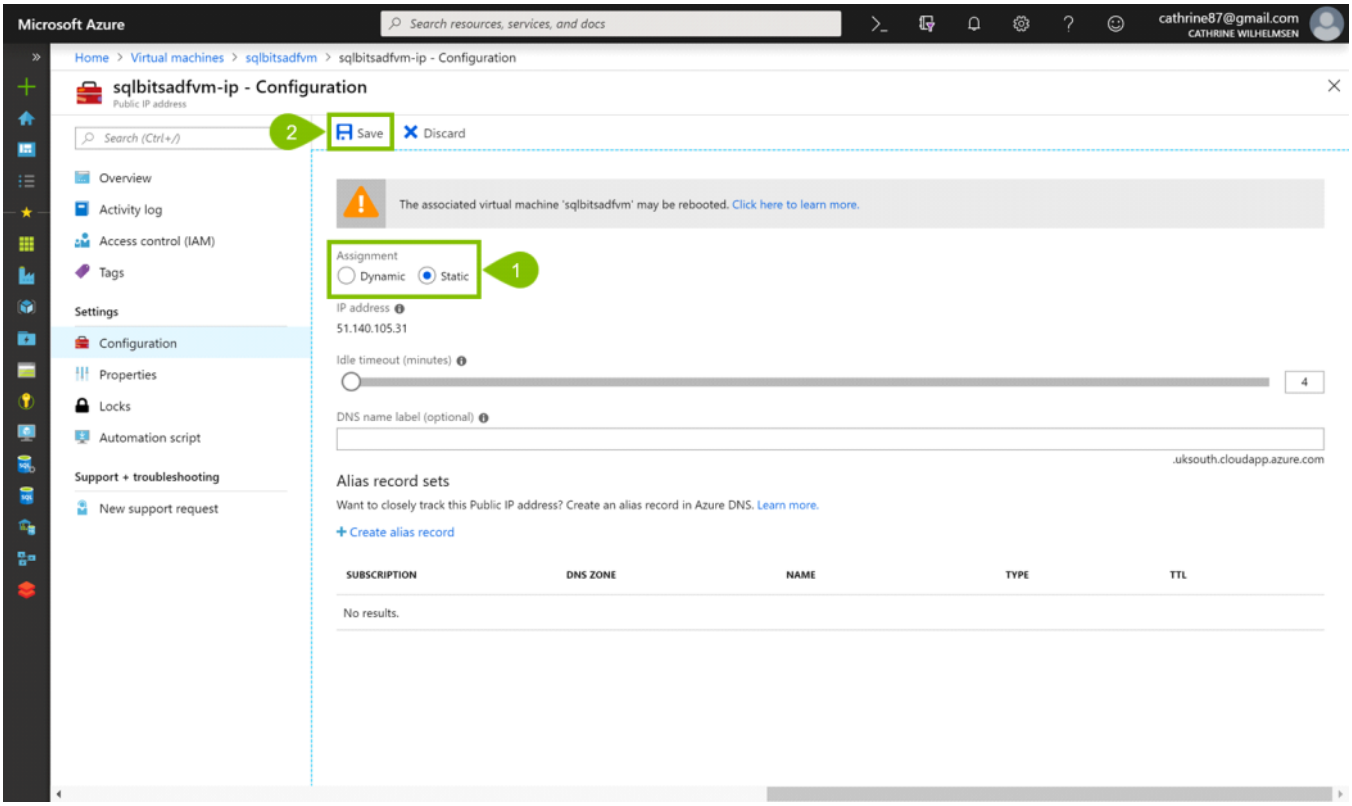


Change the Public IP Address from Dynamic to Static

In this workshop, we don't want to keep our Virtual Machine running all the time as that will incur costs. To be able to start and stop the virtual machine and reconnect to it without having to change the connection settings every time, you need to change the IP address settings. From the Virtual Machine page, click on the **Public IP Address**.

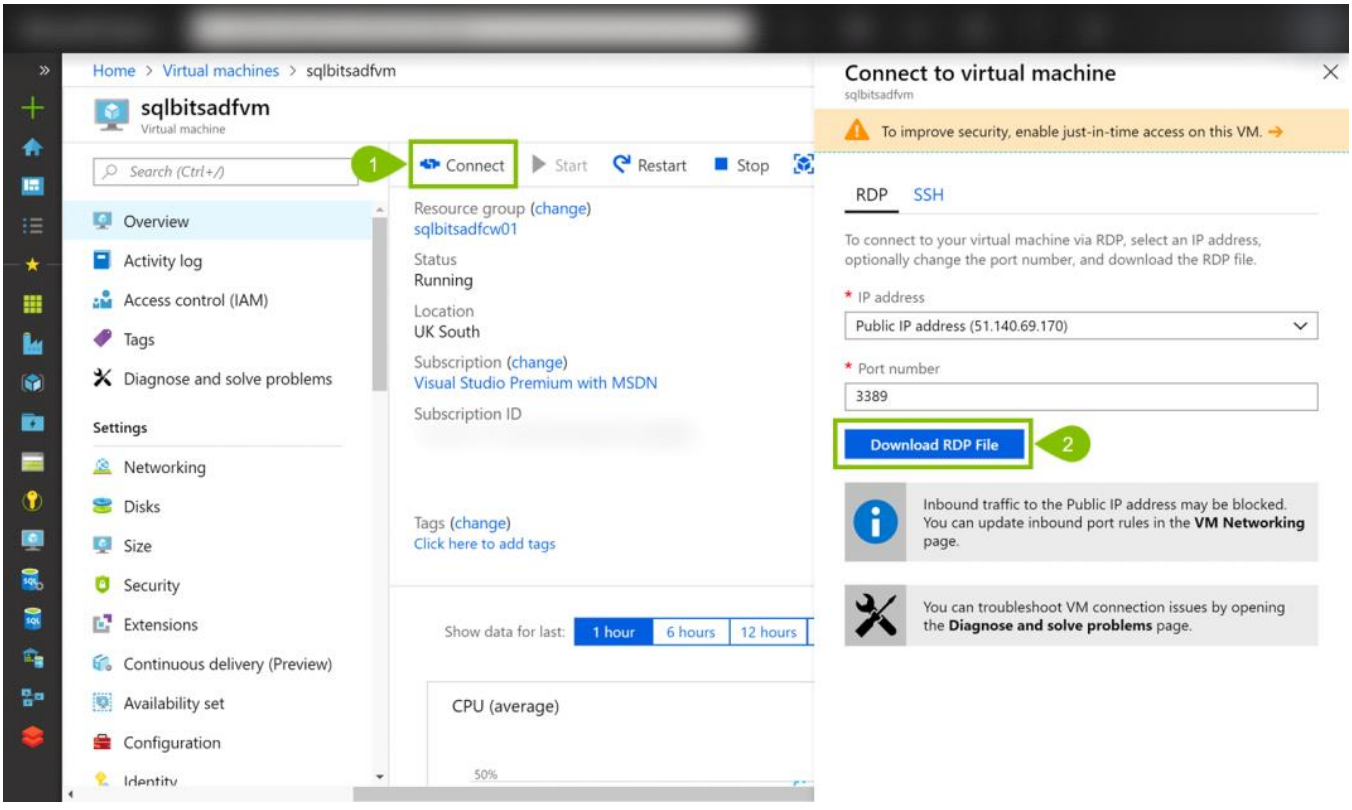


Change the Assignment from Dynamic to **Static**. Click **Save**.

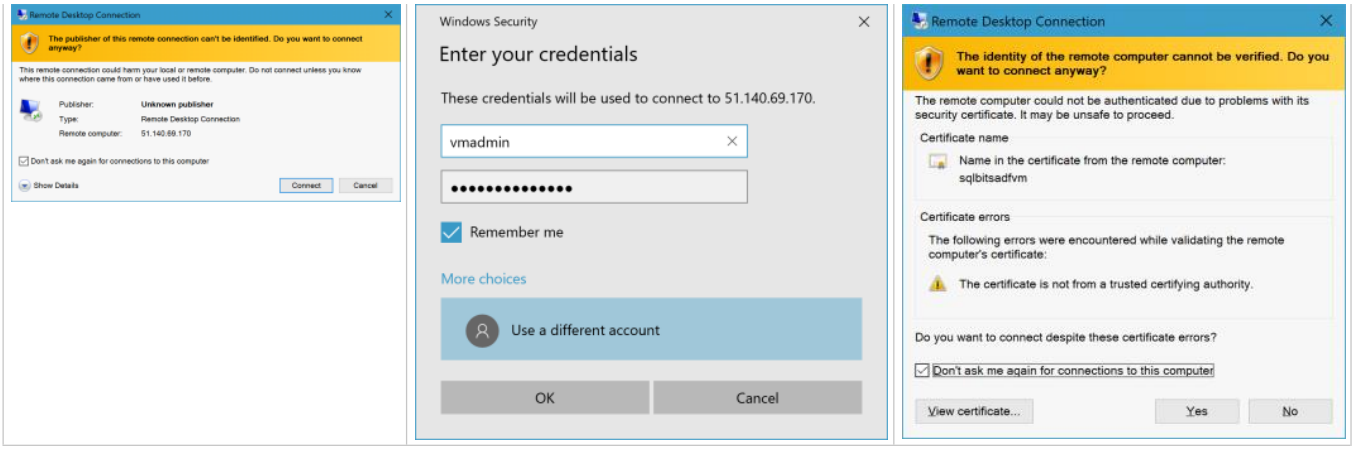


Connect to the Virtual Machine

Go back to the Virtual Machine page. Click **Connect** and download the **RDP** file.

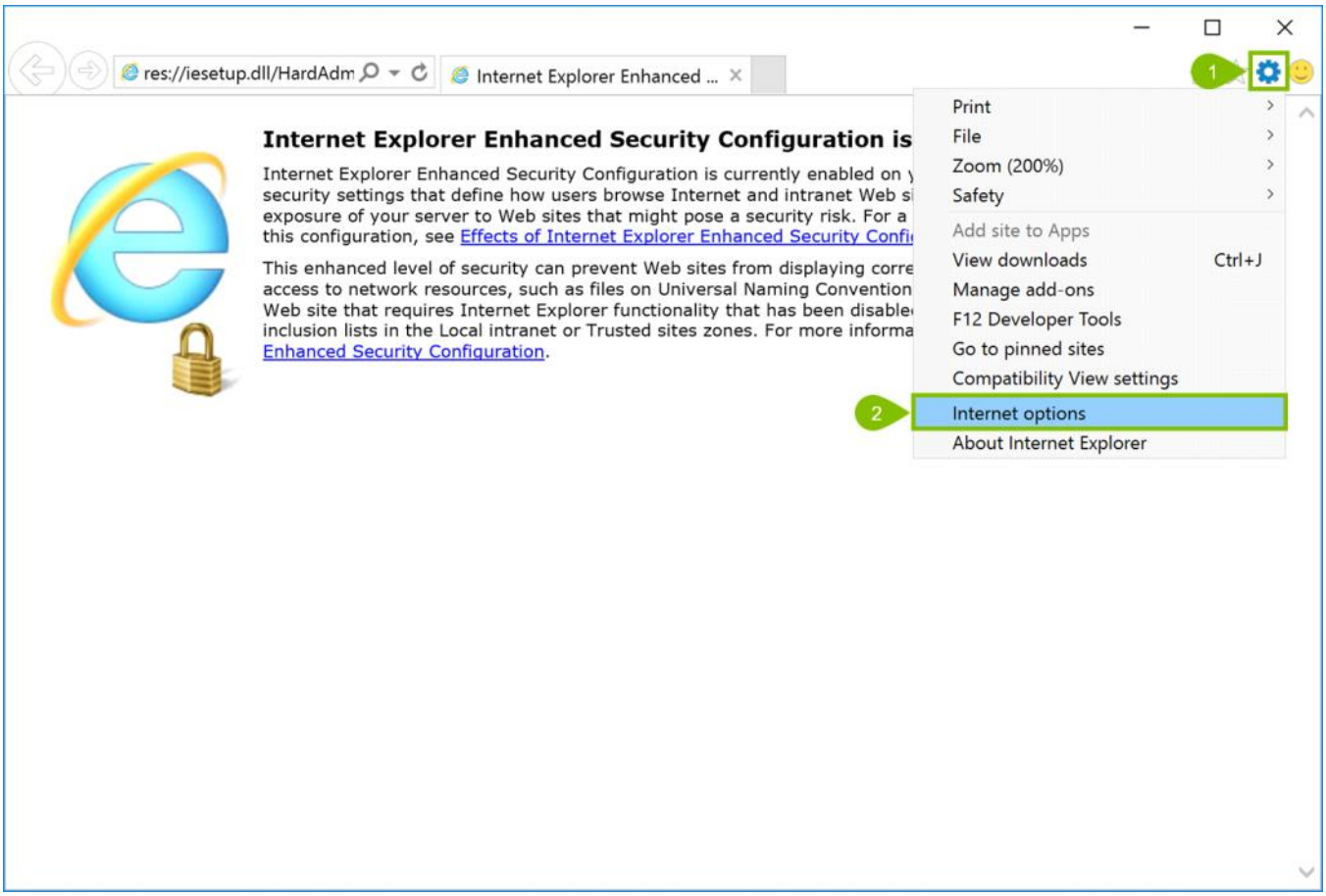


Open the RDP file, click Connect, then choose **Use a different account** under More choices, enter your username and password (for example **vmadmin** / **VeryStr0ngPassw0rd!**), and click Yes.

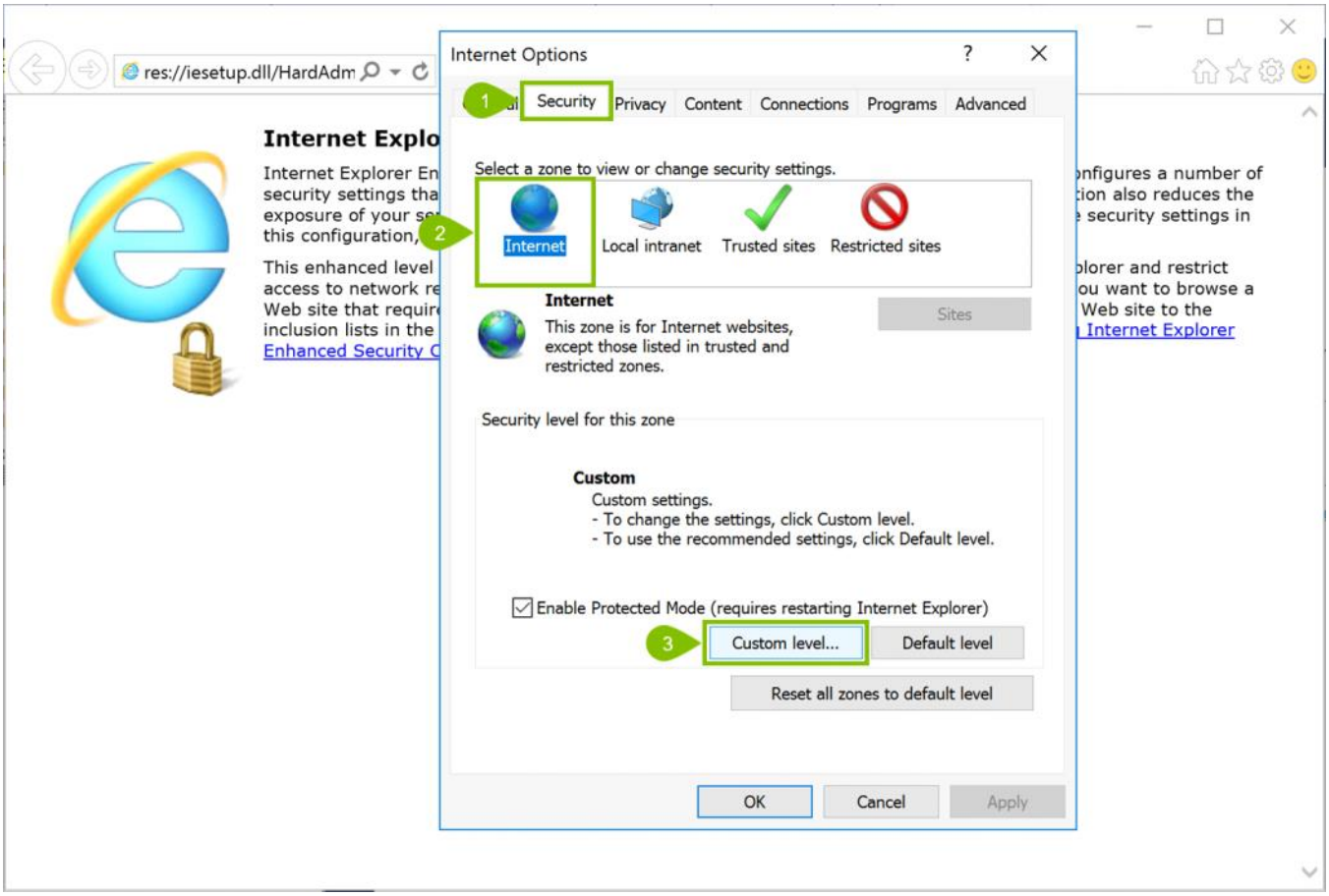


Download the AdventureWorksLT Demo Database

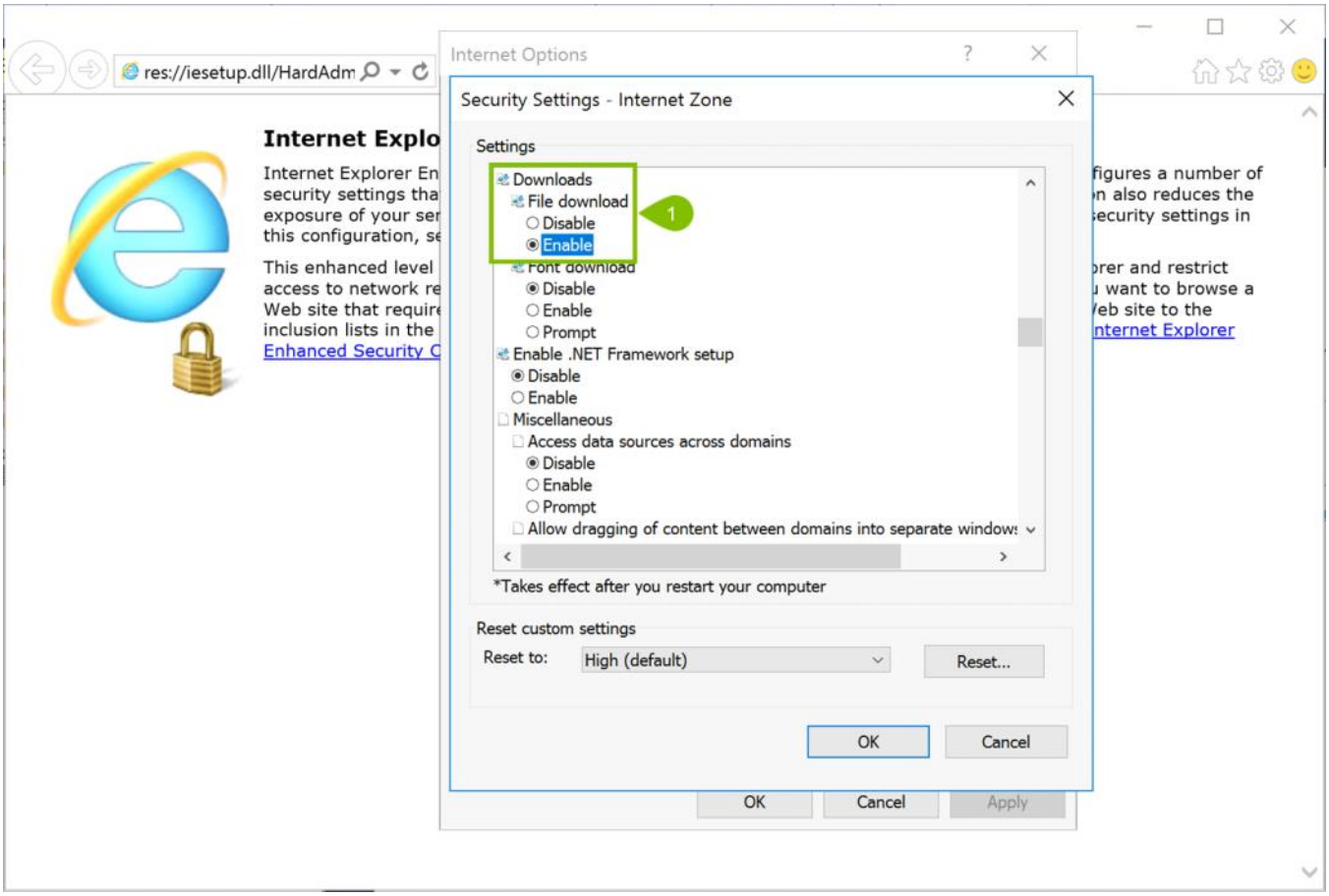
Once inside the Virtual Machine, open Internet Explorer. To be able to download the AdventureWorksLT demo database, you first need to change the security settings. Click **Settings**, then **Internet Options**.



Click the **Security** tab, select **Internet**, then click **Custom level**.

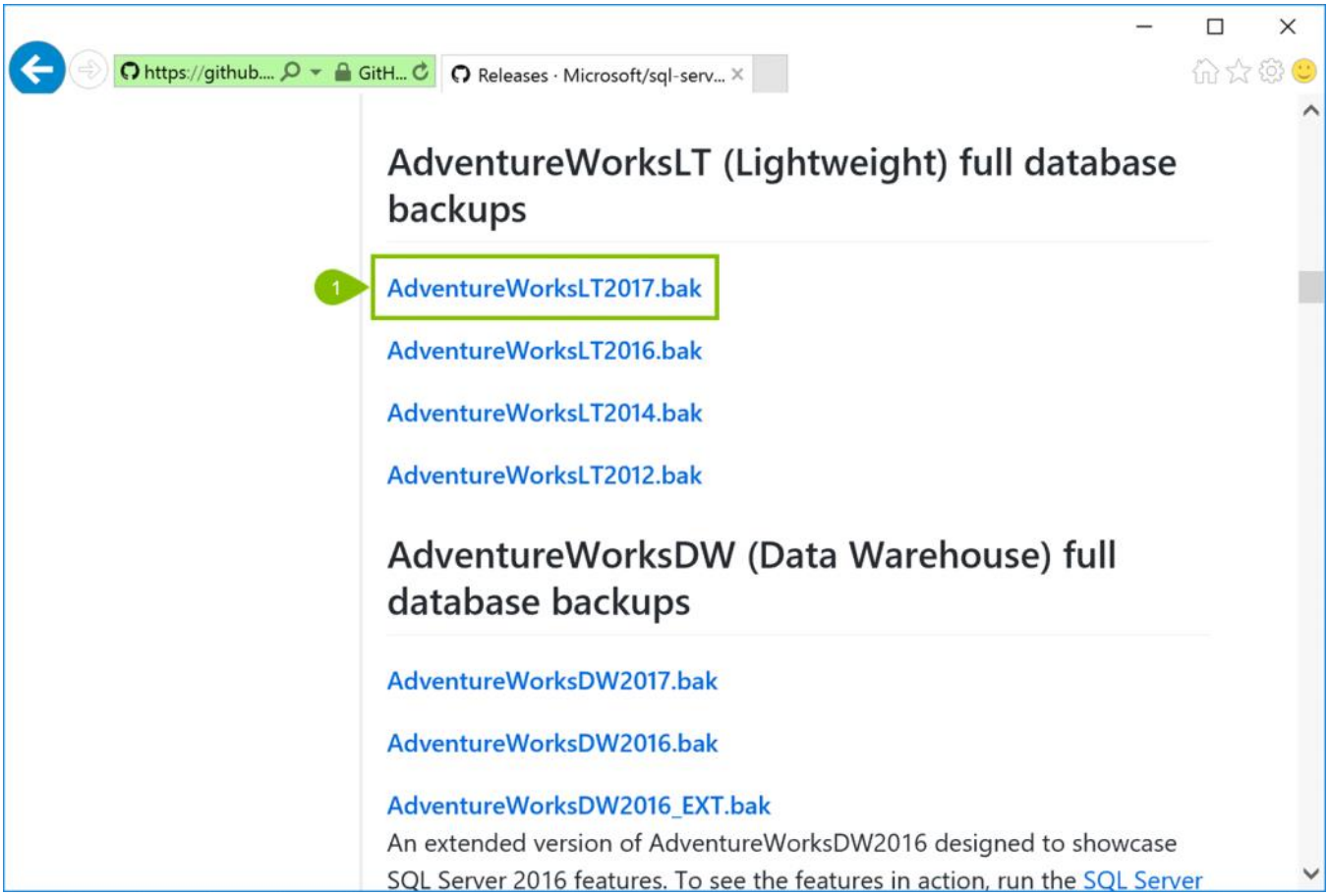


Scroll down to **Downloads**, choose **Enable**.



Scroll further down to **Scripting**, choose **Enable**. Click Yes to confirm you want to change the settings for the zone, click OK to close the Settings windows, and OK again to close the Internet Options window.

Go to https://github.com/Microsoft/sql-server-samples/releases, scroll down, and download **AdventureWorksLT2017.bak** to **D:**.



Open **SQL Server Management Studio (SSMS)**, connect to **localhost**, and restore the **AdventureWorksLT** database.

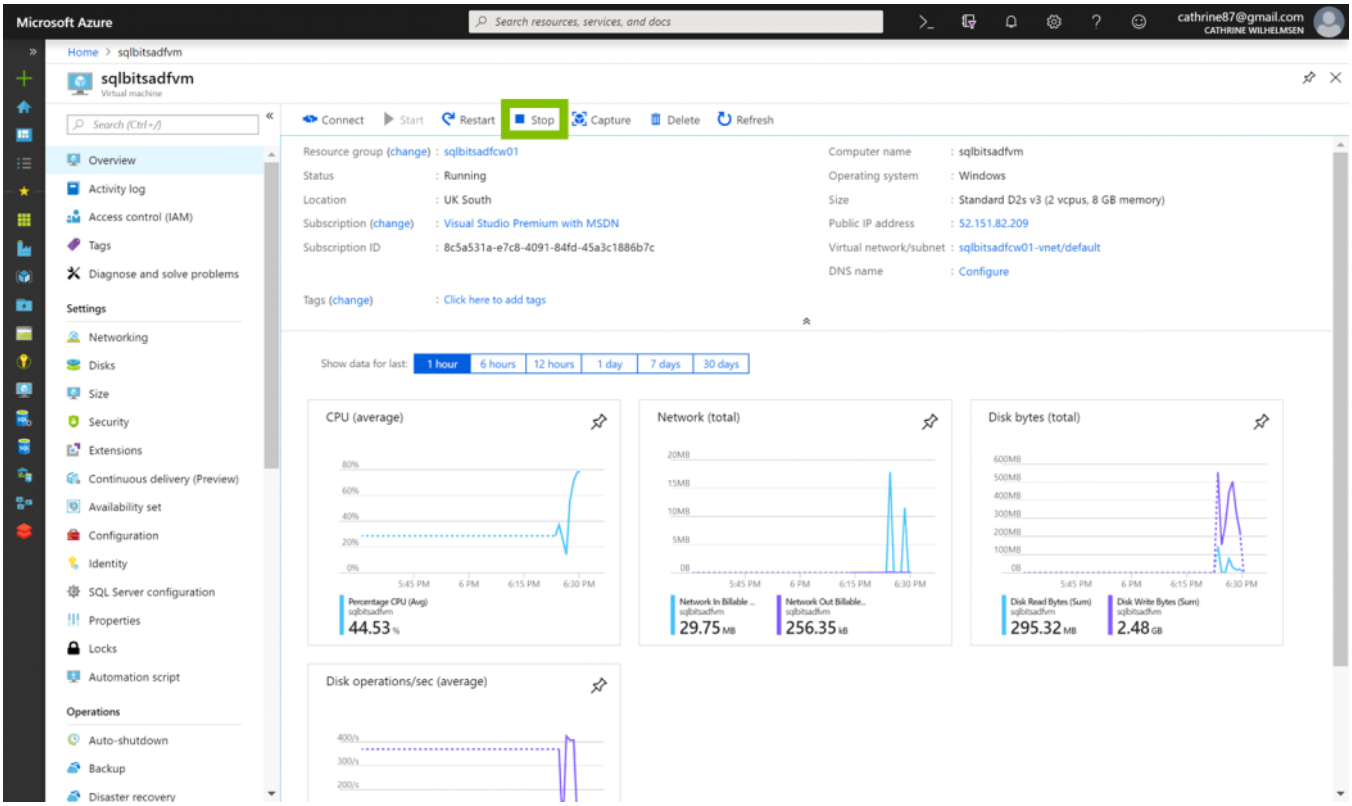
```
USE [master];
GO

RESTORE DATABASE [AdventureWorksLT]
FROM  DISK = N'D:\AdventureWorksLT2017.bak'
WITH  FILE = 1,
MOVE N'AdventureWorksLT2012_Data' TO N'F:\Data\AdventureWorksLT2012.mdf',
MOVE N'AdventureWorksLT2012_Log' TO N'F:\Log\AdventureWorksLT2012_log.ldf',
NOUNLOAD,  STATS = 5
GO
```

Open **SQL Server Management Studio (SSMS)**, connect to **localhost**, and run the following query in the **master** database to set up security and permissions.

```
USE [master];
GO

CREATE LOGIN DataLoadUser WITH PASSWORD = 'DataFactoryD3m0!';



USE AdventureWorksLT
GO
```

```
CREATE USER DataLoadUser FOR LOGIN DataLoadUser;

CREATE ROLE Executor;
GRANT EXECUTE TO [Executor]

CREATE ROLE Reader;
GRANT SELECT TO [Reader];

EXEC sp_addrolemember 'Executor', 'Reader';

GRANT VIEW CHANGE TRACKING ON Schema::SalesLT TO [Reader];
GRANT VIEW DEFINITION ON Database::AdventureWorksLT to [Reader];

EXEC sp_addrolemember 'Reader', 'DataLoadUser';
```

Once the AdventureWorksLT database has been restored, exit the Virtual Machine and stop it.



Additional information:
https://docs.microsoft.com/en-us/azure/virtual-machines/windows/sql/quickstart-sql-vm-create-portal

Please note: It is very important to ensure this resource is stopped after creation, as it will incur costs if left running.

Post-Setup: Ensure all Resources are Paused or Stopped

- Azure SQL Data Warehouse (*Paused*)
- Azure Analysis Service (*Paused*)
- Virtual Machine (*Stopped*)

Lab 01: Azure Data Factory Overview

Background and Goals

In this lab, you will learn how to create your first Azure Data Factory, as well as the foundational Linked Services, Datasets, and Integration Runtimes.

After you create all the necessary resources, you will build a simple pipeline that copies data from a SQL Server source to an Azure Data Lake Storage Gen1 sink. Finally, you will debug and trigger the newly created pipeline.

Prerequisites

In order to complete this lab, you will need to have previously created:

- Resource Group
- Azure Data Lake Storage Gen1
- Azure SQL Server
- Azure SQL Database
- Virtual Machine (Free SQL Server License: SQL Server 2017 Developer on Windows Server 2016) with AdventureWorksLT Demo Database

Overview

Activity 01: Create Azure Data Factory and Configure Security

- Create Azure Data Factory
- Run PowerShell Script to Create Azure Active Directory Group

Activity 02: Setup Integration Runtime

- Create Self-Hosted Integration Runtime in the Azure Data Factory
- Install Integration Runtime on Virtual Machine (simulating an on-premises SQL Server)

Activity 03: Setup Staging Database

- Deploy Staging database from DACPAC
- Setup Master and Staging Security

Activity 04: Create Linked Services

- Create Linked Service to SQL Server in Virtual Machine
- Create Linked Service to Azure SQL Database
- Create Linked Service to Azure Data Lake Storage Gen1

Activity 05: Create Datasets

- Create SQL Server Dataset
- Create Azure Data SQL Database Dataset

Activity 06: Create Pipeline

- Create Pipeline

Activity 07: Execute Pipeline

- Debug Pipeline
- Trigger Pipeline

- Monitor Pipeline

Let's get started with Activity 01!

Activity 01: Create Azure Data Factory and Configure Security

Activity Overview

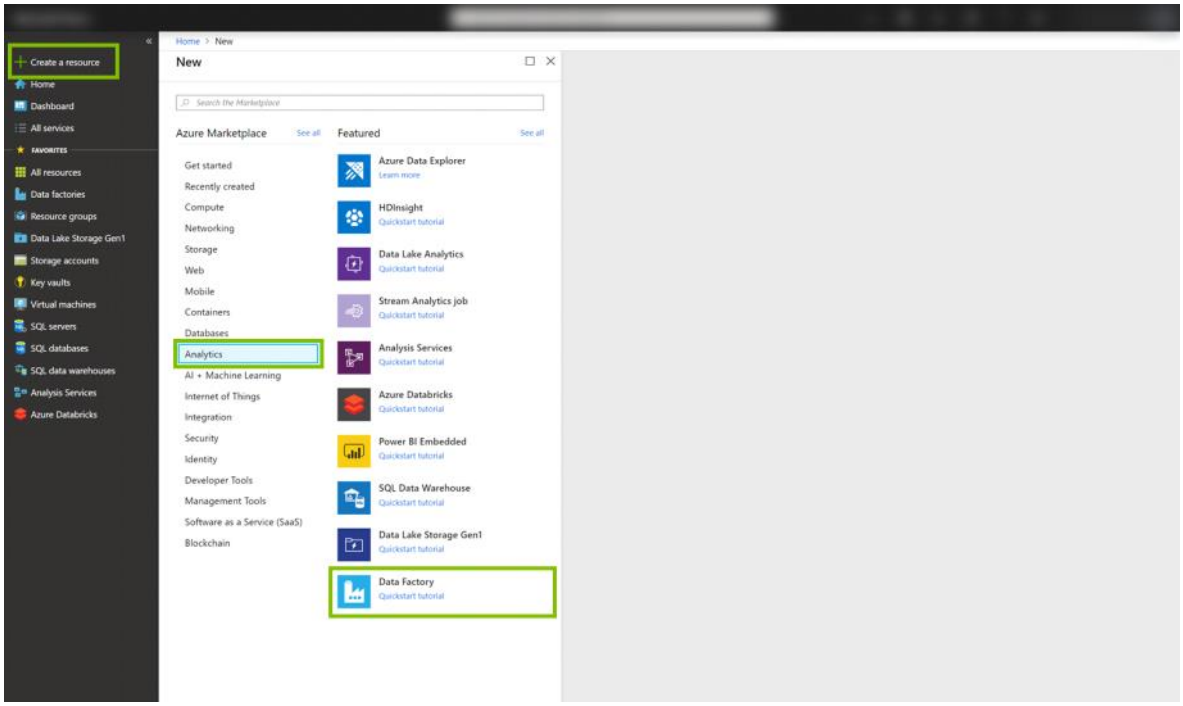
Estimated time to complete activity: **5 minutes**.

In this activity, you will create an Azure Data Factory. This activity is, not surprisingly, required to complete the rest of the labs and activities in the workshop.

Create Azure Data Factory

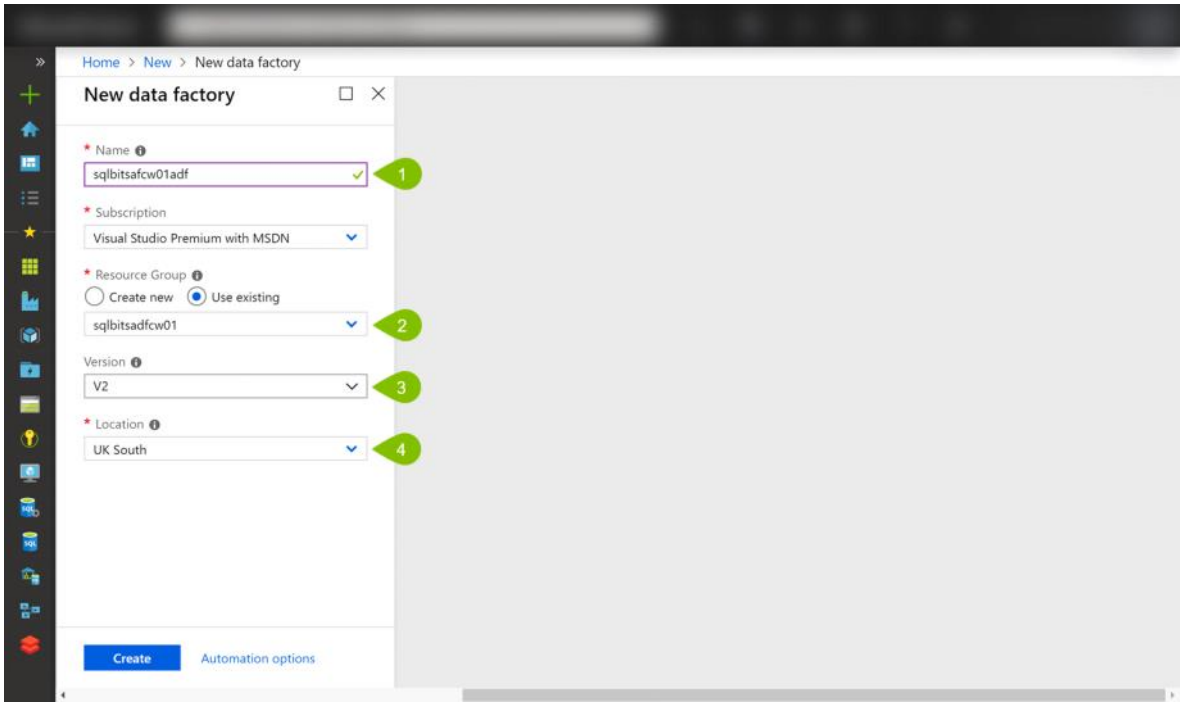
Open **Microsoft Edge** or **Google Chrome** and navigate to http://portal.azure.com.

Click **Create a resource** in the left menu, click **Analytics**, and then select **Data Factory**:



On the **New Data Factory** page, provide the following information:

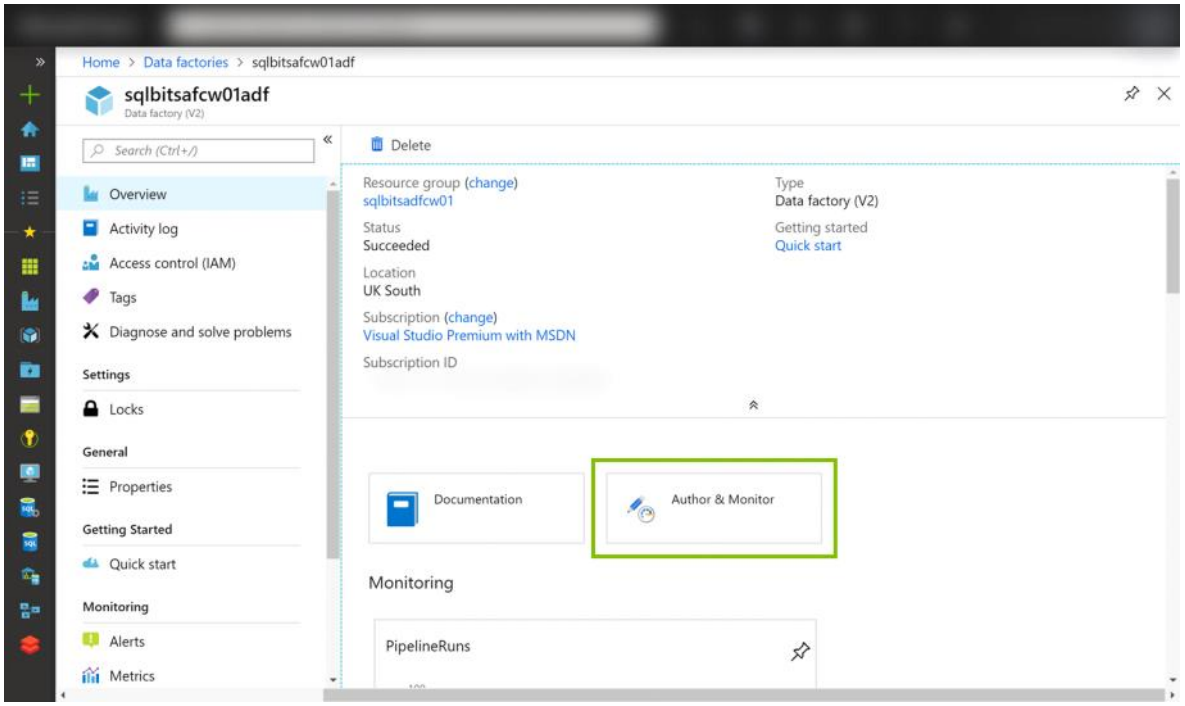
Step	Setting	Value	Notes
1	Name	**sqlbitsadf*<999>*adf**	Use the name of the Resource Group and add **adf** as a suffix.
2	Resource Group	**sqlbitsadf*<999>***	Choose the Resource Group you created in the prerequisites instructions.
3	Version	**V2**	Select **V2**.
4	Location	**UK South**	Choose **UK South**.



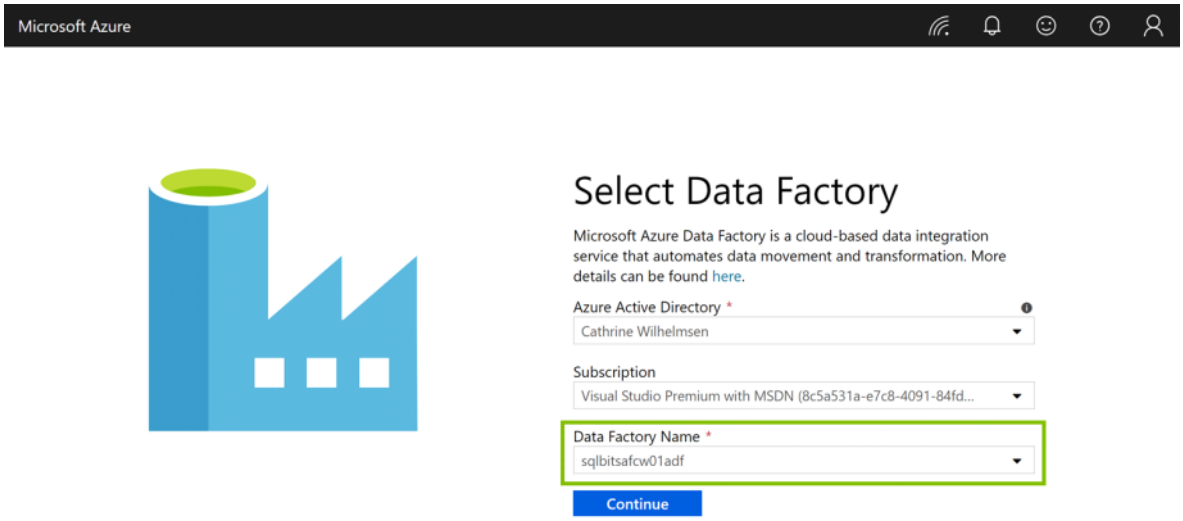
Navigate to the Azure Data Factory

There are two ways to navigate to your new Azure Data Factory:

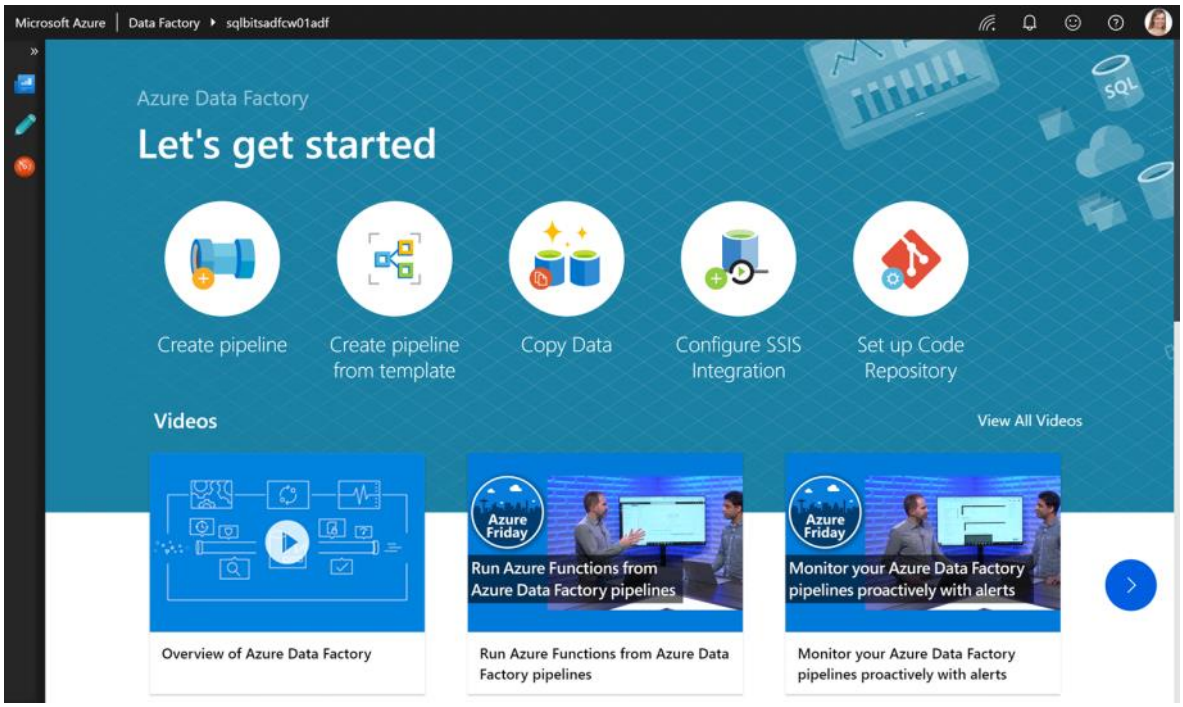
1. From the Azure Data Factory resource page, click on **Author & Monitor:**



2. Go directly to https://adf.azure.com and select your new Azure Data Factory:



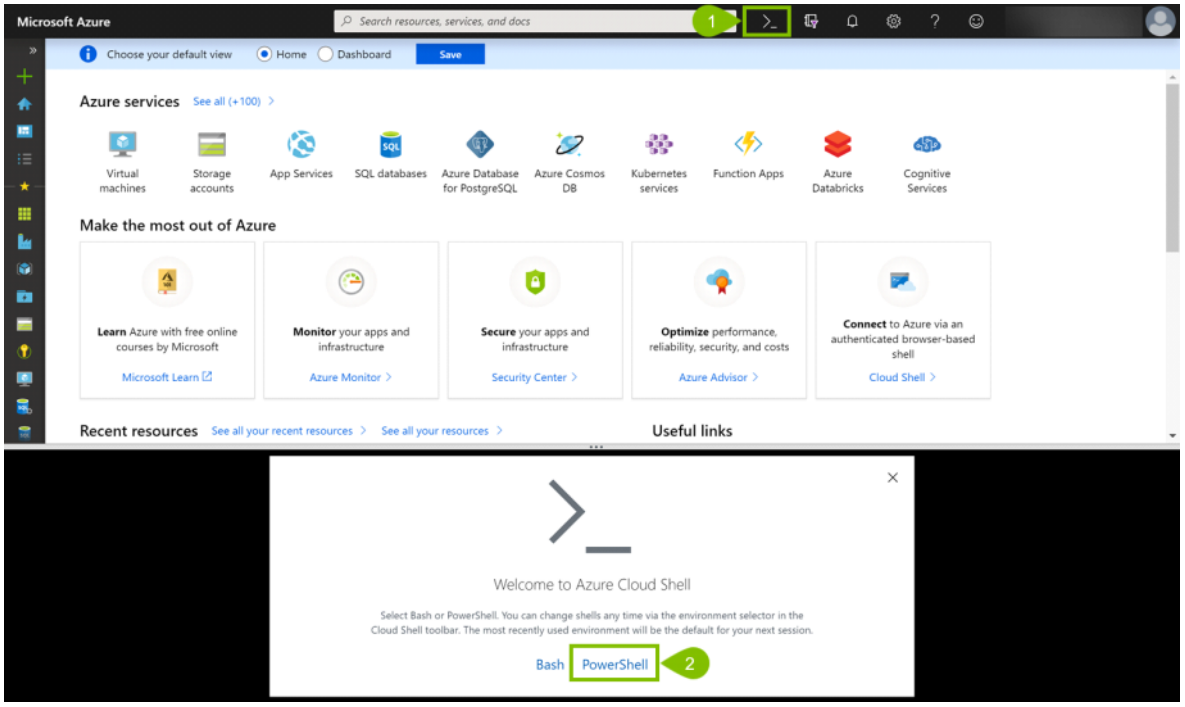
You will now see the **Let's get started** page:



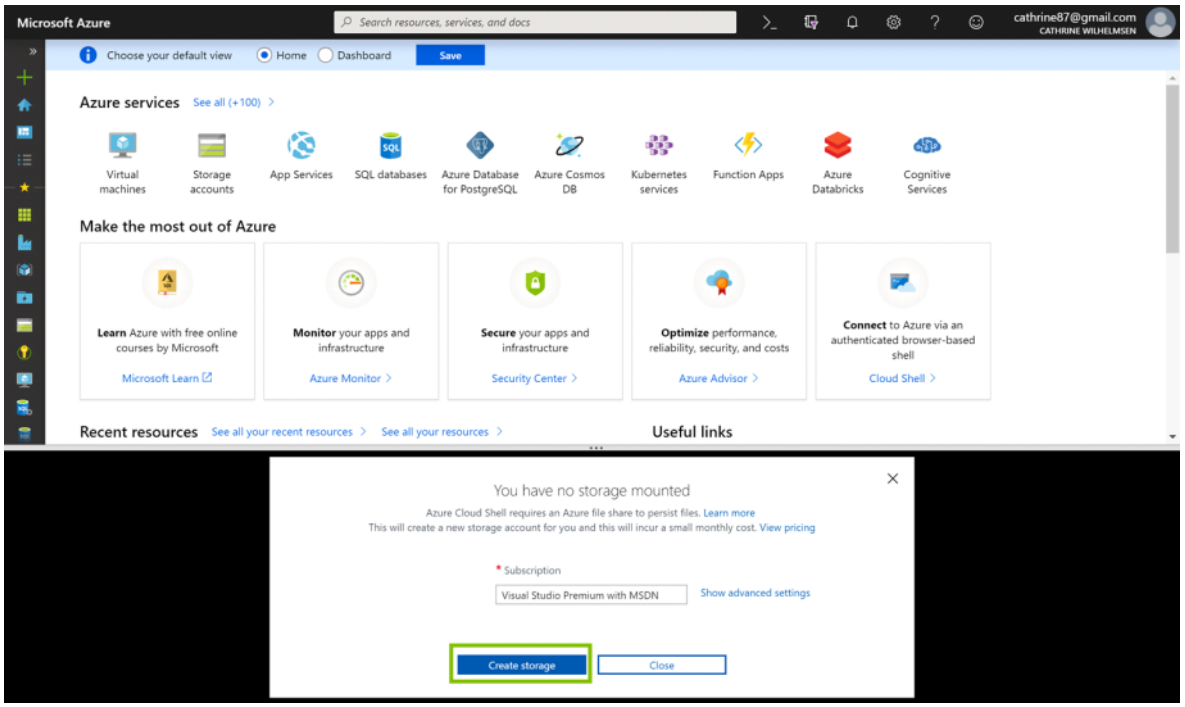
Run PowerShell Script to Create Azure Active Directory Group

To access your resources from Azure Data Factory, you need to create an Azure Active Directory Group.

Open a **Cloud Shell session** from the Azure Portal and choose **PowerShell**.

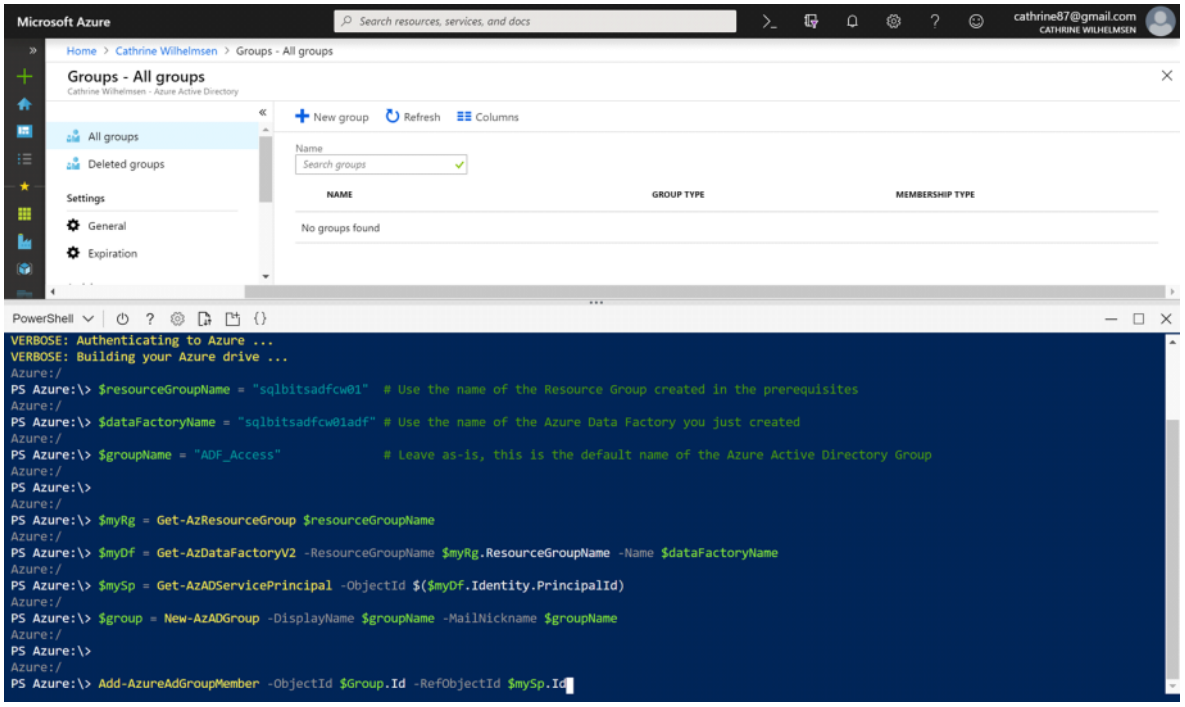


If this is the first time you open a Cloud Shell session, you need to **Create Storage**.



Once the shell is ready, paste the following script and hit enter.

```
$resourceGroupName = "sqlbitsadf<999>"  # Use the name of the Resource Group created in the prerequisites
$dataFactoryName = "sqlbitsadf<999>adf" # Use the name of the Azure Data Factory you just created
$groupName = "ADF_Access"               # Leave as-is, this is the default name of the Azure Active Directory Group

$myRg = Get-AzResourceGroup $resourceGroupName
$myDf = Get-AzDataFactoryV2 -ResourceGroupName $myRg.ResourceGroupName -Name $dataFactoryName
$mySp = Get-AzADServicePrincipal -ObjectId $($myDf.Identity.PrincipalId)
$group = New-AzADGroup -DisplayName $groupName -MailNickname $groupName

Add-AzureAdGroupMember -ObjectId $Group.Id -RefObjectId $mySp.Id
```



This creates an Azure Active Directory group with one member called ADF_Access.

Activity Summary

You have now created your Azure Data Factory! Next, you will setup an Integration Runtime.

Activity 02: Setup Integration Runtime

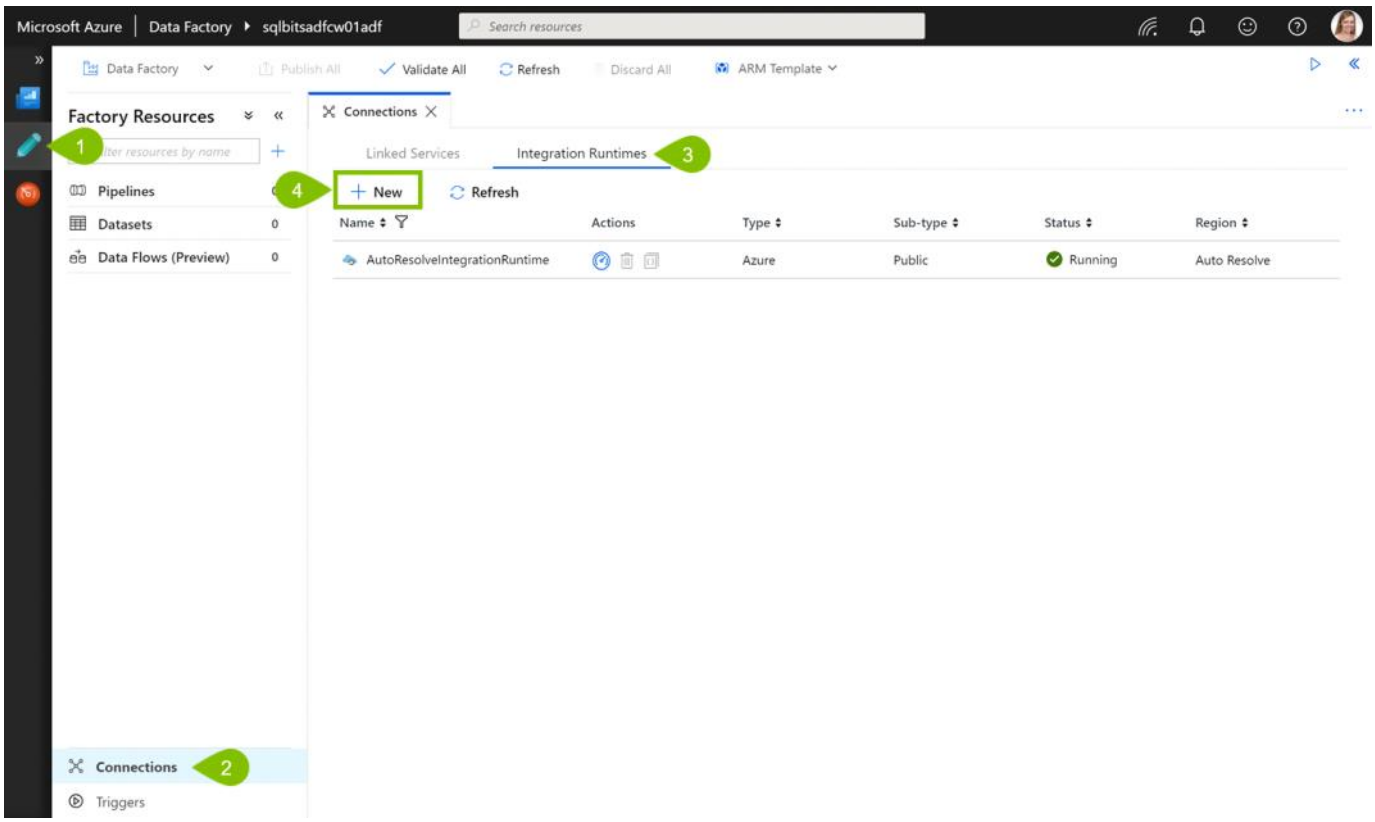
Activity Overview

Estimated time to complete activity: 5-**10 minutes**.

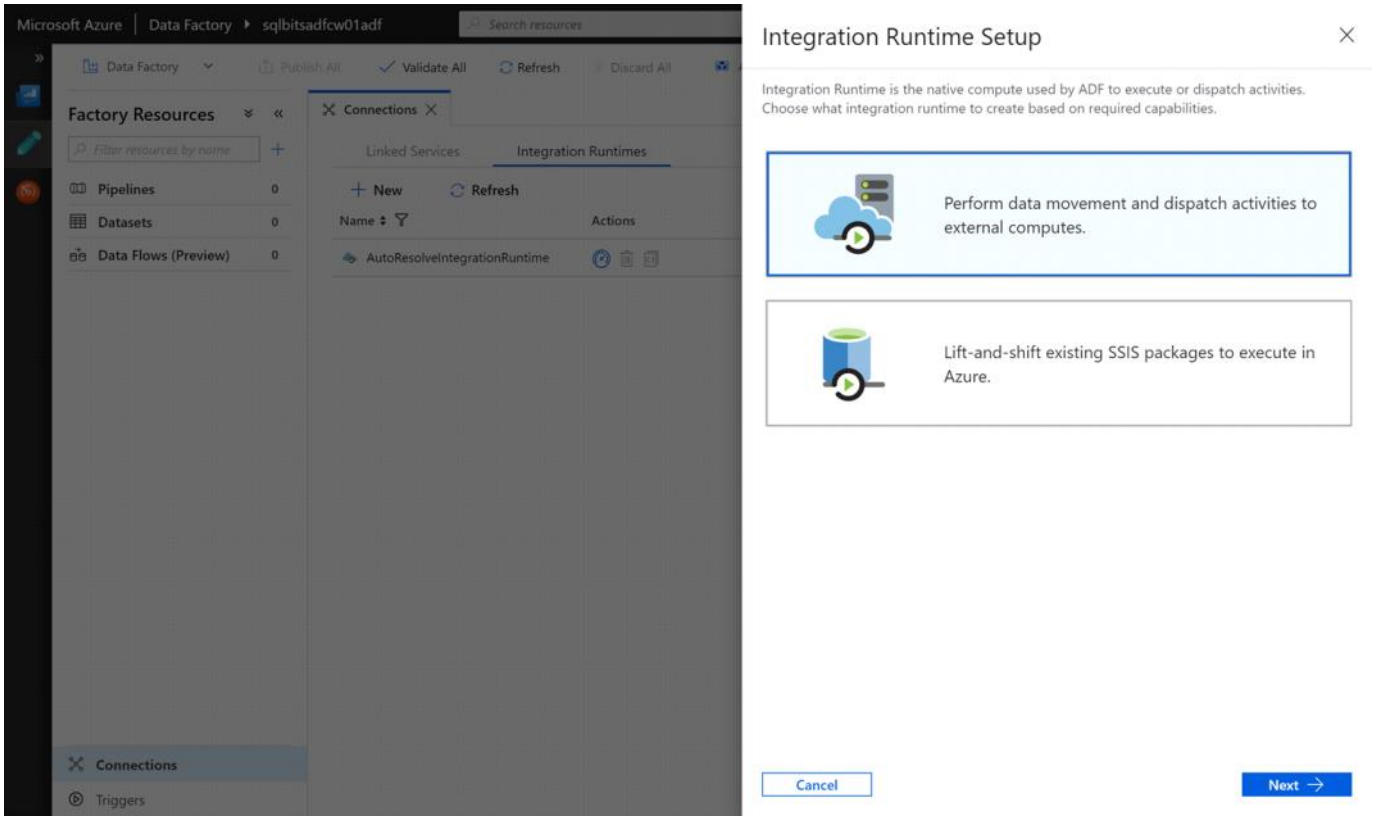
In this activity, you will create an Integration Runtime that connects to the Virtual Machine you created in the prerequisites.

Create the Self-Hosted Integration Runtime

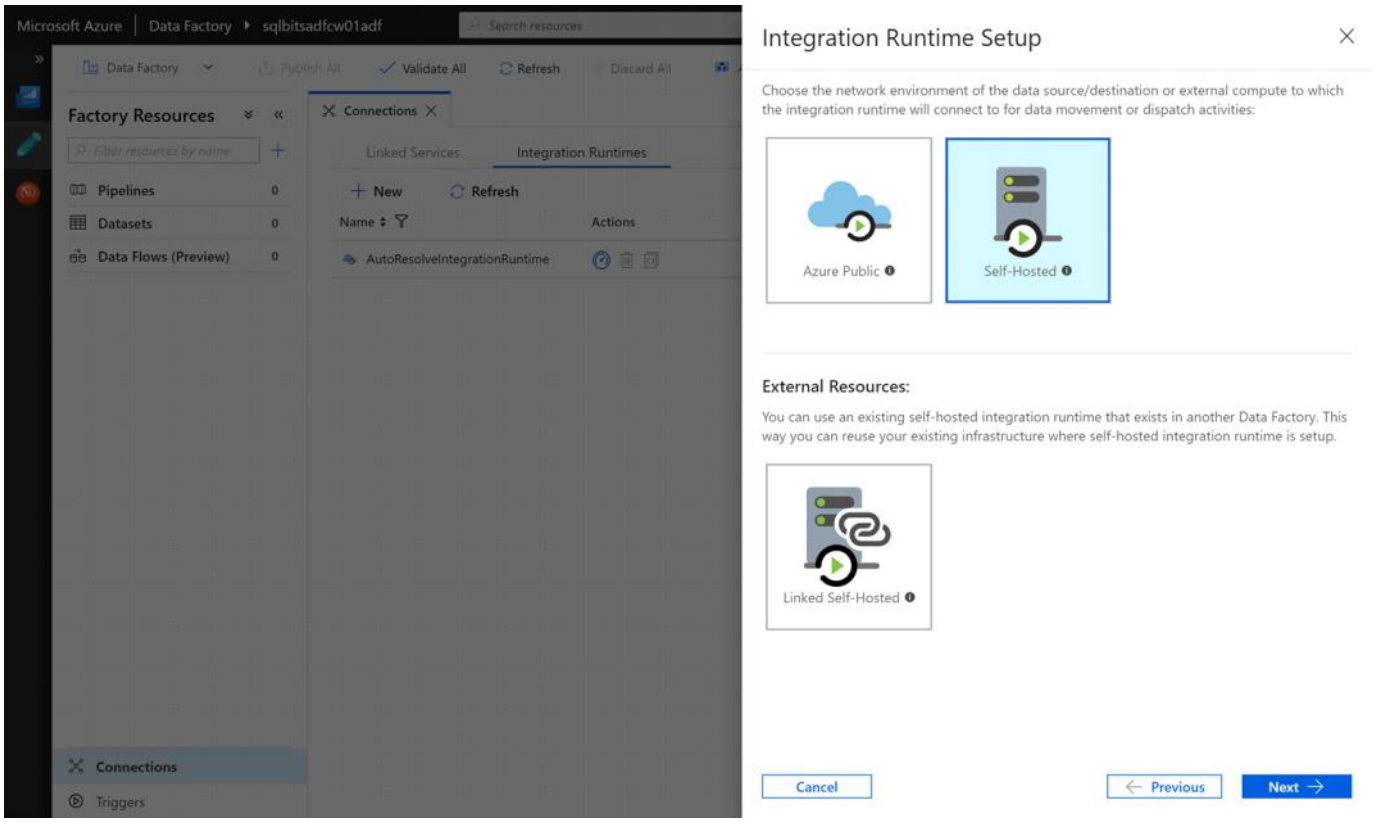
1. Click the **Author** (*pencil)* icon
2. Click on **Connections**
3. Click on **Integration Runtimes**
4. Click **New**



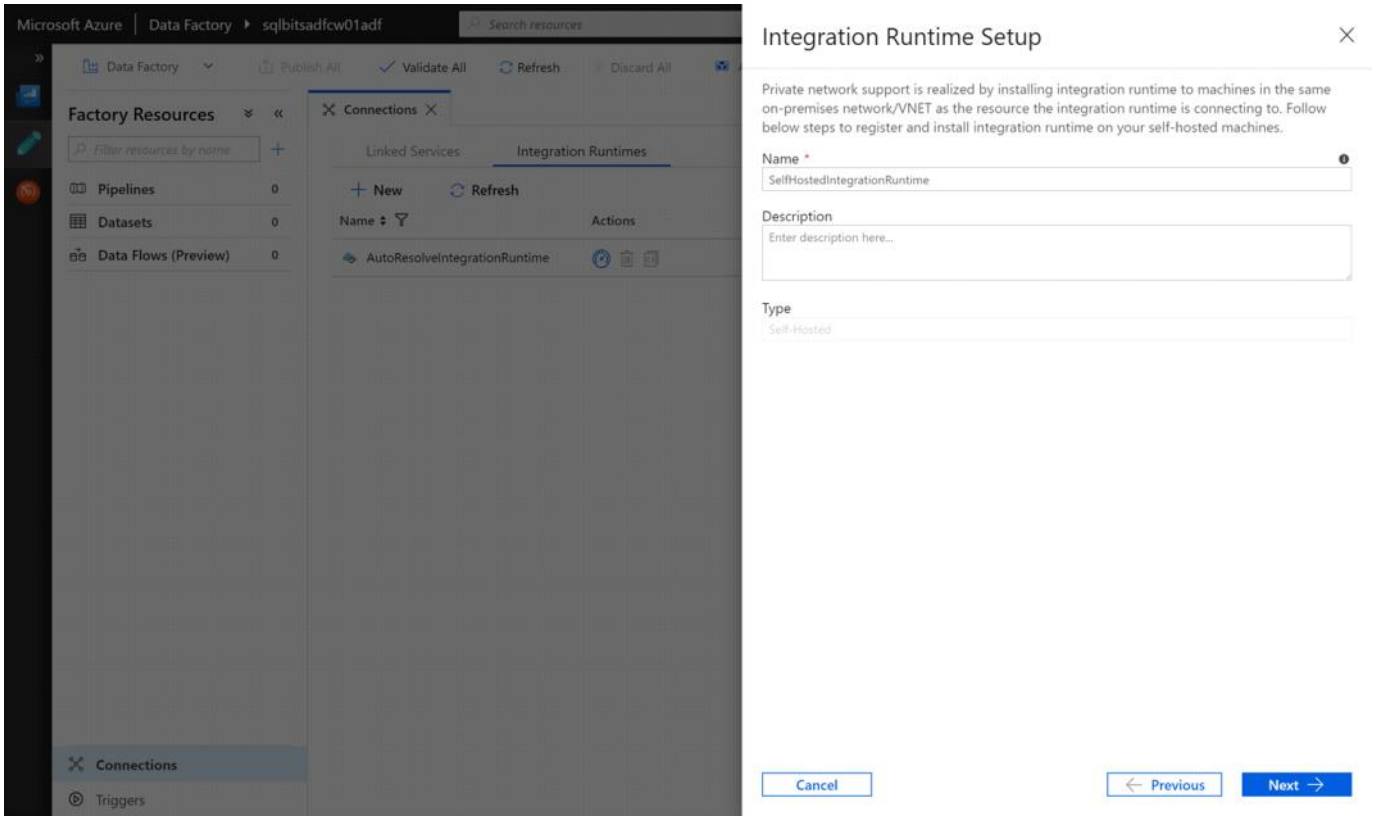
5. Select **Perform data movement and dispatch activities to external computes** and click **Next**



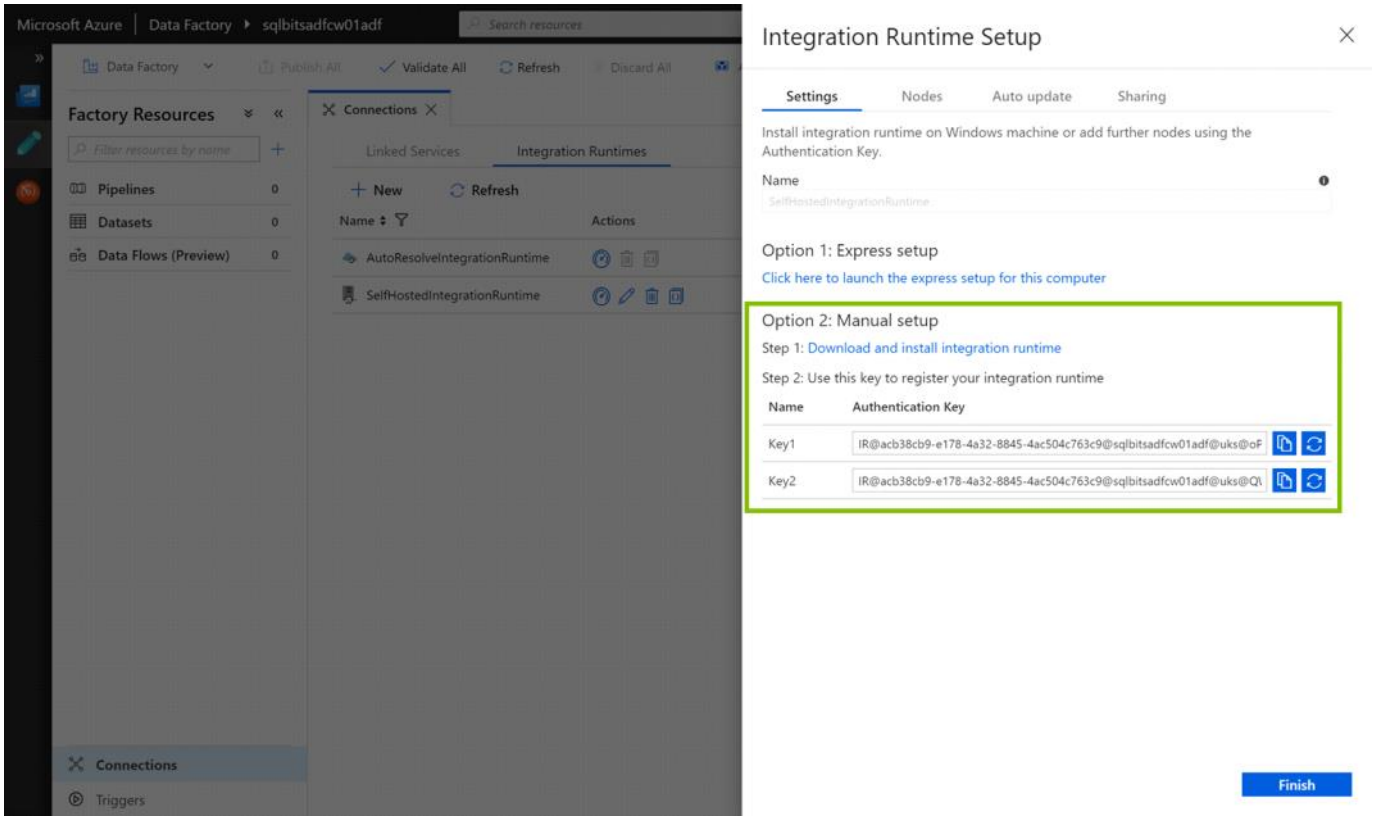
6. Select **Self-Hosted** and click **Next**



7. Enter the name **SelfHostedIntegrationRuntime** and click **Next**



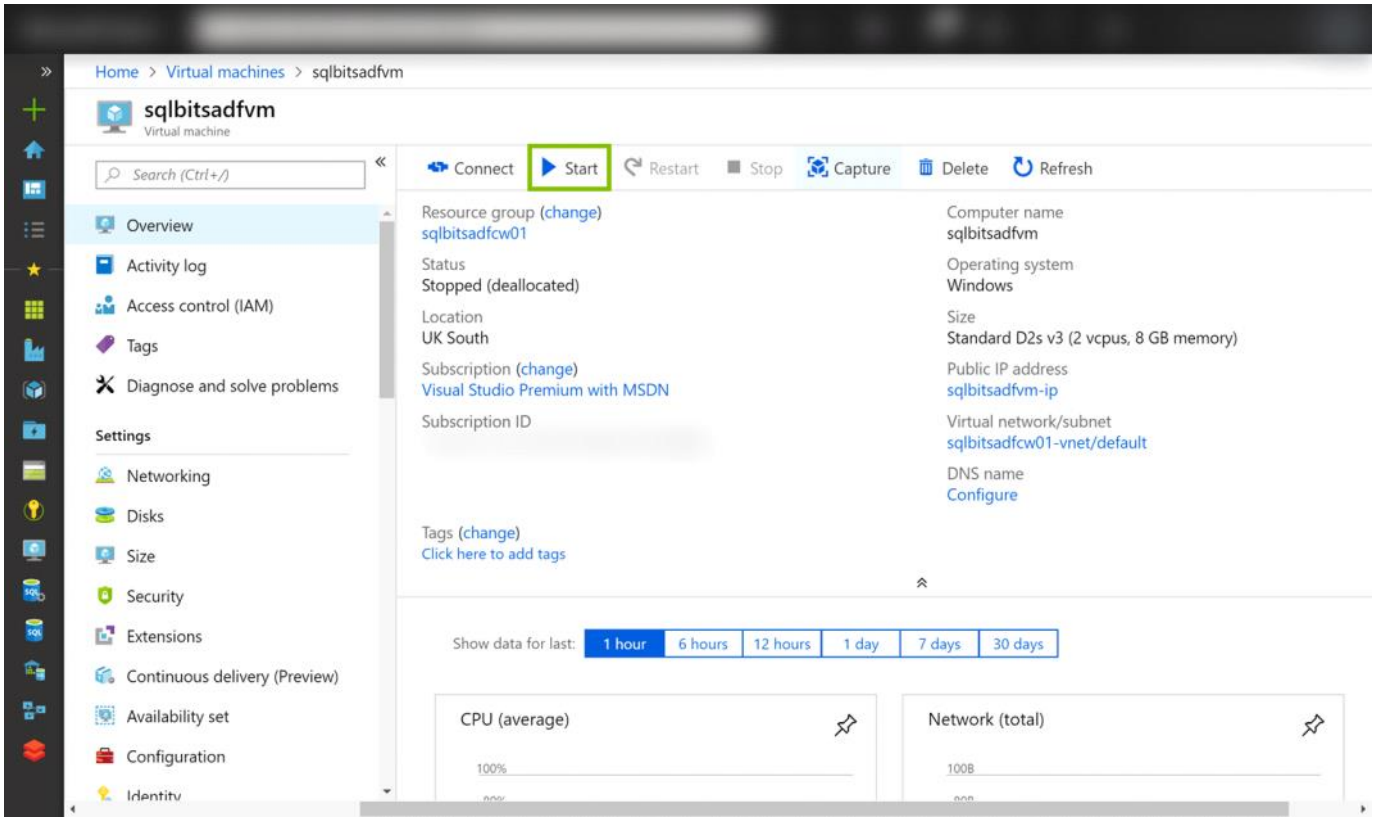
8. Once the Integration Runtime has been created in the Azure Data Factory, you need to manually download and install the integration runtime in your Virtual Machine. Make note that you will find your **Authentication Keys** here, and **leave this window/tab open**.



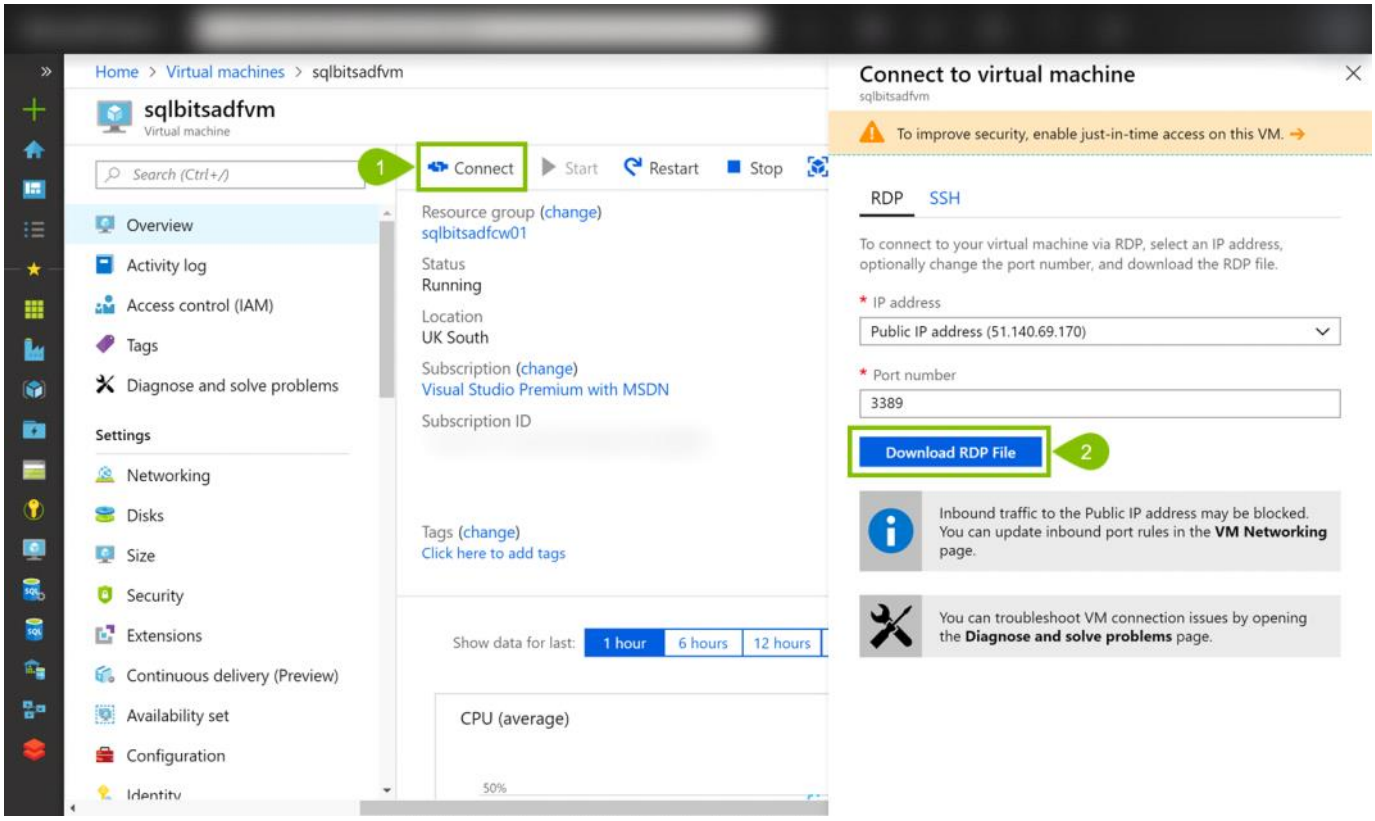
Start the Virtual Machine

In a different window/tab, go to http://portal.azure.com and navigate to the Virtual Machine you created in the prerequisites.

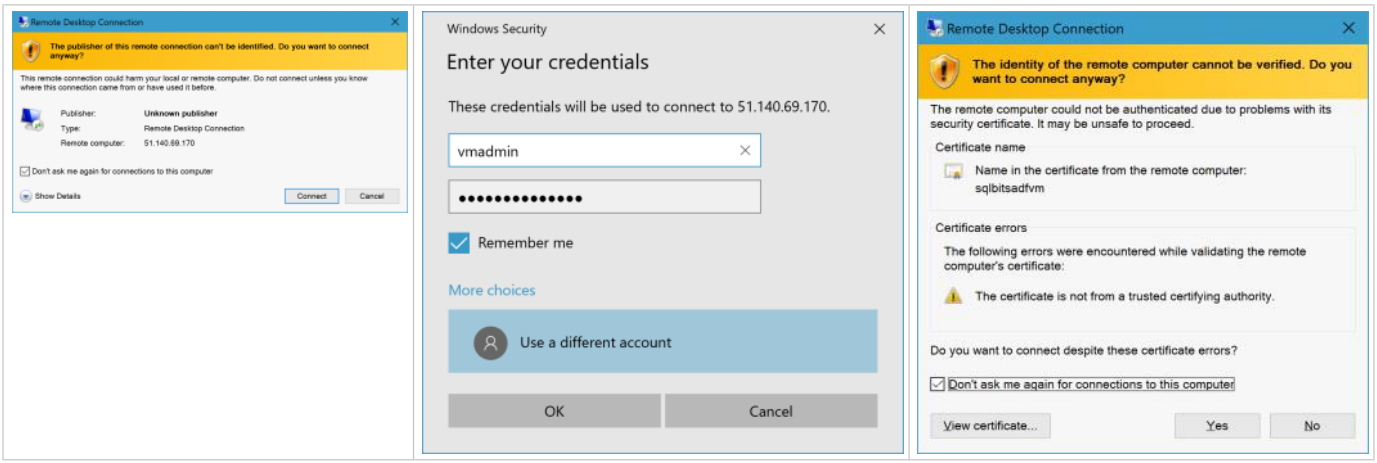
Start the Virtual Machine.



Click **Connect** and download the **RDP** file.

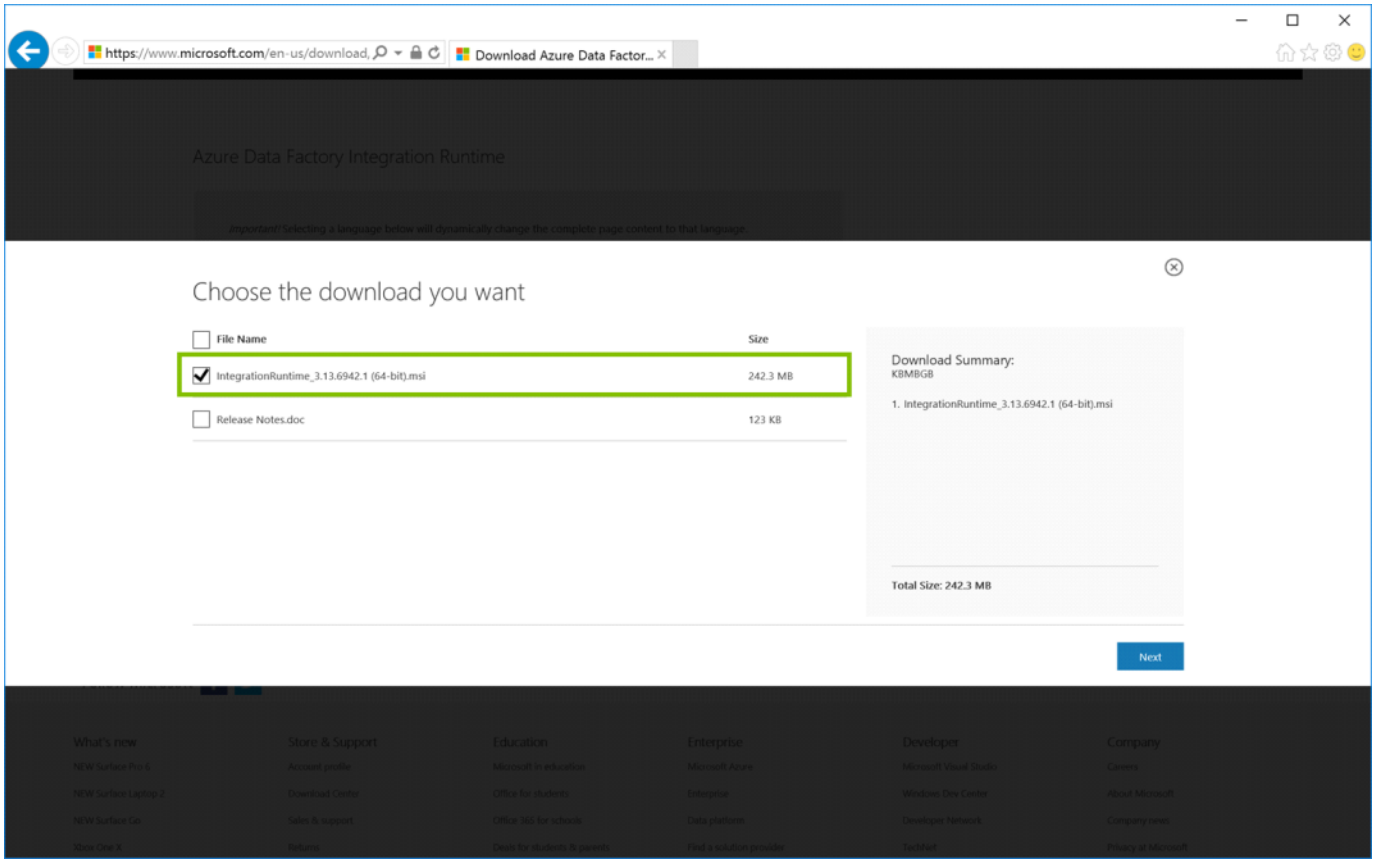


Open the RDP file, click Connect, then choose **Use a different account** under More choices, enter your username and password (for example **vmadmin** / **VeryStr0ngPassw0rd!**), and click Yes.



Download the Azure Data Factory Integration Runtime

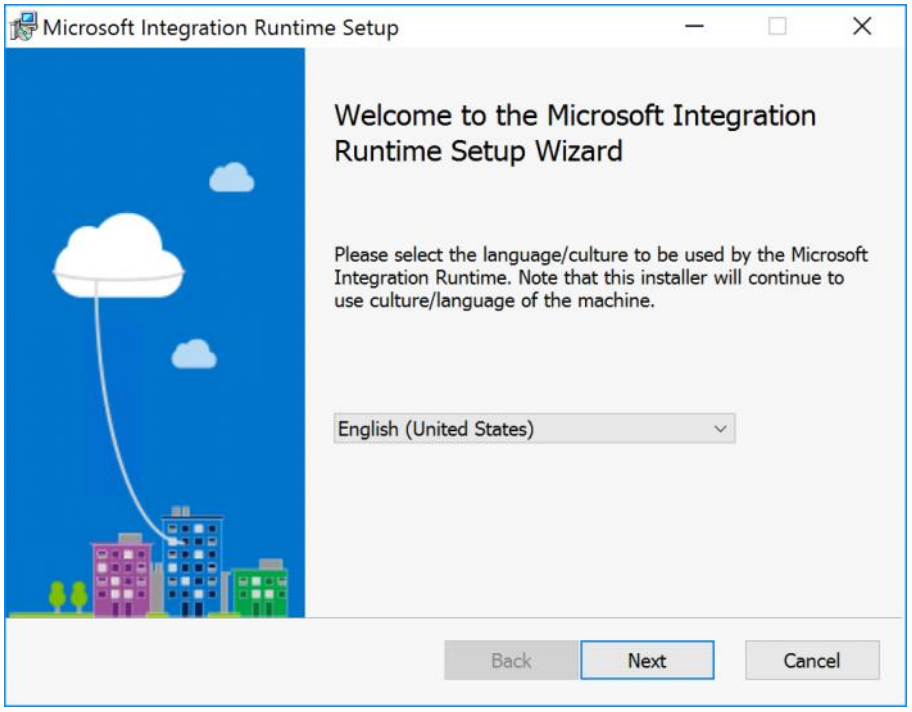
Once inside the Virtual Machine, open Internet Explorer. Navigate to https://www.microsoft.com/en-us/download/details.aspx?id=39717 and download the Azure Data Factory Integration Runtime.

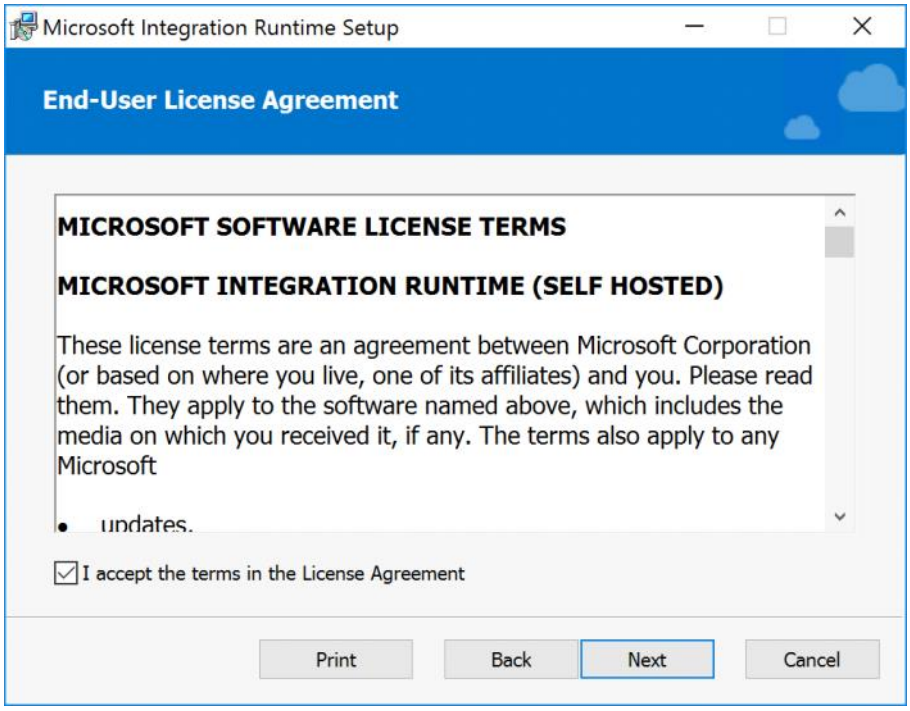


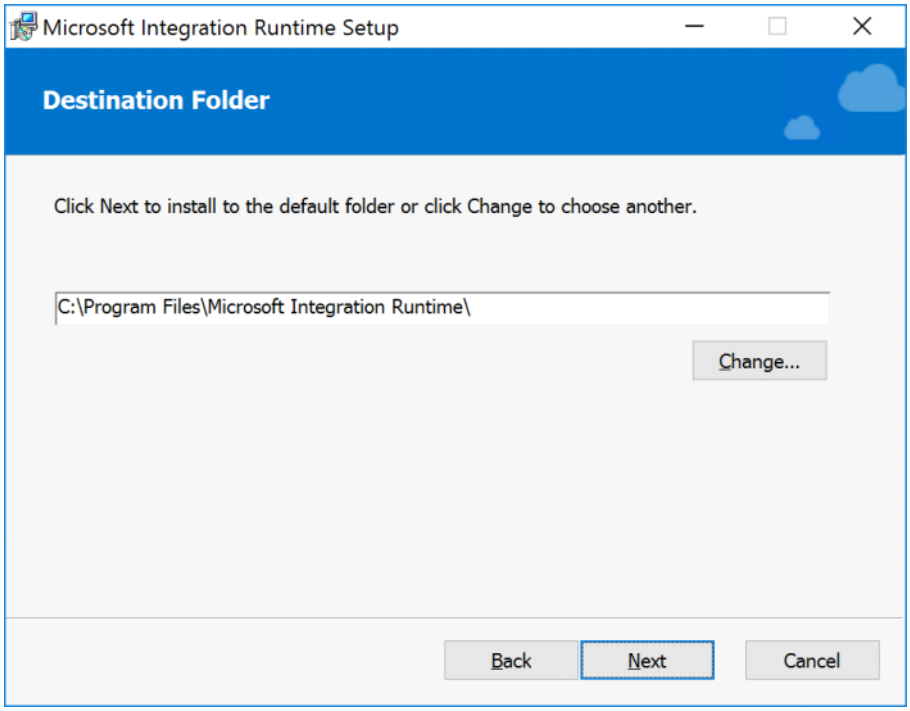
(*If you are having problems with the security settings, please refer to the instructions in the prerequisites.*)

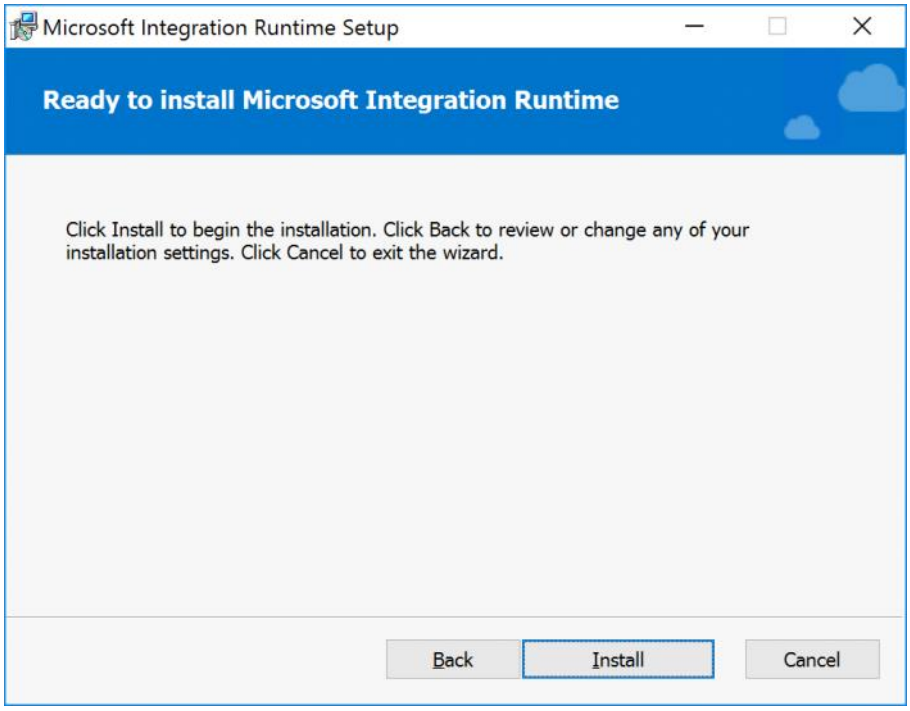
Install the Azure Data Factory Integration Runtime

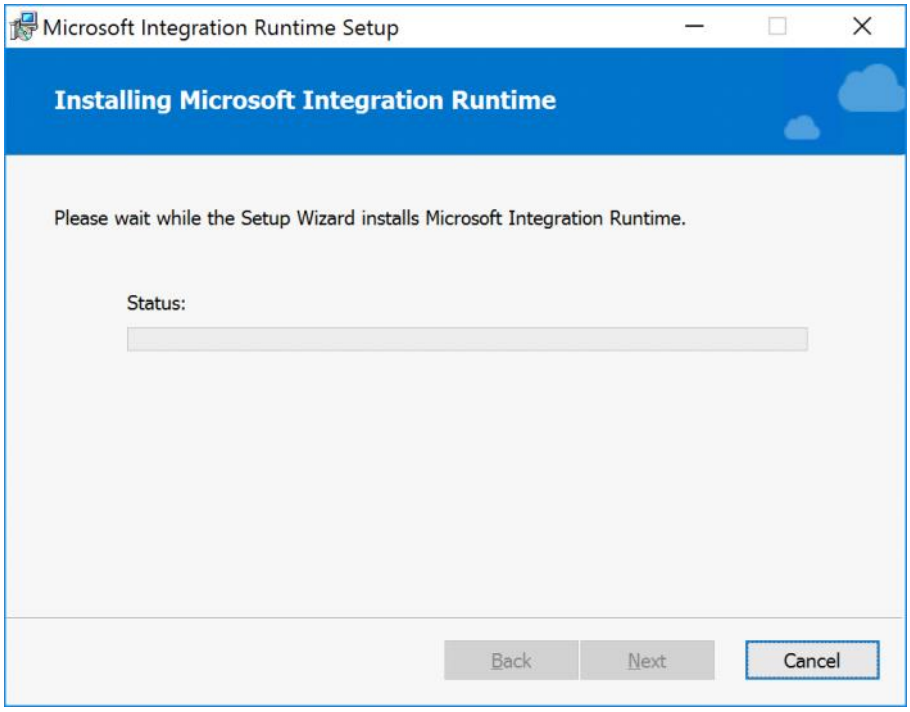
Run the downloaded Azure Data Factory Integration Runtime Installer.

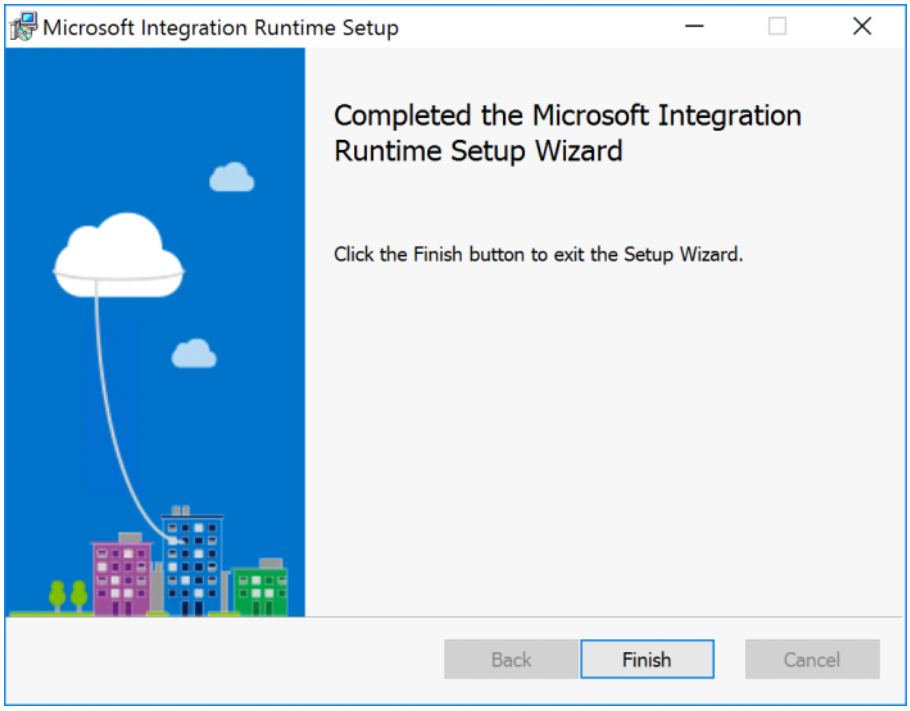



Microsoft Integration Runtime Setup
End-User License Agreement
MICROSOFT SOFTWARE LICENSE TERMS
MICROSOFT INTEGRATION RUNTIME (SELF HOSTED)
These license terms are an agreement between Microsoft Corporation (or based on where you live, one of its affiliates) and you. Please read them. They apply to the software named above, which includes the media on which you received it, if any. The terms also apply to any Microsoft
updates.
I accept the terms in the License Agreement
Print
Back
Next
Cancel

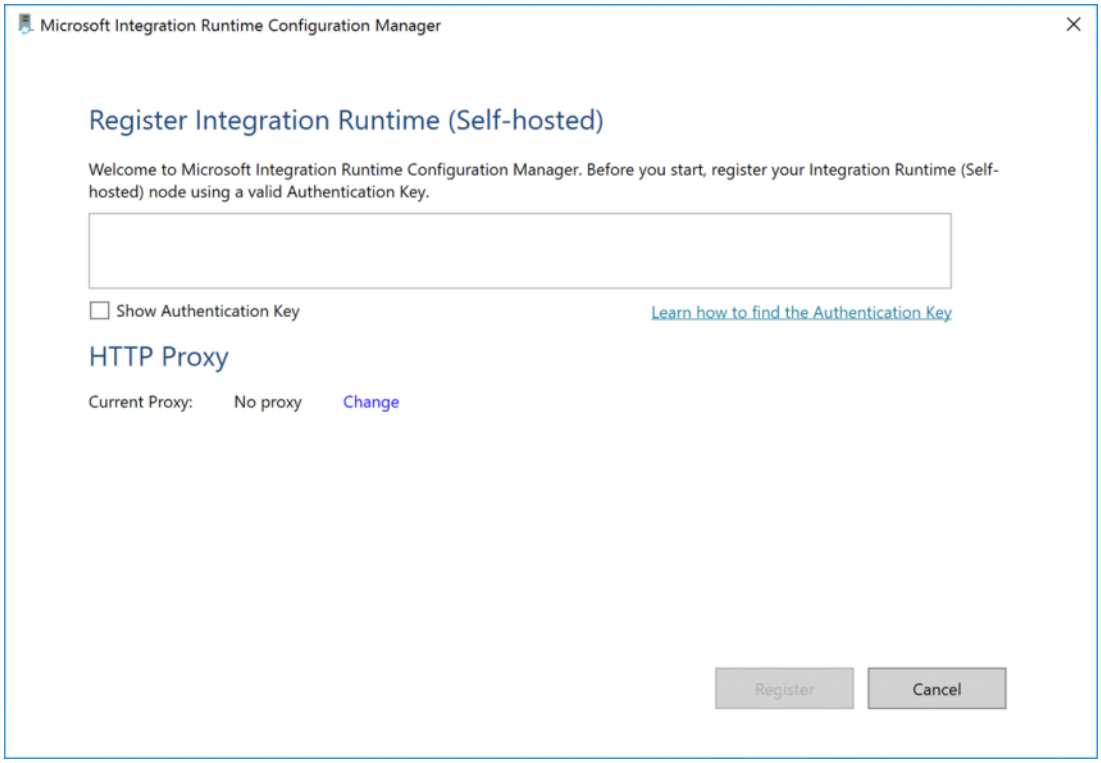

Microsoft Integration Runtime Setup
Destination Folder
Click Next to install to the default folder or click Change to choose another.
C:\Program Files\Microsoft Integration Runtime\
Change...
Back
Next
Cancel


Microsoft Integration Runtime Setup
Ready to install Microsoft Integration Runtime
Click Install to begin the installation. Click Back to review or change any of your installation settings. Click Cancel to exit the wizard.
Back
Install
Cancel

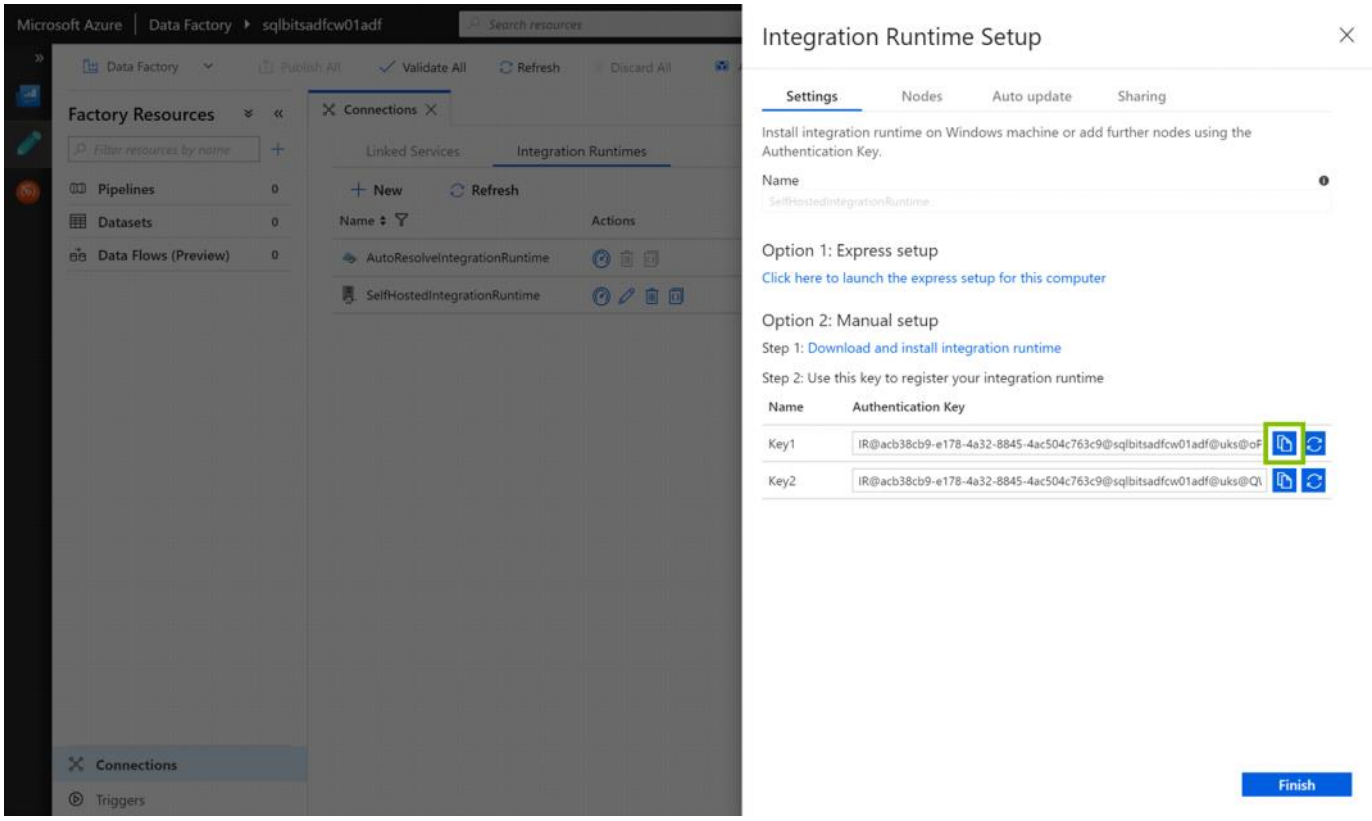

Microsoft Integration Runtime Setup
Installing Microsoft Integration Runtime
Please wait while the Setup Wizard installs Microsoft Integration Runtime.
Status:
Back
Next
Cancel



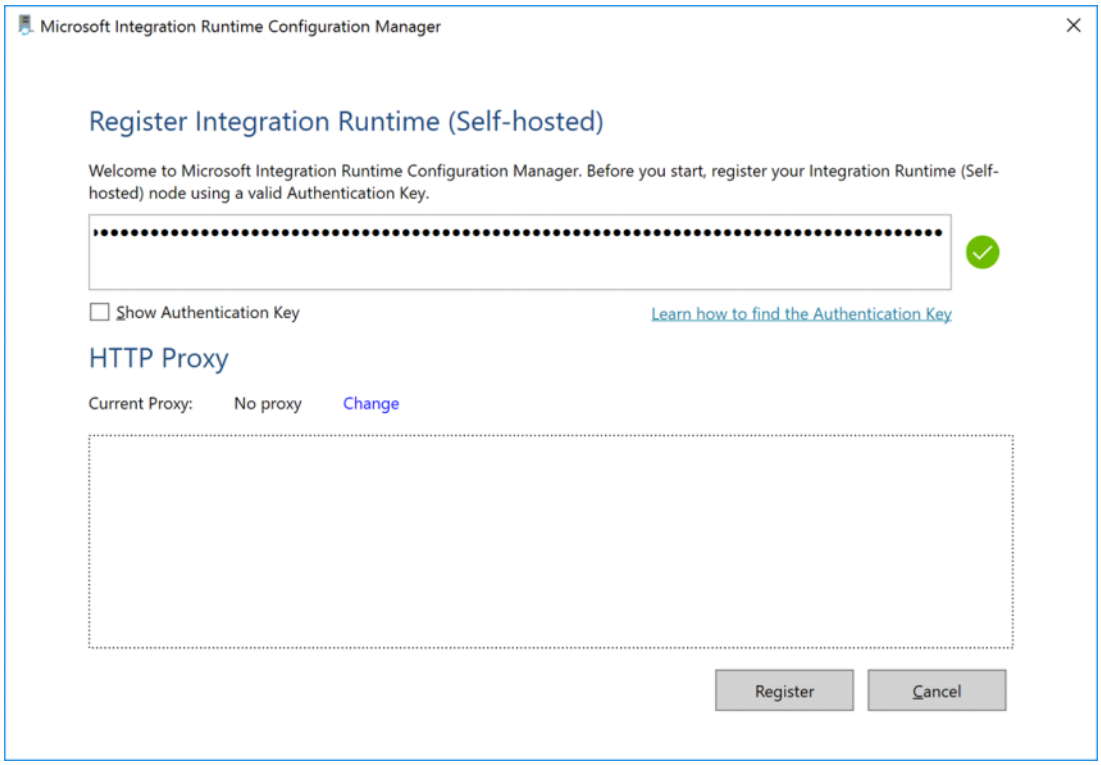
Once the **Microsoft Integration Runtime Configuration Manager** opens, you will need to enter one of the **Authentication Keys** from the Azure Data Factory.



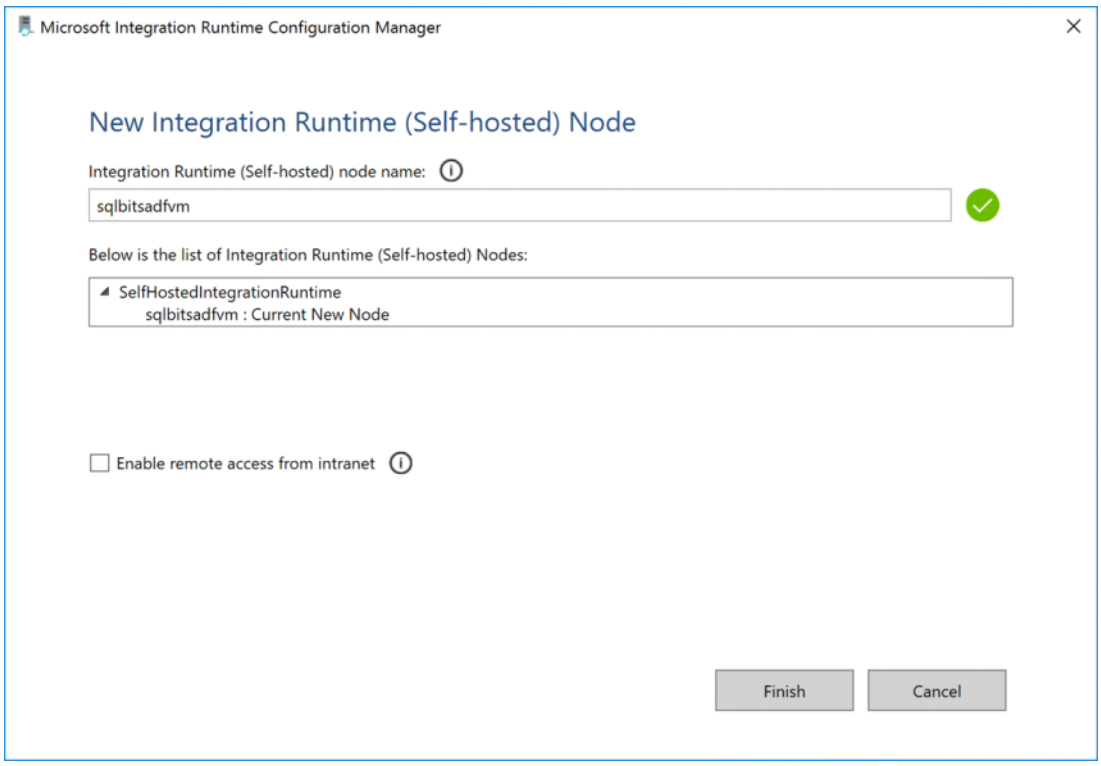
Minimize the Virtual Machine, and go back to the Azure Data Factory window/tab you left open. Copy one of the **Authentication Keys**.



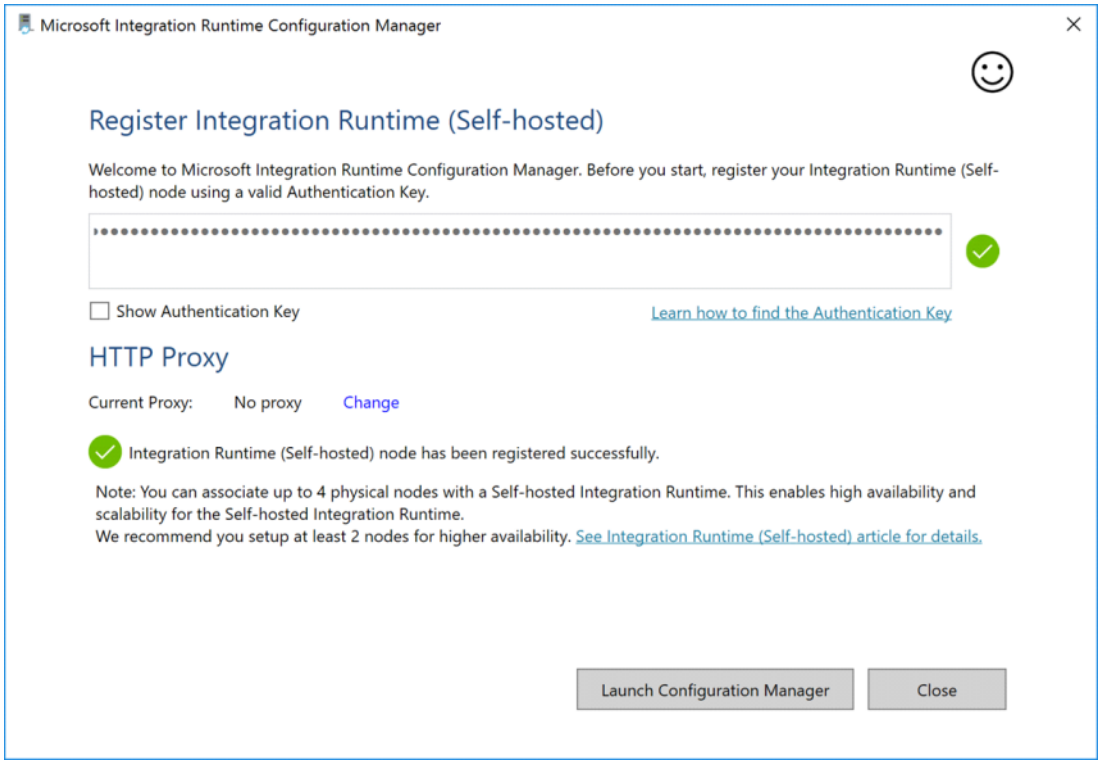
Return to your Virtual Machine and paste the **Authentication Key**. You should see a green checkmark. Click **Register**.



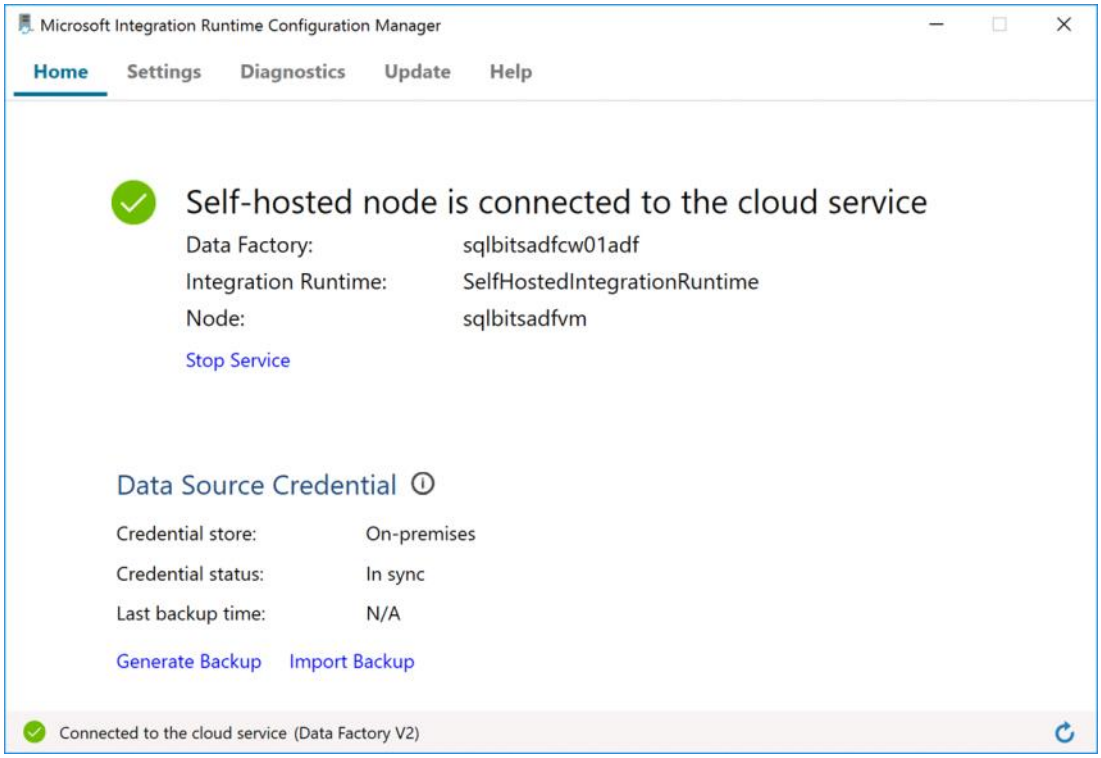
Next, you will set up a Self-Hosted Node. Click **Finish**.



Once the Integration Runtime has been registered successfully, you can click **Close**.

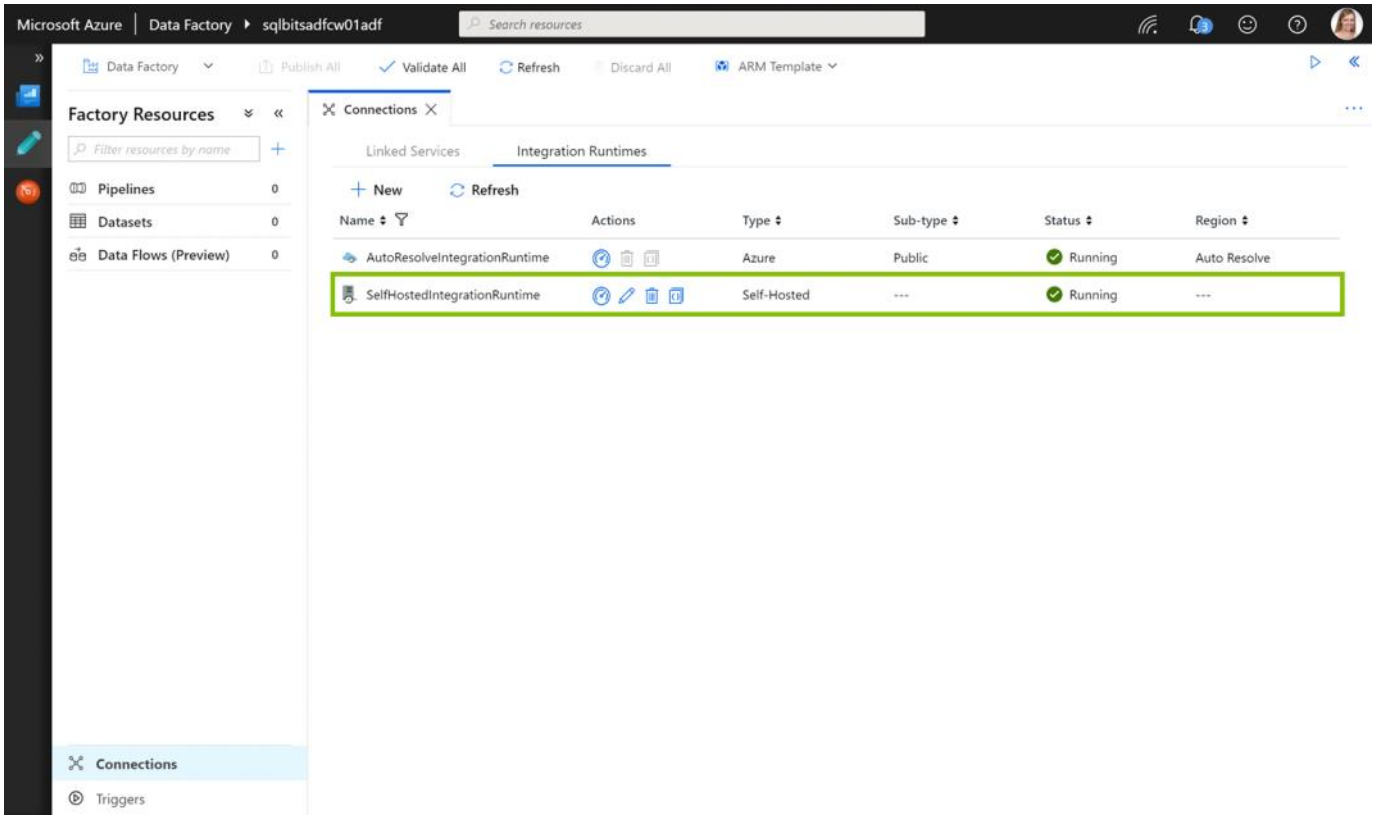


If you click **Launch Configuration Manager** instead, you will see the status of the Self-Hosted Node. It should be connected to the Data Factory V2 cloud service.



(*You can always return to this Configuration Manager from the start menu in your Virtual Machine.*)

Minimize the Virtual Machine, and go back to the Azure Data Factory window/tab you left open. If the Integration Runtime Menu is still open, click Finish. You will now see that your new **SelfHostedIntegrationRuntime** is **Running**.



Activity Summary

In this activity, you have created your Self-Hosted Integration Runtime connected to your Virtual Machine, which will be your source in the rest of the lab. Next, you will create the sink (destination) database.

Activity 03: Setup Staging Database

Activity Overview

Estimated time to complete activity: 5-**10 minutes**.

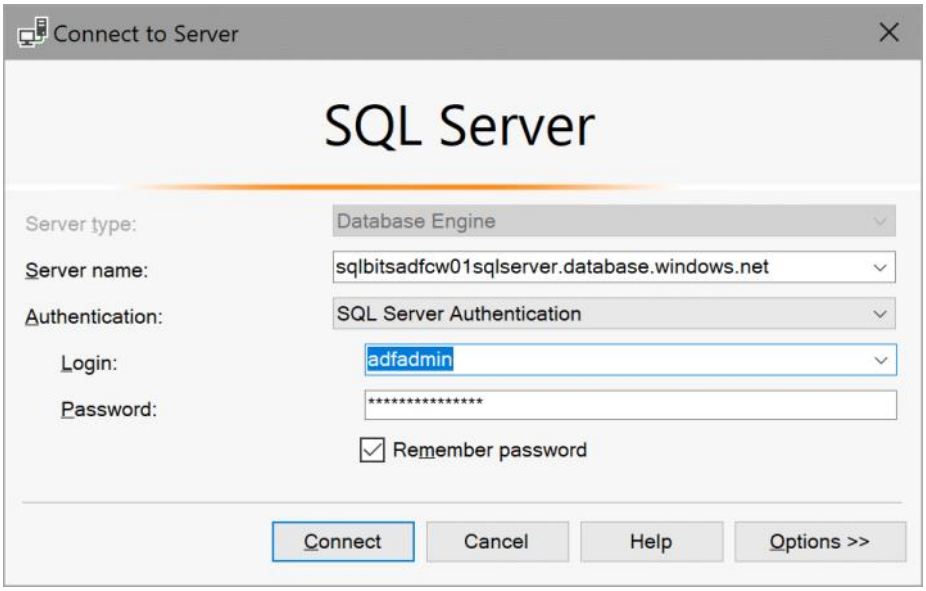
In order to save time during these labs, we have created a DACPAC of the Staging database that includes necessary tables, stored procedures, table types, and more.

If you have already created a blank Staging database - *as instructed in an earlier version of the prerequisites* - we do apologize for this extra step. It will save some time in the end :)

Delete Empty Staging Database

Note: If you do not already have an empty Staging database, skip this step.

Open SQL Server Management Studio (SSMS) and connect to your SQL Server as the **adfadmin** user.



Right-click on the Staging database and choose **Delete**. Wait for the operation to complete, then **shut down SQL Server Management Studio**.

(**Note:** We have sometimes experienced a bug where you are unable to deploy a new database with the same name as a database that was just deleted. To avoid running into this issue, make sure you completely close SSMS once the database has been deleted.)

Download Staging.dacpac and StagingSecurity.sql script

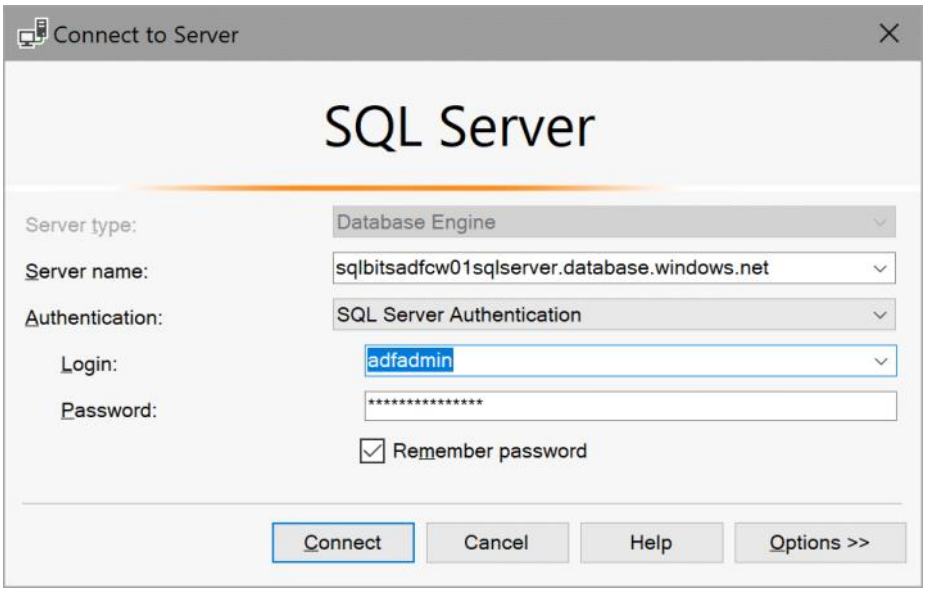
Download the latest versions of the following files from:
https://github.com/jasonhorner/adfdeepdive/tree/master/Labs/01%20-%20ADF%20Overview.

- **Staging.dacpac**
- **Azure SQL Server - Master DB Security.sql**

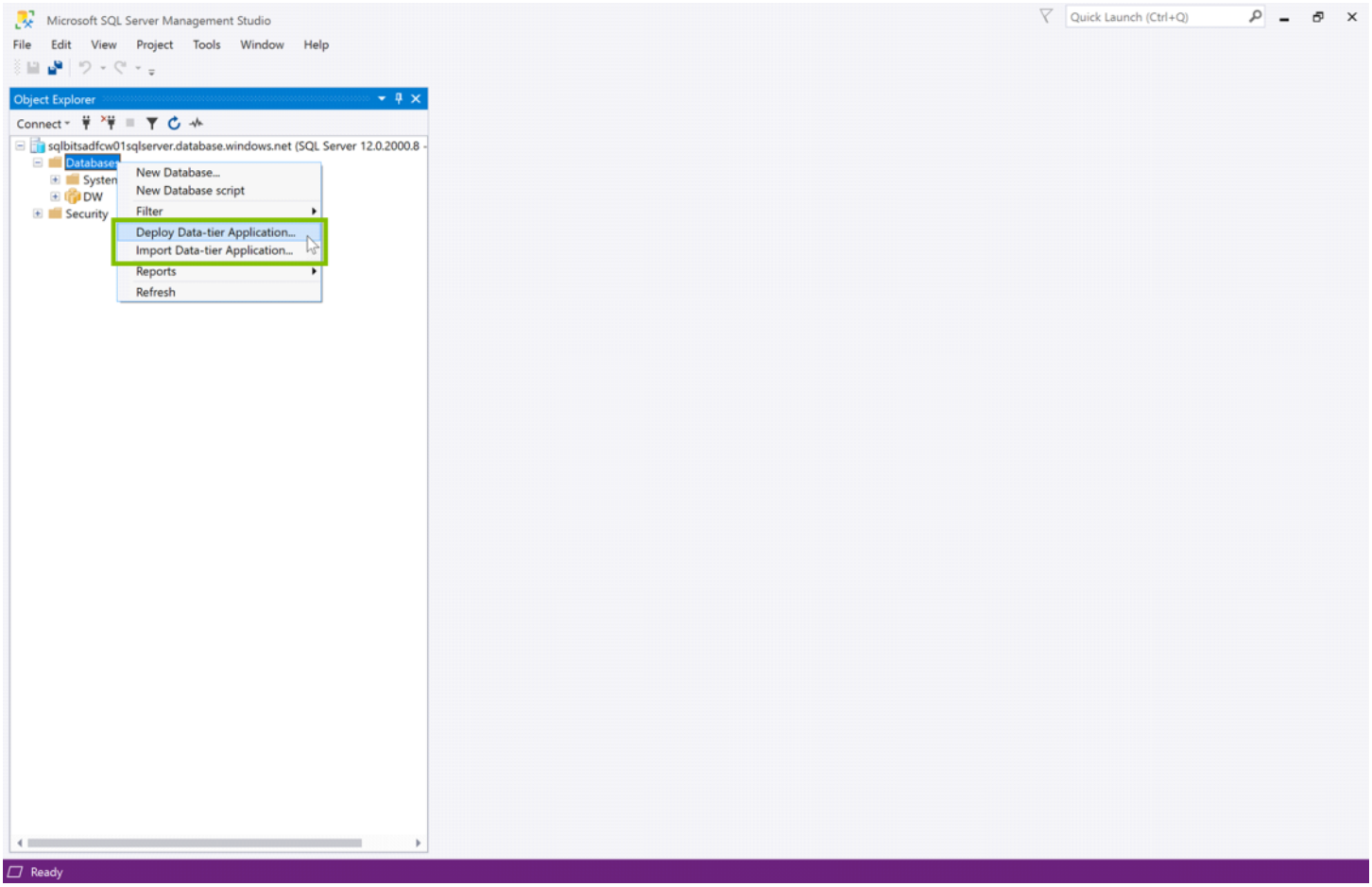
- **Azure SQL Server - Staging DB Security.sql**

Deploy DACPAC as adfadmin

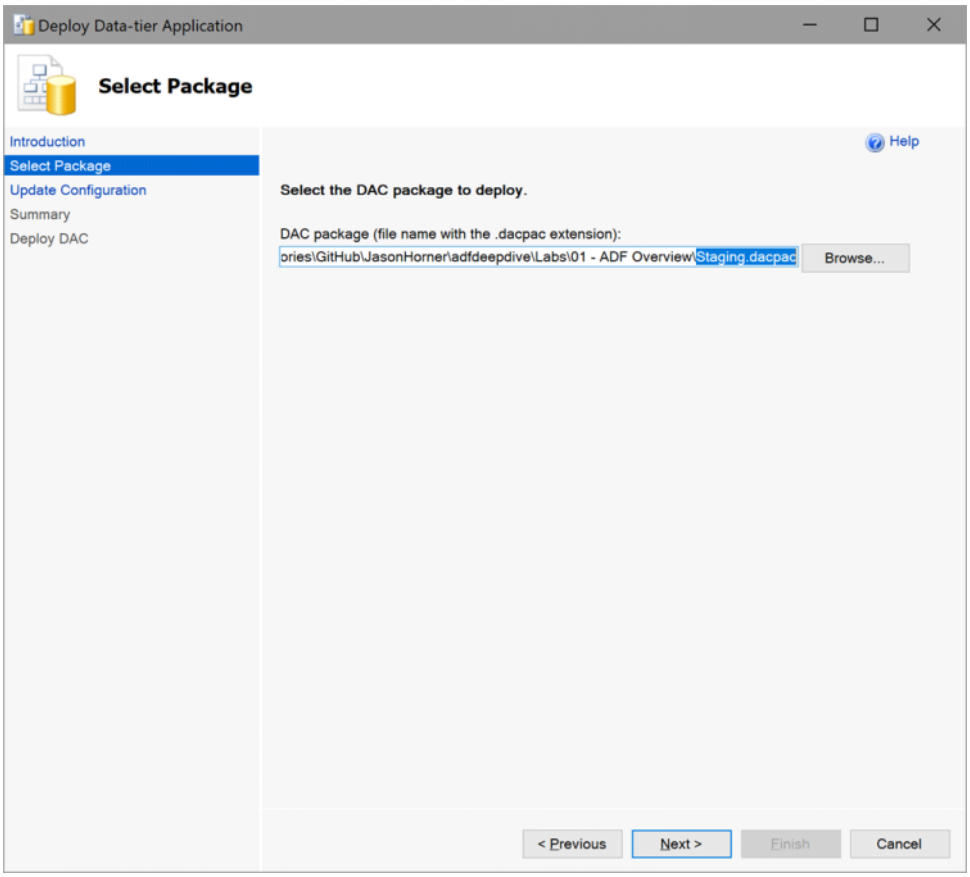
(Re-)Open SQL Server Management Studio (SSMS) and connect to your SQL Server as the **adfadmin** user.
(*This is the SQL Server admin user created in Prerequisites Step 5.*)



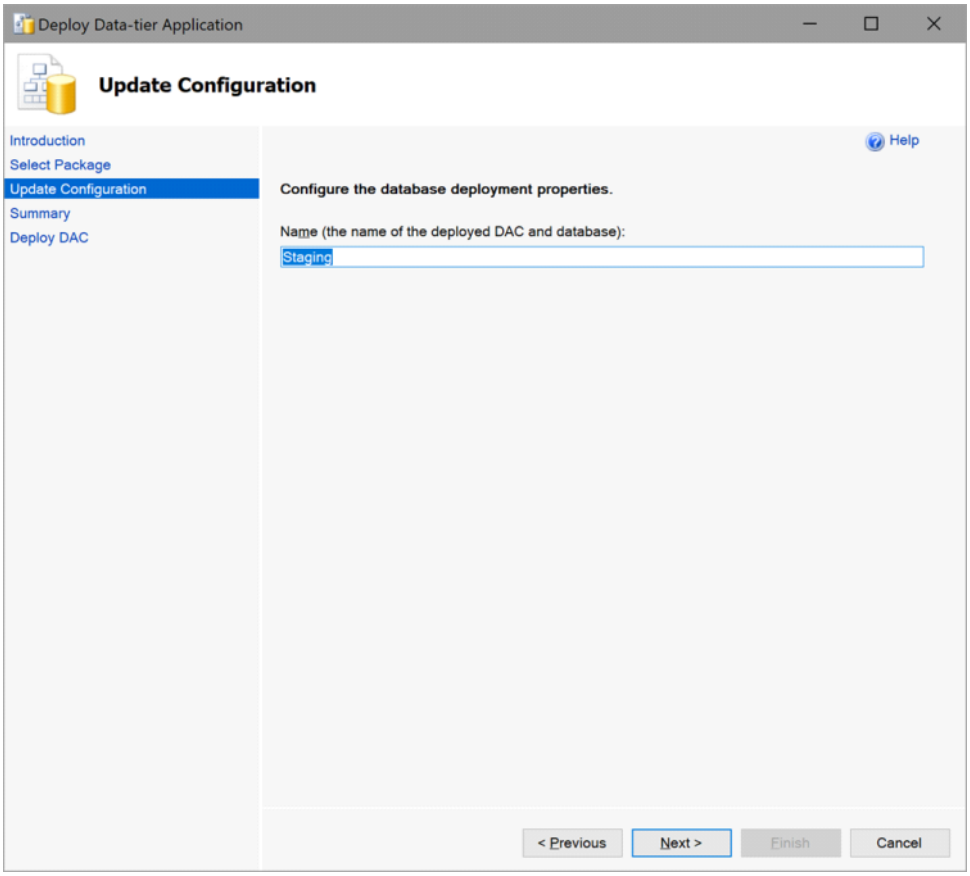
Right-click on **Databases** and select **Deploy Data-tier Application**.



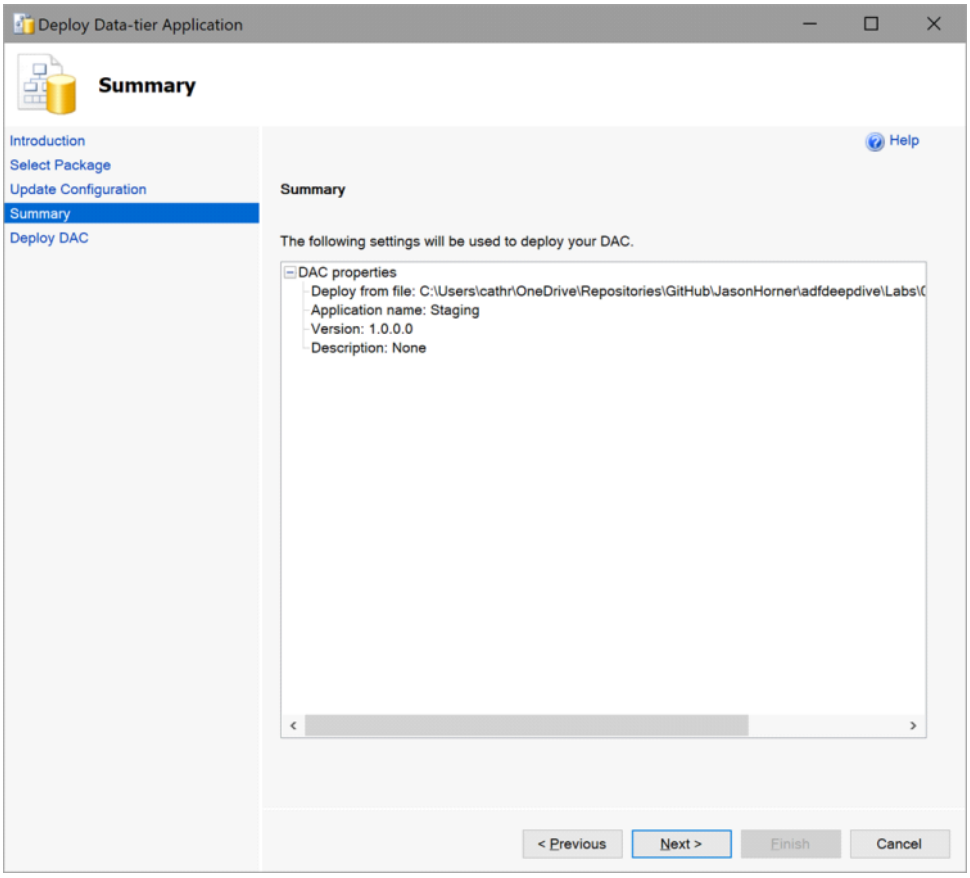
Select the downloaded **Staging.dacpac** file.



Keep the **Staging** name.

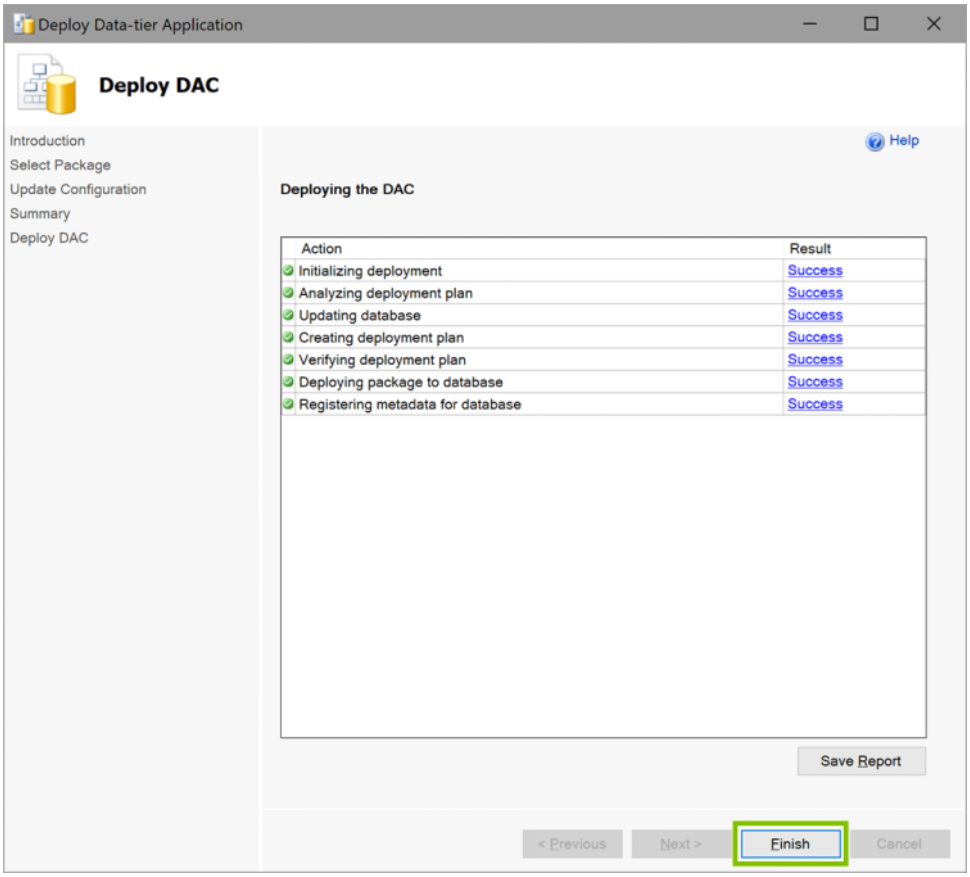


Verify the settings.



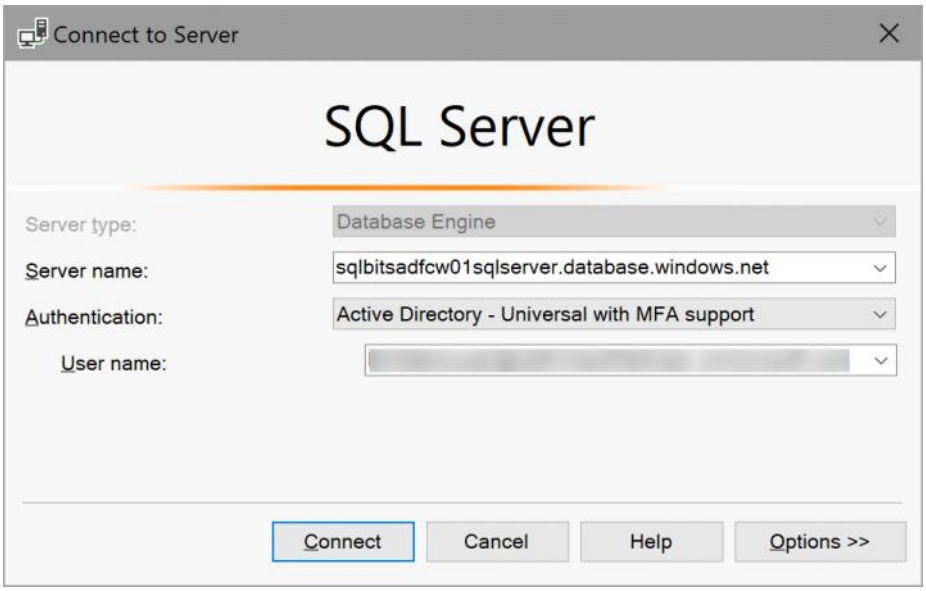
The deployment will usually take 3-5 minutes. Once the database has been deployed successfully, click

Finish.



Setup Master and Staging Security

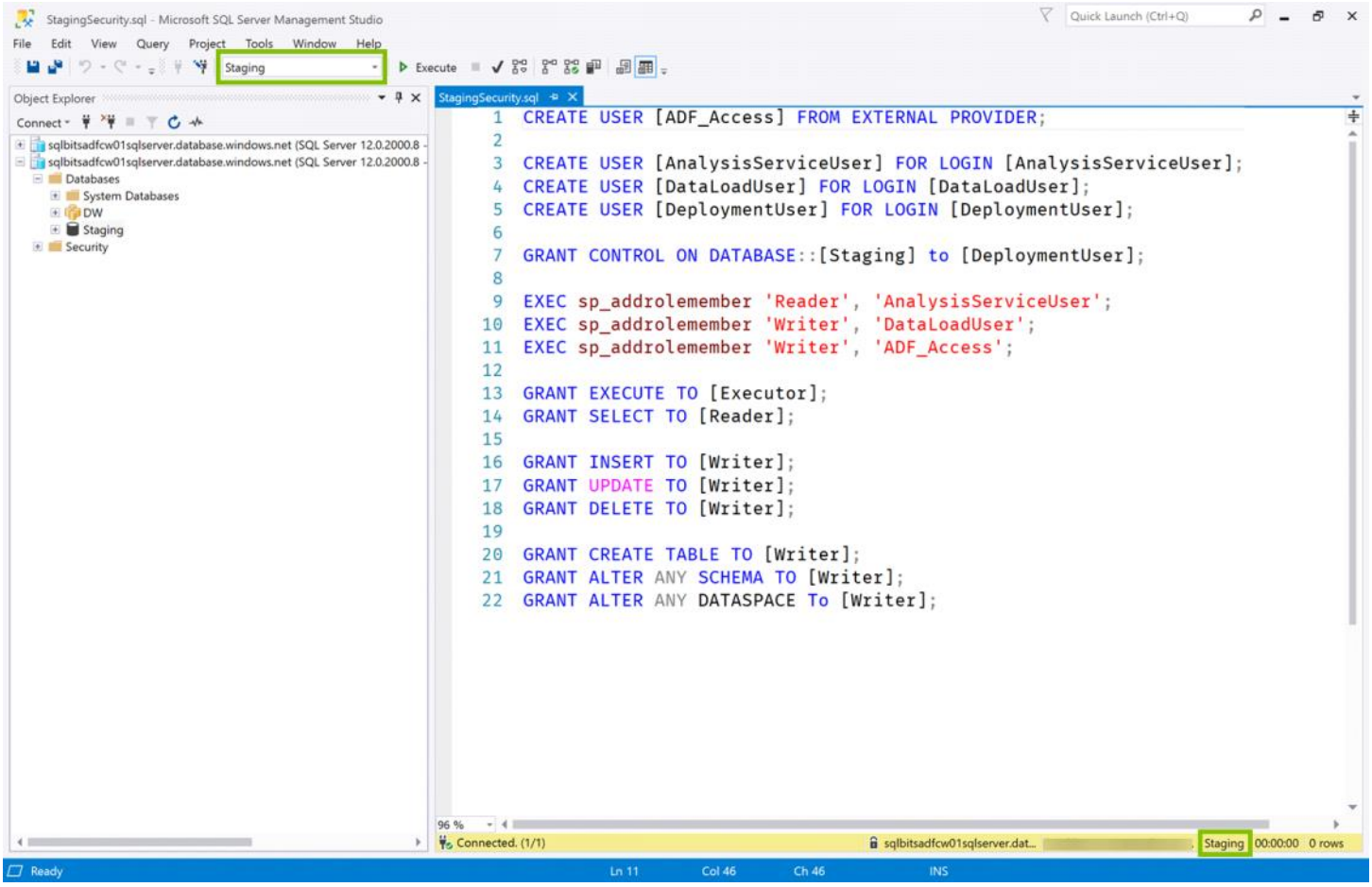
Open a new connection to your SQL Server as your **Active Directory** user. (*This is the user you specified as the Active Directory Admin in Prerequisites Step 5.*)



Connect to **Master** and open **Azure SQL Server - Master DB Security.sql**. Execute the script.

Connect to **Staging** and open **Azure SQL Server - Staging DB Security.sql.** Ensure that you are connected

to the Staging database and execute the script.



Activity Summary

In this activity, you have deployed the Staging database, which will be your sink (destination) in the rest of the lab. Next, you will create Linked Services to connect to the SQL Server in your Virtual Machine, as well as to your Staging Azure SQL Database and Azure Data Lake Storage Gen1.

Activity 04: Create Linked Services

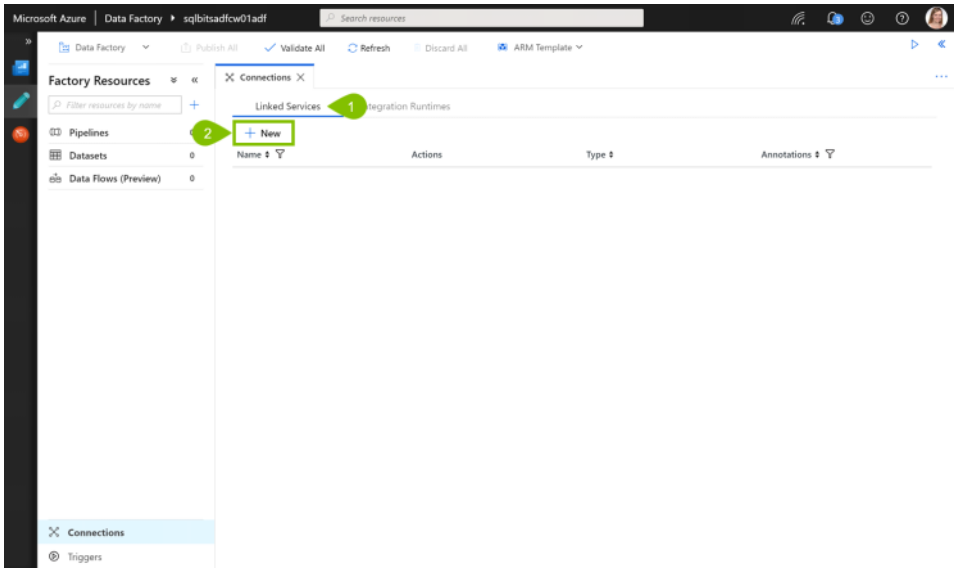
Activity Overview

Estimated time to complete activity: **5 minutes**.

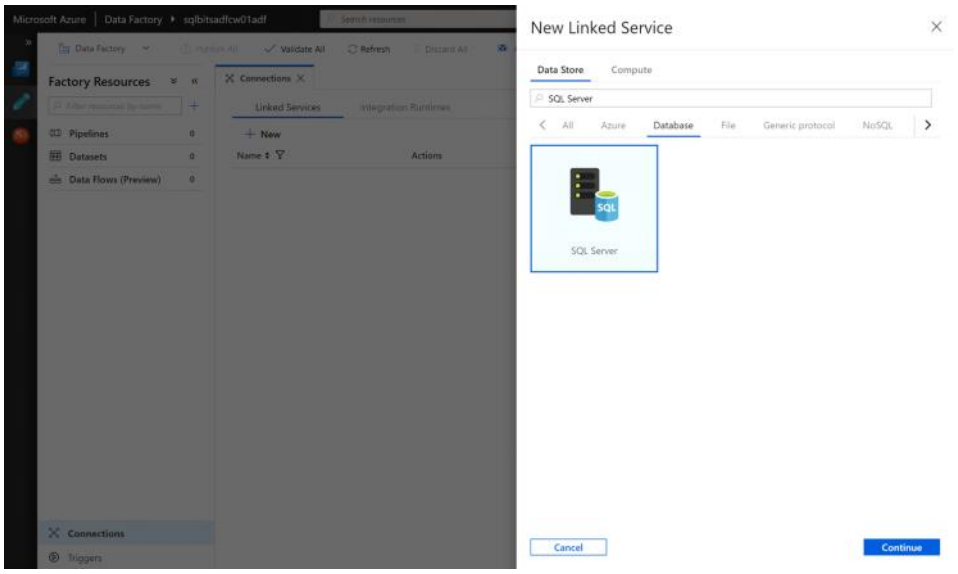
In this activity, you will create Linked Services to connect to the SQL Server in your Virtual Machine, as well as to your Azure SQL Database and Azure Data Lake Storage Gen1.

Create a Linked Service to the SQL Server in the Virtual Machine

In the **Connections** tab, click on **Linked Services**, and click **New**.



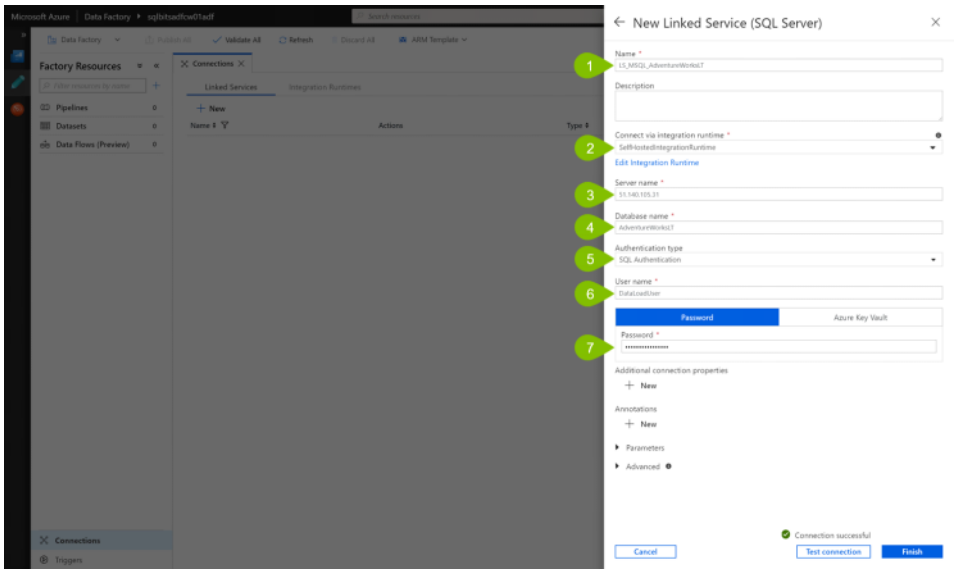
The New Linked Service menu opens. Navigate to Database -> SQL Server, or type in **SQL Server** in the search. Click **Continue**.



In the **New Linked Service (SQL Server)** pane, provide the following information:

Step	Setting	Value	Notes
1	Name	**LS_MSQL_AdventureWorksLT**	Use the prefix **LS_MSQL** (*for Linked Service, Microsoft SQL Server*) and use **AdventureworksLT** as the name.
2	Connect via Integration Runtime	**SelfHostedIntegrationRuntime**	Select the Self-Hosted Integration Runtime you created in the previous activity.
3	Server Name	**<IP Address>**	The Server Name is the **IP address** of the Virtual Machine you created in the prerequisites. You can find this IP address from the Azure Portal, or from the Integration Runtime settings. (*See instructions below.*)
4	Database Name	**AdventureWorksLT**	Use the **AdventureWorksLT** database you created in the prerequisites.
5	Authentication Type	**SQL Authentication**	Use **SQL Authentication**.

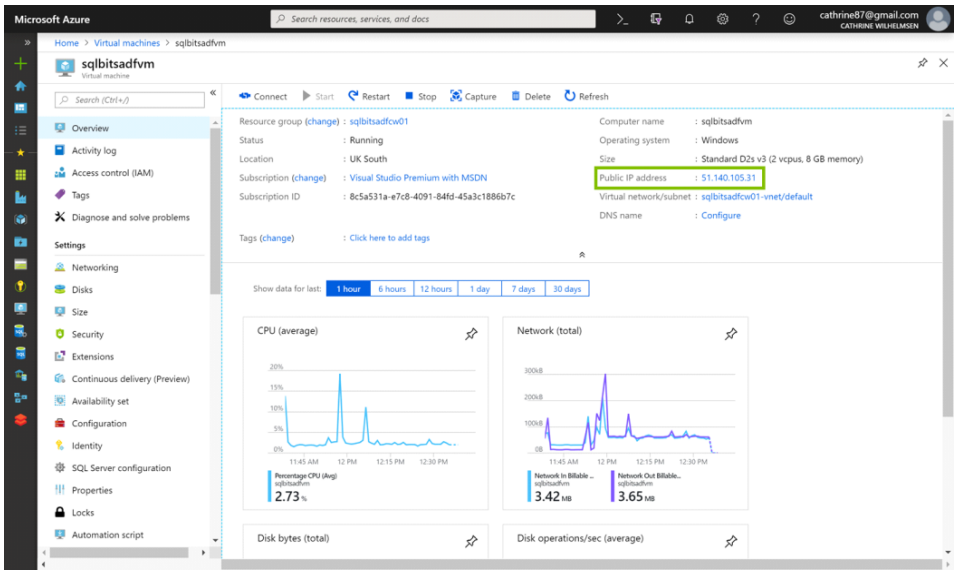
6	User Name	**DataLoadUser**	Use the user you created in the prerequisites, for example **DataLoadUser**.
7	Password	**DataFactoryD3m0!**	Use the password you created in the prerequisites, for example **DataFactoryD3m0!**



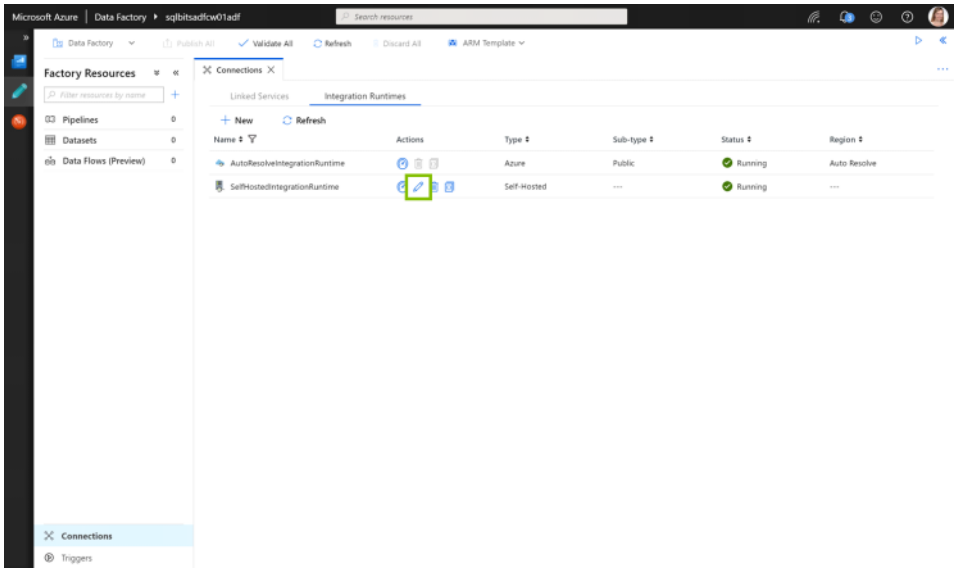
Click **Finish**.

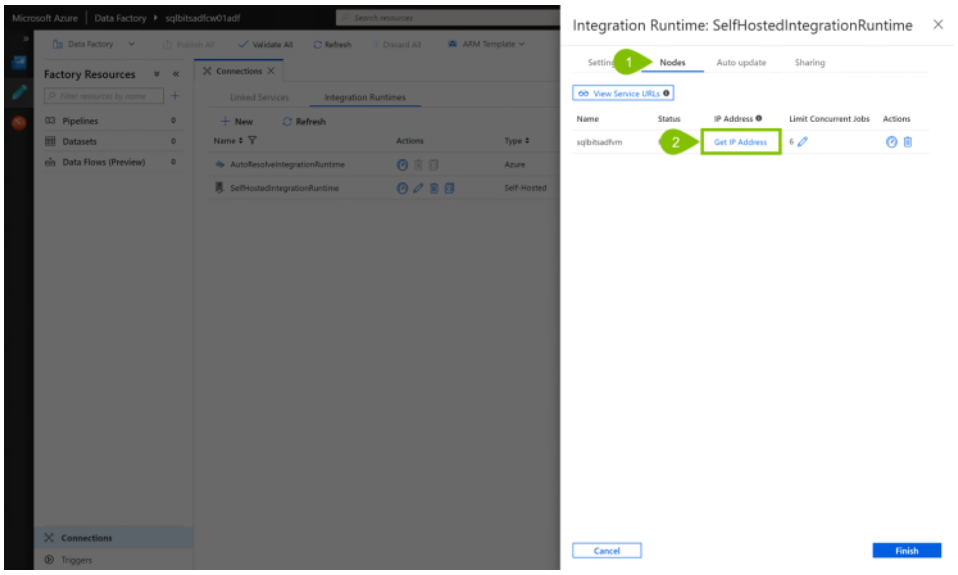
Finding the IP Address of the Virtual Machine

Option 1: In the Azure Portal, navigate to the Virtual Machine and copy the **Public IP Address**.



Option 2: In Azure Data Factory, go to the Integration Runtime **Nodes** settings and click **Get IP Address**.

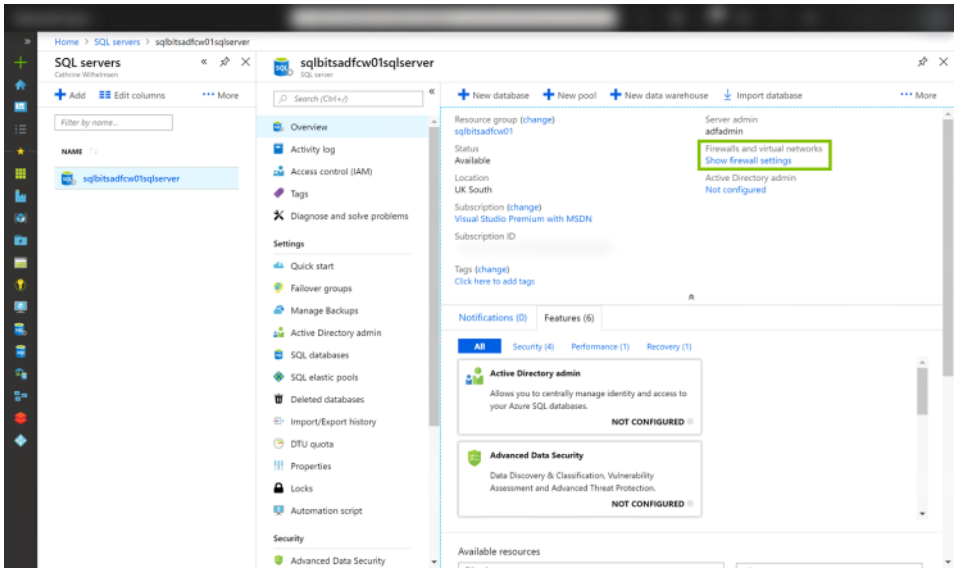


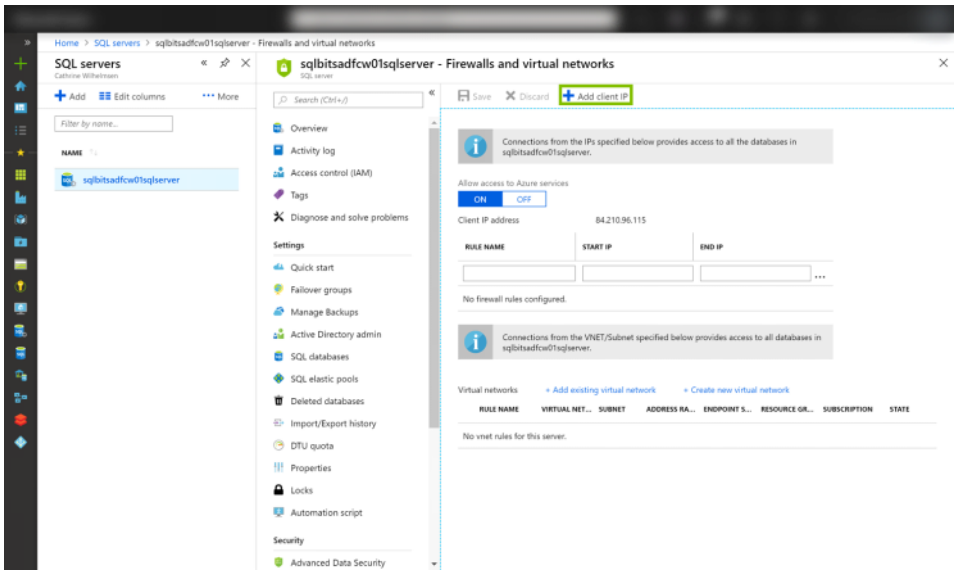


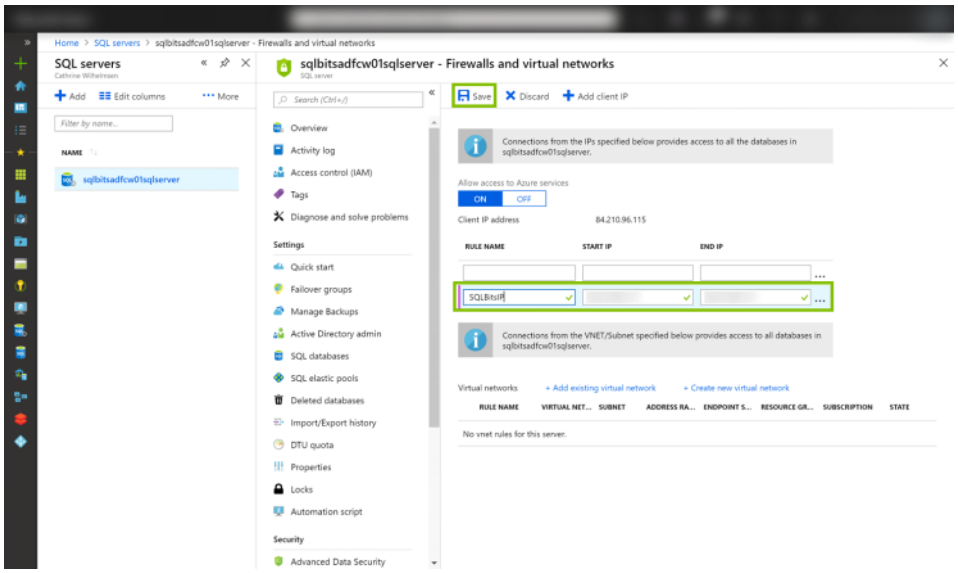
Create a Linked Service to the Azure SQL Database

To be able to connect to your Azure SQL Server from your local computer and Azure Data Factory, you first need to add a firewall rule to allow access from the SQLBits WiFi, then configure SQL Server security. In this step, we will also create the objects needed for the next activity.

Add a Firewall Rule for the SQLBits WiFi

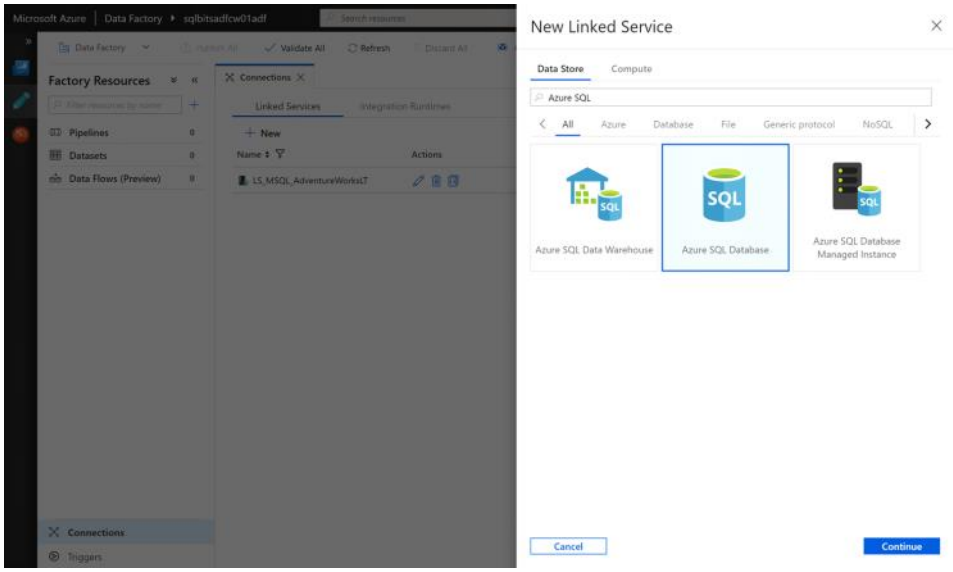






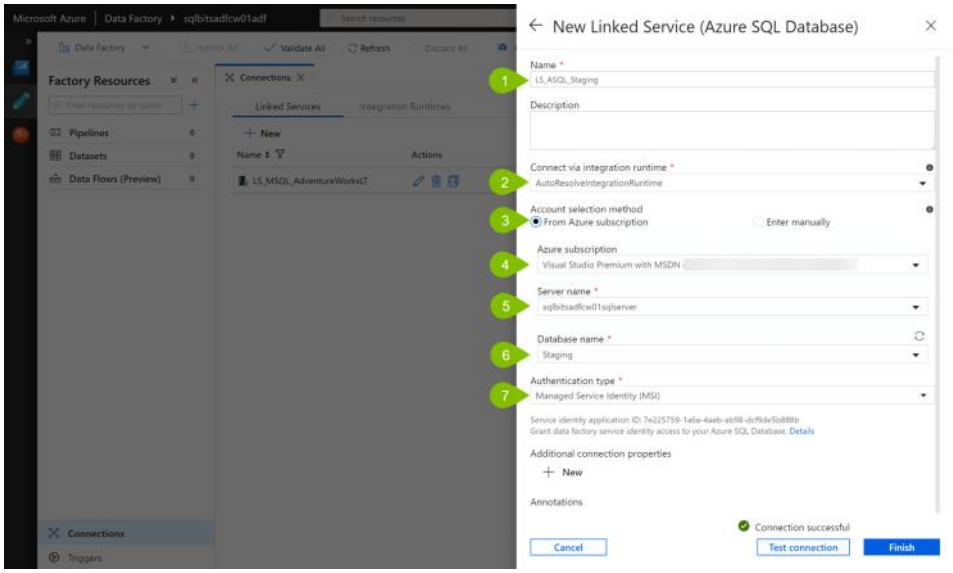
Create the Linked Service

Create a new Linked Service. Navigate to Azure -> Azure SQL Database, or type in **Azure SQL** in the search. Click **Continue**.



In the New Linked Service (SQL Server) pane, provide the following information:

Step	Setting	Value	Notes
1	Name	**LS_ASQL_Staging**	Use the prefix **LS_ASQL** (for Linked Service, Azure SQL Database) and use Staging as the name.
2	Connect via Integration Runtime	**AutoResolveIntegrationRuntime**	Keep the default **AutoResolveIntegrationRuntime**.
3	Account Selection Method	**From Azure Subscription**	Keep the default **From Azure Subscription.**
4	Azure Subscription	**<Your Subscription>**	Select your **Azure Subscription.**
5	Server Name	**sqlbitsadf*<999>*sqlserver**	Select the **SQL Server** created in the prerequisites.
6	Database Name	**Staging**	Select the **Staging** database created in the prerequisites.
7	Authentication Type	**Managed Service Identity (MSI)**	Choose **Managed Service Identity (MSI)**. This connects using the identity of the Azure Data Factory.



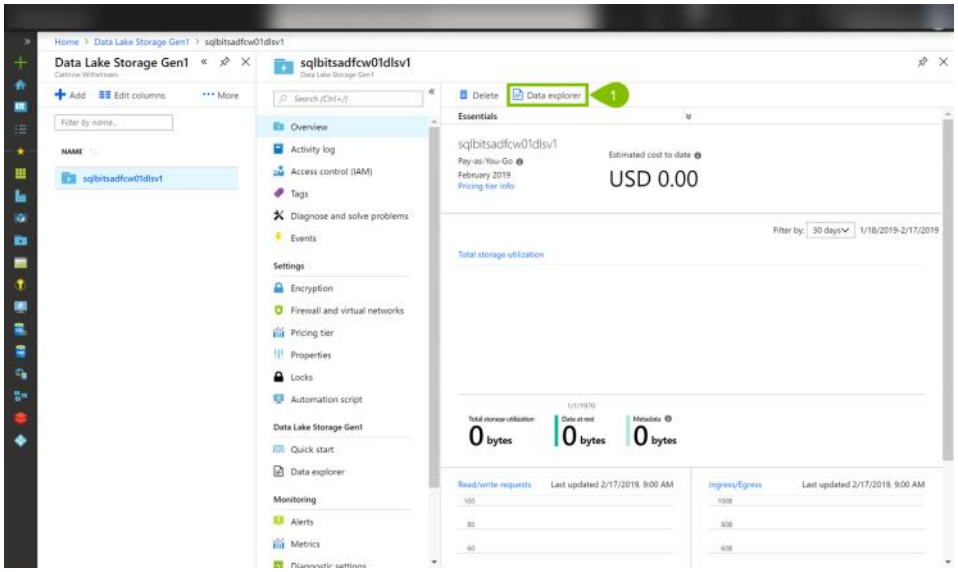
Test the connection, then click **Finish**.

Create a Linked Service to the Azure Data Lake Storage Gen1

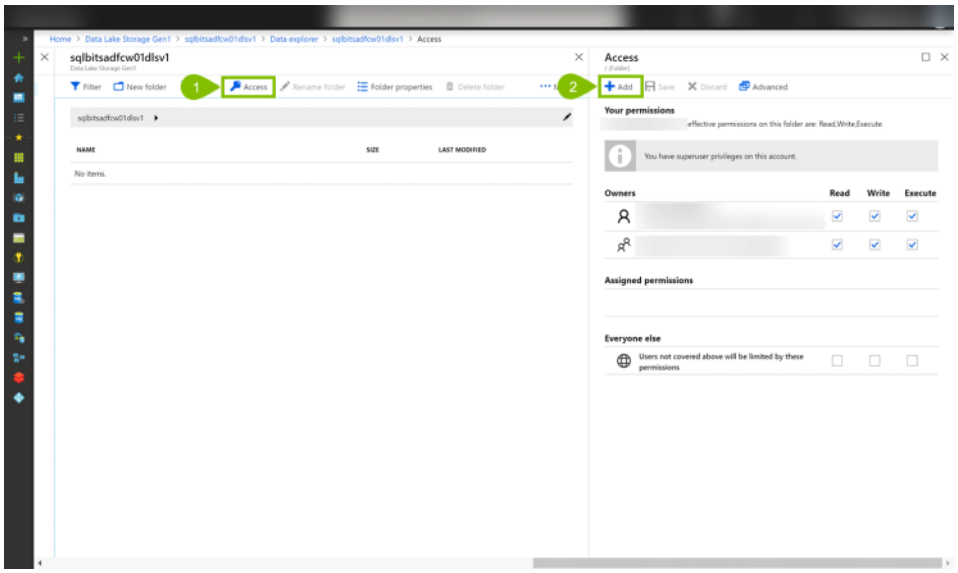
To be able to connect to your Azure Data Lake Storage Gen1 from Azure Data Factory, you first need to give the ADF_Access group (that you created in Activity 01) access.

Give the ADF_Access Group Permissions

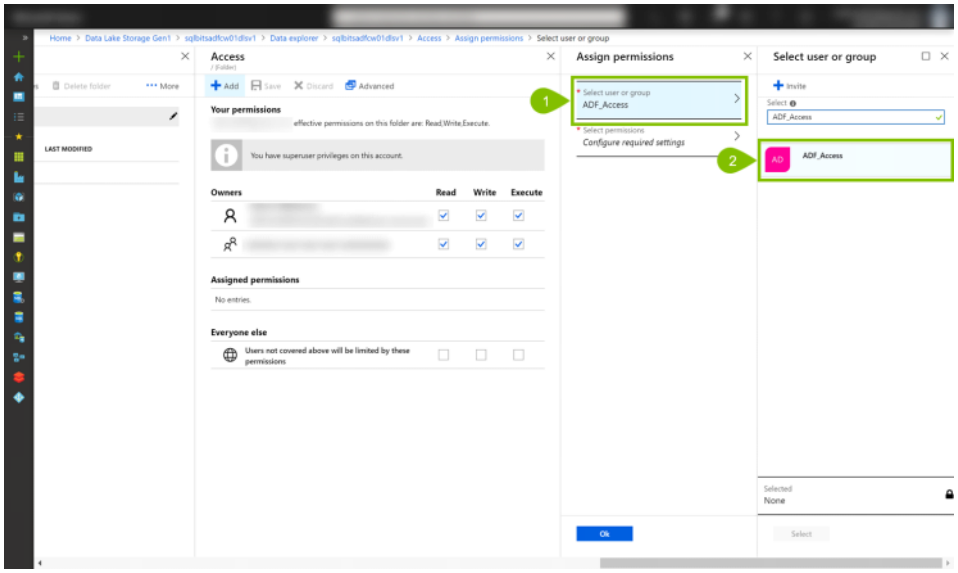
Go to the Azure Data Lake Storage Gen1 and click **Data Explorer**.



Click **Access**, then **Add**.



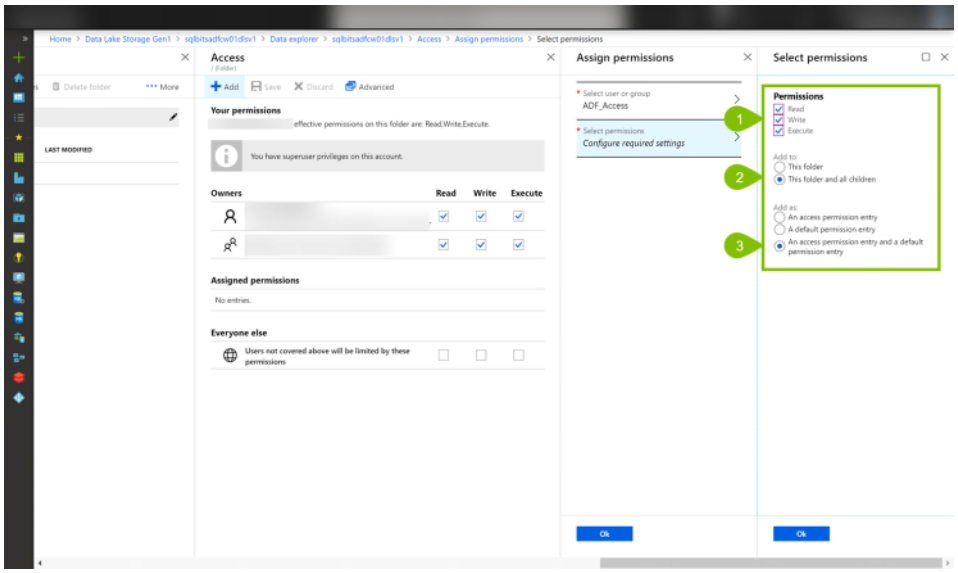
Click **Select user or group**, then select the **ADF_Access** group.



Change the default settings to:

- Allow **Read**, **Write**, and **Execute**
- Add to: **This folder and all children**

- Add as: **An access permission entry and a default permission entry**



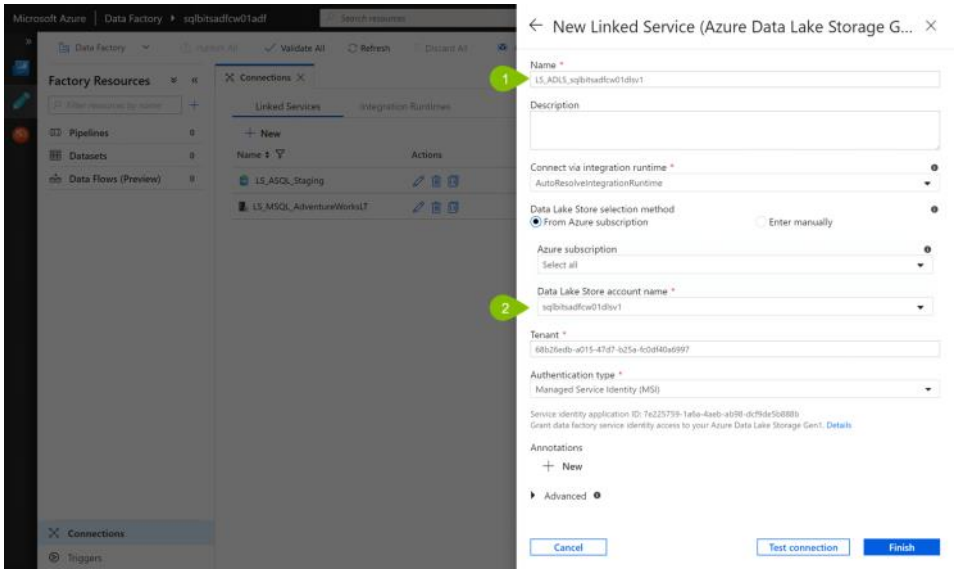
Click **OK** and close out of the other panes.

Create the Linked Service

Create a new Linked Service. Navigate to Azure -> Azure Data Lake Storage Gen1, or type in **Data Lake** in the search. Click **Continue**.

Step	Setting	Value	Notes
1	Name	**LS_ADLS_sqlbitsadf*<999>*dlsv1**	Use the prefix **LS_ADLS** (for Linked Service, Azure Data Lake Storage) and use the name of the Azure Data Lake Storage Gen1 you created in the prerequisites.
2	Data Lake Store Account Name	**sqlbitsadf*<999>*dlsv1**	Choose the **Azure Data Lake Storage Gen1** you created in the prerequisites.

Unless specified above, use the default settings.



Test the connection, then click **Finish**.

Activity Summary

You have now created your first Linked Services, including configuring connection security. Next, you will create your first Datasets.

Activity 05: Create Datasets

Activity Overview

Estimated time to complete activity: **5 minutes**.

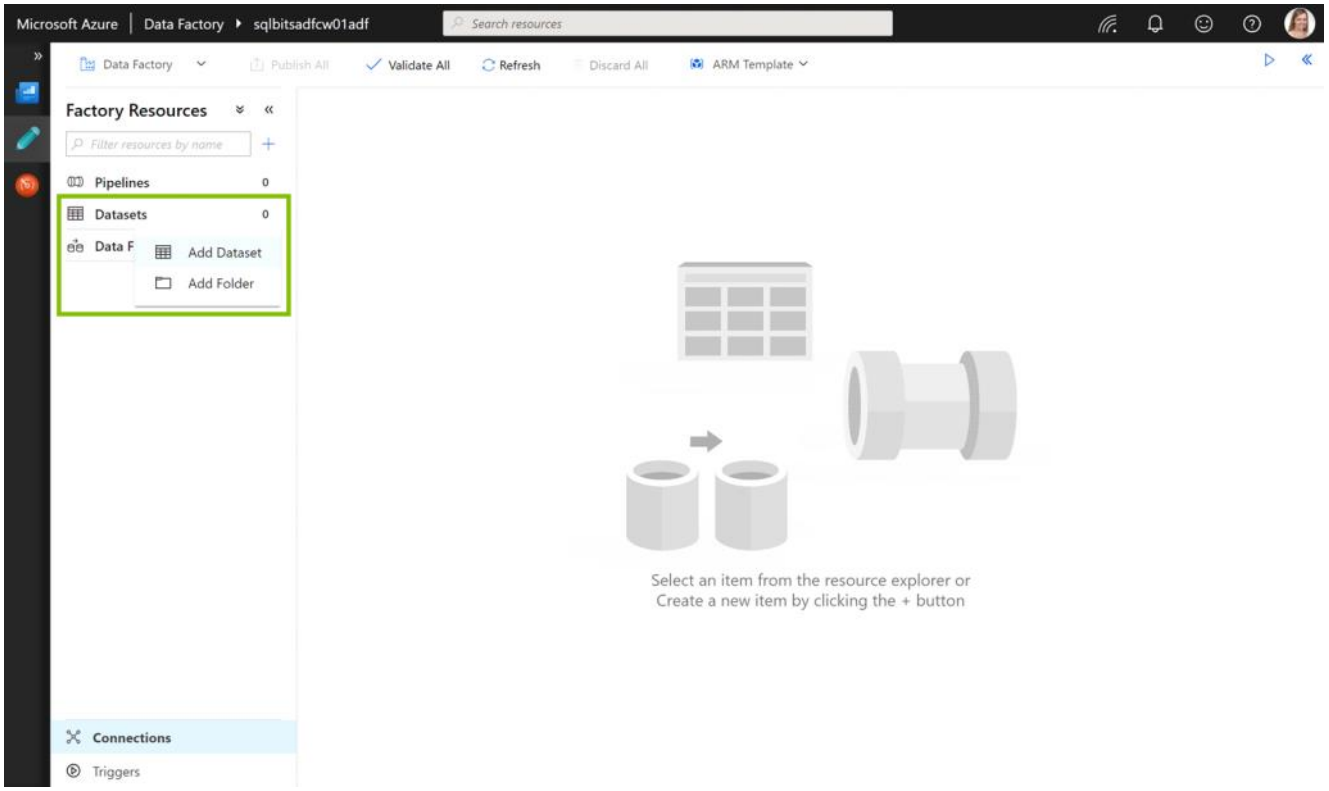
In this activity, you will create the Datasets needed to copy data from the SQL Server in the Virtual Machine to the Azure SQL Database.

Create a SQL Server Dataset

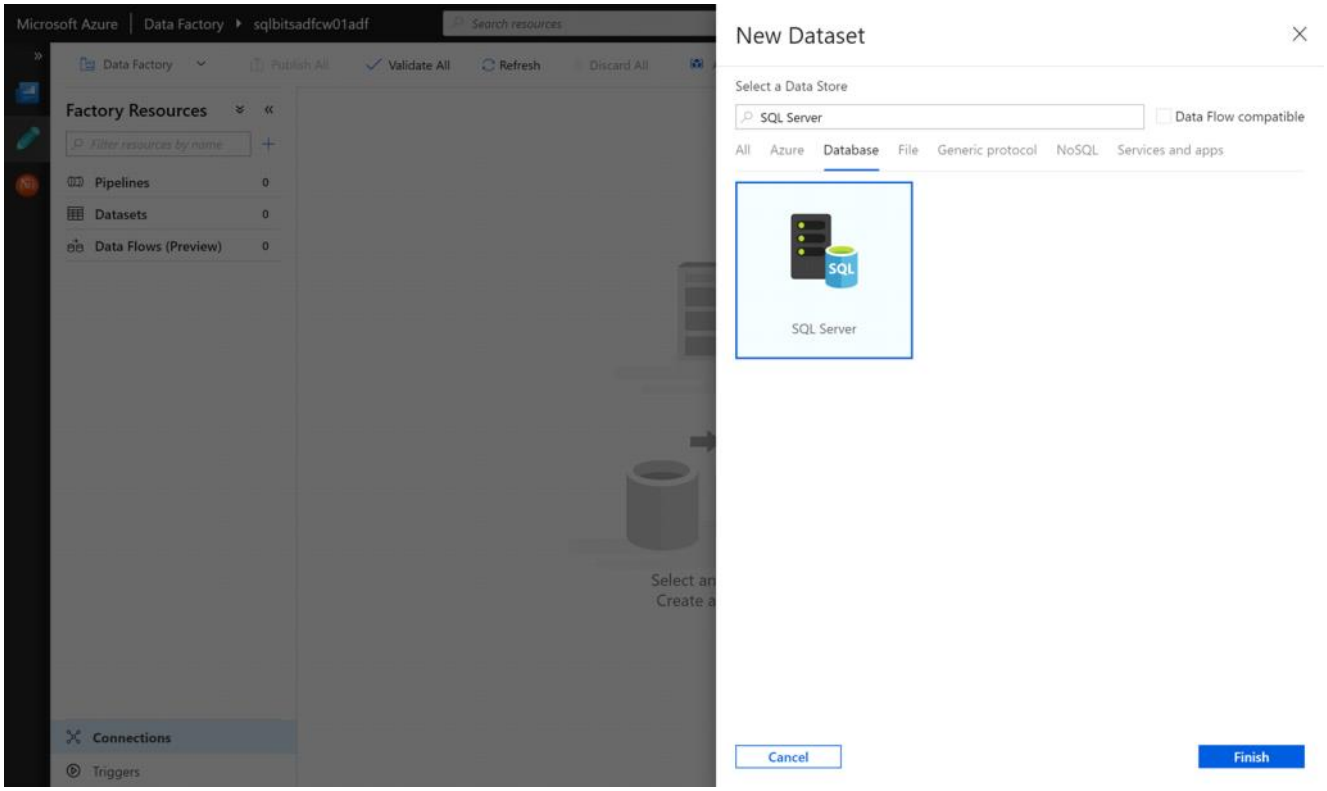
Use the following settings:

Step	Setting	Value	Notes
1	Name	**DS_MSQL_SalesLT_Customer**	Use the prefix **DS_MSQL_** (*for DataSet, Microsoft SQL Server*) and use **SalesLT_Customer** (*the source schema and table*) as the name.
2	Linked Service	**LS_MSQL_AdventureWorksLT**	Choose the **SQL Server Linked Service** you created in the previous activity.
3	Table	**SalesLT.Customer**	Choose the **SalesLT.Customer** table.

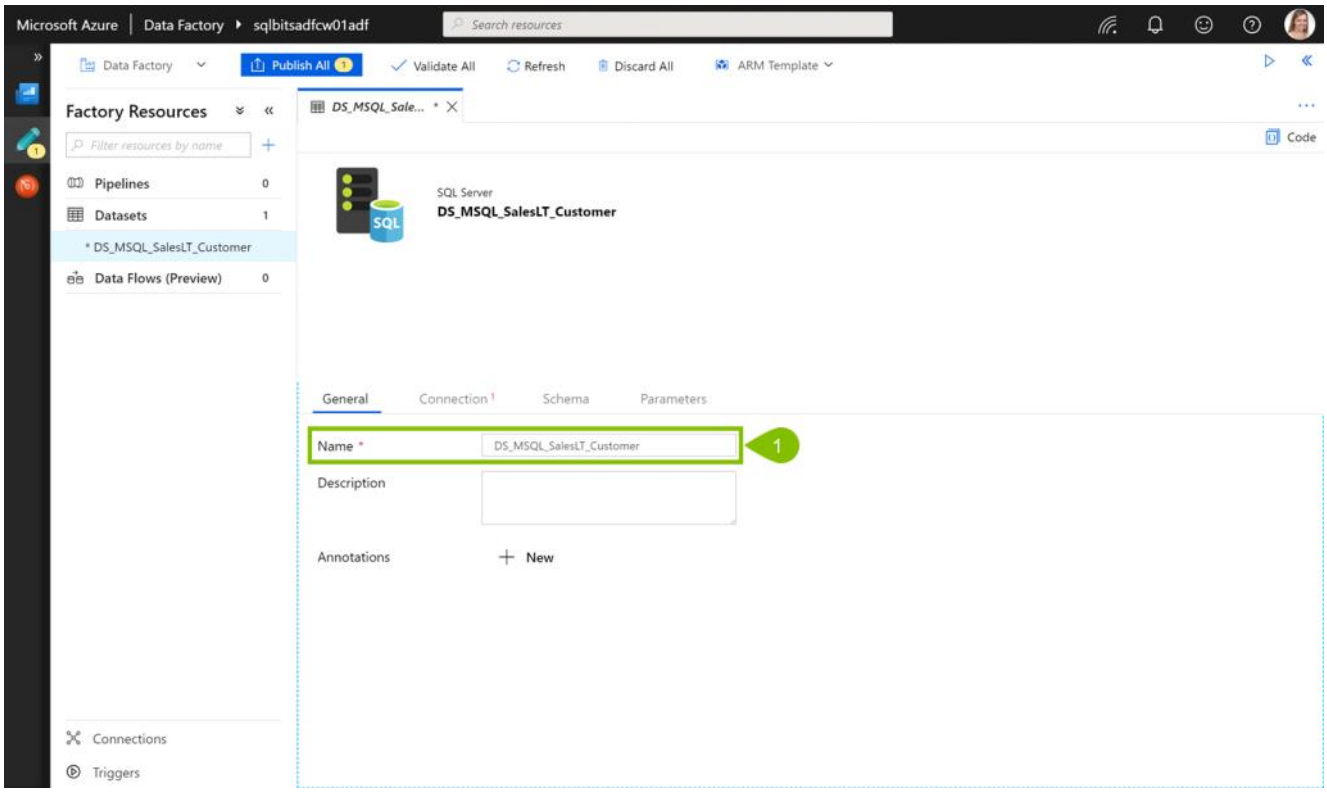
Under Factory Resources, click the ellipsis next to Datasets, then click **Add Dataset**.
(*You can also click the + sign and then click Dataset.)*



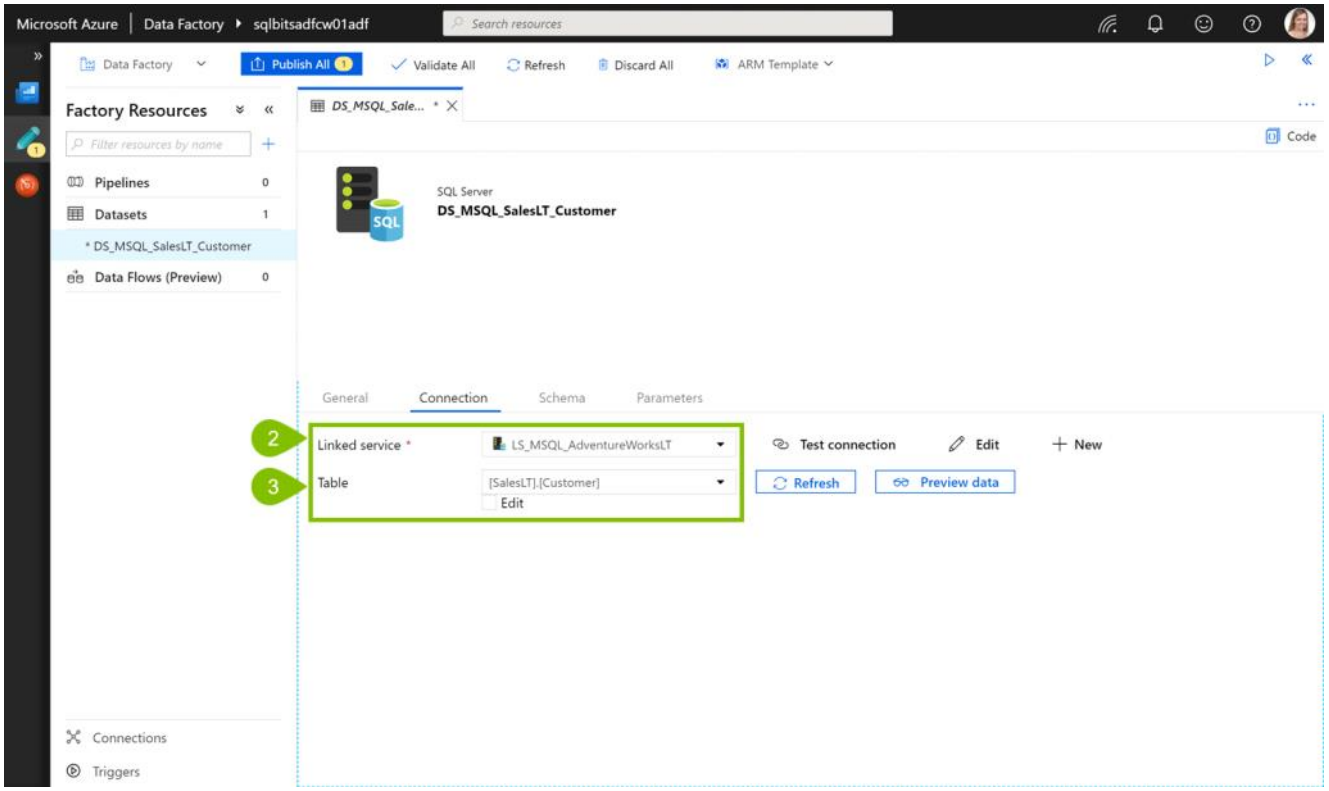
The **New Dataset** menu opens. Navigate to Database -> SQL Server, or type in SQL Server in the search.
Select **SQL Server** and click **Finish**.



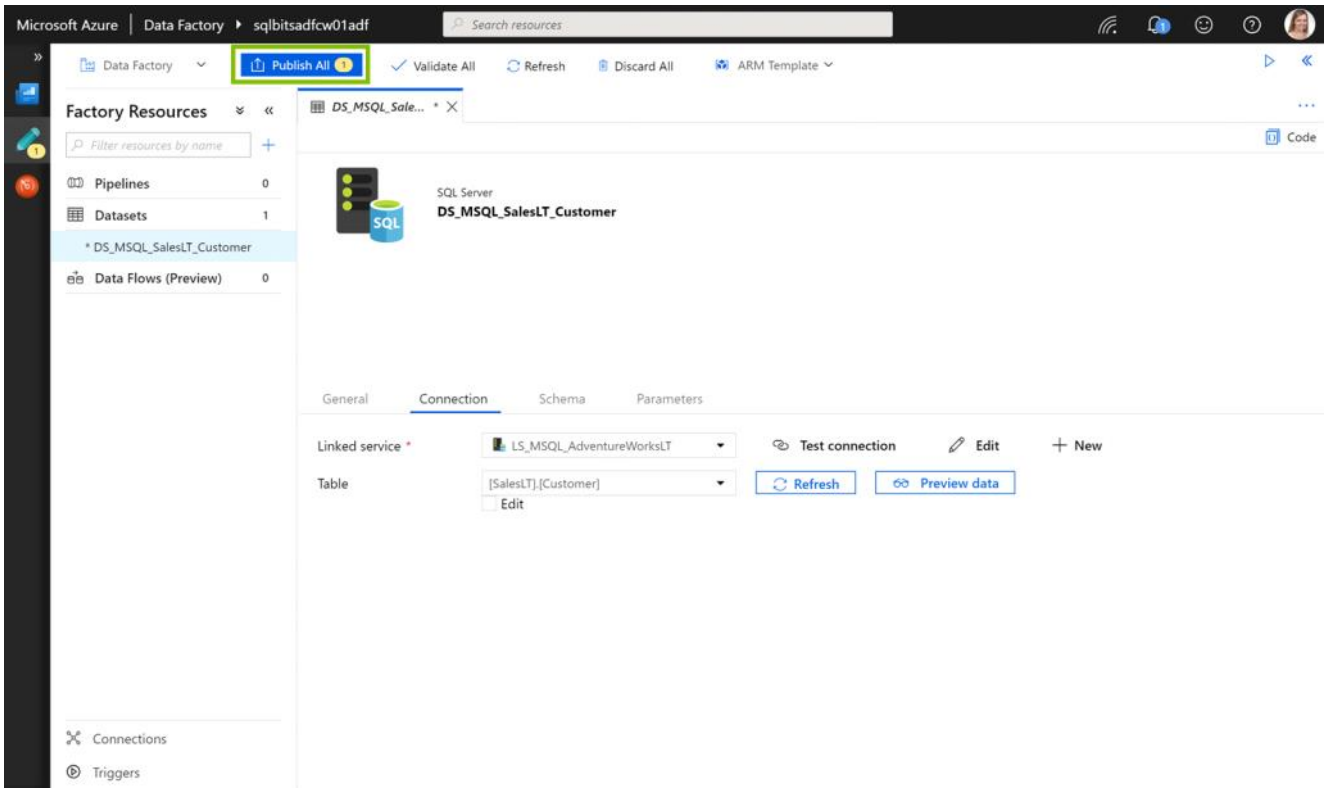
In the **General** tab, name the Dataset **DS_MSQL_SalesLT_Customer**.



In the **Connection** tab, select the **LS_MSQL_AdventureWorksLT** linked service, and the **SalesLT.Customer** table.



Click **Publish All** to save.



Create an Azure SQL Database Dataset

Repeat the previous steps, but this time, create an **Azure SQL Database** dataset. Use the following settings:

Step	Setting	Value	Notes
1	Name	**DS_ASQL_SalesLT_Customer**	Use the prefix **DS_ASQL_** (*for DataSet, Azure SQL Database*) and use **SalesLT_Customer** (*the sink schema and table*) as the name.
2	Linked Service	**LS_ASQL_Staging**	Choose the **Azure SQL Database Linked Service** you created in the previous activity.
3	Table	**AWLTSRC.SalesLT_Customer**	Choose the **AWLTSRC.SalesLT_Customer** table.

Activity Summary

You have now created your first Datasets. Next, you will create your first Pipeline to copy data between these Datasets.

Activity 06: Create Pipeline

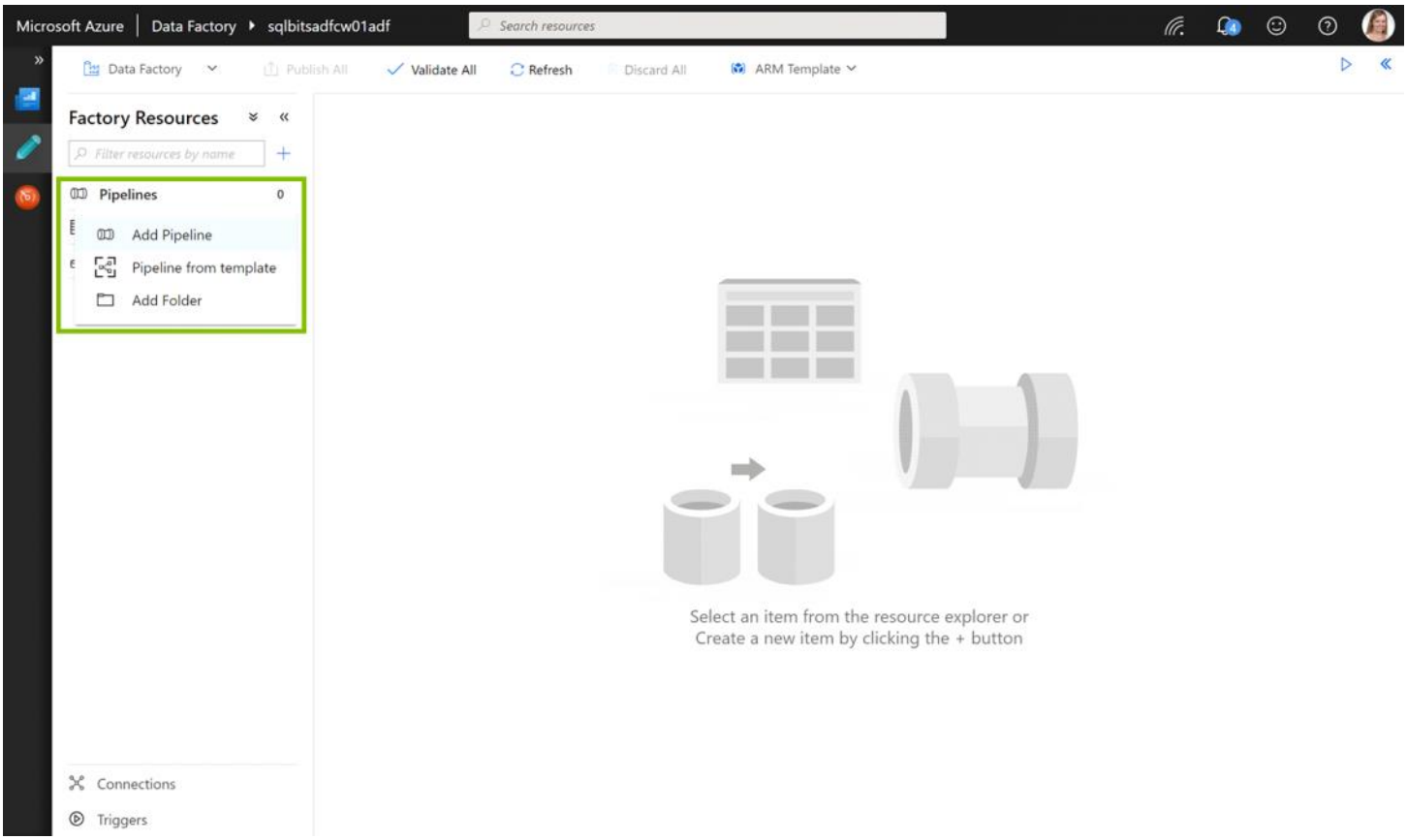
Activity Overview

Estimated time to complete activity: **5 minutes**.

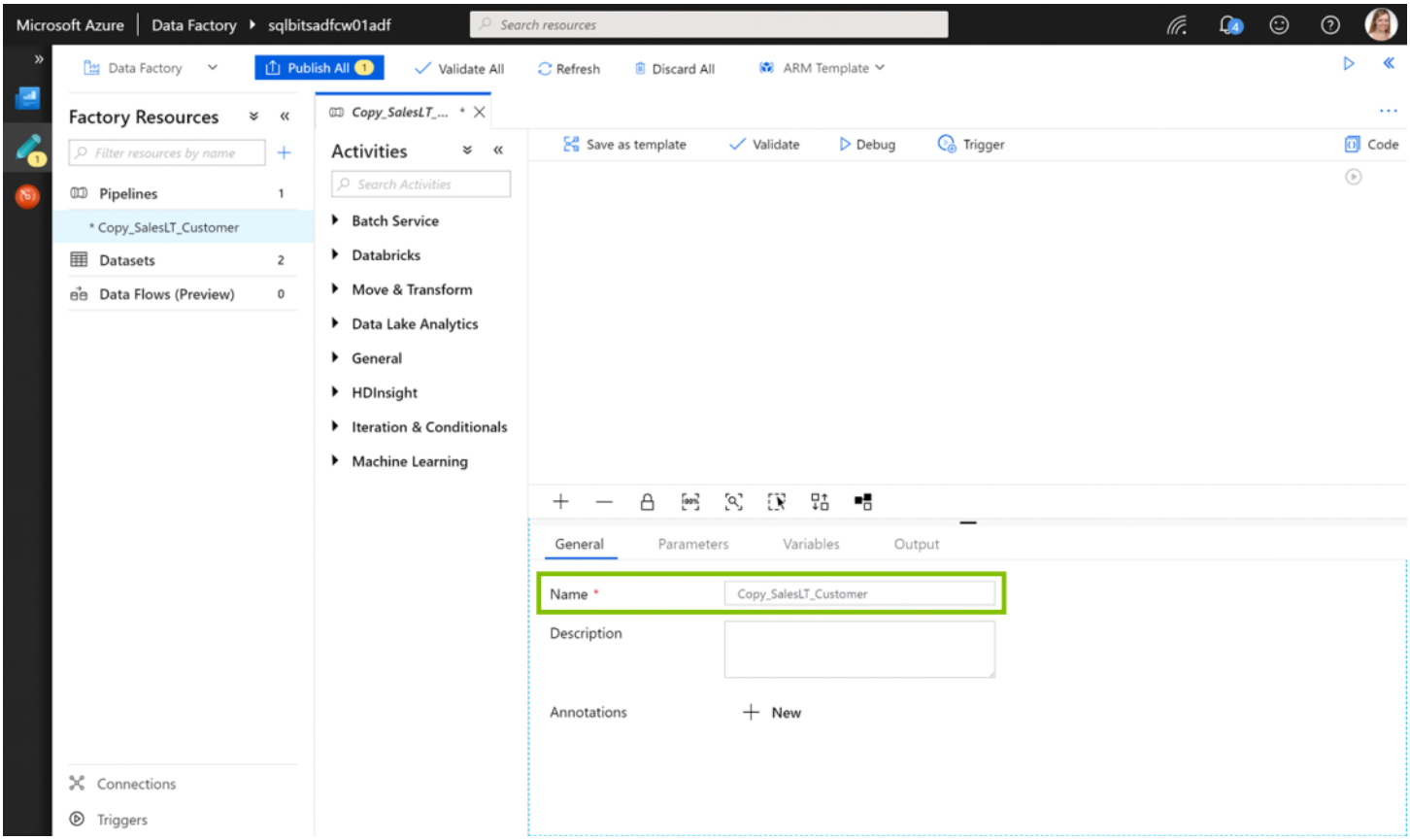
In this activity, you will create the Pipeline to copy data between your SQL Server in the Virtual Machine to the Azure SQL Database.

Create the Pipeline

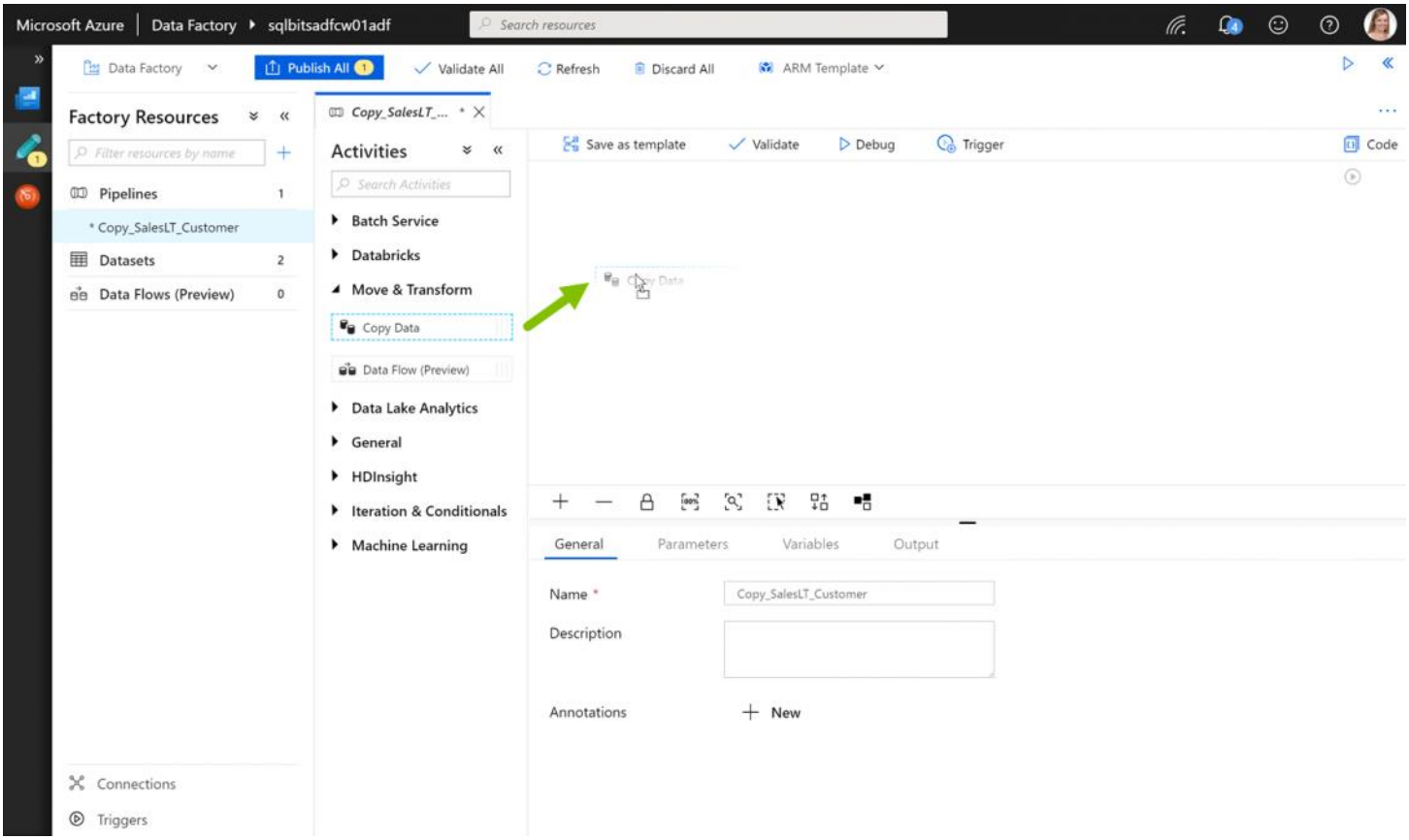
Under Factory Resources, hover over Pipelines until the ellipsis shows up, click it, then click **Add Pipeline**.
(*You can also click the + sign and then click Pipeline.)*



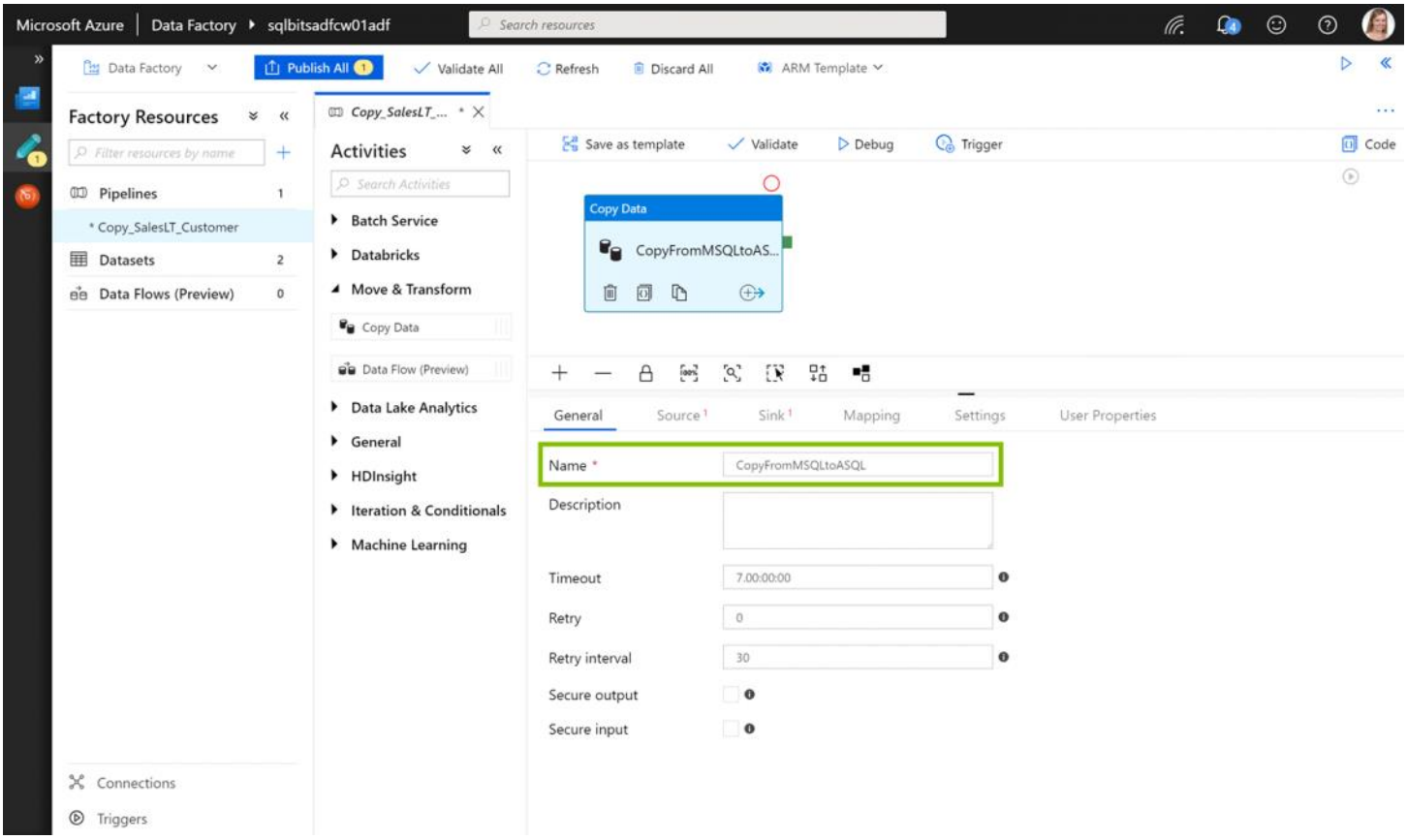
In the **General** tab, name the Pipeline **Copy_SalesLT_Customer**.



In the **Activities** toolbox, expand **Move & Transform. (***You can also search for activities by name.*) Drag the **Copy Data** activity onto the pipeline designer surface.

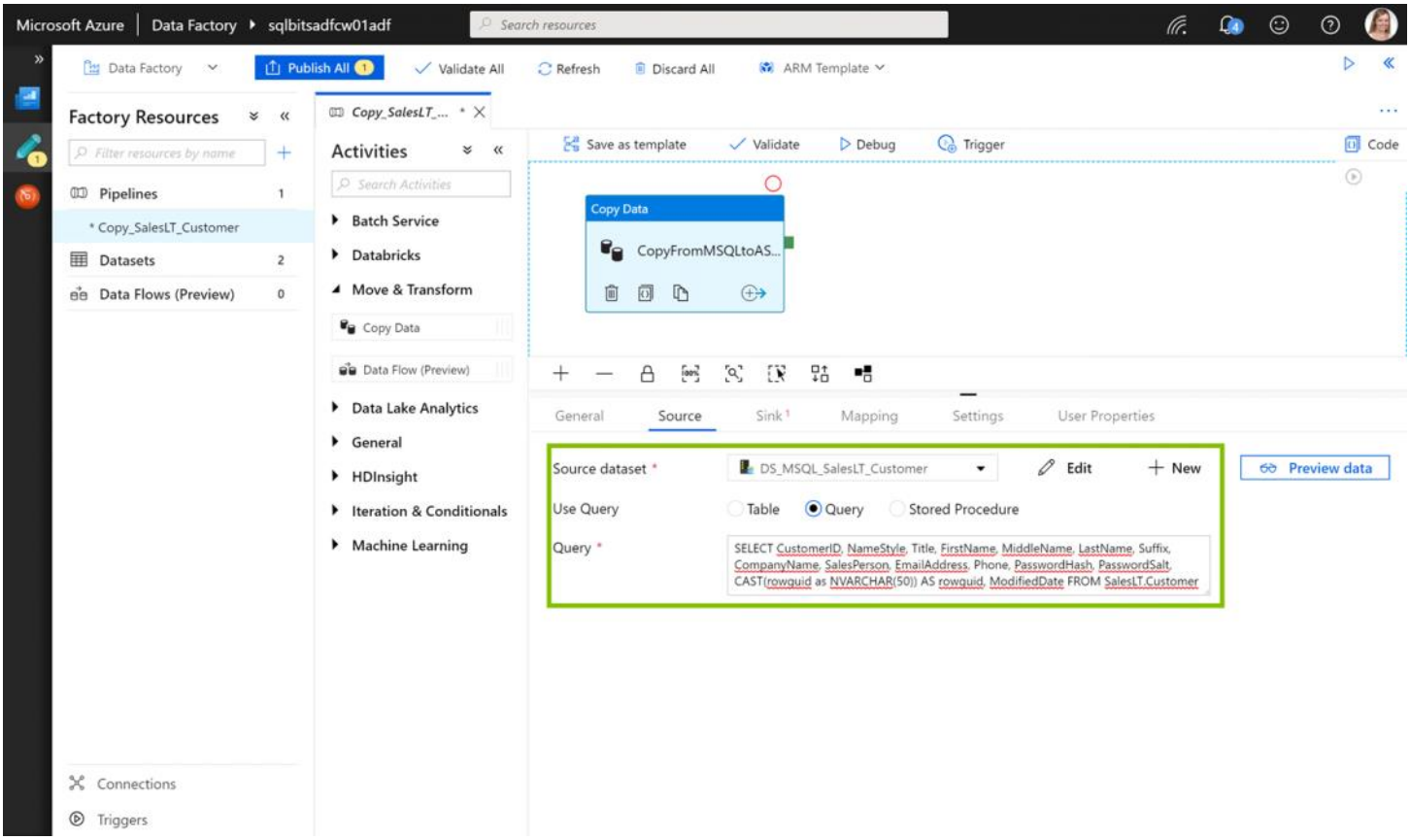


Click on the Copy Data activity. In the **General** tab, give the activity the name **CopyFromMSQLtoASQL**.



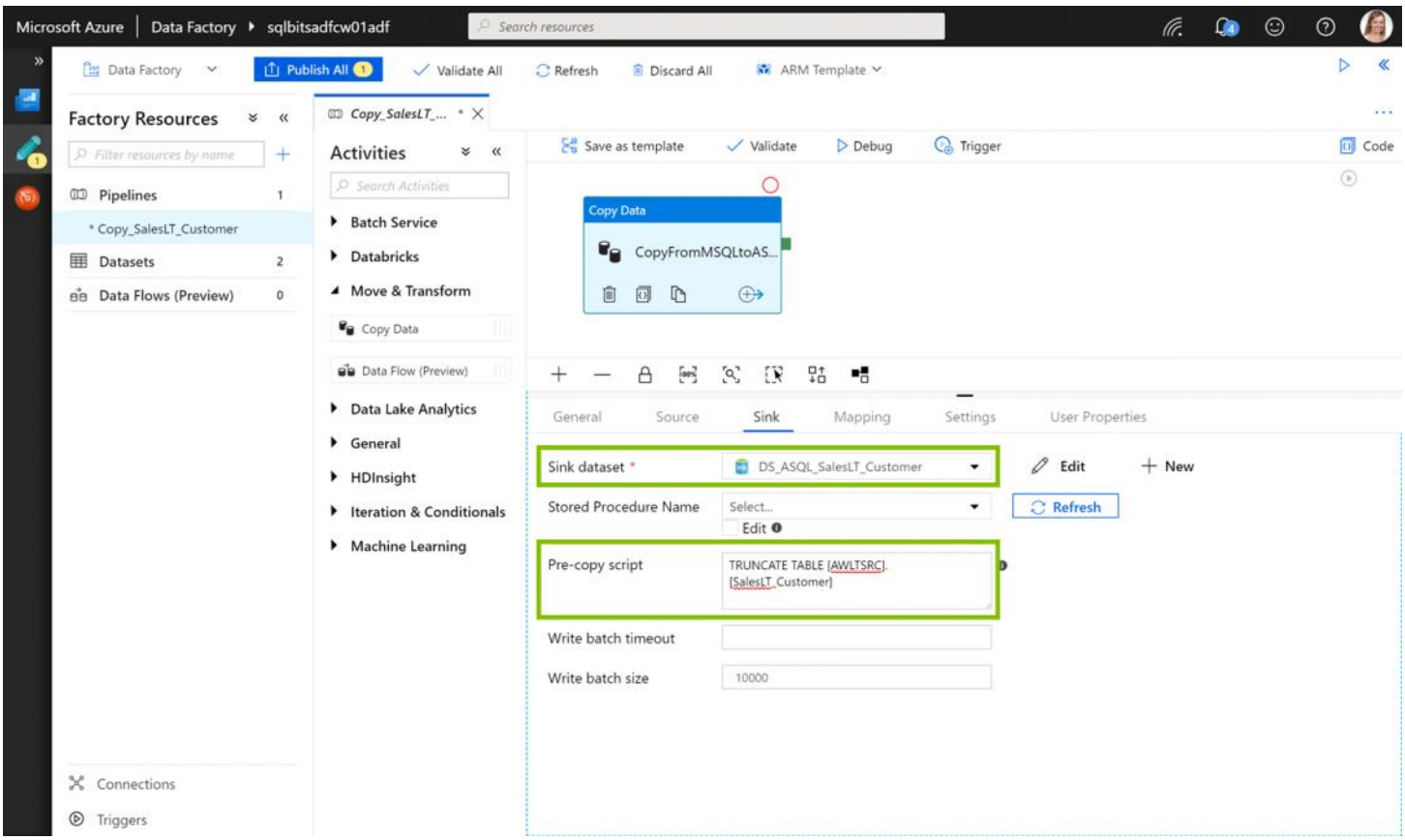
In the **Source** tab, select the **DS_MSQL_SalesLT_Customer** dataset. Select Query, and use the following:

```
SELECT CustomerID, NameStyle, Title, FirstName, MiddleName, LastName, Suffix,
CompanyName, SalesPerson, EmailAddress, Phone, PasswordHash, PasswordSalt,
CAST(rowguid as NVARCHAR(50)) AS rowguid, ModifiedDate FROM SalesLT.Customer
```

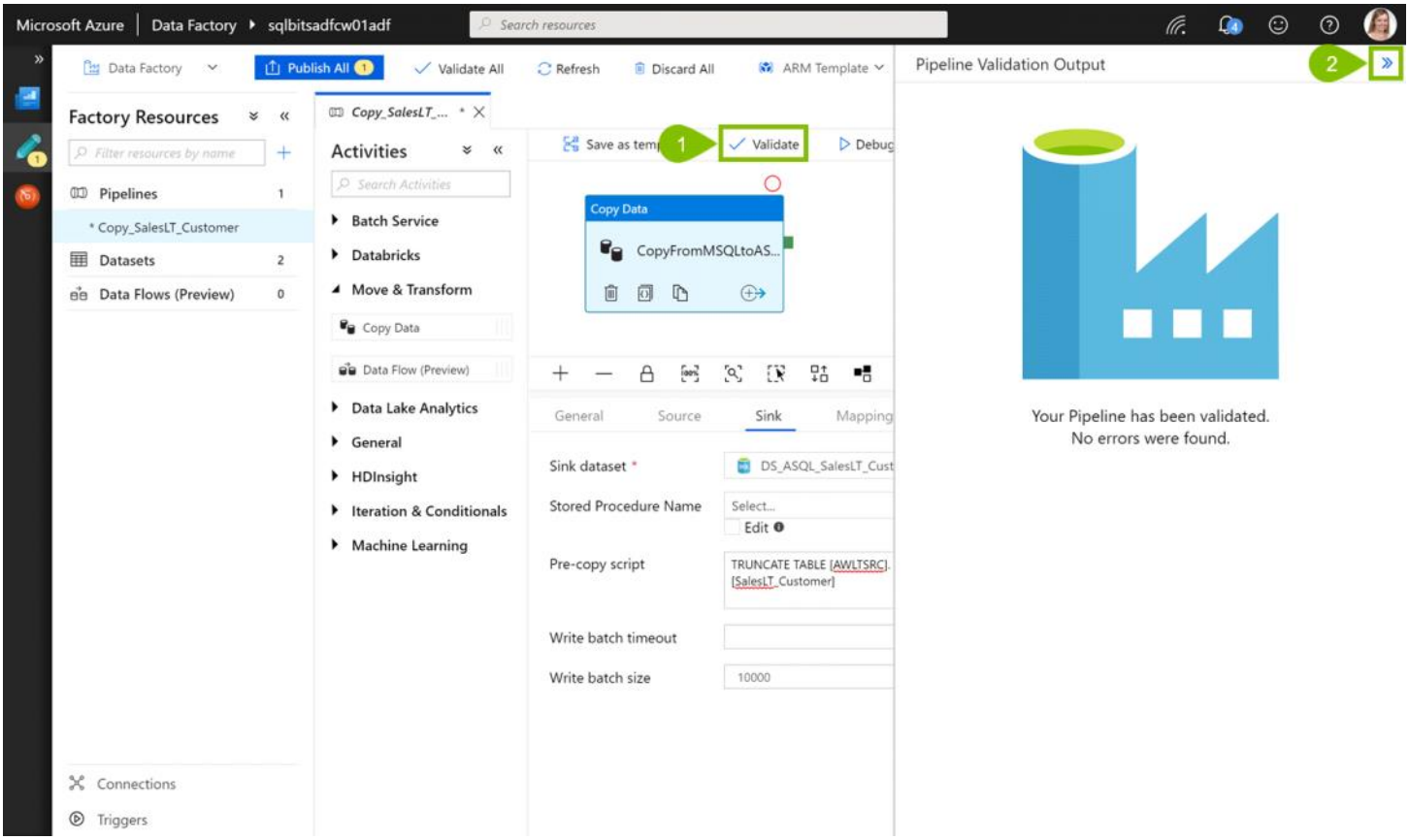


In the **Sink** tab, select the **DS_ASQL_SalesLT_Customer** dataset.
In the Pre-copy Script, enter the following:

```
TRUNCATE TABLE [AWLTSRC].[SalesLT_Customer]
```



Click **Validate** on the pipeline toolbar above the design surface to validate the pipeline settings. Confirm that the pipeline has been successfully validated. To close the validation output, select the **>>** (*right arrow*) button.



Click **Publish All** to save.

Activity Summary

You have now created your first Pipeline. Next, you will debug and trigger the Pipeline.

Activity 07: Execute Pipeline

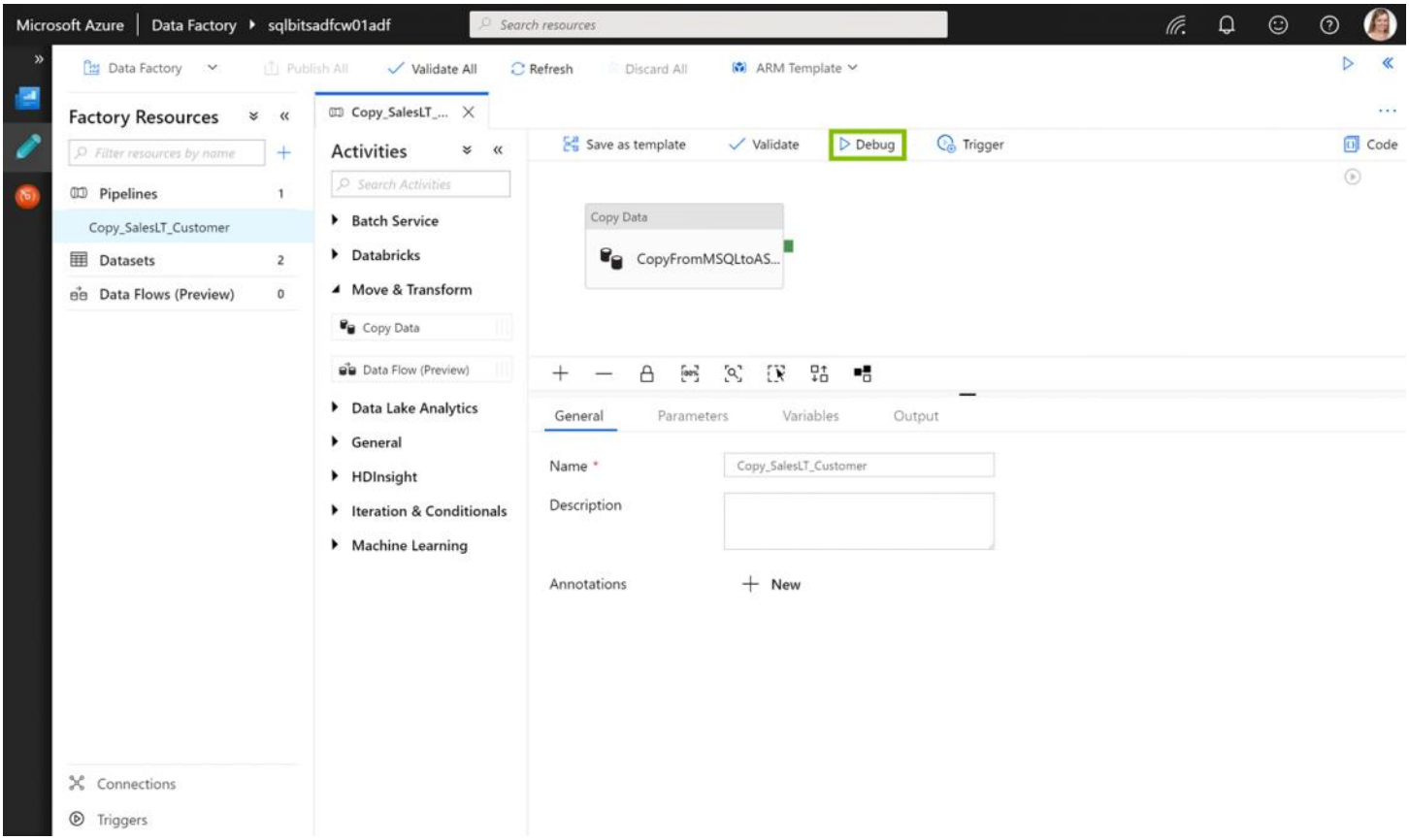
Activity Overview

Estimated time to complete activity: **5 minutes**.

In this activity, you will debug and then trigger the Pipeline created in the previous step.

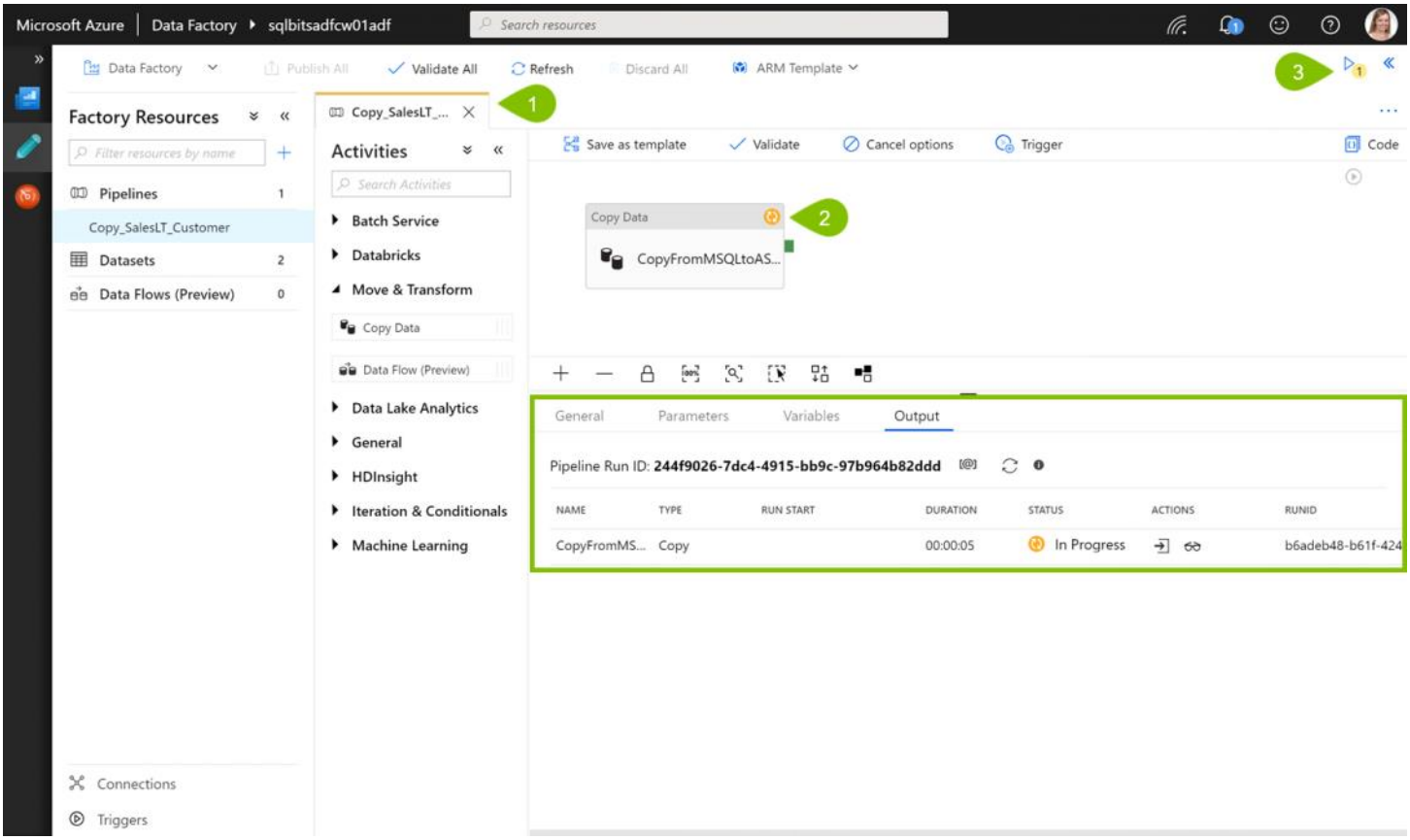
Debug the Pipeline

Click Debug on the pipeline toolbar above the design surface to trigger a test run.

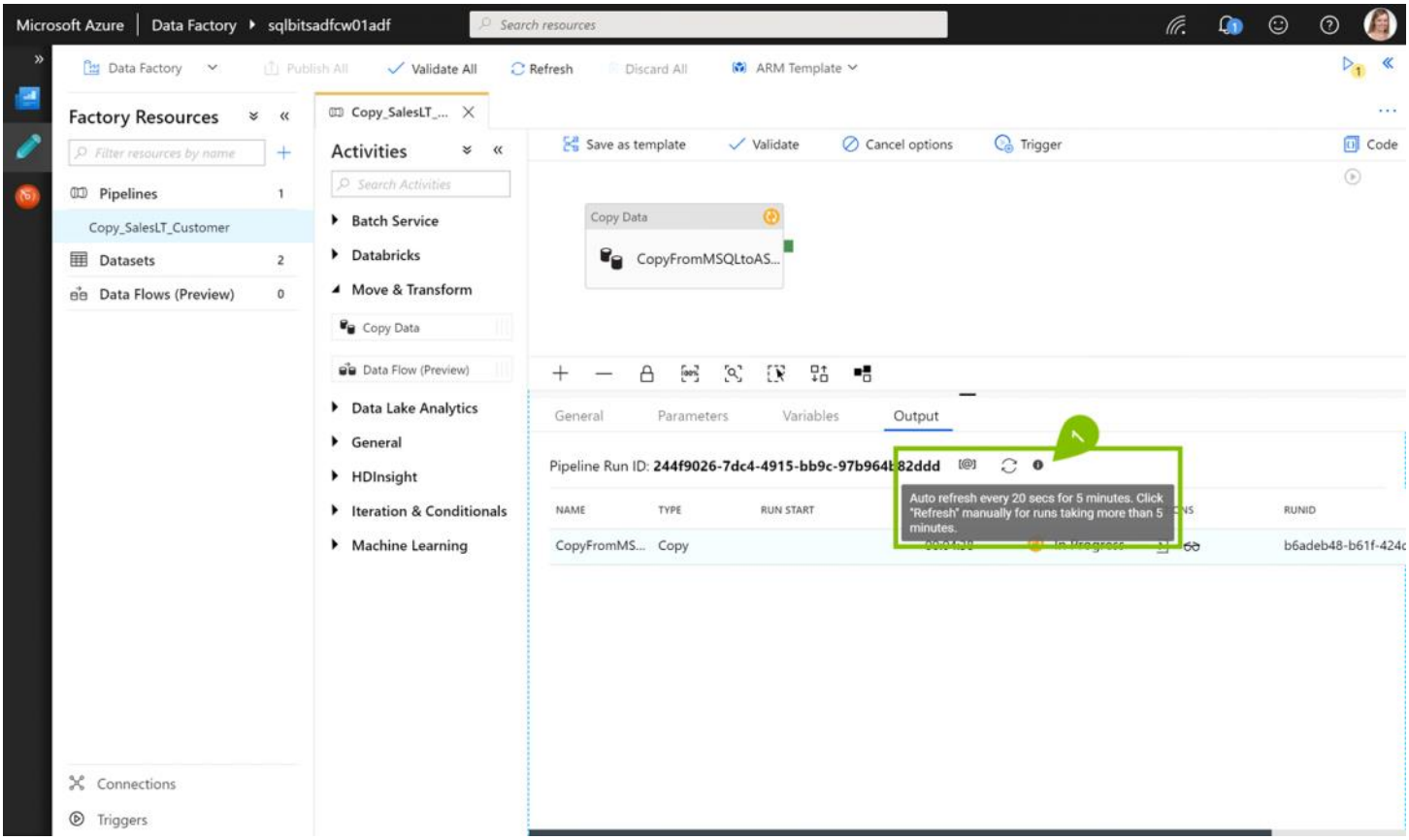


The **Output** tab will open, and you will see the status of the pipeline run. Also notice the other debug indicators:

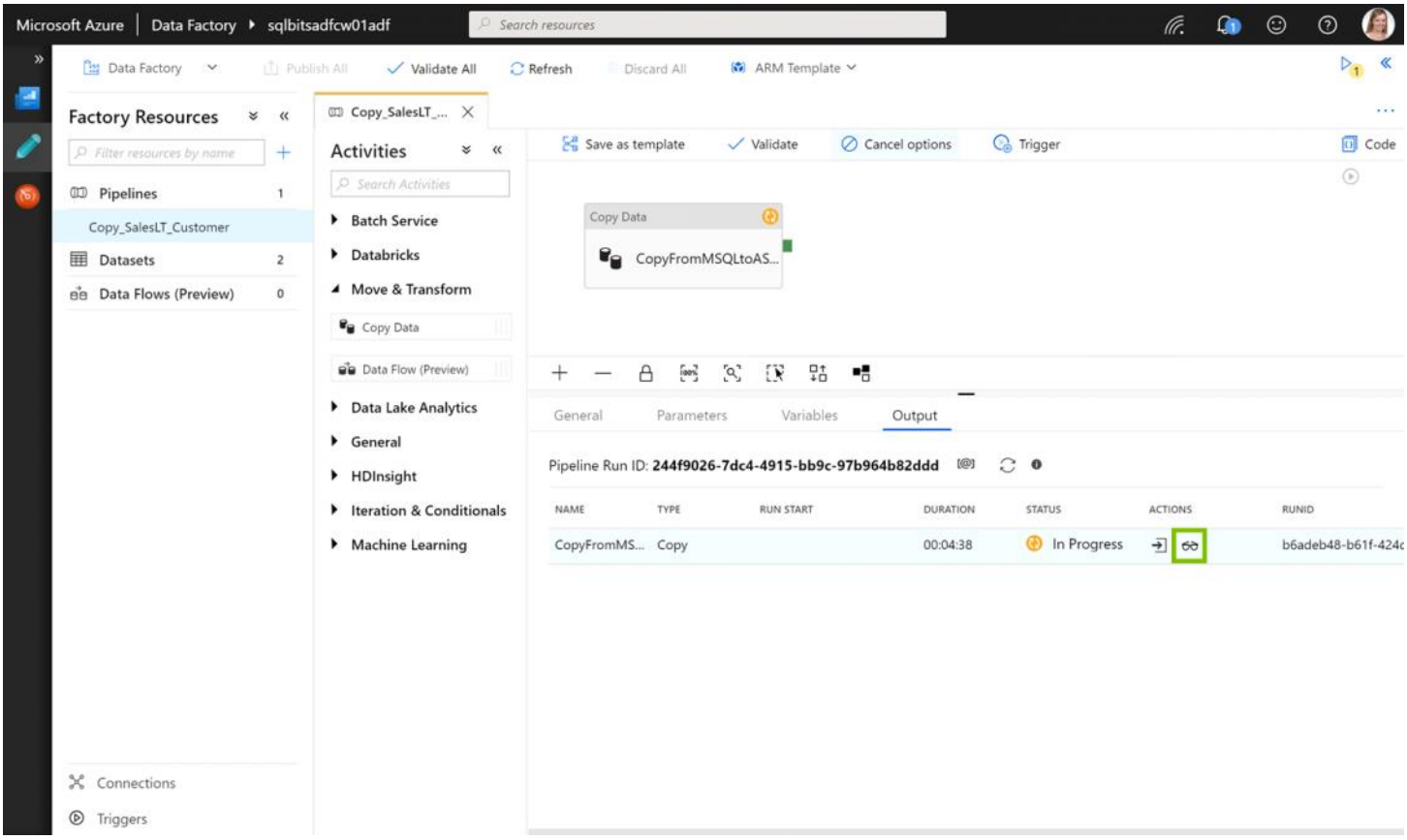
1. **Yellow tab bar**
2. **In Progress icon** on Copy Data activity
3. **View Active Debug Runs icon** in Azure Data Factory toolbar



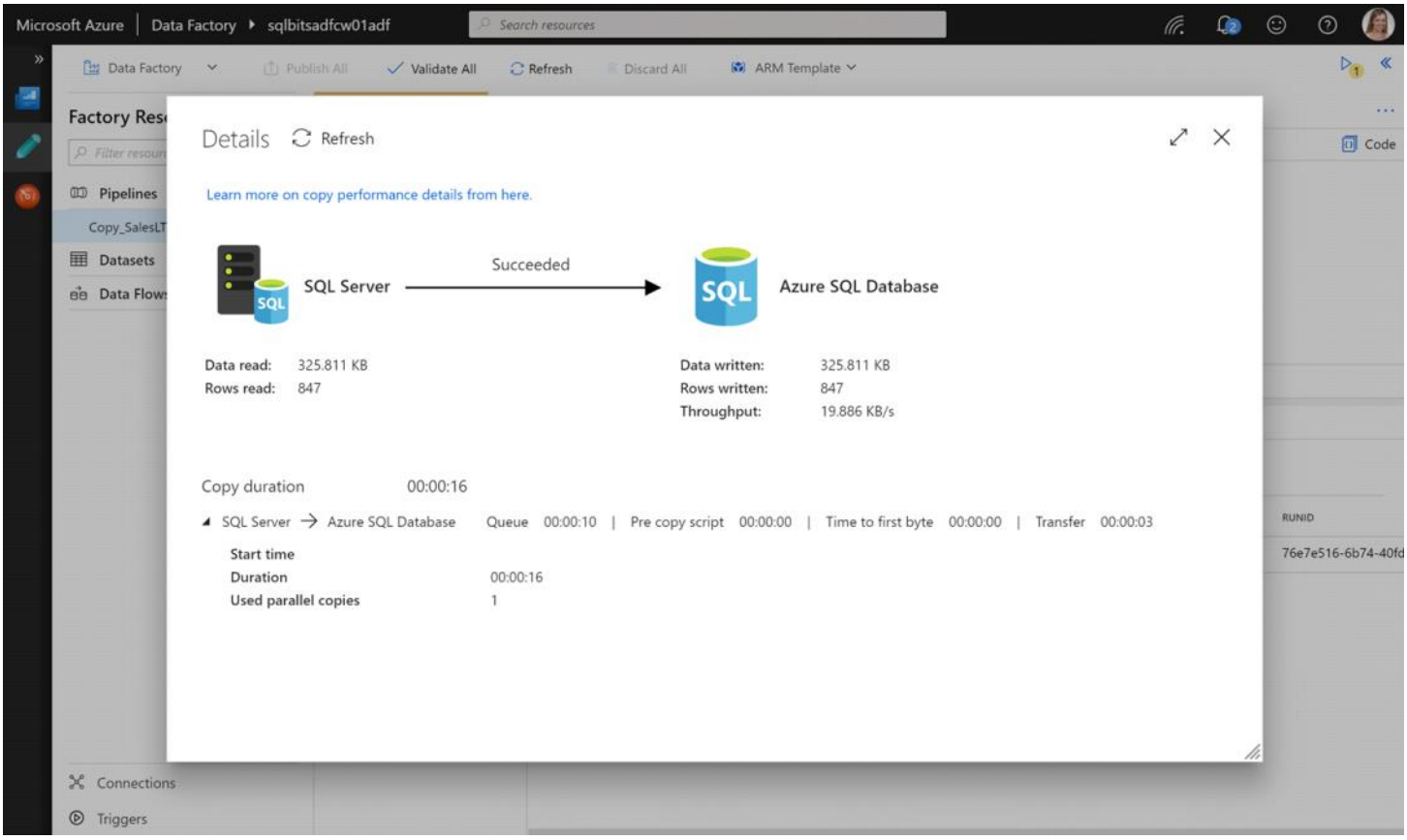
If you hover over the **information icon**, you will see helpful tips and explanations. In this case, it informs you that if the pipeline run takes longer than 5 minutes, you have to **manually refresh** to see the updated status.



If you click the **glasses icon**, you will see the details of the Copy Data activity.

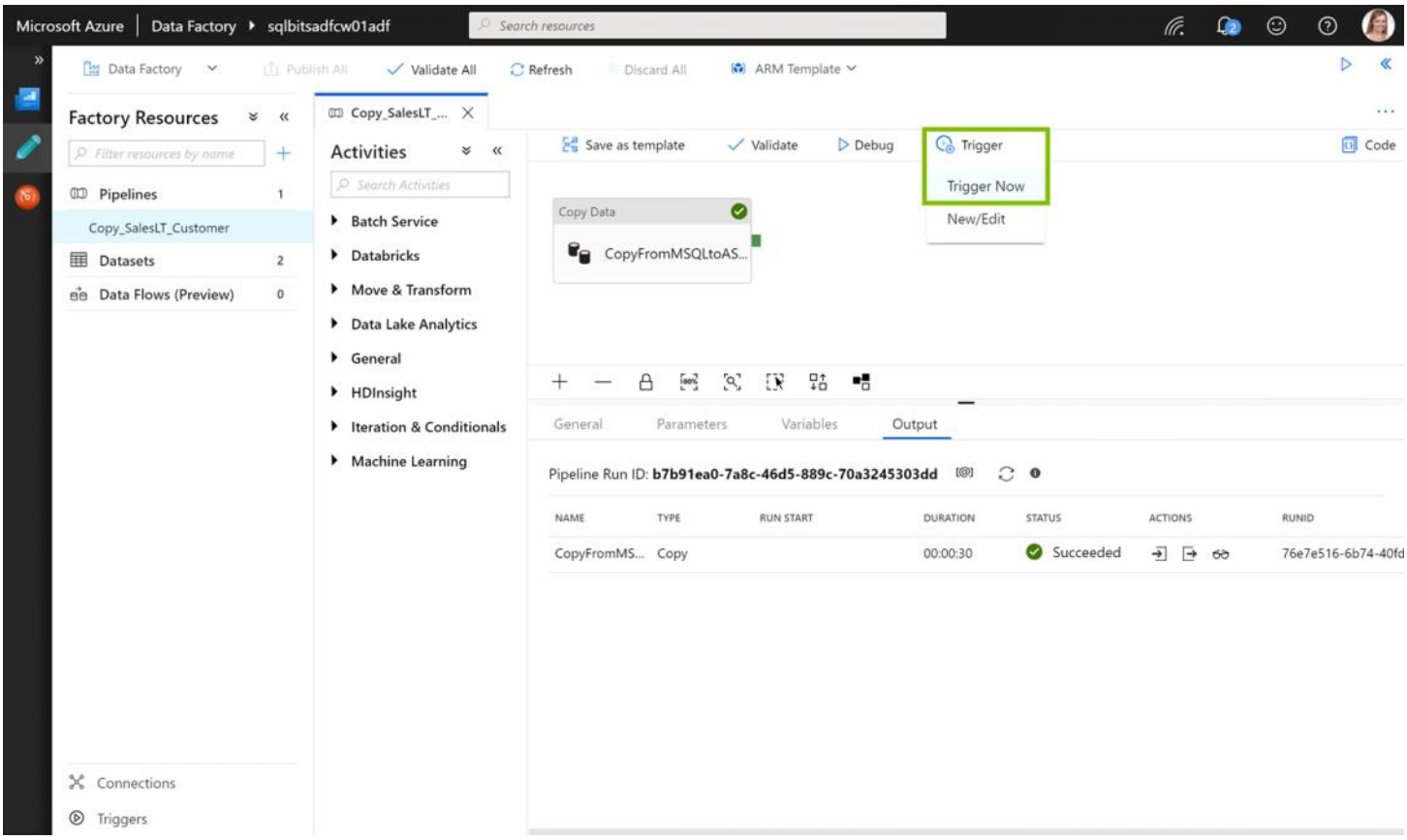


In the **Details** window, you can see information about performance, data and rows read / written, duration, and more. This will give you a good indication of the performance of your Copy Data activity. You can learn more about the Copy Data performance between various sources and sinks by clicking on the link.



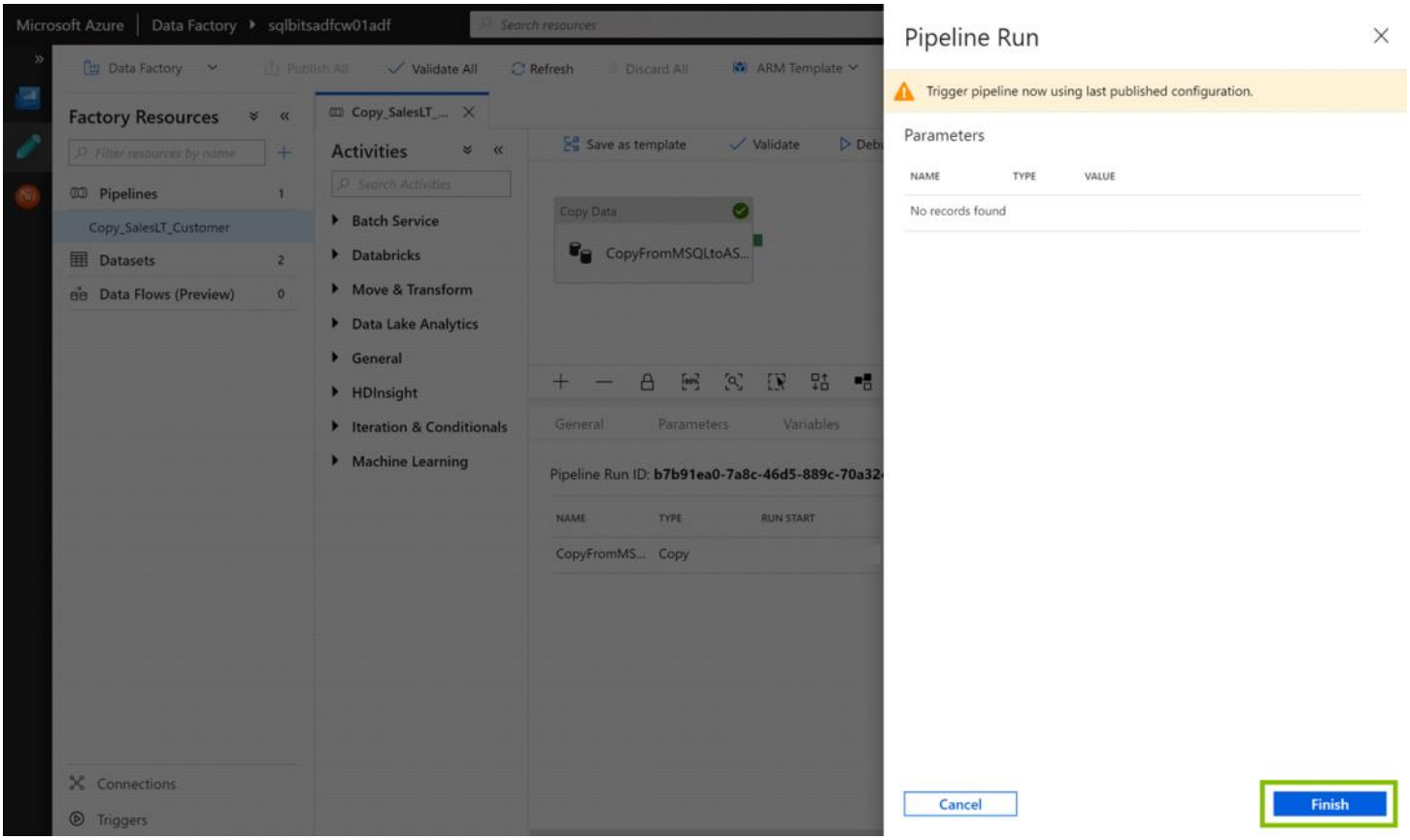
Trigger the Pipeline Manually

To trigger the pipeline manually, select Trigger on the pipeline toolbar, and then select Trigger Now.

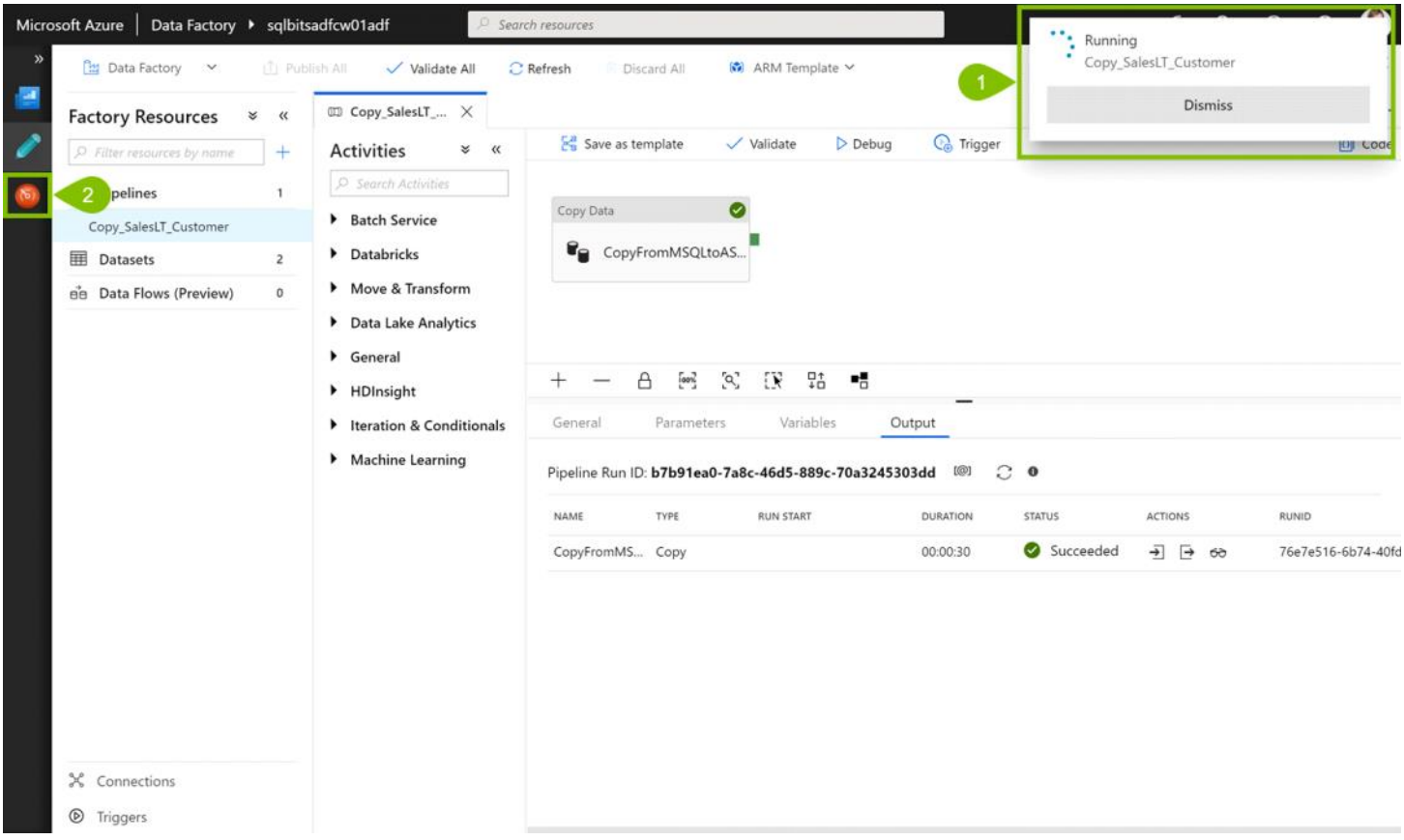


Notice the warning: "*Trigger pipeline now using last published configuration*". If you have unpublished changes in your pipeline, you must click **Publish All** before you can trigger a run of the new version. Otherwise, it will use the previously published version. Similarly, you have to publish a new pipeline before you can trigger a run of it.

Click **Finish**.

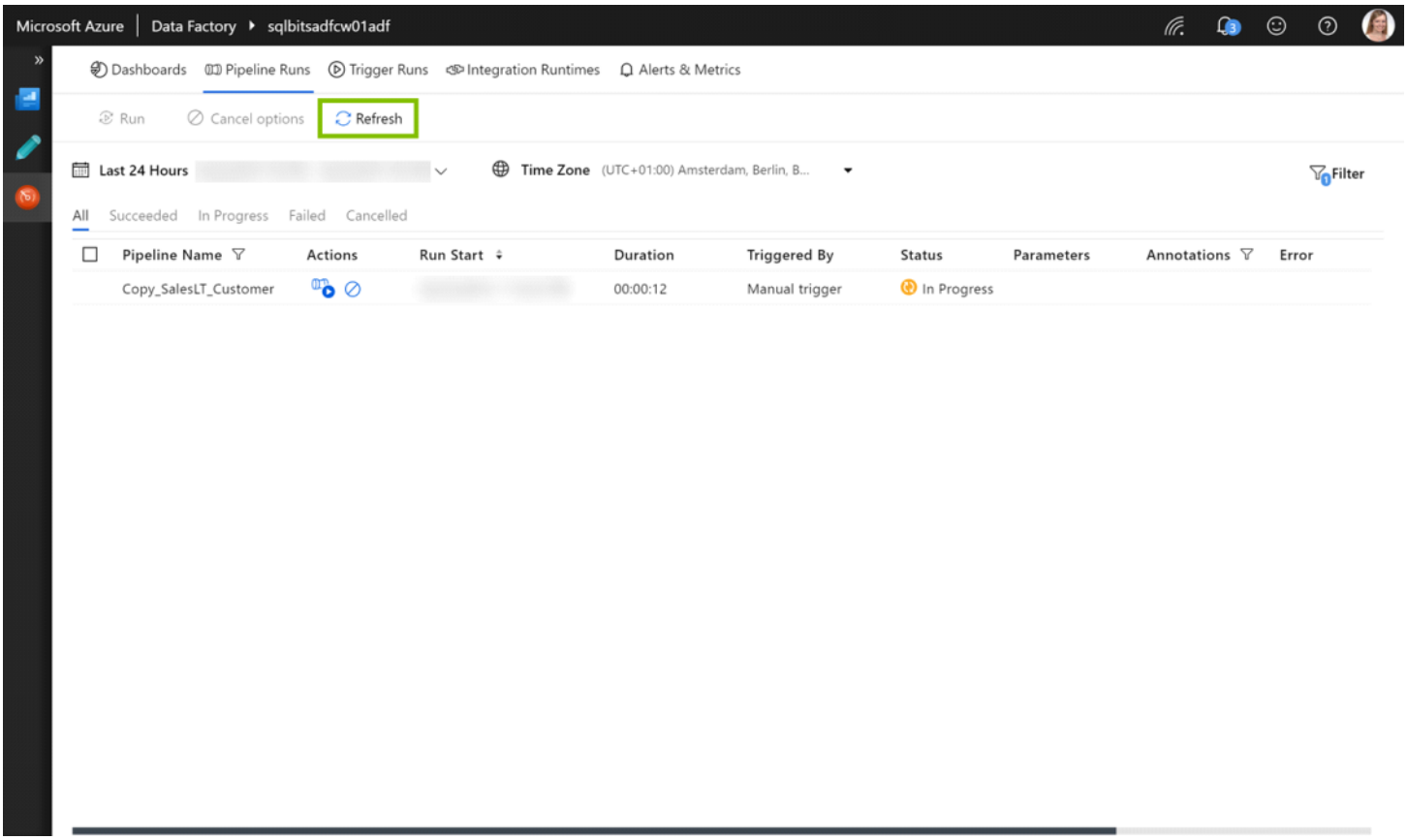


You will get a notification that the pipeline is **running**. Switch to **Monitor**.

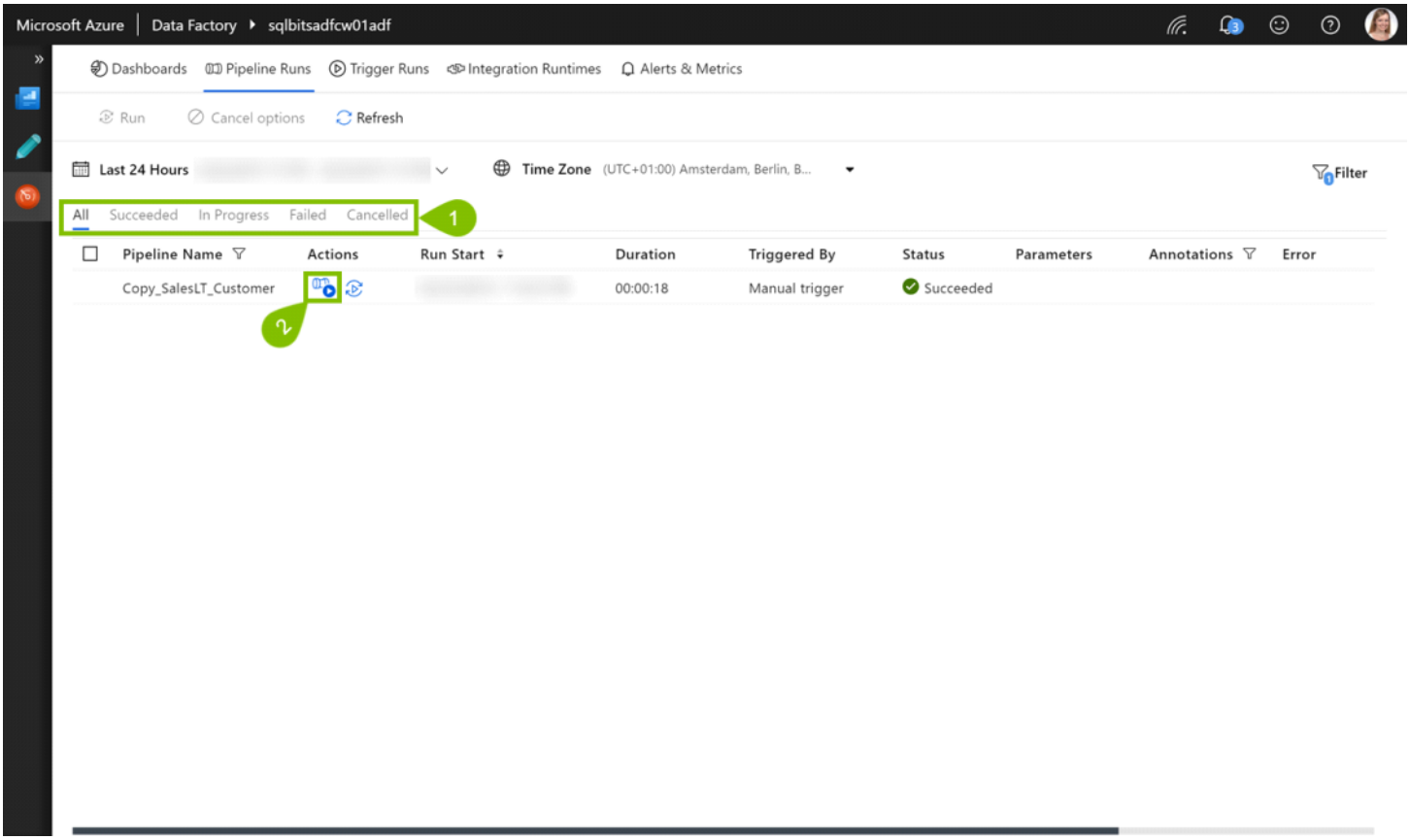


Monitor the Pipeline

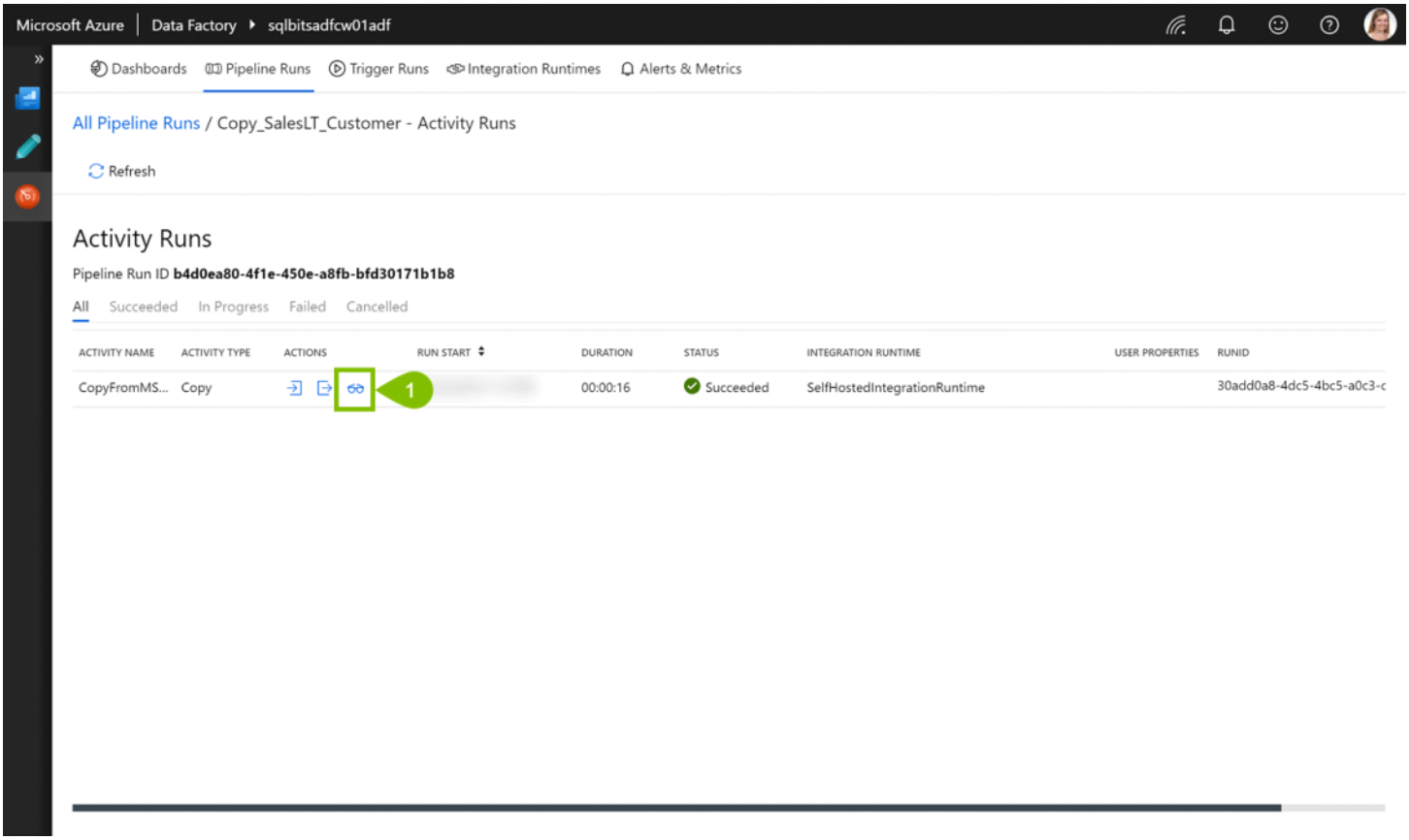
Under Pipeline Runs, you will see the status of the pipeline. Click **Refresh** to see an updated status.



Click the **All / Succeeded / In Progress / Failed / Cancelled** tabs to quickly filter the view. Click **View Activity Runs** to see the details.



To view details about the copy operation, select the Details (eyeglasses image) link in the Actions column. This will show you the same details as during debugging.



Activity Summary

You have now executed your first Pipeline. In the next lab, you will add parameters to make the pipeline dynamic, and continue building out your solution.

Lab 02: ADF Basics

Background and Goals

In Lab 01, we created a simple pipeline that copied data from a SQL Server source to an Azure SQL Database sink. In a typical big data pipeline, we need to perform this task many times over to copy data from all the source tables. Ideally, we want to eliminate the need to build redundant pipelines.

In this lab, you will learn how to build on the basics to create parameterized, dynamic, and reusable pipelines. These techniques are foundational to applying more advanced patterns in Azure Data Factory.

Prerequisites

In order to complete this lab, you will need to have previously completed Lab 01.

Overview

Activity 01: Adding Pipeline Parameters

- Create Folder
- Clone, Rename, and Move Pipelines
- Create Pipeline Parameters
- Use Pipeline Parameters in Activities
- Validate and Execute Pipelines

Activity 02: Copying Data From File Based Stores

- Upload files to Azure Data Lake Storage Gen1 using Azure Data Explorer
- Create new Datasets
- Create new Pipelines
- Publish and Debug Pipelines

Activity 03: Creating a Master Pipeline

- Create Precedence Constraints
- Execute Other Pipelines
- Trigger Pipelines

Activity 01: Adding Pipeline Parameters

Activity Overview

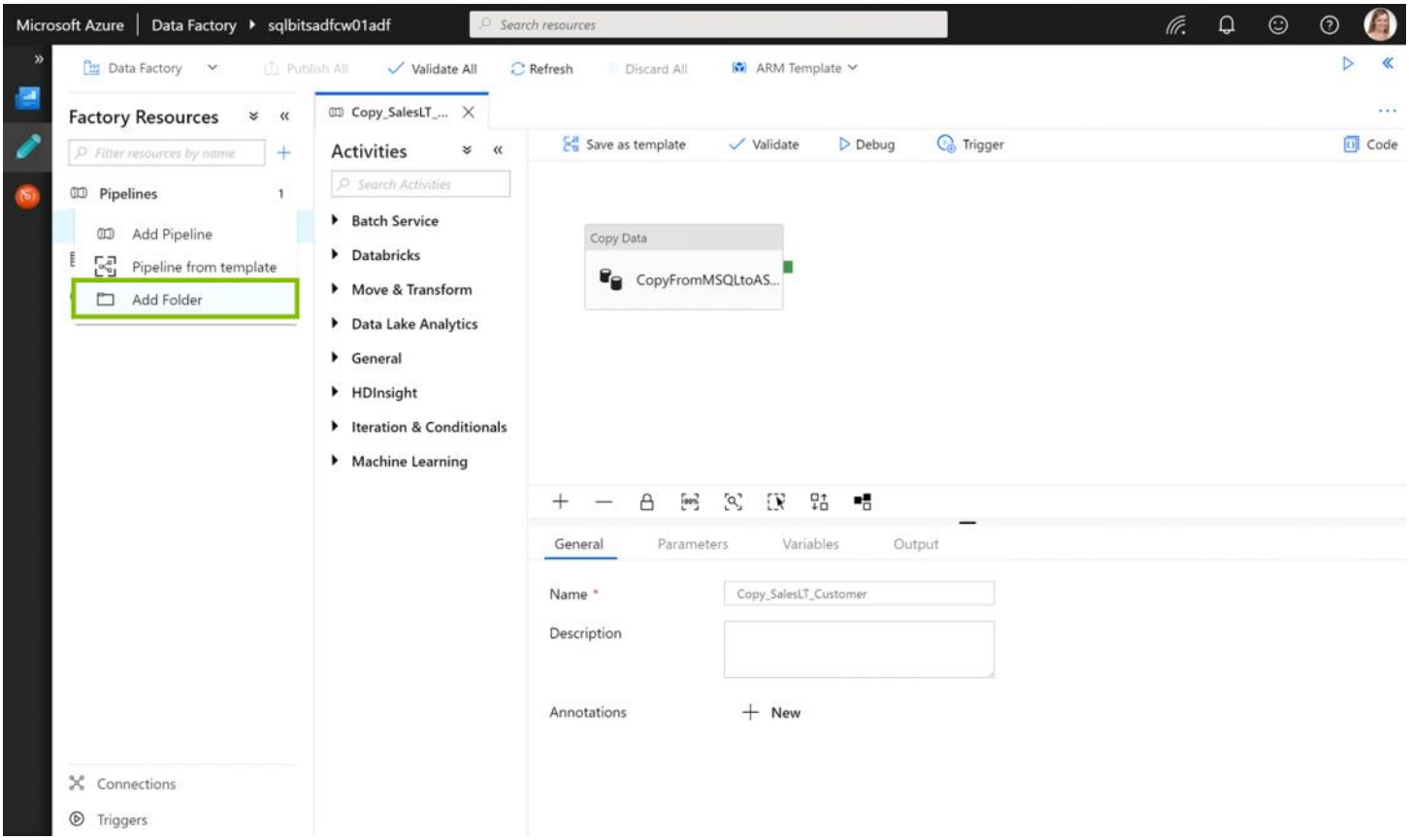
Estimated time to complete activity: **10 minutes**.

In Lab 01, we created a simple pipeline that copied data from a SQL Server source to an Azure SQL Database sink. In a typical big data pipeline, we need to perform this task many times over to copy data from all the source tables. Ideally, we want to eliminate the need to build redundant pipelines.

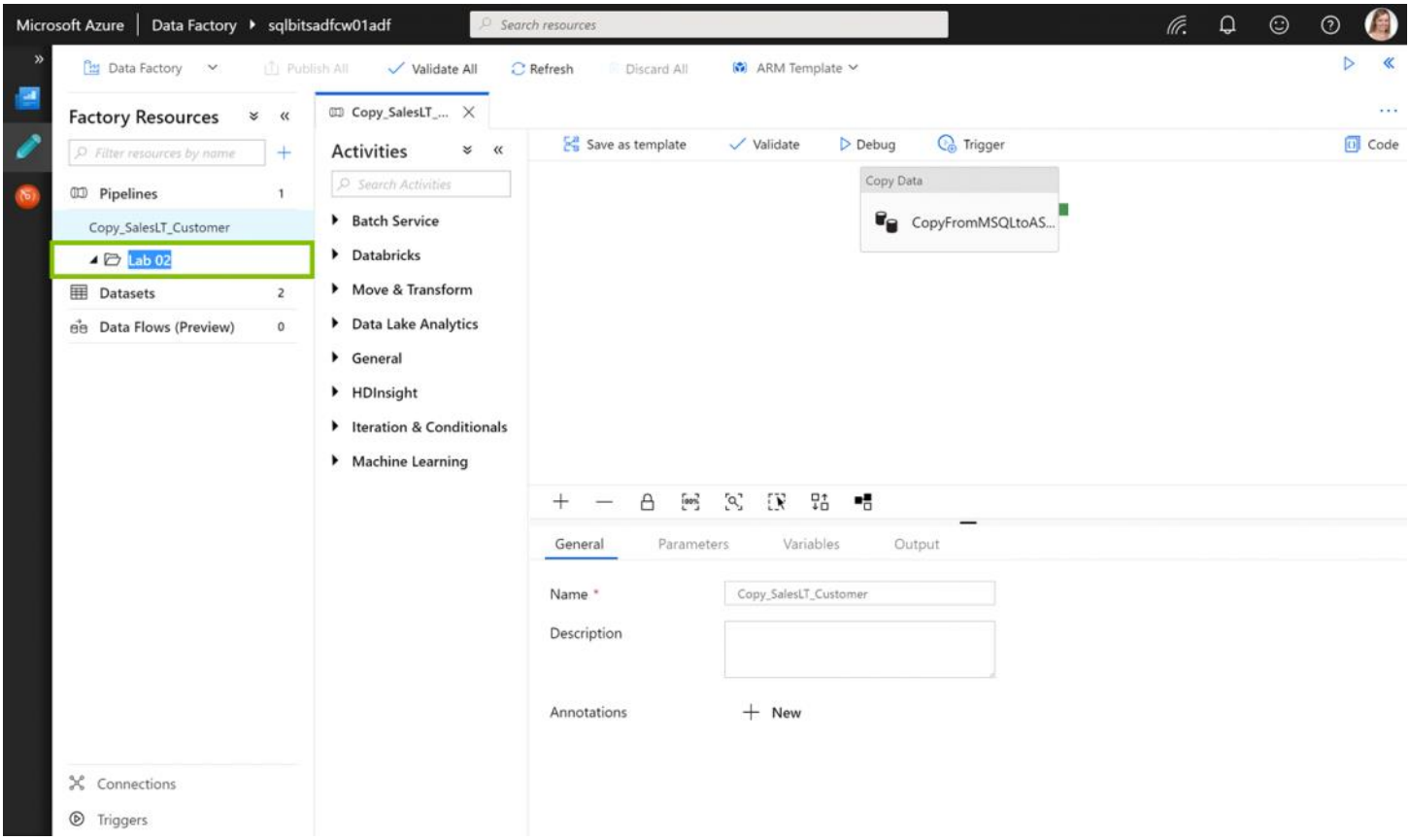
In this activity, we will create pipeline parameters to implement dynamic behavior. This technique is foundational to applying more advanced patterns in Azure Data Factory.

Create a New Folder

Under Factory Resources, hover over Pipelines until the ellipsis shows up, click it, then click **Add Folder**.

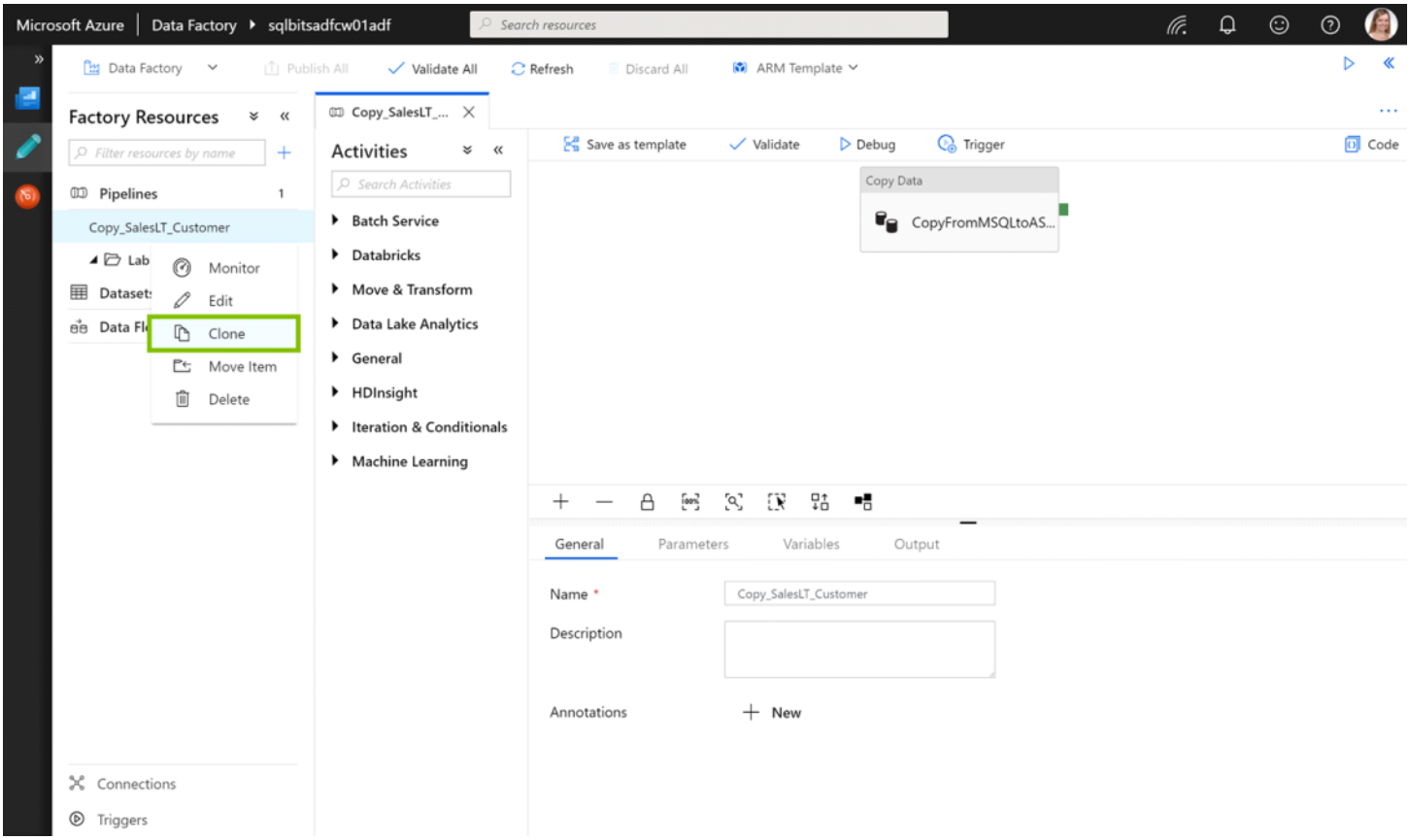


Name the folder **Lab 02.**

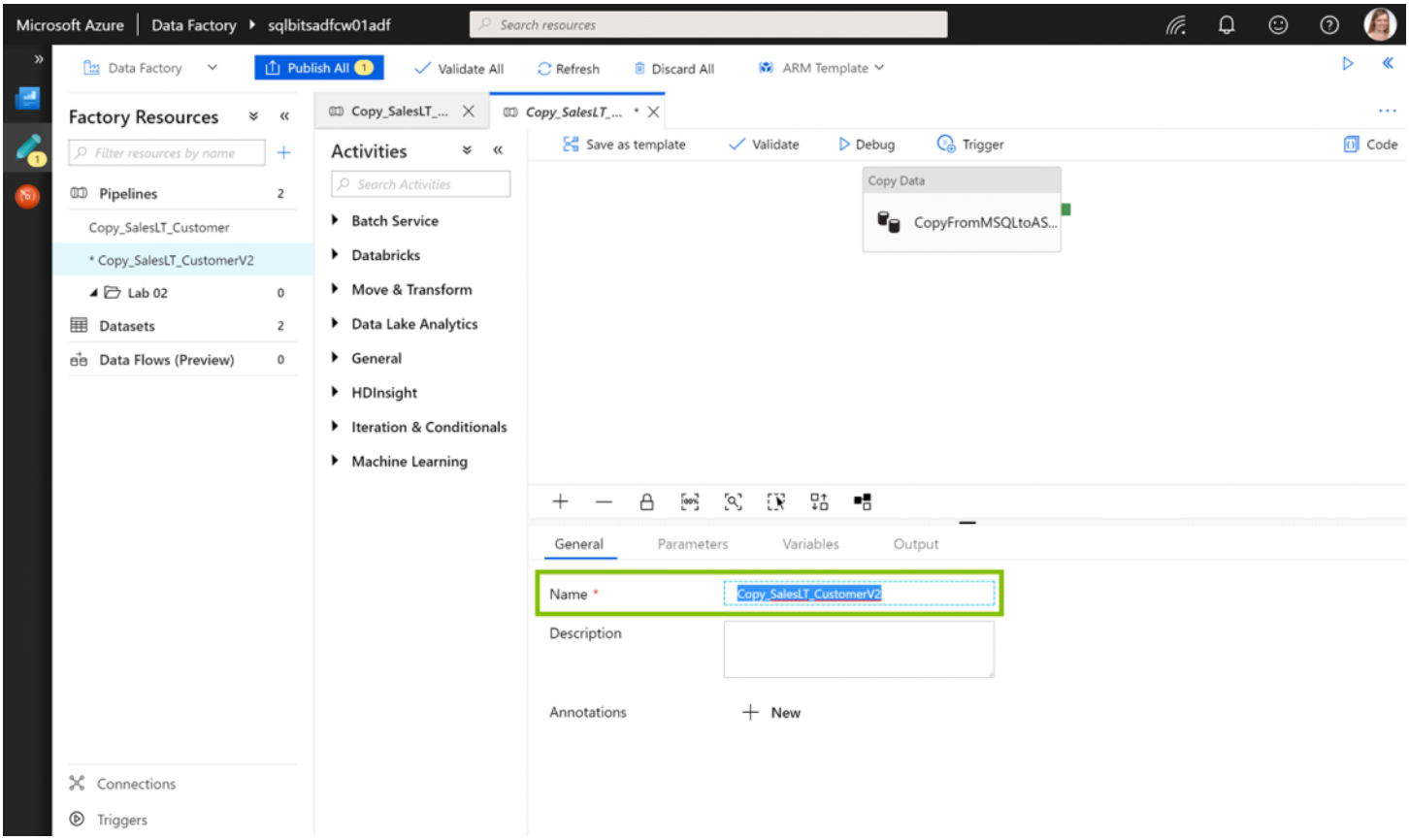


Clone, Rename, and Move the Existing Pipeline

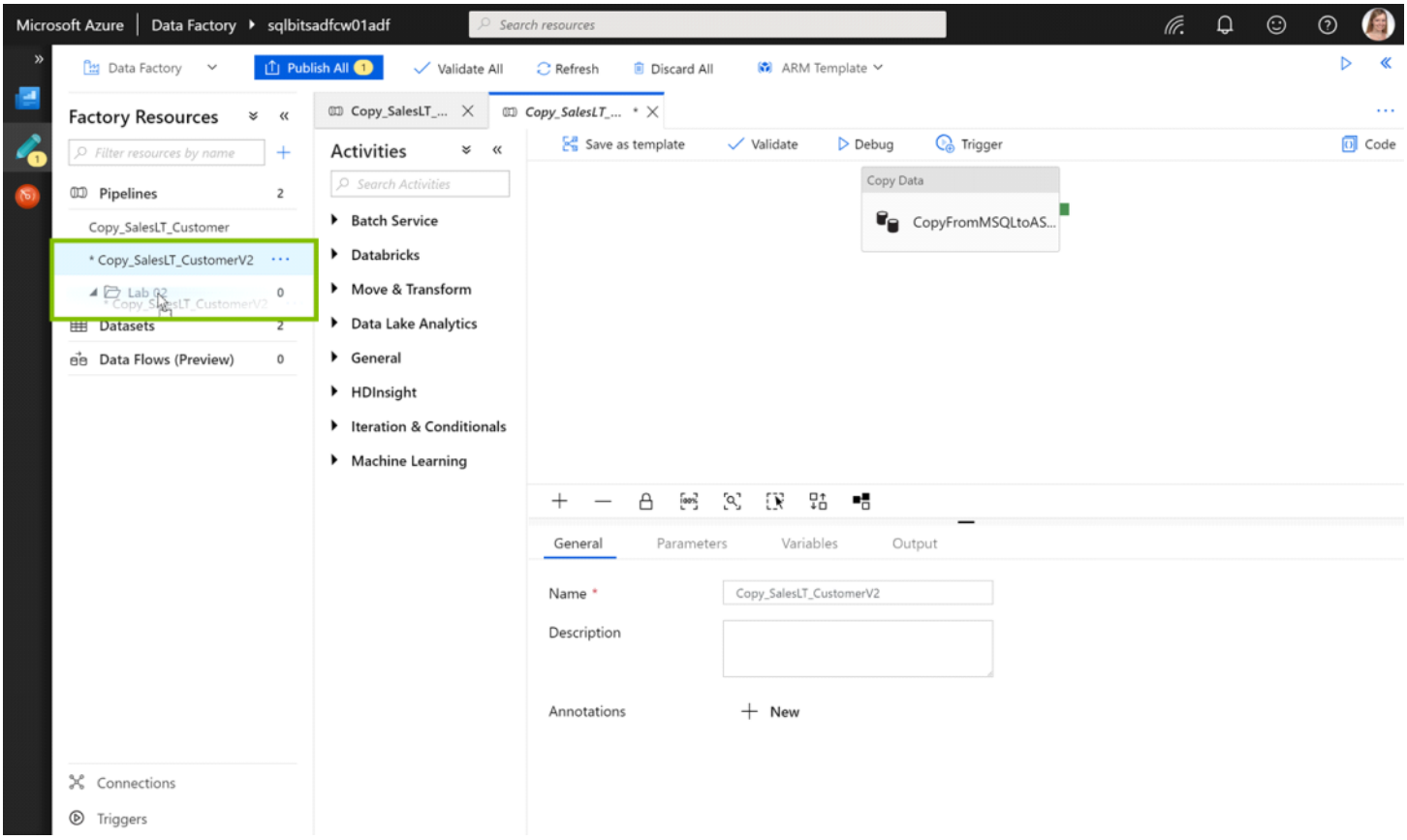
Hover over the **Copy_SalesLT_Customer** pipeline until the ellipsis shows up, then click **Clone**.



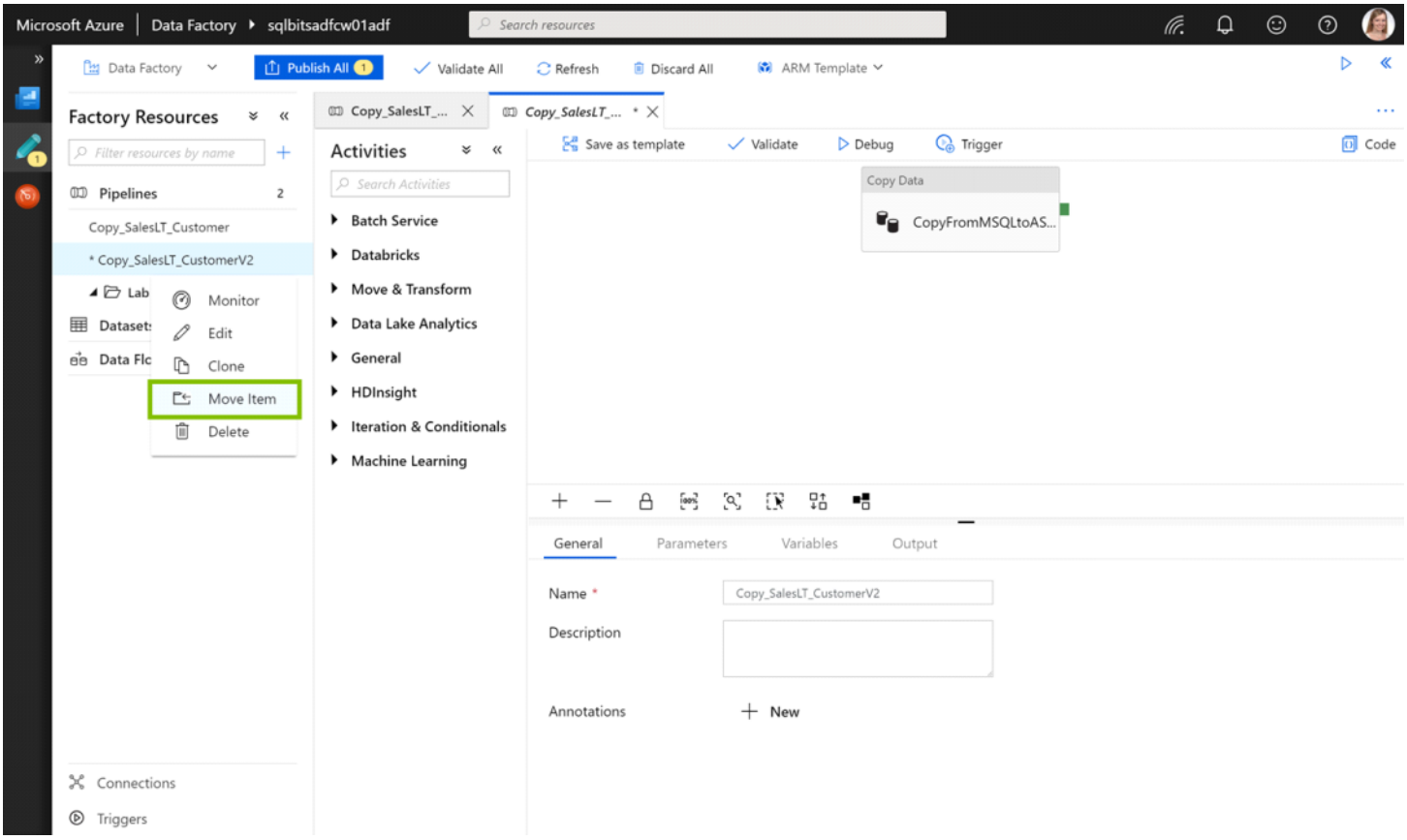
The new pipeline will get the default name **pipeline1** and will be automatically opened. Rename the pipeline to **Copy_SalesLT_CustomerV2.**

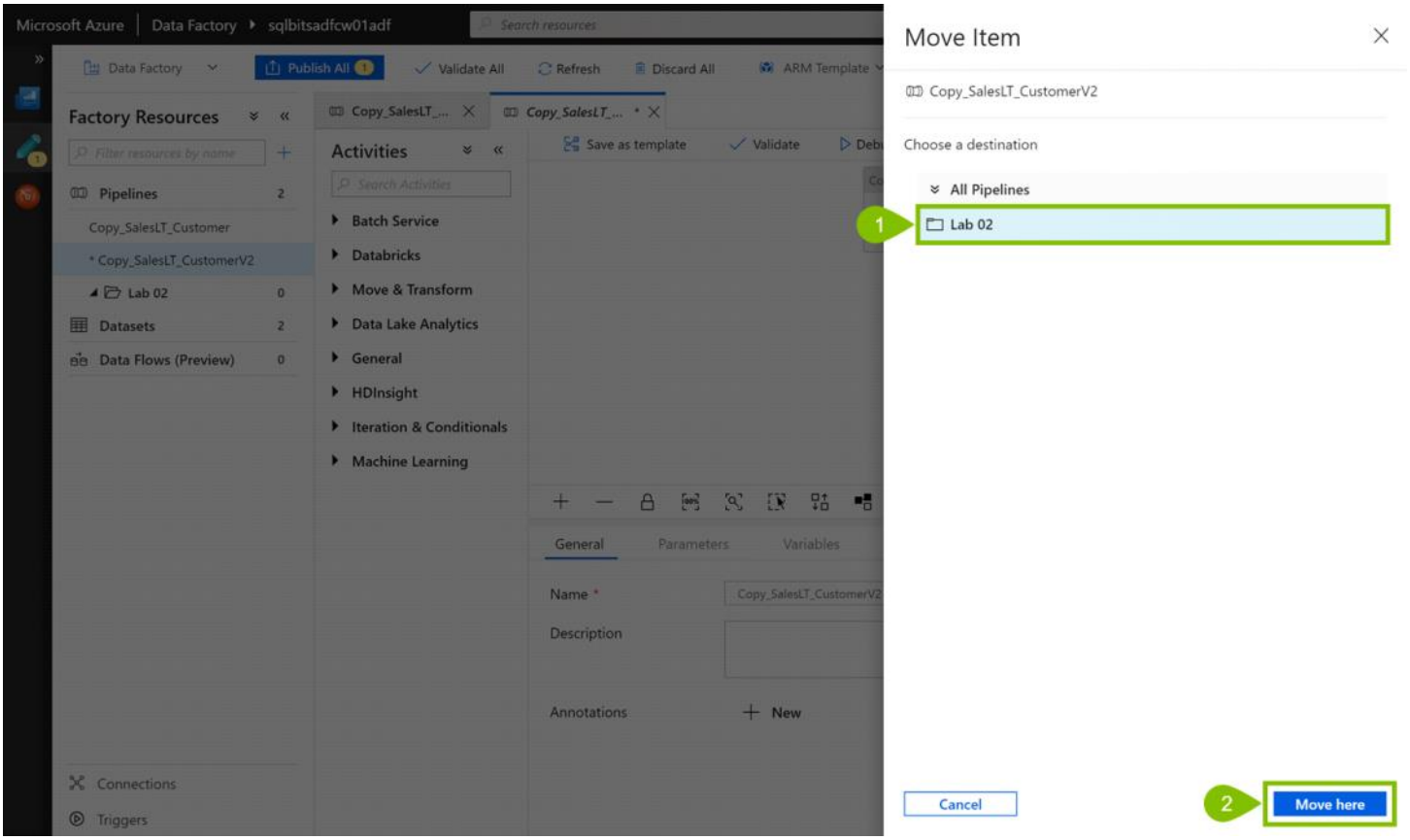


Move the new pipeline into the **Lab 02** folder by dragging and dropping it onto the folder name.



If you prefer, you can use the **Move Item** option instead. This is a very useful option once you add more factory resources, as dragging and dropping *can* be difficult when you have to scroll up and down.





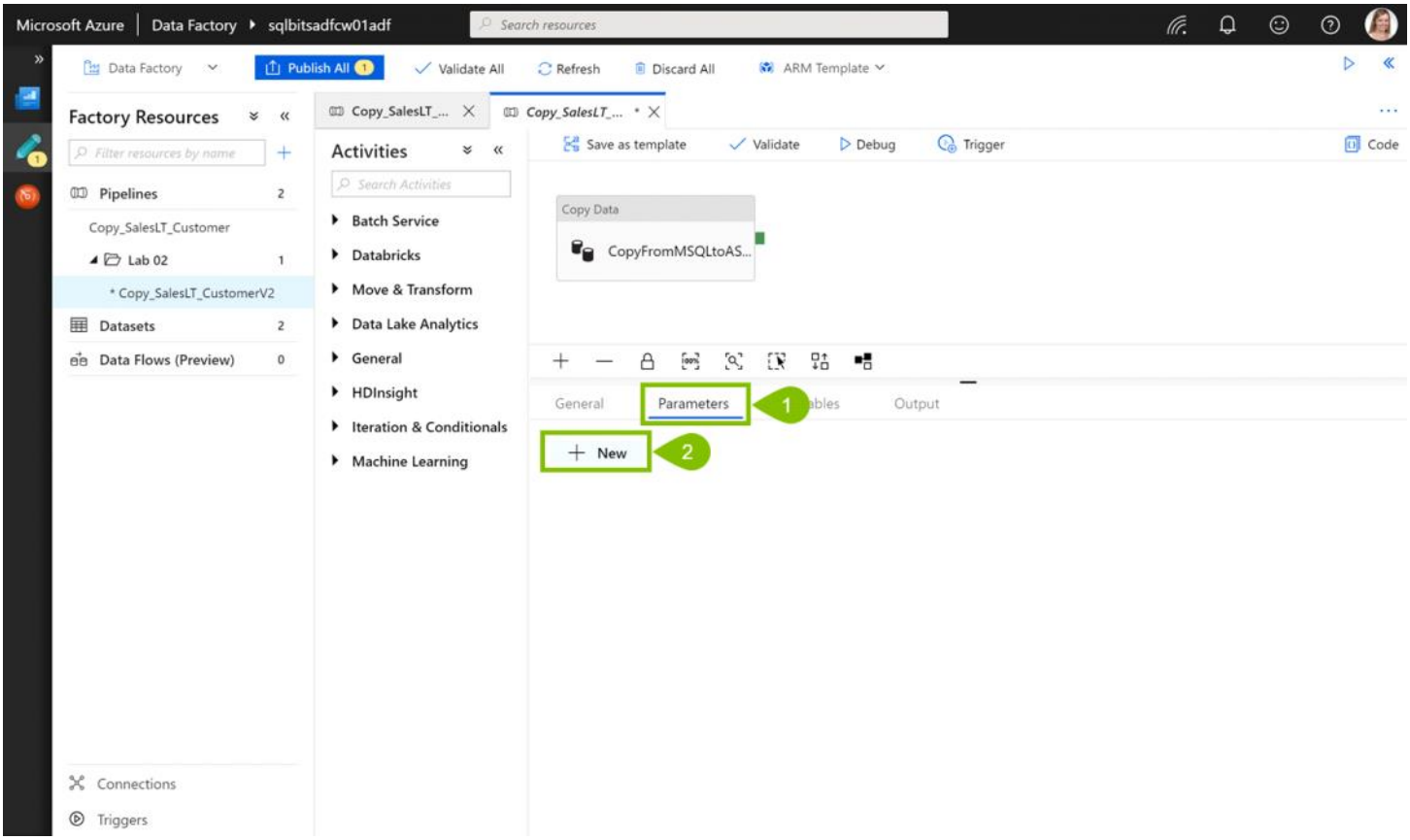
Add Pipeline Parameters

There are two ways to create pipeline parameters. One is fairly straightforward, while the other can be easy to miss. To familiarize you with both approaches, we will demonstrate both in this step. The result should be that your pipeline has the following two parameters:

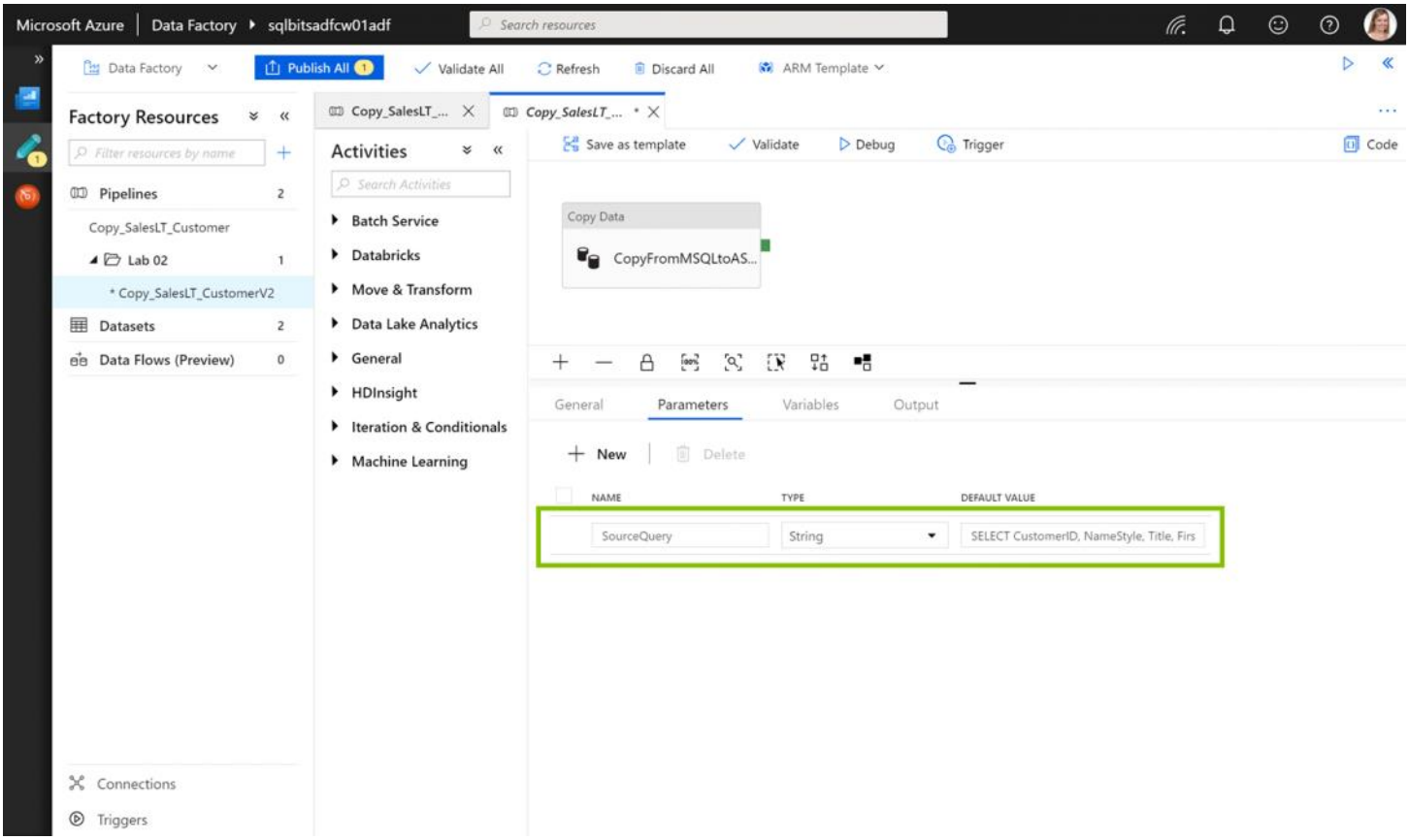
Parameter	Name	Type	Default Value
1	SourceQuery	String	`SELECT CustomerID, NameStyle, Title, FirstName, MiddleName, LastName, Suffix, CompanyName, SalesPerson, EmailAddress, Phone, PasswordHash, PasswordSalt, CAST(rowguid as NVARCHAR(50)) AS rowguid, ModifiedDate FROM SalesLT.Customer`
2	SinkPreCopyScript	String	`TRUNCATE TABLE [AWLTSRC].[SalesLT_Customer]`

Create Pipeline Parameter from Pipeline

We will create the first parameter from the pipeline. Click anywhere on the pipeline design surface (outside the Copy Data activity) and choose the **Parameters** tab. We will create the first parameter this way, so click **+ New** once.



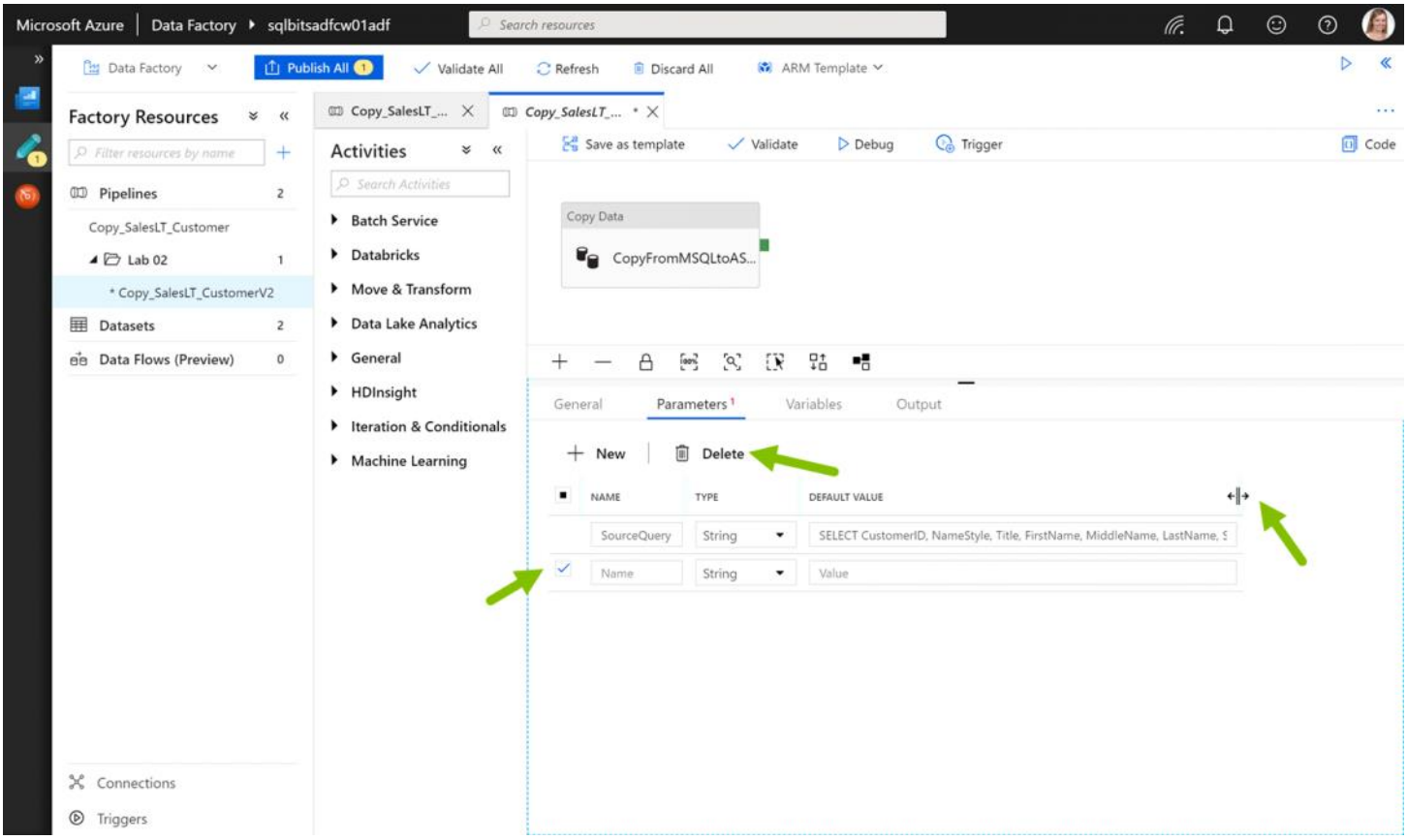
Add the **SourceQuery** parameter.



While you are in the Parameters tab, familiarize yourself with the UI by trying the following:

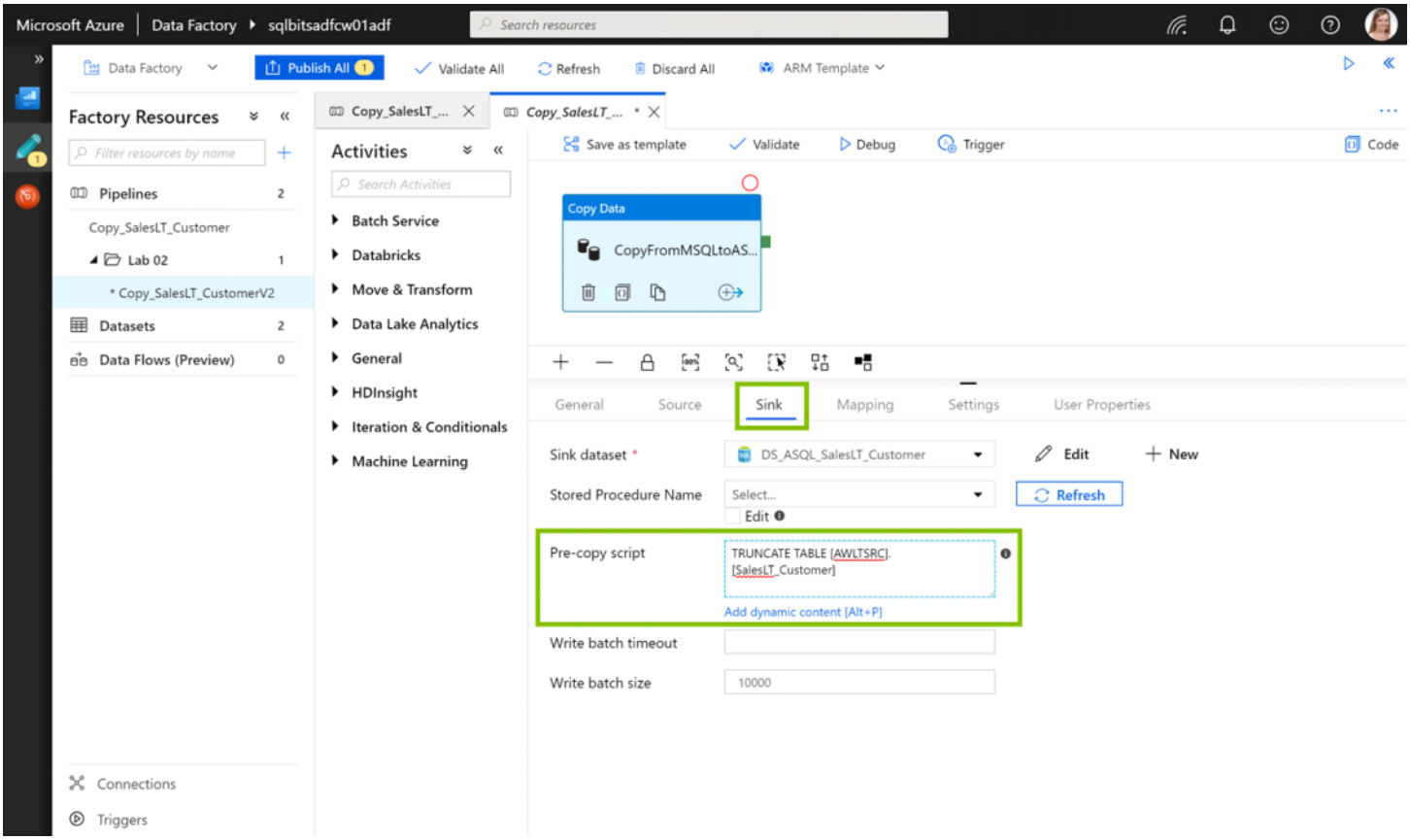
- Create a new parameter, then delete it. (*Use the checkbox.*)

- Resize the parameter columns. (*Hover over Name / Type / Default Value*)

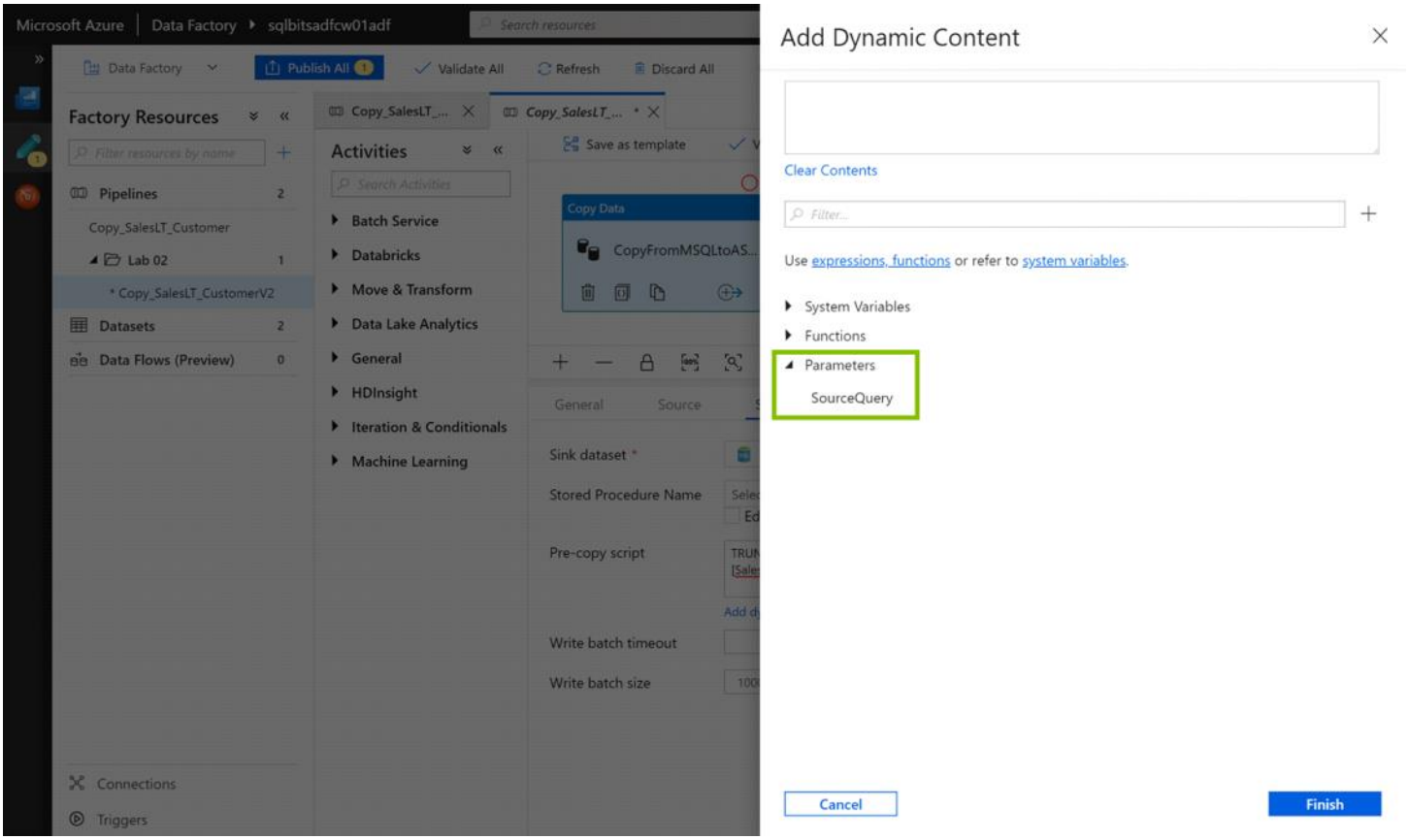


Create Pipeline Parameter from Activity

We will create the second parameter from the **Copy Data activity**. Click on the activity and choose the **Sink** tab. Then, click inside the **Pre-copy Script** box and Notice that a new link shows up: **Add dynamic content [Alt+P]**.

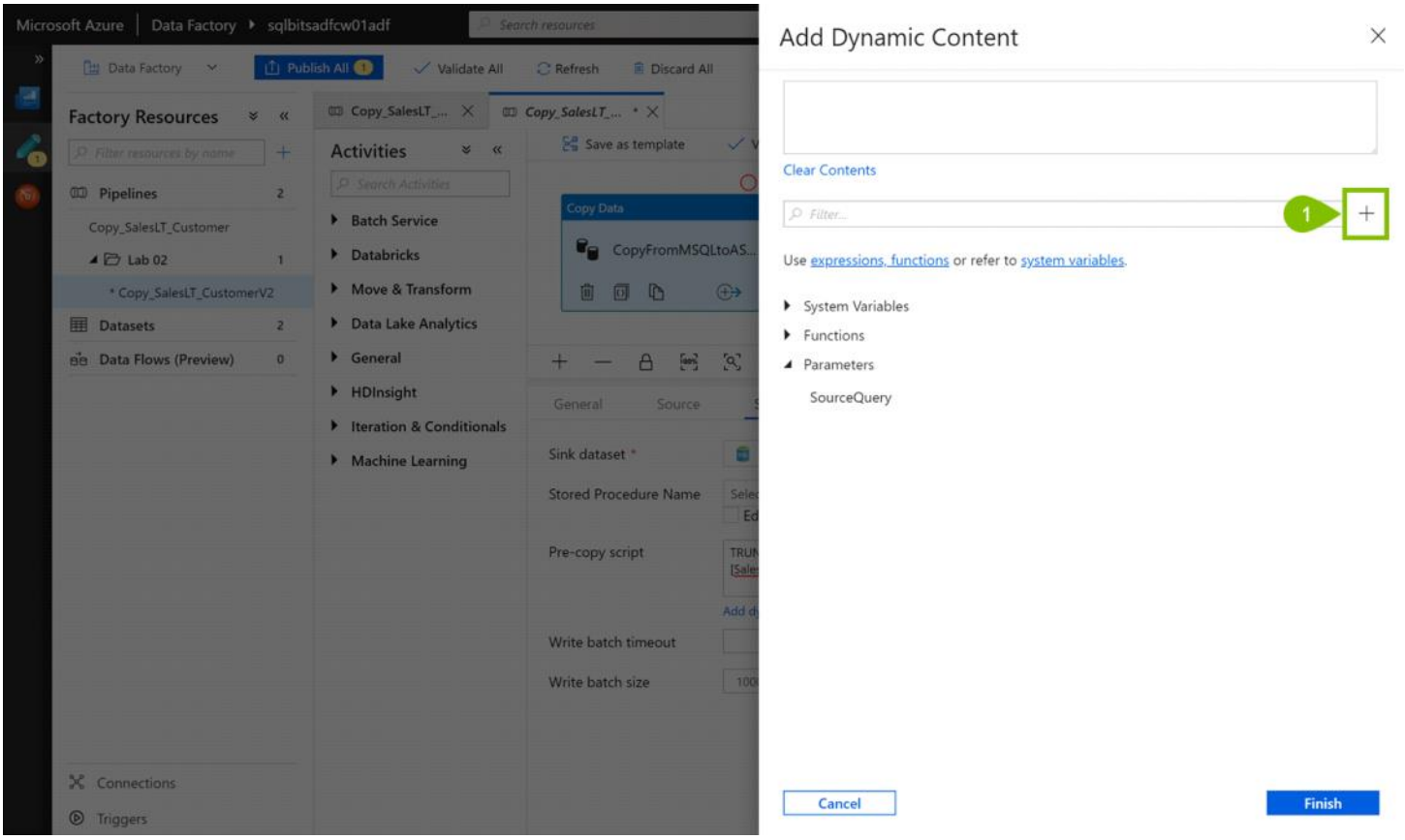


Click on the **Add dynamic content** link, or press **Alt+P**. The Add Dynamic Content pane will open, and you will see the previously created parameter listed.

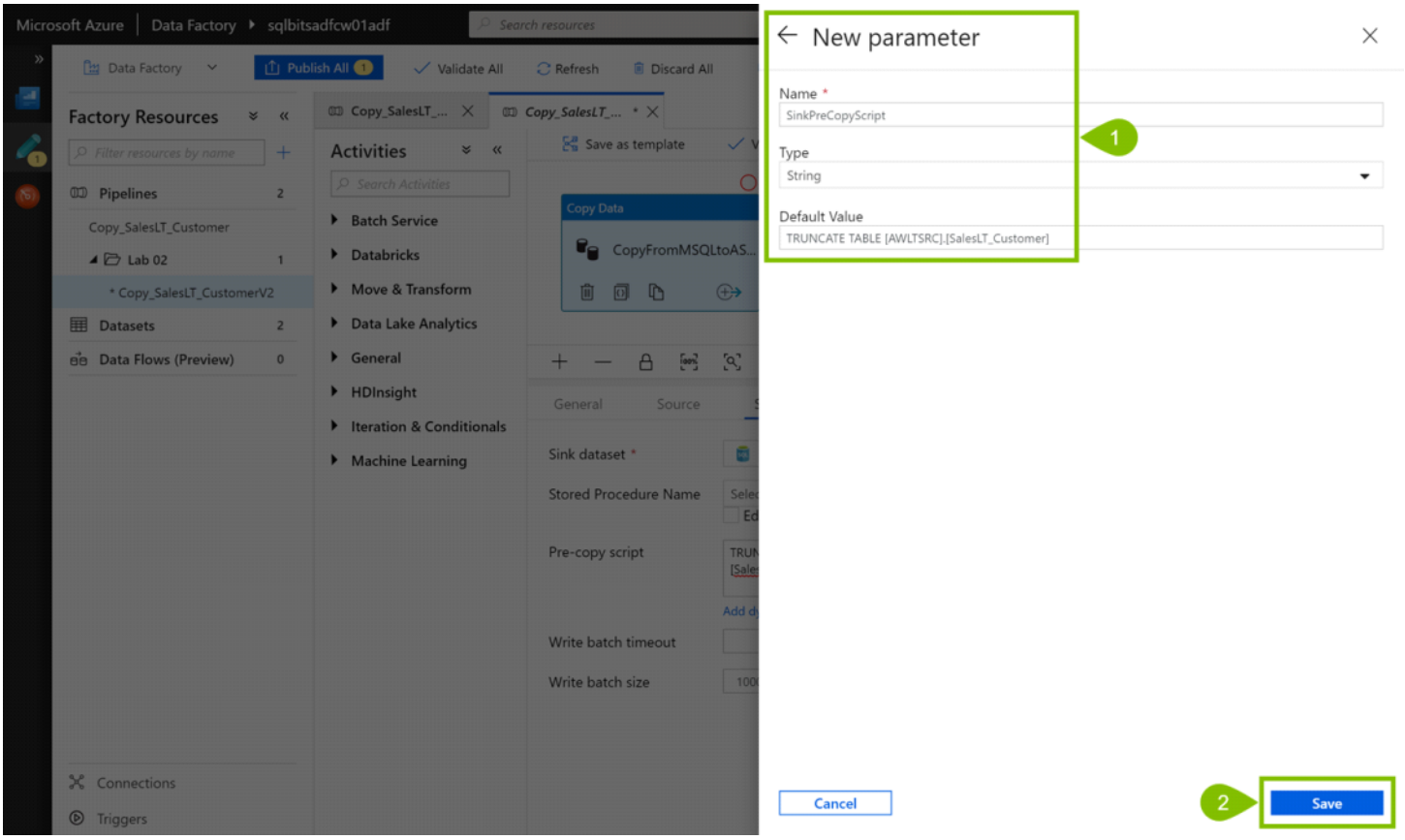


Next to Filter, you will see a **+**. This is very easy to miss, but you can actually create a new parameter

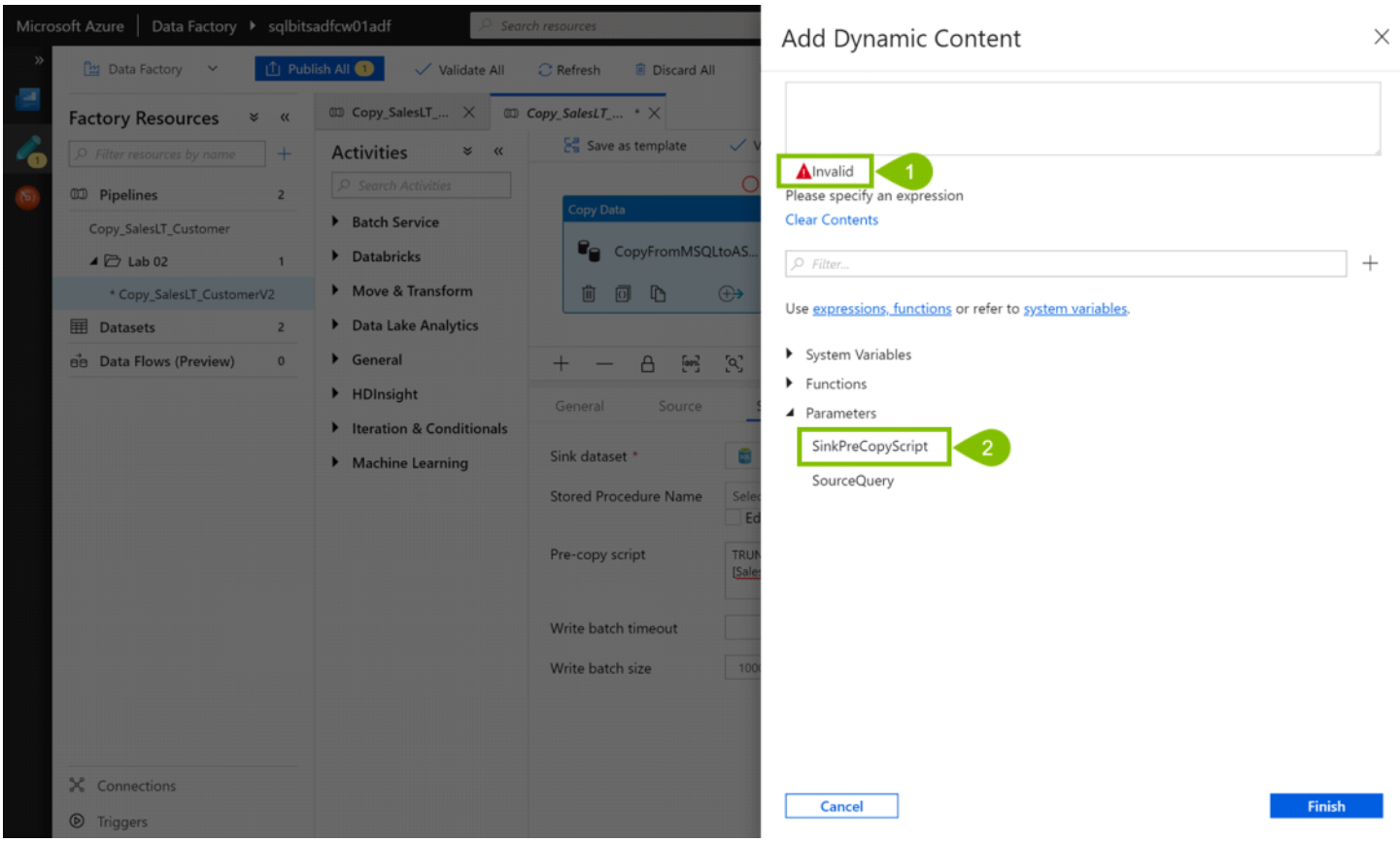
from here! Click the **Plus Sign**.



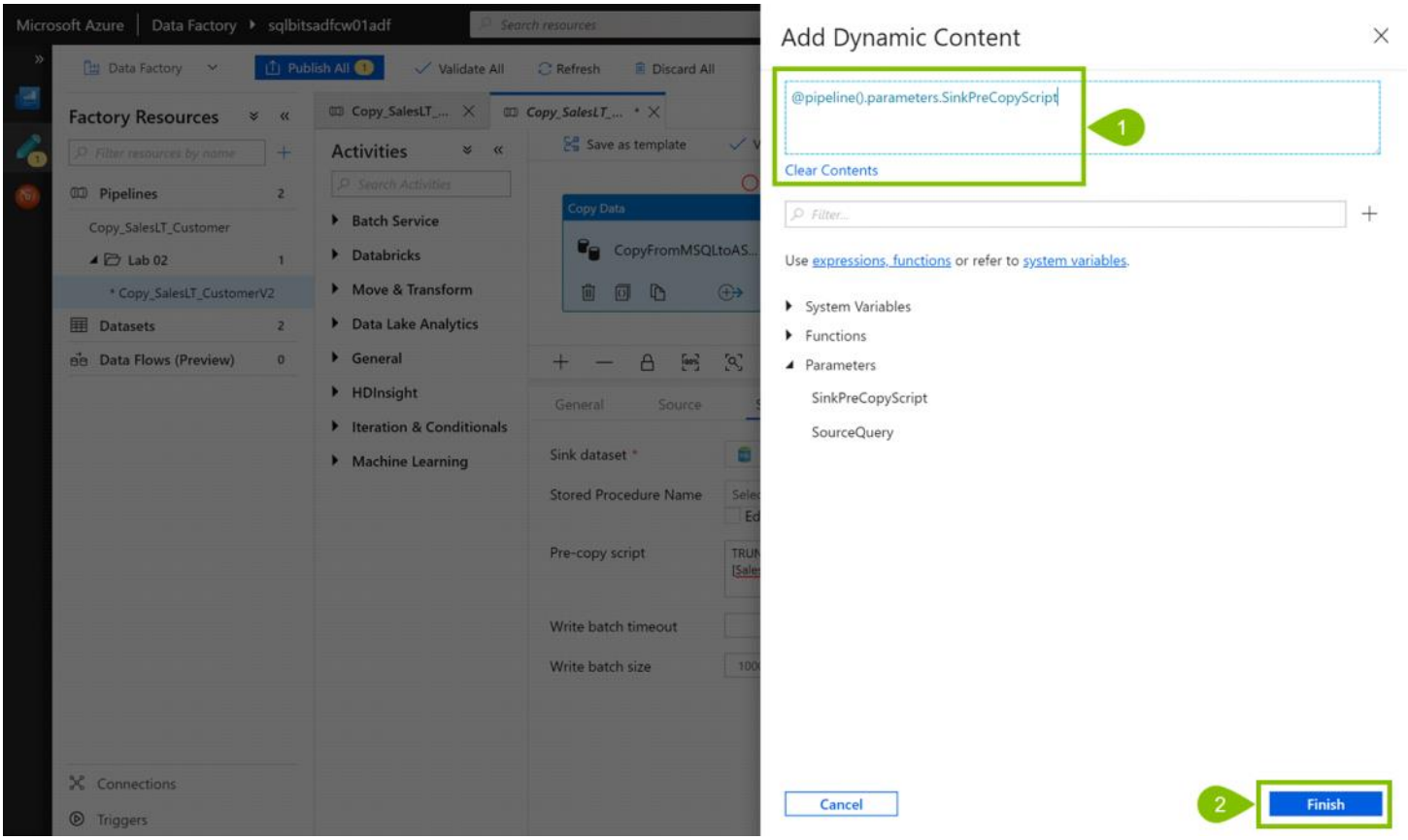
In the New Parameter pane, create the **SinkPreCopyScript** parameter. Click Save.



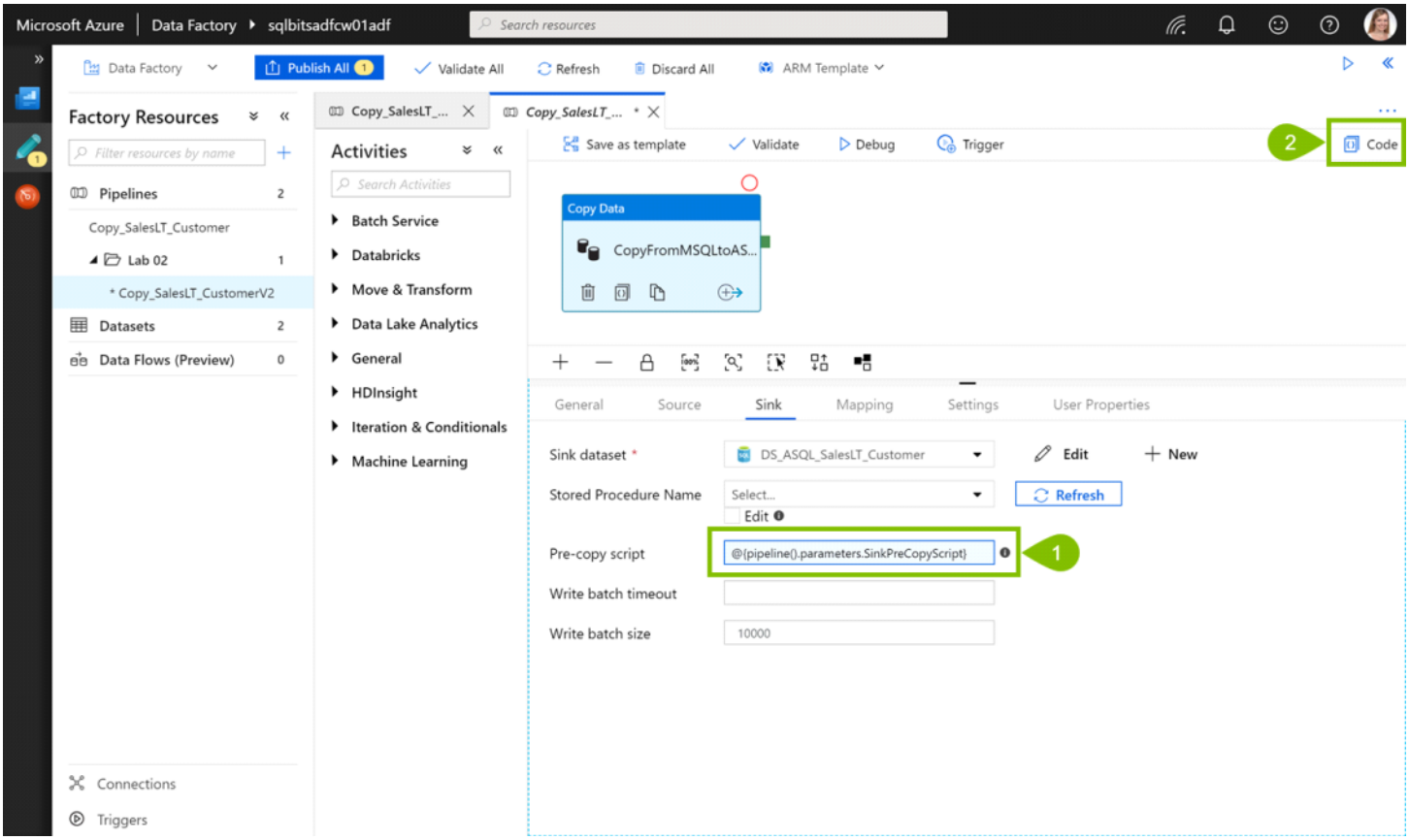
The parameter will get saved, but it will not be added to the dynamic content automatically, so you will see an **Invalid** warning. Click the new **SinkPreCopyScript** parameter to add it.



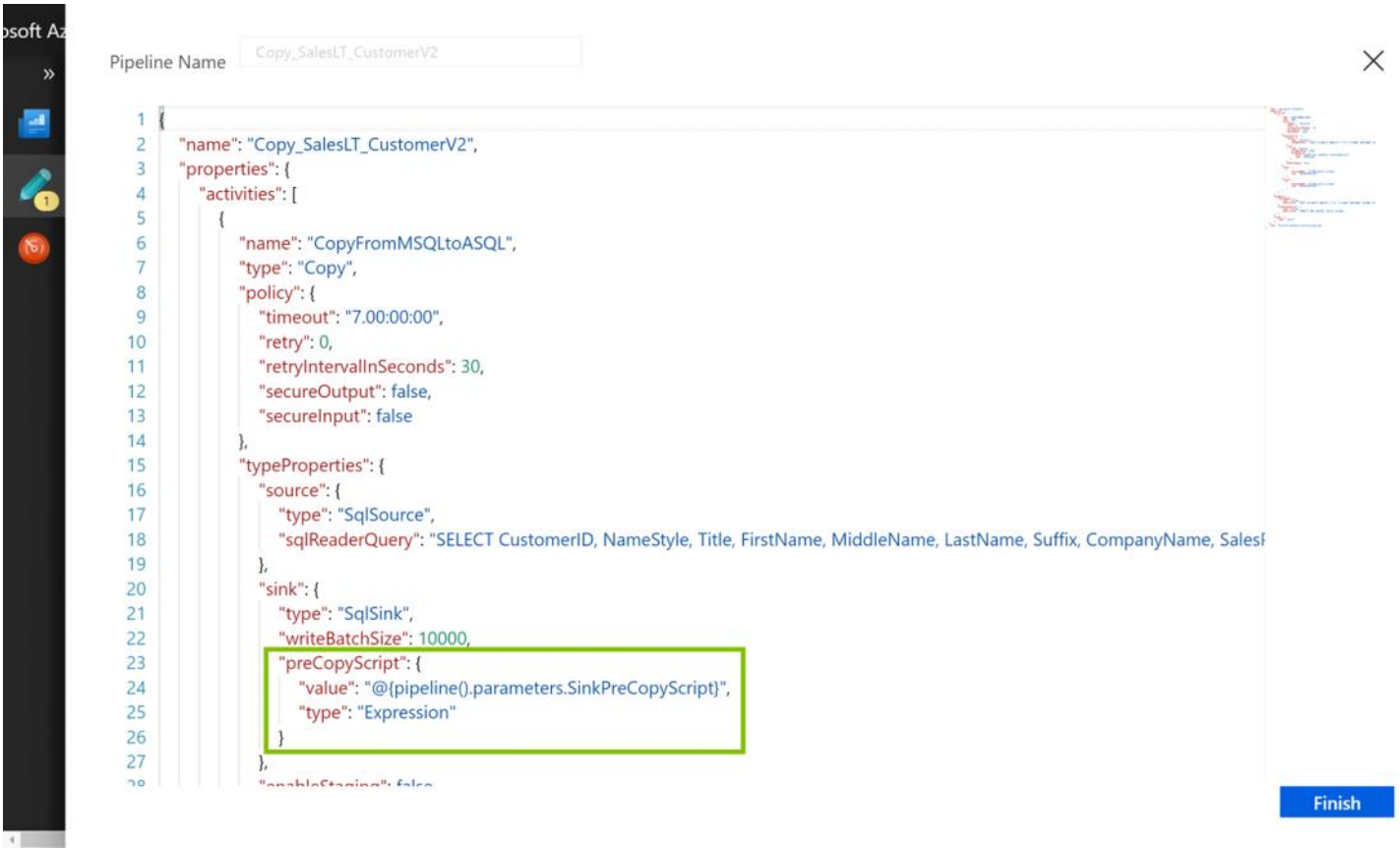
You will now see the **@pipeline().parameters.SinkPreCopyScript** syntax, and the text and text box turns blue. Click **Finish**.



Notice that the Pre-copy script box has now **turned blue**. This means that you are using dynamic content. You can also click on the **Code** to verify that you are using dynamic content.

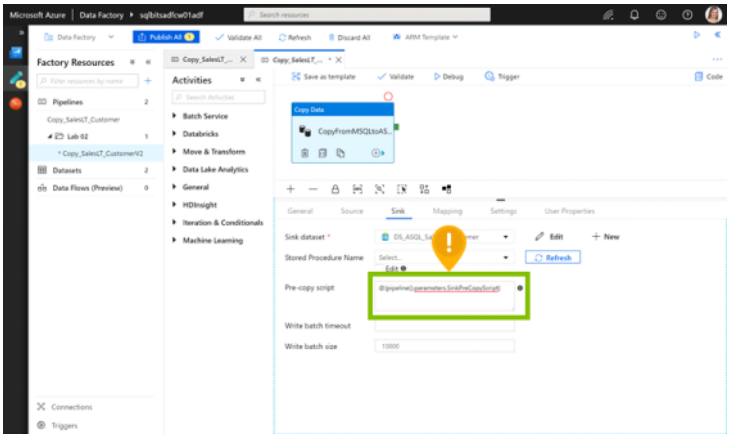


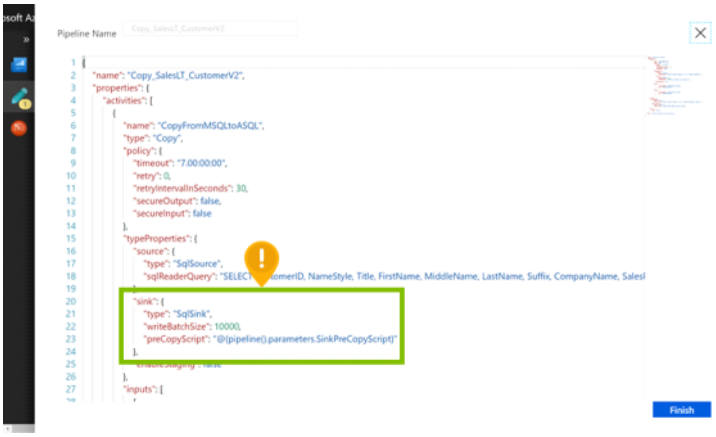
Under sink, verify that the **preCopyScript** is now **Type: Expression**.



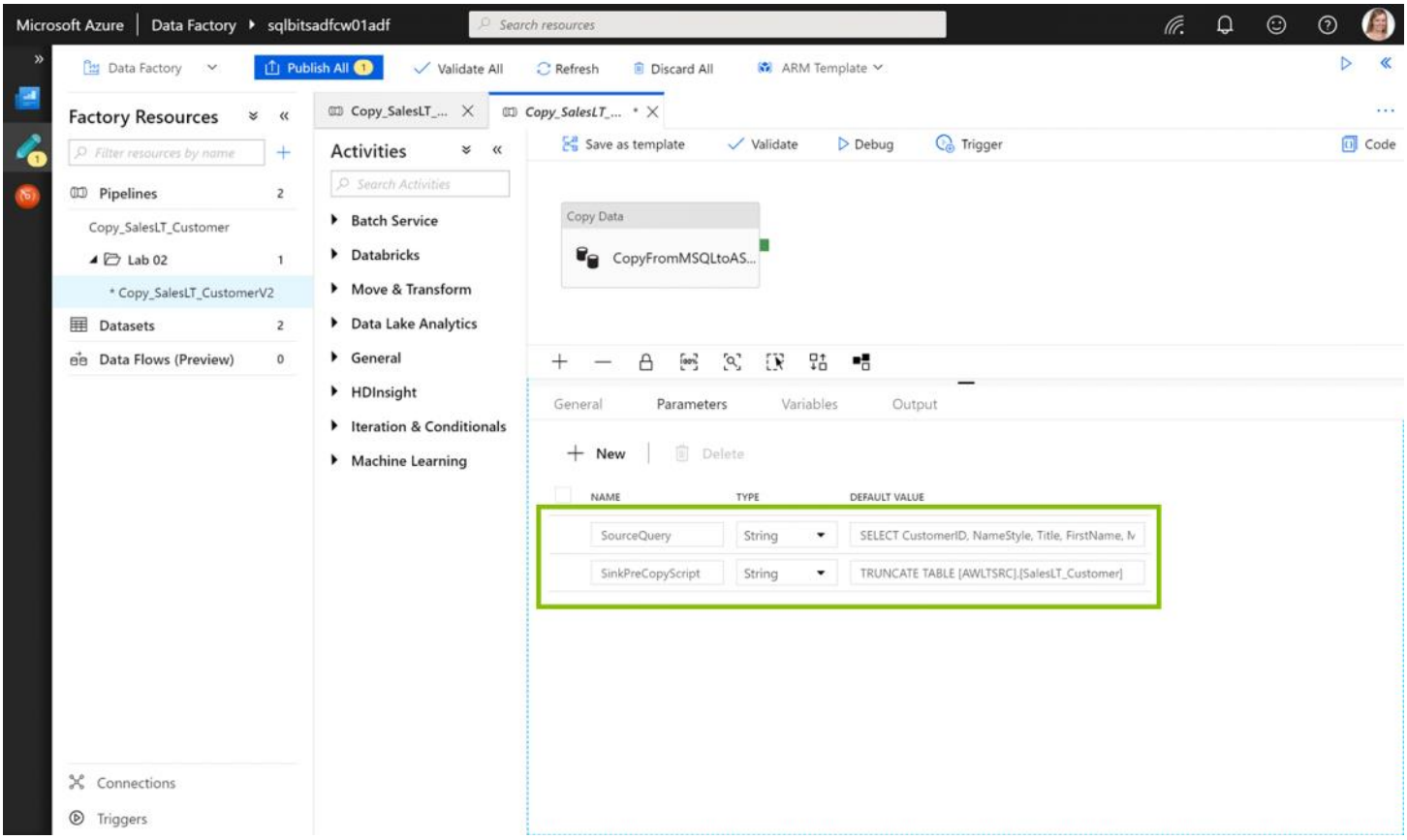
Note: It is very important that you **always go through the Add dynamic content [Alt+P] pane when adding parameters**. If you simply type in an expression directly, the content will not be interpreted as dynamic content. You can see this in two ways:

- The text box has not turned blue
- The property is not set to Type: Expression



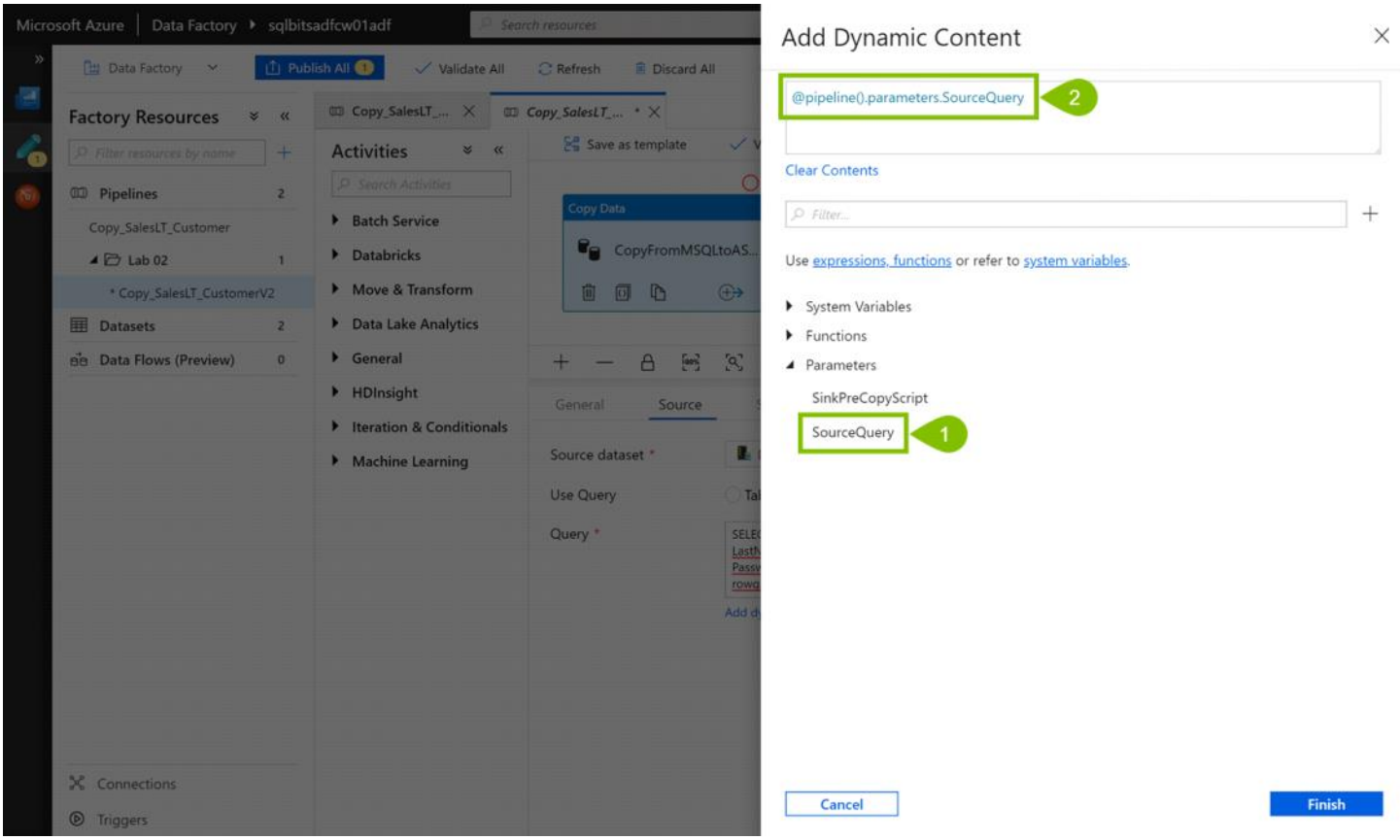


Go back to the Pipeline Parameters and verify that both parameters have been added successfully.



Use Parameters in Copy Data Activity

Click on the **CopyFromMSQLtoASQL** Copy Data activity and go to the **Source** tab. Click inside the **Query** box, and open the **Add Dynamic Content** pane by clicking the blue link or pressing Alt+P. Click on the **SourceQuery** parameter to add it, and click **Finish**.

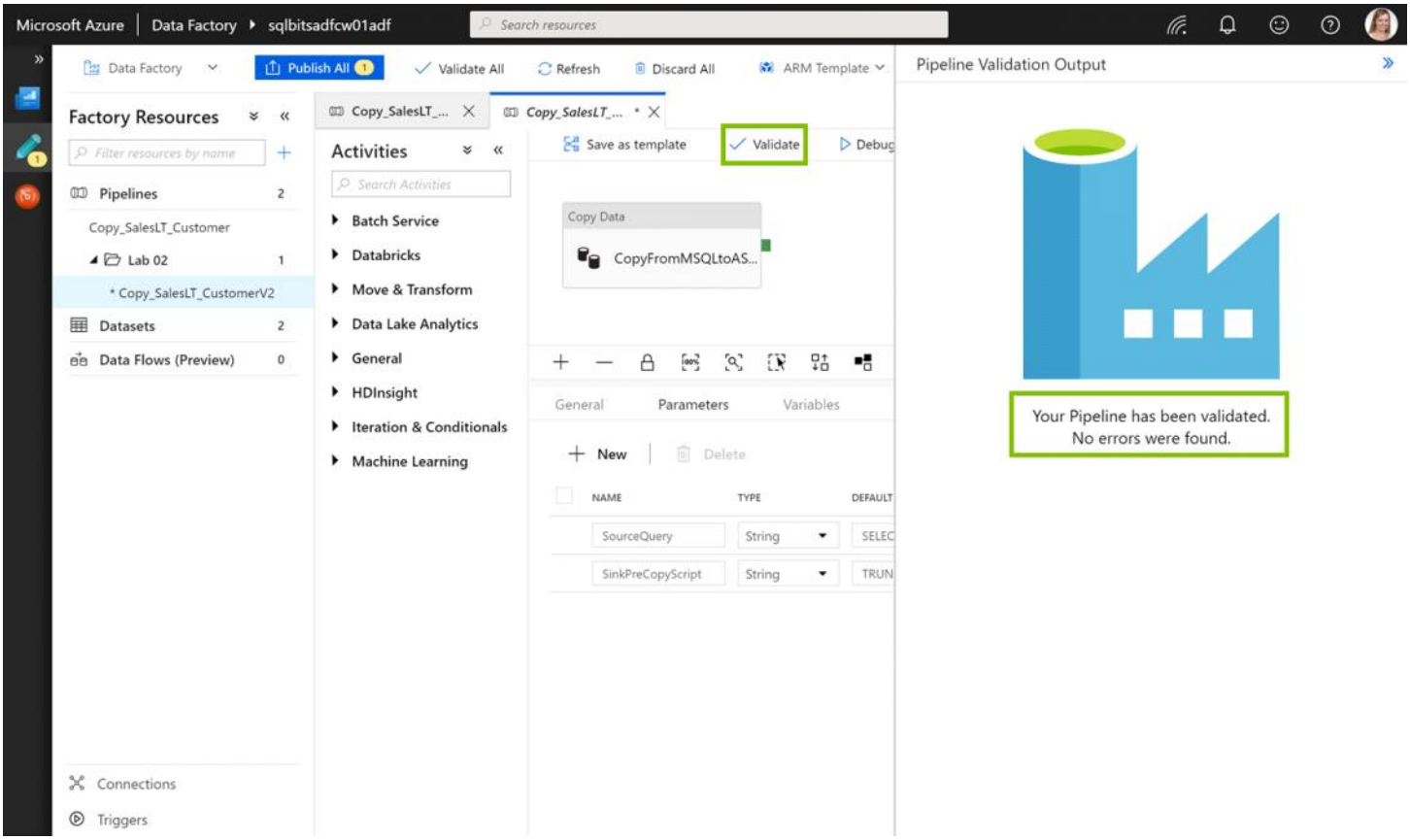


Go to the **Sink** tab and verify that it is using the **SinkPreCopyScript** pipeline parameter that we created in the previous step.

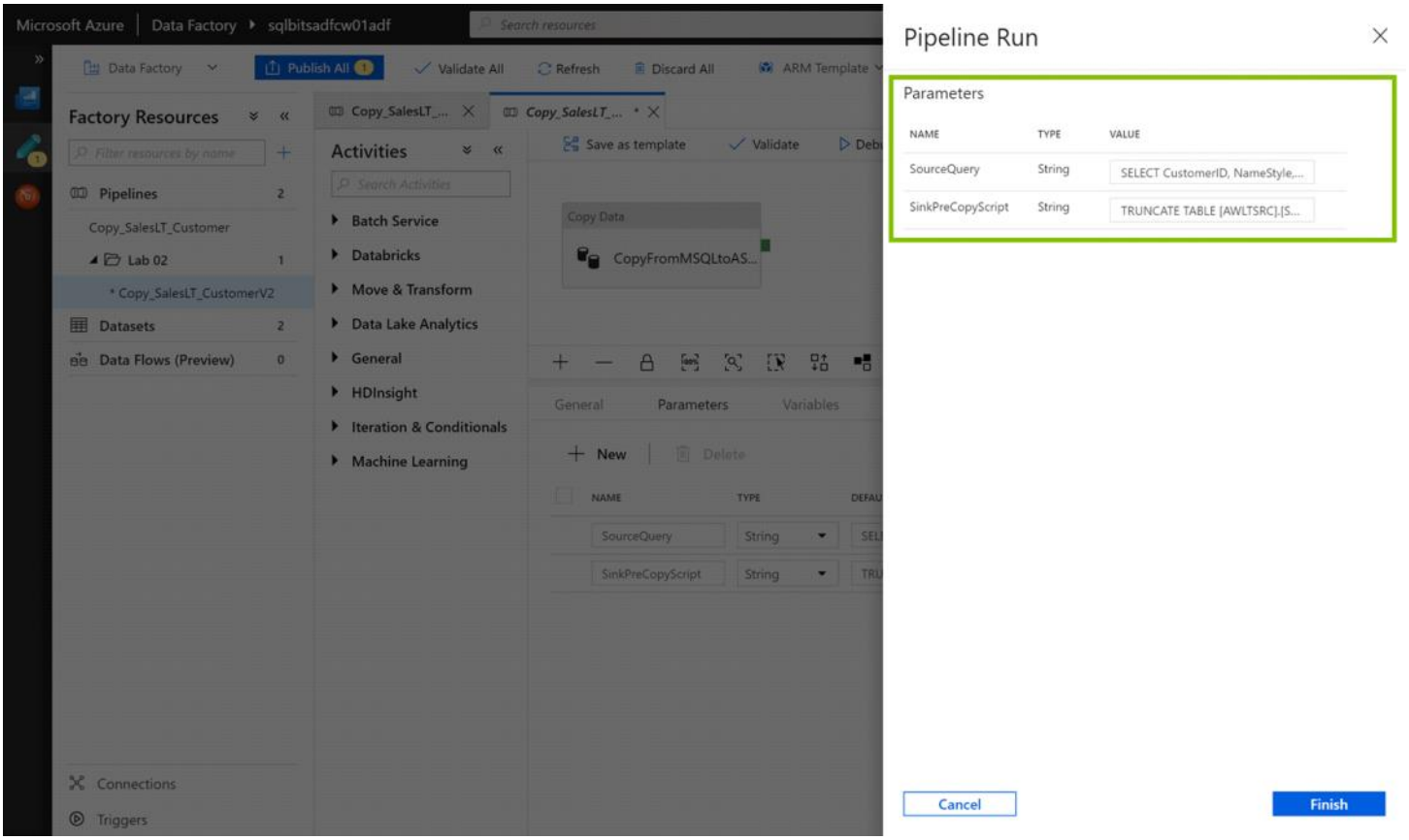
Validate and Execute Pipeline

Once you have replaced the hardcoded values with the new pipeline parameters, you can validate and debug / trigger the pipeline.

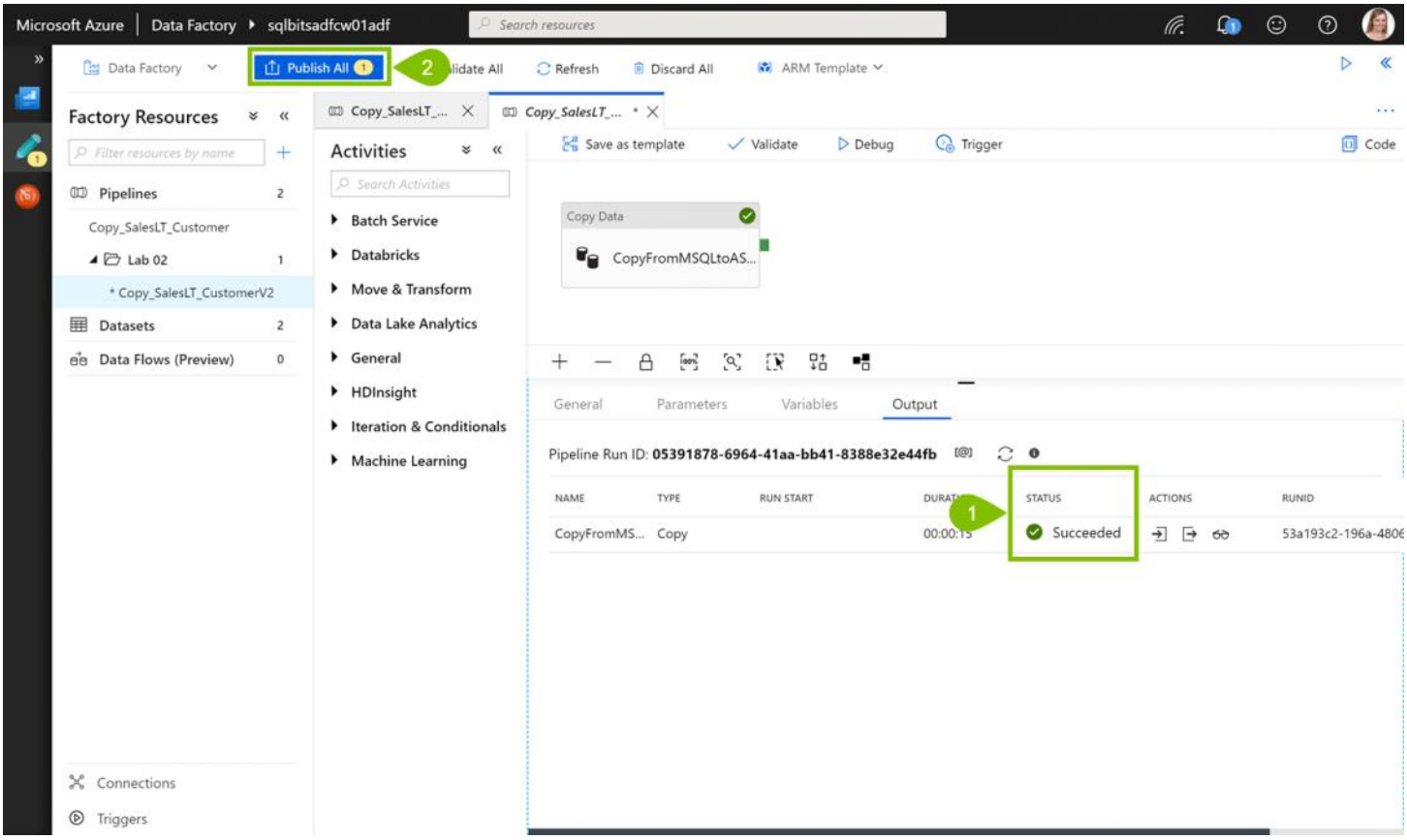
Click on **Validate** and ensure that you have no errors.



Click on **Debug** and notice that you now have to specify the pipeline parameters before debugging. You can choose to accept the default parameters, or replace them.



Verify that the pipeline run **succeeded**, and **Publish** to save your new pipeline**.**



TIP: We typically recommend debugging the package once with default values to make sure nothing is broken, and then re-running it with new values to verify that the dynamic behavior is working as expected. You can skip the second run in this lab.

Activity Summary

You have now created an updated version of a pipeline that uses pipeline parameters instead of hardcoded values. In the next activity, we will continue to build out our solution and add more data sources. We will copy new data from a JSON file and a text file stored in ADLS v1 to our Azure SQL Database.

Activity 02: Copying Data From File Based Stores

Activity overview

Estimated time to complete activity: **10 minutes**.

In Lab 01, we created a simple pipeline that copied data from a SQL Server source to an Azure SQL Database sink. In the previous activity, we parameterized this pipeline. While copying data from SQL Server to Azure SQL Database is a common use case, you will likely also have to load data from other sources such as an Azure Data Lake.

In this activity, we will load data from a JSON and a Text file in Azure Data Lake Storage Gen2 Data Lake container to Azure SQL Database. The sink dataset will be parameterized and reused for both file copies.

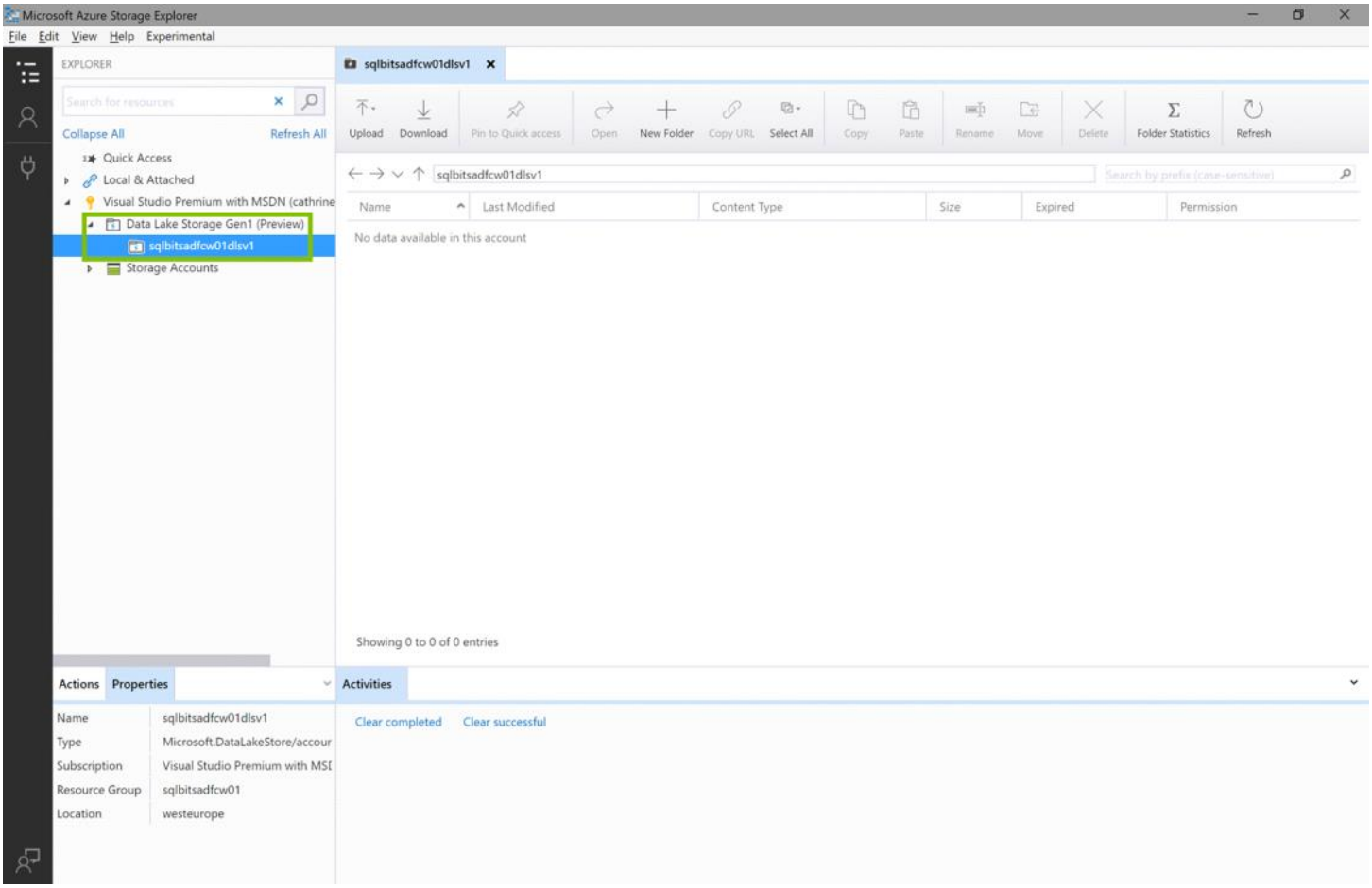
Download Files from GitHub

Download **Address.json** and **CustomerAddress.txt** from https://github.com/jasonhorner/adfdeepdive/tree/master/Labs/02%20-%20ADF%20Basics.

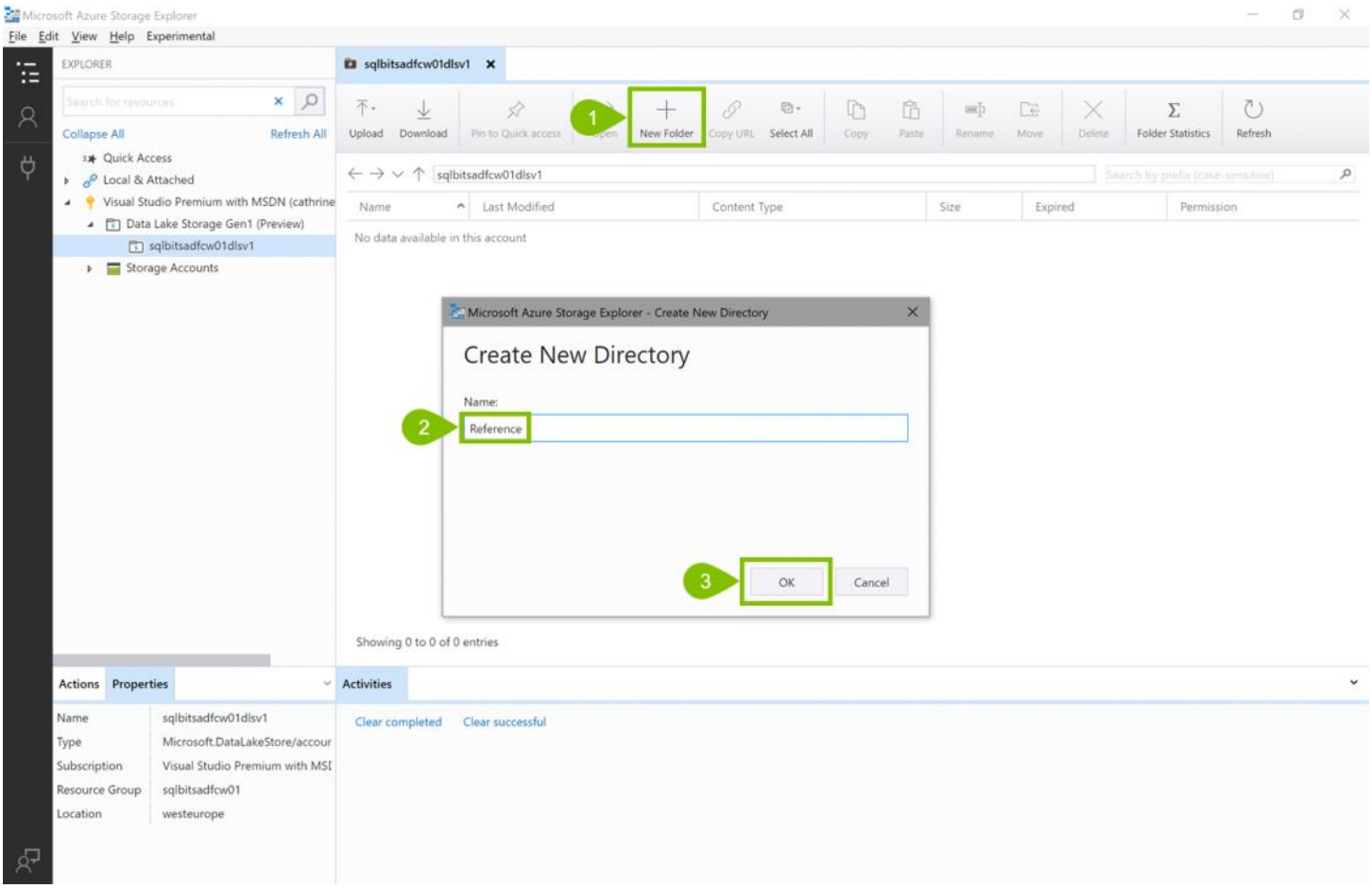
(*You can download them directly or work from a clone of the repository. This is entirely up to you and how comfortable you are working with Git clients.)*

Upload Files to Azure Data Lake Storage Gen1

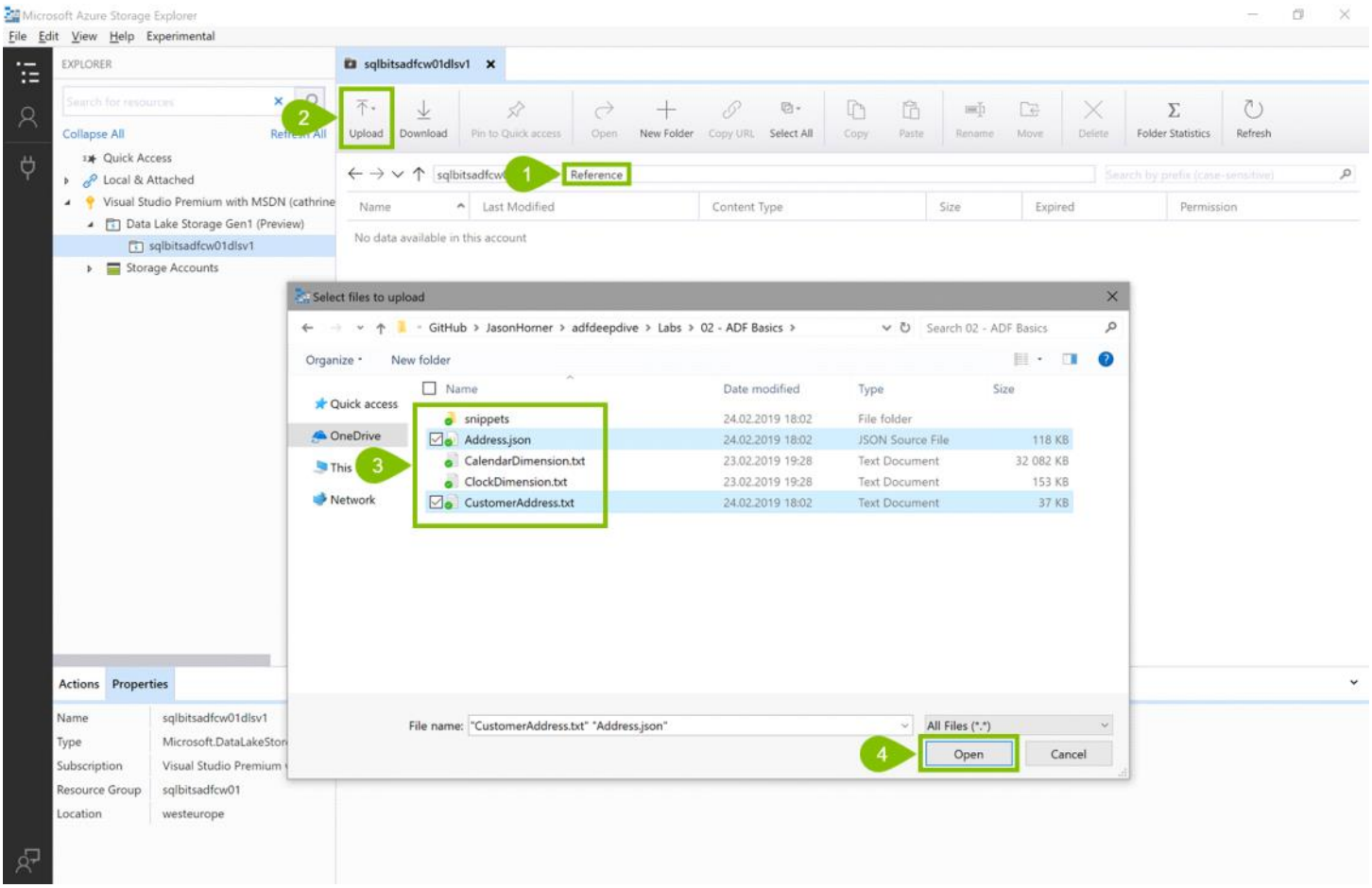
Open Azure Storage Explorer and navigate to the **sqlbitsadf<*999*>dlsv1** Azure Data Lake Storage Gen1 you created in the prerequisites.



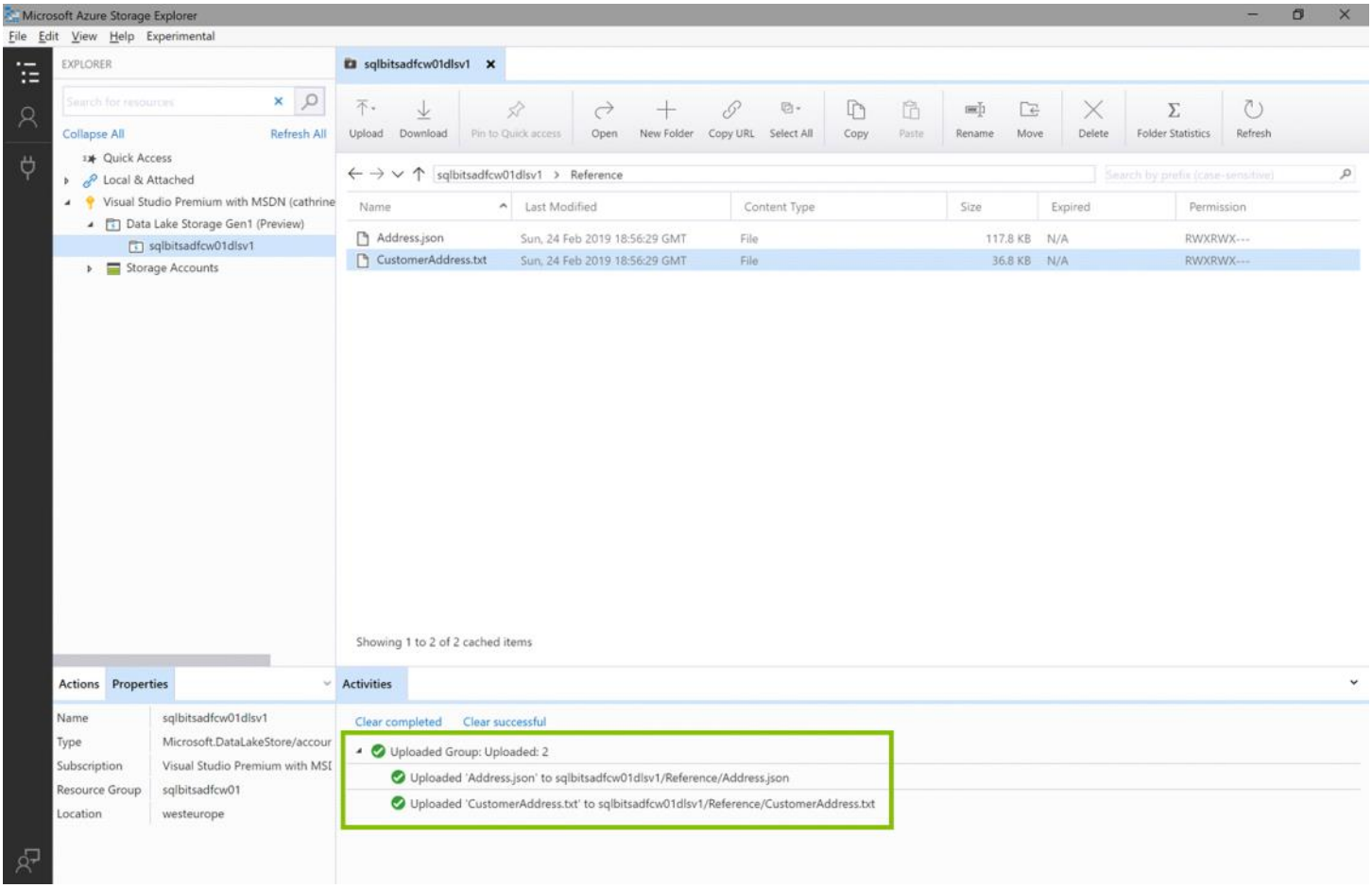
Create a new **Folder** called **Reference**.



Ensure you are navigated to **Reference**. Click **Upload Files**. Select the **Address.json** and **CustomerAddress.txt** files you downloaded, and click **Open**.



Verify that the files have been **uploaded successfully**.



Create New Factory Resources

After uploading the files to Azure Data Lake Storage Gen1, you will create two new pipelines, one for each file. To complete this task, you will also need to create new Datasets.

As you have now successfully created Datasets and Pipelines in previous activities, we will mainly provide the settings and values needed in this lab. Some additional information will be provided where instructions differ from previous activities. If you get stuck, review the previous activities, or ask for help from a neighbor or from the instructors.

Create New Pipeline and Dataset for Address.json

Create a pipeline named **Copy_Address** in the **Lab 02** folder, and add one Copy Data activity named **Copy Address**. In the **Source** tab of the Copy Data activity, click **+ New** and create a dataset with the following properties.

Setting	Value	Notes
Dataset Type	**Azure Data Lake Storage Gen1**	
Name	**DS_ADLS_Address**	
Linked	**LS_ADLS_sqlbitsadf<*999*>dlsv1**	

Service		
File Path	**Reference / Address.json**	Click **Browse** to navigate to the file instead of typing in the path manually.
File Format	**JSON Format**	
Folder	***Lab 02***	*Optional, but included as a reminder. Organize your Factory Resources in any way that you prefer.*

Unless specified above, use the default settings.

Ensure that the **Data Preview** looks ok.

Switch back to the **Copy_Address pipeline**. If the Source dataset refers to a default name like *AzureDataLakeStoreFile1*, click the dropdown and select **DS_ADLS_Address** instead.

Open the **Sink** tab. You will create a new, parameterized dataset to represent a dynamic Azure SQL Database sink that can be reused in other pipelines.

In the **Sink** tab of the Copy Data activity, click **+ New** and choose **Azure Sql Database.** Name the Dataset **DS_ASQL_Staging** and move it to a new **Generic Datasets** folder.

Go to the **Connection** Tab and choose the existing Staging database Linked Service **LS_ASQL_Staging.**

For the **Table** value, check **Edit**, click inside the text box, and then click **Add Dynamic Content [Alt+P].**

The **Add Dynamic Content** pane will show up on the right hand side of the screen. Click the **+** to the right of the filter text box and create a new parameter.

Setting	**Value**
Name	TableName
Type	String
Default Value	dbo.TableName

After clicking **Save,** you will be returned to the dynamic content pane. Scroll to the parameters section

at the bottom of the dialog and chose the newly created parameter **TableName.** The expression **@dataset().tableName** should now show up in the first textbox. Click **Finish.**

Verify that the dynamic expression shows up in the Table text box, and that the text box turns blue to indicate that it is using dynamic properties. Switch to the **Parameters** tab to verify that the dataset has the TableName parameter.

Switch back to the **Copy_Address pipeline**. If the Sink dataset refers to a default name like *AzureSqlTable1*, click the dropdown and select **DS_ASQL_Staging** instead.

Notice that the Sink dataset now shows the **TableName** *dataset parameter* under Dataset properties. Next, we want to create a *pipeline parameter* and map it to the *dataset parameter*. This will allow us to pass a table name into the pipeline, which will then be passed into the dataset.

Click inside the **Value** textbox under Dataset Properties and open the Dynamic Content pane. Create a new pipeline parameter.

Setting	Value
Name	SinkTableName
Type	String
Default Value	AWLTSRC.SalesLT_Address

Next, click inside the **Pre-Copy Script** textbox and open the Dynamic Content pane. Create a new pipeline parameter.

Setting	Value
Name	SinkPreCopyScript
Type	String
Default Value	TRUNCATE TABLE AWLTSRC.SalesLT_Address

Once the Pre-Copy Script has been parameterized, open the Pipeline Parameters and verify that the pipeline now has two parameters **SinkTableName** and **SinkPreCopyScript**.

Create New Pipeline and Dataset for CustomerAddress.txt

Follow all the same steps as above, but this time create a **Copy_CustomerAddress** pipeline for the CustomerAddress.txt file. Note that this time you can simply reuse the parameterized DS_ASQL_Staging Dataset.

Setting	Value	Notes
Dataset Type	**Azure Data Lake Storage Gen1**	
Name	**DS_ADLS_CustomerAddress**	
Linked Service	**LS_ADLS_sqlbitsadf<*999*>dlsv1**	
File Path	**Reference / CustomerAddress.txt**	Click **Browse** to navigate to the file instead of typing in the path manually.

File Format	**Text Format**	Click **Detect Text Format** instead of manually choosing the settings.
Folder	***Lab 02***	*Optional, but included as a reminder. Organize your Factory Resources in any way that you prefer.*

Setting	**Value**
Name	SinkTableName
Type	String
Default Value	AWLTSRC.SalesLT_CustomerAddress

Setting	**Value**
Name	SinkPreCopyScript
Type	String
Default Value	TRUNCATE TABLE AWLTSRC.SalesLT_CustomerAddress

Publish and Debug the New Pipelines

Click **Validate All**. If there are no errors, click **Publish All**.

Trigger both pipelines. Notice the default pipeline properties that will get passed into the generic Sink dataset.

Activity Summary

You have now created two new pipelines that copy a JSON and a Text file from Azure Data Lake Storage Gen1 into Azure SQL Database. We have parameterized the Sink dataset so it can be reused for multiple copy activities.

Activity 03: Creating a Master Pipeline

Activity Overview

Now that we have multiple pipelines, we want to orchestrate them together. We can achieve this by creating a "master" pipeline. (*We will explore this design pattern in more depth in a later lab.*) The master pipeline will first execute the Copy_SalesLT_CustomerV2 pipeline. If that succeeds, it will execute the pipelines Copy_Address and Copy_CustomerAddress. Finally, we will perform some transformations by calling a stored procedure activity to join the data from these datasets and load a final Customer table. This pattern is very similar to the approach you would take with a traditional ELT pipeline in SSIS or another ETL Tool.

Create New Pipeline

Create a new pipeline **Master_Customer** in the **Lab 02** Folder.

Add Execute Pipeline Activity for the Copy_SalesLT_CustomerV2 Pipeline

Click **Activities -> General** and drag an **Execute Pipeline** task onto the design surface. Name it **Copy_SalesLT_CustomerV2.**

Click the **Settings** tab. Select the pipeline **Copy_SalesLT_CustomerV2**

Expand **Advanced** and click **Auto-fill parameters.**

The values will get automatically populated with the defaults from the pipeline, but you can modify these or create new ones if needed.

Add Execute Pipeline Activity for the Copy_Address Pipeline

Add a second Execute Pipeline Activity named **Copy_Address** and auto-fill and verify all parameters.

Add Execute Pipeline Activity for the Copy_CustomerAddress Pipeline

Add a third Execute Pipeline Activity named **Copy_CustomerAddress** and auto-fill and verify all parameters.

Add Stored Procedure Activity

Click **Activities -> General** and drag a **Stored Procedure** task onto the design surface. Name it **usp_Customer_Load.**

Go to the **SQL Account** tab and select **LS_ASQL_Staging**.

Go to the **Stored Procedure** tab and select **[Stage].[usp_Customer_Load].**

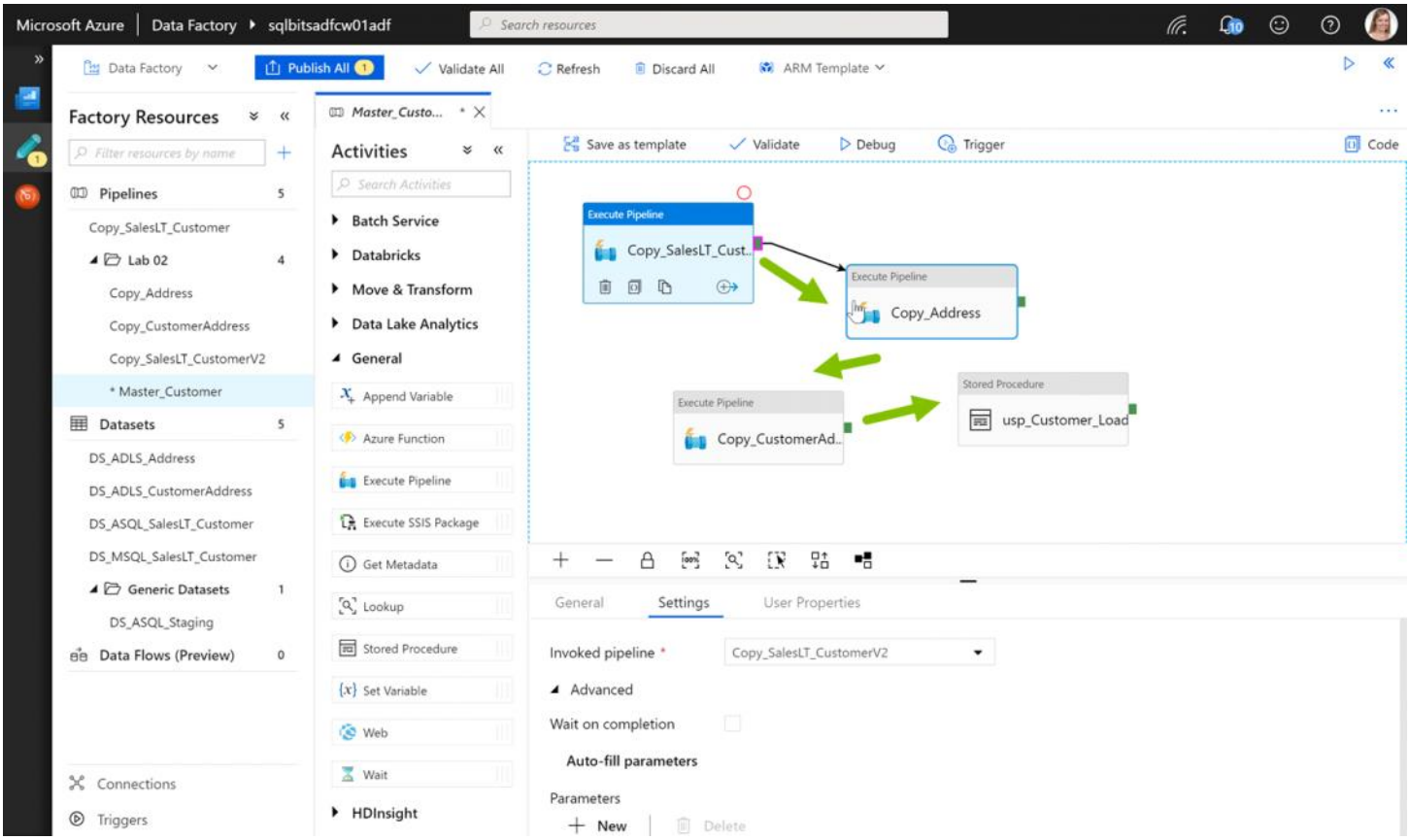
Click the **Import Parameter** button. This will automatically import all of the stored procedure parameters for you. You could also manually create these, but that would be time-consuming and cumbersome.

Set the parameter values for these:

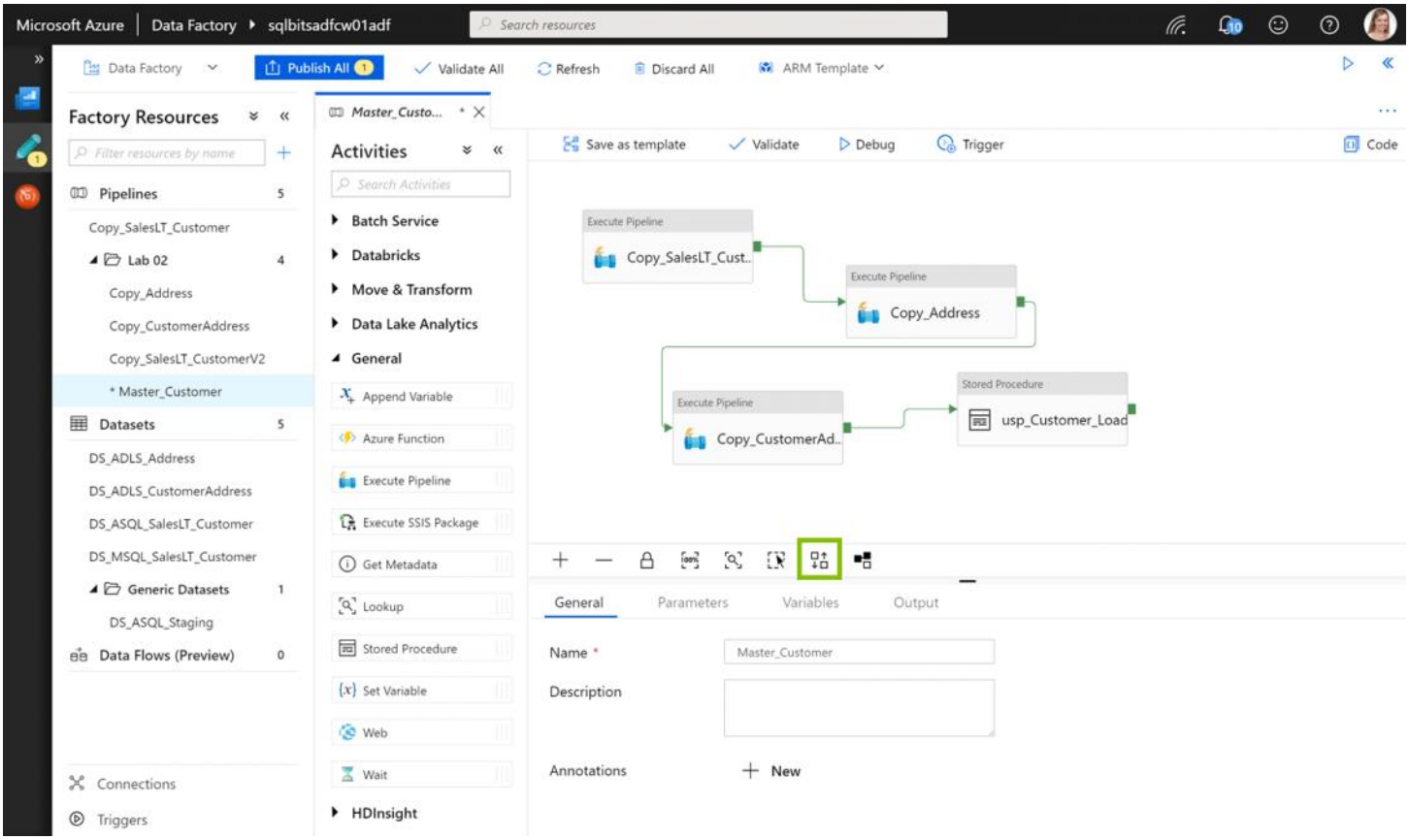
Setting	Value	Notes
BatchId	**-1**	Enter this as a literal string.
ETLAuditLogId	**-1**	Enter this as a literal string.
ETLControlId	**-1**	Enter this as a literal string.
PipelineId	**@pipeline().RunId**	Add this as Dynamic Content. *Hint: Use System Variables in the Add Dynamic Content Pane.*
PipelineName	**@pipeline().Pipeline**	Add this as Dynamic Content. *Hint: Use System Variables in the Add Dynamic Content Pane.*
PipelineTriggerType	**@pipeline().TriggerType**	Add this as Dynamic Content. *Hint: Use System Variables in the Add Dynamic Content Pane.*
SinkName	**Stage.Customer**	Enter this as a literal string.
SourceName	**AWLTSRC.Customer**	Enter this as a literal string.
SourceSystem	**AWLTSRC**	Enter this as a literal string.

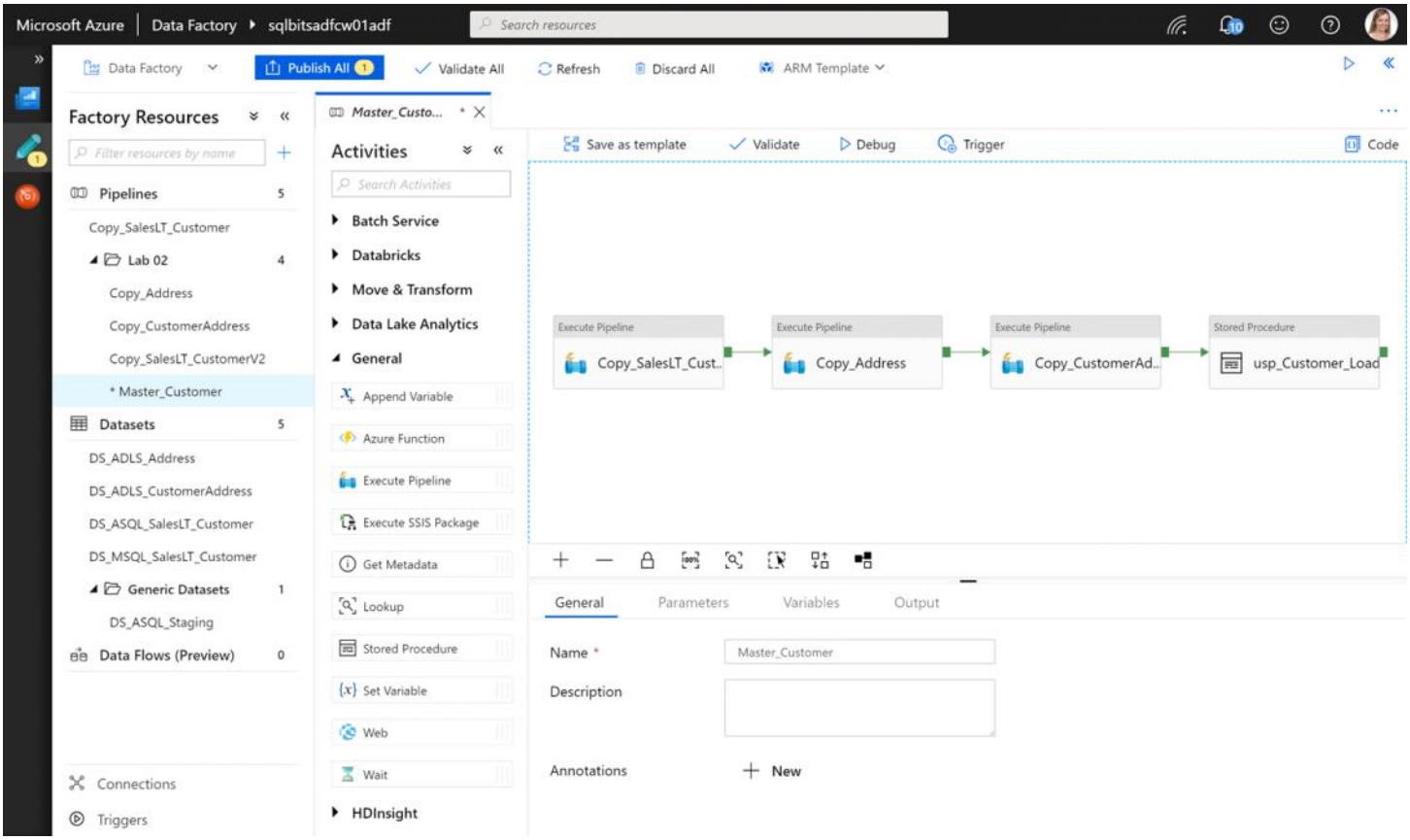
Create Precedence Constraints

Add **Success precedence constraints** between each of the Execute Pipeline Activities and the Stored Procedure activity by clicking the green box on each activity and dragging the arrow onto the next task.

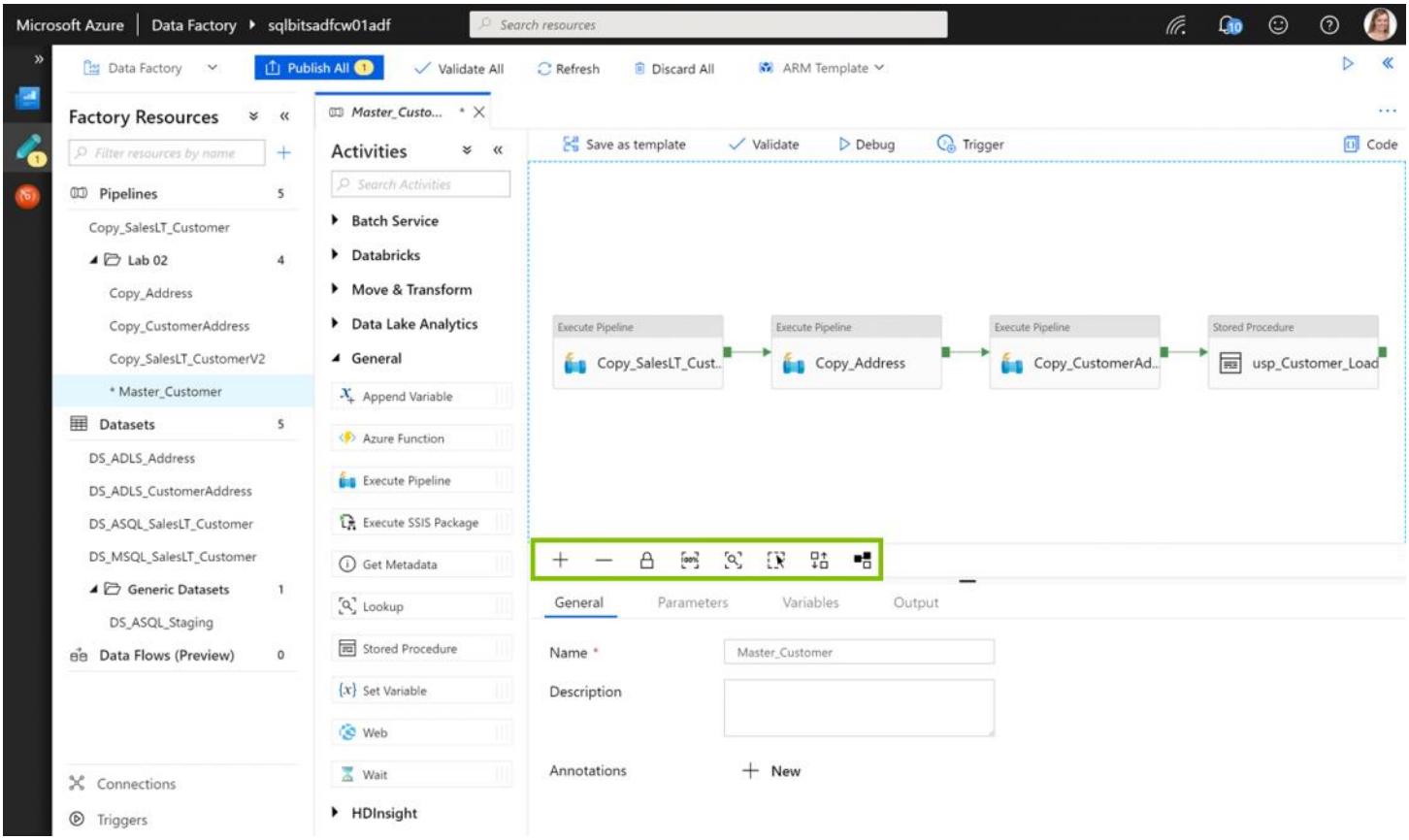


Click the Auto-Align button to clean up the design surface.





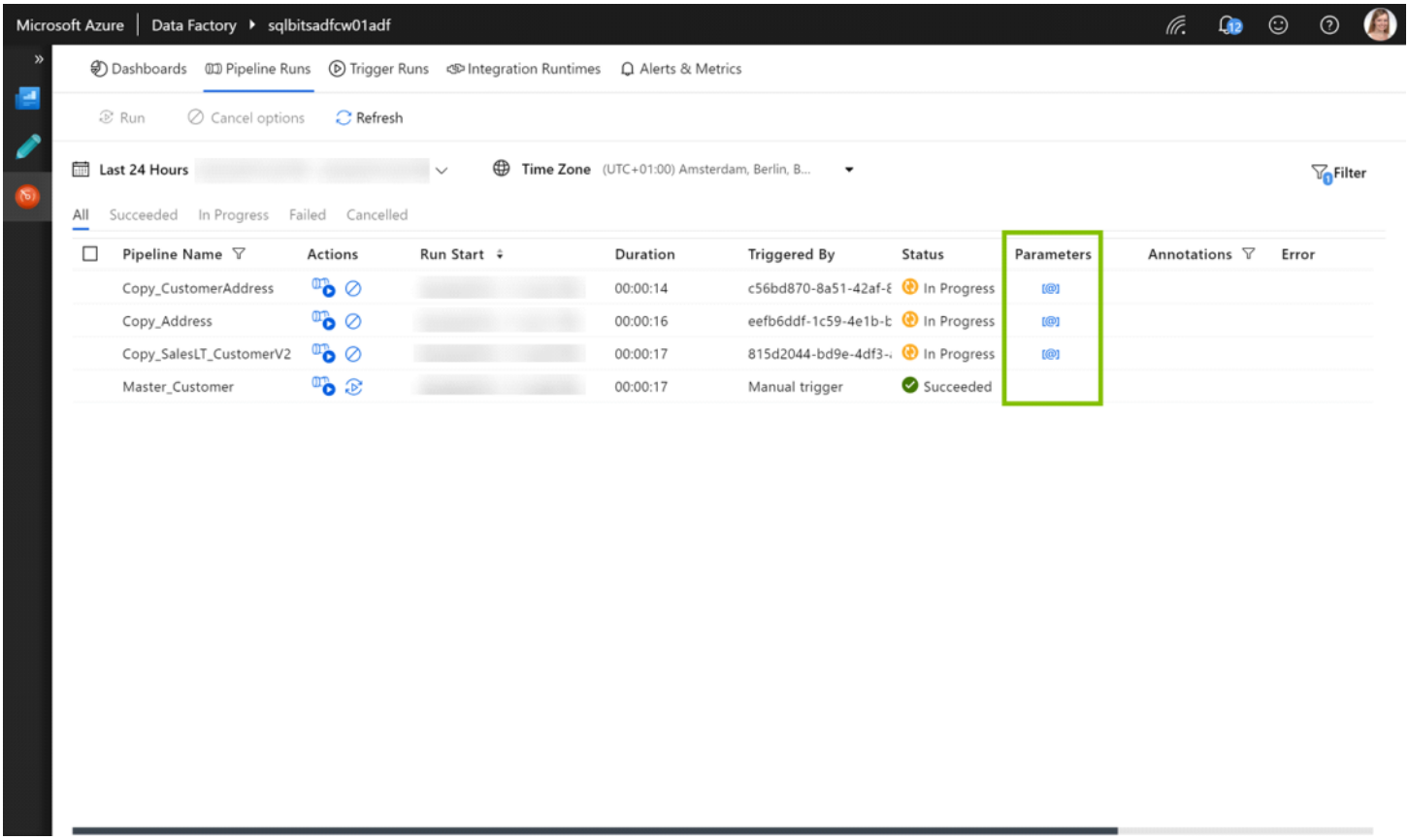
Experiment with the design surface buttons if you can't see all the activities at once.

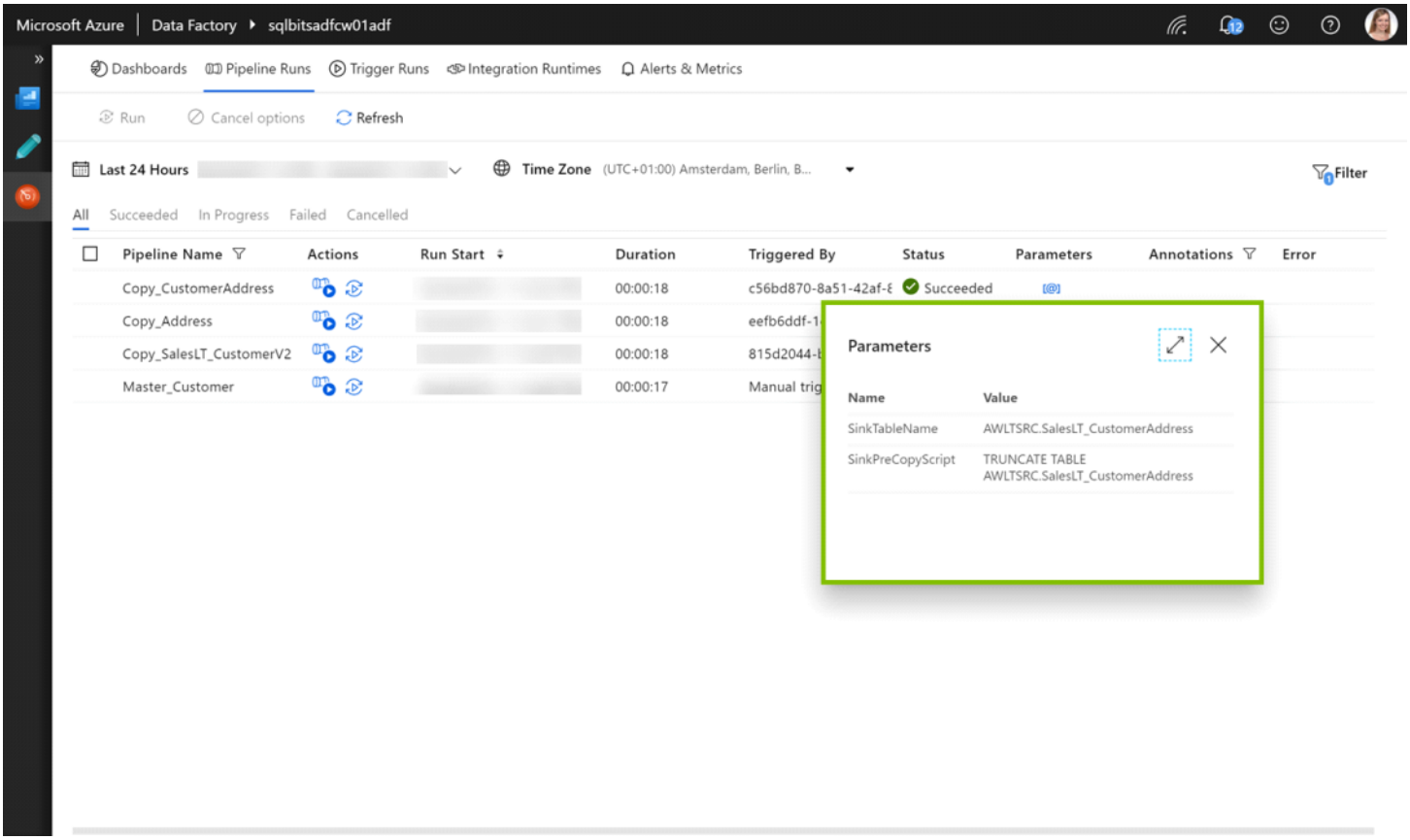


Trigger the pipeline

Finally, **Publish All**, then **Trigger** your pipeline to verify that everything is in a working state.

In **Monitor**, click the **Parameters** to see the values used for each activity.





Activity Summary

You have now created a master pipeline that performs a basic ELT Routine by loading data from the customer, address and customeraddress datasets. We load data from a relational source and both a JSON and CSV file. We parametrized these connections and pipelines to make them reusable.

Bonus Activity: Parameterize Source Datasets

Activity Overview

In Activity 02, you created a parameterized Sink dataset. If you have spare time in this lab, parameterize the Source datasets reading JSON and Text files so they can be reused for any JSON or Text file.

We have provided some samples json files in the **02 - ADF Basics** folder. See if you can load these to a SQL Table.

What about the Copy_SalesLT_Customer and Copy_SalesLT_CustomerV2 pipelines from Activity 01? What have you learned in this lab that can be implemented to improve these pipelines?

Hints and things to consider:

- Dynamic File Paths
- Dataset Parameters
- Dataset Names
- Folder Names
- Usage of Datasets and Parameters in Pipelines

Lab 04: ADF Design Patterns

Background

In Lab 02, we created some pipelines and demonstrated a rudimentary ELT Pattern, however there is much more needed to build a robust solution. In this lab, we will build upon what we learned in Lab 01 and Lab 02. We will extend the functionality and add some much needed polish.

In this lab, we will take the existing solution and add incremental Load capabilities, we will also make it fully metadata driven so a single master pipeline can drive the extract and load of 1 or many tables from a source system.
Finally we will add the capability to call stored procedures to load a staging area based on our work in Lab 02 Activity 03

At this point you should be getting very familiar with the in's and outs of the Azure Data Factory visual editing environment so we won't always explicitly call out each step in the U?I with a screenshot as we did before. But don't worry if you get stuck you can refer back to previous activities, feel free to also ask your lab partner or the instructor for help.

Prerequisites

In order to complete this lab, you will need to have previously created:

- Azure Data Factory From Lab 01
- Copy Activity Pipeline From Lab 01
- Pipelines from Lab 02

Overview

- Add Pipeline Parameters to Copy Activity
    - Parameter 1
    - Parameter 2
- Create New pipeline to copy from file based stored (ADLS Gen1)

- Create a "Master Pipeline
- Add a stored procedure activity

Let's get started with Activity 1!

In this lab we will take the existing solution and make it fully metadata driven. We will also enable change tracking to allow for incremental load capabilities.

Bulk Tables Transfer with Incremental Load

1) Driving the Loop
    a. Adding Metadata Entries
    b. Creating stored procedures
2) Creating the lookup tasks
3) Using the foreach
4) Executing the child pipeline

Staged Load - one drawback of the above approach is that the code will perform row by row inserts. In order to maximize performance for large fact table loads and leverage the Sql bulkload we will perform a staged load:

1) Create DB Objects
    a. Staging table
    b. Post load Sproc
2) Create copy activity
    a. Configure source propertie
    b. Configure pre copy script (Truncste table)
    c. Configure sink
3) Configure post load sproc activity
4) Publish and execute pipeline
    a. Setup a db trace to verify
5) Bonus Labs
    a. Configure Inmemory tables
    b. Configure temporal tables

Compute execution - you may want to use ADF to orchestrate big data solutions such as hive spark and azure Data lakes analytics or even stored procedures in azure sqldb or sql dw. Often these work flows can be chained together using a simple metadata driven pipeline. The following lab walks us through such a use case:

Streaming processing - it is common to have to ingest data in real time or near realtime
From source such as Azure Event hubs, Apache kafka or other message buses. While ADF isn't a great solution for implementing a true real-time solution it can orchestrate micro batch loading

Activity 01: Implement an Incremental Load

Activity Overview (10 minutes)

In the previous lab we used and truncate and load pattern while sometimes this is the only option available. We are going to try and refine the approach by performing an Incremental load. Along the way we will look at an interesting way to add Transformation capabilities in ADF Via SQL Stored procedures this also allows us to get around some mapping issues.

Create a New Folder

Let's kick off this lab by performing an activity you already know how to do creating a new folder: **Lab 03** While we are doing this lets also create a new pipeline by cloning the Copy_SalesLT_CustomerV2, changing the name to **Copy_SalesLT_CustomerV3**, and placing that in the new Lab 03 Folder we just created when all of these tasks are complete it should look like this:

Modify the Copy Activity Sink Tab

Now we need to modify the copy Activity Sink tab by making the following changes to support incremental load.

Remove the precopy activity, since we are loading incrementally we won't be needing it.

Set the stored procedure name to **[AWLTSRC].[usp_SalesLT_Customer_Merge]**

Set the Table Type Property

Now we need to also set the Table Type property to a User Defined table type this will be the "Buffer" that Azure Data Factory populates and runs for each set of incoming rows. In this case, the user Defined Table Type has been predefined so we can just enter it: **[AWLTSRC].[SalesLT_CustomerType]**

Import and Wireup the Stored Procedure parameters

Click the **import Parameter** button a list of stored procedure parameters should appear now set the values per the below table:

Setting	Value	Notes
BatchId	**-1**	Enter this as a literal string
ETLAuditLogId	**-1**	Enter this as a literal string
ETLControlId	**-1**	Enter this as a literal string
LogType	**Information**	Enter this as a literal string
PipelineId	**@pipeline().RunId**	Enter this as a dynamic Property
PipelineName	**@pipeline().Pipeline**	Enter this as a dynamic Property
PipelineTriggerType	**@pipeline().TriggerType**	Enter this as a dynamic Property
SinkName	**Stage.Customer**	Enter this as a literal string
SourceName	**AWLTSRC.Customer**	Enter this as a literal string
SourceSystem	**AWLTSRC**	Enter this as a literal string

Note: the write batch size property is set to 10,000 by default. This means the stored procedure will be called once for every 10,000 rows therefore if there are 100,000 rows in the source table the stored procedure will be executed 10 times.

At this point everything has been wired up now let's test the incremental load.

Testing the incremental Load

First let's delete all of the data in the destination table: **[AWLTSRC].[SalesLT_Customer]**

TSQL
TRUNCATE TABLE [AWLTSRC].[SalesLT_Customer];

Now debug the pipeline or if you have previously published it run it via a manualy trigger.

Inspect the table results

TSQL
SELECT * FROM [AWLTSRC].[SalesLT_Customer];

You should have roughly 847 rows returned. Also be sure to note the updatetime and createdatetime

Now rerun the pipeline with no changes and check the row count it should be the same and the rows creatio nand update time should not have changed:

Now on the source Database **AdventureWorksLT** run a query inserting and updating rows (Deletes wont be tracked)

AdventureWorksLT Modification script

```
USE [AdventureWorksLT]
GO

INSERT INTO [SalesLT].[Customer]
SELECT [NameStyle], [Title], [FirstName], [MiddleName], [LastName], [Suffix], [CompanyName],
[SalesPerson], [EmailAddress], [Phone], [PasswordHash], [PasswordSalt], NEWID(), [ModifiedDate]
FROM [SalesLT].[Customer]
WHERE CustomerId < 10
GO

UPDATE [SalesLT].[Customer]
  SET
    [CompanyName] = [CompanyName] + ':UPD'
 WHERE CustomerId < 10
GO
```

Rerun the pipeline and verify the **Staging** database with the below scripts

Staging Verification script
-- check for updates, replace with your Datetime SELECT * FROM [AWLTSRC].[SalesLT_Customer] WHERE UpdateDateTime != Createdatetime; -- check for Inserts, replace with your Datetime SELECT * FROM [AWLTSRC].[SalesLT_Customer] ORDER BY CreateDateTime DESC;

Remember to **Publish All** to save.

Activity Summary

You have now have an incremental load process that is working

Activity 02: Bulk Table Transfer

Activity Overview (10 minutes)

In the previous lab we created an incremental load pattern.
We are now going to make this property data driven. via a metadata control table

Execute Database preparation script

In order to get the lab going we need to change the state of some of the table the following script will do that to make sure we are ready.

Create a New Pipeline

create a new pipeline by cloning the **Copy_SalesLT_CustomerV3** and renaming it to: **Copy_SalesLT**

Create a New Parameterized Source Dataset

After cloning the **Copy_SalesLT_CustomerV3** Create a clone of the source dataset

Replace the hard coded table name in the dataset with a new dataset parameter called **tableName.** set the default value to the currently hard coded value.
After you save the changes on the cloned dataset, move the dataset into the **generic datasets** folder.

Create a New Parameterized Sink Dataset

Follow the similar steps from the previous task to create a clone of the sink dataset

Don't forget to set the default value to **Source** and move the dataset to the **generic datasets** folder.

Modify Copy Activity Sink and Source

Modify the copy activity **Source Properties** to match these values:

Setting	Value	Notes
Source dataset		Select the newly created parameterized source dataset from the previous step
TableName (dataset parameter)	@pipeline().parameters.SourceTableName	You will need to add a new pipeline parameter called: **SourceTableName** set the default value to: **[SalesLT].[Customer]**
Query	@pipeline().parameters.SourceQuery	You will need to add a new pipeline parameter called: **SourceQuery** if it doesn't already exist.

Modify the copy activity **Sink** Properties to match these values

Setting	Value	Notes
Sink dataset		Select the newly created parameterized sink dataset from the previous step
TableName (dataset parameter)	**Source**	You will need to add a new pipeline parameter Called: **SinkTableName** set the default value to: **Source**
Stored Procedure Name	**@pipeline().parameters.SinkStoredProcedureName**	You will need to add a new pipeline parameter Called: **SinkStoredProcedure** set the default value to: **[AWLTSRC].[usp_SalesLT_Customer_Merge]** **Note: you have to check the edit box to enable this field to be made dynamic**
Table type	**@pipeline().parameters.SinkTableType**	You will need to add a new pipeline parameter Called: **SinkTableType** set the default value to: **[AWLTSRC].[SalesLT_CustomerType]**
BatchId	**@pipeline().parameters.BatchId**	You will need to add a new pipeline parameter Called: **BatchId** set the default value to: **-1**. Consider the data type for this parameter.
ETLAuditLogId	**-1**	Enter this as a literal string
ETLControlId	**-1**	Enter this as a literal string
LogType	**Information**	Enter this as a literal string
PipelineName	**@pipeline().Pipeline**	Enter this as a dynamic Property
PipelineTriggerType	**@pipeline().TriggerType**	Enter this as a dynamic Property
SinkName	**@pipeline().parameters.SinkTableName**	If it doesn't already exist, you will need to add a new pipeline parameter Called: **SinkTableName** set the default value to:
SourceName	**@pipeline().parameters.SourceTableName**	If it doesn't already exist, you will need to add a new pipeline parameter Called: **SourceTableName** set the default value to:
SourceSystem	**AWLT**	Enter this as a literal string
Write batch size	**@pipeline().parameters.SinkWriteBatchSize**	You will need to add a new pipeline parameter Called: **SinkWriteBatchSize** set the default value to: 10000. Consider the data type for this parameter.

Verify Pipeline Parameters

We wired up a lot of parameters take a look through the screenshot below and verify that they match:

Test the SalesLT Pipeline

Now that we have the pipeline setup lets test it to make sure everything is going according to plan. Publish the pipeline if necessary, correct any errors, then execute the pipeline be either debug or a manual trigger. By default the pipeline should load the **AWLTSRC.SalesLT_Customer** Table (you may want to truncate the table first)

Create a "Master" Pipeline

Create a new Pipeline Called **Copy_SalesLT_Master** move it to Folder **Lab 03**

Add Batch Lookup Parameter

Create a new lookup activity called: **Get BatchId**

Setting	Value	Notes
Linked Service	ds_asql_staging	
TableName	dbo.TableName	Use the default value. This will not be used when we're executing a Stored Procedure.
Stored Procedure	[ETL].[usp_getBatchID]	You need to wireup the **inputBatchId** parameter by clicking the import parameters and chossing the treat as null option for the parameter

Add Metadata Lookup Activity

Create another lookup activity connected via a success precedence constraint. Call it: **Get Table Metadata**

Configure the activity as below:

Setting	Value	Notes
Linked Service	ds_asql_staging	
TableName	dbo.TableName	Use the default value. This will not be used when we're executing a Stored Procedure.
Query	SELECT * FROM [ETL].[fn_GetTableList_Merge] (NULL,NULL,NULL)	This will return a list of tables from the metadata table

NOTE: Be sure to uncheck first row only so that the activity will return more than one row

Add Foreach Activity

Add a foreach activity called **Load Each Table**

On the settings tab configure the **Items** to be **@activity('Get Table Metadata').output.value** (NOTE: Be sure the name inside the activity matches your)

Note: for the purposes of debugging check the sequential box this ensures that the foreach does not go parallel

On the **Activities** tab configure a execute pipeline activity called**: Merge Load Table** to execute the **Copy_SalesLT** pipeline passing in the following values from the Items

Setting	Value	Notes
SourceReaderQuery	@Item().SourceReaderQuery	This values comes from the output of the Get Table Metadata Lookup activity:
BatchId	@{activity('Get BatchID').output.firstRow.BatchID}	This value comes from the output of the Get Batch Id Lookup activity.
SinkName	Source	This is hard coded because the table type parameter name is consistent across all stored procedures
SourceTableName	@Item().SourceTableName	
SourceSystemName	@Item().SourceSystemName	
SinkWriteBatchSize	@Item().SinkWriteBatchSize	
SinkStoredProcedureName	@item().SinkStoredProcedure	
SinkTableType	@Item().SinkTableType	
SinkPreCopyScript	-1	

Execute the Master Pipeline to test

Now that you have created a parameterized child pipeline and a metadata driven master pipeline, you can execute it if all goes well you should be able to repopulate the tables (you may want to truncate them first to be sure everything is working)

Use the truncate and select scripts we provided in the first activity of this lab if needed.

Activity Summary

You have now have a metadata driven master process that trigger an incremental load. It would be fairly simple to extend thisto any of the other tables in the AdventureworkLT Database.

Bonus Activity: Add Product Related Tables

Activity Overview (10 minutes)

In the previous lab we used predefined stored procedures and queries for the Custom Related tables in **AdventureworksLT** if you really want to test your understanding of the pattern you should be able to follow the same pattern for the product related tables:

Table
[SalesLT].[Product]
[SalesLT].[ProductCategory]
[SalesLT].[ProductModel]
[SalesLT].[ProductModelProductDescription]

Keep in mind that for each of the above table you need to create 3 objects(the names below are hard coded to the product table each object name will need to change for each table):

a User Defined TableType - **[AWLTSRC].[SalesLT_ProductType]**
a sink table - **[AWLTSRC].[SalesLT_Product]**
a merge stored procedure - **[AWLTSRC].[sp_SalesLT_Product_Merge]**

Finally you also need to add an entry in the ETL Control table here is an example (For the customer table the values will need to change for the product tables you will need 1 entry per table):
INSERT [ETL].[ETLControl_Merge] ([SourceSystem], [SourceDatabase], [SourceSchema], [SourceTable], [SinkDatabase], [SinkSchema], [SinkTable], [SinkTableType], [SinkStoredProcedure], [SinkPreLoadScript], [SinkWriteBatchSize], [ETLIncrementalDate], [ETLIncrementalID], [QueryColumns], [QueryPredicate], [QueryPrimaryKey], [QueryPredicateType], [QueryFrom], [LoadType], [TableType], [IsActive], [UpdateDateTime], [UpdateBatchId]) VALUES (N'AWLTSRC', N'AdventureWorksLT', N'SalesLT', N'Customer', N'Staging', N'AWLTSRC', N'SalesLT_Customer', N'AWLTSRC.SalesLT_CustomerType', N'usp_SalesLT_Customer_Merge', NULL, 10000, NULL, 0, N'NameStyle, Title, FirstName, MiddleName, LastName, Suffix, CompanyName, SalesPerson, EmailAddress, Phone, PasswordHash, PasswordSalt, rowguid, ModifiedDate', NULL, N'CustomerID', NULL, NULL, N'Incremental', N'Stage', 1, CAST(N'2018-09-23T12:47:13.3830000' AS DateTime2), NULL)

Bonus Activity: Copy Data incrementally with Change Tracking

Activity Overview

In the previous lab, we used a hash-based delta detection approach to perform a merge load.

Modify our existing pipeline to use change tracking to bulk transfer tables incrementally you will need to make some pretty extensive modification to the existing pipeline and activities to get and set the high watermarks.

We have added some scripts to get you going, and there are also some preexisting objects in the database that should be helpful.

Lab 05: Mapping Data Flows

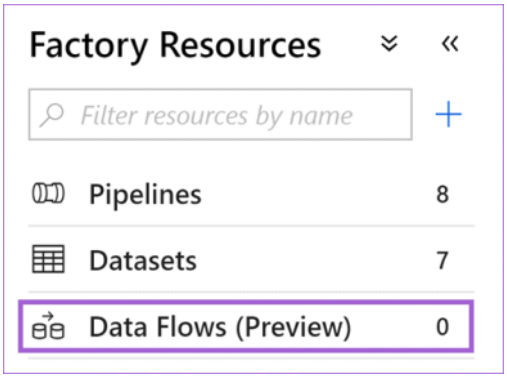
Background and Goals

In this lab, you will get hands-on experience building a Mapping Data Flow, as well as experience working with new Dataset types.

We will create a Pipeline to download public datasets from the Internet Movie Database (https://imdb.com) into our Azure Storage Account. Then, we will create a Mapping Data Flow to transform the data and load it into our Azure SQL Data Warehouse.

Prerequisites

You must have already signed up for the Azure Data Factory Mapping Data Flow Preview (https://aka.ms/dataflowpreview) and have received confirmation that your subscription has been whitelisted. If you do, you will see **Data Flows (Preview)** under Factory Resources.



If you weren't able to get this done in time for the workshop, team up with another attendee who has.

In addition, you will need to have previously created:

- Resource Group
- Azure Storage Account
- Azure SQL Server
- Azure SQL Data Warehouse

Lab Details

The Internet Movie Databse (IMDb) has made several subsets of their data available for personal and non-commercial use. In this lab, we want to get information about movies, their ratings, and the number of votes. We will get this information from the **title.basics** and **title.ratings** files.

Information about the IMDb datasets, including descriptions and details, can be found here: https://www.imdb.com/interfaces/

The actual datasets can be found here: https://datasets.imdbws.com/

Source File Format

Each dataset is contained in a gzipped, tab-separated-values (TSV) formatted file in the UTF-8 character set. The first line in each file contains headers that describe what is in each column. A '\N' is used to denote that a particular field is missing or null for that title/name.

Overview

Activity 01: Build Pipeline to Copy Files

- Create Linked Services for HTTP, Azure Blob Storage, and Azure SQL Data Warehouse
- Create Datasets for HTTP, Azure Blob Storage, and Azure SQL Data Warehouse
- Create Pipeline with Parameters and Looping

Activity 02: Create the Mapping Data Flow

- Create Mapping Data Flow

Activity 03: Execute the Mapping Data Flow

- Start Azure SQL Data Warehouse
- Create Destination Table in Azure SQL Data Warehouse
- Create Pipeline to Debug and Execute Mapping Data Flow
- Monitor Mapping Data Flow
- Stop Azure SQL Data Warehouse

Activity 01: Build Pipeline to Copy Files

Activity Overview

Estimated time to complete activity: **10 minutes**.

By now, you should be familiar with creating Linked Services, Datasets, and Pipelines, so we will only provide the high-level details for you.

In this activity, we will create a Pipeline to copy and prepare the files we will use in our Mapping Data Flow. You will get experience with three new Dataset types: **HTTP**, **Parquet**, and **Azure SQL Data Warehouse**.

Create Linked Services

Create three Linked Services. One **HTTP** Linked Service for *getting* the source files, one **Azure Blob Storage** Linked Service for *storing* the source files, and one **Azure SQL Data Warehouse** Linked Service for the transformed output data.

Setting	Value
Type	**HTTP**
Name	**LS_HTTP_IMDb**
Base URL	**https://datasets.imdbws.com/**
Authentication Type	**Anonymous**

Setting	Value
TYPE	**Azure Blob Storage**
Name	**LS_WASB_IMDb**
Authentication Type	**Use Account Key**
Account Selection Method	**From Azure Subscription**
Azure Subscription	**<Your SQLBits Subscription>**
Storage Account Name	**sqlbitsadf<999>wasb**

Setting	Value
TYPE	**Azure SQL Data Warehouse**
Name	**LS_ASDW_DW**
Account Selection Method	**From Azure Subscription**
Azure Subscription	**<Your SQLBits Subscription>**
Server Name	**Sqlbitsadf<999>sqlserver**
Database Name	**DW**
Authentication Type	**SQL Authentication**
User Name	**Adfadmin**
Password	**VeryStr0ngPassw0rd!**

Create Datasets

Create three Datasets. One **HTTP** Dataset for *getting* the source files, one **Azure Blob Storage** Dataset for *storing* the source files, and one **Azure SQL Data Warehouse** Dataset for the transformed output data.

Setting	Value	Note
Type	**HTTP**	
Name	**DS_HTTP_IMDb**	
Linked Service	**LS_HTTP_IMDb**	
Relative URL	**@dataset().FileName**	Create and use a Dataset Parameter named **FileName** with the default value **title.basics**
Compression Type	**GZip**	
Compression Level	**Fastest**	
File Format	**Text Format**	
Column Delimiter	**Tab (\t)**	
Row Delimiter	**Line Feed (\n)**	
Colum Names in the First Row	**Yes** (*Checked*)	
Quote Character	**"** (*Double Quote*)	
NULL Value	**\N**	

Setting	Value	Note
Type	**Azure Blob Storage**	
Name	**DS_WASB_IMDb**	
Linked Service	**LS_WASB_IMDb**	
File Path: Container	**@dataset().FilePathDirectory**	Create and use a Dataset Parameter named **FilePathDirectory** with the default value **mappingdataflows/imdb**
File Path: File	**@dataset().FileName**	Create and use a Dataset Parameter named **FileName** with the default value **title.basics**
File Format	**Parquet**	

Setting	Value	Note
Type	**Azure SQL Data Warehouse**	
Name	**DS_ASDW_DW_Movies**	
Linked Service	**LS_ASDW_DW**	
Table	**[dbo].[Movies]**	Click **Edit** and type in the name manually

Create the Pipeline

Create a new folder called **Mapping Data Flows**, and add a new pipeline called **PL_IMDb_Copy_HTTP_GZip_to_ADLS_Parquet**.

In previous labs, we have created configuration tables and used the Lookup activity to get the files and tables to work with. Since we want to primarily focus on the Mapping Data Flows feature in this task, we will keep things a little simpler in this pipeline and use an array parameter instead.

Create the following **Pipeline Parameters**:

Name	Type	Default Value
FileNames	Array	["title.basics","title.ratings"]
SourceFileType	String	.tsv.gz
SinkFilePathDirectory	String	mappingdataflows/imdb
SinkFileType	String	.parquet

Add a **ForEach** task named **Copy HTTP GZip to ADLS Parquet**, and set the **Items** property to the **@pipeline().parameters.FileNames** parameter.

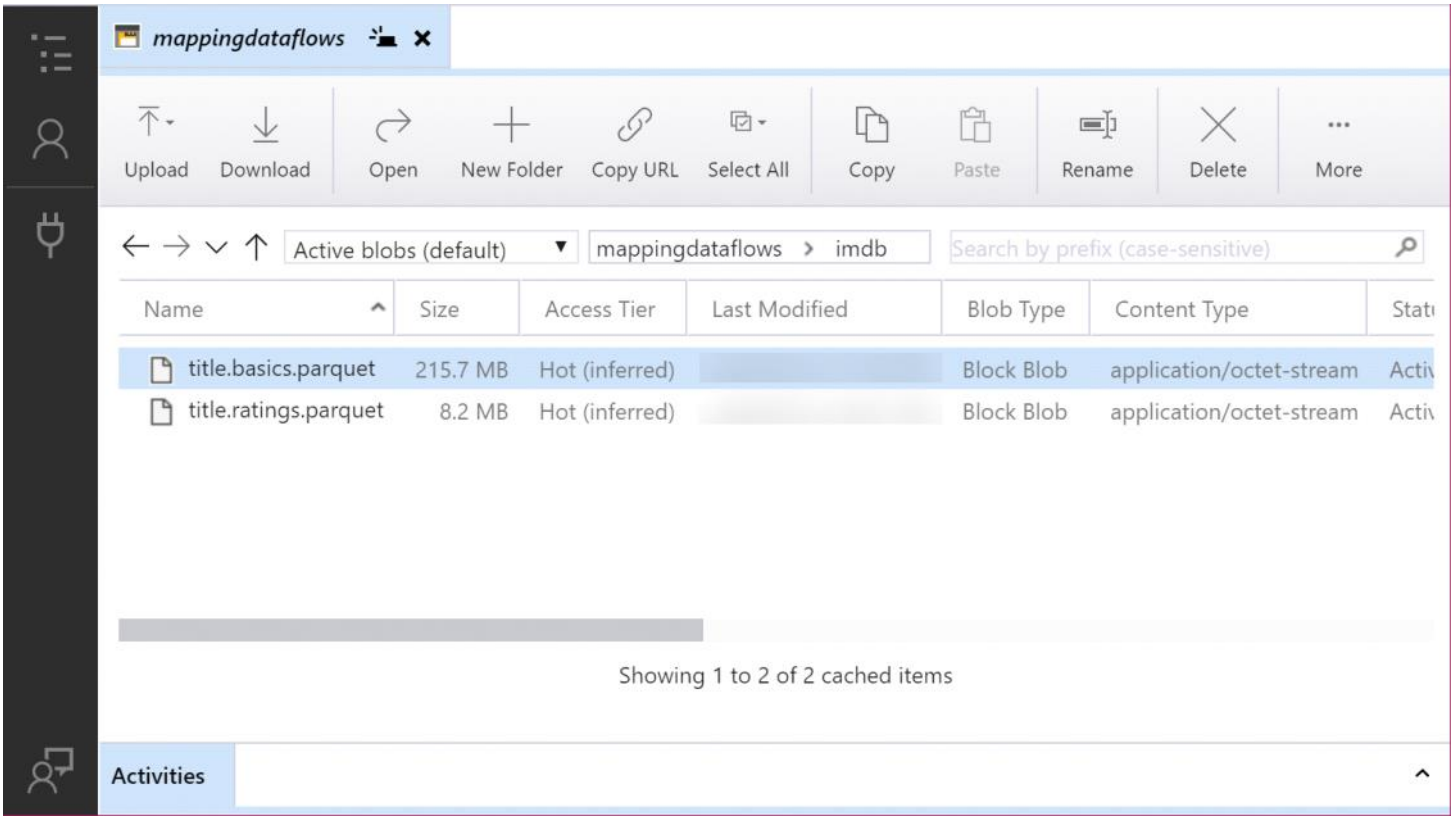
In the ForEach Activities, add a **Copy Data** activity named **HTTP GZip to ADLS Parquet**.

In the Copy Data activity, use the **Source** dataset **DS_HTTP_IMDb**. Set the **FileName** value to **@concat(item(), pipeline().parameters.SourceFileType)**.

In the Copy Data activity, use the **Sink** dataset **DS_WASB_IMDb**. Set the **FIlePathDirectory** value to **@pipeline().parameters.SinkFilePathDirectory** and the **FileName** value to **@concat(item(), pipeline().parameters.SinkFileType)**.

Finally, **Validate** and **Publish All**, then **Trigger** the pipeline.

Open **Azure Storage Explorer** and verify that your two new source files have been copied to your Azure Blob Storage.



Activity Summary

Now that you have your source data, let's build a Data Flow!

Activity 02: Create the Mapping Data Flow

Activity Overview

Estimated time to complete activity: **10 minutes**.

In this activity, we will create a Pipeline to copy and prepare the files we will use in our Mapping Data Flow. You will get experience with two new Dataset types: **HTTP** and **Parquet**. But first, we need to give the ADF_Access Active Directory Group access to the Azure Storage Account.

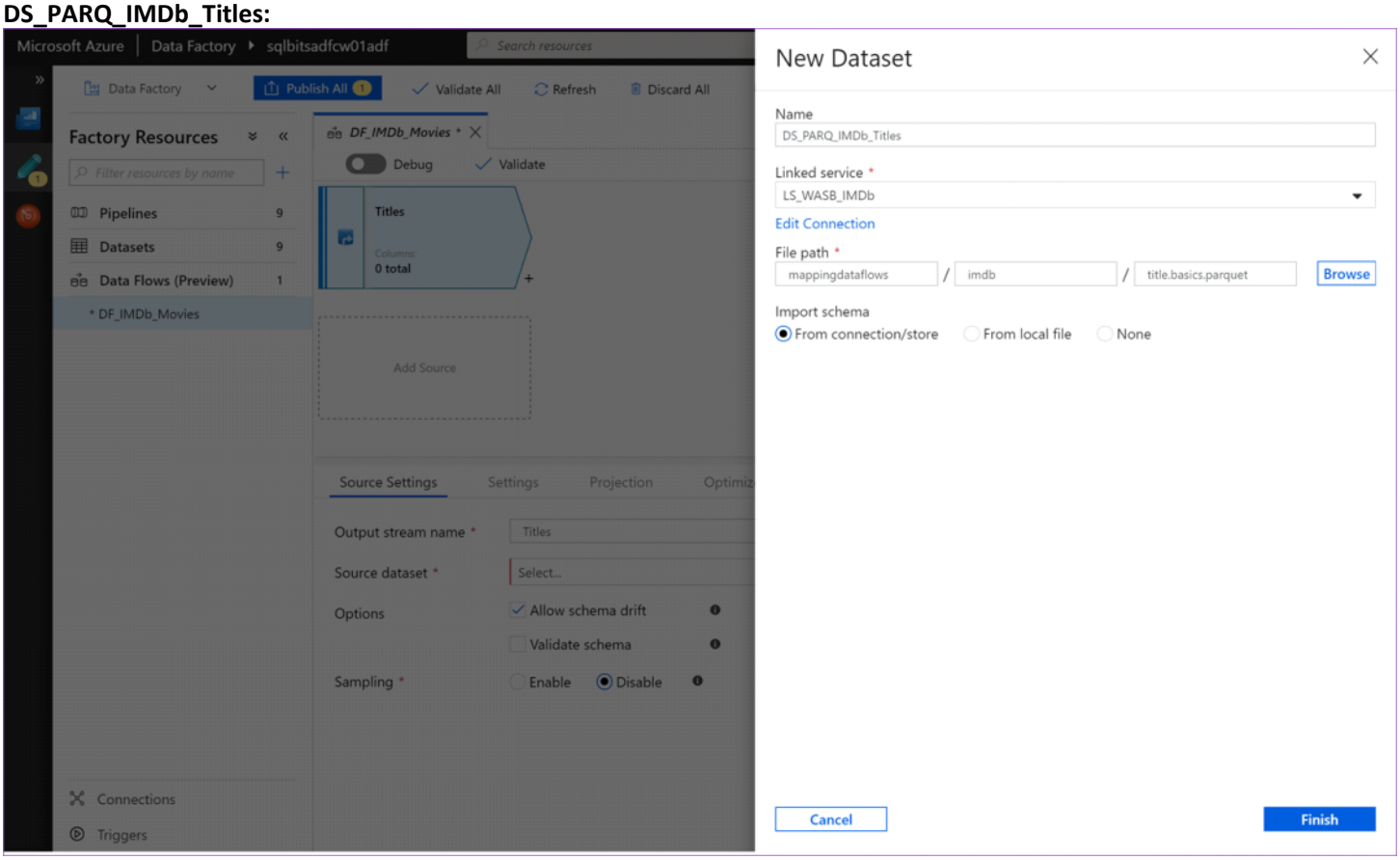
Create Data Flow

Add a new **Data Flow** named **DF_IMDb_Movies**.

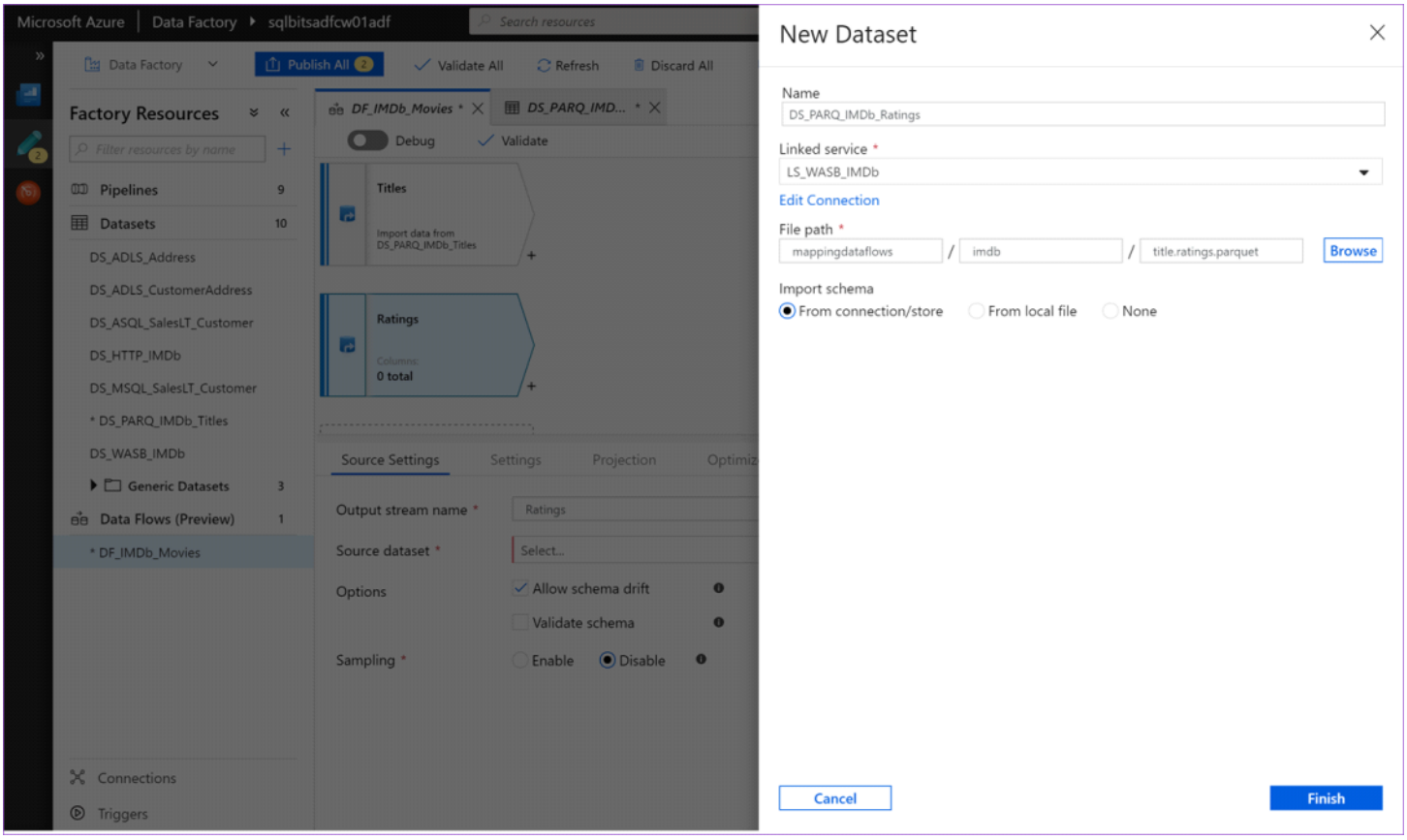
Add Sources

Add **two Sources**, one for each source file. For each source, create a new **Parquet Dataset**.

DS_PARQ_IMDb_Titles:

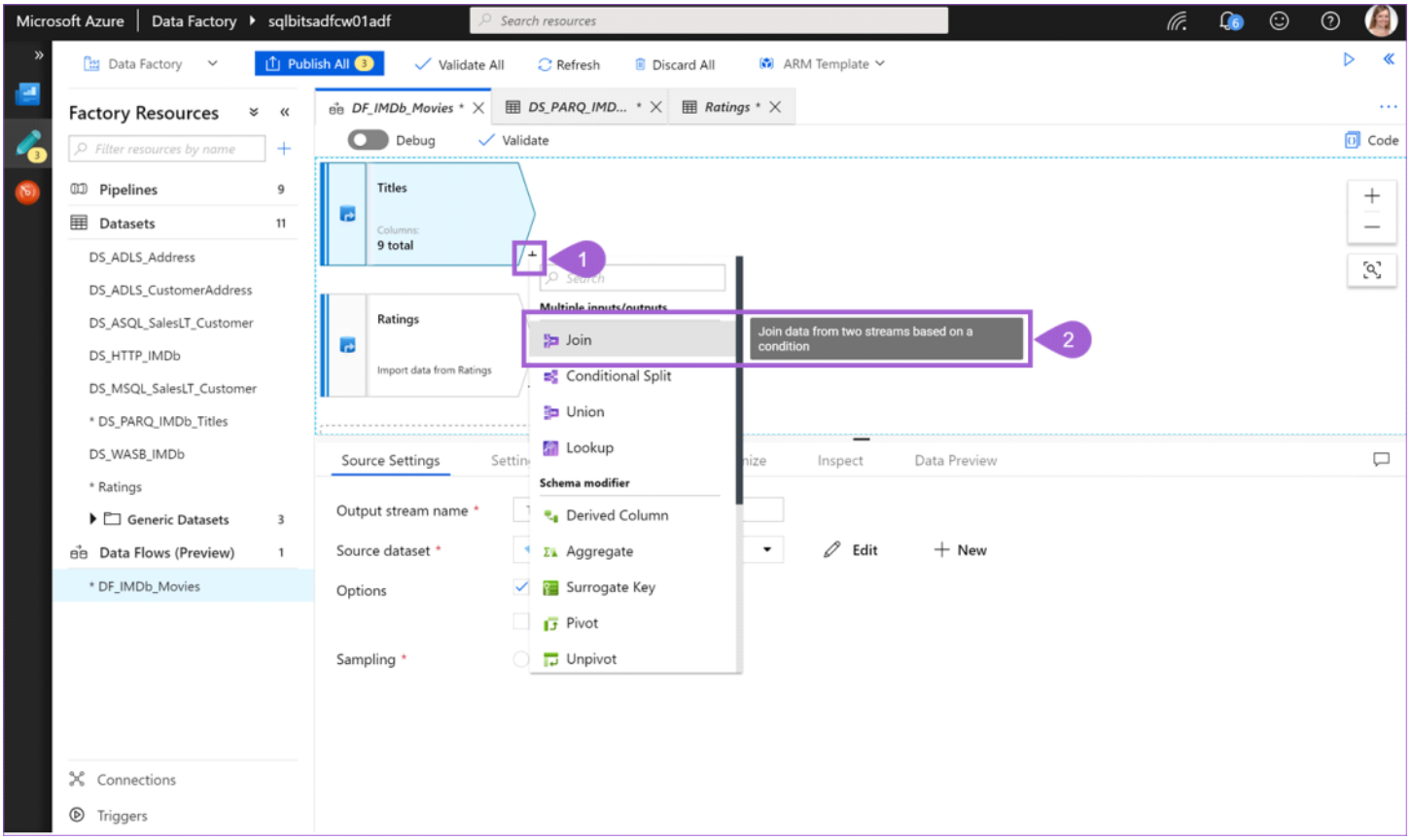


DS_PARQ_IMDb_Ratings:

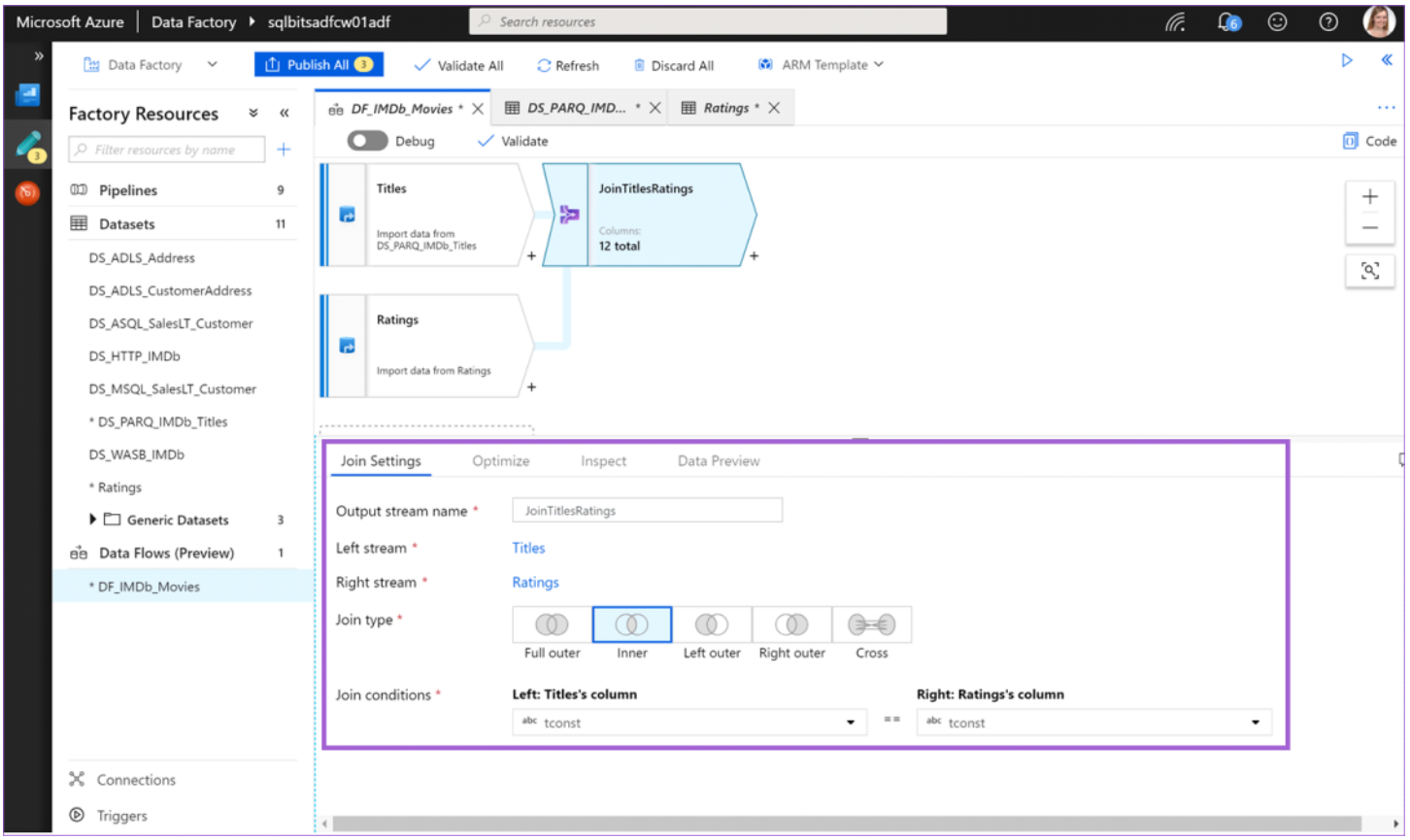


Join Sources

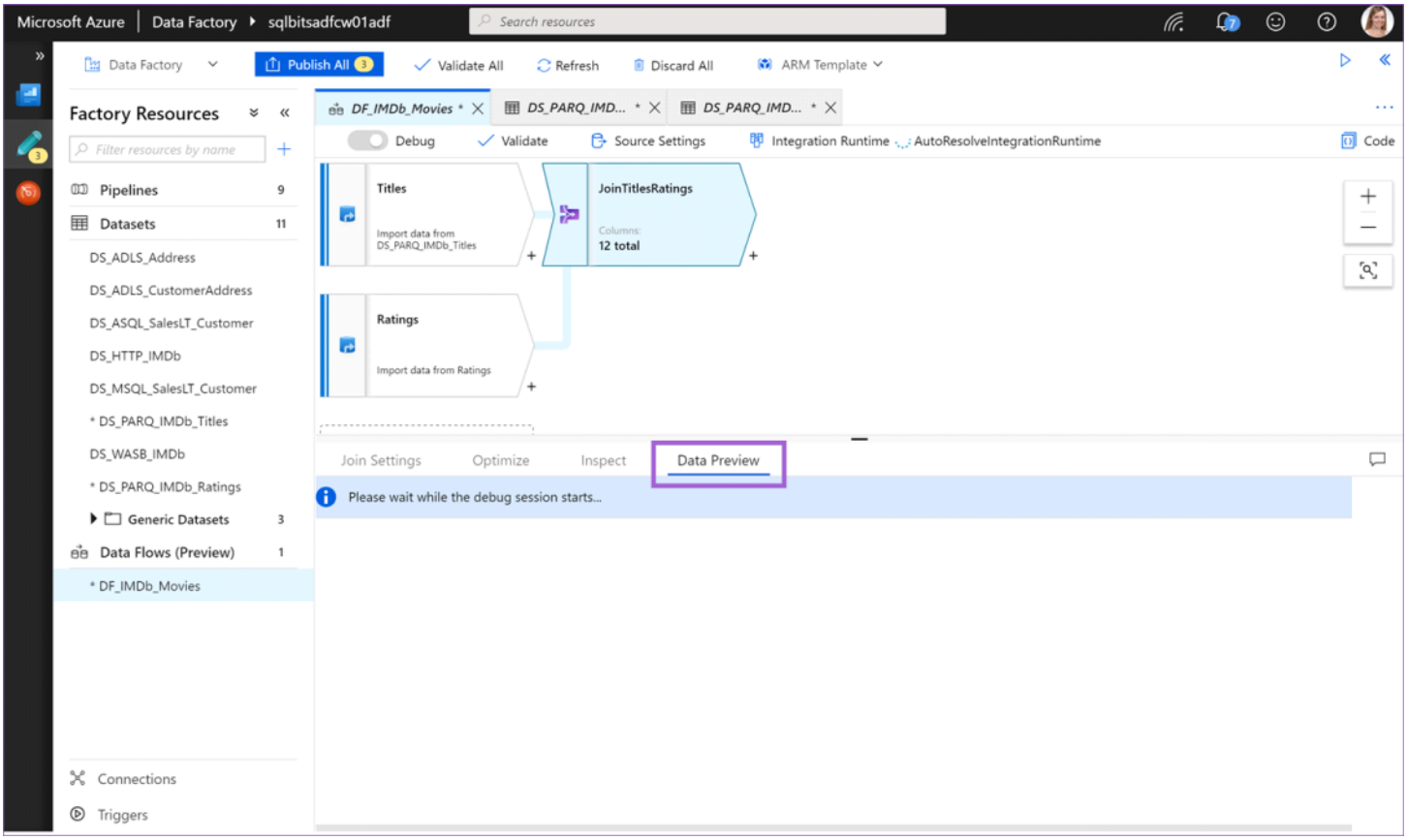
Next to the **Titles** source, click the + plus sign. Add a **Join** transformation.



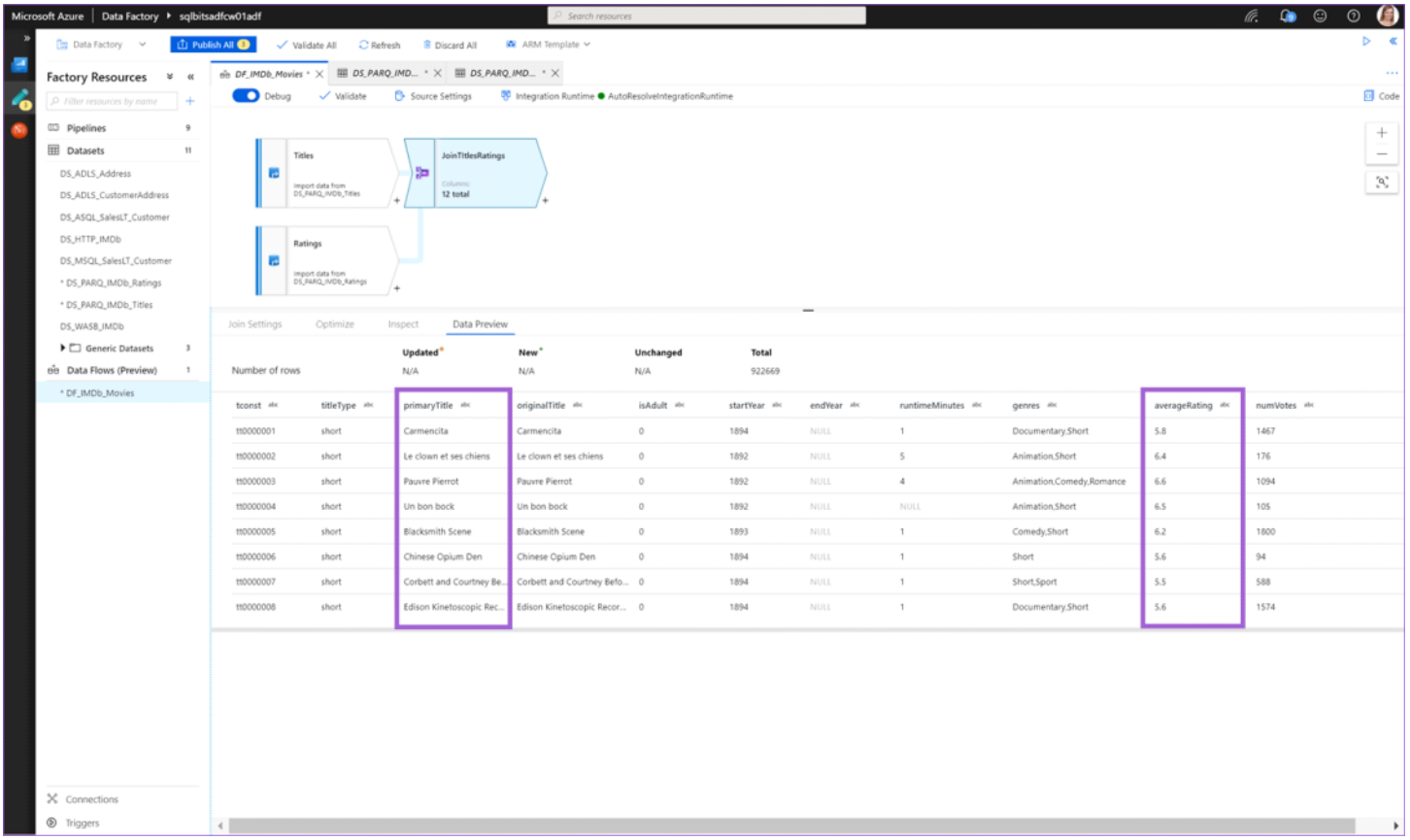
Create an **Inner Join** on the **tconst** columns.



Switch to the **Data Preview** tab and start **Debug**. Wait for the Databricks cluster to get ready. This can take around 5 minutes the first time.

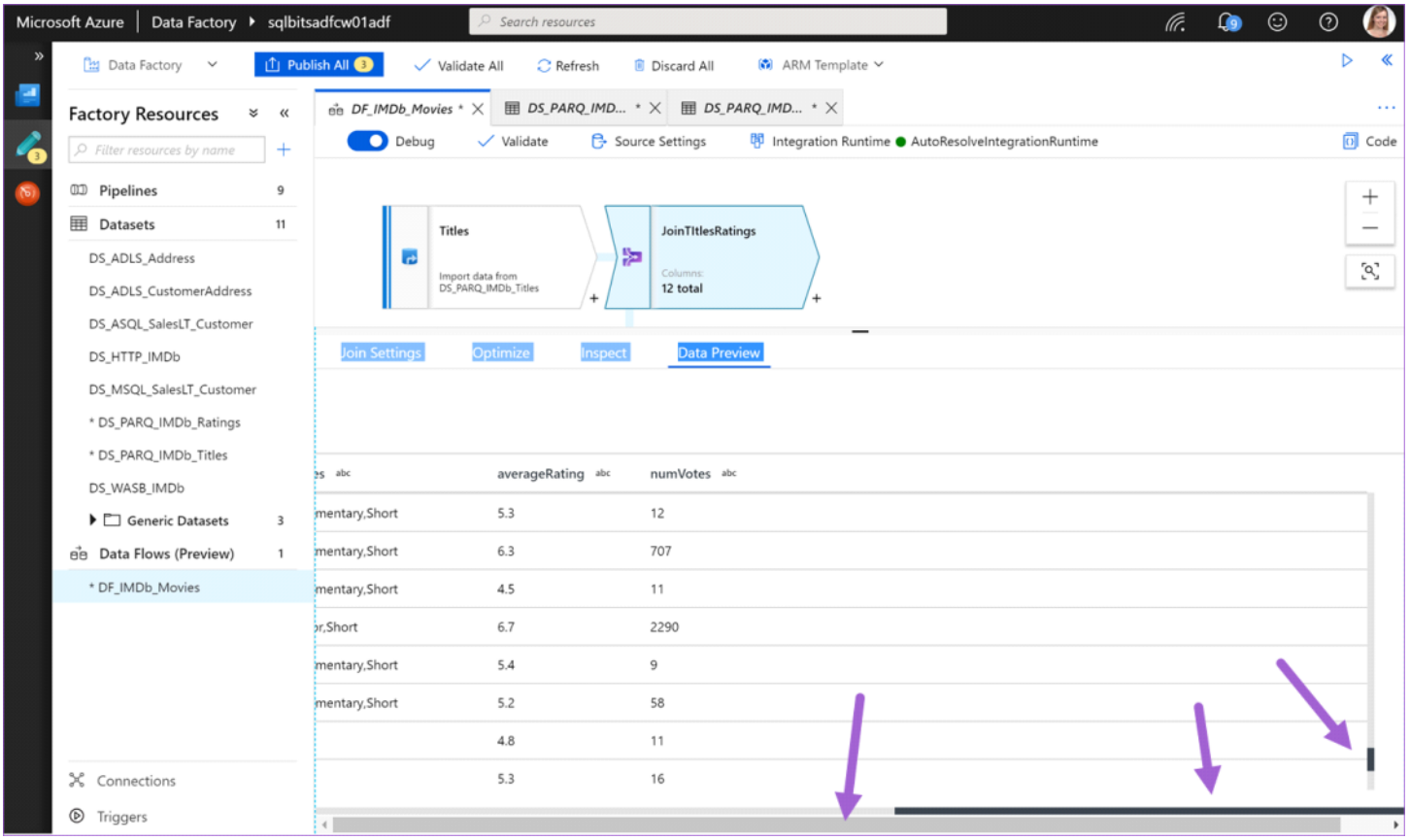


Fetch the latest preview data and verify that you can see both movie titles and their ratings.



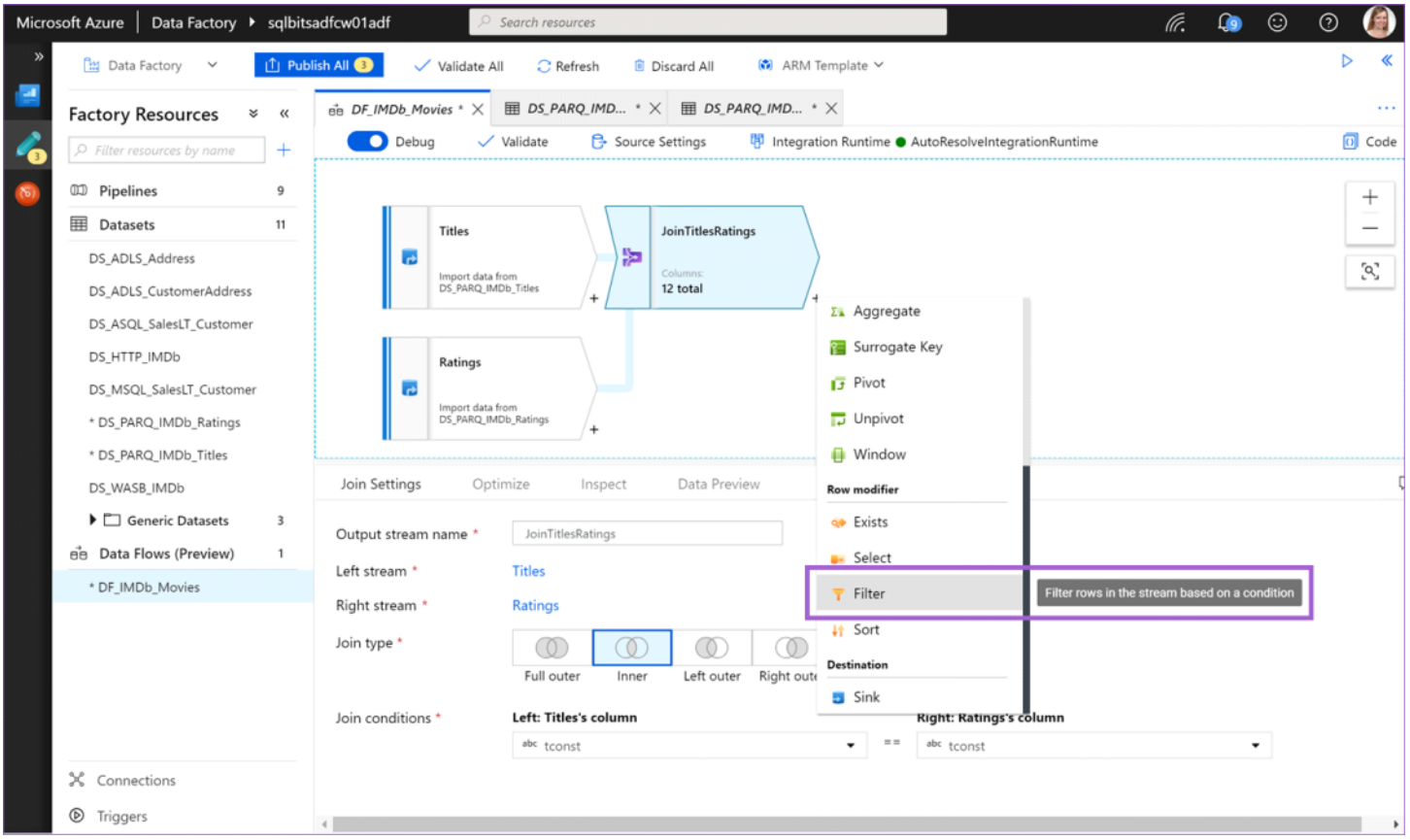
Note: You may run into the "double scrollbars" issue where you have to scroll in both the Data Preview

pane *and* inside the results grid. This can be rather painful to navigate.

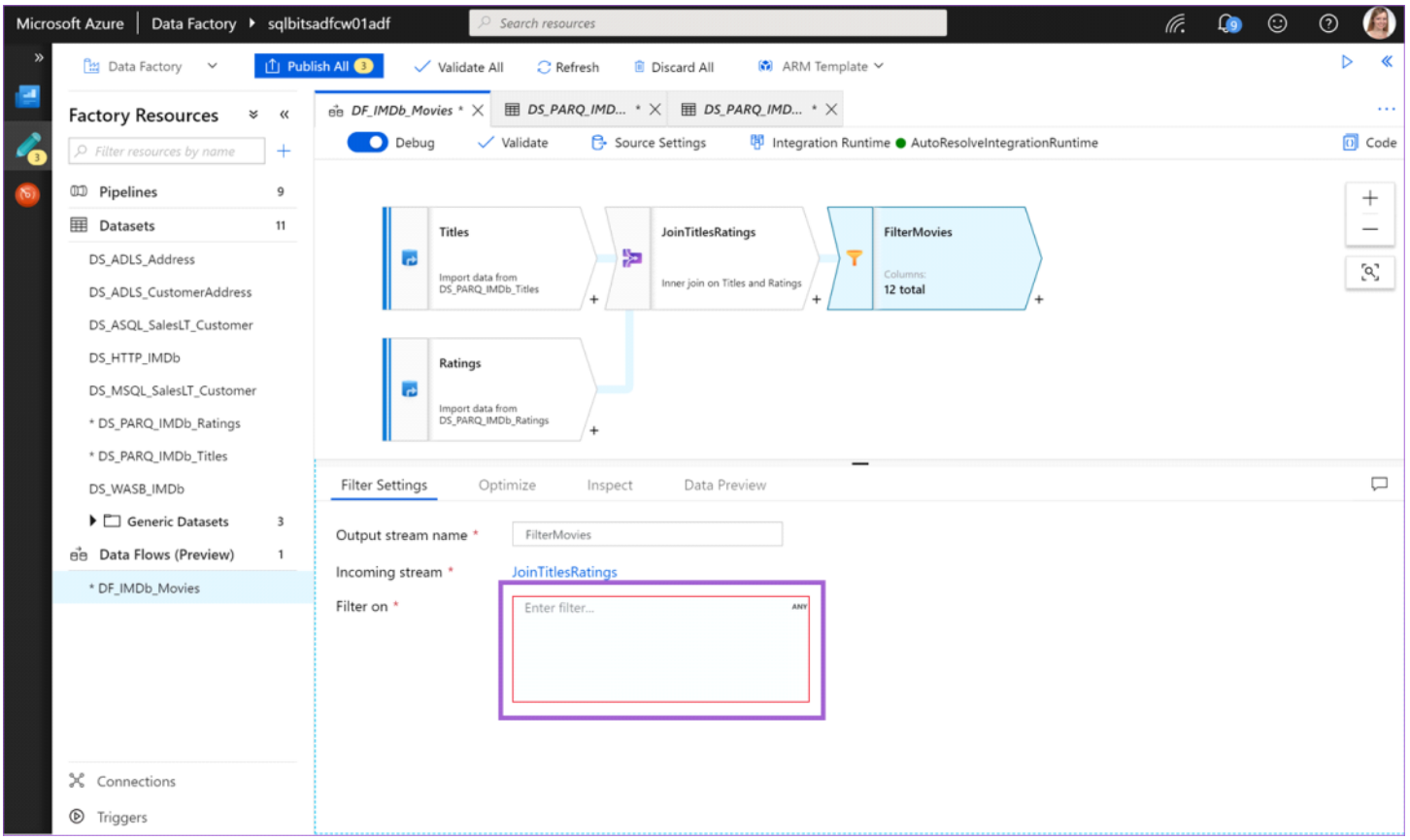


Filter Rows

Next to the **Join** transformation, click the + plus sign. Add a **Filter** transformation.

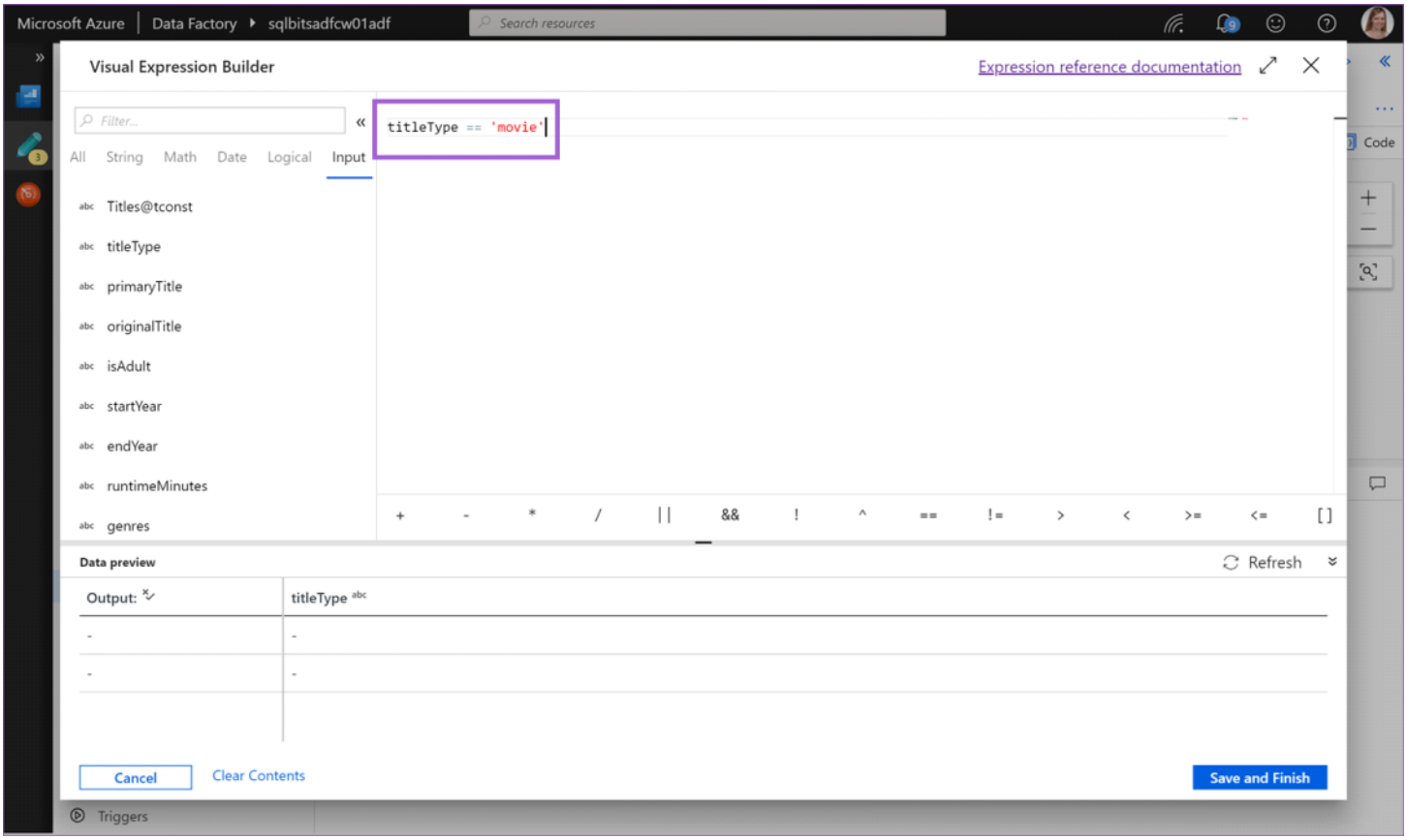


Open the **Visual Expression Editor** by clicking in the **Filter on** box.



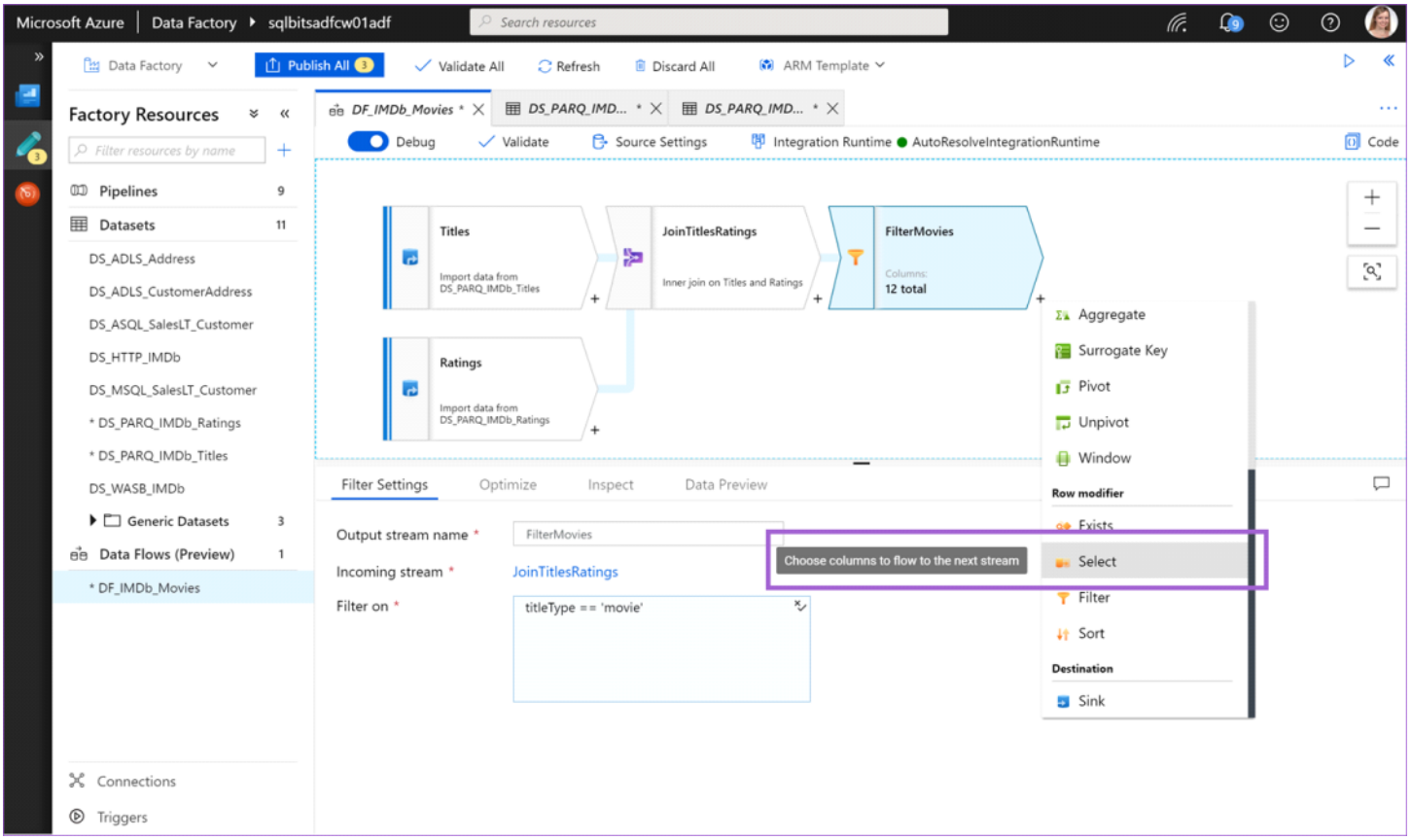
You can click the Input tab to see the input columns, or use the intellisense. Experiment by clicking on the various transformations. Finally, type in the expression `titleType == 'movie'`

Note: These datasets contain the titles of adult movies. If you prefer to remove these, use the following expression instead: `isAdult == '0' && titleType == 'movie'`

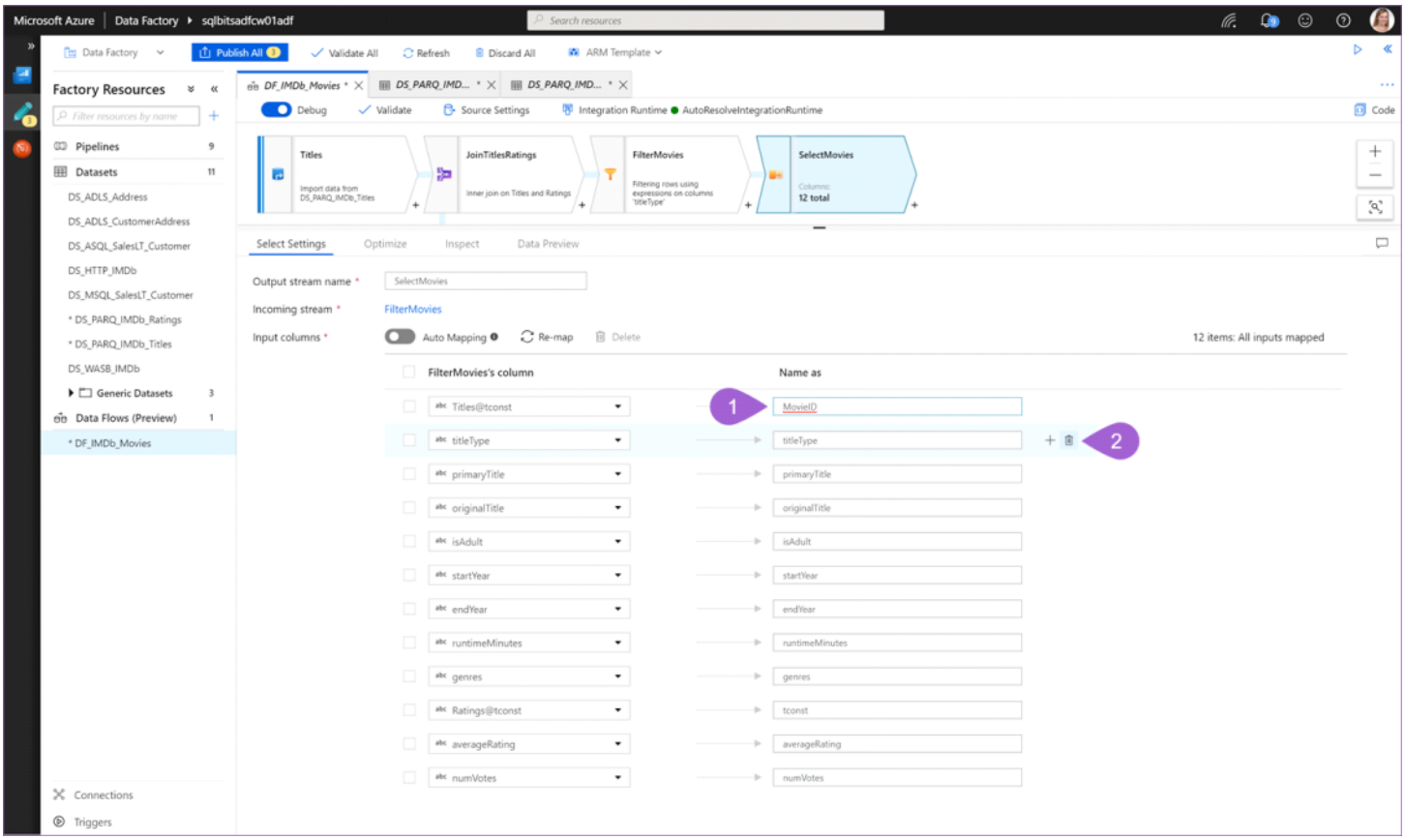


Select and Rename Columns

Next to the **Filter** transformation, click the + plus sign. Add a **Select** transformation.



It can help to zoom out and resize the panes in the interface. Click inside the **Name as** text boxes to rename columns, or hover over and click the icon to delete columns. Notice that when two columns have the same names in the sources, you will get a warning, and they will be prefixed with **Source@Column.**

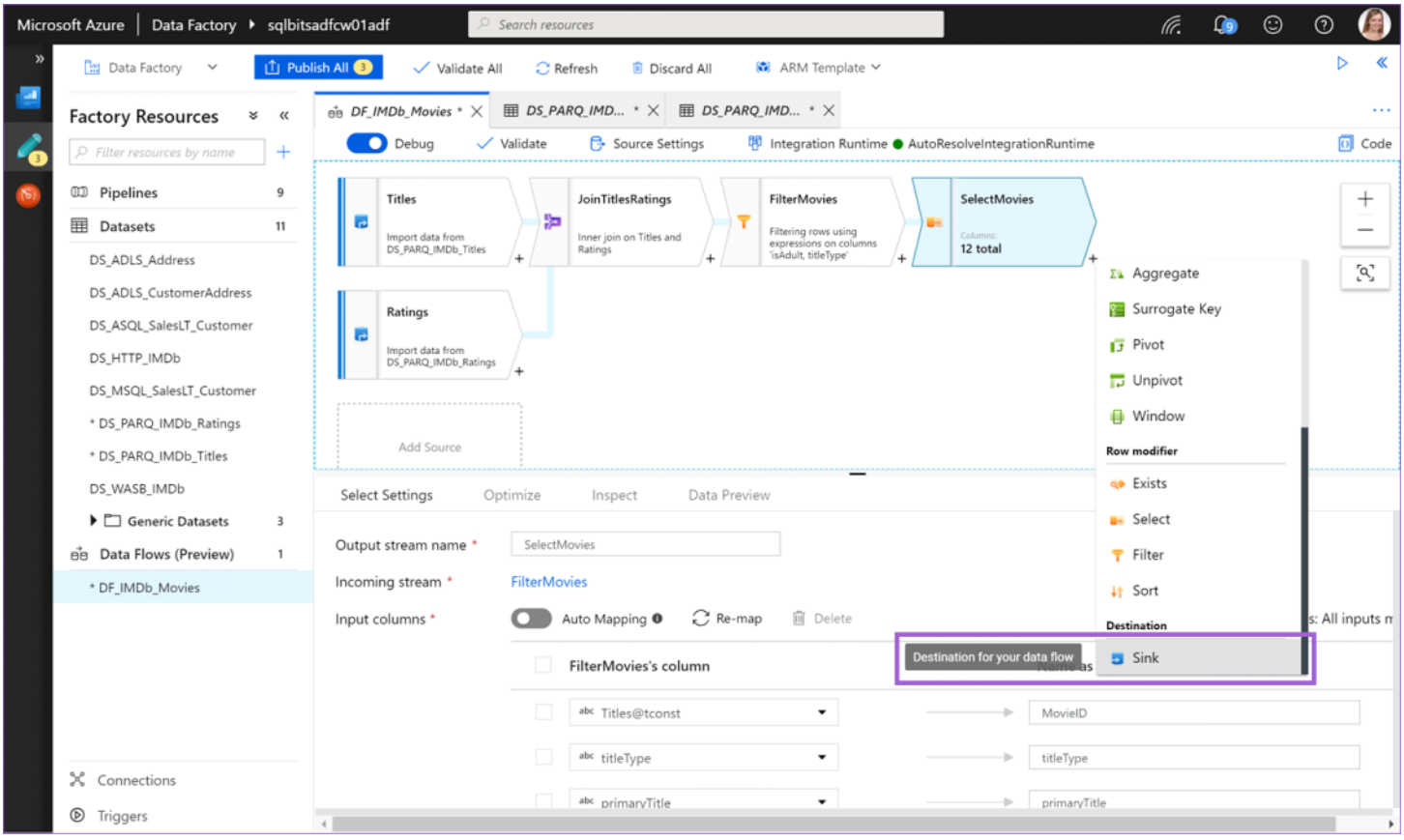


Select and rename the columns.

Column	Name As	Delete
Titles@tconst	MovieID	
titleType		Delete
primaryTitle	Title	
originalTitle	OriginalTitle	
isAdult		Delete
startYear	ReleaseYear	
endYear		Delete
runtimeMinutes	RuntimeMinutes	
genres	Genres	
Ratings@tconst		Delete
averageRating	AverageRating	
numVotes	NumVotes	

Add Sink

Next to the **Select** transformation, click the + plus sign. Add a **Sink** transformation.



For the **Sink dataset**, select the **DS_ASDW_DW_Movies** dataset.

Click **Publish All** to save.

Activity Summary

Now that you have your Data Flow, let's execute it!

Activity 03: Execute the Mapping Data Flow

Activity Overview

Estimated time to complete activity: **5 minutes**.

In this activity, we will create a Pipeline to debug and execute the Data Flow. First, we need to start our Azure SQL Data Warehouse and create our destination table. Then, we will execute the Data Flow and verify that the data has been loaded. Finally, it is important that we stop our Azure SQL Data Warehouse so we don't incur any additional costs.

Start Azure SQL Data Warehouse

From the Azure Portal, **start** your Azure SQL Data Warehouse.

Create Destination Table

Open **SQL Server Management Studio** (SSMS) and connect to your Azure SQL Data Warehouse. Create the **dbo.Movies** table.

```
DROP TABLE IF EXISTS [dbo].[Movies]
GO

CREATE TABLE [dbo].[Movies]
(
    [MovieID] [nvarchar](15) NULL,
    [Title] [nvarchar](200) NULL,
    [OriginalTitle] [nvarchar](200) NULL,
    [ReleaseYear] [smallint] NULL,
    [RuntimeMinutes] [smallint] NULL,
    [Genres] [nvarchar](200) NULL,
    [AverageRating] [decimal](4, 2) NULL,
    [NumVotes] [int] NULL
)
WITH
(
    DISTRIBUTION = HASH ( [ReleaseYear] ),
    CLUSTERED COLUMNSTORE INDEX
)
GO
```

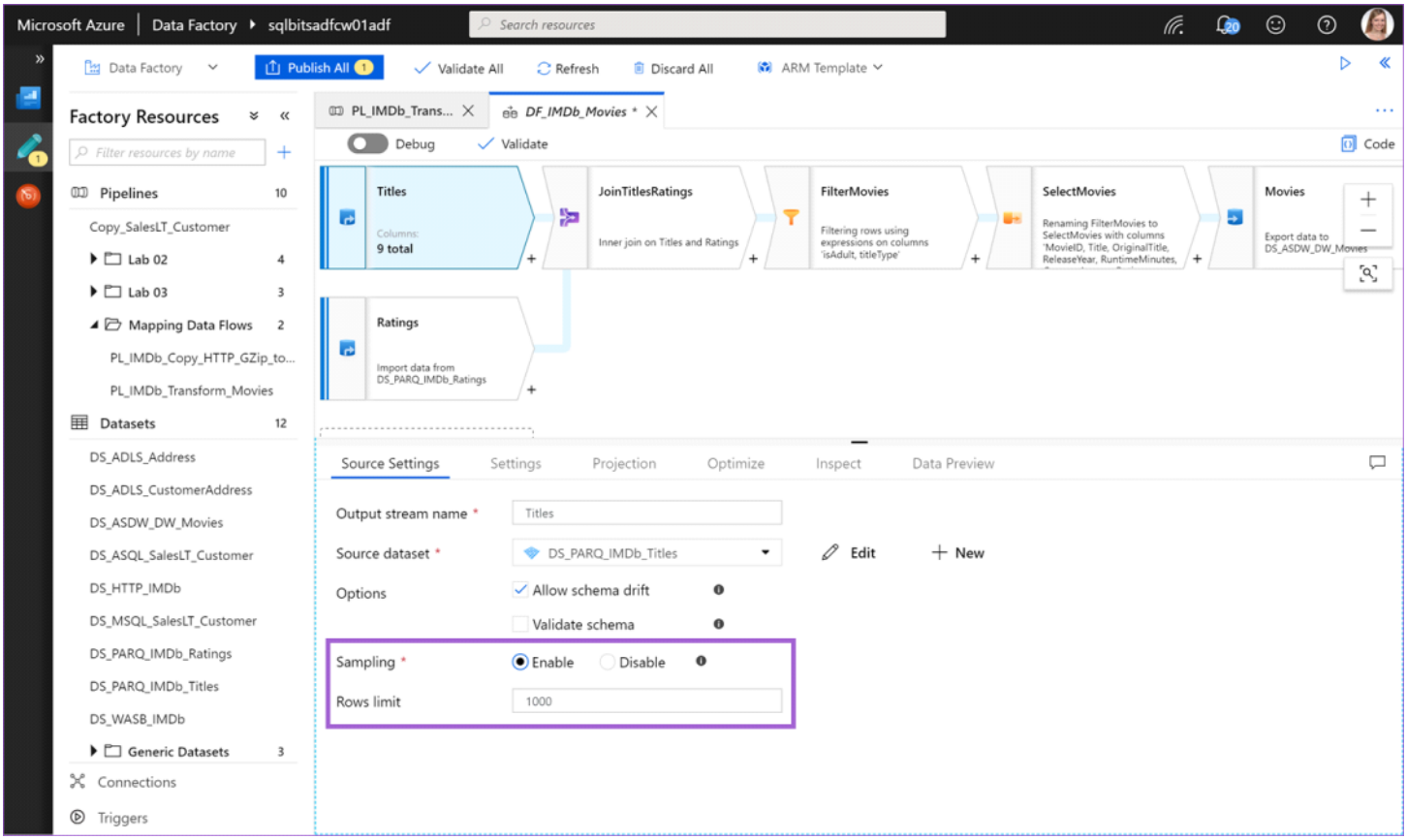
Create Pipeline for Debugging and Executing the Data Flow

To debug a Data Flow, you must run it from a Pipeline. In the **Mapping Data Flows** folder, add a new pipeline called **PL_IMDb_Transform_Movies**.

Add a **Data Flow** activity and choose the **DF_IMDb_Movies** Data Flow. Notice the Settings page. (It is

currently not possible to change the Databricks values.)

Note: To keep the running time to a minimum, we recommend that you enable **Sampling** on the **Titles** source. Set this to 1000 to begin with.

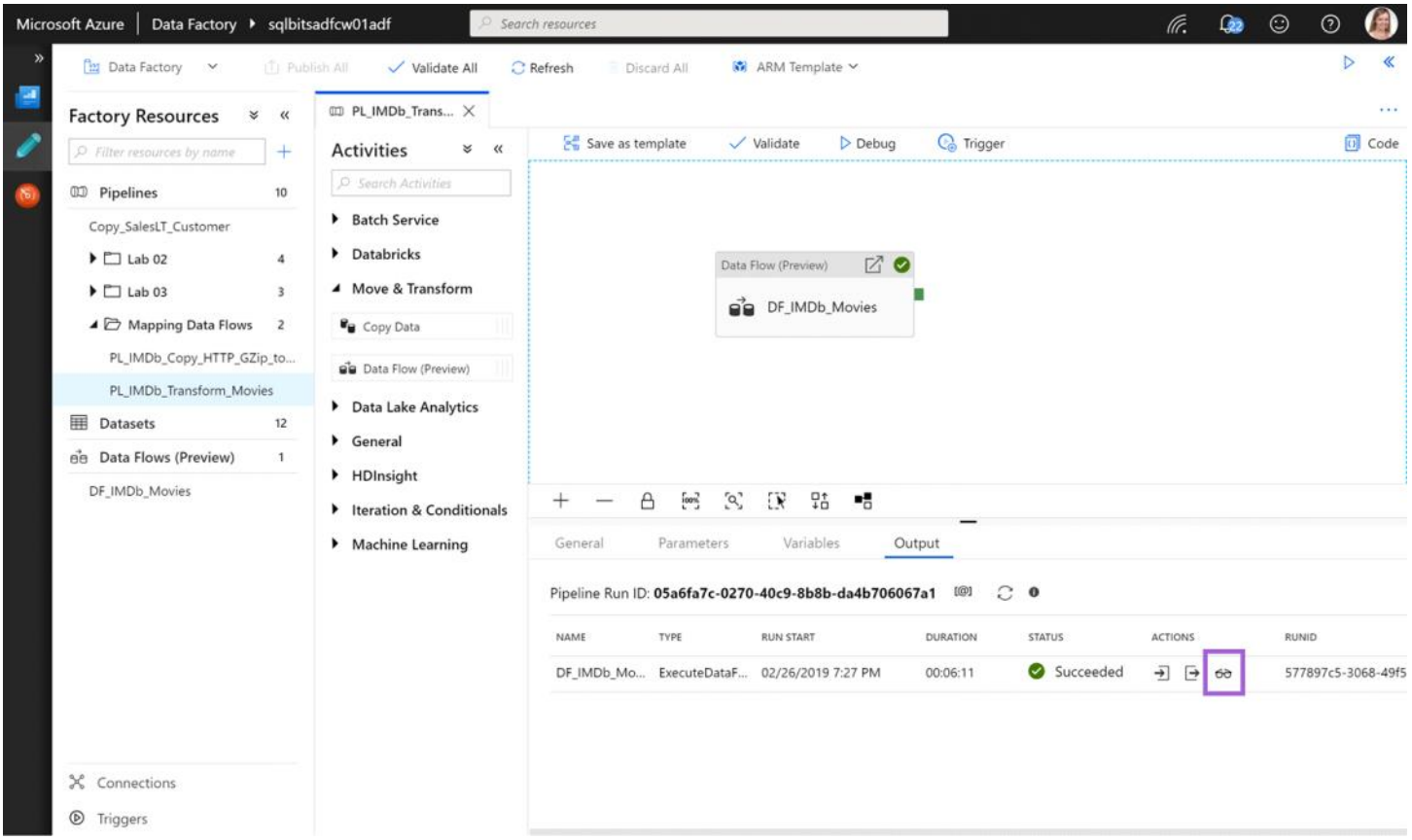


You can always change or remove this later and re-run the pipeline.

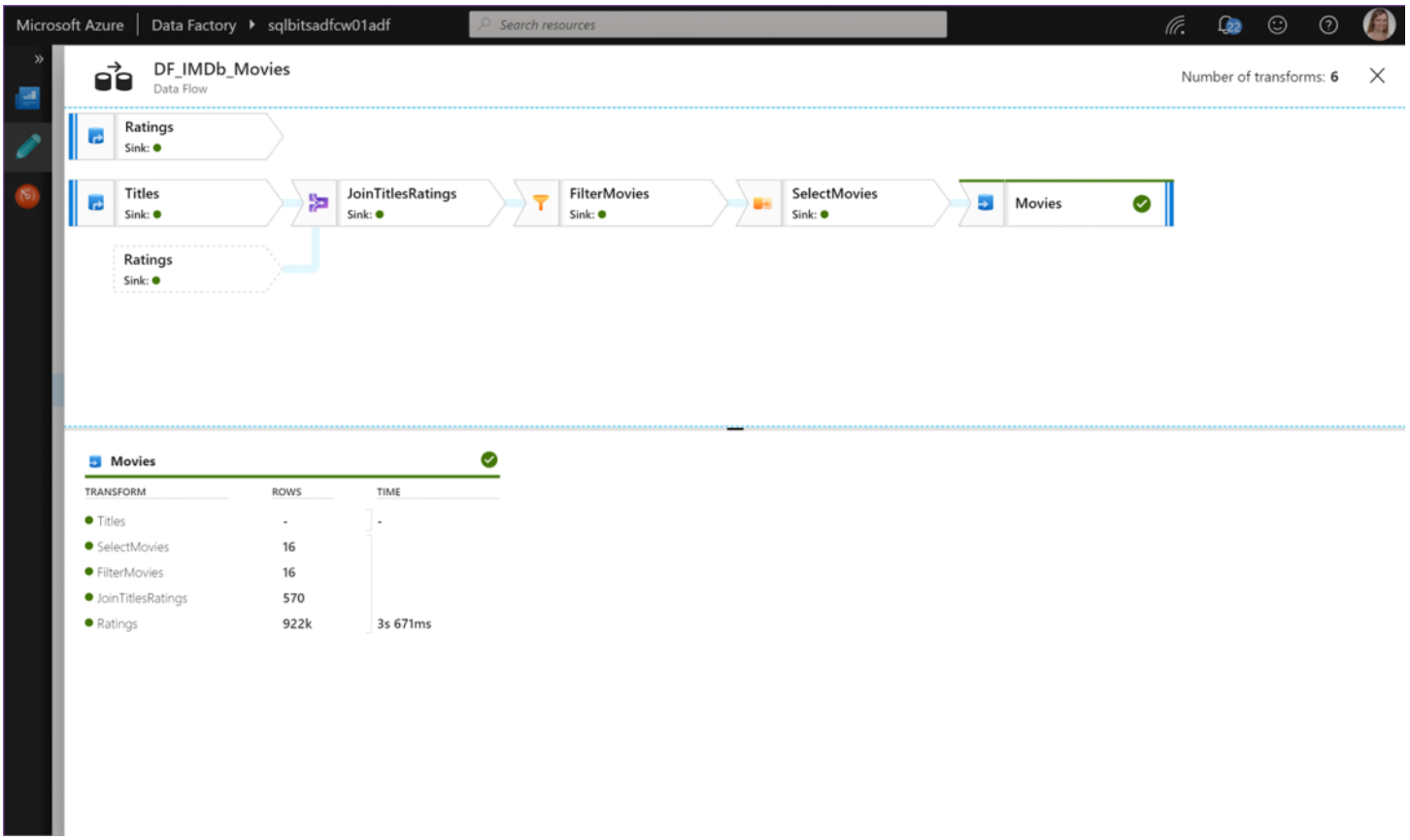
Click **Publish All**. Then **Debug** the pipeline.

Review the Execution Plan

Once the Pipeline has executed successfully, review the **Execution Plan** by click on the eyeglasses icon.



Click around and familiarize yourself with this interface.



Stop Azure SQL Data Warehouse

From the Azure Portal, **stop** your Azure SQL Data Warehouse.

It is very important to ensure this resource is stopped after this activity is completed, as it will incur costs if left running.

Activity Summary

Congratulations! You have now built and executed your Data Flow.

Bonus Activity: Load Additional Files and Experiment with Transformations

Activity Overview

In this lab, you have worked with just two source files from the available IMDb datasets. If you want to, you can expand on the solution to load the remaining files and experiment with more transformations.

Which other sources and sinks are available in Data Flows? Can you build out a dataset for TV Series in addition to Movies? How can you transform comma-separated columns into rows? How can you get just the top 250 highest-rated movies?

Lab 06: SSIS

In this lab we will cover some of the more advanced features that are need when the core capabilities of Azure data factory leave you short these are SSIS Lift and shift and Azure Data Flows

1) SSIS
2) DataFlows

SSIS

you can use SQL Server Data Tools (SSDT) or SQL Server Management Studio (SSMS) to deploy and run SQL Server Integration Services (SSIS) packages in this runtime in Azure.

Provision an Azure-SSIS integration runtime

1. On the Let's get started page, select the Configure SSIS Integration Runtime tile.

2. On the General Settings page of Integration Runtime Setup, complete the following steps:

A. For Name, enter the name of your integration runtime.
b. For Description, enter the description of your integration runtime.
c. For Location, select the location of your integration runtime. Only supported locations are displayed. We recommend that you select the same location of your database server to host SSISDB.
d. For Node Size, select the size of node in your integration runtime cluster. Only supported node sizes are displayed. Select a large node size (scale up), if you want to run many compute/memory –intensive packages.
e. For Node Number, select the number of nodes in your integration runtime cluster. Only supported node numbers are displayed. Select a large cluster with many nodes (scale out), if you want to run many packages in parallel.
f. For Edition/License, select SQL Server edition/license for your integration runtime: Standard or Enterprise. Select Enterprise, if you want to use advanced/premium features on your integration runtime.
g. For Save Money, select Azure Hybrid Benefit (AHB) option for your integration runtime: Yes or No. Select Yes, if you want to bring your own SQL Server license with Software Assurance to benefit from cost savings with hybrid use.
h. Click Next.

3. On the SQL Settings page, complete the following steps:
For Subscription, select the Azure subscription that has your database server to host SSISDB.
b. For Location, select the location of your database server to host SSISDB. We recommend that you select the same location of your integration runtime.
c. For Catalog Database Server Endpoint, select the endpoint of your database server to host SSISDB. Based on the selected database server, SSISDB can be created on your behalf as a standalone database, part of an elastic pool, or in a Managed Instance and accessible in public network or by joining a virtual

network.
For guidance in choosing the type of database server to host SSISDB, see Compare SQL Database logical server and Managed Instance. If you select Azure SQL Database with virtual network service endpoints/Managed Instance to host SSISDB or require access to on-premises data, you need to join your
Azure-SSIS IR to a virtual network. See Create Azure-SSIS IR in a virtual network.
d. On Use AAD authentication... checkbox, select the authentication method for your database server to host SSISDB: SQL or Azure Active Directory (AAD) with the managed identity for your Azure Data Factory (ADF). If you check it, you need to add the managed identity for your ADF into an AAD group with access permissions to the database server, see Create Azure-SSIS IR with AAD authentication.
e. For Admin Username, enter SQL authentication username for your database server to host SSISDB.
f. For Admin Password, enter SQL authentication password for your database server to host SSISDB.
g. For Catalog Database Service Tier, select the service tier for your database server to host SSISDB: Basic/Standard/Premium tier or elastic pool name.
h. Click Test Connection and if successful, click Next.

4. **On the Advanced Settings page, complete the following steps:**

a. For Maximum Parallel Executions Per Node, select the maximum number of packages to execute concurrently per node in your integration runtime cluster. Only supported package numbers are displayed.
Select a low number, if you want to use more than one cores to run a single large/heavy-weight package that is compute/memory -intensive. Select a high number, if you want to run one or more small/light-weight
packages in a single core.
b. For Custom Setup Container SAS URI, optionally enter Shared Access Signature (SAS) Uniform Resource Identifier (URI) of your Azure Storage Blob container where your setup script and its associated files are stored, see Custom setup for Azure-SSIS IR.
c. On Select a VNet... checkbox, select whether you want to join your integration runtime to a virtual network. You should check it if you use Azure SQL Database with virtual network service endpoints/Managed Instance to host SSISDB or require access to on-premises data, see Create Azure-SSIS
IR in a virtual network.
Create an Azure-SSIS integration runtime

5. Click Finish to start the creation of your integration runtime.

6. On the Connections tab, switch to Integration Runtimes if needed. Select Refresh to refresh the status.

Use the links in the Actions column to stop/start, edit, or delete the integration runtime. Use the last link to
view JSON code for the integration runtime. The edit and delete buttons are enabled only when the IR is stopped.

Create an Azure-SSIS integration runtime

Deploy SSIS package

Now, use SQL Server Data Tools (SSDT) or SQL Server Management Studio (SSMS) to deploy your SSIS packages to Azure. Connect to your Azure SQL Database server that hosts the SSIS Catalog (SSISDB database).

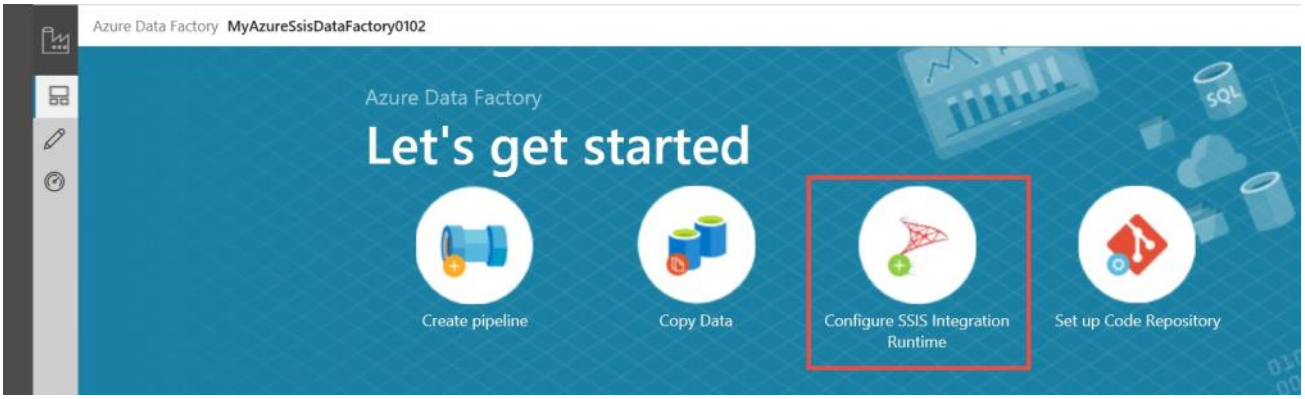
The name of Azure SQL Database server is in the format <servername>.database.windows.net .

Activity 01: Create SSIS Integration runtime

Activity Overview (5 minutes)

Configure SSIS Integration Runtime

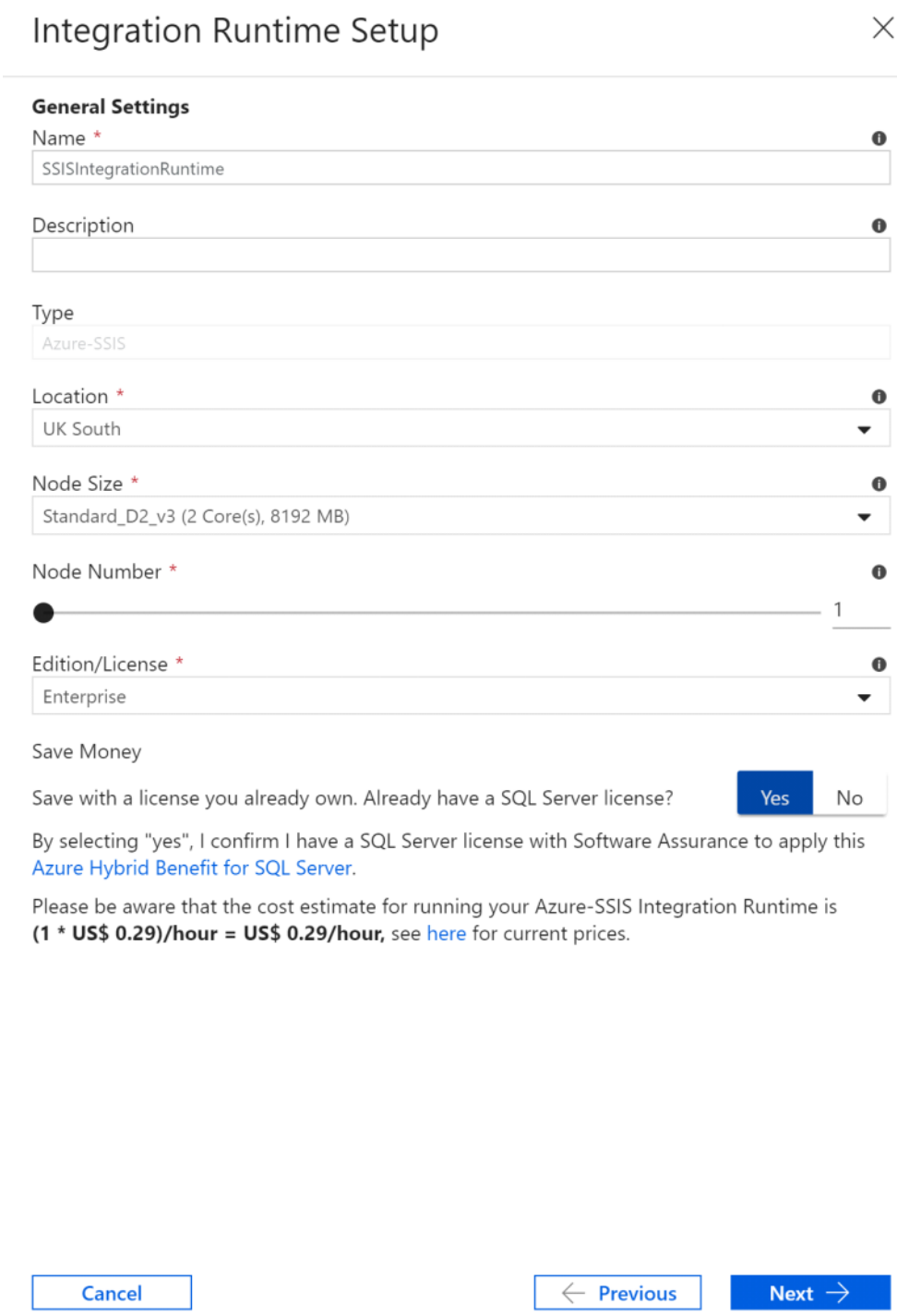
In the get started page, click Configure SSIS Integration Runtime tile.



On the General Settings page of Integration Runtime Setup, complete the following steps:

Setting	Value	Notes
Name	SSISIntegrationRuntime	
Location	UK South	Choose **UK South** Unless you picked a different region when you setup the labs in that case use that region. For example some may have chosen **West Europe**
Node Size	Standard_D2_v3	Chose the smallest size for demo purposes.
Node Number	1	Note: you can use the slider or the dropdown on the far right.
Edition/License	Enterprise	Note we are choosing enterprise but standard would work this gives you access to the all of the SSIS features that are only available in enterprise edition
Save Money		Choosing this options will reduce the cost but assume you have a valid SQL Server License. Make the best choice for your situation

After configuring your screen should like similar to below:



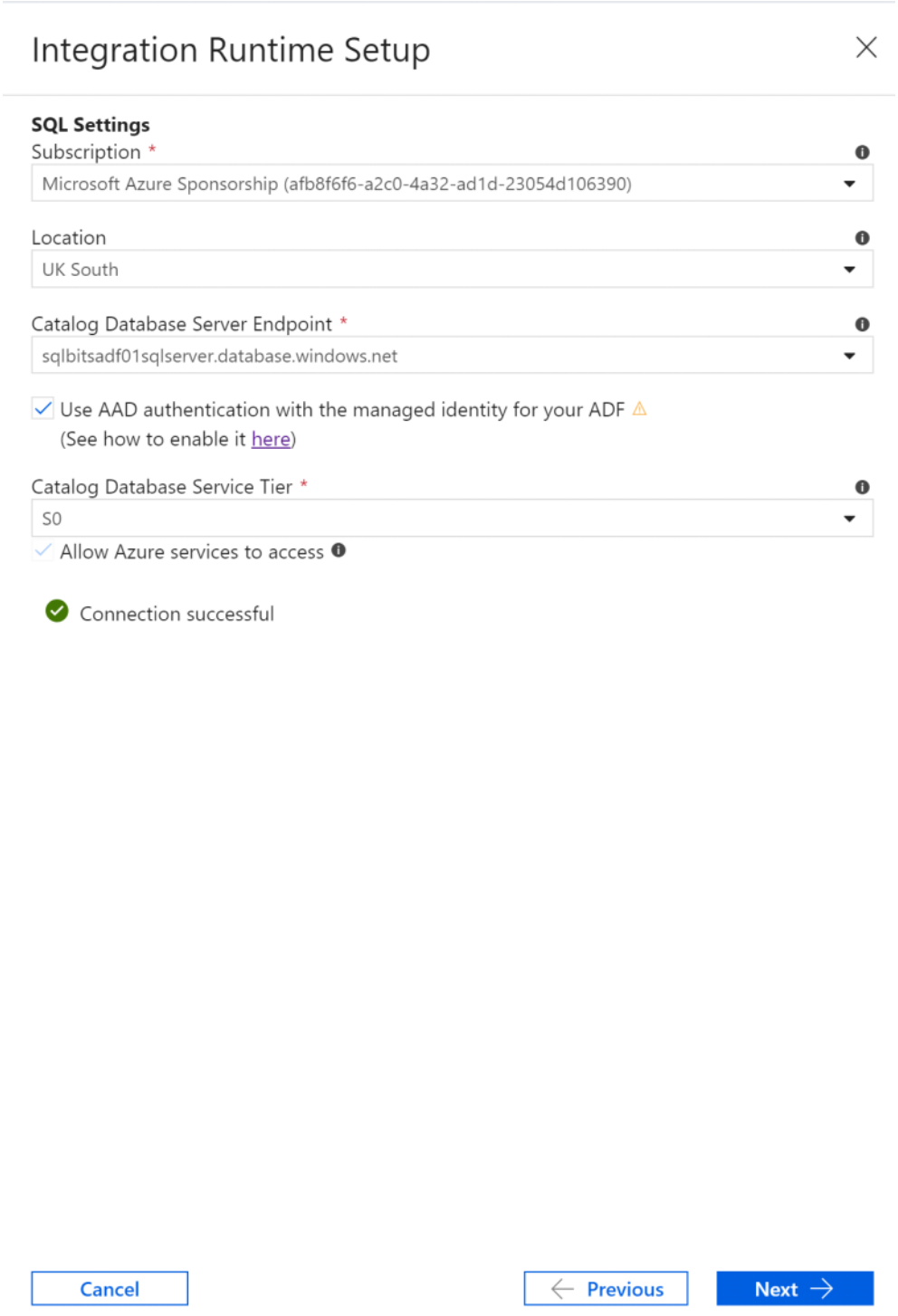
Now Click **Next**

On the SQL Settings page, complete the following steps:

Setting	Value	Notes
Subscription	Leave alone	the subscription information should be auto populated
Location	UK South	Choose **UK South** Unless you picked a differen**t** region when you setup the labs in that case use that region. For example some may have chosen **West Europe**
Catalog Database Server Endpoint		This value should be auto populated
Use AAD authentication		**Optional** you can set this up but you will have to follow the directions in the link it involves running a PowerShell script. Note: if you check this the other options go away
Admin Username	adfadmin	This will be the account you chose for the Logical SQL Server during the prereq

		setup tasks
Admin Password		This will be the password you chose for the Logical SQL Server during the prereq setup tasks
Catalog Database Service Tier	S0	

When you are done the screen should look similar to this (be sure to click Test Connection before moving on)



Now click **Next**

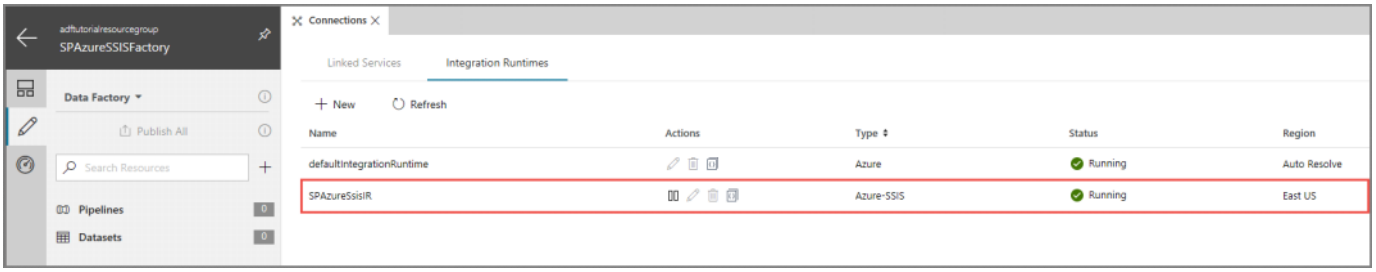
On the **Advanced Settings** page, take the defaults

Setting	Value	Notes
Custom Setup Container SAS URI	Leave blank	this property can be used to link to custom setup binaries such as MSI's and Exe's. We won't be using it here but if you want more information: https://docs.microsoft.com/en-us/azure/data-factory/how-to-configure-azure-ssis-ir-custom-setup
Select a VNet for your Azure-SSIS Integration Runtime to join and allow ADF to create certain network resources	unchecked	This property can be used if you need to setup a VNET for advanced scenarios (for example accessing an on-prem data source from within SSIS) if you would like to learn more: https://docs.microsoft.com/en-us/azure/data-factory/join-azure-ssis-integration-runtime-virtual-network

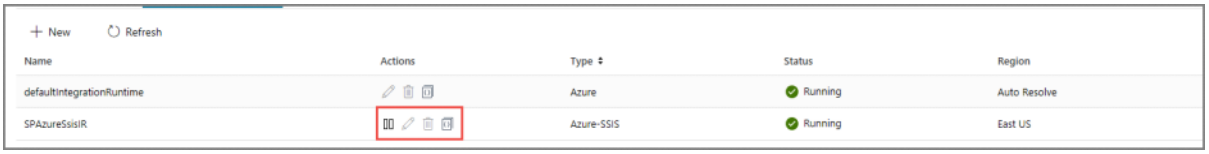
Click **Next** review the settings and then chose **Finish**

Note: it will take 30-40 minutes for the IR to show running periodically check the status. It is critical not to leave it running after the initial deploy as it will incur costs be sure to shut it down when it is done provisioning

In the Connections window, switch to Integration Runtimes if needed. Click Refresh to refresh the status.



Use the links under Actions column to stop/start, edit, or delete the integration runtime. Use the last link to view JSON code for the integration runtime. The edit and delete buttons are enabled only when the IR is stopped.



Note: you could have directly set this up from the Connections Integration Runtime Tab of the visual Authoring U/I.

Summary

In this activity you learned how to setup an Azure SSS integration runtime. Be sure to stop the integration runtime

Activity 02: Deploy SSIS Project

Activity Overview (5 minutes)

Now, use SQL Server Data Tools (SSDT) or SQL Server Management Studio (SSMS) to deploy your SSIS packages to Azure. Connect to your Azure SQL Database server that hosts the SSIS Catalog (SSISDB database).

The name of Azure SQL Database server is in the format <servername>.database.windows.net .

If you get stuck, see the following articles from the SSIS documentation:

Deploy, run, and monitor an SSIS package on Azure
Connect to the SSIS Catalog on Azure
Schedule package execution on Azure
Connect to on-premises data sources with Windows authentication

Next, we will connect to the Integration Services Catalog to upload the provided package.

Run security scripts

We need to run the following two scripts to ensure that our deployment account has the correct permissions to run the SSIS Pa ckage

Master - DBManager Role.sql
SSISDB - DeploymentUser Security.sql

These are located in the folder: **Labs\06 - SSIS Lift and shift**

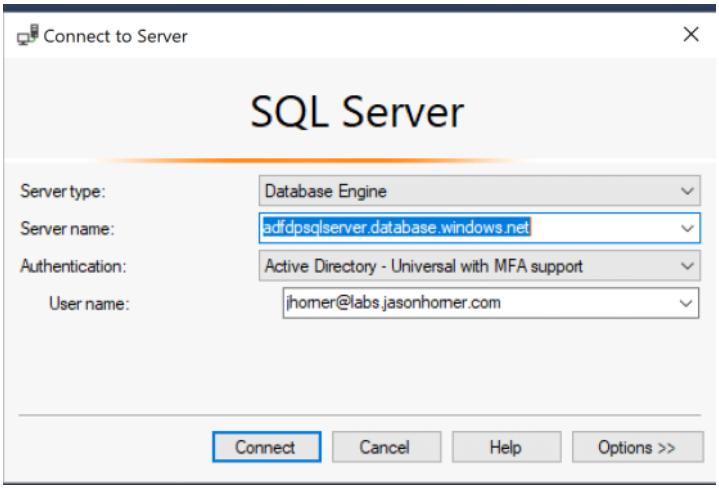
After these scripts run, move on to the next step

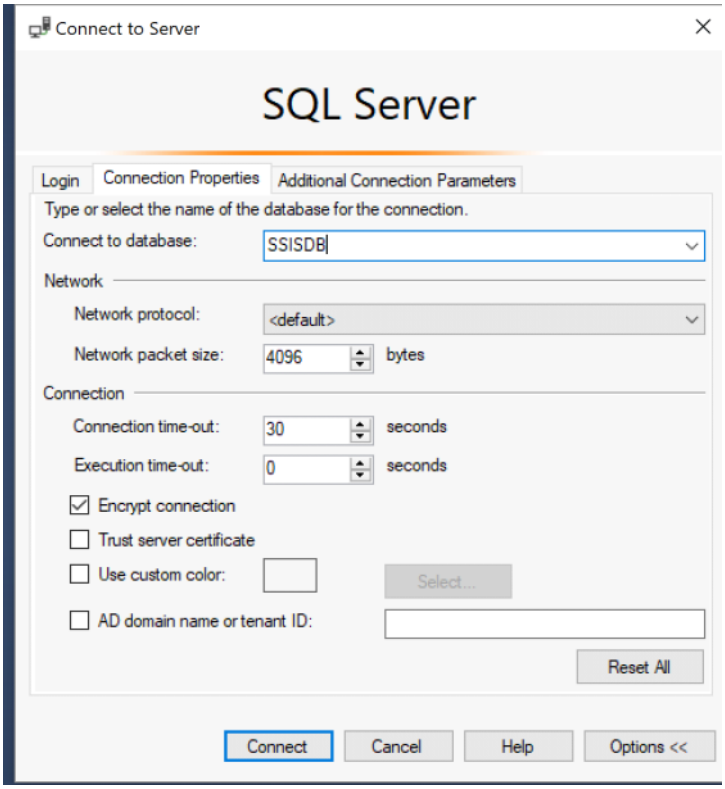
From SQL Server Management Studio, connect to the Integration Services Catalog.

Deploy SSIS Project

1) From SQL Server Management Studio, connect to the Integration Services Catalog.

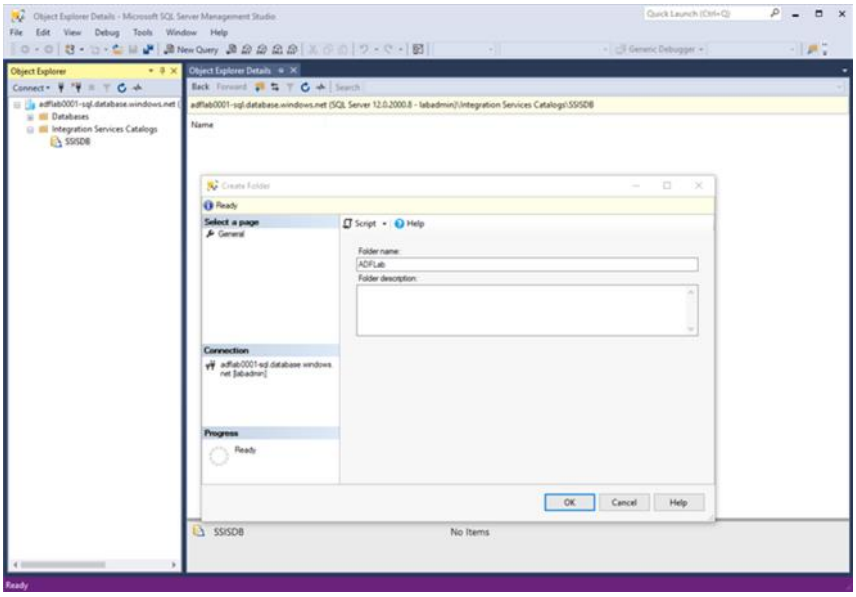
Item	Value	Notes
SQL Server	**<Logical SQL Server>.database.windows.net**	This will be the name of the azure data factory. It must be unique. Save this value for later as you will refer to it often
Login	**DeploymentUser**	We use the sql account here, as we experienced problems with the AAD Account
Password	**<Your Password>**	This is the password that you set
Authentication		
Database	**SSISDB**	



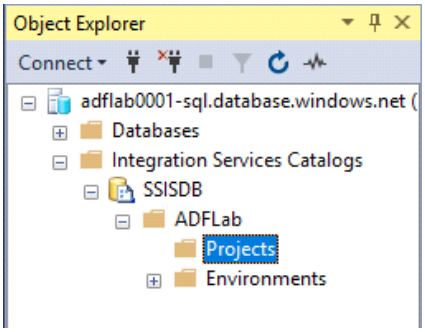


NOTE: It Is critical that you set the default database to SSISDB, if you don't you wont get the integration catalog folder below

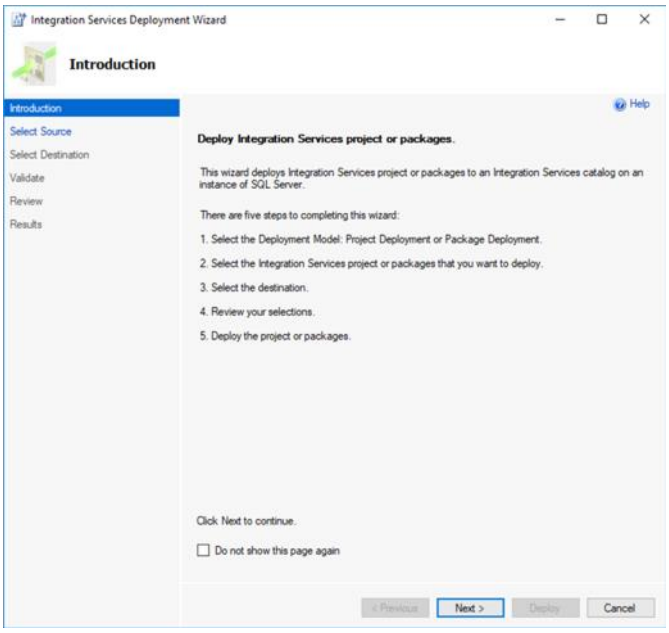
2) Right Click on the **SSISDB** in the **Integration Services Catalogs** and Create folder called **<ADFLab>**.



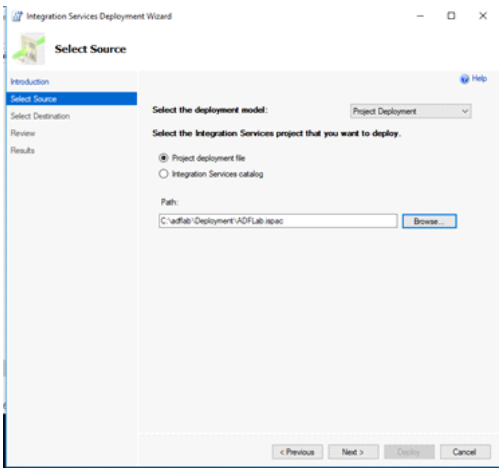
3) Navigate to the **Projects** folder beneath the **ADFLab** folder. Right click on the **Projects** folder to Start the Deploy Projects Wizard.



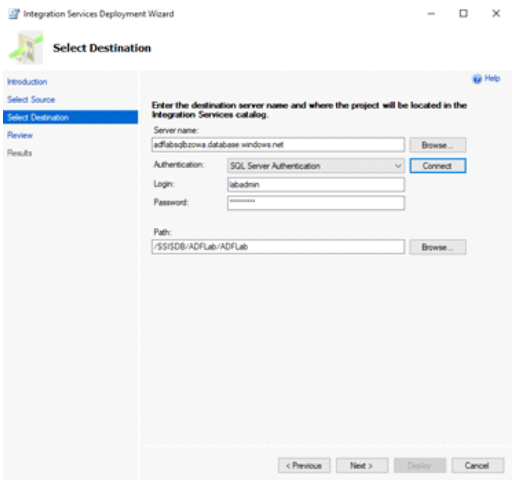
1) Click **Next**, if the Introduction Screen is displayed. (Feel Free top check the do not display)



1) Select Project Deployment and click Browse locate the **SSISDemo.ispac** file in the folder **Labs\06 - SSIS Lift and shift**.

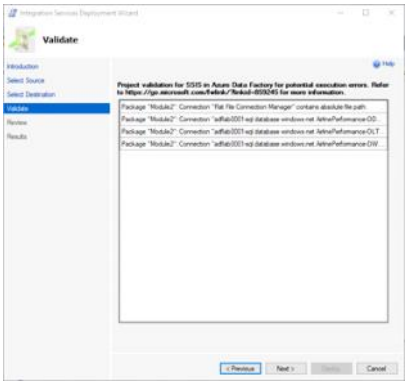


2) Select the Destination Integration Services Catalog

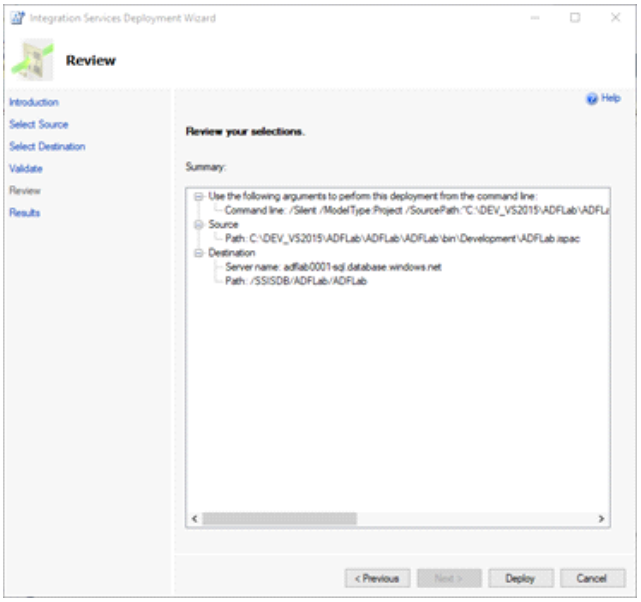


Item	Value	Notes
SQL Server	**<Logical SQL Server>.database.windows.net**	This will be the name of the azure data factory. It must be unique. Save this value for later as you will refer to it often
Authentication	**SQl Server Authentication**	
Login	**DeploymentUser**	This is the deployment user SQL Account
Password	**<Your Password>**	This is the password that you use to access the azure portal
Path	**/SSISDB/ADFLAB**	The path that represents the folder you created earlier this should already be populated

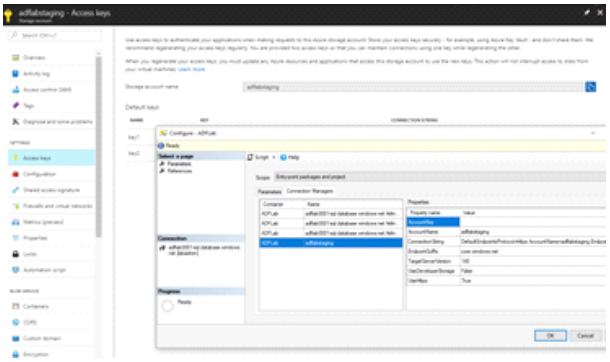
1) Review Validate Results.



1) Review configurations and Deploy the SSIS Project



4) Configure Connection Managers



Connection Manager	Value	Notes
SQL Server	**<Logical SQL Server>.database.windows.net**	This will be the name of the azure data factory. It must be unique. Save this value for later as you will refer to it often
Username	**DataLoadUser**	NOTE: this is the dataload user account not the deploymentUser
Password		The password you set

Update the package you should now be able to run and test it.

Summary

In this activity you learned how to Deploy an ispac file to an SSIS Catalog hosted in Azure Sql Database while the package it self was quite trivial and we could have done more with parameters environments and variables. This demonstrated the core principals

Activity 03a: Create a pipeline with an Execute SSIS Package activity

Activity Overview (5 minutes)

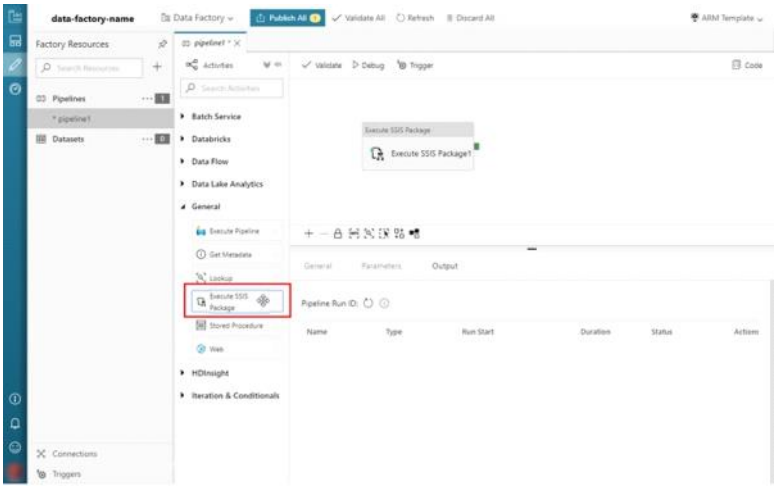
Now that we have created an SSIS Integration Runtime and deployed an SSIS Package to the Catalog, we create a pipeline with a Execute SSIS Package Activity. This activity simplifies the execution of SSIS Packages from Azure Data Factory, however as we will see in the following lab we can also fall back and use a generic stored procedure activity this gives us more fine grained control over the exact TSQL that is used.

Create a pipeline with an Execute SSIS Package activity

In this step, you use the Data Factory UI to create a pipeline. You add an Execute SSIS Package activity to the pipeline and configure it to run the SSIS package.

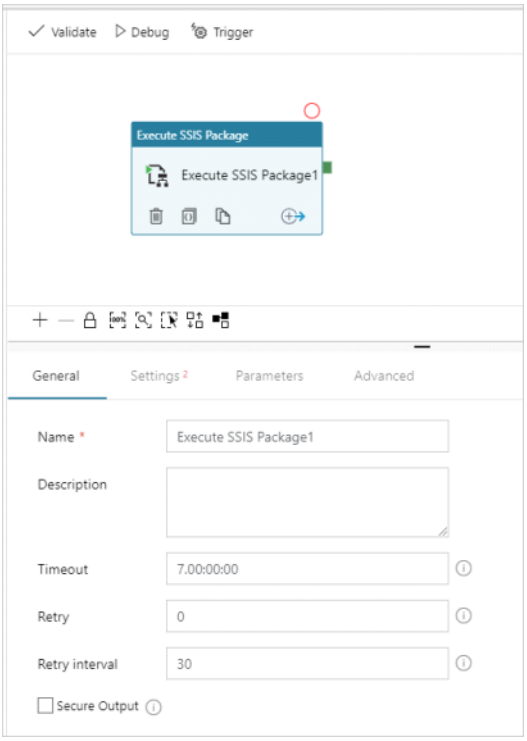
Create A New Pipeline Called **ExecuteSSIS**

In the Activities toolbox, expand General, and drag and drop the Execute SSIS Package activity to the pipeline canvas

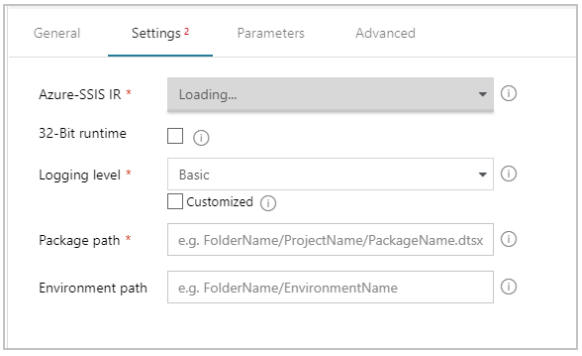


On the General tab of properties for the Execute SSIS Package activity, provide a name and description for

the activity. Set optional timeout and retry values.



On the Settings tab of properties for the Execute SSIS Package activity, select the Azure-SSIS Integration
Runtime associated with the SSISDB database where the package is deployed. Provide the package path in
the SSISDB database in the format <folder name>/<project name>/<package name>.dtsx . Optionally specify
32-bit execution and a predefined or custom logging level, and provide an environment path in the format
<folder name>/<environment name> .



3) To validate the pipeline configuration, click Validate on the toolbar. To close the **Pipeline Validation Report**, click >>.

Activity Summary

After completing this activity we should have a new pipeline that can be used to execute an SSIS Package. We showed how to configure this activity. In the next activity, we will look at an alternative

method to execute the SSIS Package via a stored procedure activity. If you want feel free to skip ahead to **Activity 04: Execute the pipeline** in that activity we will show you how to execute and monitor the pipeline and also cover testing and debugging the deployment.

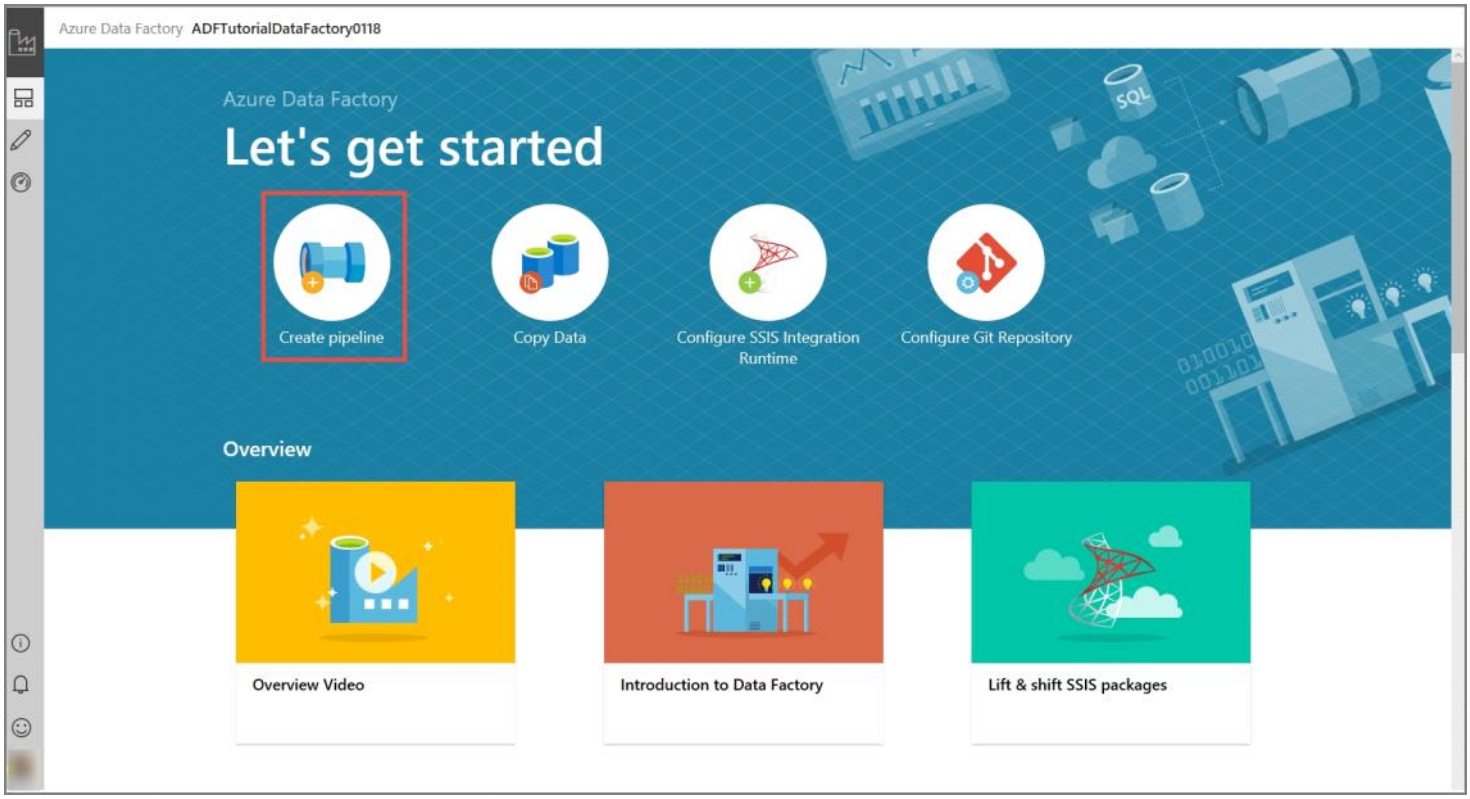
Activity 03b: Create a Pipeline with a Stored Procedure Activity

Activity Overview (5 minutes)

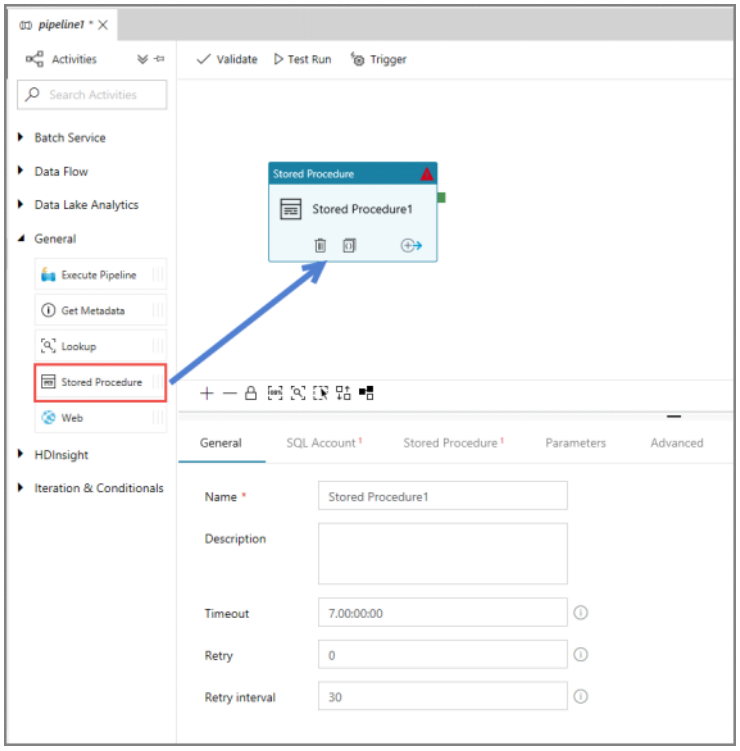
In this activity, we will look at an alternative method for executing an SSIS Package from Azure Data Factory using a Stored Procedure Activity.

Execute SSIS Package Using Stored Procedure Activity

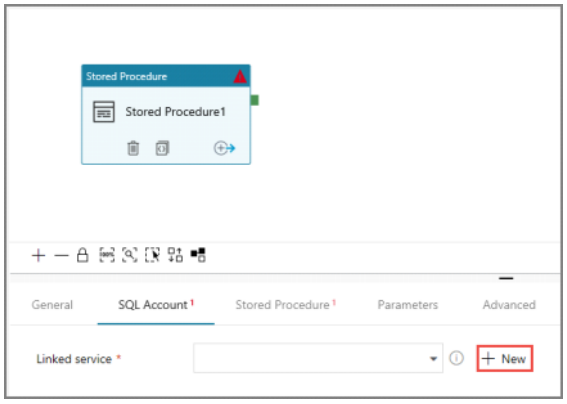
1) In the get started page, click **Create** pipeline:



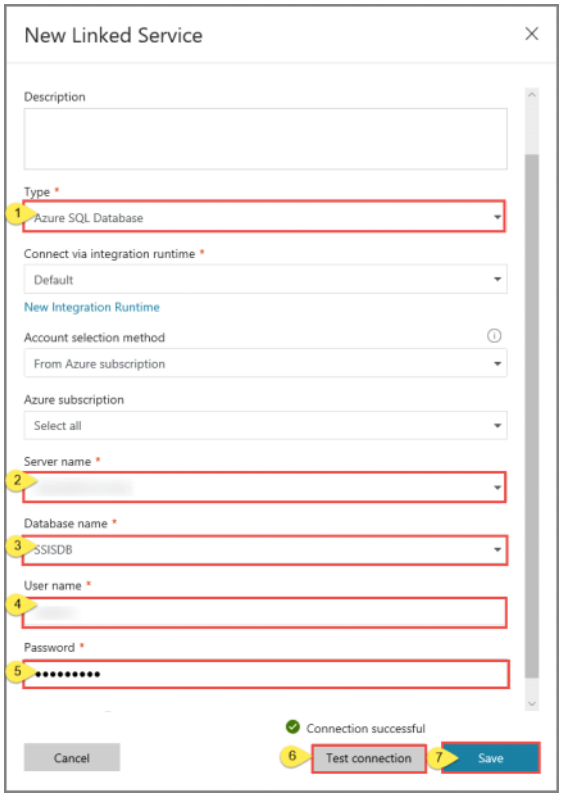
1) In the **Activities** toolbox, expand **General**, and drag-drop **Stored Procedure** activity to the pipeline canvas



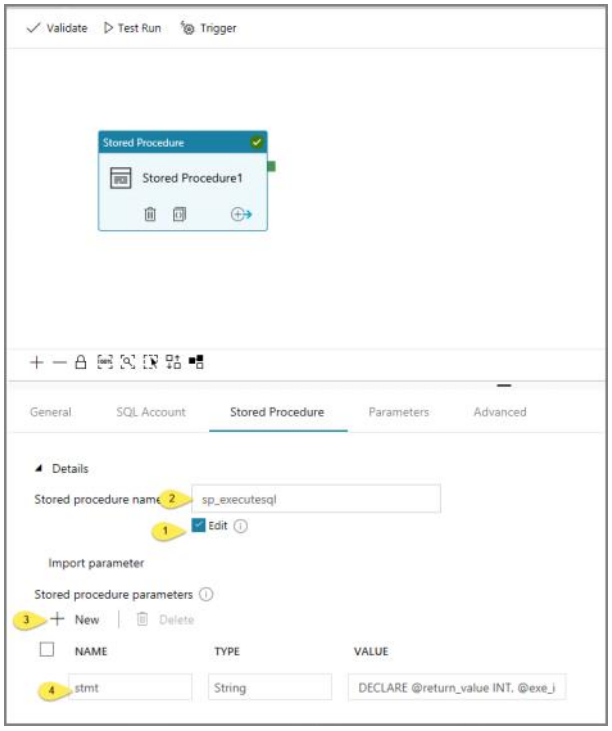
3) In the properties window for the stored procedure activity, switch to the **SQL Account** tab, and click **+ New**. You create a connection to the Azure SQL database that hosts the SSIS Catalog (SSIDB database).



4) In the **New Linked Service** window, do the following steps:



5) In the properties window, switch to the Stored Procedure tab from the SQL Account tab, and do the
following steps:

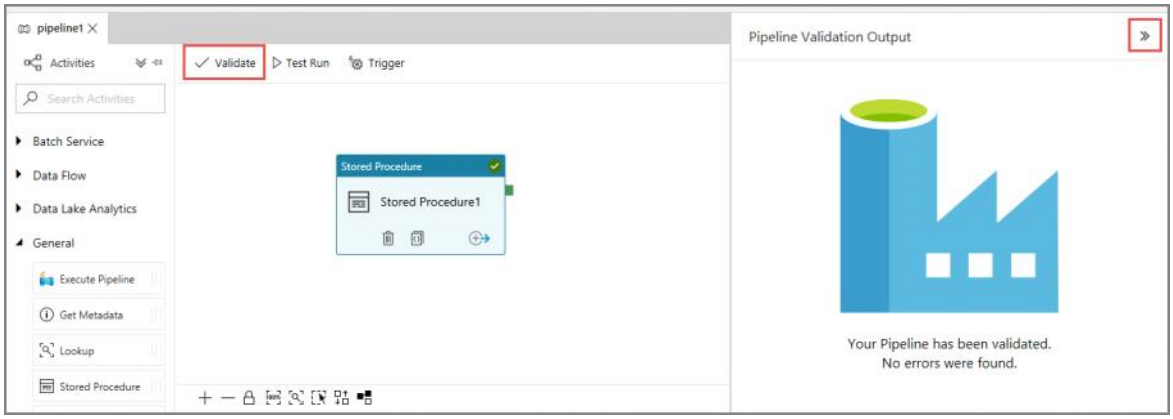


You will need the following snippet for the **stmt** parameter:

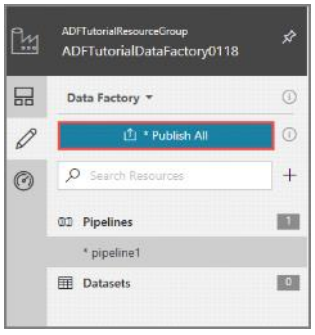
DECLARE @return_value INT, @exe_id BIGINT, @err_msg NVARCHAR(150) EXEC
@return_value=[SSISDB].

[catalog].[create_execution] @folder_name=N'<FOLDER name in SSIS Catalog>',
@project_name=N'<PROJECT name in SSIS Catalog>', @package_name=N'<PACKAGE name>.dtsx',
@use32bitruntime=0, @runinscaleout=1, @useanyworker=1, @execution_id=@exe_id OUTPUT
EXEC
[SSISDB].[catalog].[set_execution_parameter_value] @exe_id, @object_type=50,
@parameter_name=N'SYNCHRONIZED', @parameter_value=1 EXEC
[SSISDB].[catalog].[start_execution]
@execution_id=@exe_id, @retry_count=0 IF(SELECT [status] FROM
[SSISDB].[catalog].[executions]
WHERE execution_id=@exe_id)<>7 BEGIN SET @err_msg=N'Your package execution did not
succeed for
execution ID: ' + CAST(@exe_id AS NVARCHAR(20)) RAISERROR(@err_msg,15,1) END

6) To validate the pipeline configuration, click **Validate** on the toolbar. To close the **Pipeline Validation Report**, click **>>**



7) Publish the pipeline to **Data Factory** by clicking **Publish All** button..



Activity Summary

After completing this activity we should have a new pipeline that can be used to execute an SSIS Package. We showed how to configure this activity. In the next activity, we will show you how to execute and monitor the pipeline and also cover testing and debugging the deployment.

Activity 04: Execute the pipeline

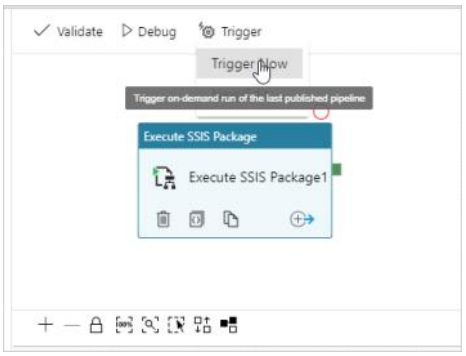
Activity Overview (5 minutes)

In this activity we will execute the pipeline we just published in the previous activity, After executing we will look at how we can monitor the execute and diagnose any failures.

NOTE: these steps should work for either of the pipelines we created in activity 03a or 03b

Trigger the pipeline

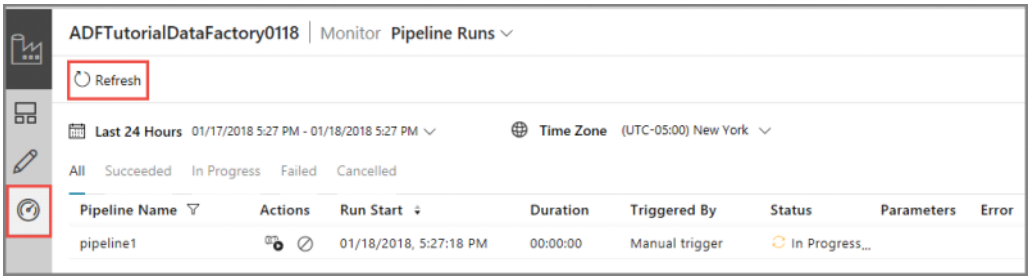
1) To trigger a pipeline run, click **Trigger** on the toolbar, and click **Trigger now**.



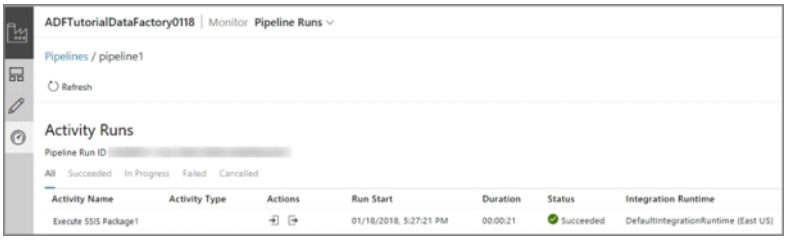
1) In the **Pipeline Run** window, select **Finish**.

Monitor the pipeline

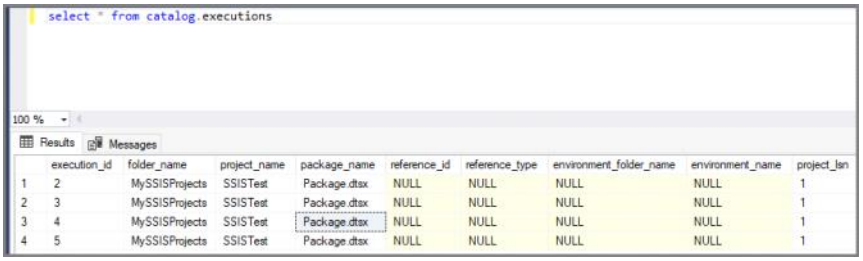
1) Switch to the **Monitor** tab on the left. You see the pipeline run and its status along with other information (such as Run Start time). To refresh the view, click **Refresh**.



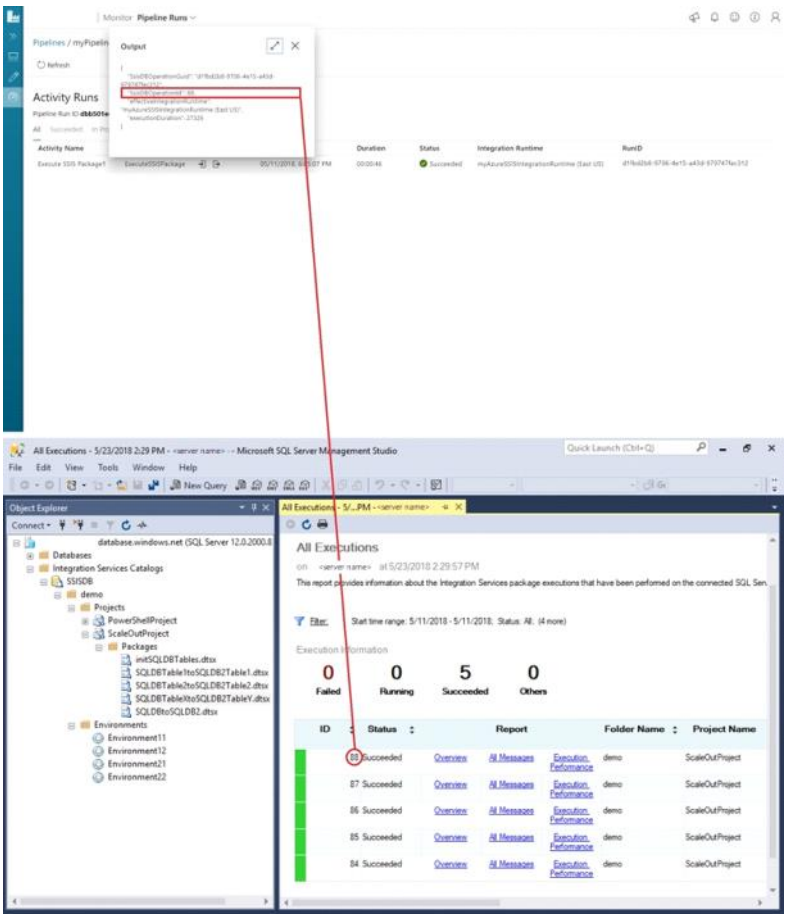
2) Click **View Activity Runs** link in the Actions column. You see only one activity run as the pipeline has only one activity (the Execute SSIS Package activity).



3) You can run the following query against the SSISDB database in your Azure SQL server to verify that the package executed.



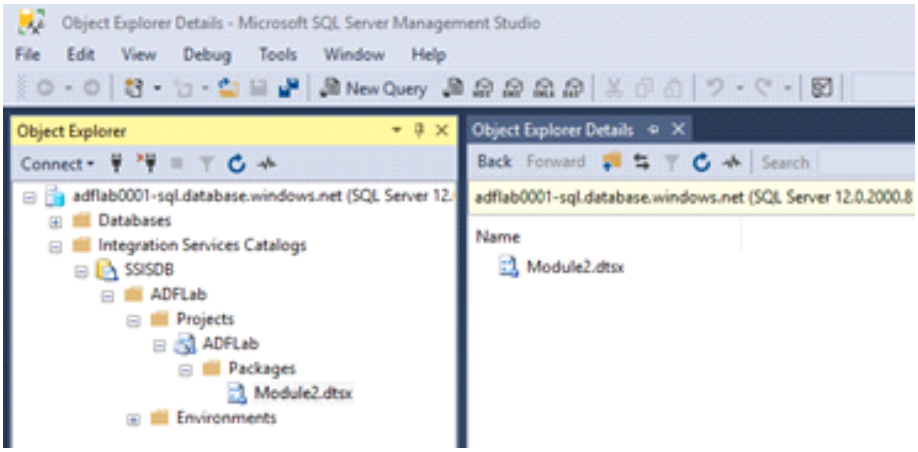
4)
You can also get the SSISDB execution ID from the output of the pipeline activity run, and use the ID to
check more comprehensive execution logs and error messages in SSMS.



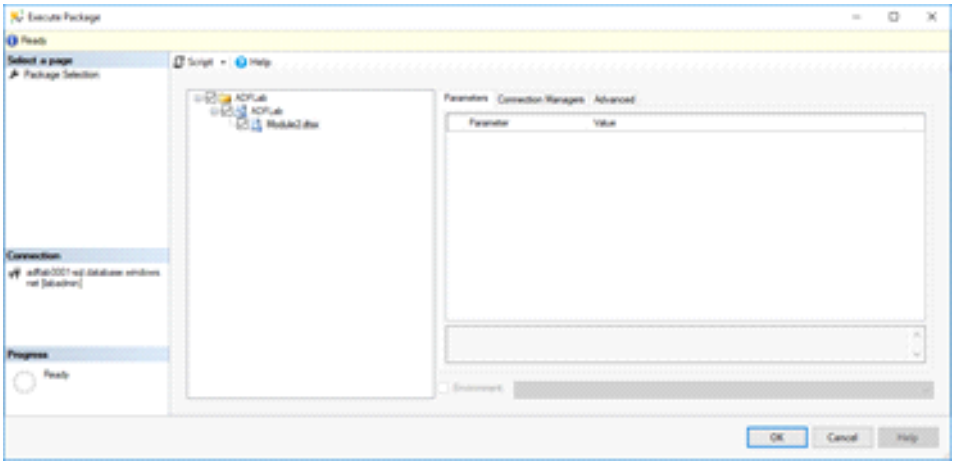
Troubleshooting

If the pipeline fails it is useful to try to execute the SSIS Package from SSMS to see if there is a problem with the deploy, Typical problems could include misconfigured Connection managers, hard coded paths or missing dependencies.

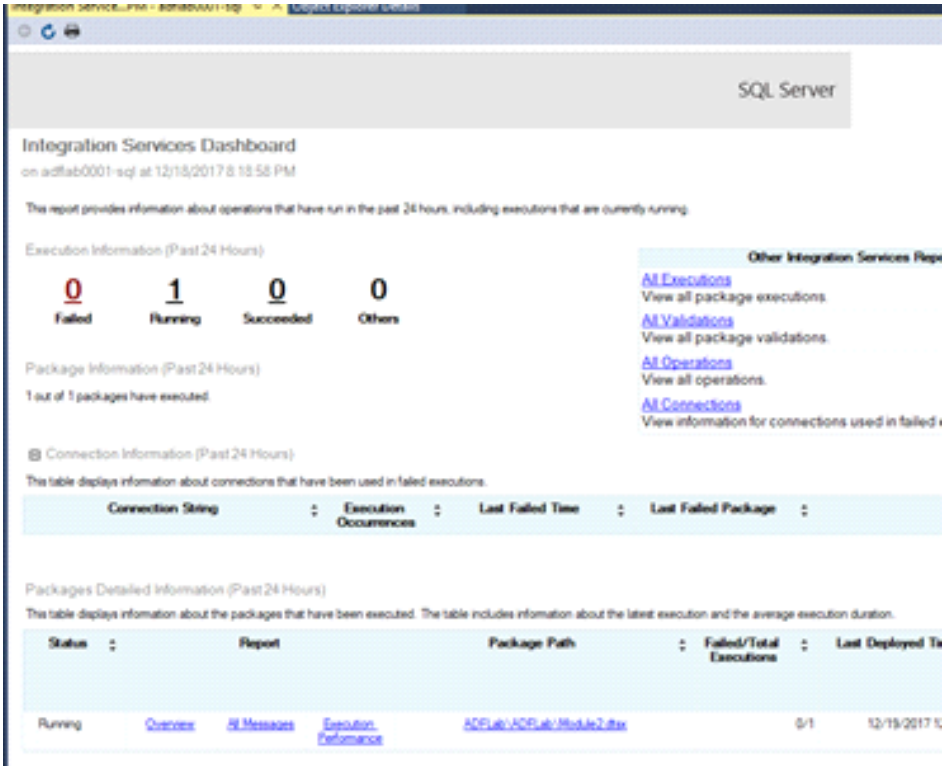
3) Right Click on the Package and choose Execute



4) Execute Package



1) Monitor Package Execution from Integration Services Dashboard



If the package fails you can use the integration services dashboard to investigate the error message further.

Bonus Lab: Enhance the SSIS Package

Our SSIS package was pretty useless Create a new SSIS Package to either export the customer data into one of the file based stores (you will need to azure feature pack installed to develop this).

Make the connection managers parameterized

For an extra tough challenge attempt to export the data from adventure works LT Database **SalesLT_SalesOrderDetail** to Either Azure SQL Database or Azure Data Lake.. Did this work? Why or why not? :)

Lab 07: Operationalizing ADF

Background

In the previous labs we have focused on building a robust solutions. Now we want to look at how we can use source control to allow a better team development experience, and also how we can setup monitoring alerting and logging
We will also learn how to import and export the solutions

Prerequisites

In order to complete this lab, you will need to have previously created:

- TBD

Overview

- Create a Schedule trigger
  - Parameter 1
  - Parameter 2
- Configure Pipeline logging
  -

- Create a "Master Pipeline
- Add a stored procedure activity

Let's get started with Activity 1!

In the previous labs we have focused on building a robust solutions. Now we want to look at how we can use source control to allow a better team development experience, and also how we can setup monitoring alerting and logging
We will also learn how to import and export the solutions

1) Configuring Source Control
   a. Configure with github
2) Setting Up Logging
   a. Configuring the OMS Dashboard
3) Setting up an alert
   a. Create an alert when a pipeline fails
4) Import and export ARM
   a. Export ARM Template
   b. Import ARM Template
5) Bonus Lab: Create a Power BI Dashboard to stream the data in real time

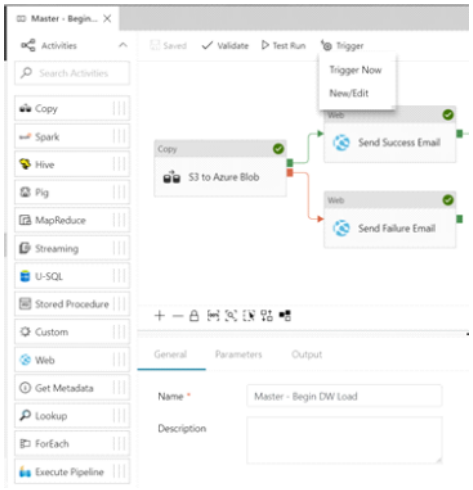
Activity 01: Creating Triggers

Activity Overview (5 minutes)

This activity walks through how to schedule a pipeline run from the Azure Data Factory GUI. We will be showing how to use the Schedule trigger which provides an interface for time-based scheduling of pipelines.

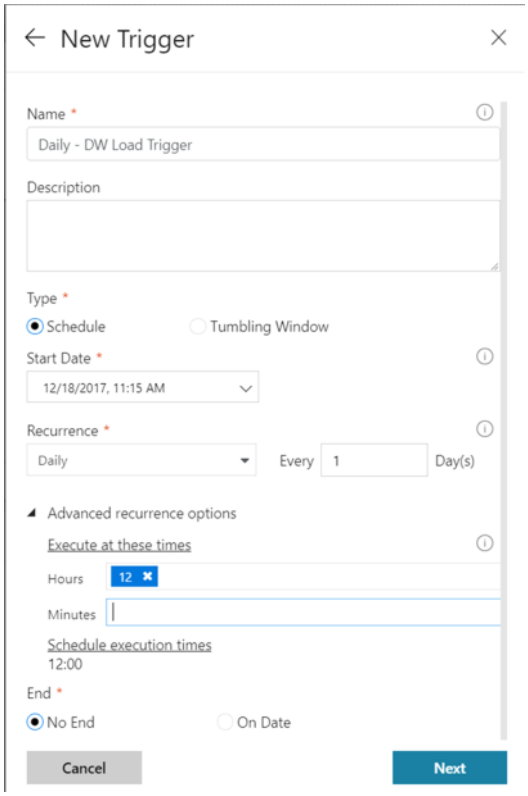
Create A Schedule Trigger

1) Click the Trigger Icon and New/Edit to create a new trigger.



1) From the Choose Trigger dropdown choose +New to create a new trigger.

3) Configure Trigger properties



Item	Value	Notes
Name	**Trg_Daily**	This will be the name of the trigger.
Type	**Schedule**	
Start Date	**Chose Today's Date**	This is the Azure Active Directory Account That you login into your Subscription with
Reoccurrence	**Daily Every 1 Day**	The trigger will execute Once daily
Advenced Reoccurance options	**Hours: 23 Minutes: 59**	This configures the reoccurrence time. Th trigger will execute at 11:59 pm
End	**No End**	The trigger will continue to run until we either delete it or or disable it

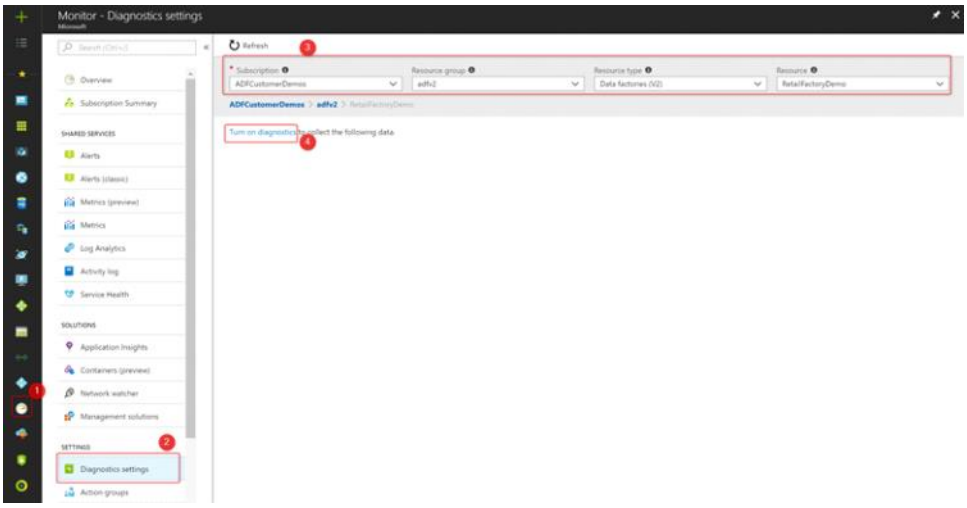
Activity Summary

After completing this activity we should have a new trigger that can be used to schedule pipeline execution. We showed how to configure this trigger for a wall clock schedule. In the next activity, we will look at configuring some of the built-in logging and reporting options from Azure Data Factory.

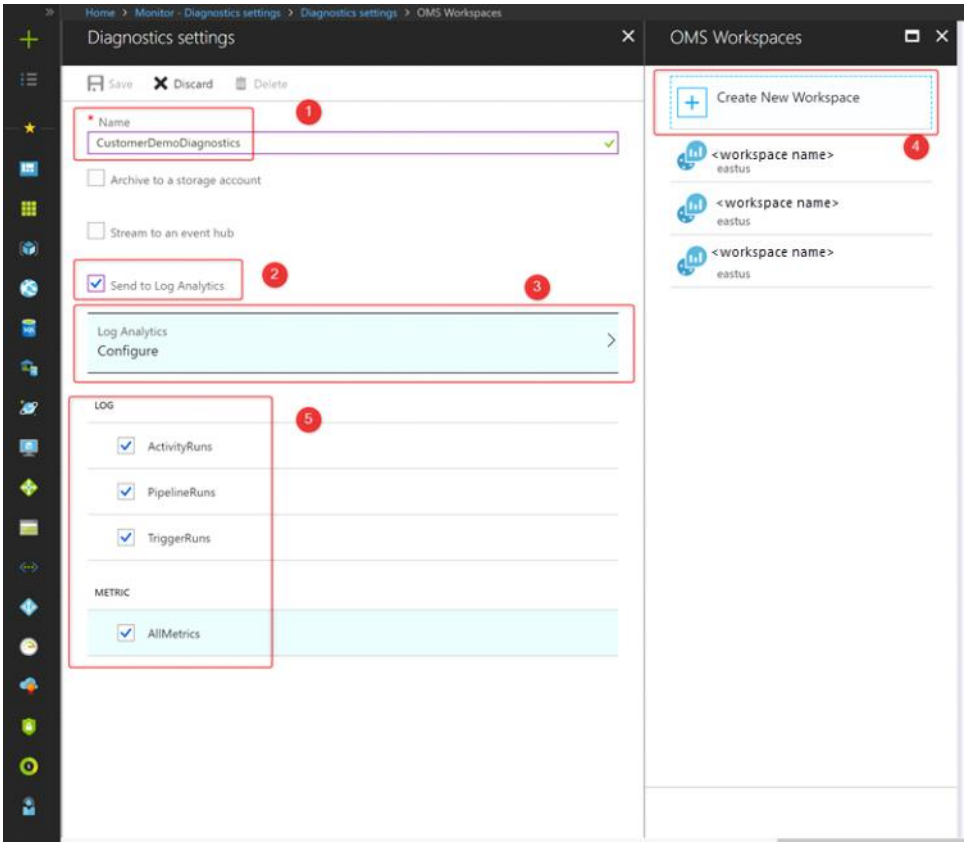
Activity 02a: Configure Logging

Enable Diagnostic Settings for your data factory.

1) Select Azure Monitor -> Diagnostics settings -> Select the data factory -> Turn on diagnostics.



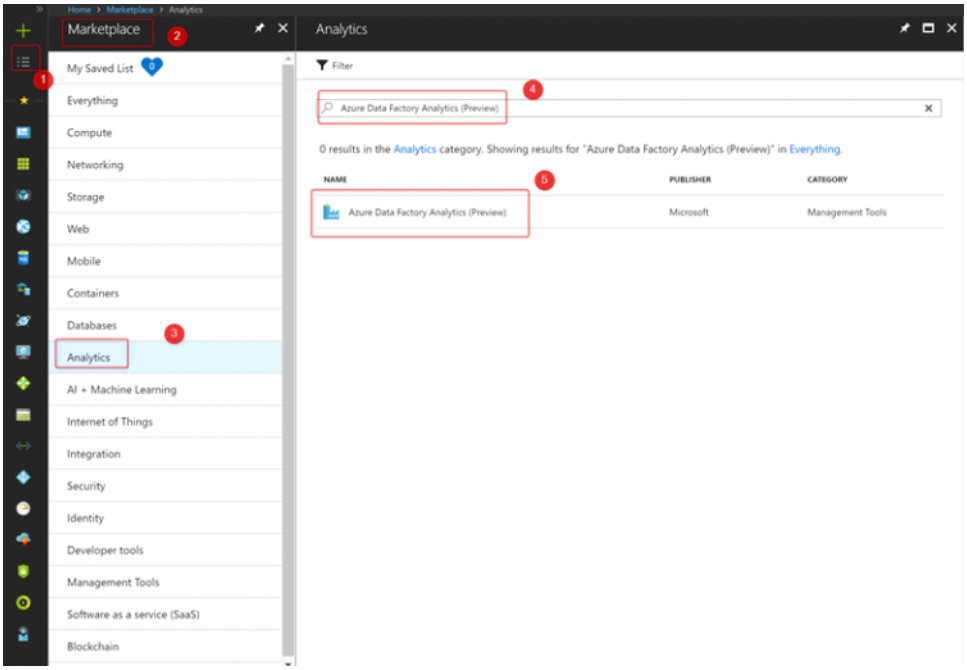
1) Provide diagnostic settings including configuration of the workspace.



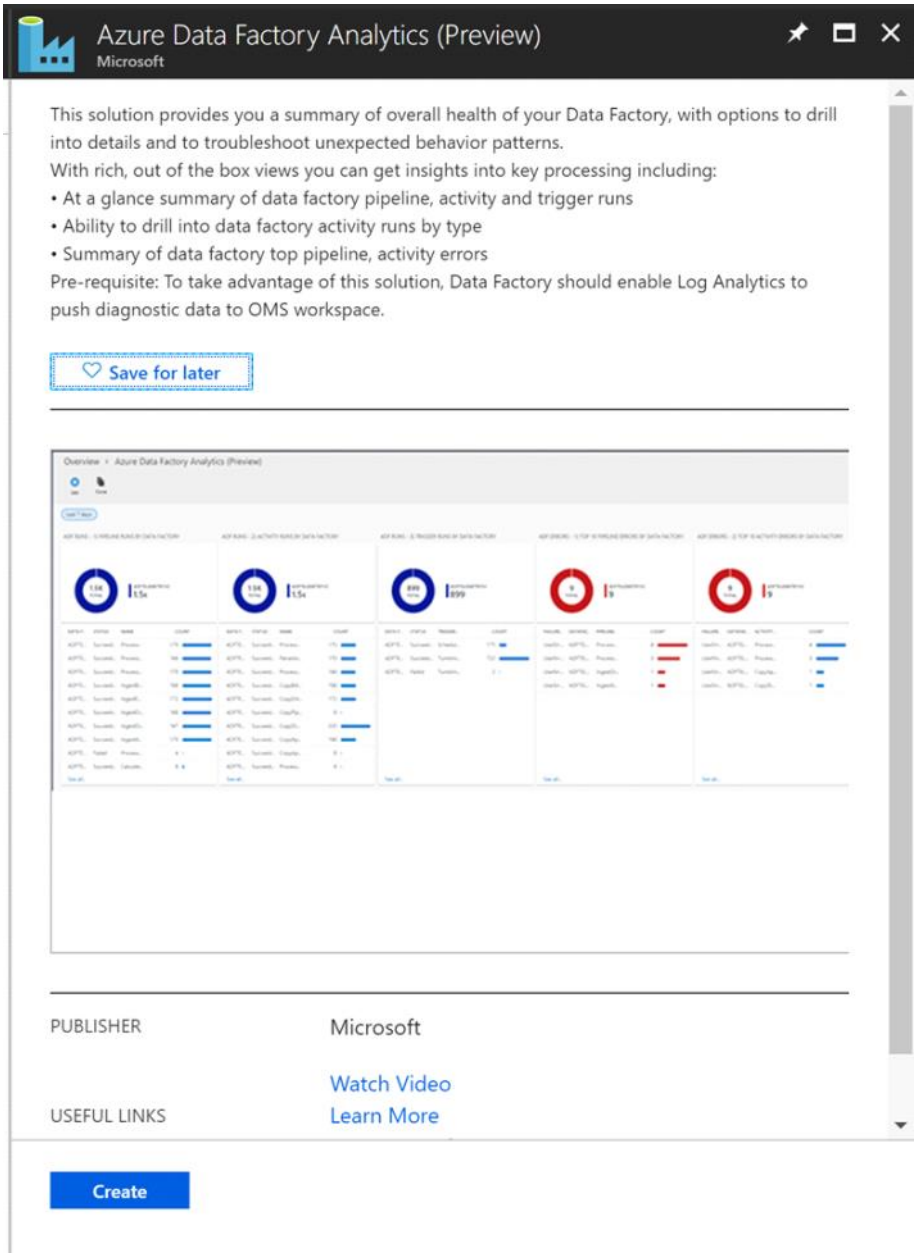
Activity 02b: Install Azure Data Factory Analytics

Install Azure Data Factory Analytics from Azure Marketplace

1)



Provide diagnostic settings including configuration of the workspace.

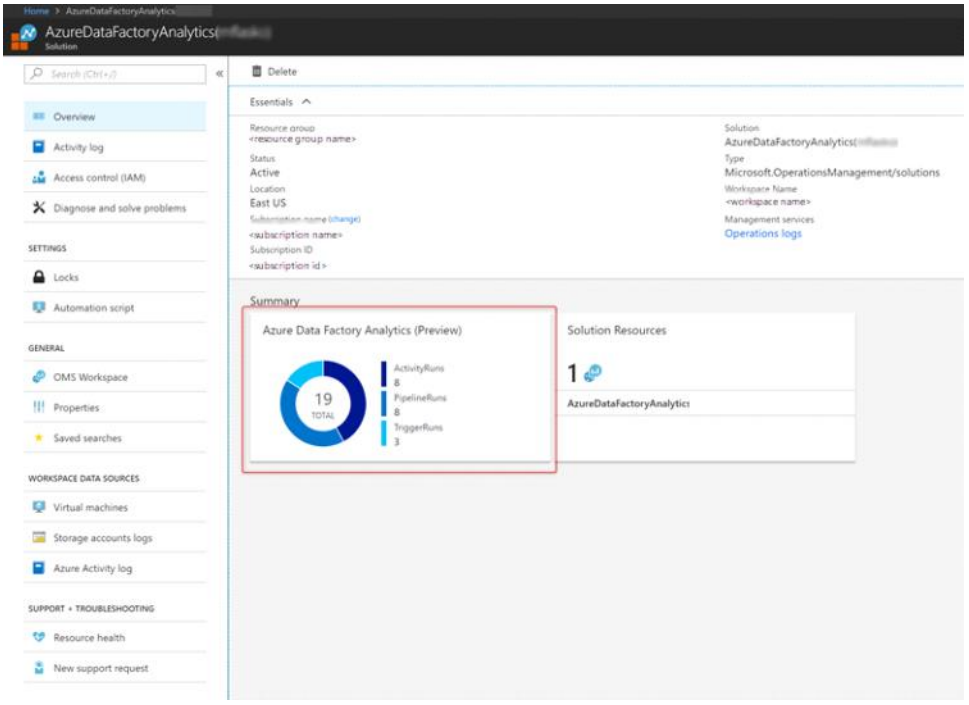


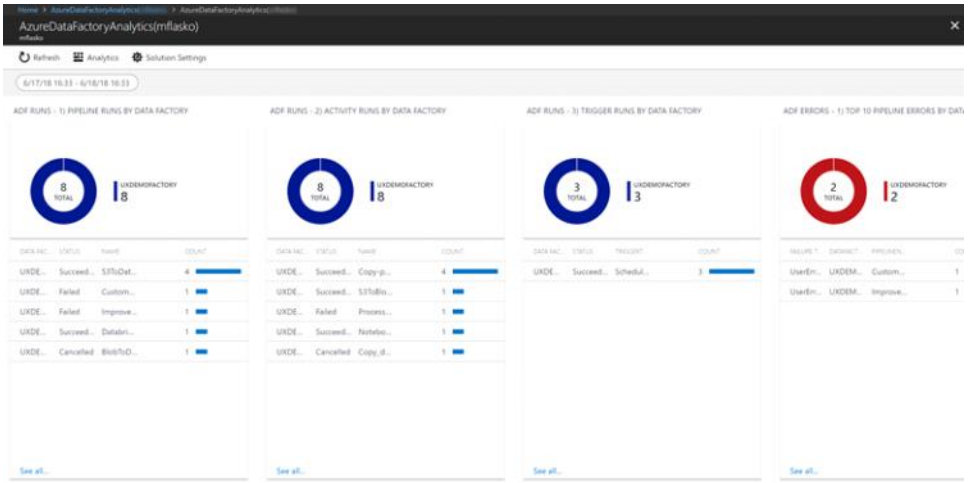
Click Create and select the Workspace and Workspace settings.

nstalling Azure Data Factory Analytics creates a default set of views that enables the following metrics:

- ADF Runs- 1) Pipeline Runs by Data Factory
- ADF Runs- 2) Activity Runs by Data Factory
- ADF Runs- 3) Trigger Runs by Data Factory
- ADF Errors- 1) Top 10 Pipeline Errors by Data Factory
- ADF Errors- 2) Top 10 Activity Runs by Data Factory
- ADF Errors- 3) Top 10 Trigger Errors by Data Factory
- ADF Statistics- 1) Activity Runs by Type
- ADF Statistics- 2) Trigger Runs by Type
- ADF Statistics- 3) Max Pipeline Runs Duration

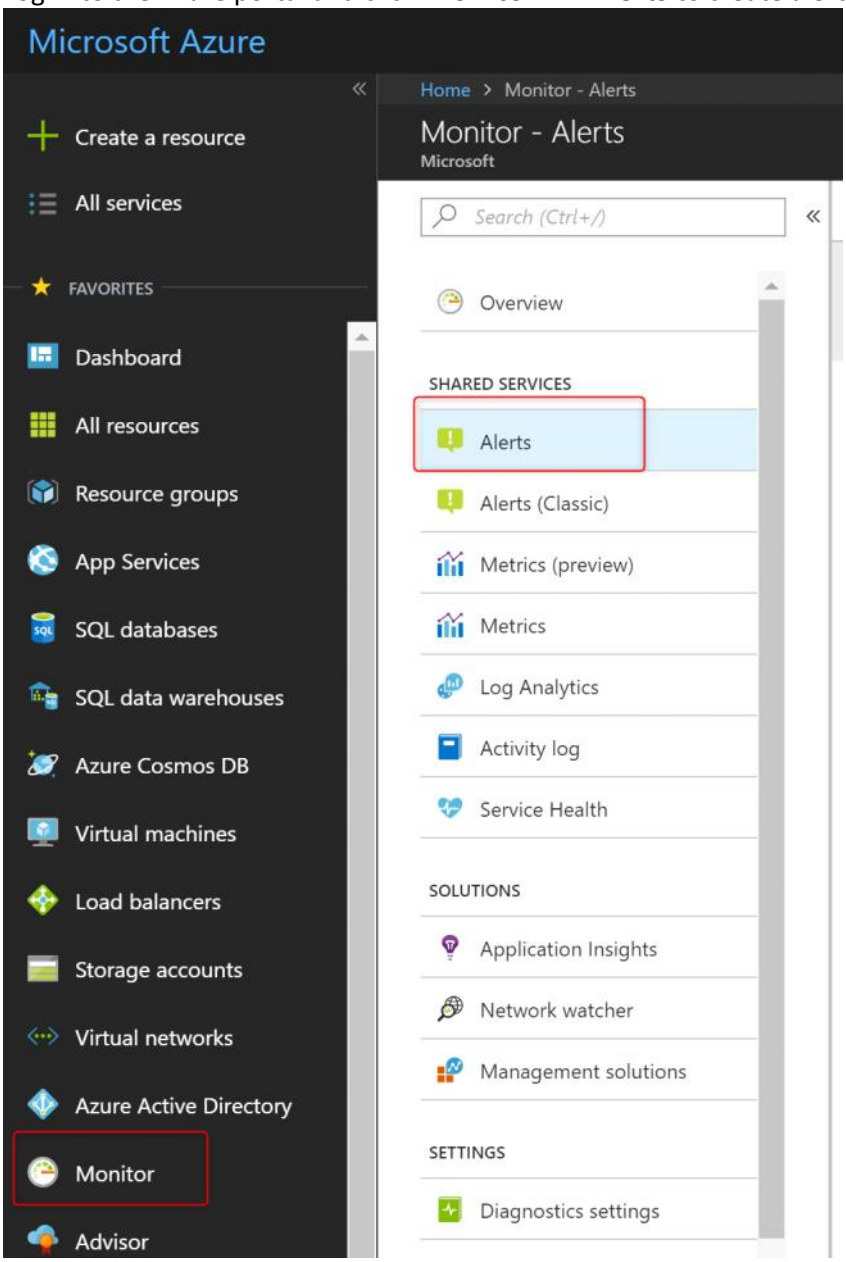
From <https://docs.microsoft.com/en-us/azure/data-factory/monitor-using-azure-monitor>


AzureDataFactoryAnalytics
Solution
Delete
Essentials
Overview
Activity log
Access control (IAM)
Diagnose and solve problems
SETTINGS
Locks
Automation script
GENERAL
OMS Workspace
Properties
Saved searches
WORKSPACE DATA SOURCES
Virtual machines
Storage accounts logs
Azure Activity log
SUPPORT + TROUBLESHOOTING
Resource health
New support request
Resource group
<resource group name>
Status
Active
Location
East US
<subscription name>
Subscription ID
<subscription id>
Solution
AzureDataFactoryAnalytics
Type
Microsoft.OperationsManagement/solutions
Workspace Name
<workspace name>
Management services
Operations logs
Summary
Azure Data Factory Analytics (Preview)
19
TOTAL
ActivityRuns
8
PipelineRuns
8
TriggerRuns
3
Solution Resources
1
AzureDataFactoryAnalytics

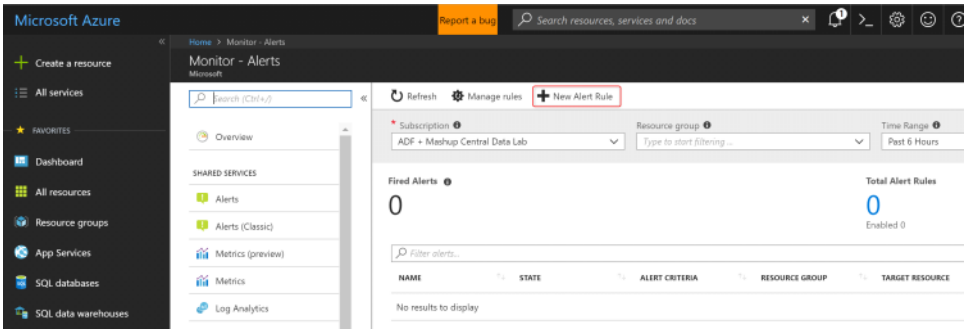

AzureDataFactoryAnalytics(mflasko)
Refresh
Analytics
Solution Settings
ADF RUNS - 1) PIPELINE RUNS BY DATA FACTORY
ADF RUNS - 2) ACTIVITY RUNS BY DATA FACTORY
ADF RUNS - 3) TRIGGER RUNS BY DATA FACTORY
ADF ERRORS - 1) TOP 10 PIPELINE ERRORS BY DATA
8
TOTAL
UXDEMOFACTORY
8
3
TOTAL
3
2
TOTAL
2
See all...

Activity 03: Creating an Alert

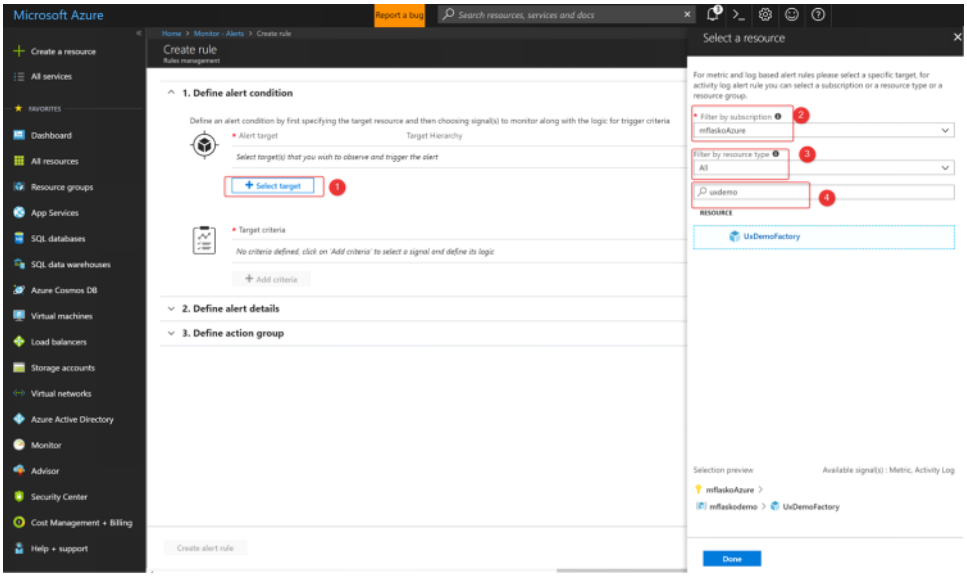
Log in to the Azure portal and click Monitor -> Alerts to create alerts.

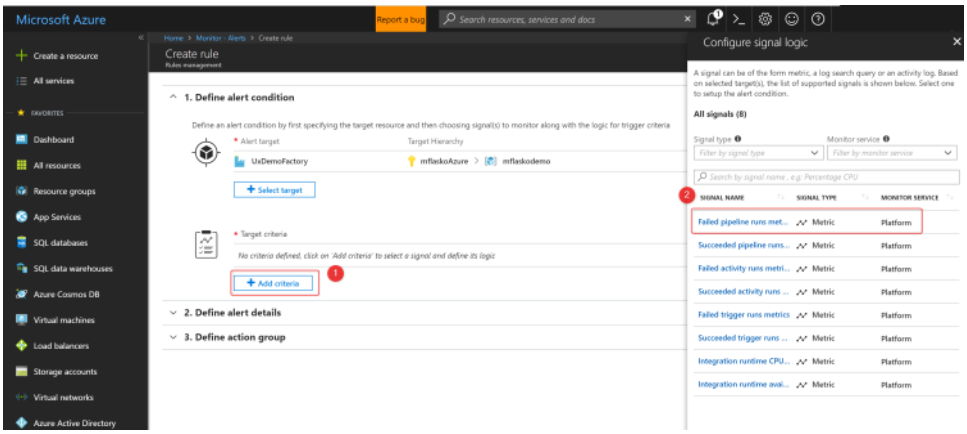


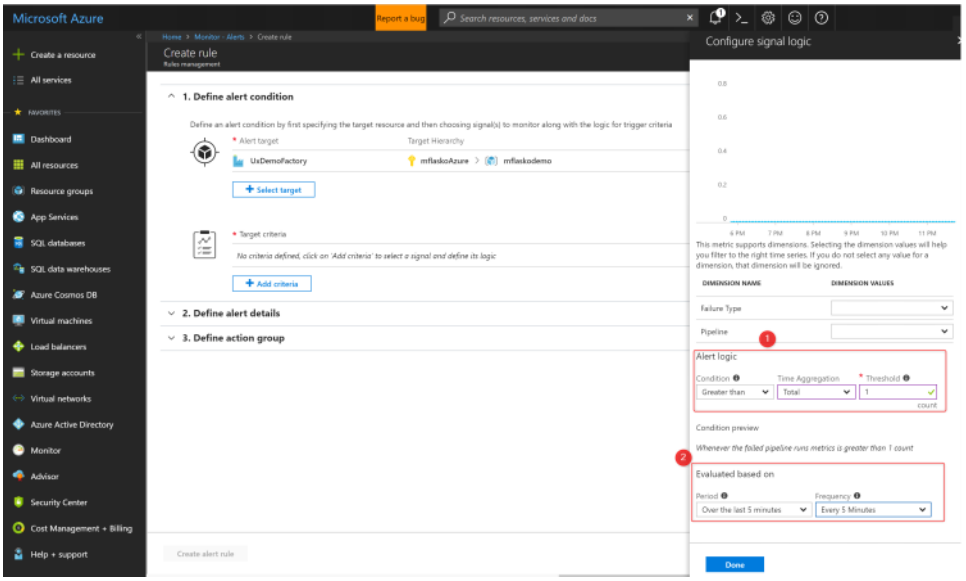
Click + New Alert rule to create a new alert.



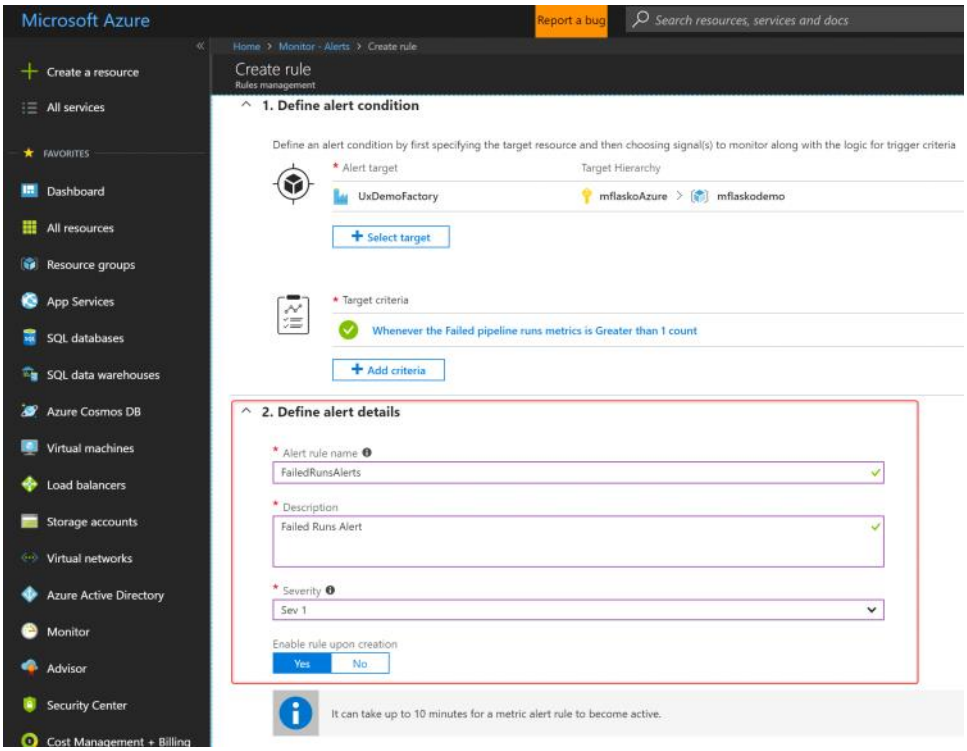
Define the Alert condition.



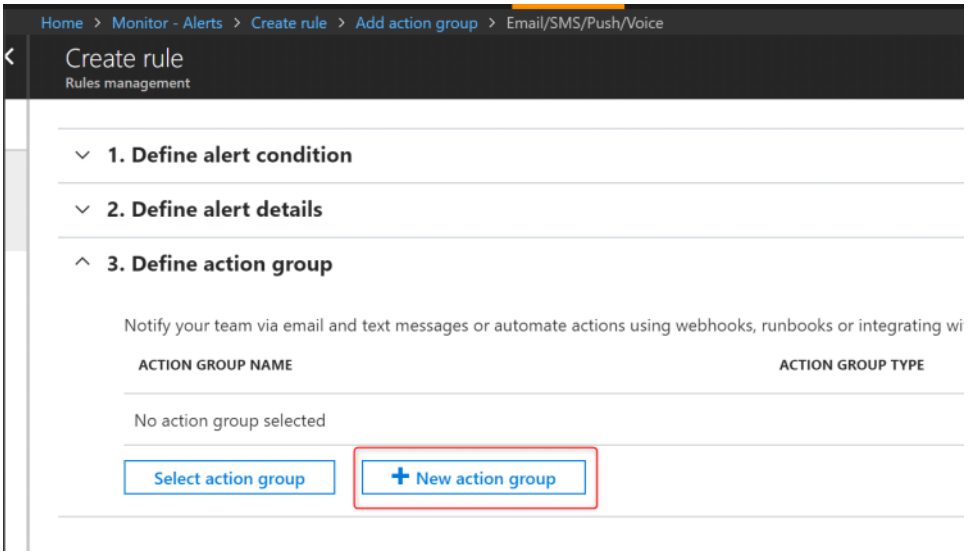


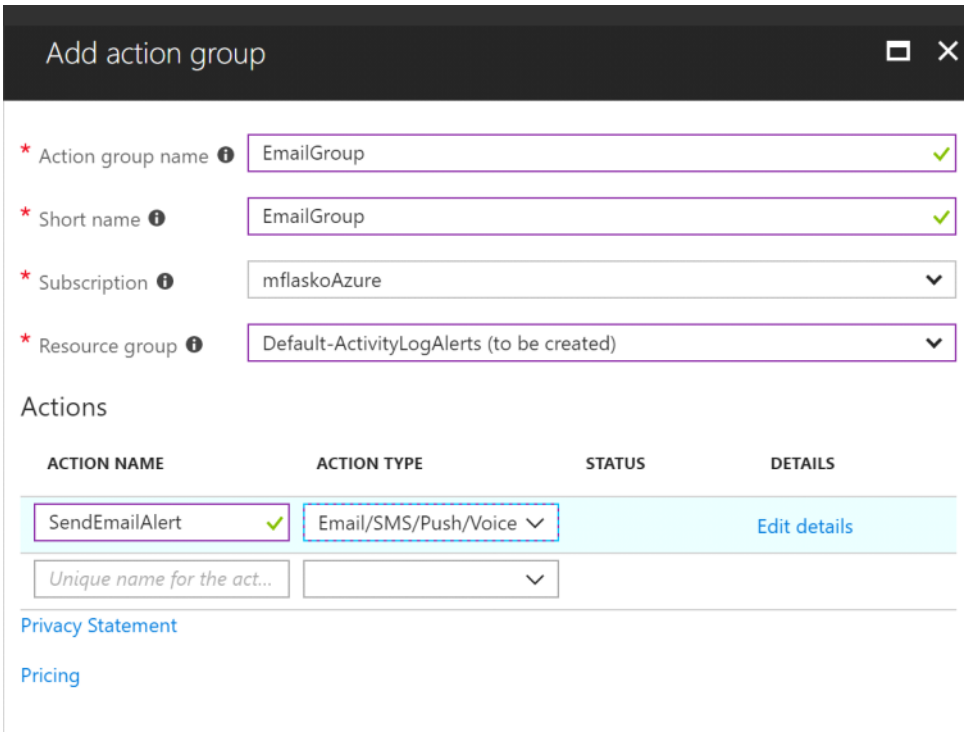


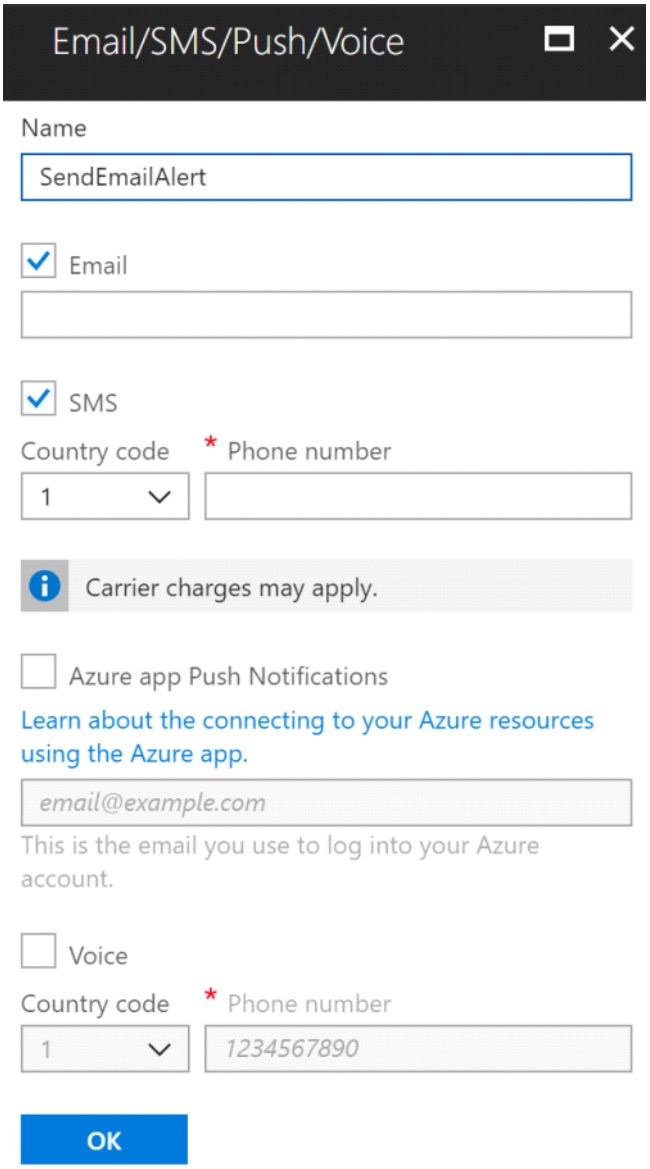
Define the Alert details.

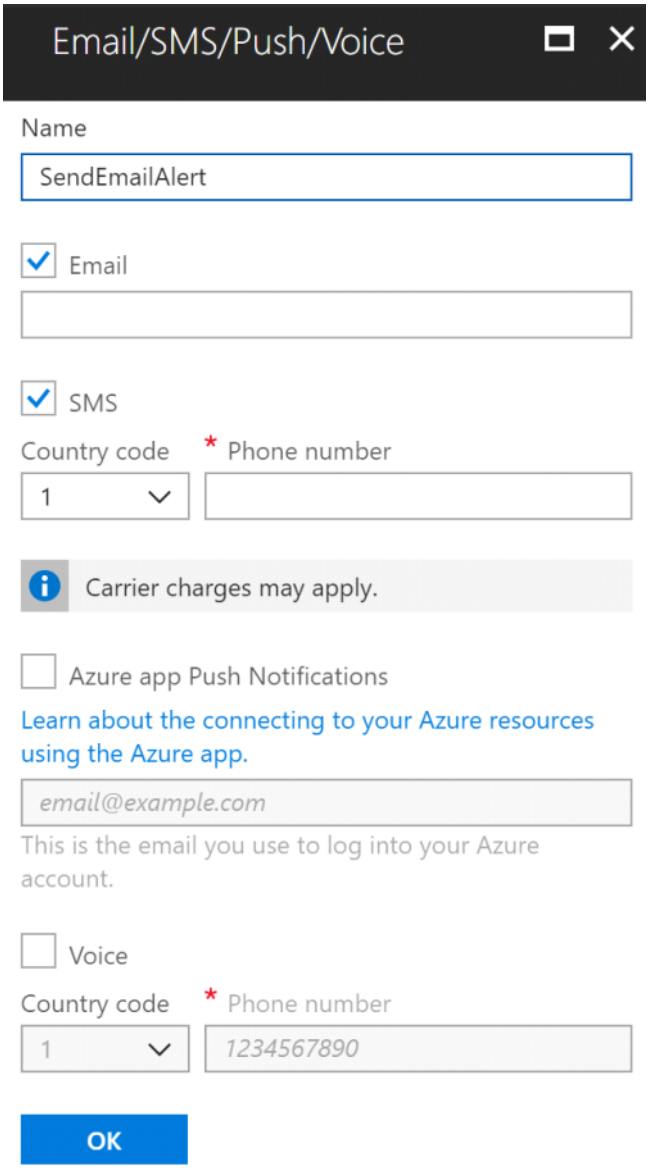


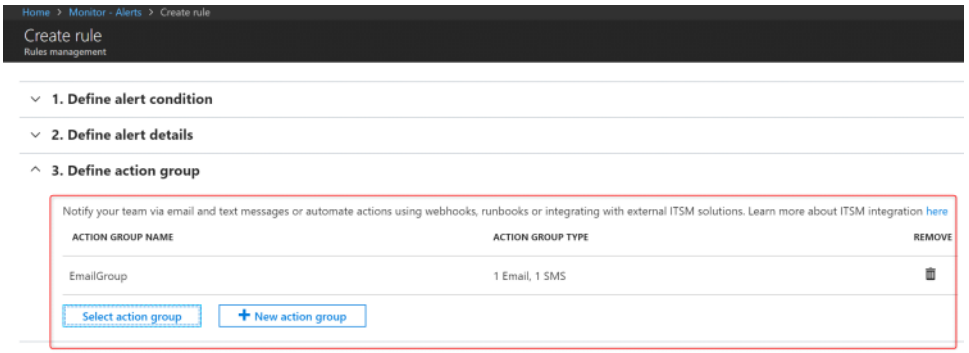
Define the Action group.


Home > Monitor - Alerts > Create rule > Add action group > Email/SMS/Push/Voice
Create rule
Rules management
1. Define alert condition
2. Define alert details
3. Define action group
Notify your team via email and text messages or automate actions using webhooks, runbooks or integrating wi
ACTION GROUP NAME
ACTION GROUP TYPE
No action group selected
Select action group
New action group


Add action group
Action group name
EmailGroup
Short name
EmailGroup
Subscription
mflaskoAzure
Resource group
Default-ActivityLogAlerts (to be created)
Actions
ACTION NAME
ACTION TYPE
STATUS
DETAILS
SendEmailAlert
Email/SMS/Push/Voice
Edit details
Unique name for the act...
Privacy Statement
Pricing


Email/SMS/Push/Voice
Name
SendEmailAlert
Email
SMS
Country code
* Phone number
1
Carrier charges may apply.
Azure app Push Notifications
Learn about the connecting to your Azure resources using the Azure app.
email@example.com
This is the email you use to log into your Azure account.
Voice
Country code
* Phone number
1
1234567890
OK


Email/SMS/Push/Voice
Name
SendEmailAlert
Email
SMS
Country code
* Phone number
1
Carrier charges may apply.
Azure app Push Notifications
Learn about the connecting to your Azure resources using the Azure app.
email@example.com
This is the email you use to log into your Azure account.
Voice
Country code
* Phone number
1
1234567890
OK


Home > Monitor - Alerts > Create rule
Create rule
Rules management
1. Define alert condition
2. Define alert details
3. Define action group
Notify your team via email and text messages or automate actions using webhooks, runbooks or integrating with external ITSM solutions. Learn more about ITSM integration here
ACTION GROUP NAME
ACTION GROUP TYPE
REMOVE
EmailGroup
1 Email, 1 SMS
Select action group
+ New action group

Bonus Activity: Configure Source Control

We walked through the needed steps for source control configuration in the lecture portion
If you have either an azure Devops or github account you can set this up for your data factory

Using the below resources setup your Azure Data Factory with either Azure DevOps Source control or github

Author with Azure Repos Git integration

https://docs.microsoft.com/en-us/azure/data-factory/author-visually#author-with-azure-repos-git-integration

Author with GitHub integration

https://docs.microsoft.com/en-us/azure/data-factory/author-visually#author-with-github-integration