Azure Cloud Scale Analytics with ADX – Lab 1

Lab Summary

This solution architecture provides support for data ingestion for both structured and unstructured data curation.

Land files (at scale if required – 100's per second) to Azure Blob, triggering automatic file ingestion into Azure Data Lake (Gen-2) via an Azure Data Factory pipeline. Data can be ingested into ADX or queried via an external table reference. The lab can easily be enhanced to include structured/relational datastores (SQL Server, PostgreSQL) or semi-structured/non-relational datastores (e.g. Cosmos DB).

Azure Services

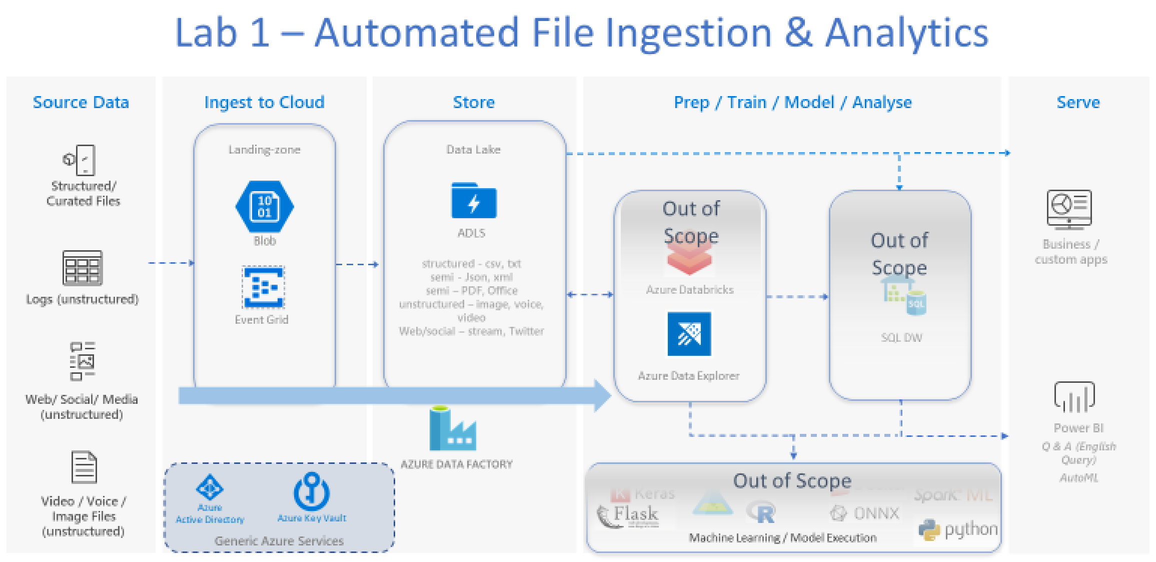
In addition to the Azure services mentioned in 'Core Azure Services' Lab1 introduces the following Azure services into the architecture:

Azure Data Factory (ADF) [link]

Azure Event Grid [link]

Lab Architecture

The diagram below shows the architecture that will be built in Lab 1.



Activities

The lab is broken down into several logical units, as follows:

- Activity 1 – Azure Blob, Azure Data Lake (ADLS)
    - Build these Azure services

- Activity 2 - Key Vault, Event Grid
    - Build these Azure services
- Activity 3 - Data Factory
    - Build these Azure services
- Activity 4 – Azure Data Explorer (ADX)
    - Build these Azure services
- Activity 5 – Security & Access
    - Configure storage SAS keys
- Activity 6 – ADF Pipeline
    - Build an ADF pipeline, triggered by Event Grid
- Activity 7 – Execute ADF Pipeline
    - Run the ADF pipeline with sample data
- Activity 8 – ADX integration with ADLS
    - Write KQL queries to analyse data

The first five lab activities are associated with building the environment that will be used in this and subsequent labs. Lab activities 6 & 7 build and execute an ADF pipeline associated with the file ingestion. Lab activity 8 gives a summary example of dynamic analytics with data residing in a data lake.

Activity 1 – Azure Blob, Azure Data Lake

As per the diagram "Lab1 – Activity 1 – Blob – Data Lake.pdf" we are creating an Azure Blob Storage account and an Azure Data Lake (Gen-2) account. Firstly, we will create the landing zone for all files to be dropped to.

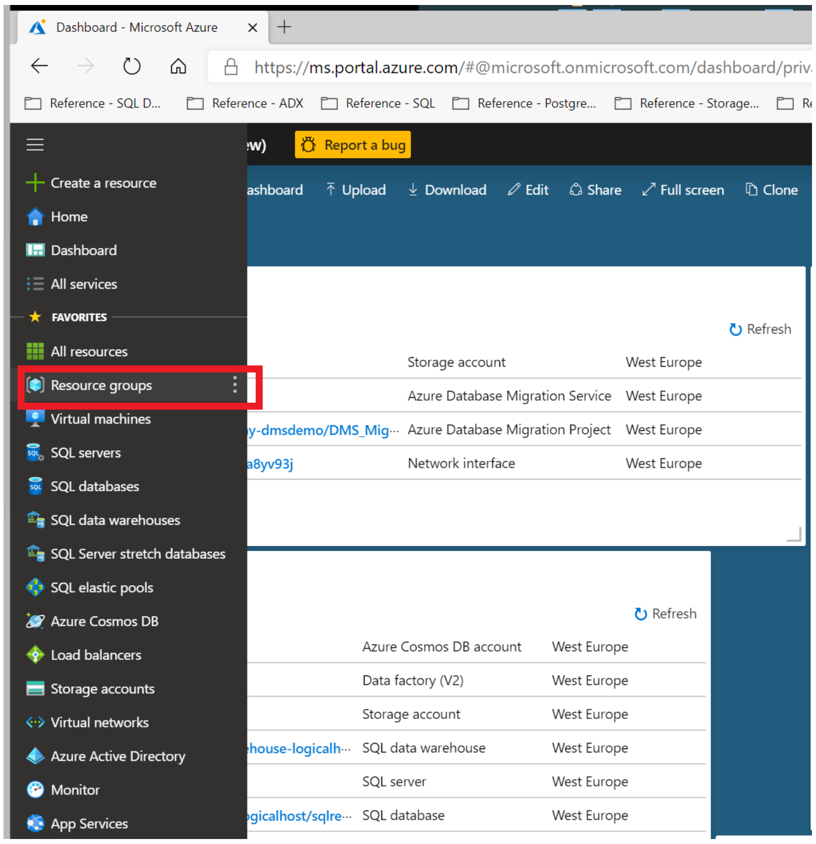
NOTE: *This lab can be further enhanced once event processing is supported on Azure Data Lake. This feature is not GA currently. Details here.*

Activity 1.1 - Create the Resource Group 'ADX'.

Define the Azure Resource Group that all the Lab 1 Azure Services will be created in.

NOTE: *Creating the Resource Group can also be achieved via PowerShell here.*

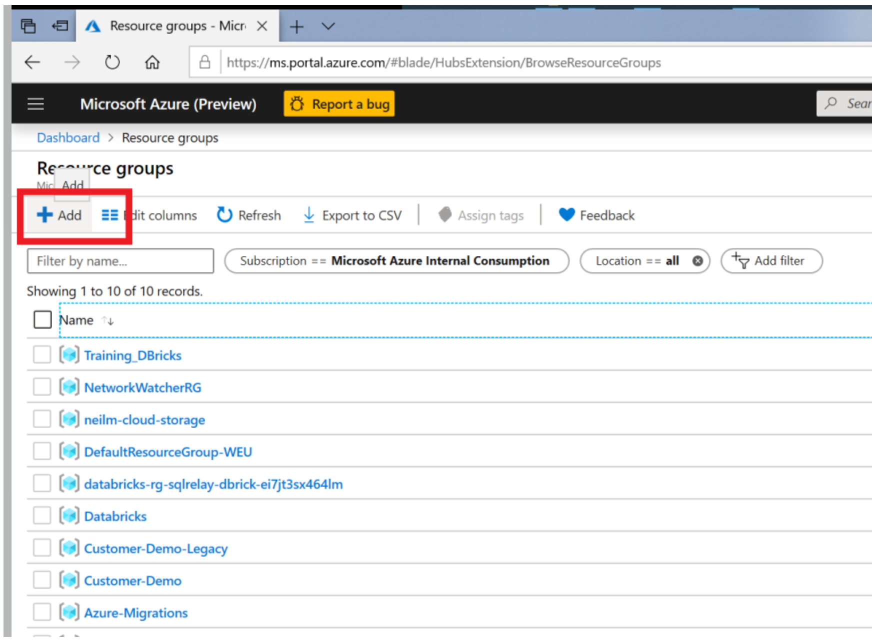
1. Sign in to the Azure portal.
2. In the Azure portal, select **Resource Groups** and the **ADX** resource group you have created above. Select **Add** (see below):



	Storage account	West Europe
	Azure Database Migration Service	West Europe
y-dmsdemo/DMS_Mig···	Azure Database Migration Project	West Europe
a8yv93j	Network interface	West Europe

	Azure Cosmos DB account	West Europe
	Data factory (V2)	West Europe
	Storage account	West Europe
house-logicalh···	SQL data warehouse	West Europe
	SQL server	West Europe
gicalhost/sqlre···	SQL database	West Europe

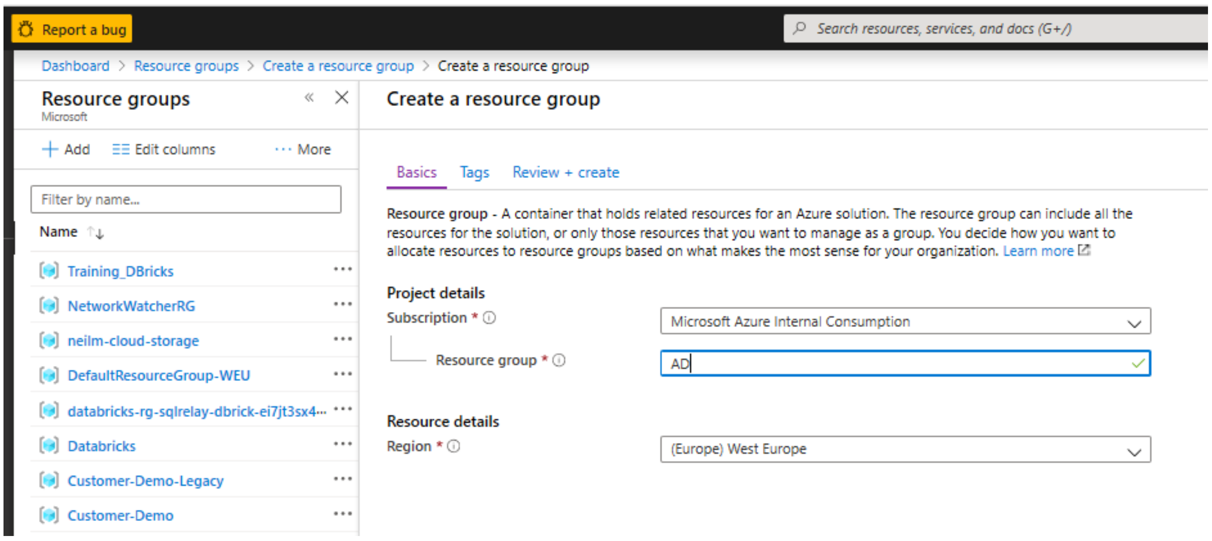
3. When the blade loads, select **Add:**


Resource groups - Micr
https://ms.portal.azure.com/#blade/HubsExtension/BrowseResourceGroups
Microsoft Azure (Preview)
Report a bug
Dashboard > Resource groups
Resource groups
Add
Add
Edit columns
Refresh
Export to CSV
Assign tags
Feedback
Filter by name...
Subscription == Microsoft Azure Internal Consumption
Location == all
Add filter

Showing 1 to 10 of 10 records.

Name
Training_DBricks
NetworkWatcherRG
neilm-cloud-storage
DefaultResourceGroup-WEU
databricks-rg-sqlrelay-dbrick-ei7jt3sx464lm
Databricks
Customer-Demo-Legacy
Customer-Demo
Azure-Migrations

4. Enter the Resource Group Details:


Report a bug

Search resources, services, and docs (G+/)

Dashboard > Resource groups > Create a resource group > Create a resource group

Resource groups
Microsoft

+ Add   Edit columns   ··· More

Filter by name...

Name

- Training_DBricks
- NetworkWatcherRG
- neilm-cloud-storage
- DefaultResourceGroup-WEU
- databricks-rg-sqlrelay-dbrick-ei7jt3sx4...
- Databricks
- Customer-Demo-Legacy
- Customer-Demo

Create a resource group

Basics   Tags   Review + create

Resource group - A container that holds related resources for an Azure solution. The resource group can include all the resources for the solution, or only those resources that you want to manage as a group. You decide how you want to allocate resources to resource groups based on what makes the most sense for your organization. Learn more

Project details

Subscription * : Microsoft Azure Internal Consumption

Resource group * : AD

Resource details

Region * : (Europe) West Europe

Property	Description	Required
Subscription	The value must be set to the subscription the ADX resource group is to be created in.	Yes
Resource Group	The name of the workshop resource group. Enter **ADX**.	Yes
Region	Enter the Azure region your resource group is to be located in. This should be a region that supports the Azure services required in this workshop and located as close as possible to your geographic location.	Yes

5. Select **Create.**

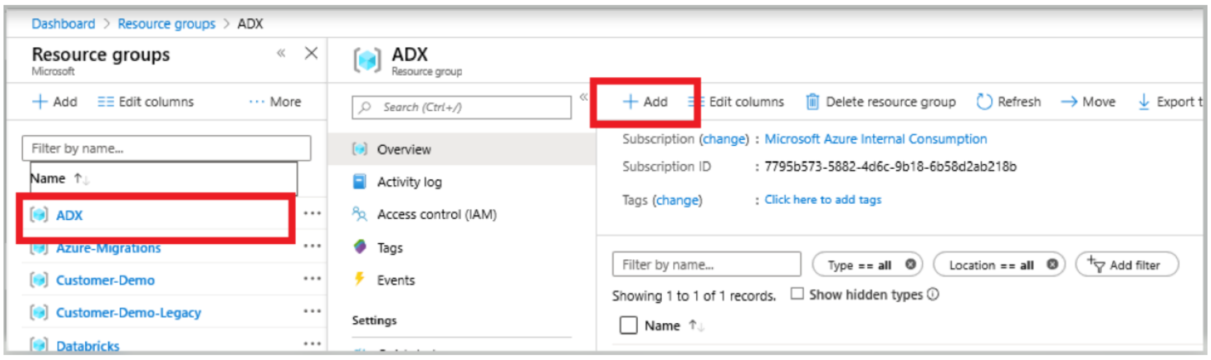
After a few minutes you will a resource group ADX into which the 'Lab1 Automated File Ingestion & Analytics' architecture can be deployed into.

Activity 1.2: Create the Blob storage account

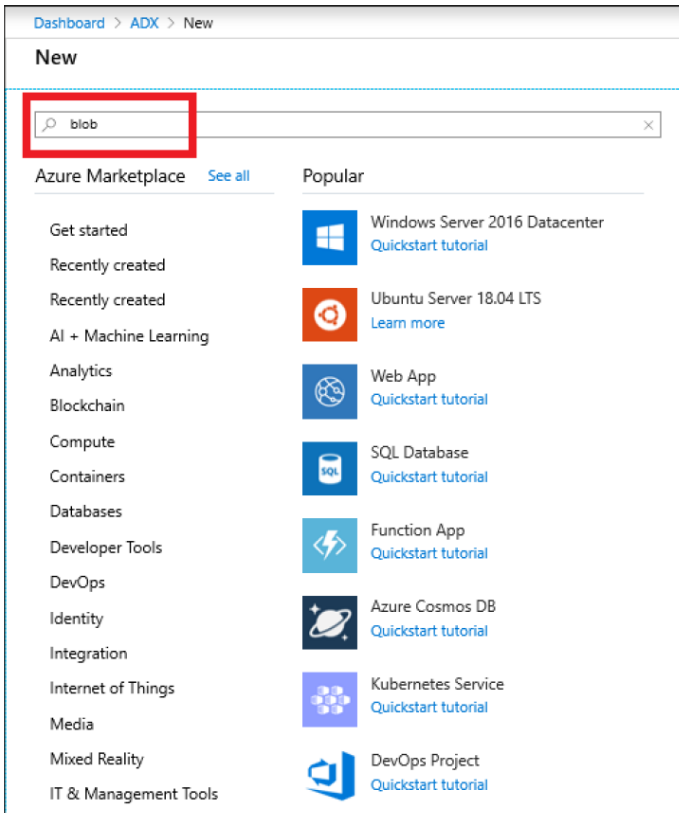
The blob storage account will act as the *landing zone* for files that will then be automatically ingested.

An explanation of Azure Blob storage is here: [link]

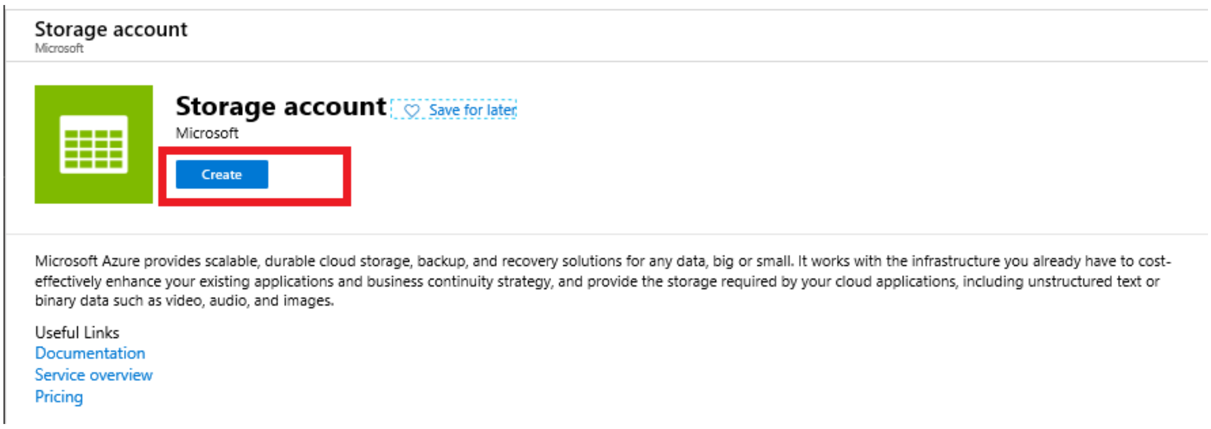
1. Within the ADX resource Group, select **+ Add** or **Create Resource**



2. Type **blob** or **storage** in the search window (see below) and then select **Storage Account** from the results displayed:



3. On the Storage Account blade, select **Create**:

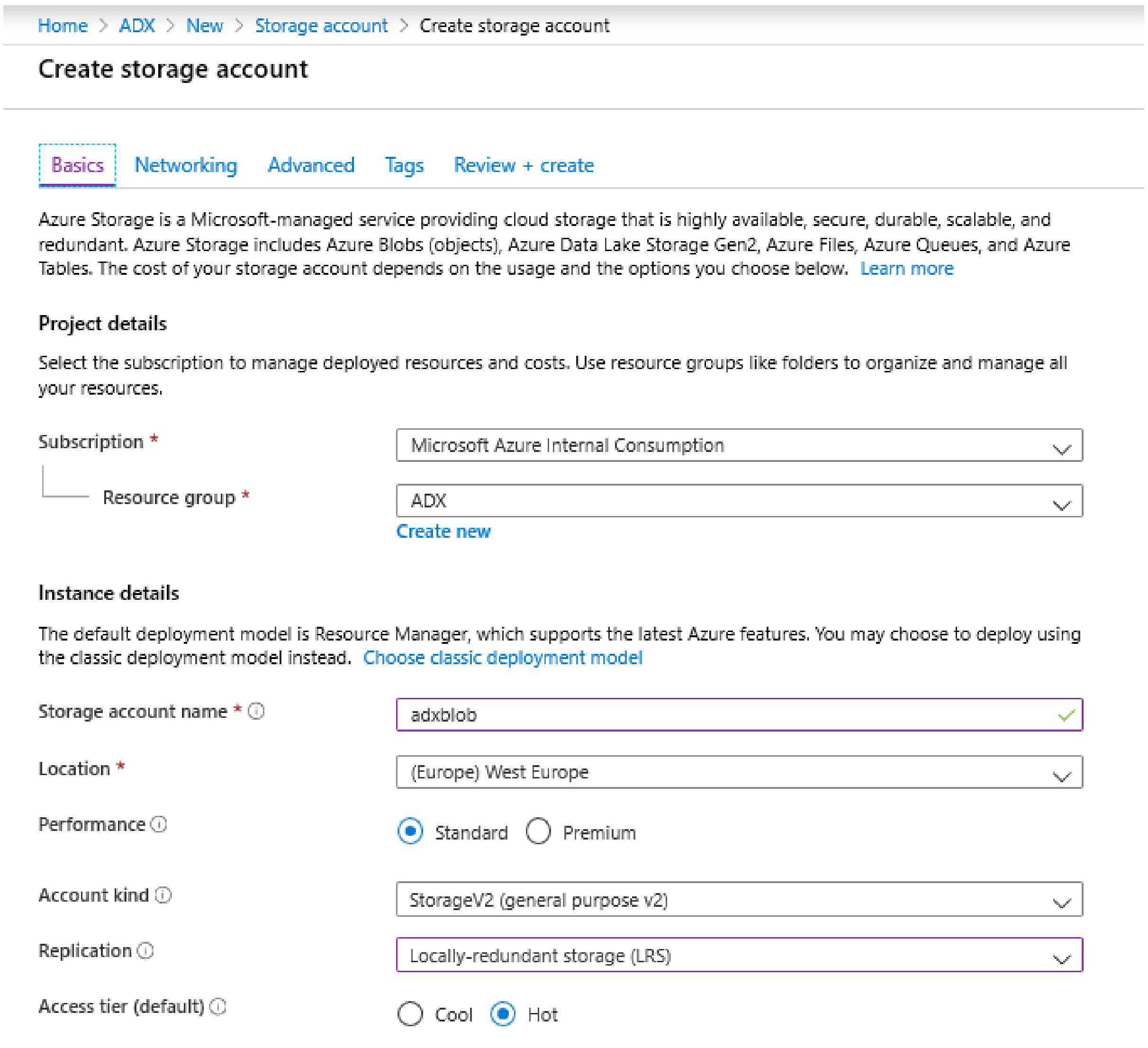


Microsoft Azure provides scalable, durable cloud storage, backup, and recovery solutions for any data, big or small. It works with the infrastructure you already have to cost-effectively enhance your existing applications and business continuity strategy, and provide the storage required by your cloud applications, including unstructured text or binary data such as video, audio, and images.

Useful Links
Documentation
Service overview
Pricing

4. On the **Create storage account** blade, complete the Basics blade (see below):

5.


Home > ADX > New > Storage account > Create storage account

Create storage account

Azure Storage is a Microsoft-managed service providing cloud storage that is highly available, secure, durable, scalable, and redundant. Azure Storage includes Azure Blobs (objects), Azure Data Lake Storage Gen2, Azure Files, Azure Queues, and Azure Tables. The cost of your storage account depends on the usage and the options you choose below. Learn more

Project details

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

Subscription * : Microsoft Azure Internal Consumption

Resource group * : ADX

Create new

Instance details

The default deployment model is Resource Manager, which supports the latest Azure features. You may choose to deploy using the classic deployment model instead. Choose classic deployment model

Storage account name * : adxblob

Location * : (Europe) West Europe

Performance : [✓ Standard] Premium

Account kind : StorageV2 (general purpose v2)

Replication : Locally-redundant storage (LRS)

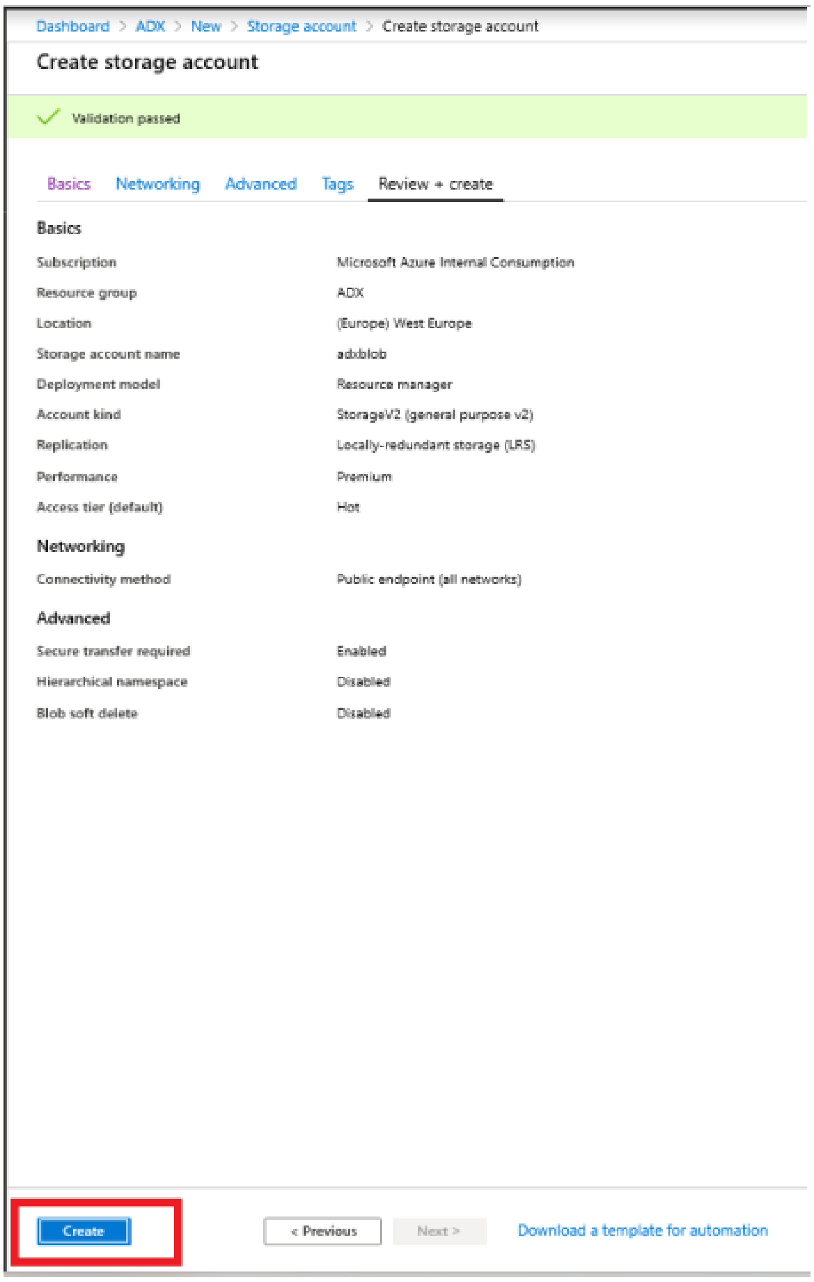
Access tier (default) : Cool [✓ Hot]

Complete the blade by entering the details as below:

Property	**Description**	**Required**
Subscription	The value must be set to the subscription the ADX resource group is created in.	Yes
Resource Group	The name of the workshop resource group. Enter **ADX**.	Yes
Storage account name	Enter **adxblob**	Yes
Location	Select your chosen region to match the resource group ADX you have created.	Yes

Property	Description	Required
Performance	Enter **Standard**	Yes
Account Kind	Select **Storage v2 (general purpose v2)**	Yes
Replication	Select **Locally redundant storage (LRS)**	Yes

5. Select **Review + Create**. The blade below will appear, select **Create**:



Basics

Subscription	Microsoft Azure Internal Consumption
Resource group	ADX
Location	(Europe) West Europe
Storage account name	adxblob
Deployment model	Resource manager
Account kind	StorageV2 (general purpose v2)
Replication	Locally-redundant storage (LRS)
Performance	Premium
Access tier (default)	Hot

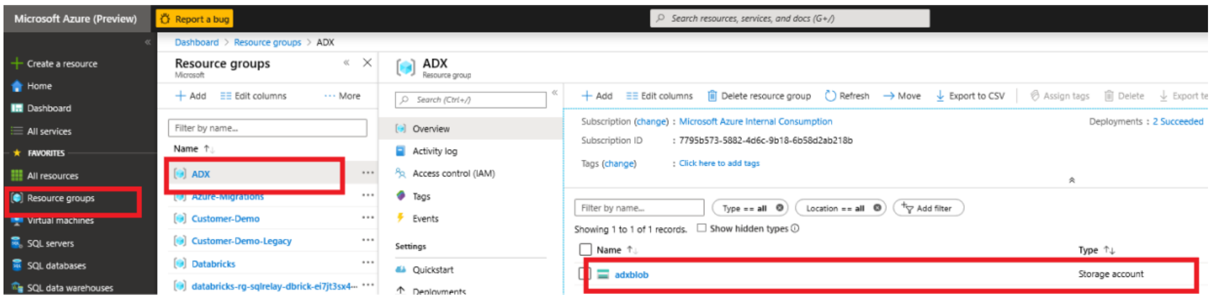
Networking

Connectivity method	Public endpoint (all networks)

Advanced

Secure transfer required	Enabled
Hierarchical namespace	Disabled
Blob soft delete	Disabled

After a short wait you will be notified that the blob storage has been created. You can go to the resource to review its setup or select **Resource Groups**, then select **ADX**, to see the ***adxblob*** resource you have just created:



This resource template can be found in the Git Repository as 'ExportedTemplate_adxblob.zip'

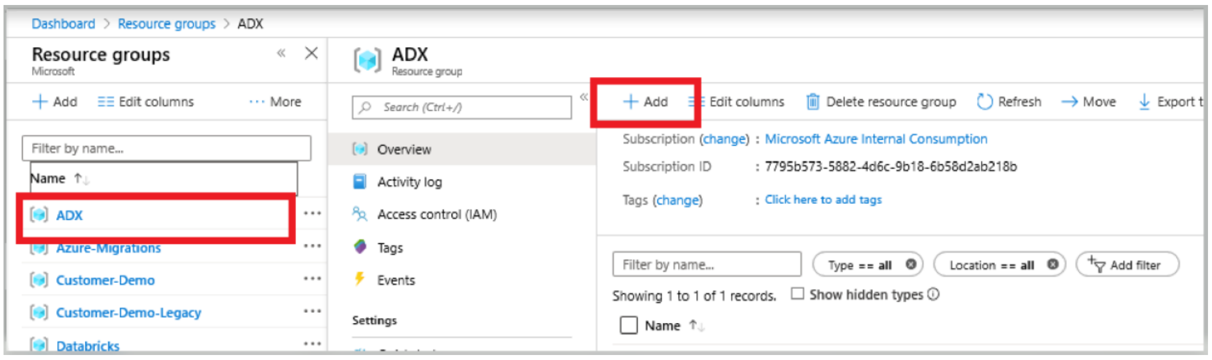
Activity 1.3 - Create the data lake storage account

The data lake storage account will serve as the *data lake* for both this and all the other labs within this workshop.

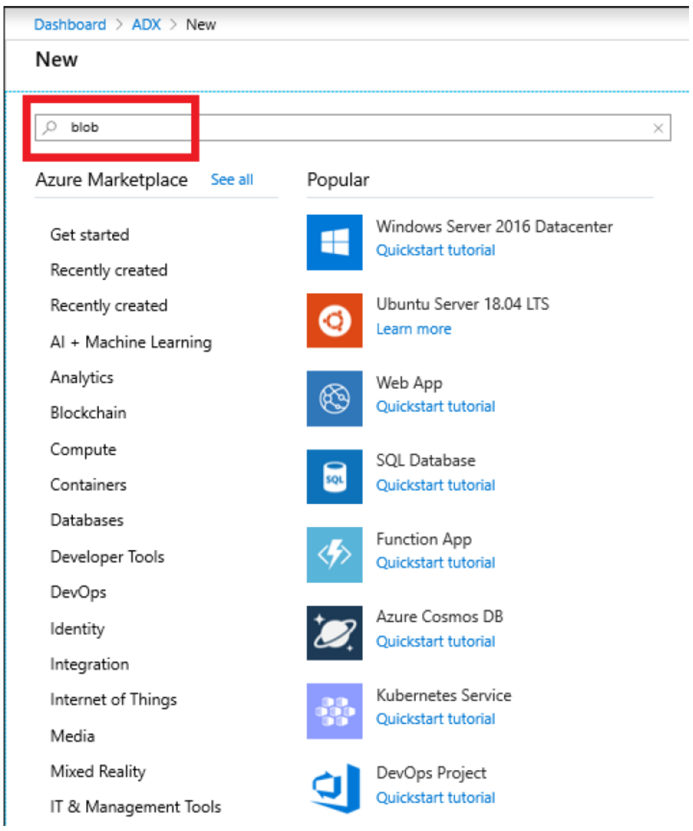
An explanation of Azure Data Lake (ADLS) resource is here [link].

NOTE: *the ADLS storage account is created via the same steps as the **adxblob** blob storage account. For completeness all the steps are included to below although there is some repetition to 'Activity 1.2 - Create the Blob storage account'.*

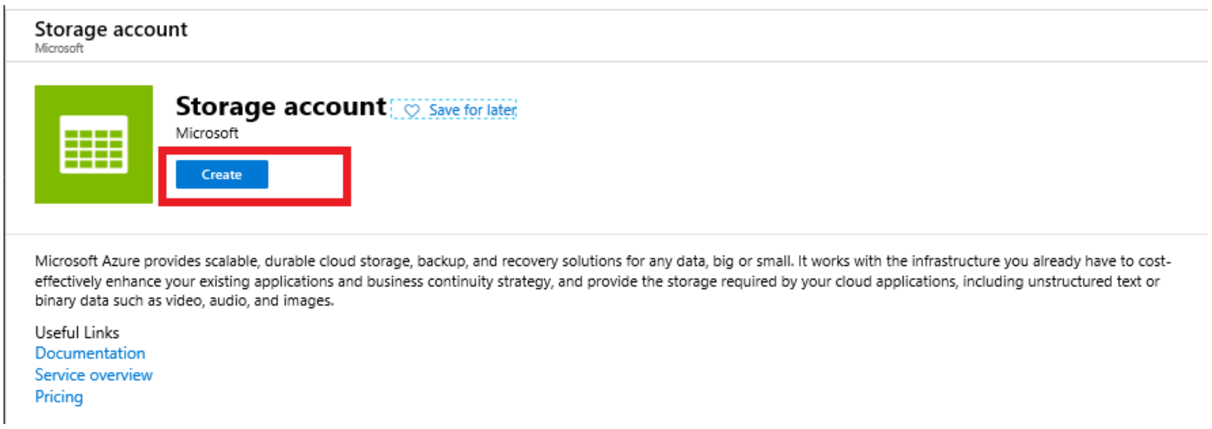
1. Within the ADX resource Group, select **+ Add** or **Create Resource**



2. Type **blob** or **storage** in the search window (see below) and then select **Storage Account** from the results displayed:



3. On the Storage Account blade, select **Create**:



Microsoft Azure provides scalable, durable cloud storage, backup, and recovery solutions for any data, big or small. It works with the infrastructure you already have to cost-effectively enhance your existing applications and business continuity strategy, and provide the storage required by your cloud applications, including unstructured text or binary data such as video, audio, and images.

Useful Links
Documentation
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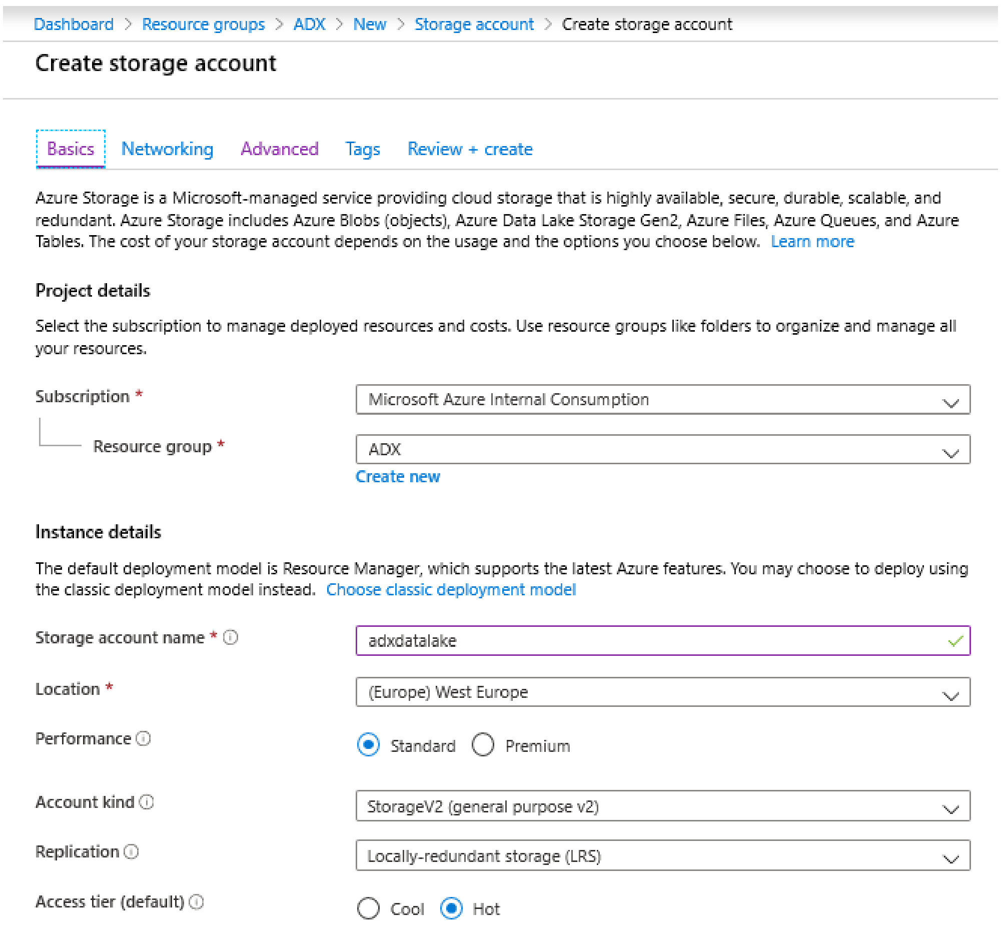
4. On the **Create storage account** blade, complete the Basics blade (see below)


Dashboard > Resource groups > ADX > New > Storage account > Create storage account

Create storage account

Azure Storage is a Microsoft-managed service providing cloud storage that is highly available, secure, durable, scalable, and redundant. Azure Storage includes Azure Blobs (objects), Azure Data Lake Storage Gen2, Azure Files, Azure Queues, and Azure Tables. The cost of your storage account depends on the usage and the options you choose below. Learn more

Project details

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

Subscription * : Microsoft Azure Internal Consumption

Resource group * : ADX

Create new

Instance details

The default deployment model is Resource Manager, which supports the latest Azure features. You may choose to deploy using the classic deployment model instead. Choose classic deployment model

Storage account name * : adxdatalake

Location * : (Europe) West Europe

Performance: [✓ Standard] Premium

Account kind: StorageV2 (general purpose v2)

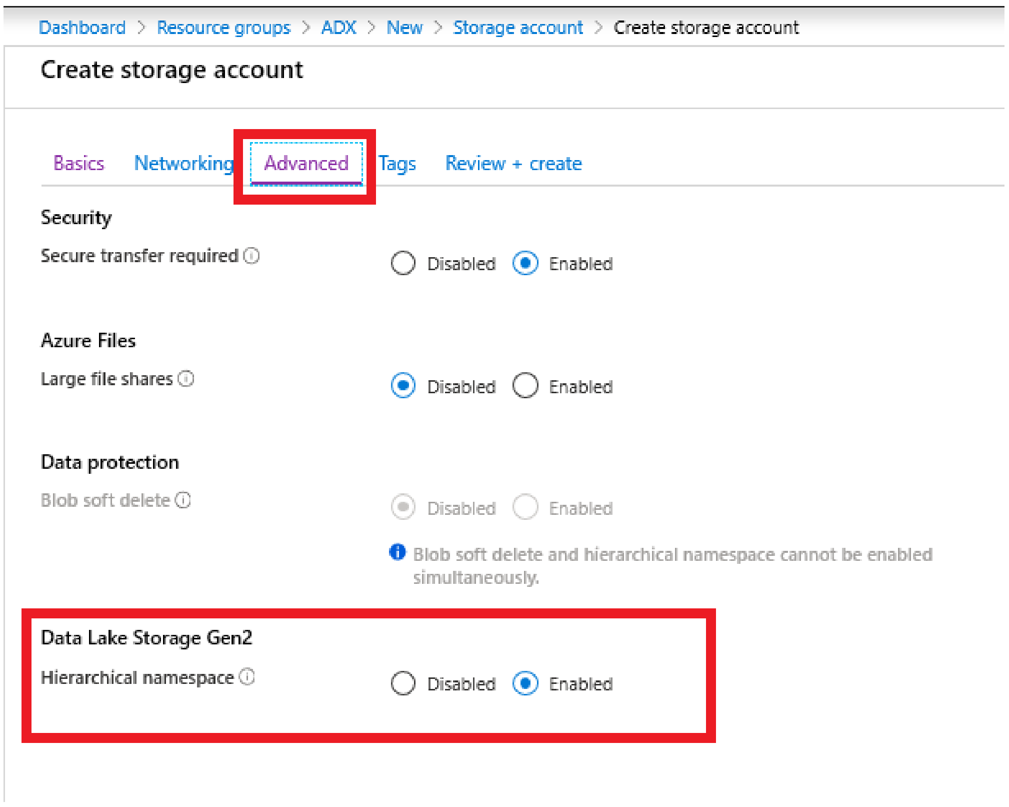
Replication: Locally-redundant storage (LRS)

Access tier (default): Cool [✓ Hot]

Complete the blade by entering the details as below:

Property	Description	Required
Subscription	The value must be set to the subscription the ADX resource group is created in.	Yes
Resource Group	The name of the workshop resource group. Enter **ADX**.	Yes
Storage account name	Enter **adxblob**	Yes
Location	Select your chosen region to match the resource group *ADX* you have created.	Yes
Performance	Enter **Standard**	Yes
Account Kind	Select **Storage v2 (general purpose v2)**	Yes
Replication	Select **Locally-redundant storage (LRS)**	Yes

5. Select **Advanced**, this is where the blob storage account had the ADLS data lake attributes enabled:



Dashboard > Resource groups > ADX > New > Storage account > Create storage account

Create storage account

Basics | Networking | Advanced | Tags | Review + create

Security

Secure transfer required: Disabled [✓ Enabled]

Azure Files

Large file shares: [✓ Disabled] Enabled

Data protection

Blob soft delete: [✓ Disabled] Enabled

Blob soft delete and hierarchical namespace cannot be enabled simultaneously.

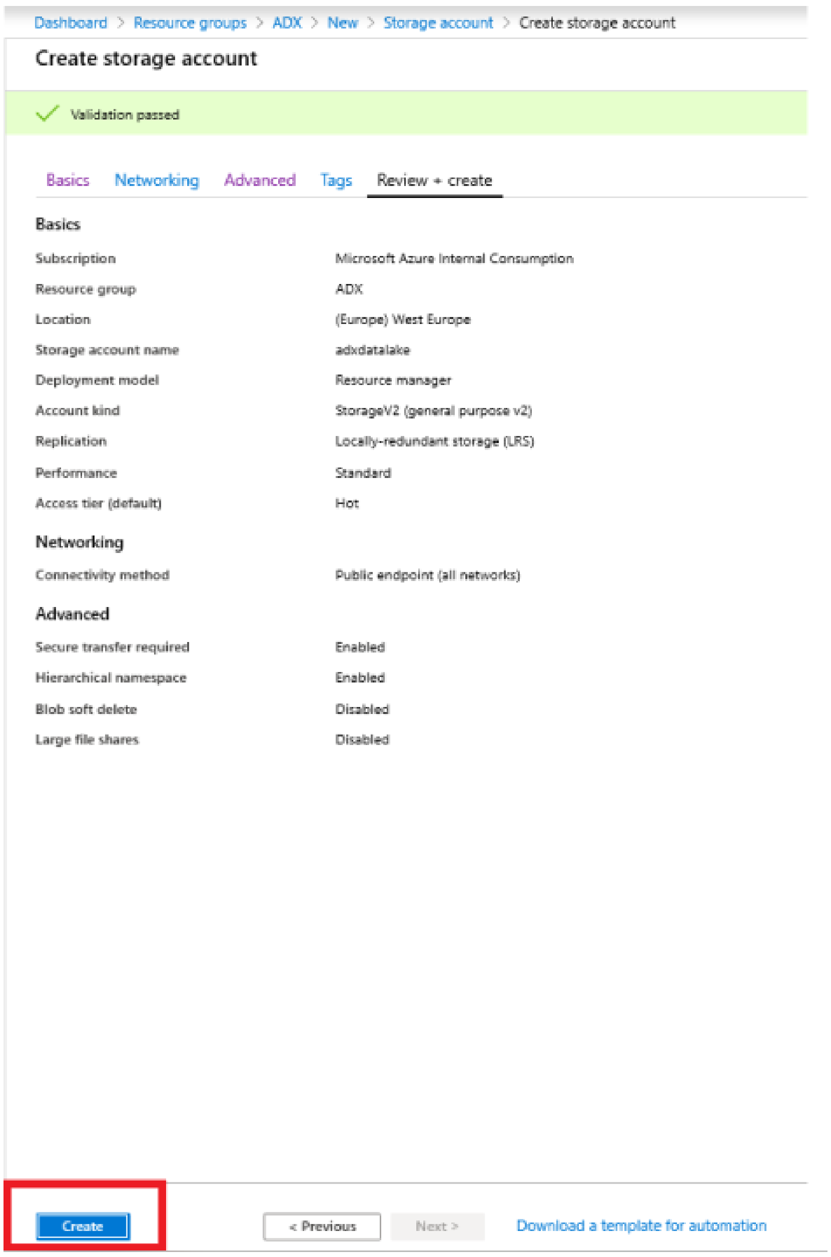
Data Lake Storage Gen2

Hierarchical namespace: Disabled [✓ Enabled]

Complete the blade by entering the details as below:

Property	**Description**	**Required**
Security	Select **Enabled**	Yes
Azure Files	Select **Disabled.** The purpose of this Lab is to create an architecture to handle files landing on the ***adxblob*** storage account (100's per second if necessary). As a result, these should be relatively small files (KBs to 1MB). Large files should be ingested via different architectural patterns.	Yes
Data Lake Storage Gen2	Enter **adxblob**	Yes

6. Select **Review + Create**. The blade below will appear, select **Create**:


Dashboard > Resource groups > ADX > New > Storage account > Create storage account
Create storage account
Validation passed
Basics
Networking
Advanced
Tags
Review + create
Create
< Previous
Next >
Download a template for automation

Basics

Subscription	Microsoft Azure Internal Consumption
Resource group	ADX
Location	(Europe) West Europe
Storage account name	adxdatalake
Deployment model	Resource manager
Account kind	StorageV2 (general purpose v2)
Replication	Locally-redundant storage (LRS)
Performance	Standard
Access tier (default)	Hot

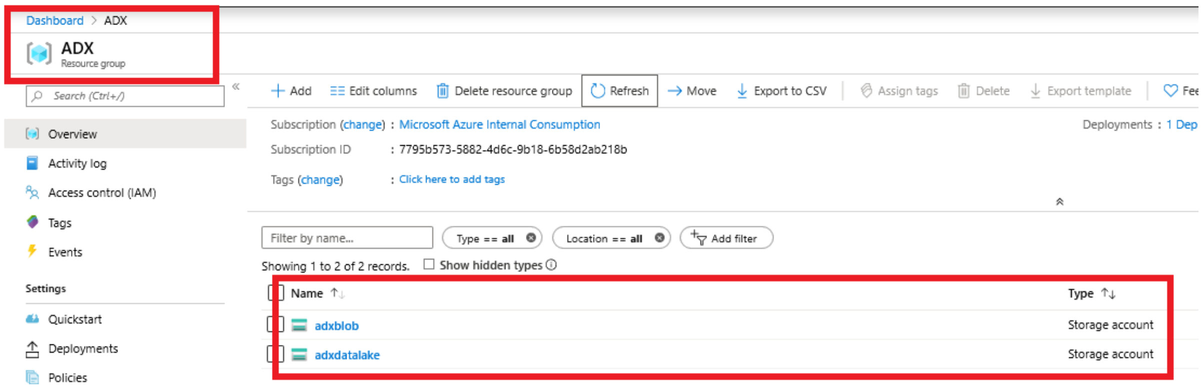
Networking

Connectivity method	Public endpoint (all networks)

Advanced

Secure transfer required	Enabled
Hierarchical namespace	Enabled
Blob soft delete	Disabled
Large file shares	Disabled

After a short wait you will be notified that the adls storage has been created. You can go to the resource to review its setup or select **Resource Groups**, then select **ADX**, to see the ***adxdatalake*** resource you have just created:



Subscription (change) : Microsoft Azure Internal Consumption
Deployments : 1 Dep
Subscription ID : 7795b573-5882-4d6c-9b18-6b58d2ab218b
Tags (change) : Click here to add tags

Showing 1 to 2 of 2 records. Show hidden types

Name	Type
adxblob	Storage account
adxdatalake	Storage account

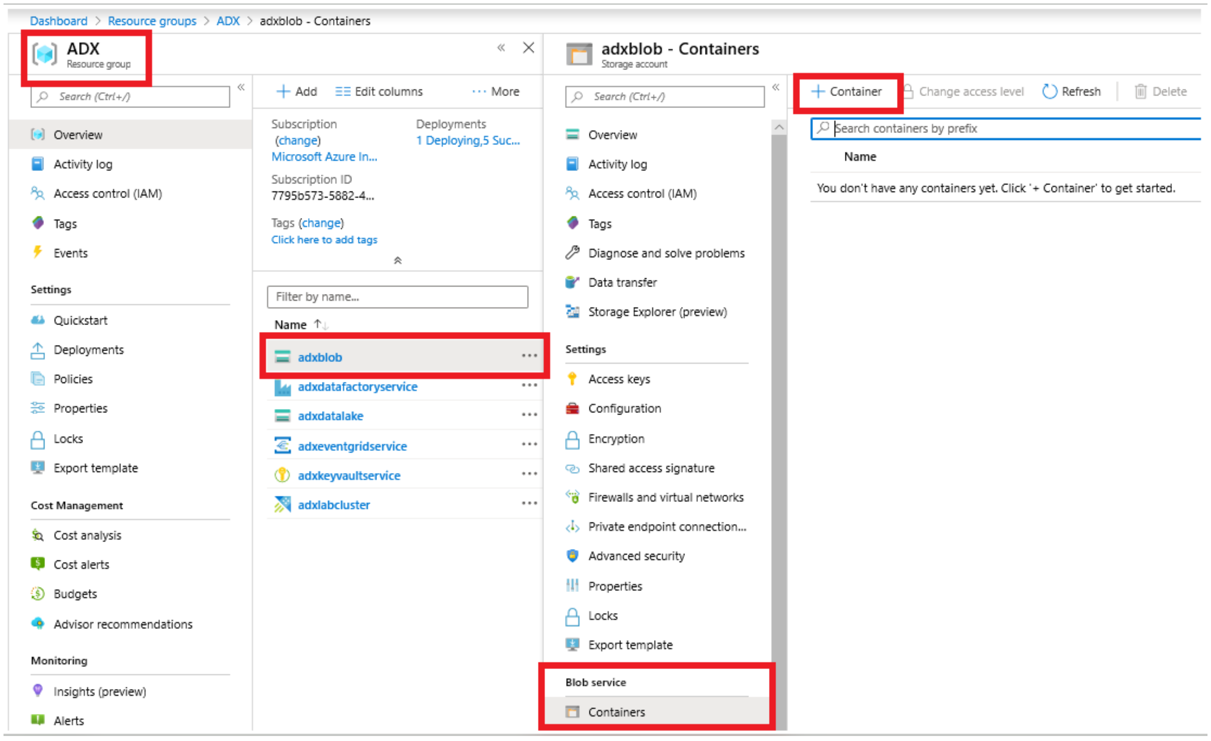
Notice that both ***adxblob*** and ***adxdatalake*** have the Type: Storage Account. Make certain you are familiar with the Azure Data Lake (ADLS) and Azure Blob services.

This ***adxdatalake*** resource template can be found in the Git Repository as 'ExportedTemplate_adxdatalake.zip'.

Activity 1.4: Configure the Blob storage

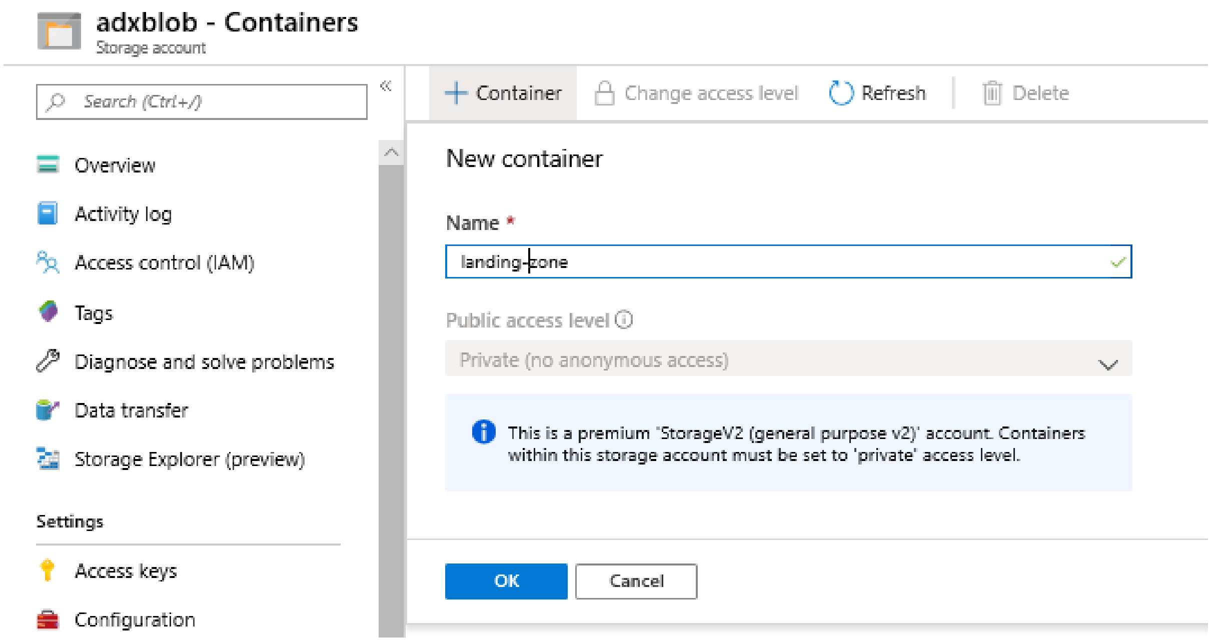
A container is required for the files to be landed to from upstream systems and services. The Azure Event Grid will generate *blob created* events that the Azure Data Factory will utilise during it pipeline execution.

1. Select the **ADX** resource group in the Azure portal
2. Select ***adxblob*** storage account
3. Select **Containers** underneath *Blob Service*
4. Select **+ Container** to add a new container, as below:



You don't have any containers yet. Click '+ Container' to get started.

5. Enter **landing-zone** and select **Ok:**



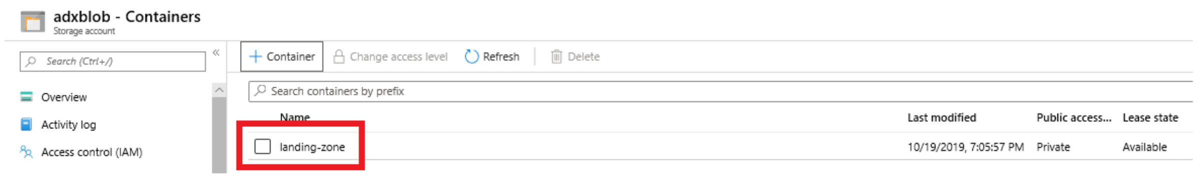
New container

Name * : landing-zone

Public access level: Private (no anonymous access)

This is a premium 'StorageV2 (general purpose v2)' account. Containers within this storage account must be set to 'private' access level.

The *landing-zone* container will be created:

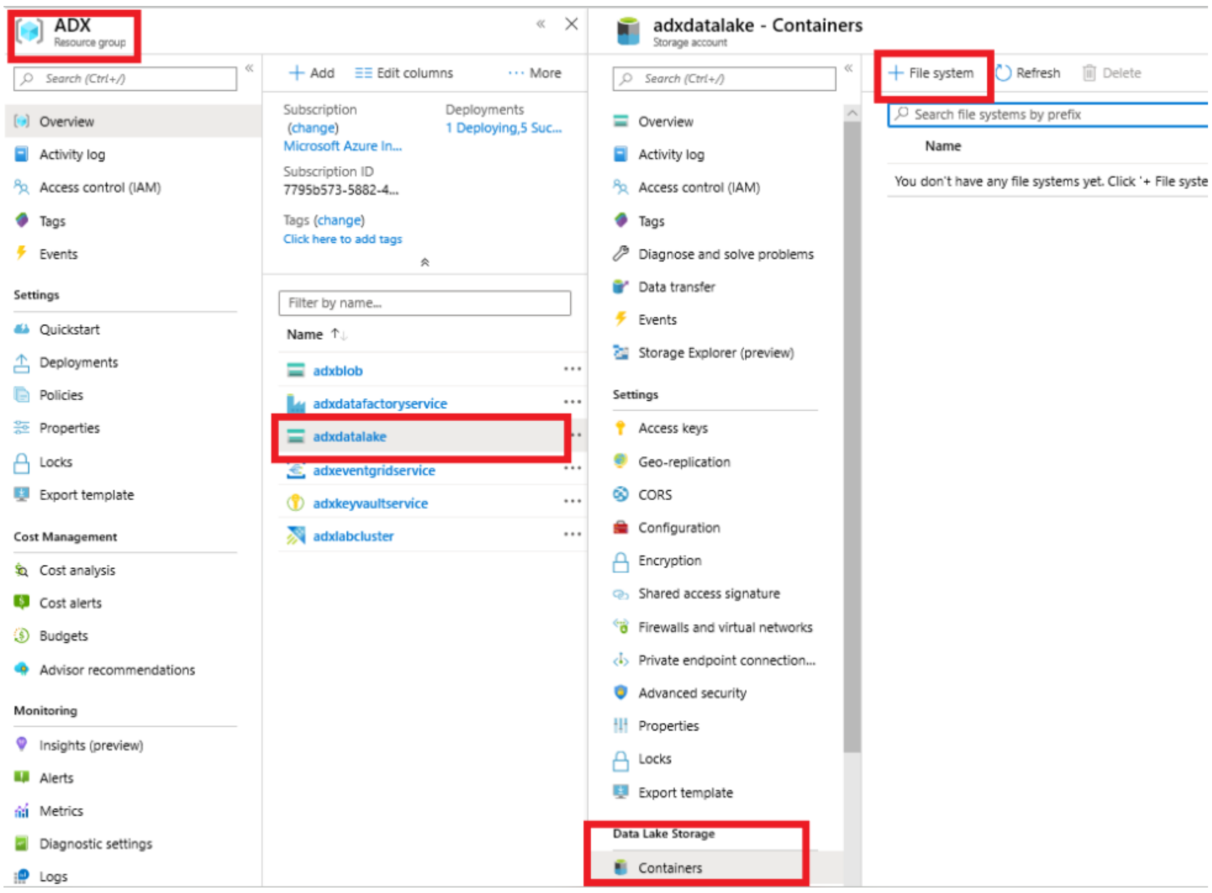


Name	Last modified	Public access...	Lease state
landing-zone	10/19/2019, 7:05:57 PM	Private	Available

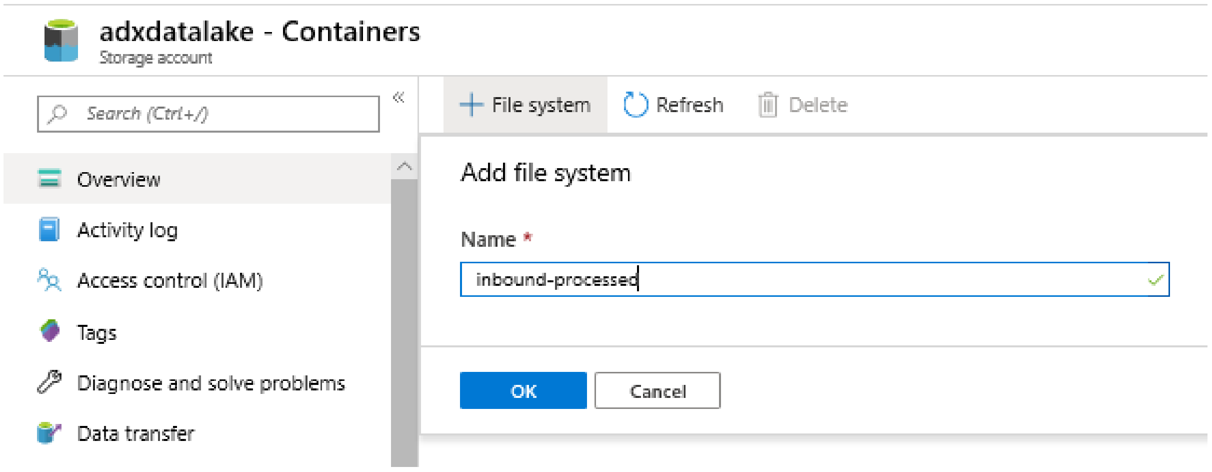
Activity 1.5: Configure the ADLS storage

A root container is required for files to be landed to in a hierarchical structure. Files will be landed to ADLS via an Azure Data Factory Pipeline activity.

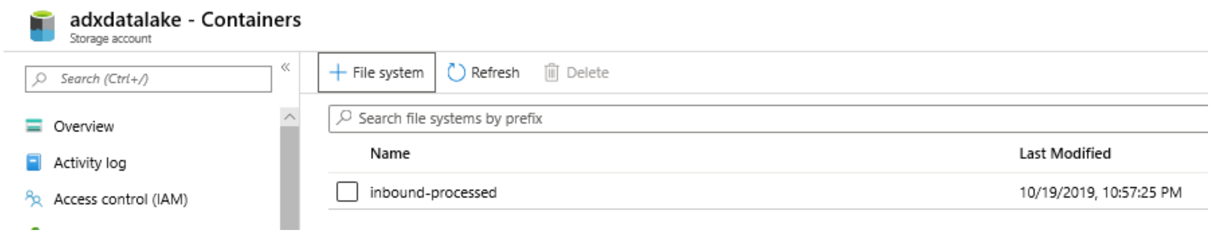
1. Select the **ADX** resource group in the Azure portal
2. Select ***adxdatalake*** storage account
3. Select **Containers** underneath *Blob Service*
4. Select **+ File System** to add a new container, as below:



5. Enter **inbound-processed** and select **OK:**



The inbound-processed container will be created:



Name	Last Modified
inbound-processed	10/19/2019, 10:57:25 PM

Activity 2 – Key Vault, Event Grid

As per the diagram “Lab1 - Activity 2 – Key Vault – Event Grid.pdf” we are creating an Azure Key Vault to securely store access account and credential information. Additionally, we are creating an Azure Event Grid to process a file(s) that lands on the blob storage ***adxblob***.

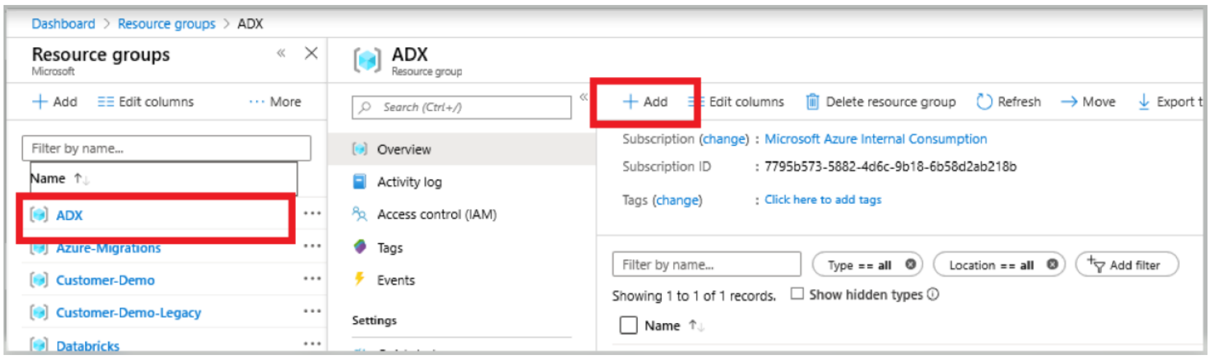
An explanation of Azure Key Vault is here [link]

An explanation of Azure Event Grid is here [link]

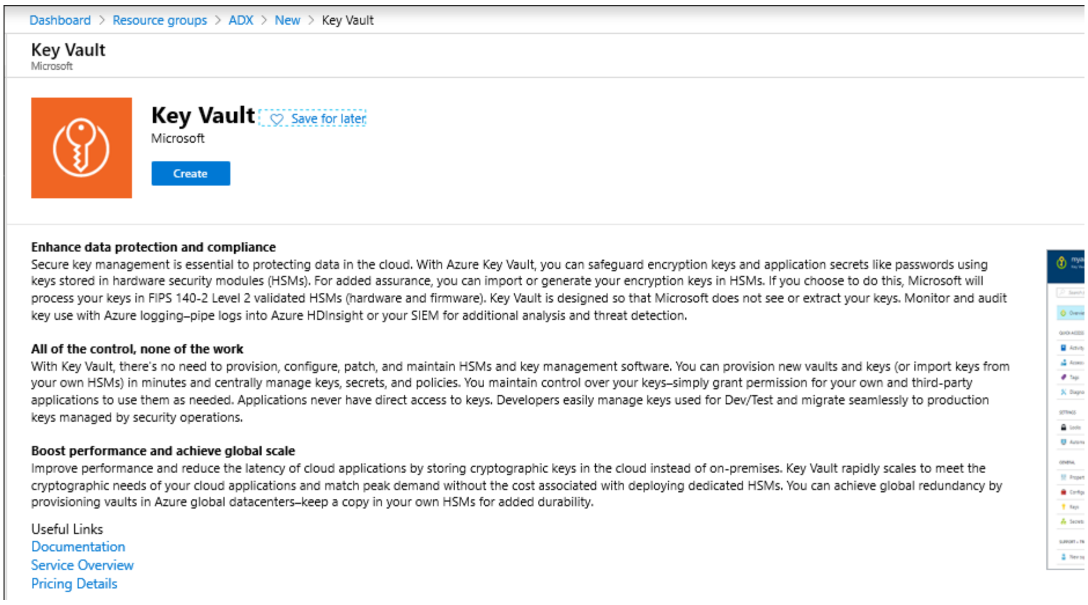
Activity 2.1 – Create the Azure Key Vault service

We will create an Azure KeyVault for use in future labs.

1. Within the ADX resource Group, select **+ Add** or **Create Resource**



2. Type **keyvault** in the search window (see below) and then select **Key Vault** from the results displayed. The following blade will appear:



Dashboard > Resource groups > ADX > New > Key Vault

Key Vault
Microsoft

Key Vault Save for later
Microsoft
Create

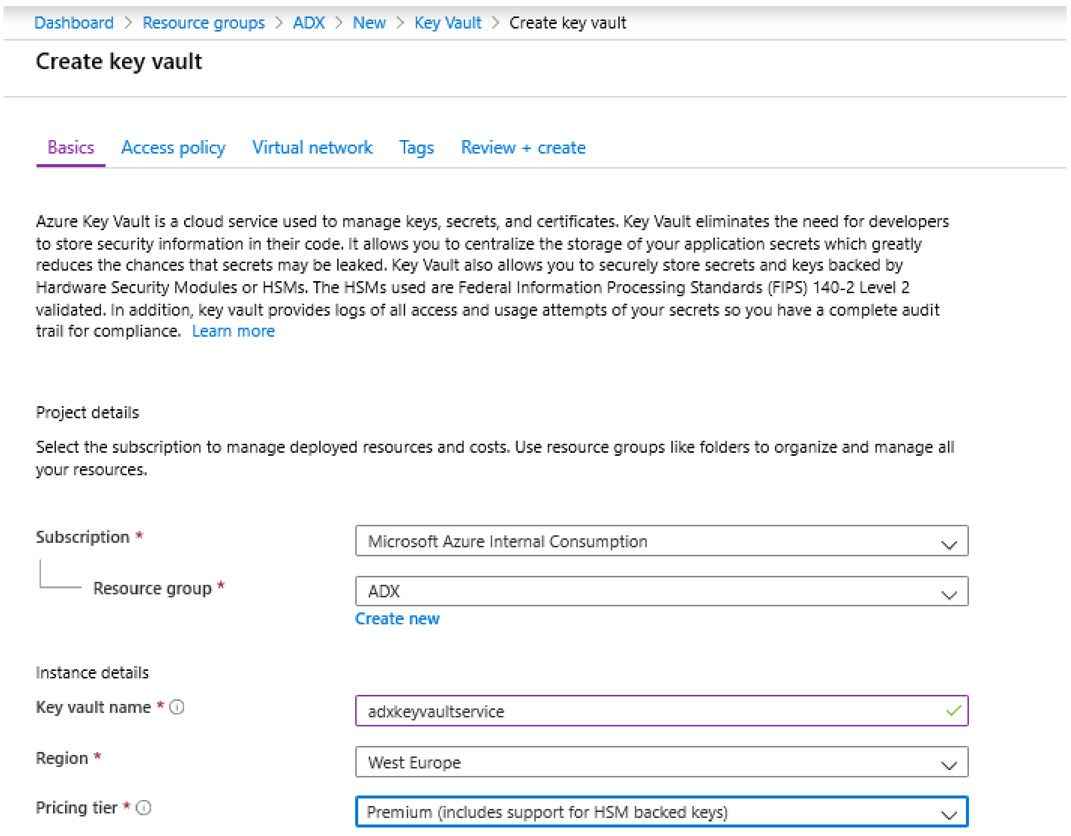
Enhance data protection and compliance
Secure key management is essential to protecting data in the cloud. With Azure Key Vault, you can safeguard encryption keys and application secrets like passwords using keys stored in hardware security modules (HSMs). For added assurance, you can import or generate your encryption keys in HSMs. If you choose to do this, Microsoft will process your keys in FIPS 140-2 Level 2 validated HSMs (hardware and firmware). Key Vault is designed so that Microsoft does not see or extract your keys. Monitor and audit key use with Azure logging–pipe logs into Azure HDInsight or your SIEM for additional analysis and threat detection.

All of the control, none of the work
With Key Vault, there's no need to provision, configure, patch, and maintain HSMs and key management software. You can provision new vaults and keys (or import keys from your own HSMs) in minutes and centrally manage keys, secrets, and policies. You maintain control over your keys–simply grant permission for your own and third-party applications to use them as needed. Applications never have direct access to keys. Developers easily manage keys used for Dev/Test and migrate seamlessly to production keys managed by security operations.

Boost performance and achieve global scale
Improve performance and reduce the latency of cloud applications by storing cryptographic keys in the cloud instead of on-premises. Key Vault rapidly scales to meet the cryptographic needs of your cloud applications and match peak demand without the cost associated with deploying dedicated HSMs. You can achieve global redundancy by provisioning vaults in Azure global datacenters–keep a copy in your own HSMs for added durability.

Useful Links
Documentation
Service Overview
Pricing Details

3. Select **Create**
4. On the Basics tab, enter details as below:


Dashboard > Resource groups > ADX > New > Key Vault > Create key vault

Create key vault

Basics | Access policy | Virtual network | Tags | Review + create

Azure Key Vault is a cloud service used to manage keys, secrets, and certificates. Key Vault eliminates the need for developers to store security information in their code. It allows you to centralize the storage of your application secrets which greatly reduces the chances that secrets may be leaked. Key Vault also allows you to securely store secrets and keys backed by Hardware Security Modules or HSMs. The HSMs used are Federal Information Processing Standards (FIPS) 140-2 Level 2 validated. In addition, key vault provides logs of all access and usage attempts of your secrets so you have a complete audit trail for compliance. Learn more

Project details

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

Subscription *: Microsoft Azure Internal Consumption

Resource group *: ADX

Create new

Instance details

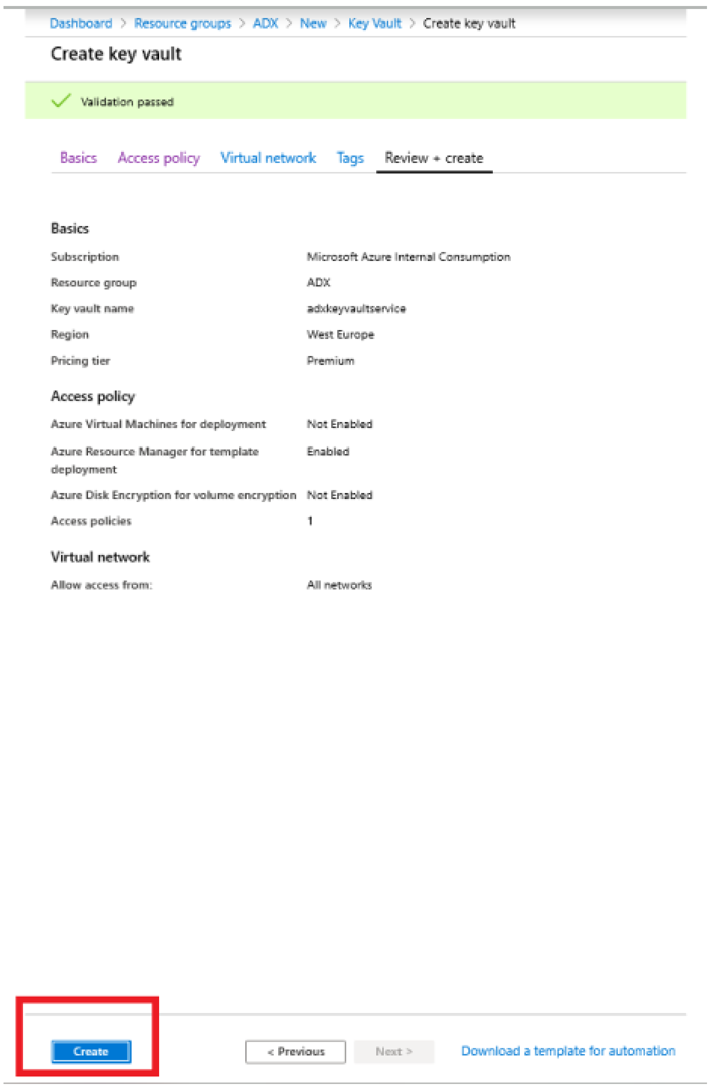
Key vault name *: adxkeyvaultservice

Region *: West Europe

Pricing tier *: Premium (includes support for HSM backed keys)

Property	Description	Required
Subscription	The value must be set to the subscription the ADX resource group is created in.	Yes
Resource Group	The name of the workshop resource group. Enter **ADX**.	Yes
Key vault name	Enter **adxkeyvaultservice**	Yes
Region	Select your chosen region to match the resource group *ADX* you have created.	Yes
Pricing Tier	Enter **Premium**	Yes

5. Select **Review + Create**. Then select **Create**:



Dashboard > Resource groups > ADX > New > Key Vault > Create key vault

Create key vault

Validation passed

Basics

Subscription	Microsoft Azure Internal Consumption
Resource group	ADX
Key vault name	adxkeyvaultservice
Region	West Europe
Pricing tier	Premium

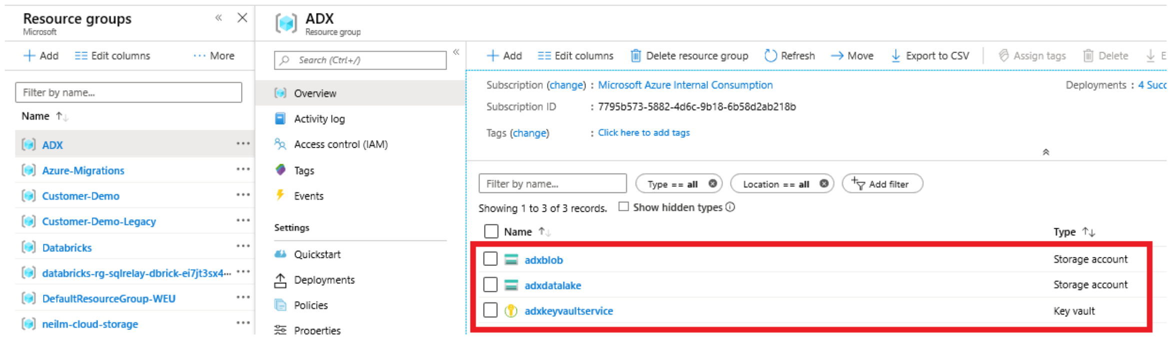
Access policy

Azure Virtual Machines for deployment	Not Enabled
Azure Resource Manager for template deployment	Enabled
Azure Disk Encryption for volume encryption	Not Enabled
Access policies	1

Virtual network

Allow access from:	All networks

After a short wait you will be notified that the Azure Key Vault has been created. You can go to the resource to review its setup or select **Resource Groups**, then select **ADX**, to see the **adxkeyvaultservice** resource you have just created:



Subscription (change) : Microsoft Azure Internal Consumption

Subscription ID : 7795b573-5882-4d6c-9b18-6b58d2ab218b

Tags (change) : Click here to add tags

Deployments : 4 Succ

Showing 1 to 3 of 3 records. Show hidden types

Name	Type
adxblob	Storage account
adxdatalake	Storage account
adxkeyvaultservice	Key vault

This **adxkeyvaultservice** resource template can be found in the Git Repository as 'ExportedTemplate_adxkeyvaultservice.zip'.

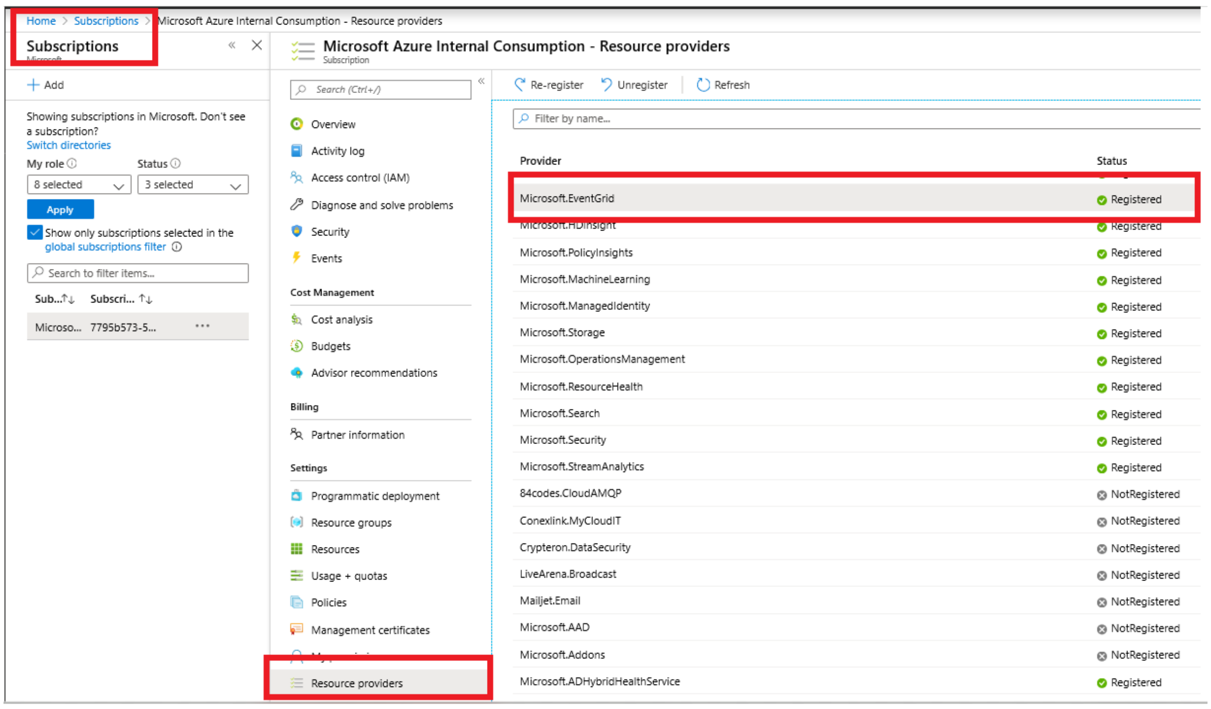
Activity 2.2 – Create the Azure Event Grid service

If you haven't previously used Event Grid in your Azure subscription, you may need to register the Event Grid resource provider.

In the Azure portal:

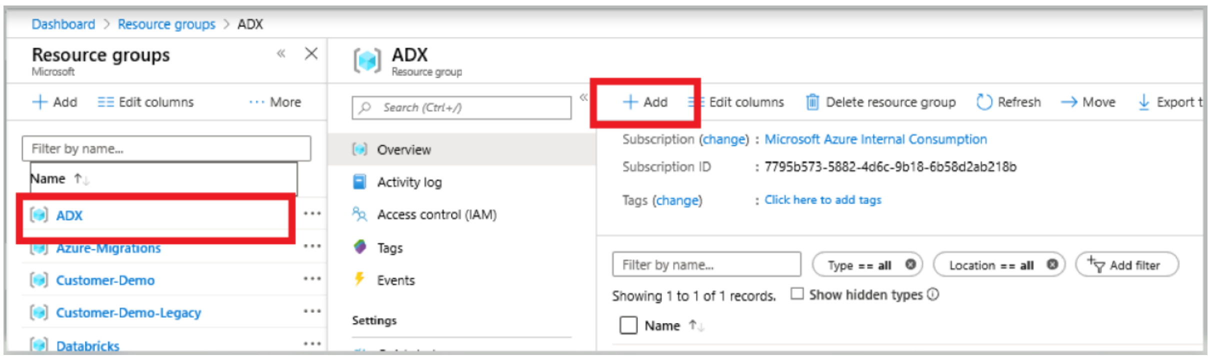
1. Select **All Services**
2. Select **Subscriptions**
3. Select the subscription you're using for this workshop/lab
4. Select **Resource providers**.
5. Find **Microsoft.EventGrid**.
6. If not registered, select **Register**.

It may take a moment for the registration to finish. Select **Refresh** to update the status. When **Status** is **Registered**, you're ready to continue.



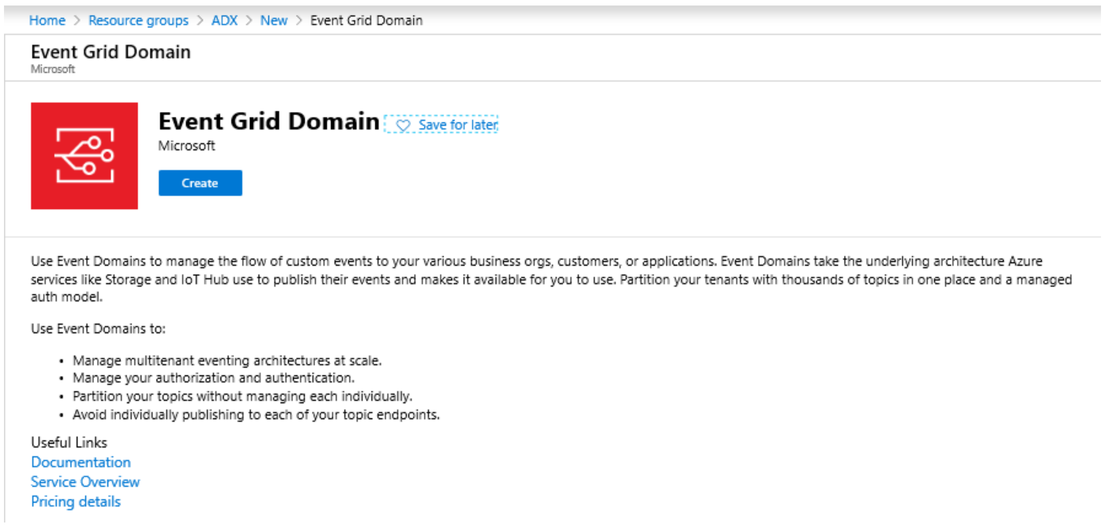
Provider	Status
Microsoft.EventGrid	Registered
Microsoft.HDInsight	Registered
Microsoft.PolicyInsights	Registered
Microsoft.MachineLearning	Registered
Microsoft.ManagedIdentity	Registered
Microsoft.Storage	Registered
Microsoft.OperationsManagement	Registered
Microsoft.ResourceHealth	Registered
Microsoft.Search	Registered
Microsoft.Security	Registered
Microsoft.StreamAnalytics	Registered
84codes.CloudAMQP	NotRegistered
Conexlink.MyCloudIT	NotRegistered
Crypteron.DataSecurity	NotRegistered
LiveArena.Broadcast	NotRegistered
Mailjet.Email	NotRegistered
Microsoft.AAD	NotRegistered
Microsoft.Addons	NotRegistered
Microsoft.ADHybridHealthService	Registered

6. Within the ADX resource Group, select **+ Add** or **Create Resource**



Subscription (change) : Microsoft Azure Internal Consumption
Subscription ID : 7795b573-5882-4d6c-9b18-6b58d2ab218b
Tags (change) : Click here to add tags
Showing 1 to 1 of 1 records.

7. Type **event grid domain** in the search window (see below) and then select **Event Grid** Domain from the results displayed. The following blade will appear:


Home > Resource groups > ADX > New > Event Grid Domain

Event Grid Domain
Microsoft

Event Grid Domain
Microsoft

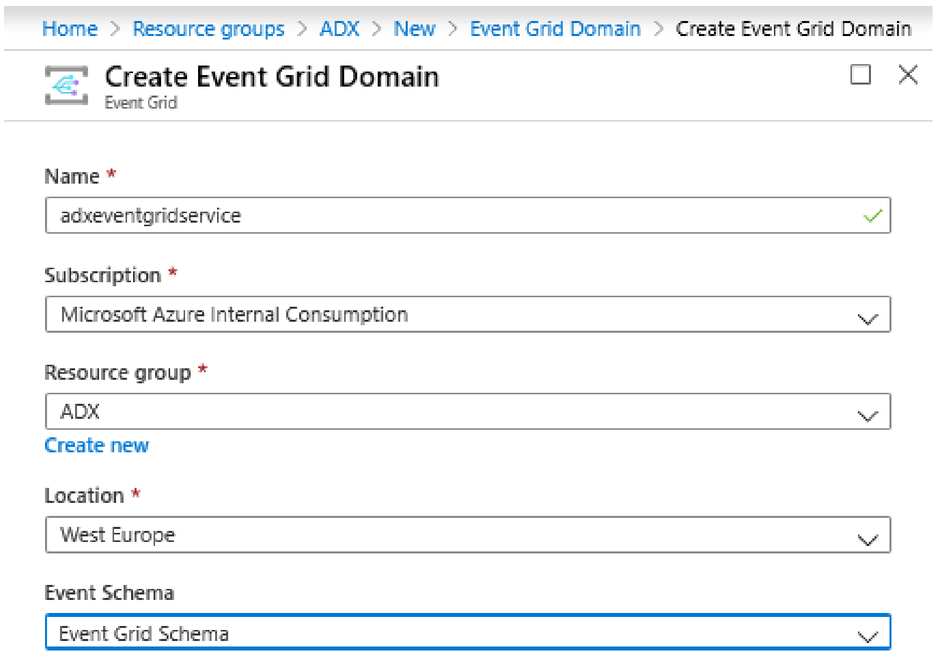
Use Event Domains to manage the flow of custom events to your various business orgs, customers, or applications. Event Domains take the underlying architecture Azure services like Storage and IoT Hub use to publish their events and makes it available for you to use. Partition your tenants with thousands of topics in one place and a managed auth model.

Use Event Domains to:

- Manage multitenant eventing architectures at scale.
- Manage your authorization and authentication.
- Partition your topics without managing each individually.
- Avoid individually publishing to each of your topic endpoints.

Useful Links
Documentation
Service Overview
Pricing details

8. Select **Create** and the following blade will appear:


Home > Resource groups > ADX > New > Event Grid Domain > Create Event Grid Domain

Create Event Grid Domain
Event Grid

Name *: adxeventgridservice

Subscription *: Microsoft Azure Internal Consumption

Resource group *: ADX

Location *: West Europe

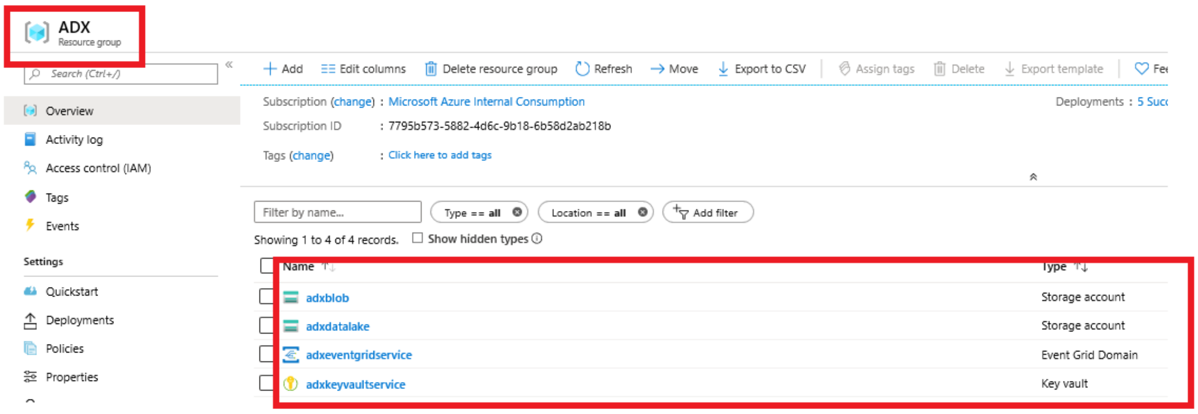
Event Schema: Event Grid Schema

Complete the blade by entering the details as below:

Property	**Description**	**Required**
Name	Enter adxeventgridservice	Yes
Subscription	The value must be set to the subscription the ADX resource group is created in.	Yes

Property	**Description**	**Required**
Resource Group	The name of the workshop resource group. Enter **ADX**.	Yes
Region	Select your chosen region to match the resource group *ADX* you have created.	Yes
Event Schema	Enter **Event Grid Schema**	Yes

9. Select **Create.** After a short wait you will be notified that the Azure Event Grid has been created. You can go to the resource to review its setup or select **Resource Groups**, then select **ADX**, to see the ***adxeventgridservice*** resource you have just created:



ADX
Resource group

Subscription (change) : Microsoft Azure Internal Consumption
Subscription ID : 7795b573-5882-4d6c-9b18-6b58d2ab218b
Tags (change) : Click here to add tags
Deployments : 5 Succ

Showing 1 to 4 of 4 records.

Name	Type
adxblob	Storage account
adxdatalake	Storage account
adxeventgridservice	Event Grid Domain
adxkeyvaultservice	Key vault

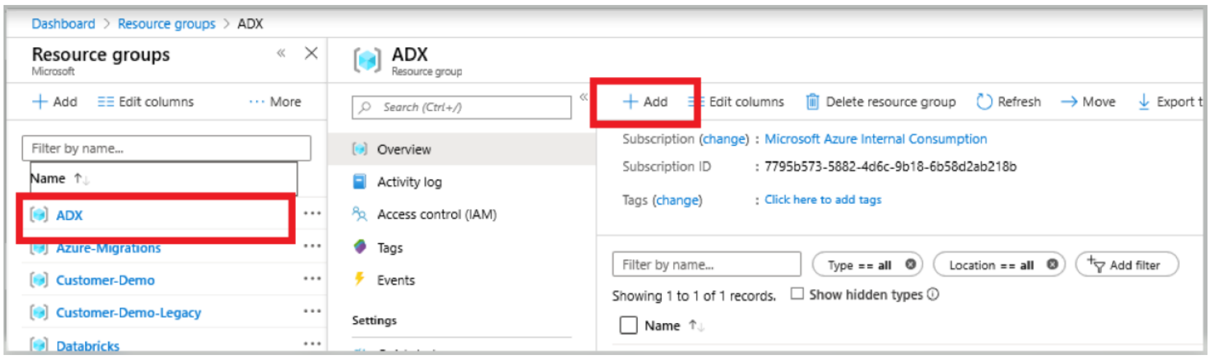
This **adxeventgridservice** resource template can be found in the Git Repository as ‘ExportedTemplate_adxeventgridservice.zip’.

Activity 3 – Data Factory

As per the diagram “Lab1 - Activity 3 – Data Factory.pdf” we are creating an Azure Data Factory (ADF). The ADF activity will be triggered by a file creation on the ***adxblob*** which will be detected via the Azure Event Grid. The ADF pipeline will move the file to the ***adxdatalake*** and deposit it in a hierarchical structure based on the date of the file creation.

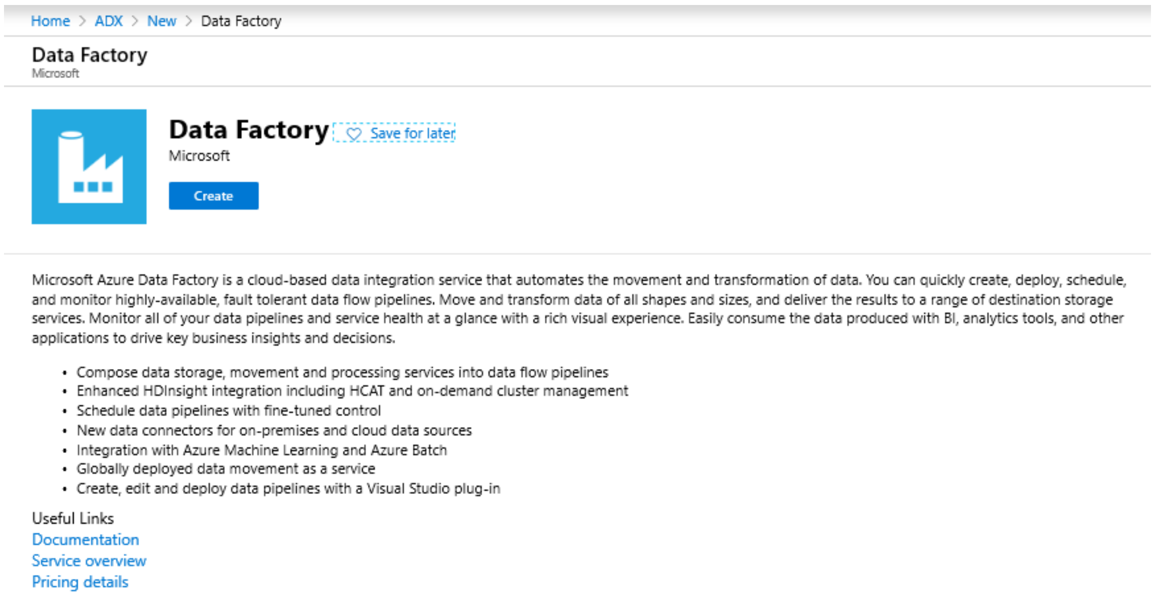
An explanation of Azure Data Factory (ADF) is here [link].

1. Within the ADX resource Group, select **+ Add** or **Create Resource**



Subscription (change) : Microsoft Azure Internal Consumption
Subscription ID : 7795b573-5882-4d6c-9b18-6b58d2ab218b
Tags (change) : Click here to add tags
Showing 1 to 1 of 1 records.

2. Type **data factory** in the search window (see below) and then select **Data Factory** from the results displayed. The following blade should be displayed:

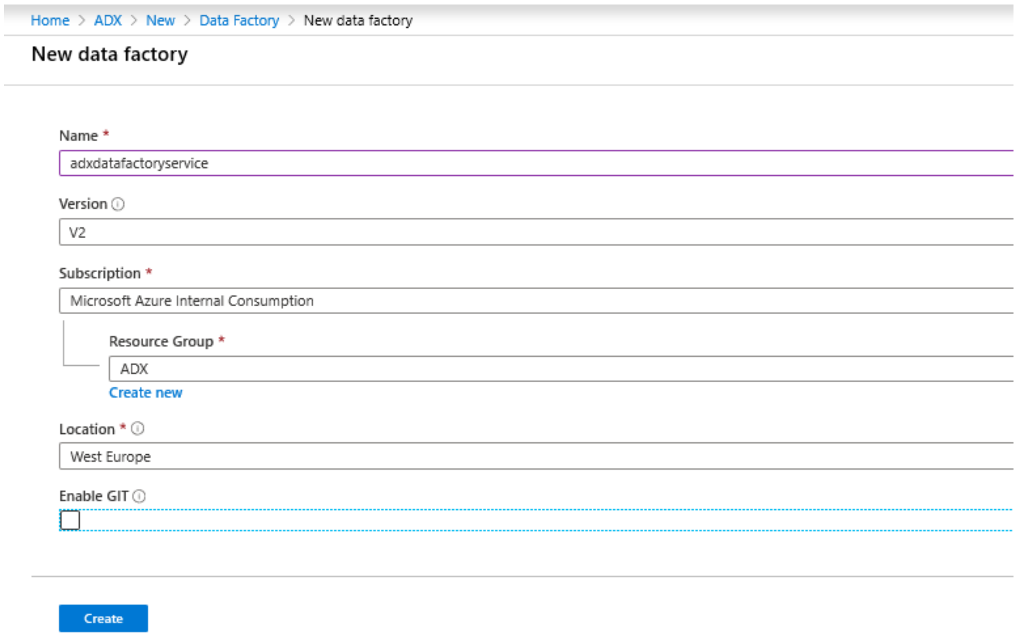


Microsoft Azure Data Factory is a cloud-based data integration service that automates the movement and transformation of data. You can quickly create, deploy, schedule, and monitor highly-available, fault tolerant data flow pipelines. Move and transform data of all shapes and sizes, and deliver the results to a range of destination storage services. Monitor all of your data pipelines and service health at a glance with a rich visual experience. Easily consume the data produced with BI, analytics tools, and other applications to drive key business insights and decisions.

- Compose data storage, movement and processing services into data flow pipelines
- Enhanced HDInsight integration including HCAT and on-demand cluster management
- Schedule data pipelines with fine-tuned control
- New data connectors for on-premises and cloud data sources
- Integration with Azure Machine Learning and Azure Batch
- Globally deployed data movement as a service
- Create, edit and deploy data pipelines with a Visual Studio plug-in

Useful Links
Documentation
Service overview
Pricing details

3. Select **Create**, the **New data factory** blade will appear:



Name *
adxdatafactoryservice
Version
V2
Subscription *
Microsoft Azure Internal Consumption
Resource Group *
ADX
Location *
West Europe
Enable GIT
☐

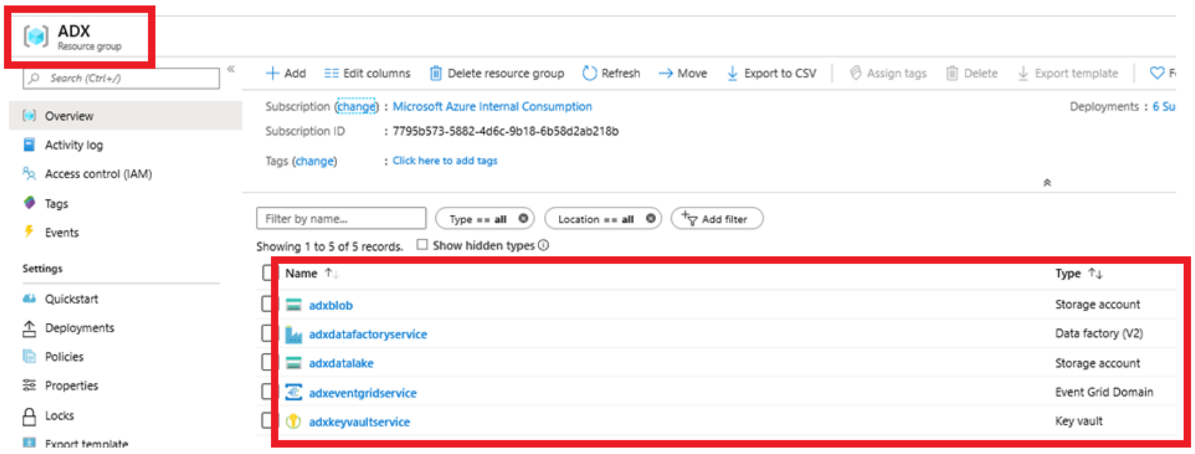
Complete the blade by entering the details as below:

Property	**Description**	**Required**
Name	Enter **adxdatafactoryservice**	Yes
Version	Enter **V2**	Yes
Subscription	The value must be set to the subscription the ADX resource group is created in.	Yes
Resource Group	The name of the workshop resource group. Enter **ADX**.	Yes
Region	Select your chosen region to match the resource group *ADX* you have created.	Yes
Enable GIT	Uncheck this box. GIT integration allows you to utilise in a DevOps CI/CD environment. This integration is beyond the scope of this workshop, so will not be configured. Further details can be found here if this is of interest. https://docs.microsoft.com/en-us/azure/data-factory/continuous-integration-deployment	Yes

NOTE: *GIT integration allows you to utilise in a DevOps CI/CD environment. This integration is beyond the scope of this workshop, so will not be configured. Further details can be found here - https://docs.microsoft.com/en-us/azure/data-factory/continuous-integration-deployment.*

GIT integration maybe the subject of a future lab within this workshop.

4. Select **Create** to build the ADF. After a short wait you will be notified that the Azure Data Factory has been created. You can go to the resource to review its setup or select **Resource Groups**, then select **ADX**, to see the ***adxdatafactoryservice*** resource you have just created:



Subscription (change) : Microsoft Azure Internal Consumption
Subscription ID : 7795b573-5882-4d6c-9b18-6b58d2ab218b
Tags (change) : Click here to add tags
Deployments : 6 Su

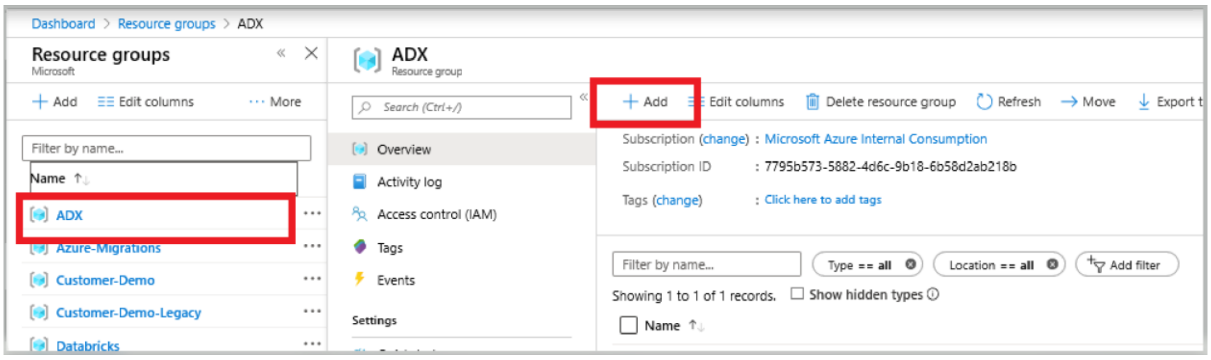
Showing 1 to 5 of 5 records.

Name	Type
adxblob	Storage account
adxdatafactoryservice	Data factory (V2)
adxdatalake	Storage account
adxeventgridservice	Event Grid Domain
adxkeyvaultservice	Key vault

Activity 4 – Azure Data Explorer (ADX)

As per the diagram "Lab1 - Activity 4 – Azure Data Explorer.pdf" we are creating the ADX cluster.

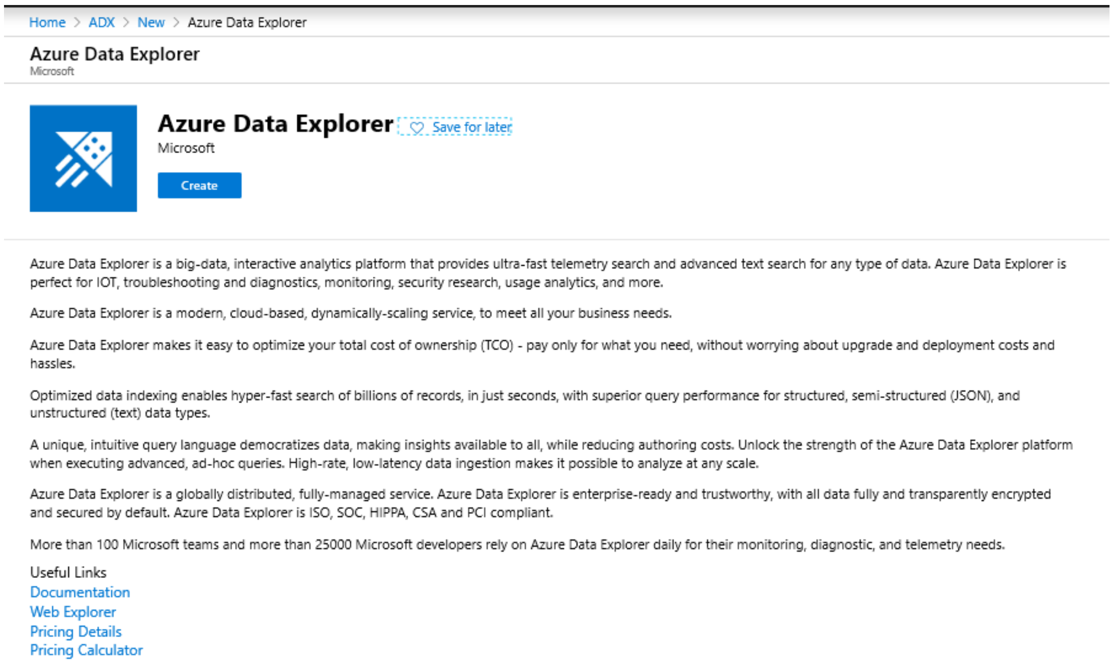
1. Within the ADX resource Group, select **+ Add** or **Create Resource**



Subscription (change) : Microsoft Azure Internal Consumption
Subscription ID : 7795b573-5882-4d6c-9b18-6b58d2ab218b
Tags (change) : Click here to add tags

Showing 1 to 1 of 1 records.

2. Type **data explorer** in the search window (see below) and then select **Azure Data Explorer** from the results displayed. The following blade will appear:


Home > ADX > New > Azure Data Explorer

Azure Data Explorer
Microsoft

Azure Data Explorer
Microsoft

Azure Data Explorer is a big-data, interactive analytics platform that provides ultra-fast telemetry search and advanced text search for any type of data. Azure Data Explorer is perfect for IOT, troubleshooting and diagnostics, monitoring, security research, usage analytics, and more.

Azure Data Explorer is a modern, cloud-based, dynamically-scaling service, to meet all your business needs.

Azure Data Explorer makes it easy to optimize your total cost of ownership (TCO) - pay only for what you need, without worrying about upgrade and deployment costs and hassles.

Optimized data indexing enables hyper-fast search of billions of records, in just seconds, with superior query performance for structured, semi-structured (JSON), and unstructured (text) data types.

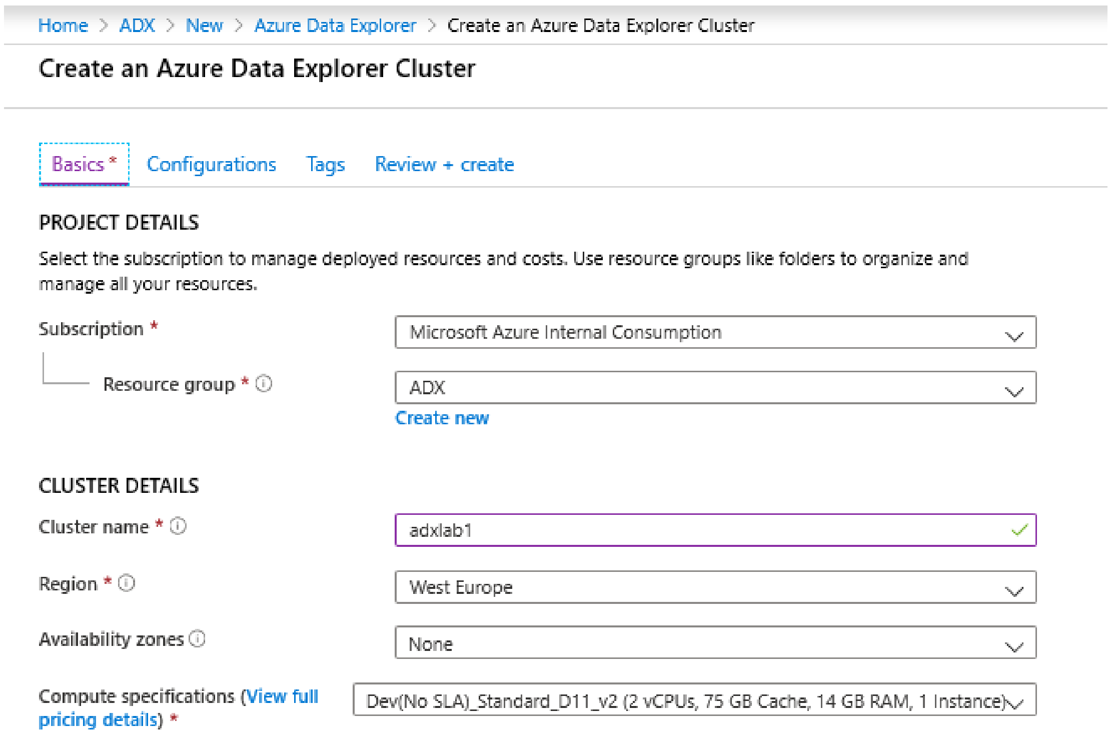
A unique, intuitive query language democratizes data, making insights available to all, while reducing authoring costs. Unlock the strength of the Azure Data Explorer platform when executing advanced, ad-hoc queries. High-rate, low-latency data ingestion makes it possible to analyze at any scale.

Azure Data Explorer is a globally distributed, fully-managed service. Azure Data Explorer is enterprise-ready and trustworthy, with all data fully and transparently encrypted and secured by default. Azure Data Explorer is ISO, SOC, HIPPA, CSA and PCI compliant.

More than 100 Microsoft teams and more than 25000 Microsoft developers rely on Azure Data Explorer daily for their monitoring, diagnostic, and telemetry needs.

Useful Links
Documentation
Web Explorer
Pricing Details
Pricing Calculator

3. Select **Create** and the following blade will appear:


Home > ADX > New > Azure Data Explorer > Create an Azure Data Explorer Cluster

Create an Azure Data Explorer Cluster

Basics * | Configurations | Tags | Review + create

PROJECT DETAILS

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

Subscription * : Microsoft Azure Internal Consumption

Resource group * : ADX

Create new

CLUSTER DETAILS

Cluster name * : adxlab1

Region * : West Europe

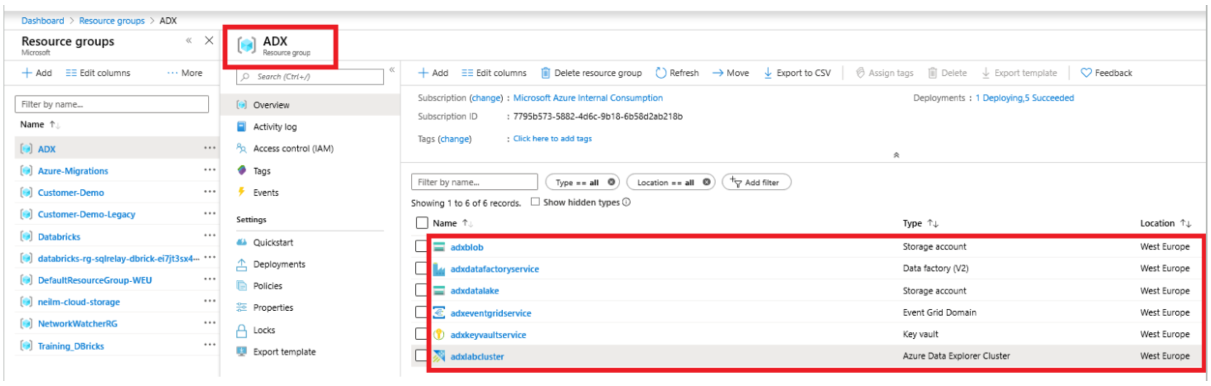
Availability zones : None

Compute specifications (View full pricing details) * : Dev(No SLA)_Standard_D11_v2 (2 vCPUs, 75 GB Cache, 14 GB RAM, 1 Instance)

Complete the **Basics** blade by entering the details as below:

Property	Description	Required
Subscription	The value must be set to the subscription the ADX resource group is created in.	Yes
Resource Group	The name of the workshop resource group. Enter **ADX**.	Yes
Name	Enter **adxlabcluster**	Yes
Region	Select your chosen region to match the resource group *ADX* you have created.	Yes
Availability zones	Select **None**	Yes
Compute specifications	The options available in this listbox will depend upon you **Region** selection. As this is a workshop, select a low spec configuration to work with. For a PoC, MVP or production installations you will need a higher specification. Select '**Dev(No SLA)**' or the smallest specification in your listbox.	Yes

4. Select **Review + Create**, then select **Create** to build the ADX cluster. After a short wait you will be notified that the ADX cluster has been created. You can go to the resource to review its setup or select **Resource Groups**, then select **ADX**, to see the ***adxlabcluster*** resource you have just created:



Subscription (change) : Microsoft Azure Internal Consumption
Subscription ID : 7795b573-5882-4d6c-9b18-6b58d2ab218b
Tags (change) : Click here to add tags
Deployments : 1 Deploying,5 Succeeded

Showing 1 to 6 of 6 records.

Name	Type	Location
adxblob	Storage account	West Europe
adxdatafactoryservice	Data factory (V2)	West Europe
adxdatalake	Storage account	West Europe
adxeventgridservice	Event Grid Domain	West Europe
adxkeyvaultservice	Key vault	West Europe
adxlabcluster	Azure Data Explorer Cluster	West Europe

This ***adxlabcluster*** resource template can be found in the Git Repository as 'ExportedTemplate_adxlabcluster.zip'.

Activity 5 – Security & Access

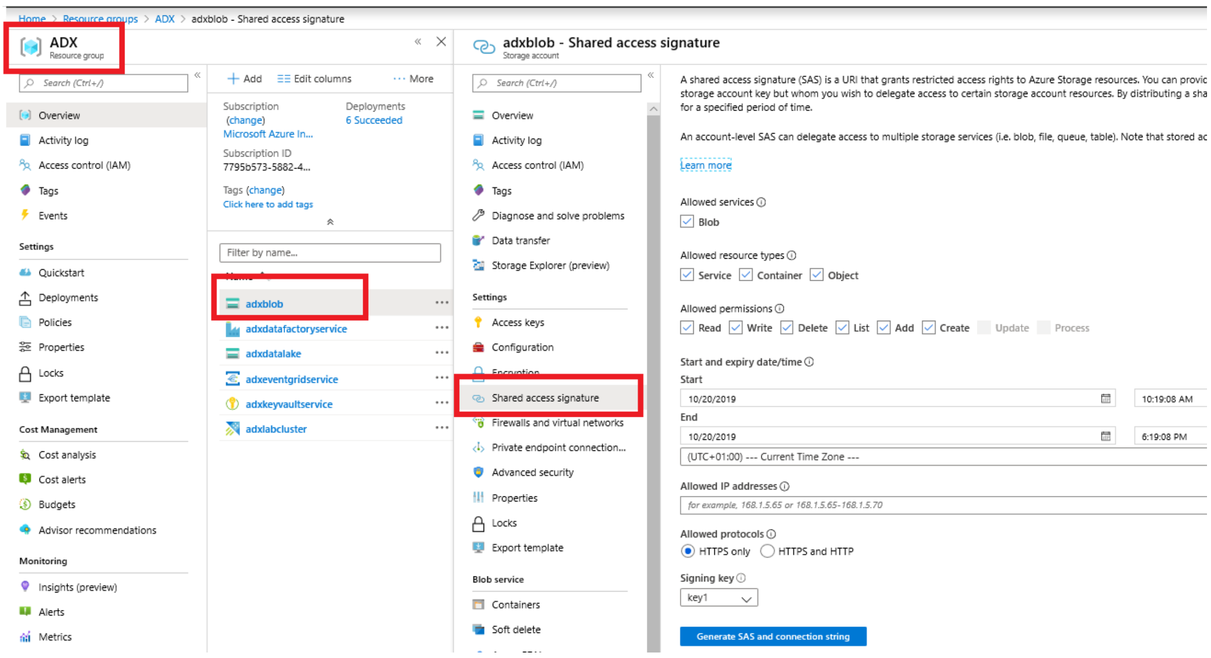
Now we have the core Azure services we need to start to configure these, in terms of security and access, in order to be able to configure the Azure Event Grid and build the Azure Data Factory (ADF) pipeline to process files.

Activity 5.1 – Create blob SAS key

We need a SAS key to be able to access the blob ***adxblob*** storage. In the Azure portal:

1. Select the **ADX** resource group
2. Select the ***adxblob*** storage account
3. Select **Share Access Signature**

The **adxblob – Shared access signature** blade will appear:



Subscription (change)
Microsoft Azure In...
Deployments
6 Succeeded
Subscription ID
7795b573-5882-4...
Tags (change)
Click here to add tags

A shared access signature (SAS) is a URI that grants restricted access rights to Azure Storage resources. You can provic
storage account key but whom you wish to delegate access to certain storage account resources. By distributing a sha
for a specified period of time.

An account-level SAS can delegate access to multiple storage services (i.e. blob, file, queue, table). Note that stored ac

Allowed services
☑ Blob

Allowed resource types
☑ Service ☑ Container ☑ Object

Allowed permissions
☑ Read ☑ Write ☑ Delete ☑ List ☑ Add ☑ Create ☐ Update ☐ Process

Start and expiry date/time
Start
10/20/2019 10:19:08 AM
End
10/20/2019 6:19:08 PM
(UTC+01:00) --- Current Time Zone ---

Allowed IP addresses
for example, 168.1.5.65 or 168.1.5.65-168.1.5.70

Allowed protocols
[✓ HTTPS only] HTTPS and HTTP

Signing key
key1

Enter values in this blade to generate a SAS key that is valid for 12 months from the date you are running this lab:

Property	**Description**	**Required**
Allowed Services	Leave all options selected	Yes
Allowed Resource Types	Leave all options selected	Yes
Allowed Permissions	Leave all options selected	Yes
Start and expiry date/time - Start	Leave as current date/time	Yes

Property	Description	Required
Start and expiry date/time - End	Select your chosen region to match the resource group *ADX* you have created. Increment the year value by 1, e.g: - If 2019, make 2020 - If 2020, make 2021	Yes
Allowed IP address	Leave blank	Yes

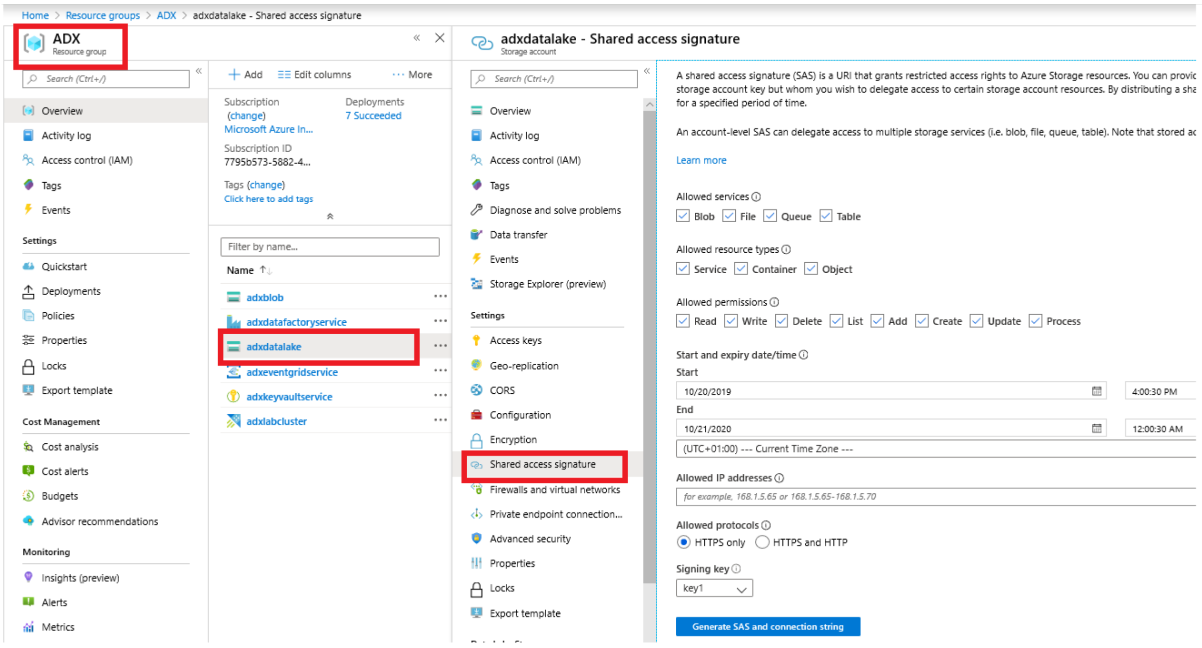
4. Select **Generate SAS and connection string**. You need to make a note of these values for future labs:
   - Connection string – save this in a text file for future reference
   - SAS token – save this in a text file for future reference
   - Blob service SAS URL – save this in a text file for future reference

Activity 5.2 – Create ADLS SAS key

We need a SAS key to be able to access the ADLS blob ***adxdatalake*** storage. In the Azure portal:

5. Select the **ADX** resource group
6. Select the ***adxdatalake*** storage account
7. Select **Share Access Signature**

The **adxdatalake – Shared access signature** blade will appear:



Subscription (change)
Microsoft Azure In...
Subscription ID
7795b573-5882-4...
Tags (change)
Click here to add tags
Deployments
7 Succeeded

A shared access signature (SAS) is a URI that grants restricted access rights to Azure Storage resources. You can provic
storage account key but whom you wish to delegate access to certain storage account resources. By distributing a sha
for a specified period of time.

An account-level SAS can delegate access to multiple storage services (i.e. blob, file, queue, table). Note that stored ac

Allowed services: ✓ Blob ✓ File ✓ Queue ✓ Table

Allowed resource types: ✓ Service ✓ Container ✓ Object

Allowed permissions: ✓ Read ✓ Write ✓ Delete ✓ List ✓ Add ✓ Create ✓ Update ✓ Process

Start and expiry date/time
Start: 10/20/2019 4:00:30 PM
End: 10/21/2020 12:00:30 AM
(UTC+01:00) --- Current Time Zone ---

Allowed IP addresses: for example, 168.1.5.65 or 168.1.5.65-168.1.5.70

Allowed protocols: [✓ HTTPS only] HTTPS and HTTP

Signing key: key1

Enter values in this blade to generate a SAS key that is valid for 12 months from the date you are running this lab:

Property	Description	Required
Allowed Services	Leave all options selected	Yes
Allowed Resource Types	Leave all options selected	Yes
Allowed Permissions	Leave all options selected	Yes
Start and expiry date/time - Start	Leave as current date/time	Yes
Start and expiry date/time - End	Select your chosen region to match the resource group *ADX* you have created. Increment the year value by 1, e.g:- If 2019, make 2020 - If 2020, make 2021	Yes
Allowed IP address	Leave blank	Yes

8. Select **Generate SAS and connection string**. You need to make a note of these values for future labs:
   - Connection string – save this in a text file for future reference
   - SAS token – save this in a text file for future reference
   - Blob service SAS URL – save this in a text file for future reference

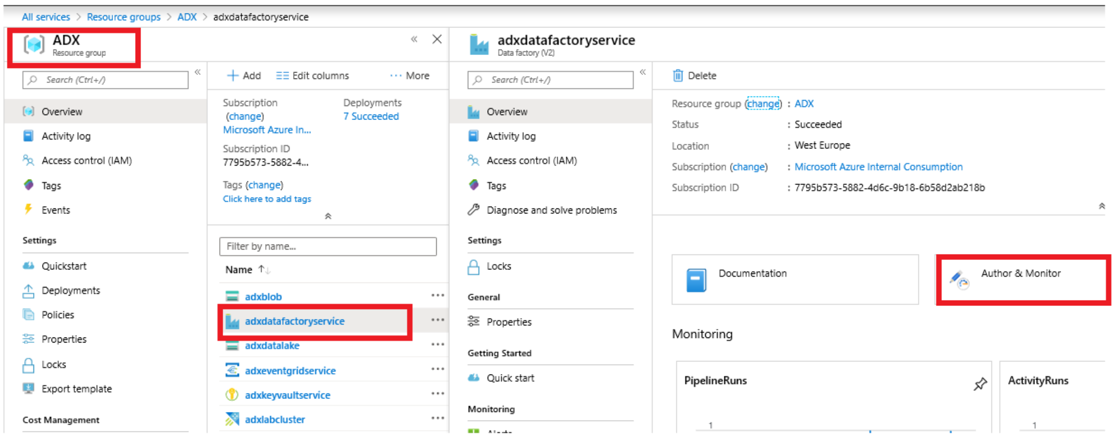
Activity 6 – ADF Pipeline

We will now create the ADF pipeline that will move the files from the blob **landing-zone** container to the ADLS **inbound-processed** container.

<u>**NOTE**</u>: *you may find it easier to have one of the JSON data files loaded into the* ***landing-zone*** *container on* ***adxblob****. The sample data is in the compressed file "sample_quote_data.zip".*

Activity 6.1 - Build the ADF Pipeline

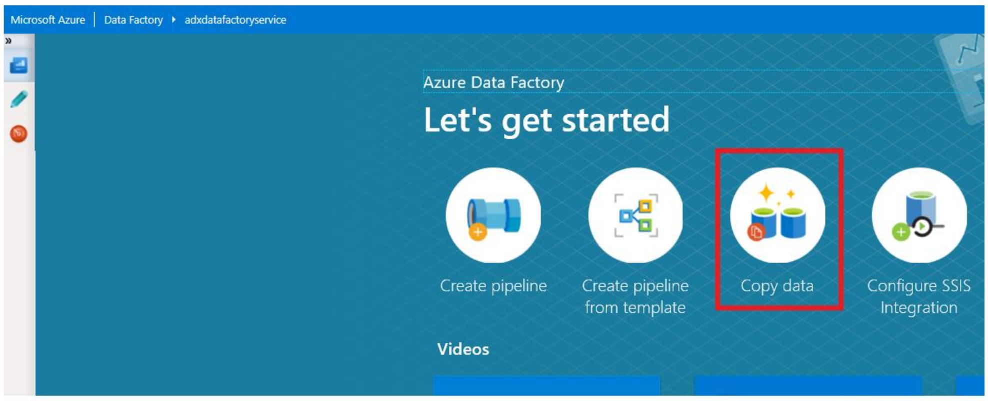
1. Select the **ADX** resource group
2. Select ***adxdatafactoryservice***
3. Select **Author & Monitor**



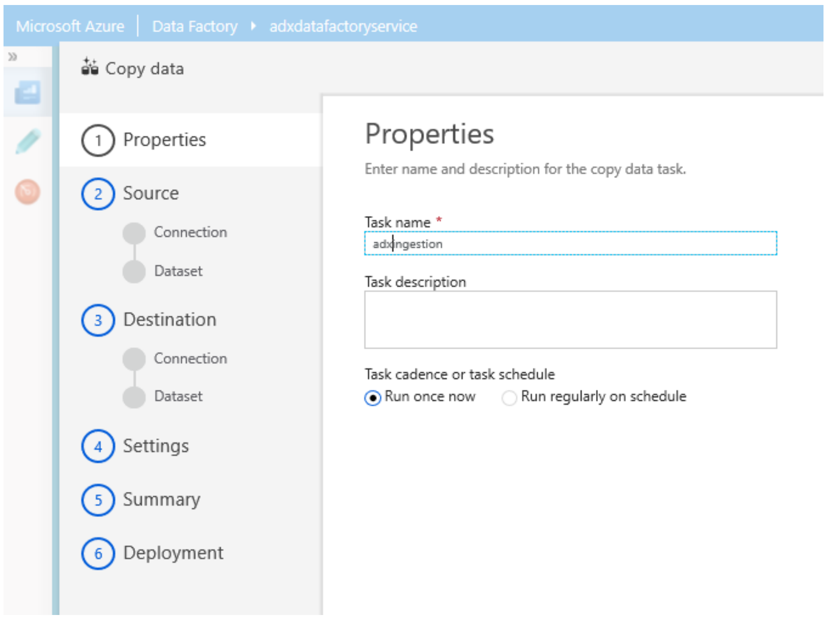
Subscription (change) Microsoft Azure In...
Deployments 7 Succeeded
Subscription ID 7795b573-5882-4...
Tags (change) Click here to add tags

Resource group (change) : ADX
Status : Succeeded
Location : West Europe
Subscription (change) : Microsoft Azure Internal Consumption
Subscription ID : 7795b573-5882-4d6c-9b18-6b58d2ab218b

4. From the landing page, select **Copy data:**



5. On the **Properties** blade, in **Task name**, enter ***adxingestion***



Properties

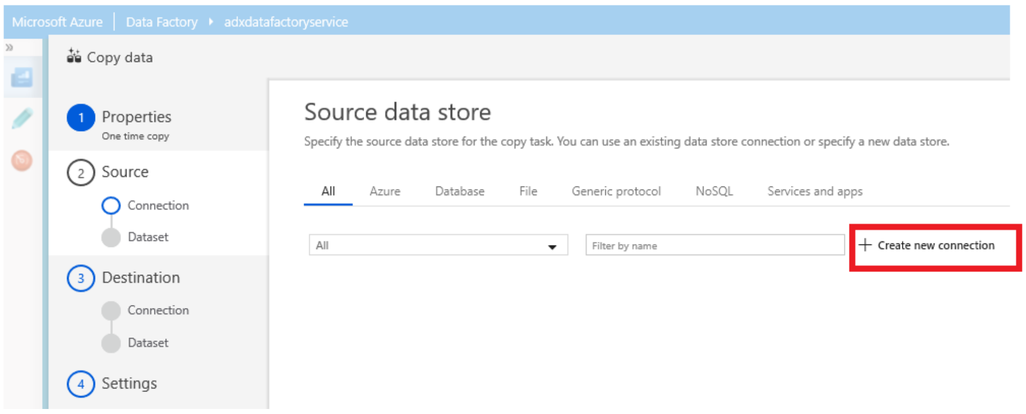
Enter name and description for the copy data task.

Task name * adxingestion

Task description

Task cadence or task schedule
[✓ Run once now] Run regularly on schedule

6. On the **Source data store** blade, select **+ Create new connection**


Microsoft Azure | Data Factory ▸ adxdatafactoryservice

Copy data

1 Properties
One time copy

2 Source
Connection
Dataset

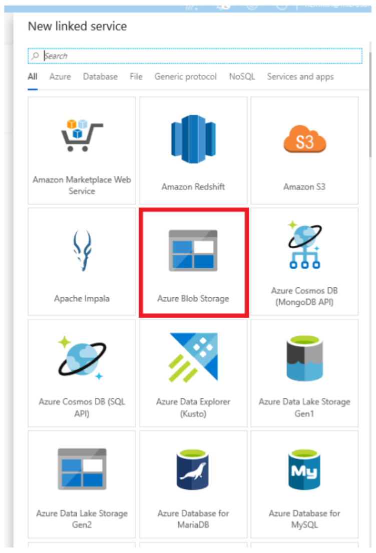
3 Destination
Connection
Dataset

4 Settings

Source data store

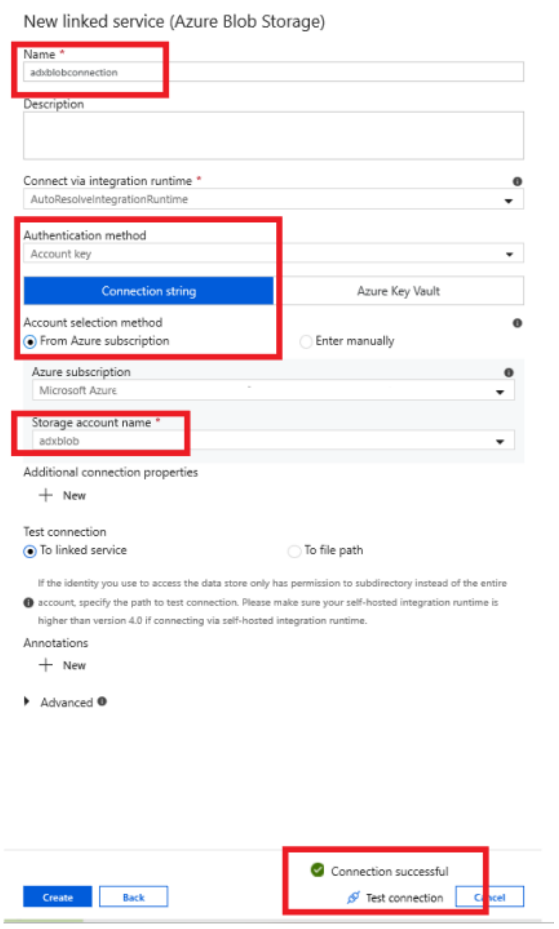
Specify the source data store for the copy task. You can use an existing data store connection or specify a new data store.

7. On the **New linked service** blade, select **Azure Blob** Storage and select **Continue**


New linked service

Search
All
Azure
Database
File
Generic protocol
NoSQL
Services and apps
Amazon Marketplace Web Service
Amazon Redshift
Amazon S3
Apache Impala
Azure Blob Storage
Azure Cosmos DB (MongoDB API)
Azure Cosmos DB (SQL API)
Azure Data Explorer (Kusto)
Azure Data Lake Storage Gen1
Azure Data Lake Storage Gen2
Azure Database for MariaDB
Azure Database for MySQL

8. On the New linked service (Azure Blob Storage) blade:


New linked service (Azure Blob Storage)

Name *: adxblobconnection

Description

Connect via integration runtime *: AutoResolveIntegrationRuntime

Authentication method: Account key

Connection string | Azure Key Vault

Account selection method: [✓ From Azure subscription] Enter manually

Azure subscription: Microsoft Azure

Storage account name *: adxblob

Additional connection properties

Test connection: [✓ To linked service] To file path

If the identity you use to access the data store only has permission to subdirectory instead of the entire account, specify the path to test connection. Please make sure your self-hosted integration runtime is higher than version 4.0 if connecting via self-hosted integration runtime.

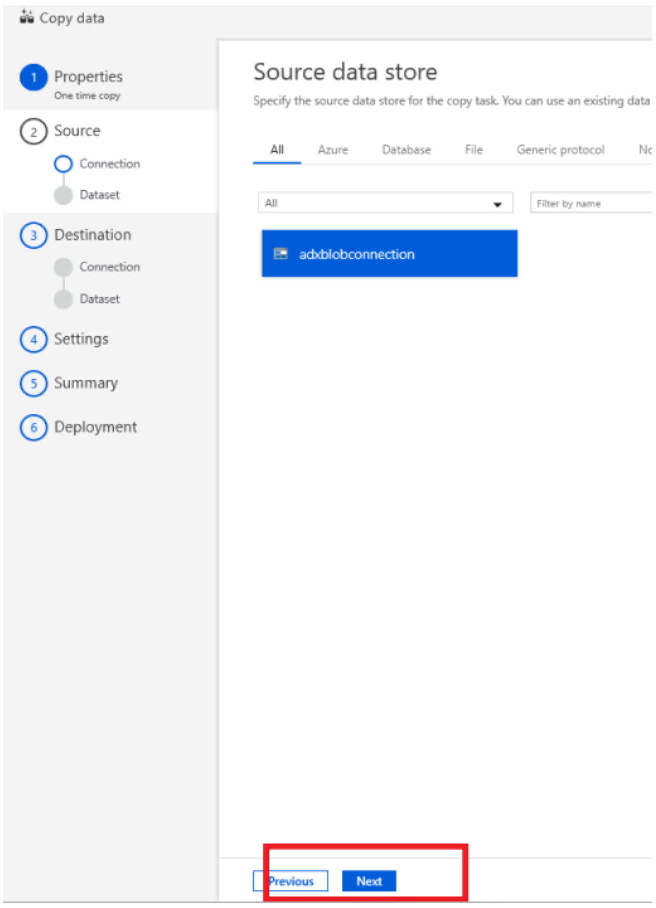
Annotations

Connection successful

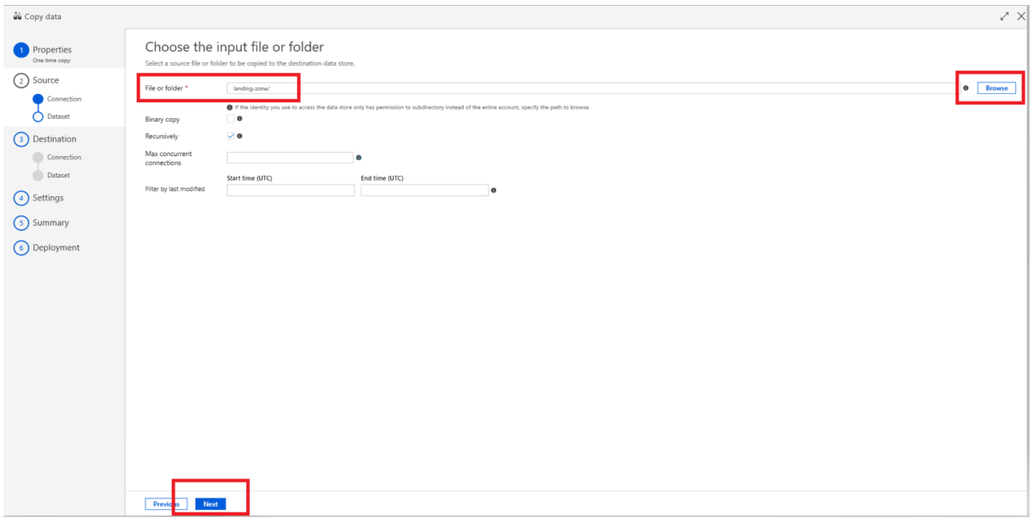
- Complete the blade using the values below:

Property	**Value**	**Required**
Name	**adxblobconnection**	Yes
Authentication Method	**Account Key**	Yes
Azure Subscription	The Azure subscription the **ADX** resource group has been created in	Yes
Storage account name	**adxblob**	Yes
Allowed IP address	Leave blank	Yes

9. Select **Test Connection**
10. Assuming “Connection successful appears”, select **Create**
11. On the **Source data store** blade, select **Next**:



12. On the **Choose the input file or folder**:
13. Browse and select the **landing-zone** container on ***adxblob*** in the **File or folder**



Choose the input file or folder

Select a source file or folder to be copied to the destination data store.

File or folder * landing-zone/

If the identity you use to access the data store only has permission to subdirectory instead of the entire account, specify the path to browse.

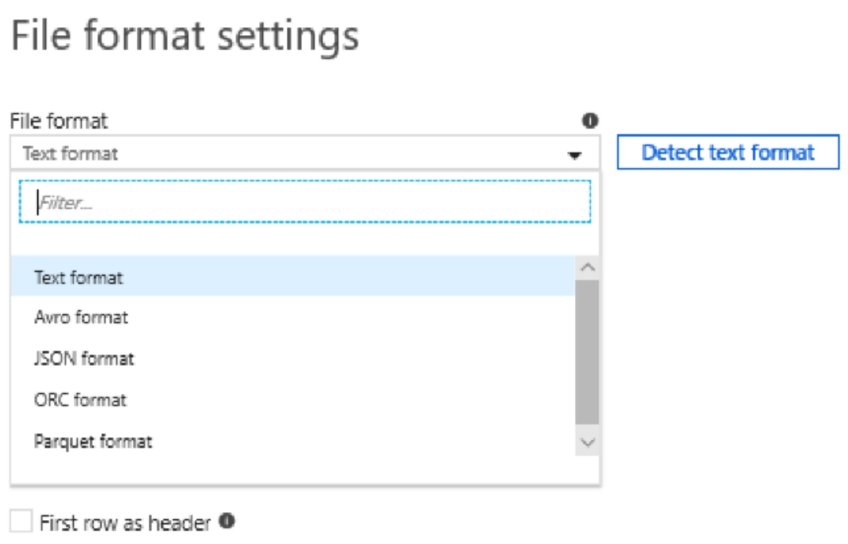
Binary copy ☐

Recursively ✓

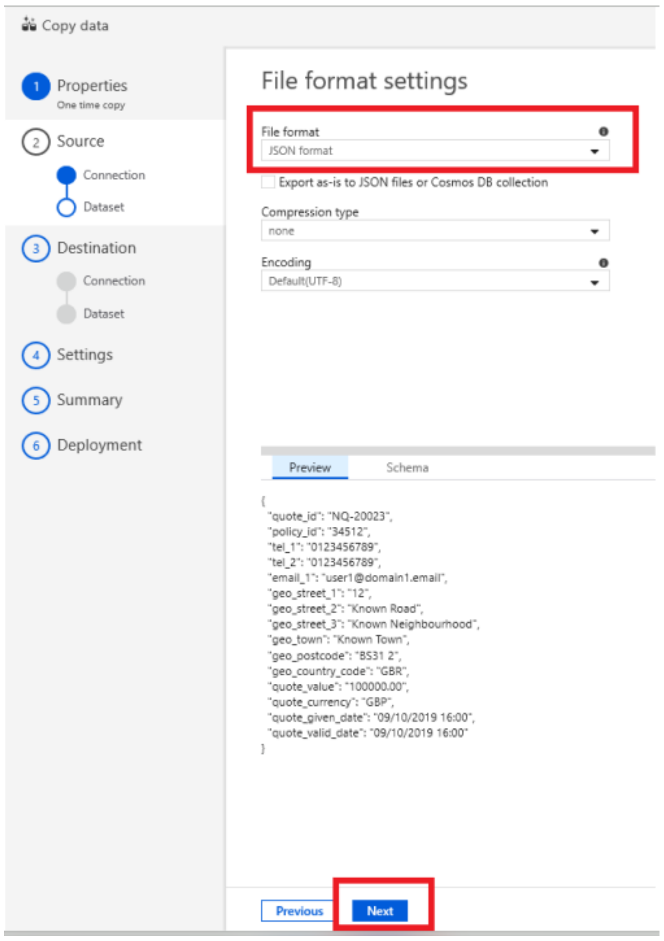
Max concurrent connections

Filter by last modified — Start time (UTC) — End time (UTC)

14. On the **File format settings** blade, various formats are supported:



15. Select **JSON** as the **File Format** *(the sample dataset is in JSON)*
16. Select **Next**



File format settings

File format: JSON format

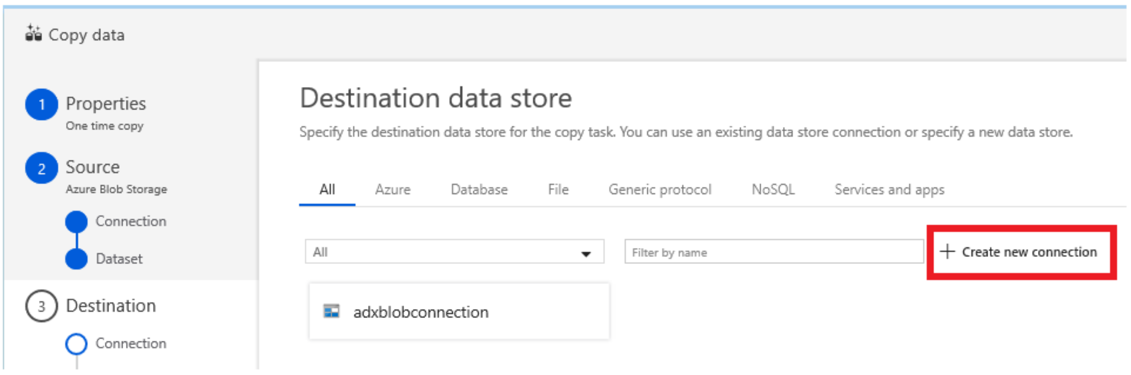
Export as-is to JSON files or Cosmos DB collection

Compression type: none

Encoding: Default(UTF-8)

```
{
  "quote_id": "NQ-20023",
  "policy_id": "34512",
  "tel_1": "0123456789",
  "tel_2": "0123456789",
  "email_1": "user1@domain1.email",
  "geo_street_1": "12",
  "geo_street_2": "Known Road",
  "geo_street_3": "Known Neighbourhood",
  "geo_town": "Known Town",
  "geo_postcode": "BS31 2",
  "geo_country_code": "GBR",
  "quote_value": "100000.00",
  "quote_currency": "GBP",
  "quote_given_date": "09/10/2019 16:00",
  "quote_valid_date": "09/10/2019 16:00"
}
```

17. On the **Destination data store** blade, select **+ Create new connection**:


Copy data

1 Properties
One time copy

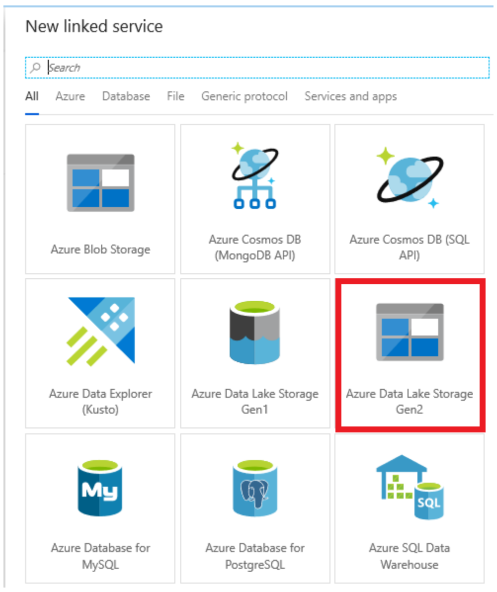
2 Source
Azure Blob Storage
Connection
Dataset

3 Destination
Connection

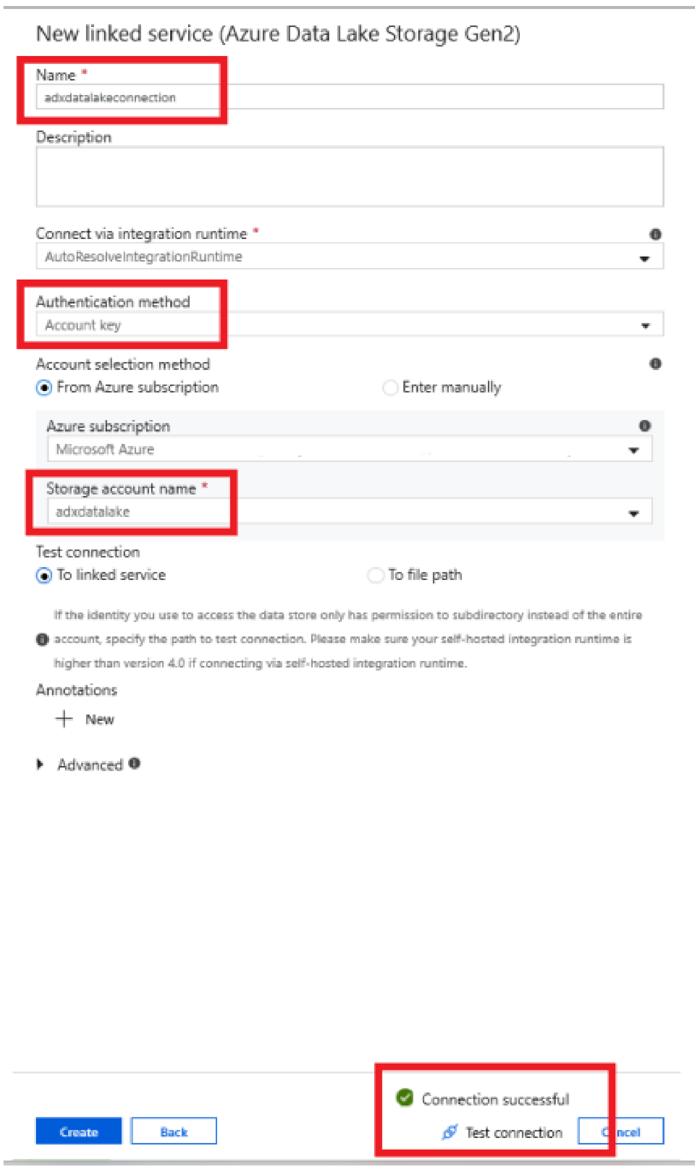
Destination data store

Specify the destination data store for the copy task. You can use an existing data store connection or specify a new data store.

18. On the **New linked service** blade, select **Azure Data Lake Storage Gen2**:


New linked service
Search
All
Azure
Database
File
Generic protocol
Services and apps
Azure Blob Storage
Azure Cosmos DB (MongoDB API)
Azure Cosmos DB (SQL API)
Azure Data Explorer (Kusto)
Azure Data Lake Storage Gen1
Azure Data Lake Storage Gen2
Azure Database for MySQL
Azure Database for PostgreSQL
Azure SQL Data Warehouse

19. On the New linked service (Azure Blob Storage) blade:



New linked service (Azure Data Lake Storage Gen2)

Name *
adxdatalakeconnection

Description

Connect via integration runtime *
AutoResolveIntegrationRuntime

Authentication method
Account key

Account selection method
From Azure subscription ● Enter manually

Azure subscription
Microsoft Azure

Storage account name *
adxdatalake

Test connection
To linked service ● To file path

If the identity you use to access the data store only has permission to subdirectory instead of the entire account, specify the path to test connection. Please make sure your self-hosted integration runtime is higher than version 4.0 if connecting via self-hosted integration runtime.

Annotations
+ New

Advanced

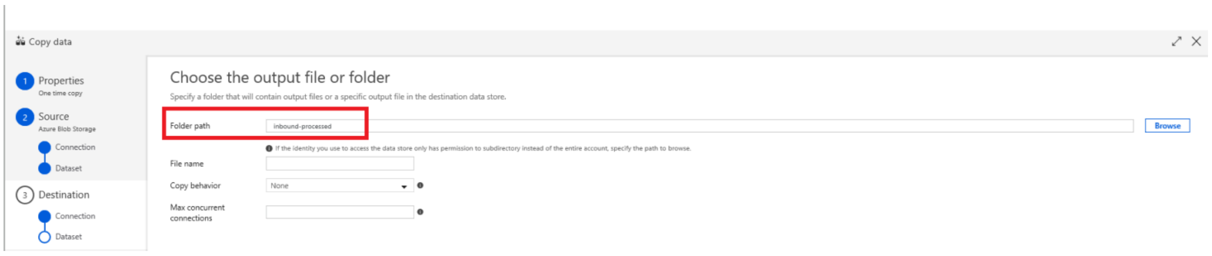
Connection successful

- Complete the blade using the values below:

Property	Value	Required
Name	**adxdatalakeconnection**	Yes
Authentication Method	**Account Key**	Yes
Azure Subscription	The Azure subscription the **ADX** resource group has been created in	Yes
Storage account name	**adxdatalake**	Yes

20. Select **Test Connection**
21. Assuming “Connection successful appears”, select **Create**

22. On the **Destination data store** blade, select **Next**
23. On the **Choose the output file or folder**:
24. Browse and select the **inbound-processed** container on ***adxdatalake*** in the **File or folder**



Choose the output file or folder

Specify a folder that will contain output files or a specific output file in the destination data store.

Folder path: inbound-processed

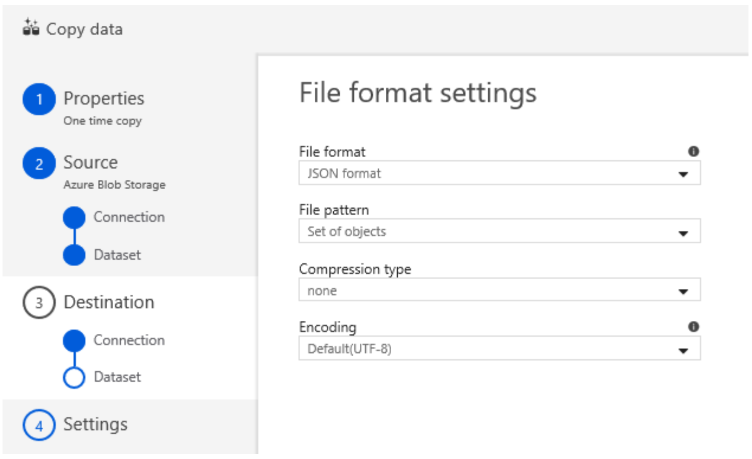
If the identity you use to access the data store only has permission to subdirectory instead of the entire account, specify the path to browse.

File name:

Copy behavior: None

Max concurrent connections:

25. On the **File format settings** blade, select **JSON**
26. Select **Set of objects** as the **File pattern**
27. Select **Next**



File format settings

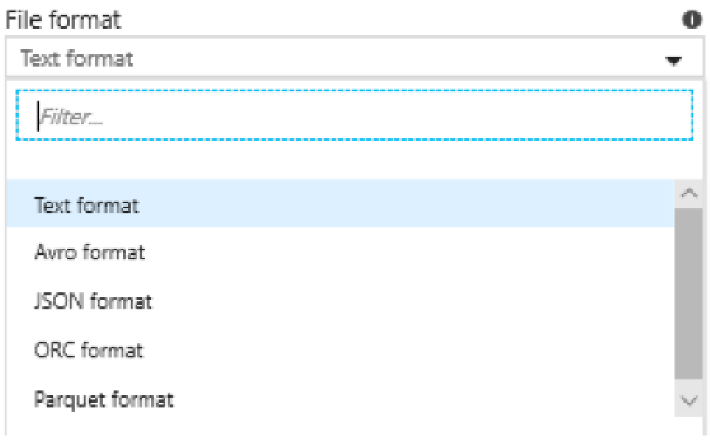
File format: JSON format

File pattern: Set of objects

Compression type: none

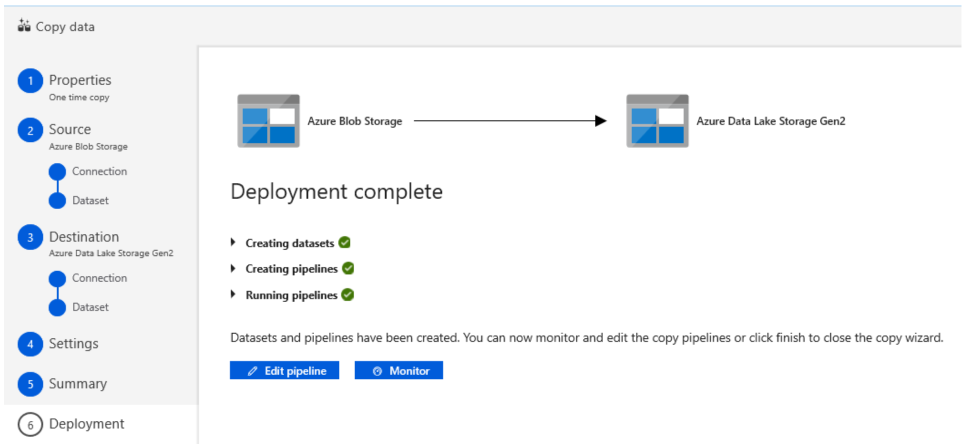
Encoding: Default(UTF-8)

<u>**NOTE**</u>: On the **File format** list-box the various formats supported:



28. On **Schema mapping** blade, select **Next** (make no alterations to the defaults)
29. On **Settings** blade, select **Next** (make no alterations to the defaults)
30. On **Summary** blade, select **Next** (make no alterations to the defaults)

31. On **Deployment** blade, the ADF pipeline will deploy. The following display should be achieved:



Deployment complete

- Creating datasets ✓
- Creating pipelines ✓
- Running pipelines ✓

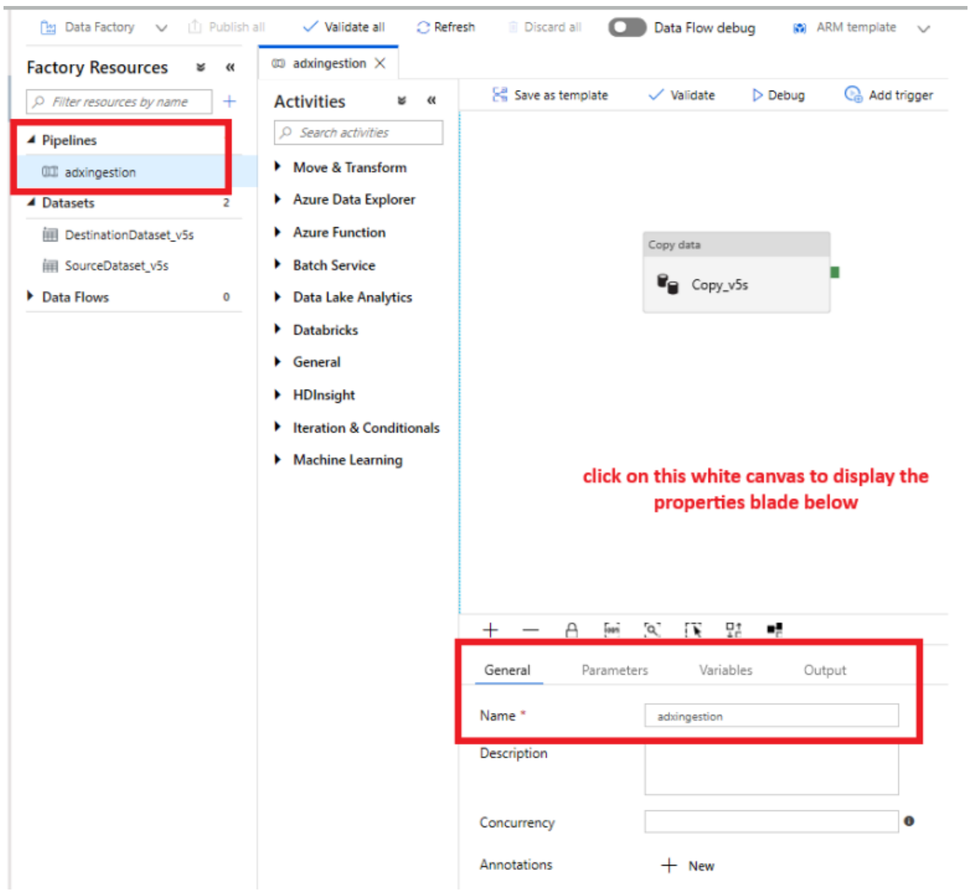
Datasets and pipelines have been created. You can now monitor and edit the copy pipelines or click finish to close the copy wizard.

32. Select **Finish**

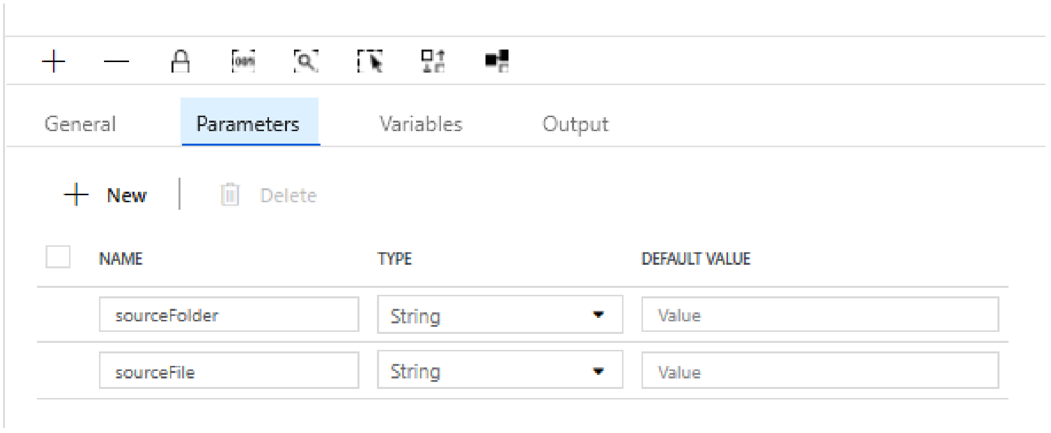
Activity 6.2 – Create the pipeline parameters

The ADF pipeline will be parameter driven to accept the blob filename and filepath that will be passed from the Event Grid.

1. Select the **ADX** resource group
2. Select the ***adxdatafactoryservice***
3. Select **Author & Monitor**
4. Select the ***adxingestion*** pipeline
5. Select the ***adxingestion*** canvas to display the properties blade:

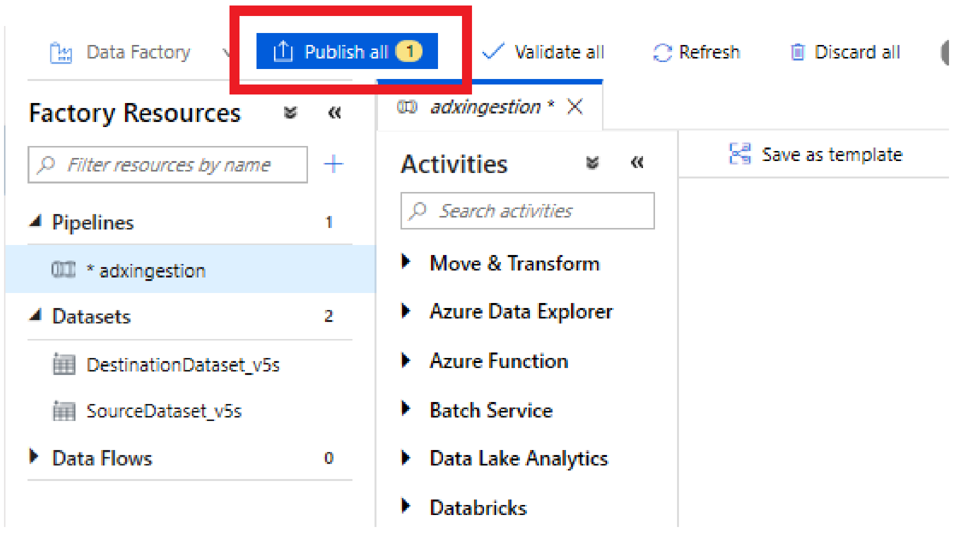


6. Select **Parameters**
7. Using the **+ New**, enter the following two parameters, **sourceFolder** and **sourceFile**



NAME	TYPE	DEFAULT VALUE
sourceFolder	String	Value
sourceFile	String	Value

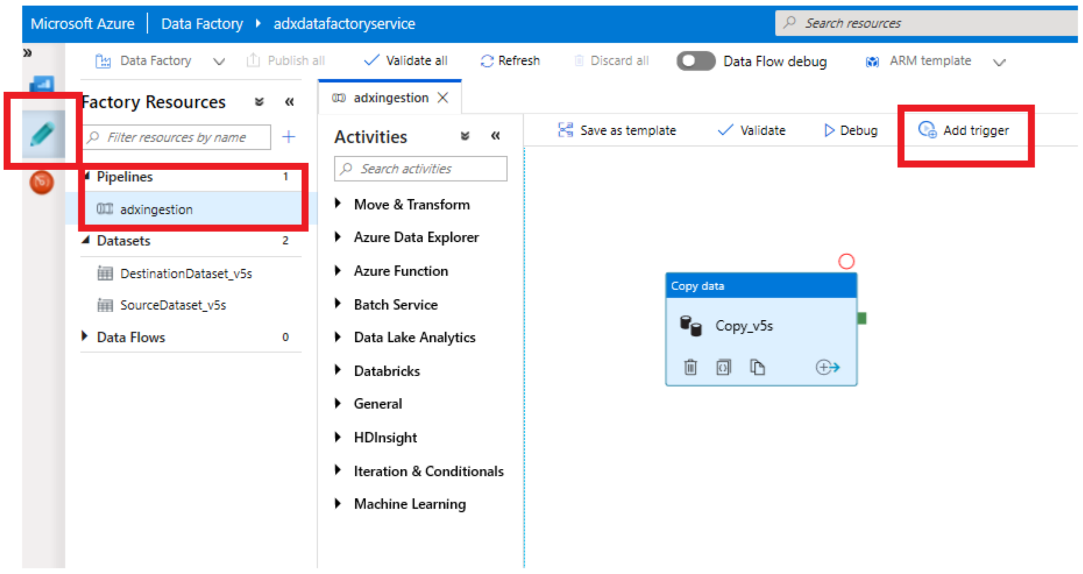
8. Select **Publish all** to publish the changes to ADF:



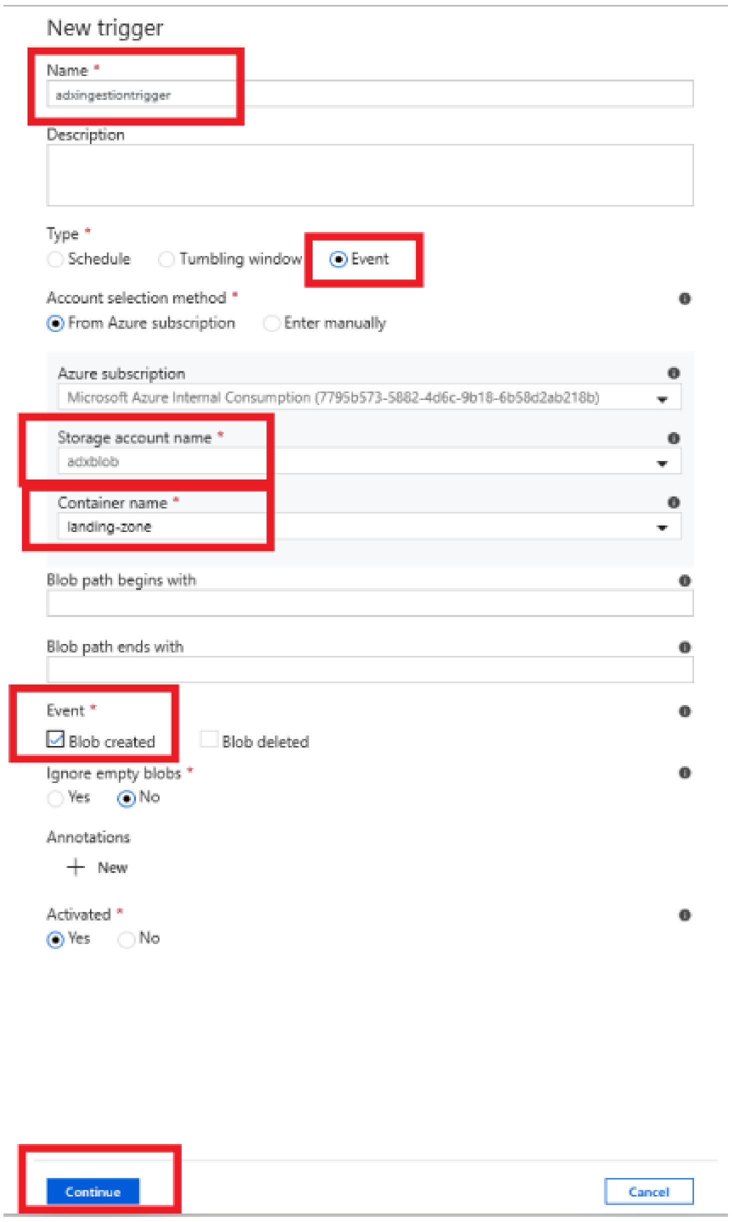
Activity 6.3 – Create the pipeline trigger

We now have the basic ADF pipeline however it needs to be triggered via files being created in the **landing-zone** container.

1. Select the **ADX** resource group
2. Select the ***adxdatafactoryservice***
3. Select **Author & Monitor**
4. Select the author icon:



5. Select the ***adxingestion*** pipeline (see above)
6. Select **Add trigger** followed by **New/Edit** in the drop-down
7. On the **Add triggesr** blade, in the drop-down, select **+ New**


New trigger

Name *
adxingestiontrigger

Description

Type *
Schedule Tumbling window [✓ Event]

Account selection method *
[✓ From Azure subscription] Enter manually

Azure subscription
Microsoft Azure Internal Consumption (7795b573-5882-4d6c-9b18-6b58d2ab218b)

Storage account name *
adxblob

Container name *
landing-zone

Blob path begins with

Blob path ends with

Event *
[✓ Blob created] Blob deleted

Ignore empty blobs *
Yes [✓ No]

Annotations
+ New

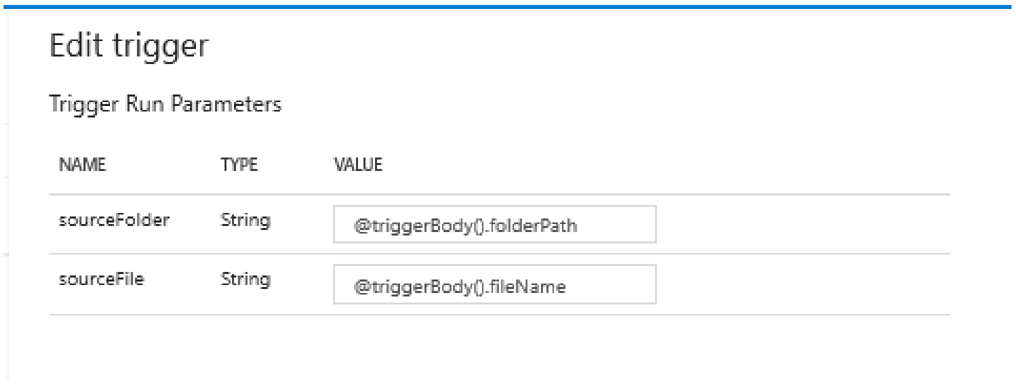
Activated *
[✓ Yes] No

- Complete the blade using the values below:

Property	**Value**	**Required**
Name	**adxingestiontrigger**	Yes
Type	**Event**	Yes
Azure Subscription	The Azure subscription the **ADX** resource group has been created in	Yes
Storage account name	**adxblob**	Yes

Property	Value	Required
Container name	**Landing-zone**	Yes
Event	**Blob created**	Yes

8. Select **Continue**
9. On New trigger blade enter the Event Grid parameters that will be passed to the pipeline parameters:



Edit trigger

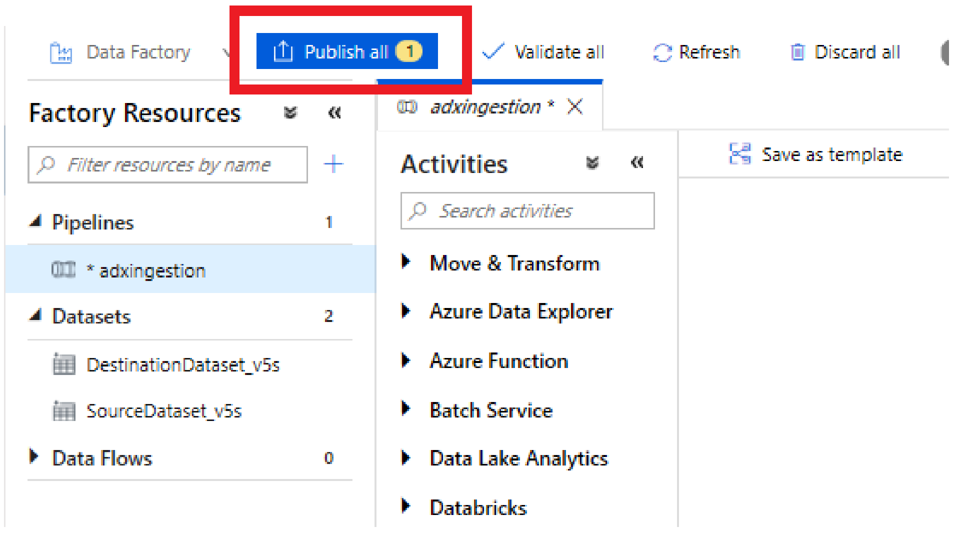
Trigger Run Parameters

NAME	TYPE	VALUE
sourceFolder	String	@triggerBody().folderPath
sourceFile	String	@triggerBody().fileName

- Complete the blade using the values below:

Property	Value	Required
sourceFolder	**@triggerBody().folderPath**	Yes
SourceFile	**@triggerBody().fileName**	Yes

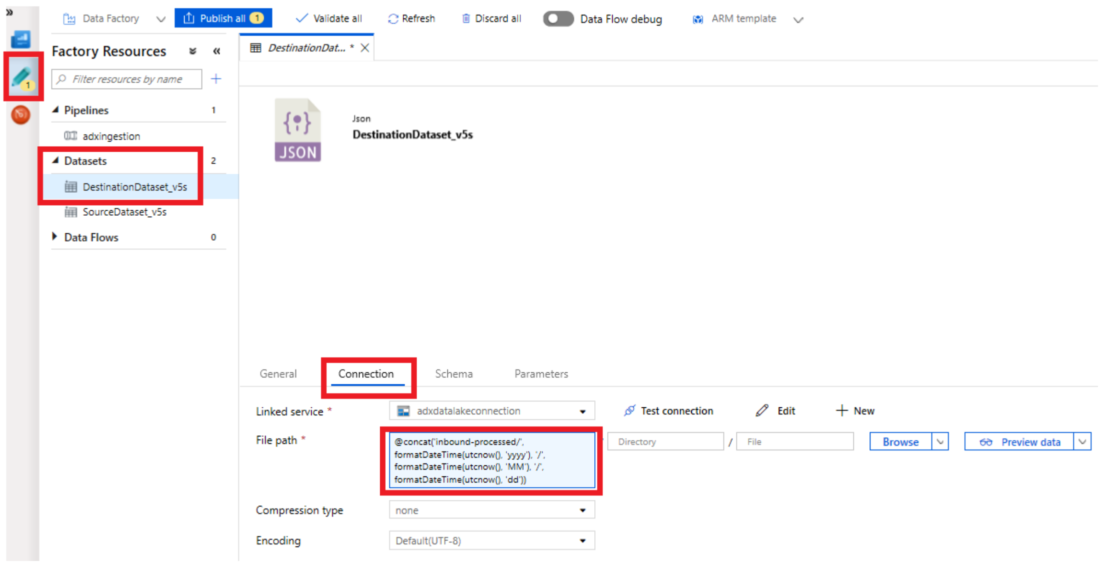
10. Select **OK**
11. Select **Publish all** to publish the changes to ADF:



Activity 6.4 – Parameterise the ADLS hierarchy

The hierarchy on ***adxdatalake*** needs to be parameterised so that files are landed in a YYYY/MM/DD structure. We will edit the ADF destination dataset to achieve this:

1. Select the **ADX** resource group
2. Select the ***adxdatafactoryservice***
3. Select **Author & Monitor**
4. Select the ***adxingestion*** pipeline
5. Select the **DestinationDataset_xxx** (**xxx** is the value specific to your Dataset)
6. Select **Connection** in the **DestinationDataset_xxx** properties blade
7. Select the **File path** field showing ***inbound-processed***



Linked service * adxdatalakeconnection

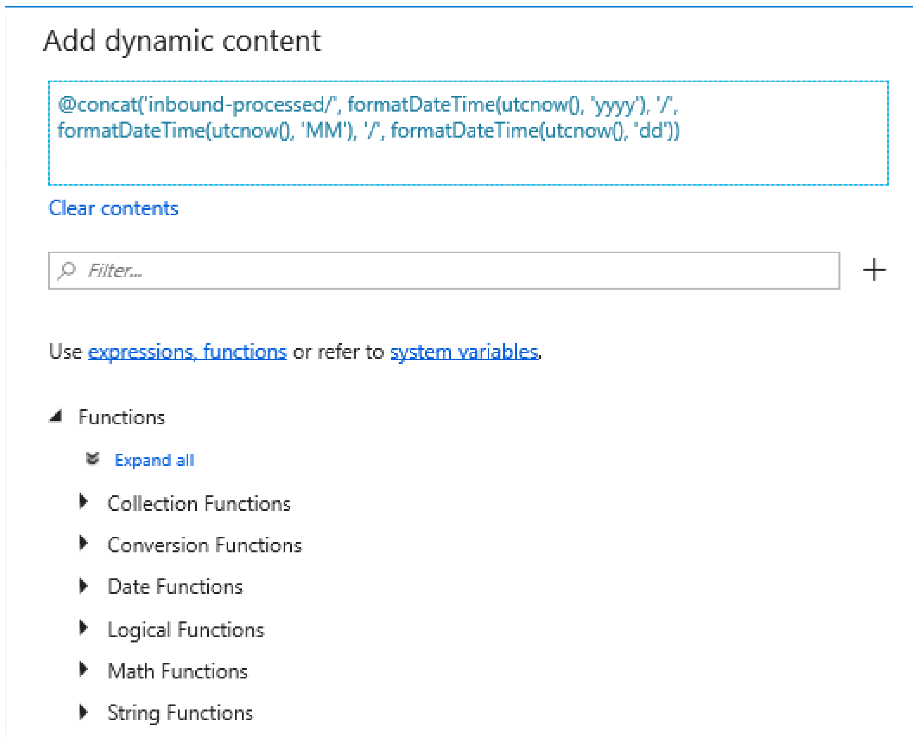
File path * @concat('inbound-processed/', formatDateTime(utcnow(), 'yyyy'), '/', formatDateTime(utcnow(), 'MM'), '/', formatDateTime(utcnow(), 'dd')) Directory / File

Compression type none

Encoding Default(UTF-8)

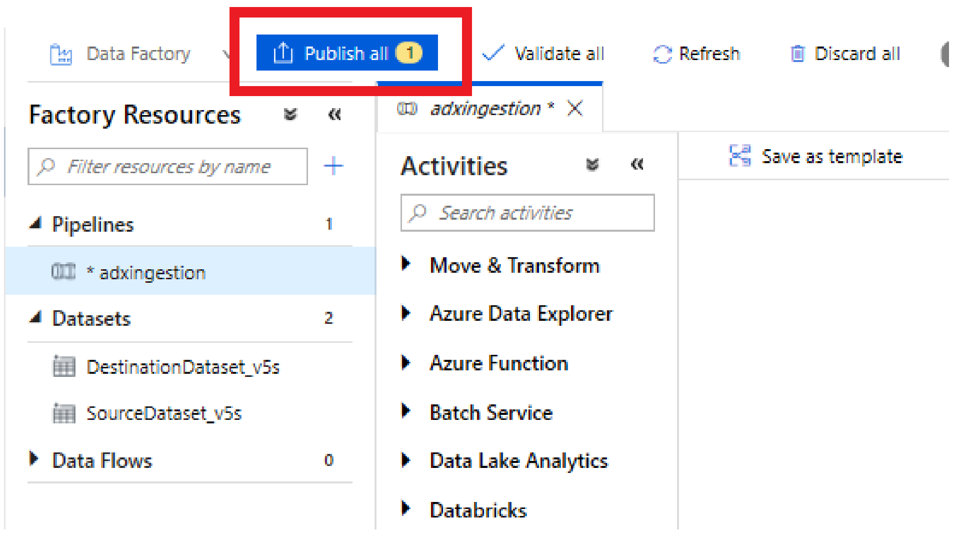
8. In the **Add dynamic content [Alt + p]** blade, enter:

   @concat('inbound-processed/', formatDateTime(utcnow(), 'yyyy'), '/', formatDateTime(utcnow(), 'MM'), '/', formatDateTime(utcnow(), 'dd'))


Add dynamic content

```
@concat('inbound-processed/', formatDateTime(utcnow(), 'yyyy'), '/', formatDateTime(utcnow(), 'MM'), '/', formatDateTime(utcnow(), 'dd'))
```

9. Select **Finish**
10. Select **Publish all** to publish the changes to ADF:



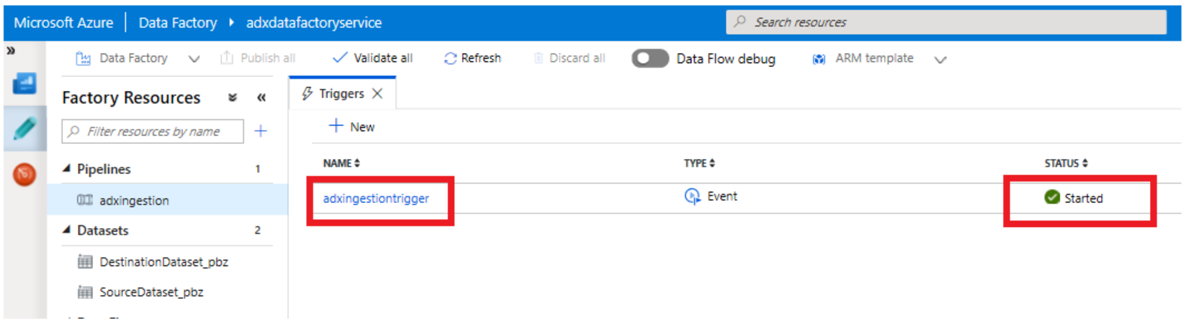
Activity 7 – Execute ADF Pipeline

We can now run the ADF ***adxingestiontrigger*** to demonstrate multiple files landing on blob and being ingested through to ***adxdatalake*** in a date orientated hierarchy (inbound-processed/YYYY/MM/DD). Repeating this process on the consecutive day will produce the same results but into inbound-processed/YYYY/MM/DD **+ 1** where + 1 is the next/consecutive day in the month.

Activity 7.1 – Start/activate the ADF trigger

To test the ADF pipeline, and generate data for Activity 8, we need to start the ADF trigger.

1. Select the **ADX** resource group
2. Select the ***adxdatafactoryservice***
3. Select **Author & Monitor**
4. Select the ***adxingestion*** pipeline
5. Select **Triggers**
6. Ensure ***adxingestiontrigger*** Status is **Started**:

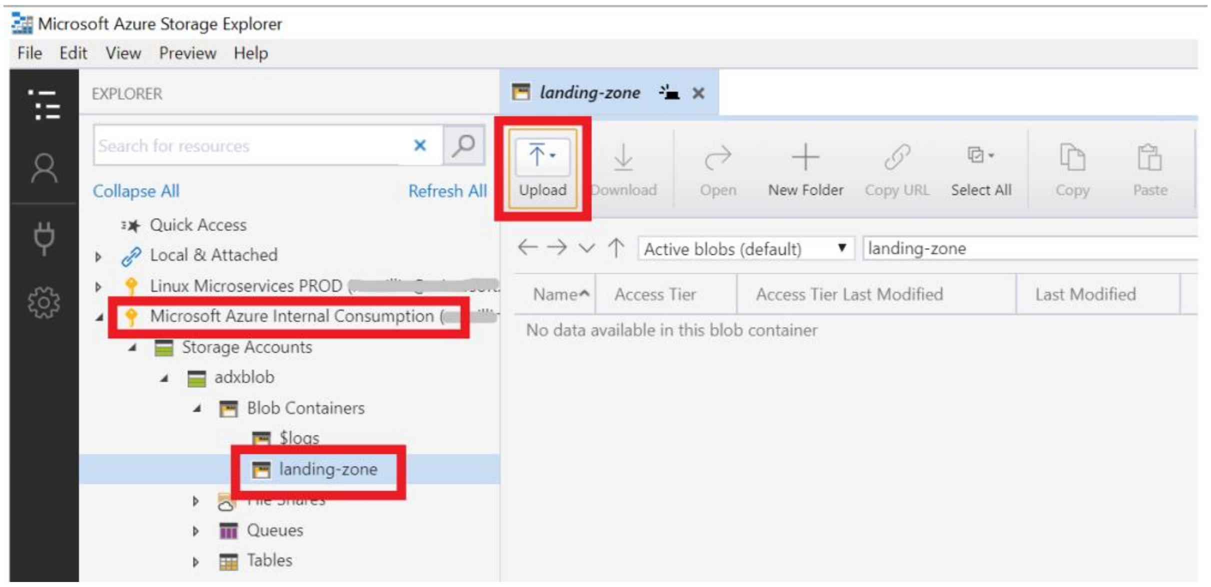


NAME	TYPE	STATUS
adxingestiontrigger	Event	Started

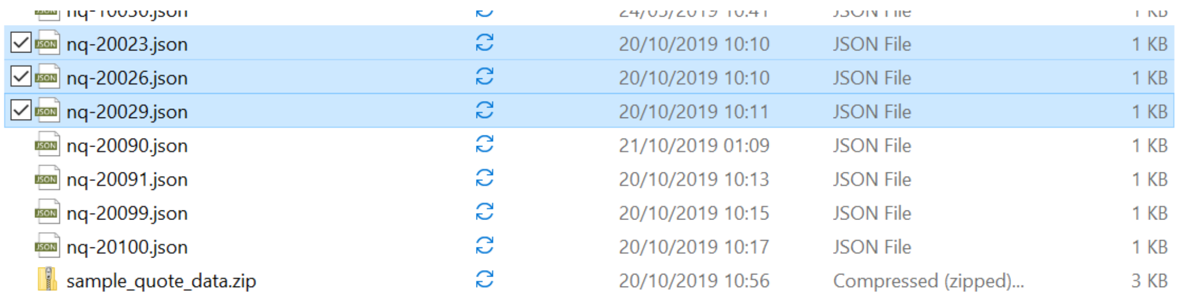
Activity 7.2 – Ingest demo data

The demo data can be found in **sampledata/sample_quote_data.zip**. This represents JSON structures for simplistic quote data. Other formats can be used according to your pipeline artefacts.

1. Unzip **sample_quote_data.zip**
2. Using either the Azure Portal or **Azure Storage Explorer**, upload these **files** (not the whole folder) to the blob ***adxblob***:

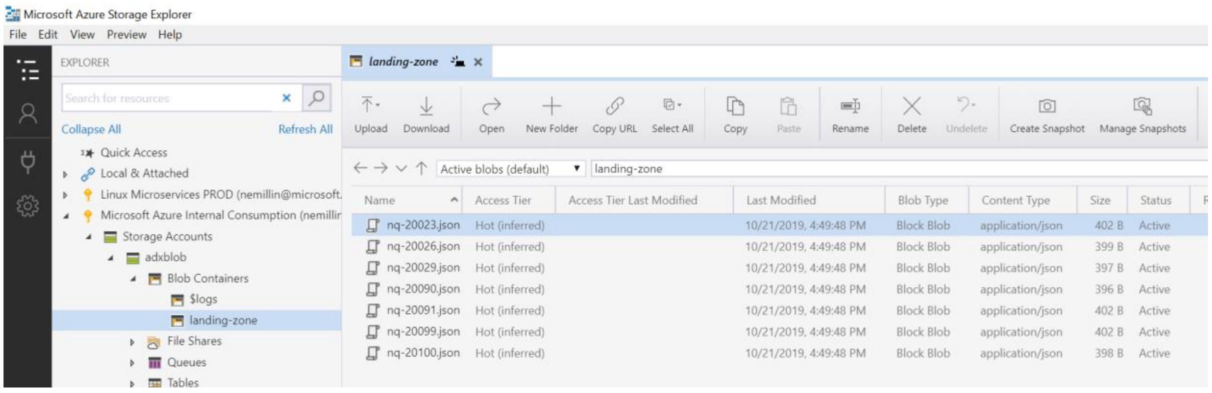


No data available in this blob container



nq-20023.json	20/10/2019 10:10	JSON File	1 KB
nq-20026.json	20/10/2019 10:10	JSON File	1 KB
nq-20029.json	20/10/2019 10:11	JSON File	1 KB
nq-20090.json	21/10/2019 01:09	JSON File	1 KB
nq-20091.json	20/10/2019 10:13	JSON File	1 KB
nq-20099.json	20/10/2019 10:15	JSON File	1 KB
nq-20100.json	20/10/2019 10:17	JSON File	1 KB
sample_quote_data.zip	20/10/2019 10:56	Compressed (zipped)...	3 KB

When the files have been uploaded the view should look like this:



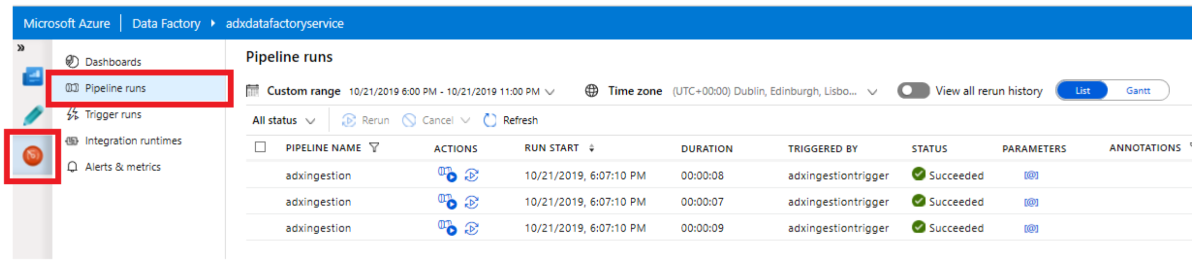
Name	Access Tier	Access Tier Last Modified	Last Modified	Blob Type	Content Type	Size	Status
nq-20023.json	Hot (inferred)		10/21/2019, 4:49:48 PM	Block Blob	application/json	402 B	Active
nq-20026.json	Hot (inferred)		10/21/2019, 4:49:48 PM	Block Blob	application/json	399 B	Active
nq-20029.json	Hot (inferred)		10/21/2019, 4:49:48 PM	Block Blob	application/json	397 B	Active
nq-20090.json	Hot (inferred)		10/21/2019, 4:49:48 PM	Block Blob	application/json	396 B	Active
nq-20091.json	Hot (inferred)		10/21/2019, 4:49:48 PM	Block Blob	application/json	402 B	Active
nq-20099.json	Hot (inferred)		10/21/2019, 4:49:48 PM	Block Blob	application/json	402 B	Active
nq-20100.json	Hot (inferred)		10/21/2019, 4:49:48 PM	Block Blob	application/json	398 B	Active

Activity 7.3 – Monitor ADF pipeline execution

Uploading the files (Activity 7.2 – Ingest demo data) to ***adxblob*** will have generated blob create events that, via Azure Event Grid ***adxeventgridservice***, will have triggered the ADF ***adxingestiontrigger*** for each individual blob created.

We can monitor the progress and status of the ADF pipeline:

1. Select the **ADX** resource group
2. Select the ***adxdatafactoryservice***
3. Select **Author & Monitor**
4. Select **Pipeline runs:**

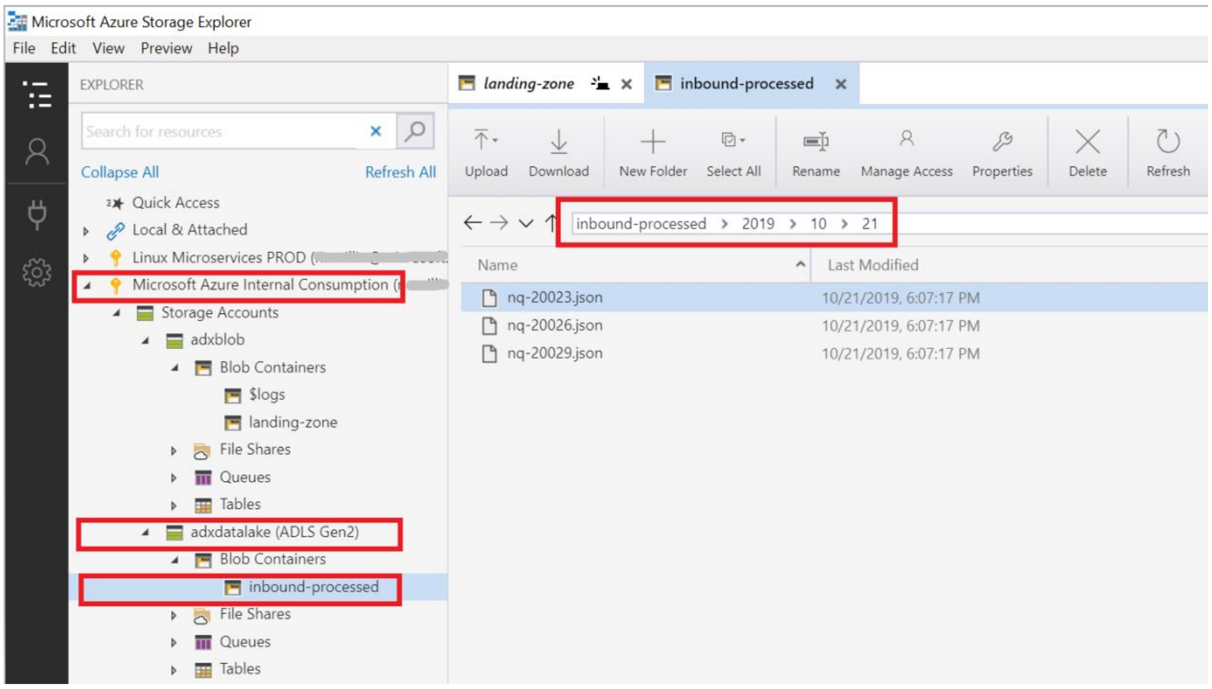


PIPELINE NAME	ACTIONS	RUN START	DURATION	TRIGGERED BY	STATUS	PARAMETERS	ANNOTATIONS
adxingestion		10/21/2019, 6:07:10 PM	00:00:08	adxingestiontrigger	✓ Succeeded	[@]	
adxingestion		10/21/2019, 6:07:10 PM	00:00:07	adxingestiontrigger	✓ Succeeded	[@]	
adxingestion		10/21/2019, 6:07:10 PM	00:00:09	adxingestiontrigger	✓ Succeeded	[@]	

Notice that there are three pipelines runs, corresponding with the three files I uploaded.

Familiarise yourself with monitoring, and reviewing, ADF pipeline activity.

5. Using either the Azure Portal or **Azure Storage Explorer**, navigate to ***adxdatalake***:



Name	Last Modified
nq-20023.json	10/21/2019, 6:07:17 PM
nq-20026.json	10/21/2019, 6:07:17 PM
nq-20029.json	10/21/2019, 6:07:17 PM

Notice that the three files have been placed in a dynamic hierarchy:

Inbound-processed/YYYY/MM/DD, which [in this example] is

Inbound-processed/2019/10/21

Activity 8 – Query data on Data Lake

We can now use ADX to query data ingested [via ADF] to **adxdatalake.**

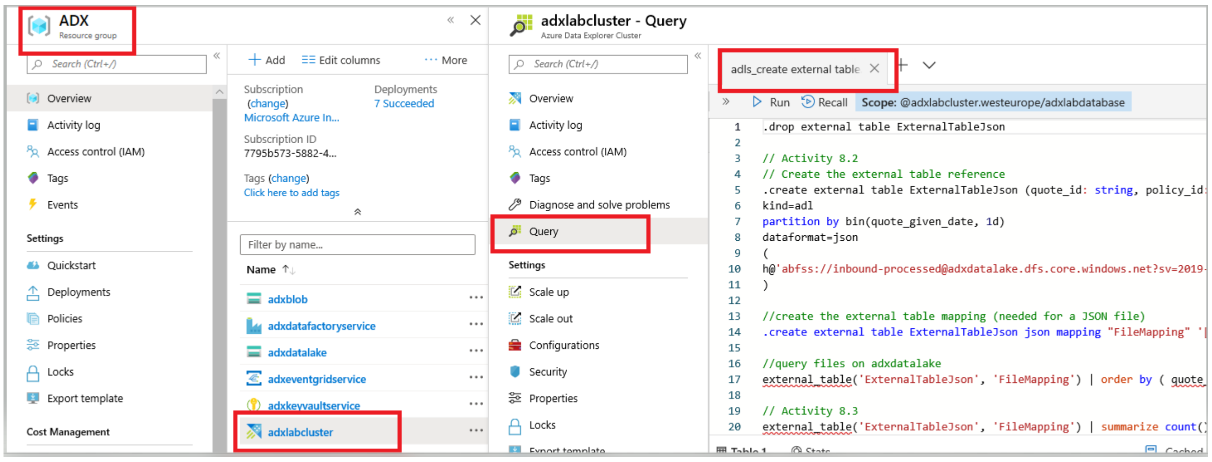
Useful links for ADX external tables are:

- Querying ADLS with ADX
- Table Management
- ADX //Build blog

Activity 8.1 – Open ADX query

We can use the Azure Portal ADX Query for this activity:

1. Select the **ADX** resource group
2. Select the **adxlabcluster**
3. Select **Query**
4. Open the KQL query file **adls_create_external_table.kql**, located in the **KQL** subfolder, in the query window



```
.drop external table ExternalTableJson

// Activity 8.2
// Create the external table reference
.create external table ExternalTableJson (quote_id: string, policy_id:
kind=adl
partition by bin(quote_given_date, 1d)
dataformat=json
(
h@'abfss://inbound-processed@adxdatalake.dfs.core.windows.net?sv=2019-
)

//create the external table mapping (needed for a JSON file)
.create external table ExternalTableJson json mapping "FileMapping" '[

//query files on adxdatalake
external_table('ExternalTableJson', 'FileMapping') | order by ( quote_

// Activity 8.3
external_table('ExternalTableJson', 'FileMapping') | summarize count()
```

We will now step through the KQL queries:

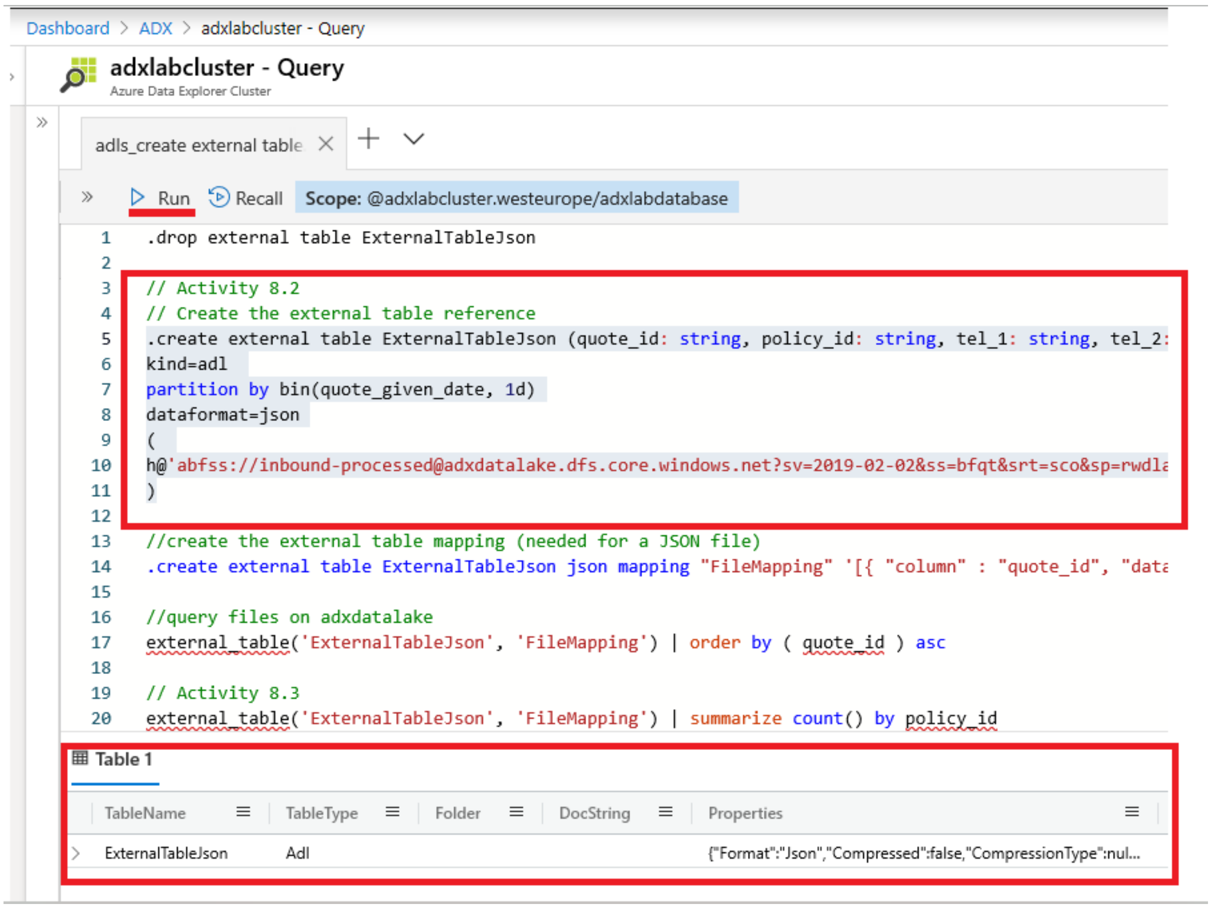
Activity 8.2 – Create External Table

We create the external table reference **ExternalTableJson**.

1. In the query window, in section 8.2 Substitute the **adxdatalake** SAS key you generated earlier where the comment appears "<substitute your adxdatalake SAS key here>". The resulting paste should have no spaces between the leading and trailing " ' ", as below:

```
// Activity 8.2
// Create the external table reference
.create external table ExternalTableJson (quote_id: string, policy_id: string, tel_1: str
kind=adl
partition by bin(quote_given_date, 1d)
dataformat=json
(
h@'abfss://inbound-processed@adxdatalake.dfs.core.windows.net?sv=2019-02-02&ss=bfqt&srt=s
)
```

2. **Run** the KQL command. No errors should appear in the results:

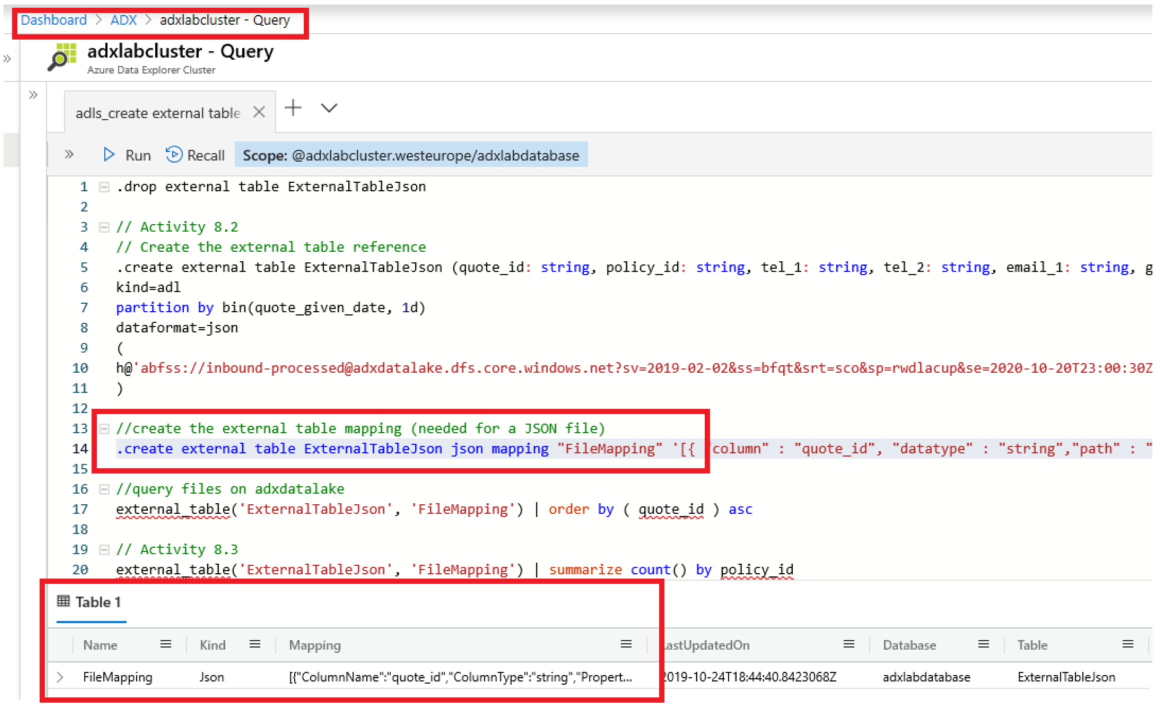

Dashboard > ADX > adxlabcluster - Query
adxlabcluster - Query
Azure Data Explorer Cluster
adls_create external table
Run
Recall
Scope: @adxlabcluster.westeurope/adxlabdatabase

```
.drop external table ExternalTableJson

// Activity 8.2
// Create the external table reference
.create external table ExternalTableJson (quote_id: string, policy_id: string, tel_1: string, tel_2:
kind=adl
partition by bin(quote_given_date, 1d)
dataformat=json
(
h@'abfss://inbound-processed@adxdatalake.dfs.core.windows.net?sv=2019-02-02&ss=bfqt&srt=sco&sp=rwdla
)

//create the external table mapping (needed for a JSON file)
.create external table ExternalTableJson json mapping "FileMapping" '[{ "column" : "quote_id", "data

//query files on adxdatalake
external_table('ExternalTableJson', 'FileMapping') | order by ( quote_id ) asc

// Activity 8.3
external_table('ExternalTableJson', 'FileMapping') | summarize count() by policy_id
```

Table 1

TableName	TableType	Folder	DocString	Properties
ExternalTableJson	Adl			{"Format":"Json","Compressed":false,"CompressionType":nul...

3. The lab sample data is JSON format. A mapping definition is required for this format of data. Highlight and **Run** the KQL code under **"//create the external table mapping (needed for a JSON file)"**. No errors should appear in the results:


Dashboard > ADX > adxlabcluster - Query
adxlabcluster - Query
Azure Data Explorer Cluster
adls_create external table
Run
Recall
Scope: @adxlabcluster.westeurope/adxlabdatabase

```
.drop external table ExternalTableJson

// Activity 8.2
// Create the external table reference
.create external table ExternalTableJson (quote_id: string, policy_id: string, tel_1: string, tel_2: string, email_1: string, g
kind=adl
partition by bin(quote_given_date, 1d)
dataformat=json
(
h@'abfss://inbound-processed@adxdatalake.dfs.core.windows.net?sv=2019-02-02&ss=bfqt&srt=sco&sp=rwdlacup&se=2020-10-20T23:00:30Z
)

//create the external table mapping (needed for a JSON file)
.create external table ExternalTableJson json mapping "FileMapping" '[{ "column" : "quote_id", "datatype" : "string","path" : "

//query files on adxdatalake
external_table('ExternalTableJson', 'FileMapping') | order by ( quote_id ) asc

// Activity 8.3
external_table('ExternalTableJson', 'FileMapping') | summarize count() by policy_id
```

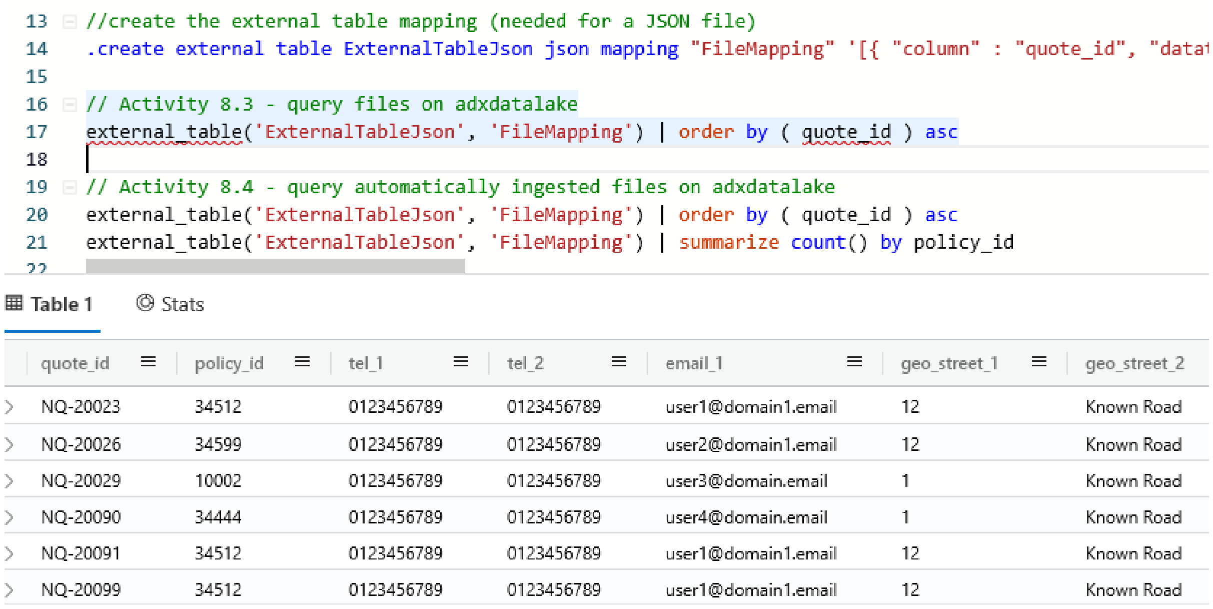
Table 1

Name	Kind	Mapping	astUpdatedOn	Database	Table
FileMapping	Json	[{"ColumnName":"quote_id","ColumnType":"string","Propert...	019-10-24T18:44:40.8423068Z	adxlabdatabase	ExternalTableJson

Activity 8.3 – Query files on adxdatalake

We can now query data stored on **adxdatalake** that has been automatically ingested via ADF without having to ingest it into ADX.

1. Highlight the KQL under "// Activity 8.2 - query files on adxdatalake"
2. **Run** the command and see the three JSON files that were uploaded to **adxblob** and ingested to **adxdatalake** via the **adxdatafactoryservice** ADF:



```
//create the external table mapping (needed for a JSON file)
.create external table ExternalTableJson json mapping "FileMapping" '[{ "column" : "quote_id", "data

// Activity 8.3 - query files on adxdatalake
external_table('ExternalTableJson', 'FileMapping') | order by ( quote_id ) asc

// Activity 8.4 - query automatically ingested files on adxdatalake
external_table('ExternalTableJson', 'FileMapping') | order by ( quote_id ) asc
external_table('ExternalTableJson', 'FileMapping') | summarize count() by policy_id
```

quote_id	policy_id	tel_1	tel_2	email_1	geo_street_1	geo_street_2
NQ-20023	34512	0123456789	0123456789	user1@domain1.email	12	Known Road
NQ-20026	34599	0123456789	0123456789	user2@domain1.email	12	Known Road
NQ-20029	10002	0123456789	0123456789	user3@domain.email	1	Known Road
NQ-20090	34444	0123456789	0123456789	user4@domain.email	1	Known Road
NQ-20091	34512	0123456789	0123456789	user1@domain1.email	12	Known Road
NQ-20099	34512	0123456789	0123456789	user1@domain1.email	12	Known Road

Activity 8.4 – Query automatically ingested files on adxdatalake

The use of ADX external tables mapping onto ADLS (**adxdatalake**) warrants that an executed query always has the current data to query. We can demonstrate this by uploading files to **adxblob** and running a KQL query against **adxdatalake**. The results of that query will have the recently uploaded JSON files included in the resultset.

1. From the JSON data located in **/sampledata** upload the following files to **adblob** (use Azure Storage Explorer or the Azure Portal)

   Nq-20090.json

   Nq-20091,json

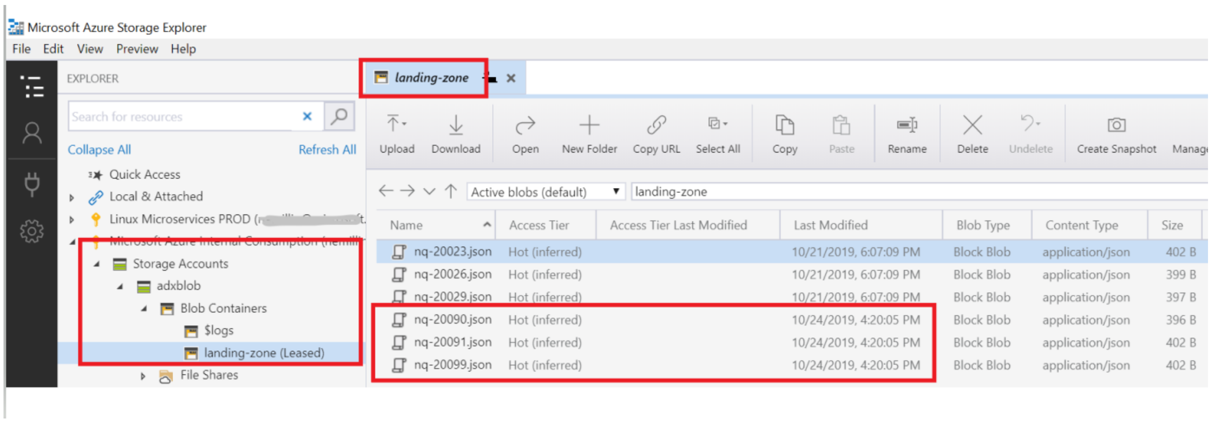
   Nq-20099.json

Reminder: These files will create 'blob created' events on **adxblob**. The evets will be captured by the **adxeventgridservice** that will, in turn, trigger the ADF pipeline **adxingestion.** The ADF pipeline automatically ingests the files to the **adxdatalake** data lake, storing them in a YYYY/MM/DD hierarchy dependant upon the data the pipeline executed.

2. Highlight the first line of KQL under "// Activity 8.4 - query automatically ingested files on adxdatalake" and **Run** this.

```
external_table('ExternalTableJson', 'FileMapping') | order by ( quote_id ) asc
```

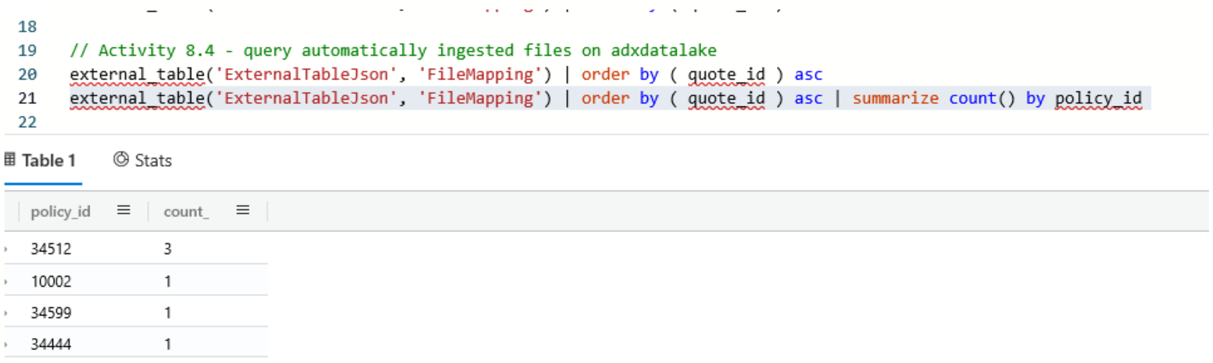
Notice the three JSON files uploaded in (1.) appear in the results:



Name	Access Tier	Access Tier Last Modified	Last Modified	Blob Type	Content Type	Size
nq-20023.json	Hot (inferred)		10/21/2019, 6:07:09 PM	Block Blob	application/json	402 B
nq-20026.json	Hot (inferred)		10/21/2019, 6:07:09 PM	Block Blob	application/json	399 B
nq-20029.json	Hot (inferred)		10/21/2019, 6:07:09 PM	Block Blob	application/json	397 B
nq-20090.json	Hot (inferred)		10/24/2019, 4:20:05 PM	Block Blob	application/json	396 B
nq-20091.json	Hot (inferred)		10/24/2019, 4:20:05 PM	Block Blob	application/json	402 B
nq-20099.json	Hot (inferred)		10/24/2019, 4:20:05 PM	Block Blob	application/json	402 B

3. Highlight the second line of KQL under "// Activity 8.4 - query automatically ingested files on adxdatalake" and **Run** this.

```
external_table('ExternalTableJson', 'FileMapping') | order by ( quote_id ) asc
| summarize count() by policy_id
```



```
// Activity 8.4 - query automatically ingested files on adxdatalake
external_table('ExternalTableJson', 'FileMapping') | order by ( quote_id ) asc
external_table('ExternalTableJson', 'FileMapping') | order by ( quote_id ) asc | summarize count() by policy_id
```

policy_id	count_
34512	3
10002	1
34599	1
34444	1

Notice that policy_id 34512 now has three files in the results.

This demonstrated the automatic file ingestion with resulting dynamic querying.

Activity 8.5 – Enhancements

You have completed lab 1. Try to enhance the activities in section 8 as follows:

- Try different file formats (csv) or larger volumes of files
- Experiment with KQL to perform richer queries

Other labs will show other ADX data ingestion techniques. Check back for updates.

Activity 8.6 – Clean-up

Remember to stop the cluster **adxlabcluster** to prevent Azure charges being incurred unnecessarily.

Credits and Acknowledgements

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