Configuring the Azure Databricks environment

In this experiment, we'll learn how to configure the Azure Databricks environment by creating an Azure Databricks workspace, cluster, and cluster pools.

Getting ready

To get started, log into **`https://portal.azure.com`** using your Azure credentials.

How to do it…

An Azure Databricks workspace is the starting point for writing solutions in Azure Databricks. A workspace is where you create clusters, write notebooks, schedule jobs, and manage the Azure Databricks environment.

An Azure Databricks workspace can be created in an Azure managed virtual network or customer managed virtual network. We'll create the environment using a customer managed virtual network.

Creating an Azure Databricks service or workspace

Let's get started with provisioning the virtual network:

1. In Azure portal, type **`Virtual Net`** into the search box and select **Virtual Networks** from the search results:

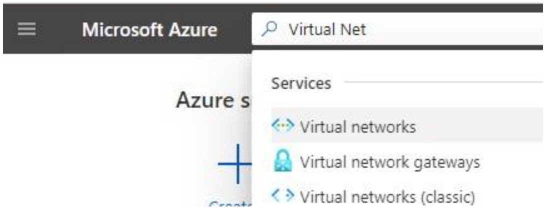
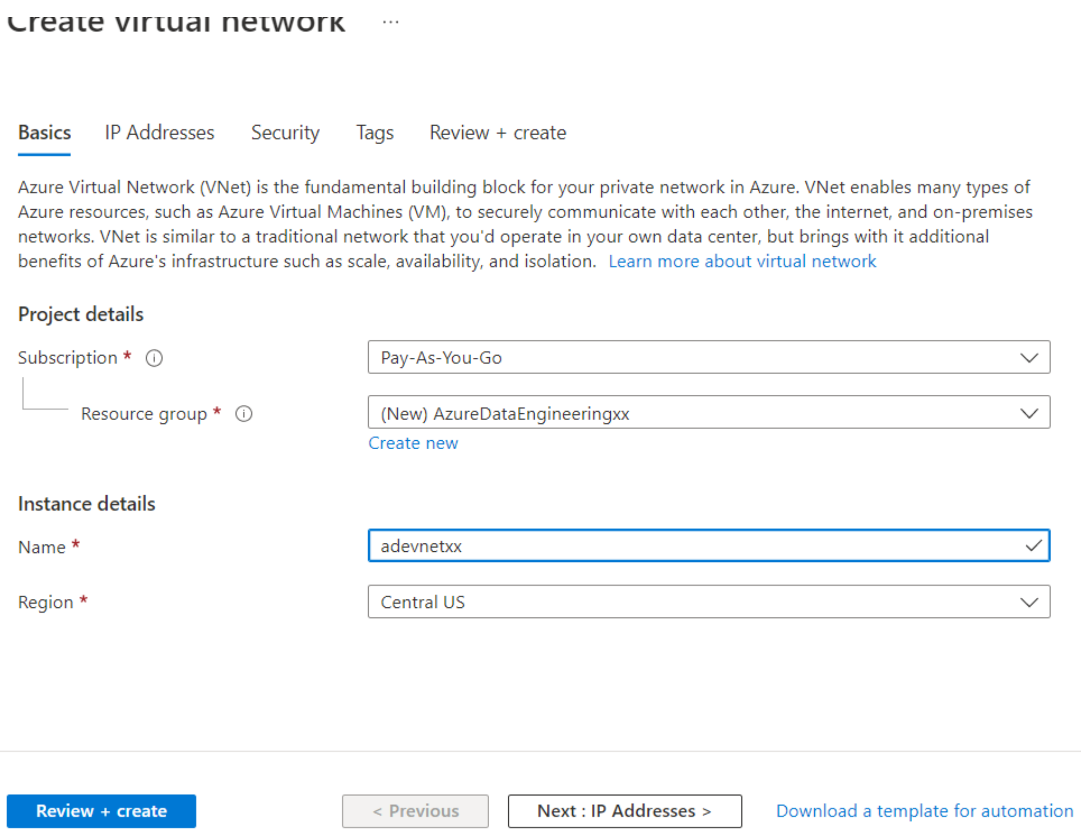


Figure 9.1 – Selecting virtual networks

2. On the **Virtual networks** page, click **Add**. On the **Create virtual network** page, under the **Basics** tab, provide **Resource group name**, **Virtual network name**, and **region**:

Note: Substitute for the student number for xx, (student1 would be adevnet01, student12 would be adevnet12). Similarly as we did earlier for the AzureDataEngineeringxx ResourceGroupName (student1

would be AzureDataEngineering01, student12 would be AzureDataEngineering12).



Create virtual network ···

Basics | IP Addresses | Security | Tags | Review + create

Azure Virtual Network (VNet) is the fundamental building block for your private network in Azure. VNet enables many types of Azure resources, such as Azure Virtual Machines (VM), to securely communicate with each other, the internet, and on-premises networks. VNet is similar to a traditional network that you'd operate in your own data center, but brings with it additional benefits of Azure's infrastructure such as scale, availability, and isolation. Learn more about virtual network

Project details

Subscription * ⓘ: Pay-As-You-Go

Resource group * ⓘ: (New) AzureDataEngineeringxx

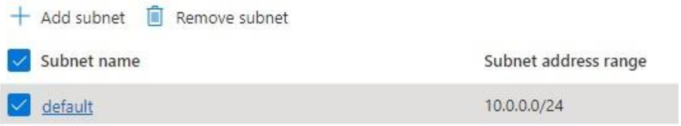
Create new

Instance details

Name *: adevnetxx ✓

Region *: Central US

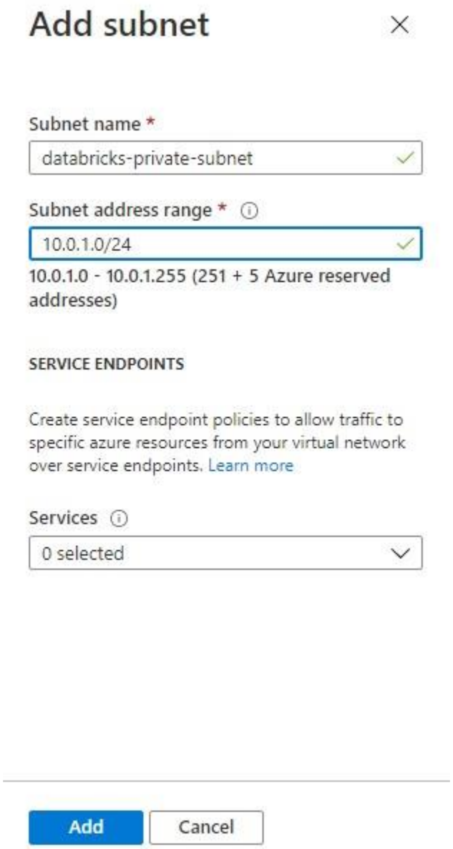
3. Click the **Next: IP Addresses >** button to go to the IP addresses tab. On the IP addresses tab, the IPv4 address space is listed as 10.0.0.0/16 by default. Leave it as-is. Select the default subnet and click **Remove subnet** to delete it:



☑ Subnet name	Subnet address range
☑ default	10.0.0.0/24

Figure 9.3 – Removing the default subnet

4. Click **Add subnet**. In the **Add subnet** dialog box, provide a subnet name of **`databricks-private-subnetxx`** and a subnet address range of **`10.0.1.0/24`**.
   Note: as we've done previously update the xx with your student number, for student1 databricks-private-subnet01 for student12 databricks-private-subnet12.
5. Click **Add** to add the subnet:



Add subnet

Subnet name *

databricks-private-subnet

Subnet address range *

10.0.1.0/24

10.0.1.0 - 10.0.1.255 (251 + 5 Azure reserved addresses)

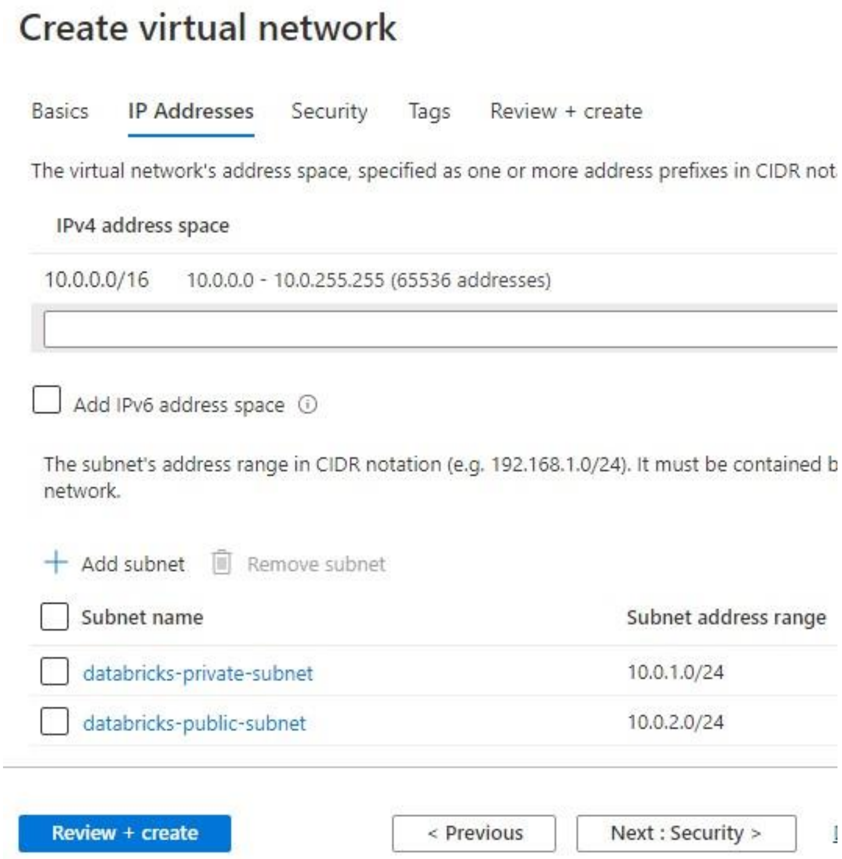
SERVICE ENDPOINTS

Create service endpoint policies to allow traffic to specific azure resources from your virtual network over service endpoints. Learn more

Services

0 selected

6. Similarly, add another subnet with a name of **`databricks-public-subnetxx`** and an address range of **`10.0.2.0/24`**:
   Note: as we've done previously update the xx with your student number, for student1 databricks-public-subnet01 for student12 databricks-public-subnet12.



Create virtual network

The virtual network's address space, specified as one or more address prefixes in CIDR not

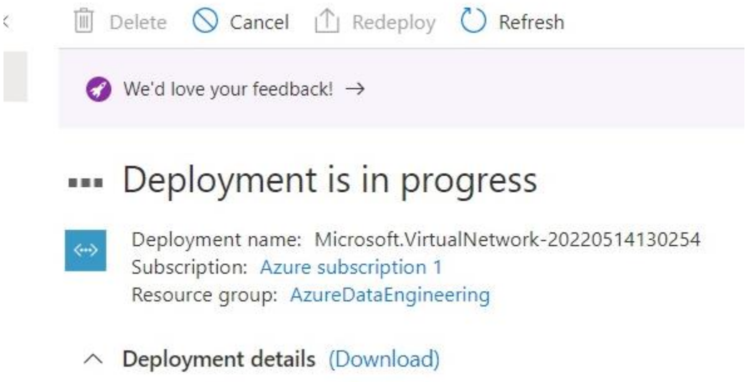
IPv4 address space	
10.0.0.0/16	10.0.0.0 - 10.0.255.255 (65536 addresses)

□ Add IPv6 address space ⓘ

The subnet's address range in CIDR notation (e.g. 192.168.1.0/24). It must be contained b network.

□ Subnet name	Subnet address range
□ databricks-private-subnet	10.0.1.0/24
□ databricks-public-subnet	10.0.2.0/24

7. Click **Review + create** and then **Create** to create the virtual network. It usually takes 2-5 minutes to create this virtual network.

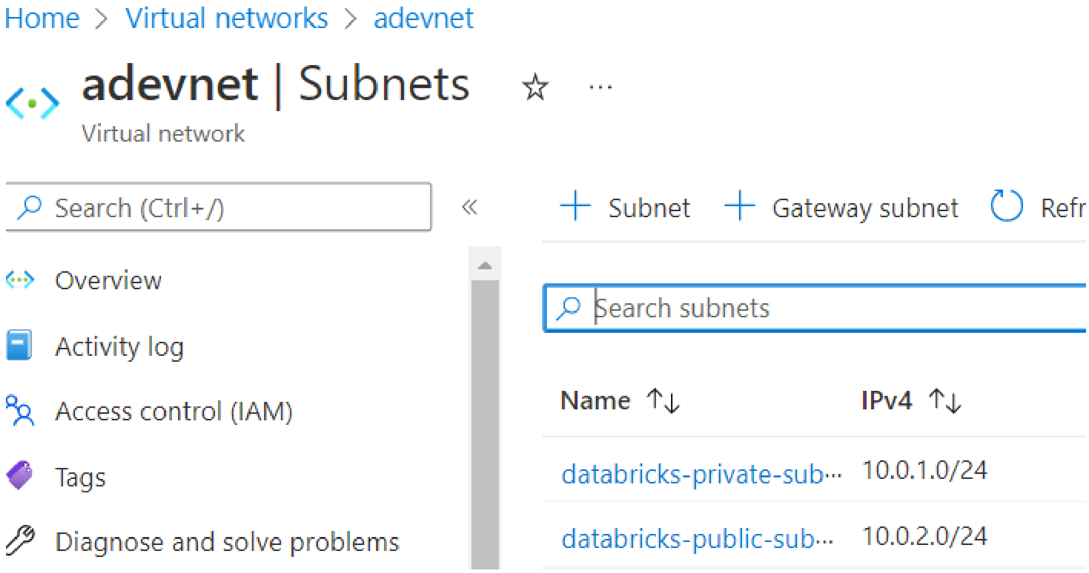


Deployment is in progress

Deployment name: Microsoft.VirtualNetwork-20220514130254
Subscription: Azure subscription 1
Resource group: AzureDataEngineering

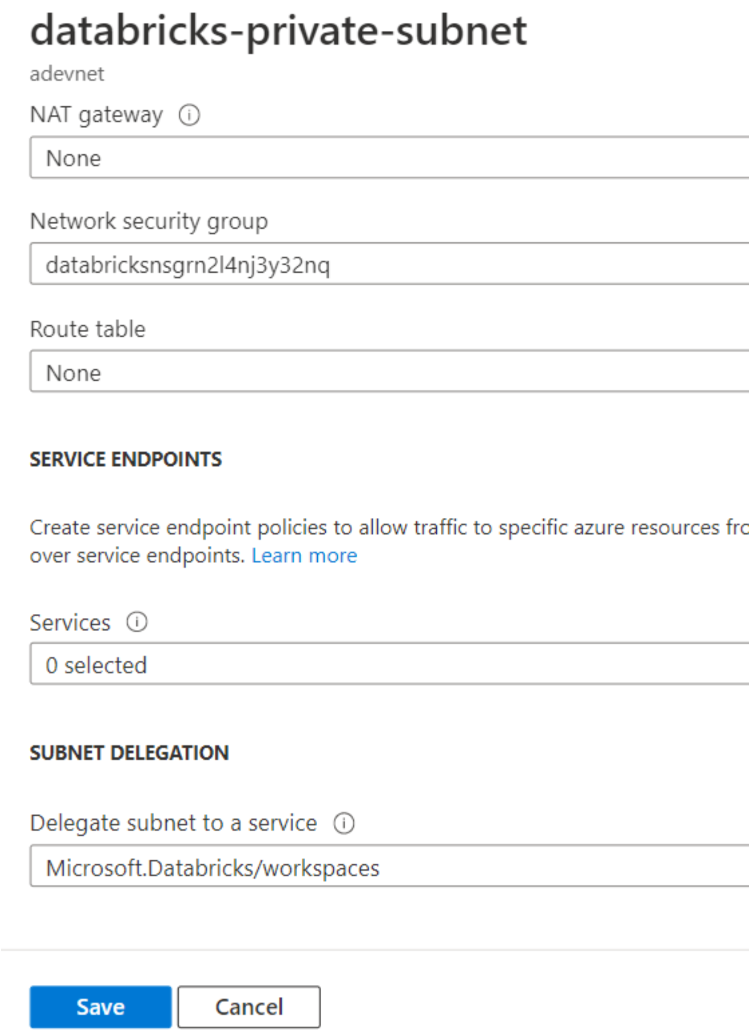
Deployment details (Download)

8. Once the virtual network has been created, click on **Go to Resources** to open the **Virtual network** page. On the **Virtual network** page, select **Subnets** from the **Settings** section:



Name ↑↓	IPv4 ↑↓
databricks-private-sub...	10.0.1.0/24
databricks-public-sub...	10.0.2.0/24

9. Click on **databricks-private-subnetxx**. On the **databricks-private-subnetxx** page, scroll down to the bottom and select **Microsoft.Databricks/workspaces** from the **Delegate subnet to a service** dropdown:



databricks-private-subnet

adevnet

NAT gateway: None

Network security group: databricksnsgrn2l4nj3y32nq

Route table: None

SERVICE ENDPOINTS

Create service endpoint policies to allow traffic to specific azure resources frc over service endpoints. Learn more

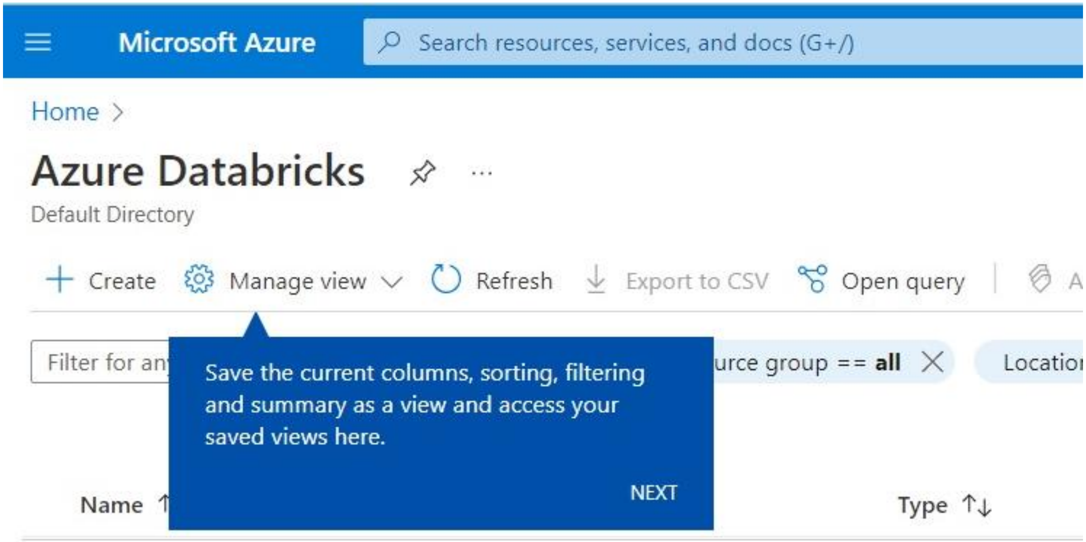
Services: 0 selected

SUBNET DELEGATION

Delegate subnet to a service: Microsoft.Databricks/workspaces

10. Click **Save** to apply the change. Follow the preceding steps to modify **`databricks-public-subnetxx`**, similar to how we modified **`databricksprivate-subnetxx`**. This completes the virtual network and subnet configuration.

11. In the Azure portal, type **`Azure Databricks`** into the search box and then select **Azure Databricks** from the search list. On the **Azure Databricks** page, click **Create** to create a new Azure Databricks service or workspace.

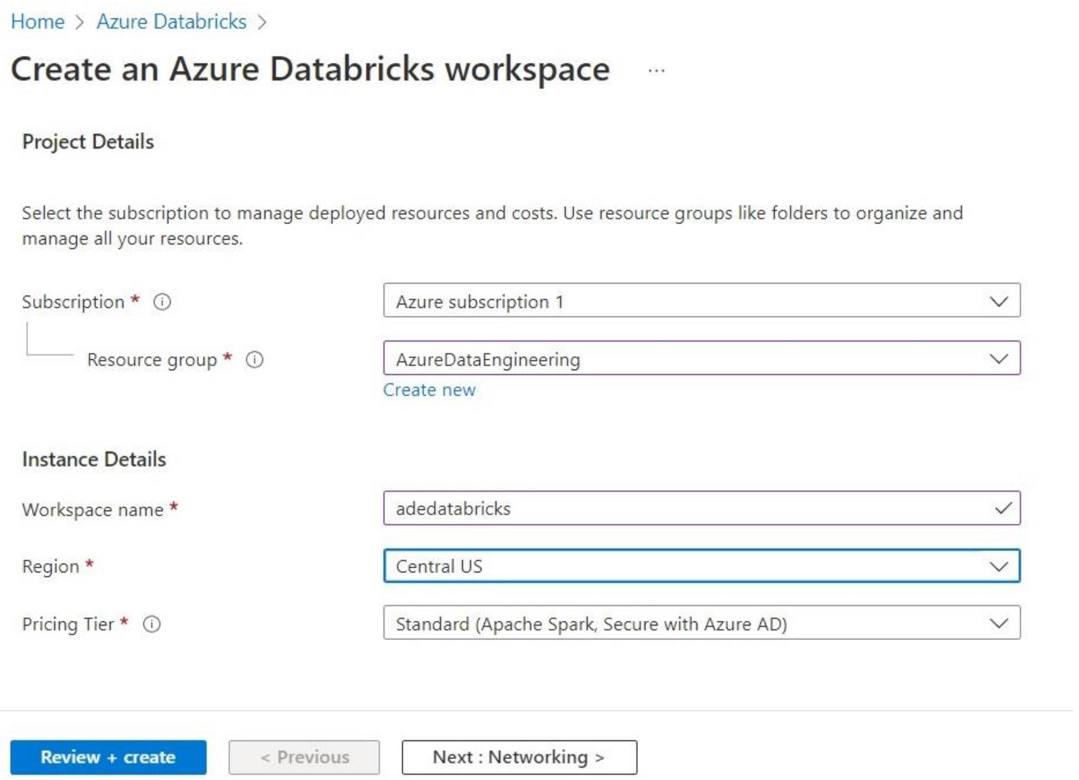


Save the current columns, sorting, filtering and summary as a view and access your saved views here.

**** **ProTip: Open the Databricks Blade jn a new browser tab so that you can refer back to the work done in the Azure VNet Blade**

12. On the **Azure Databricks Workspace** page, under the **Basics** tab, provide the **Resource group**, **Workspace name**, **Location**, and **Pricing Tier** values (Azure Databricks has two pricing tiers, **Standard** and **Premium**. Premium tier includes all the features of the Standard tier and role-based access. For more details about these tiers, please visit `https://azure.microsoft.com/en-in/pricing/details/databricks/`.):

Note: Append student number to the Databricks workspace naming, (student1 would be adedatabricks01, student12 would be adedatabricks12).



Home > Azure Databricks >

Create an Azure Databricks workspace ...

Project Details

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

Subscription * ⓘ: Azure subscription 1

Resource group * ⓘ: AzureDataEngineering

Create new

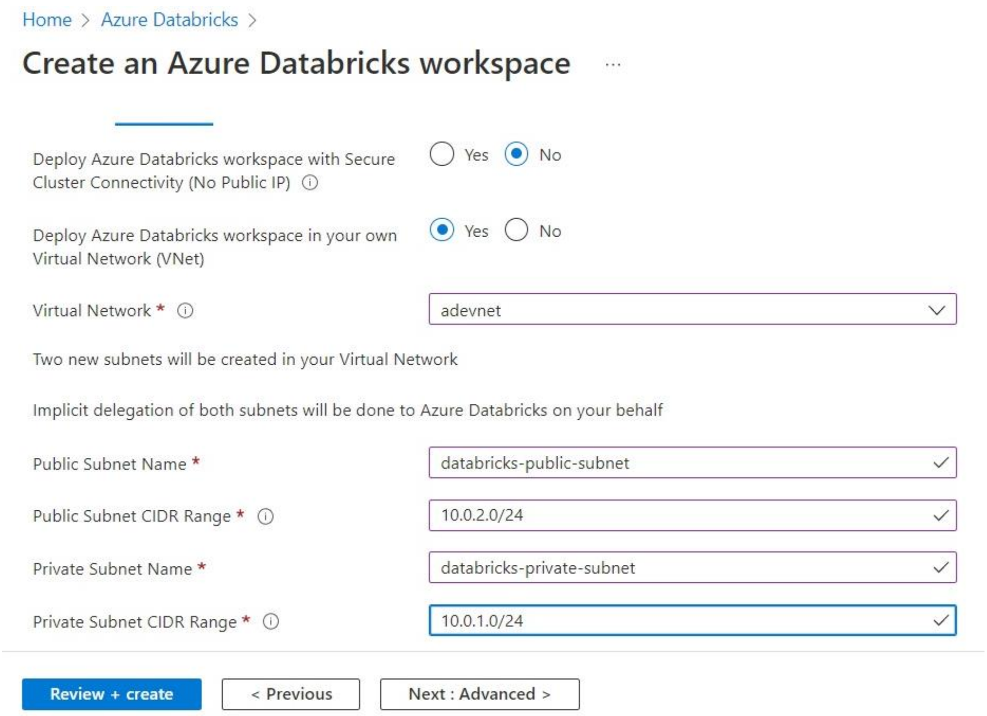
Instance Details

Workspace name *: adedatabricks

Region *: Central US

Pricing Tier * ⓘ: Standard (Apache Spark, Secure with Azure AD)

13. Click **Next: Networking >** to go to the **Networking** tab. On the **Networking** tab, select **Yes** for **Deploy Azure Databricks workspace in your own Virtual Network (Vnet)**. Select the virtual network we created earlier from the **Virtual Network** dropdown. Provide the public subnet name, private subnet name, public subnet CIDR range, and private subnet CIDR range that we created earlier:



Home > Azure Databricks >

Create an Azure Databricks workspace

Deploy Azure Databricks workspace with Secure Cluster Connectivity (No Public IP) ○ Yes ● No

Deploy Azure Databricks workspace in your own Virtual Network (VNet) ● Yes ○ No

Virtual Network * adevnet

Two new subnets will be created in your Virtual Network

Implicit delegation of both subnets will be done to Azure Databricks on your behalf

Public Subnet Name * databricks-public-subnet

Public Subnet CIDR Range * 10.0.2.0/24

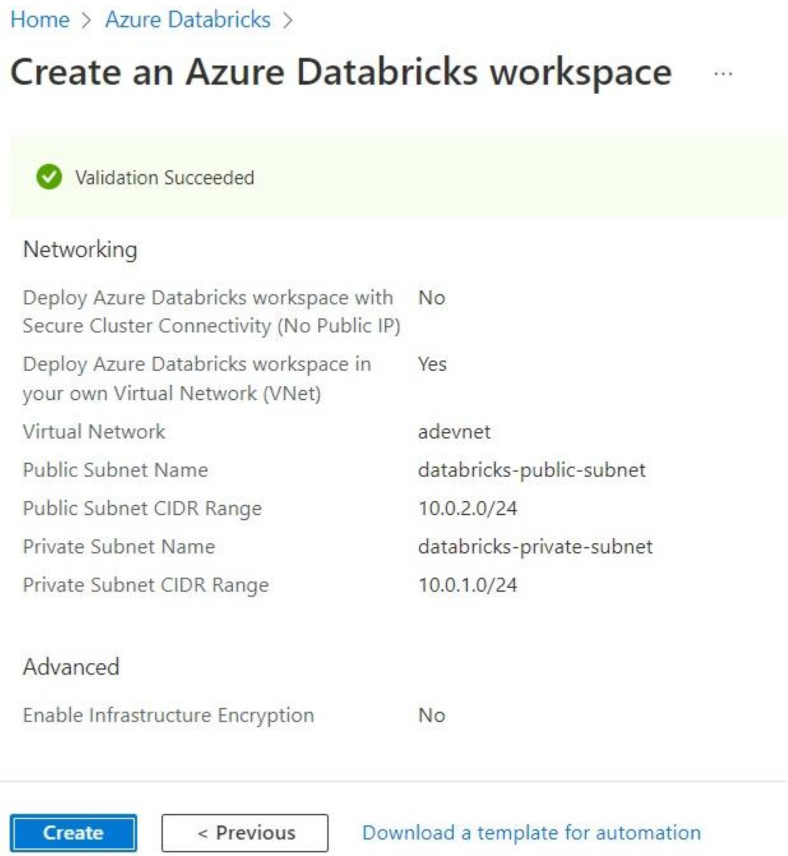
Private Subnet Name * databricks-private-subnet

Private Subnet CIDR Range * 10.0.1.0/24

Azure Databricks uses one public and one private subnet. The public subnet allows you to access the Azure Databricks control plane. Databricks clusters are deployed on the private subnet. It's recommended to not provision any other service in the Databricks private subnet.

> **Note**
> If the public and private subnet don't exist, they'll be created as part of your Azure Databricks workspace automatically.

14. Click **Review + create** and then click **Create** after successful validation. Next we'll provision the Databricks workspace.



Create an Azure Databricks workspace ...

✓ Validation Succeeded

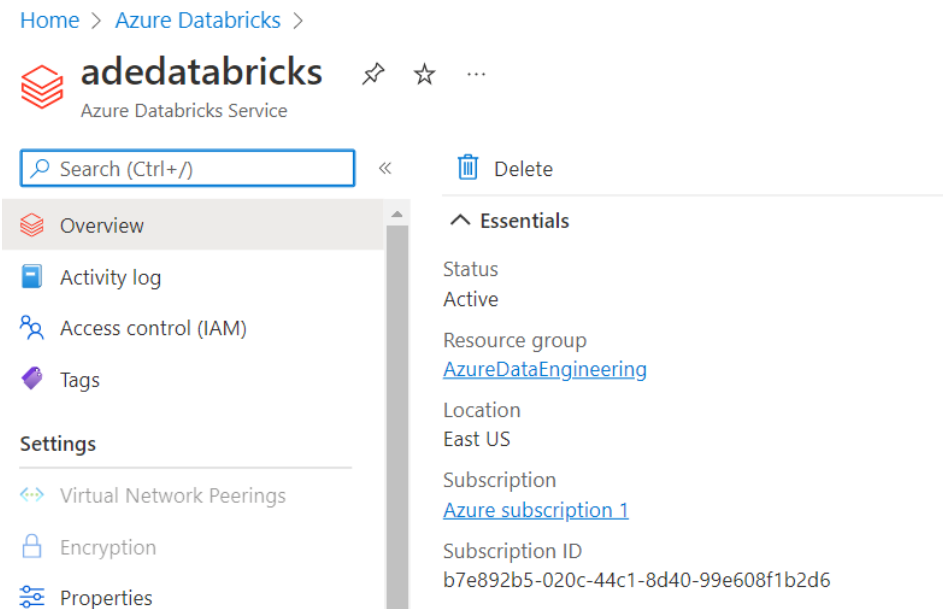
Networking

Deploy Azure Databricks workspace with Secure Cluster Connectivity (No Public IP)	No
Deploy Azure Databricks workspace in your own Virtual Network (VNet)	Yes
Virtual Network	adevnet
Public Subnet Name	databricks-public-subnet
Public Subnet CIDR Range	10.0.2.0/24
Private Subnet Name	databricks-private-subnet
Private Subnet CIDR Range	10.0.1.0/24

Advanced

Enable Infrastructure Encryption	No

15. Once the Azure Databricks Workspace has been deployed, select **Go to resource** to go to the newly created Azure Databricks workspace:



Status
Active

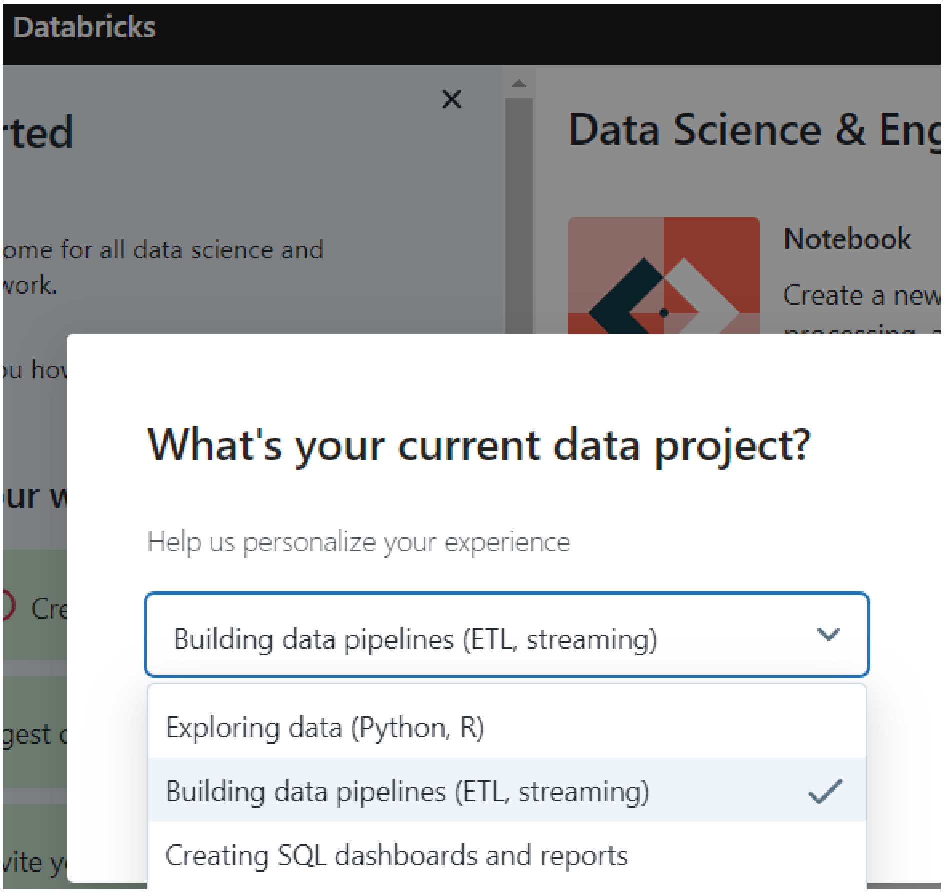
Resource group
AzureDataEngineering

Location
East US

Subscription
Azure subscription 1

Subscription ID
b7e892b5-020c-44c1-8d40-99e608f1b2d6

16. Click on **Launch Workspace** to open the Azure Databricks workspace, the Databricks launch will ask you for your preference and we'll choose **Pipelines** and select **Finish**:



What's your current data project?

Help us personalize your experience

Building data pipelines (ETL, streaming)

Exploring data (Python, R)

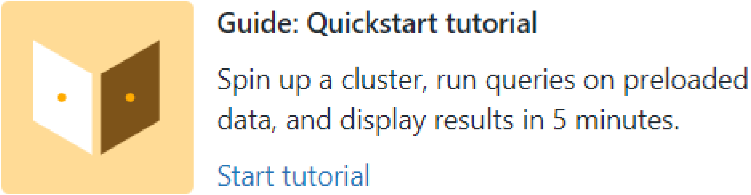
Building data pipelines (ETL, streaming) ✓

Creating SQL dashboards and reports

Databricks authentication is done through Azure **Active Directory** (**AD**). The AD username is displayed at the top-right corner of the workspace page.

An Azure Databricks workspace allows us to create clusters, notebooks, jobs, data sources, and folders so that we can write data transformation or MLFlow experiments. It also helps us organize multiple projects into different folders.

Take 5 minutes to go through the Quickstart, select **Start tutorial**



Guide: Quickstart tutorial

Spin up a cluster, run queries on preloaded data, and display results in 5 minutes.

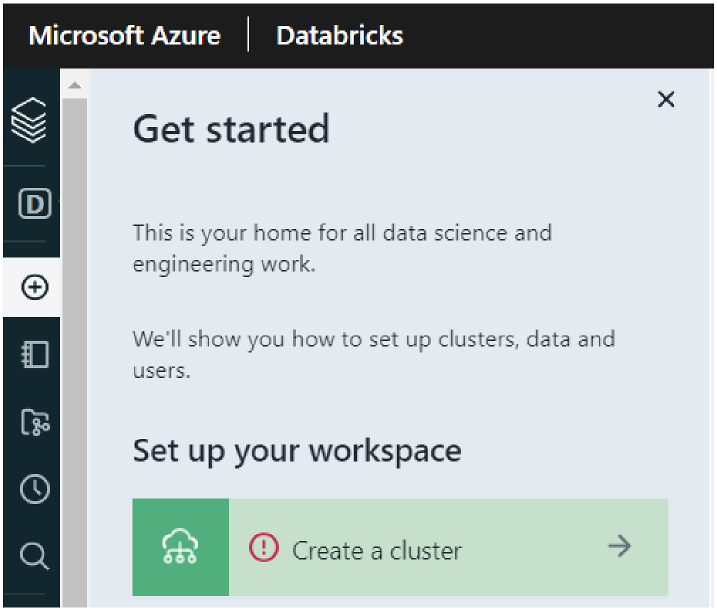
Start tutorial

Now, let's create some Azure Databricks clusters.

Creating Azure Databricks clusters

Follow these steps:

1. To create a cluster, select **Create a cluster** from the Get started menu of the Databricks workspace:



Microsoft Azure | Databricks

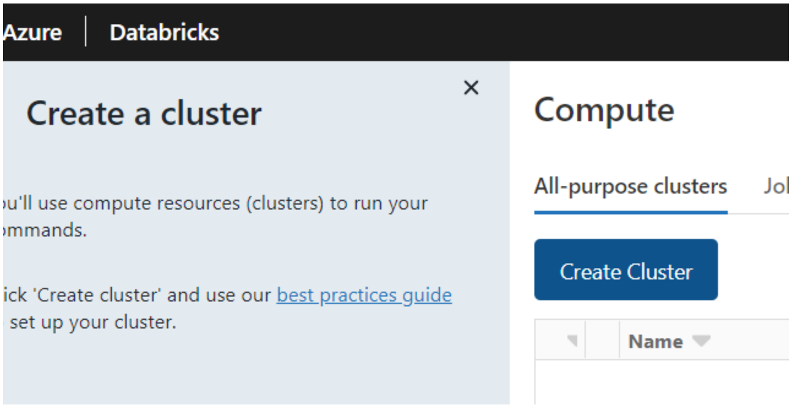
Get started

This is your home for all data science and engineering work.

We'll show you how to set up clusters, data and users.

Set up your workspace

There are two types of clusters: **Interactive** and **Automated**. Interactive clusters are created manually by users so that they can interactively analyze the data while working on, or even developing, a data engineering solution. Automated clusters are created automatically when a job starts and are terminated as and when the job completes.



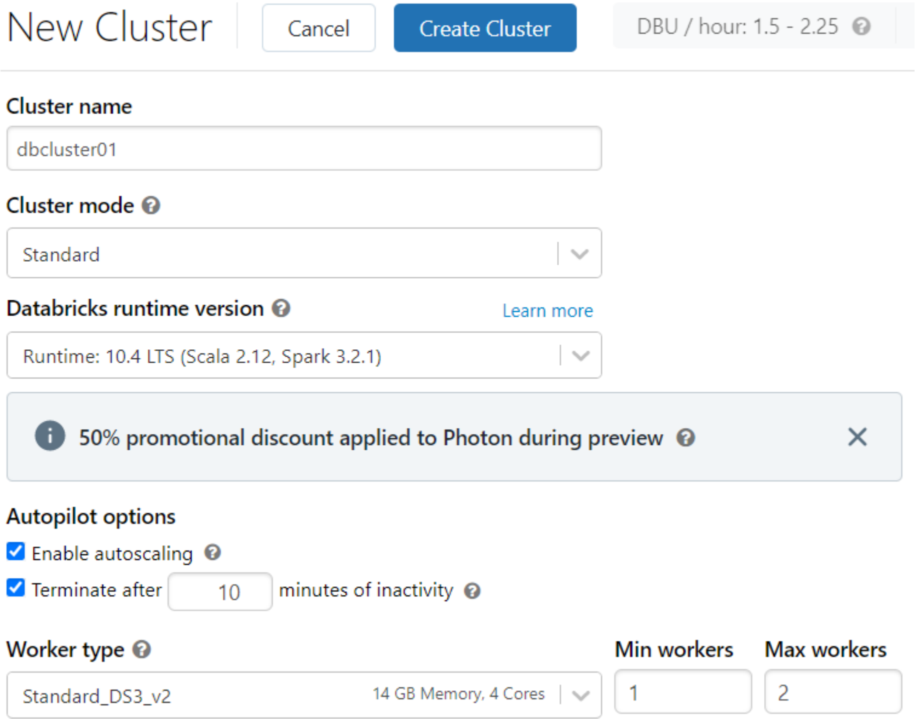
Create a cluster

u'll use compute resources (clusters) to run your
mmands.

ick 'Create cluster' and use our best practices guide
set up your cluster.

Compute

2. Click **Create Cluster** to create a new cluster. On the **New Cluster** page, provide a cluster name of **`dbclusterxx, substituting your student number for xx, for student1, dbcluster01, for student12, dbcluster12`**. Then, set **Cluster Mode** to **Standard, Default Worker Standard_DS3_V2, Terminate after** to `10` minutes of inactivity, **Min Workers** to **`1`**, **Max Workers** to **`2`**, and leave the rest of the options with their defaults:


New Cluster

DBU / hour: 1.5 - 2.25

Cluster name: dbcluster01

Cluster mode: Standard

Databricks runtime version: Runtime: 10.4 LTS (Scala 2.12, Spark 3.2.1)

50% promotional discount applied to Photon during preview

Autopilot options

☑ Enable autoscaling

☑ Terminate after 10 minutes of inactivity

Worker type: Standard_DS3_v2 14 GB Memory, 4 Cores

Min workers: 1

Max workers: 2

There are two cluster modes: **Standard** and **High Concurrency**. Standard cluster mode uses single-user clusters, optimized to run tasks one at a time. In a standard cluster, if there are tasks from multiple users, then a failure in one task may cause the other task to fail as well. Note that one task can consume all the cluster's resources, causing another task to wait. High Concurrency cluster mode is optimized to run multiple tasks in parallel; however, it only supports R, Python, and SQL workloads and doesn't supports Scala.

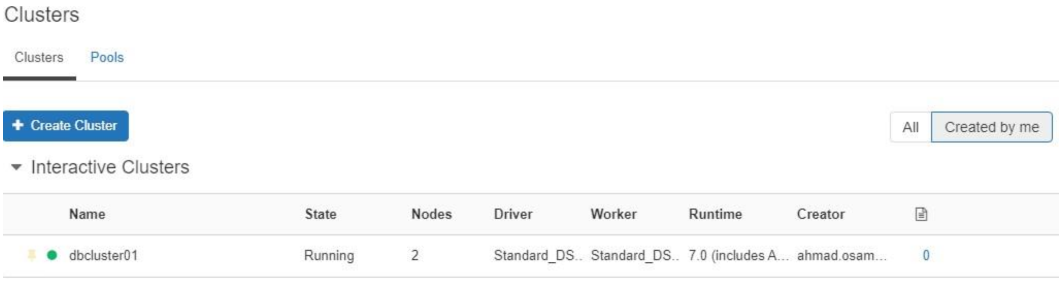
These autoscaling options allow Databricks to provision as many clusters as required to process a task within the limit, as specified by the **Min Workers** and **Max Workers** options.

The **Terminate after** option terminates the clusters when there's no activity for a given amount of time. In our case, the cluster will auto terminate after 10 minutes of inactivity. This option helps save costs.

There are two types of cluster nodes: **Worker Type** and **Driver Type**. The driver type node is responsible for maintaining a notebook's state information, interpreting the commands being run from a notebook or a library, and running the Apache Spark master. The worker type nodes are the Spark executor nodes, and these are responsible for distributed data processing.

The **Advanced Options** section can be used to configure Spark configuration parameters, environment variables, tags, configure SSH in the clusters, enable logging, and run custom initialization scripts at the time of cluster creation.

3. Click **Create Cluster** to create the cluster. It will take around 5-10 minutes to create the cluster and may take more time, depending on the number of worker nodes that have been selected:



Name	State	Nodes	Driver	Worker	Runtime	Creator	
● dbcluster01	Running	2	Standard_DS..	Standard_DS..	7.0 (includes A...	ahmad.osam...	0

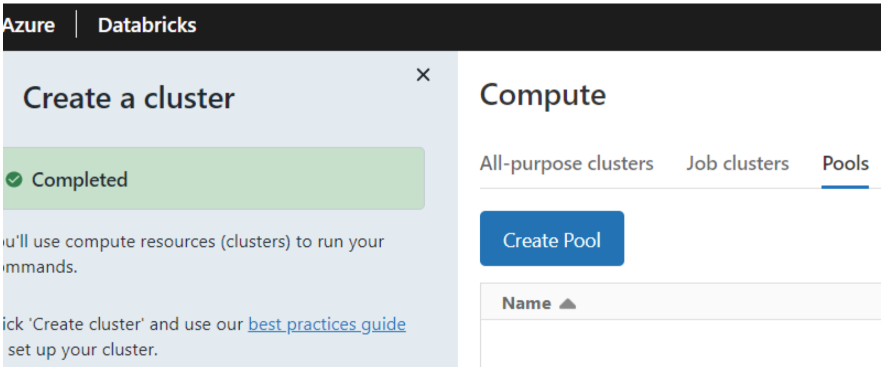
Figure 9.15 – Viewing your clusters

Observe that there are two nodes – one driver and worker – even though the max number of worker nodes is two. Databricks will only create the two worker nodes when the autoscaling condition you've set is reached.

Creating Azure Databricks Pools

Azure Databricks Pools optimize autoscaling by keeping a set of idle, ready-to-use instances without the need for creating instances when required. These idle instances are not charged for. To create Azure Databricks Pools, execute the following steps:

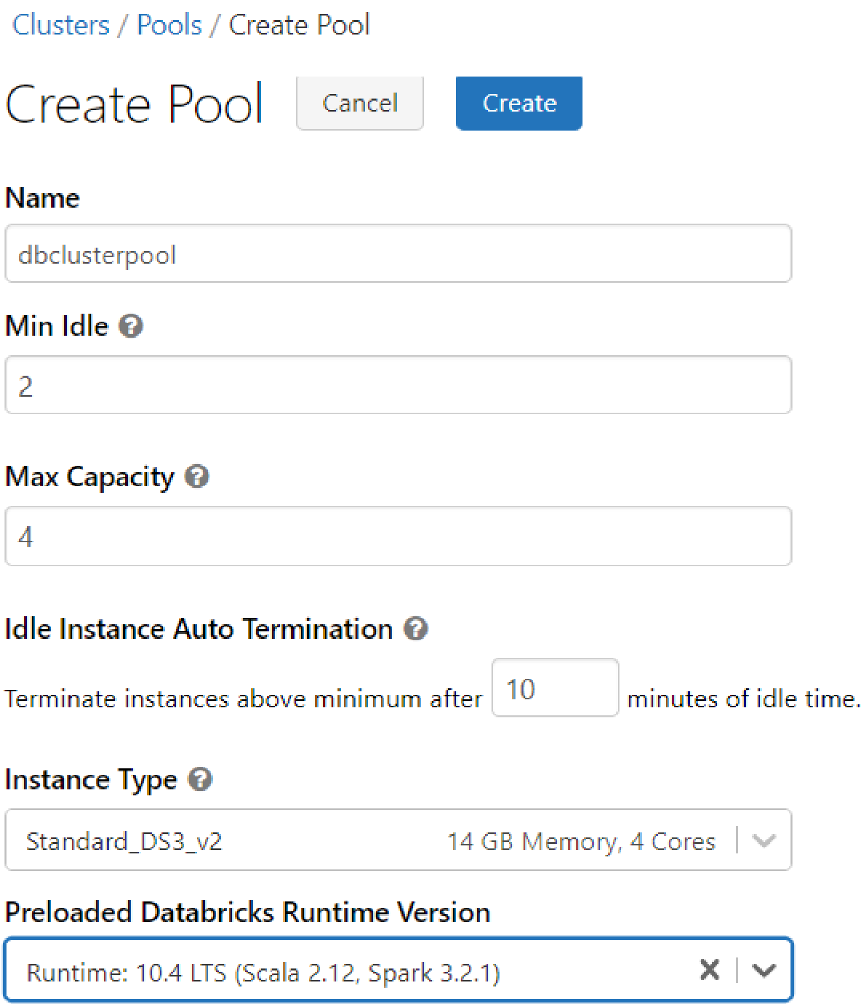
1. In your Azure Databricks workspace, on the **Clusters** page, select the **Pools**



u'll use compute resources (clusters) to run your mmands.

ick 'Create cluster' and use our best practices guide set up your cluster.

2. Select **Create Pool** to create a new pool. Provide the pool's name dbclusterpoolxx, replacing the xx with your student number. For student1, dbclusterpool01, for student12, dbclusterpool12. Then set **Min Idle** to **2**, **Max Capacity** to **4**, and **Idle Instance Auto Termination** to **10**. Leave **Instance Type** as its default of **Standard_DS3_v2** and set **Preloaded Databricks Runtime Version** to **10.4 LTS**:



Name: dbclusterpool

Min Idle: 2

Max Capacity: 4

Idle Instance Auto Termination

Terminate instances above minimum after 10 minutes of idle time.

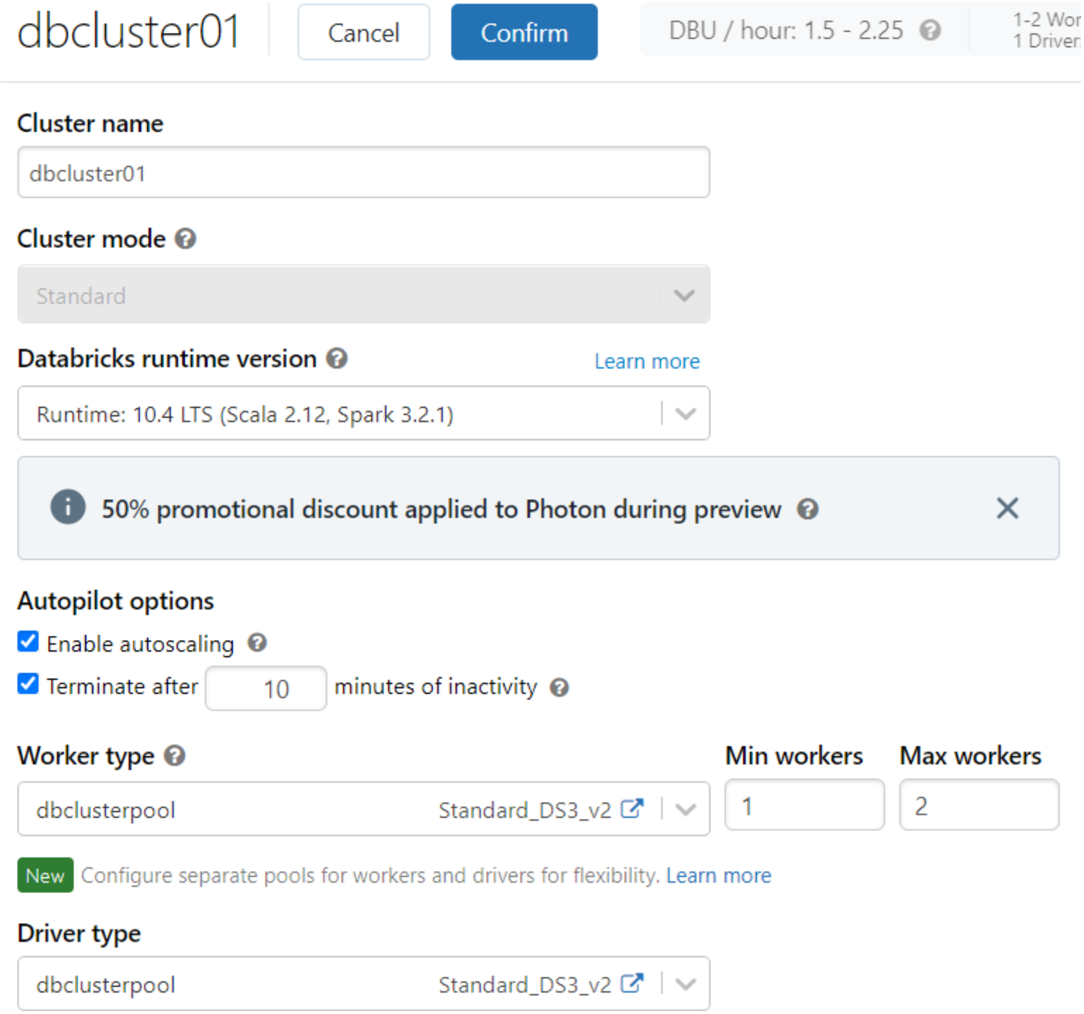
Instance Type: Standard_DS3_v2 14 GB Memory, 4 Cores

Preloaded Databricks Runtime Version: Runtime: 10.4 LTS (Scala 2.12, Spark 3.2.1)

Min Idle specifies the number of instances that will be kept idle and available and won't terminate. The **Idle Instance Auto Terminate** settings doesn't apply to these instances.

Max Capacity limits the maximum number of instances to this number, including idle and running ones. This helps with managing cloud quotas and their costs. The Azure Databricks runtime is a set of core components or software that run on your clusters. There are different runtimes, depending on the type of workload you have. To find out more about the Azure Databricks runtime, please visit **`https://docs.microsoft.com/en-us/azure/databricks/runtime/`**.

3. Click **Create** to create the pool. We can attach a new of existing or cluster to a pool by specifying the pool name under the **Pool** option. In the workspace, navigate to the **Clusters** page and select **dbclusterxx**, which we created in *Step 2* of the previous section. On the **dbclusterxx** page, click **Edit** and select **dbclusterpoolxx** from the **Worker type** drop-down list and from the **Driver type** drop-down list:



DBU / hour: 1.5 - 2.25 | 1-2 Wor | 1 Driver

Cluster name: dbcluster01

Cluster mode: Standard

Databricks runtime version: Runtime: 10.4 LTS (Scala 2.12, Spark 3.2.1)

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Autopilot options

☑ Enable autoscaling

☑ Terminate after 10 minutes of inactivity

Worker type: dbclusterpool Standard_DS3_v2 | Min workers: 1 | Max workers: 2

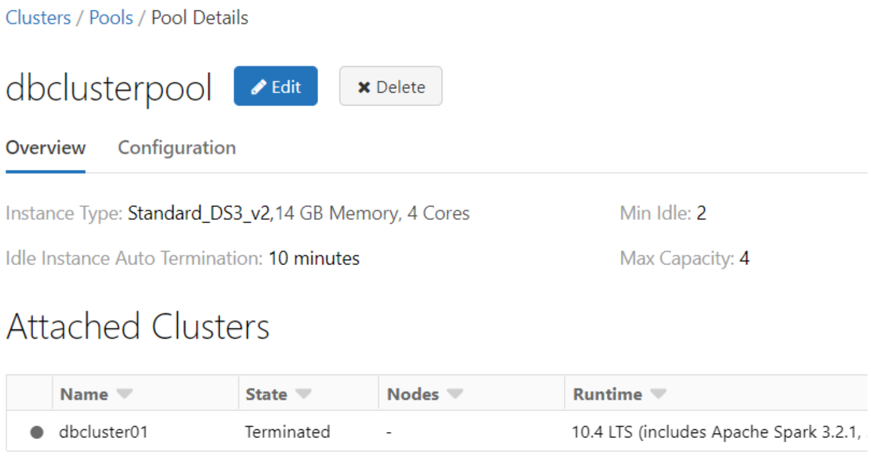
Configure separate pools for workers and drivers for flexibility.

Driver type: dbclusterpool Standard_DS3_v2

4. Click **Confirm** to apply these changes. The cluster will now show up in the **Attached Clusters** list:

We can add multiple clusters to a pool; however, we should modify the number of idle clusters and their maximum instance capacity accordingly.

Whenever an instance, such as **`dbclusterxx`**, requires an instance, it'll attempt to allocate the pool's idle instance. If an idle instance isn't available, the pool expands to provision new instances.



dbclusterpool

Instance Type: Standard_DS3_v2,14 GB Memory, 4 Cores

Min Idle: 2

Idle Instance Auto Termination: 10 minutes

Max Capacity: 4

Attached Clusters

	Name	State	Nodes	Runtime
●	dbcluster01	Terminated	-	10.4 LTS (includes Apache Spark 3.2.1,

Congratulations you've created and configured your Azure Databricks cluster