

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:

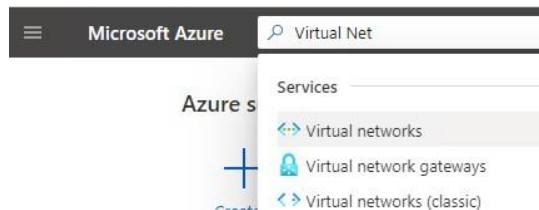


Figure 9.1 – Selecting virtual networks

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

Review + create

< Previous

Next : IP Addresses >

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- 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.
- If your default is different, say 10.1.0.0/16 for the VNET, then your subnet groups would change for the below Databricks subnets to use that range for your subnets.
- you'd have to ensure that you either change that Leave it as-is. Select the default subnet and click **Remove subnet** to delete it:

	Add subnet		Remove subnet
<input checked="" type="checkbox"/>	Subnet name		Subnet address range
<input checked="" type="checkbox"/>	default		10.0.0.0/24

Figure 9.3 – Removing the default subnet

- 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: If your VNET range is not 10.0.0.0, but rather 10.1.0.0, then your subnet ranges would start with 10.1 rather than 10.0, for instance 10.1.1.0/24, and 10.1.2.0/24.
Note: as we've done previously update the xx with your student number, for student1 databricks-private-subnet01 for student12 databricks-private-subnet12.
- Click **Add** to add the subnet:

Add subnet

×

Subnet name *

✓

Subnet address range * ⓘ

✓

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 ⓘ

▼

Add
Cancel

8. 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

Basics IP Addresses Security Tags Review + create

The virtual network's address space, specified as one or more address prefixes in CIDR notation

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 by the virtual network.

[+ Add subnet](#) [Remove subnet](#)

<input type="checkbox"/> Subnet name	Subnet address range
<input type="checkbox"/> databricks-private-subnet	10.0.1.0/24
<input type="checkbox"/> databricks-public-subnet	10.0.2.0/24

[Review + create](#) [< Previous](#) [Next : Security >](#) ⓘ

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

Delete
 Cancel
 Redeploy
 Refresh

We'd love your feedback! →

Deployment is in progress

Deployment name: Microsoft.VirtualNetwork-20220514130254
 Subscription: [Azure subscription 1](#)
 Resource group: [AzureDataEngineering](#)

^ Deployment details [\(Download\)](#)

- 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:

Home > Virtual networks > adevnet

adevnet | Subnets

Virtual network

Search (Ctrl+ /)

- Overview
- Activity log
- Access control (IAM)
- Tags
- Diagnose and solve problems

+ Subnet
 + Gateway subnet
 Refr

Search subnets

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

- 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

databricksnsgnrn2l4nj3y32nq

Route table

None

SERVICE ENDPOINTS

Create service endpoint policies to allow traffic to specific azure resources from over service endpoints. [Learn more](#)

Services ⓘ

0 selected

SUBNET DELEGATION

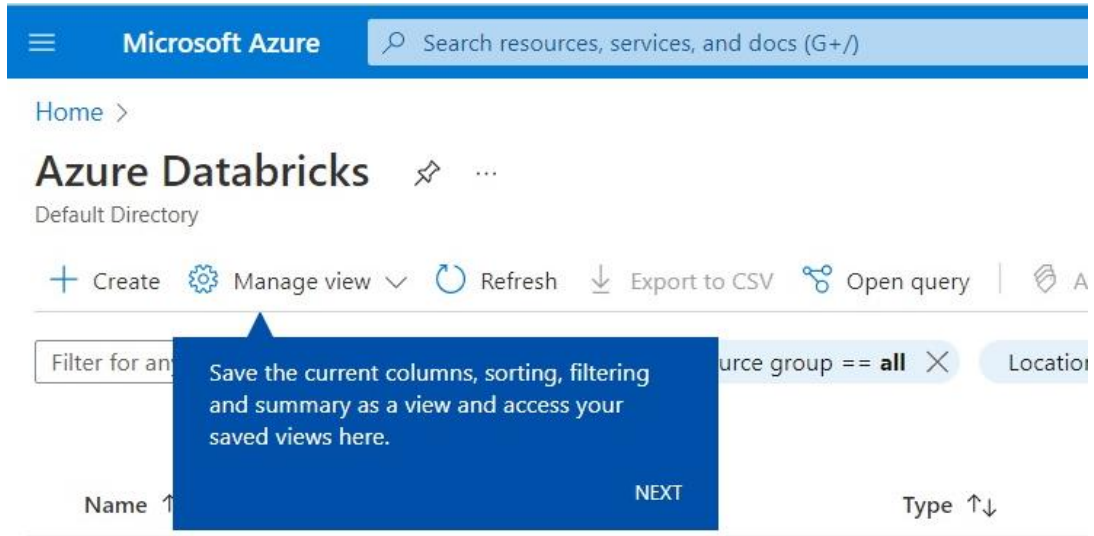
Delegate subnet to a service ⓘ

Microsoft.Databricks/workspaces

Save

Cancel

- 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.
- 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.



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

14. 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).

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 * ⓘ	<input type="text" value="Azure subscription 1"/>
Resource group * ⓘ	<input type="text" value="AzureDataEngineering"/>
	Create new

Instance Details

Workspace name *	<input type="text" value="adedatabricks"/>
Region *	<input type="text" value="Central US"/>
Pricing Tier * ⓘ	<input type="text" value="Standard (Apache Spark, Secure with Azure AD)"/>

[Review + create](#)

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[Next : Networking >](#)

- 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:

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 ✓

Review + create

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Next : Advanced >

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.

16. 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
----------------------------------	----

Create

< Previous

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

Home > Azure Databricks >



adedatabricks

Azure Databricks Service



Search (Ctrl+/)



Delete



Overview



Activity log



Access control (IAM)



Tags

Settings



Virtual Network Peerings



Encryption



Properties

^ Essentials

Status

Active

Resource group

[AzureDataEngineering](#)

Location

East US

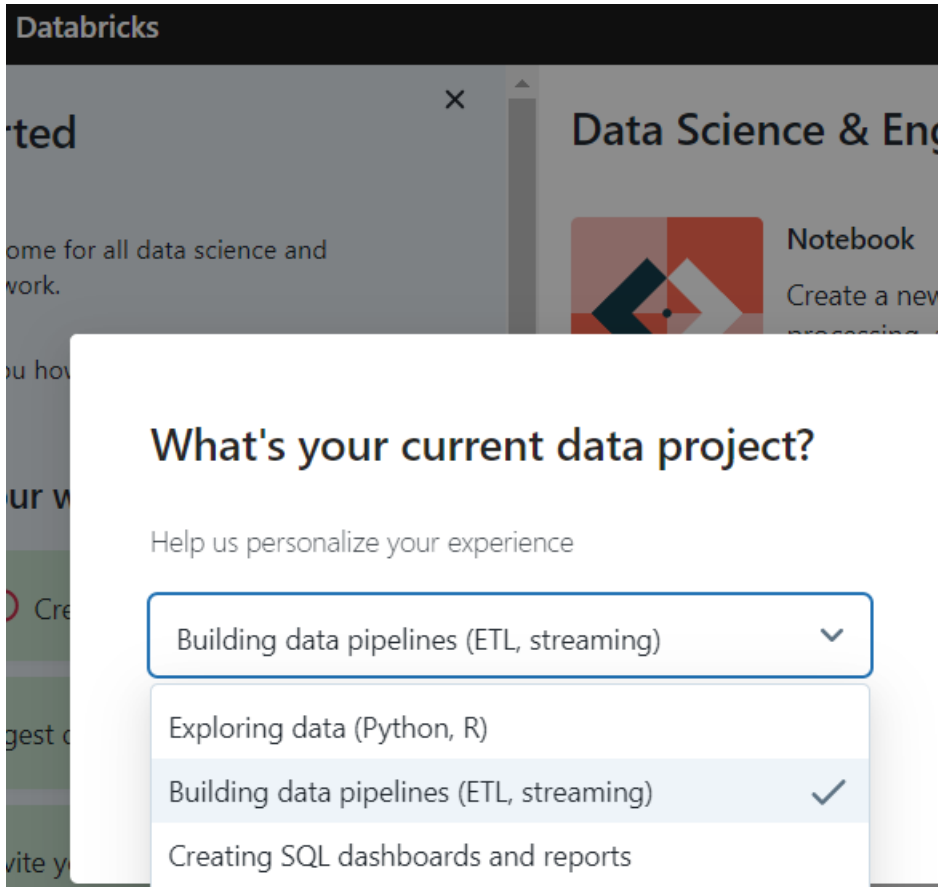
Subscription

[Azure subscription 1](#)

Subscription ID

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

- 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**.
Note: This option might not be displayed on the project type selection, if it's not visible then proceed to the Quickstart Tutorial and Cluster creation.



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.

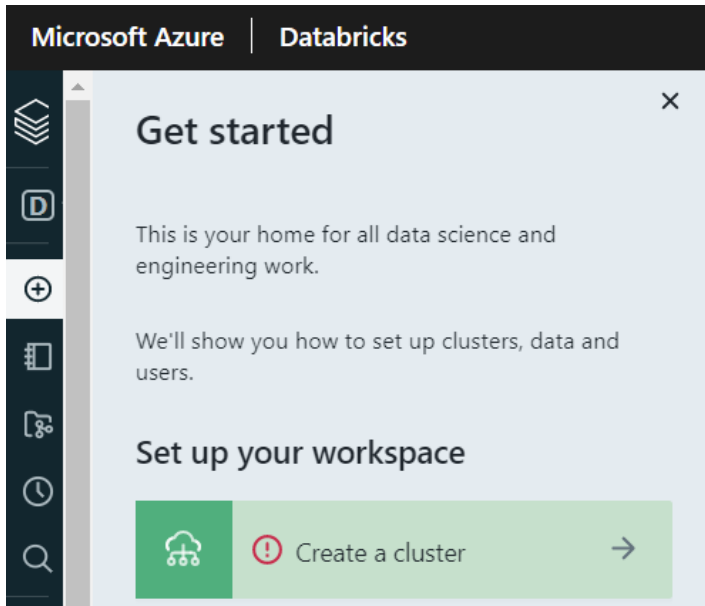
[Start tutorial](#)

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:



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.

Azure | Databricks

Create a cluster

you'll use compute resources (clusters) to run your commands.

Click 'Create cluster' and use our [best practices guide](#) to set up your cluster.

Compute

All-purpose clusters | Job clusters

Create Cluster

Name

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** to **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

Cancel

Create 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)

Learn more

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:

Clusters

Clusters Pools

+ Create Cluster

All Created by me

▼ Interactive Clusters


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

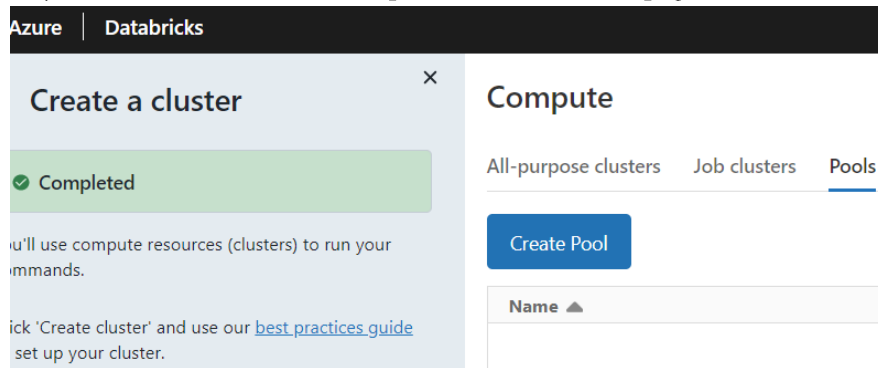
Figure 9.15 – Viewing your clusters

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**



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:

[Clusters](#) / [Pools](#) / Create Pool

Create Pool

Cancel

Create

Name

dbclusterpool

Min Idle ?

2

Max Capacity ?

4

Idle Instance Auto Termination ?

Terminate instances above minimum after 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:

dbcluster01

Cancel

Confirm

DBU / hour: 1.5 - 2.25 ?

1-2 Wor
1 Driver

Cluster name

dbcluster01

Cluster mode ?

Standard ▼

Databricks runtime version ? [Learn more](#)

Runtime: 10.4 LTS (Scala 2.12, Spark 3.2.1) ▼

i

 50% promotional discount applied to Photon during preview ?

×

Autopilot options

☒ Enable autoscaling ?

☒ Terminate after minutes of inactivity ?

Worker type ?

dbclusterpool Standard_DS3_v2 [↗](#) | ▼

Min workers

Max workers

New

 Configure separate pools for workers and drivers for flexibility. [Learn more](#)

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 **dbclusterxxx**, 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.

[Clusters](#) / [Pools](#) / Pool Details

dbclusterpool

Edit

Delete

Overview Configuration

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