Running RumbleDB on Azure HDInsight Clusters

We provide instructions for the **ungraded** Azure exploration you have time until the exam (we will try to push for that with Azure now), feedback on the exploration is welcomed but not compulsory. Please use the feedback box on Moodle: https://moodle-app2.let.ethz.ch/mod/journal/view.php?id=836348 .

The overall goal of the **ungraded** Azure assignment is that you will have enough time to explore and experiment with RumbleDB in clusters with a huge dataset to push the limit, but no strings attached.

For the subscriptions that are still not activated, we are working with the Azure team to speed up the process.

Important: Remember to **delete** the cluster once you are done. If you want to stop doing the assignments at any point, delete it and recreate it using the same container name as you used the first time, so that the resources are still there.

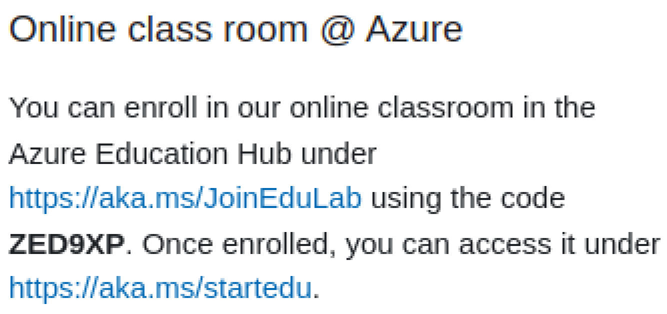
Please do not hesitate to contact us anytime to clarify details.

Happy rumbling.

Your Big Data TA Team

Enroll to the Azure Lab

You can enroll in the Azure Lab using the following links (accessible from Moodle). And you need to wait until we approve your request. Once your request is approved, you need to accept the subscription provided to you. Note that the new code is ZED9XP.

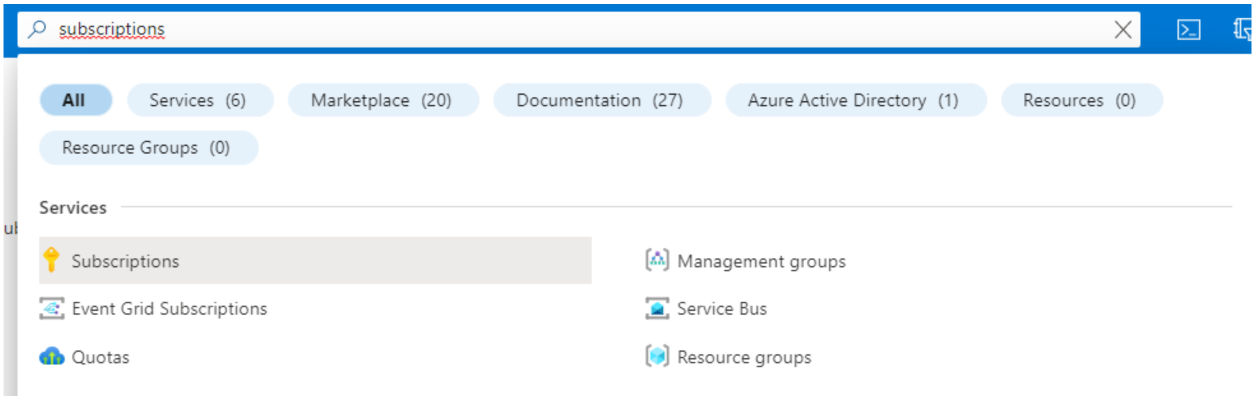


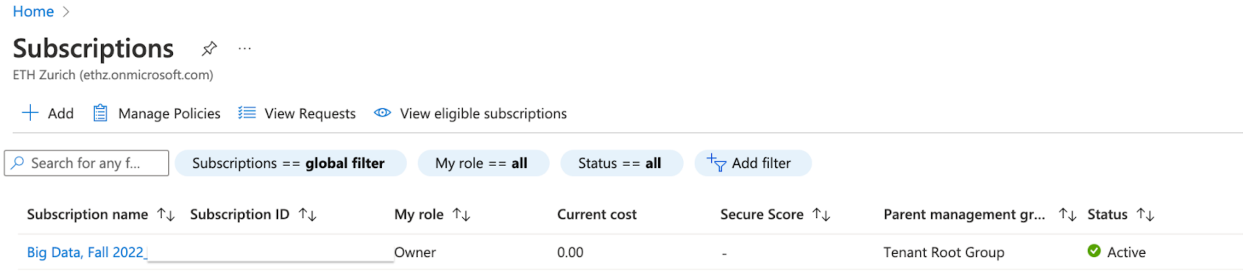
Online class room @ Azure

You can enroll in our online classroom in the Azure Education Hub under https://aka.ms/JoinEduLab using the code **ZED9XP**. Once enrolled, you can access it under https://aka.ms/startedu.

- ## Accept the subscription

Once you have accepted your subscription, you could login on the azure portal with your account, search for “subscriptions" in the search tab and click on the option with the key logo. Make sure that you can see the big-data subscription. You will be able to create resources with this subscription account, e.g., VMs and HDInsight clusters.

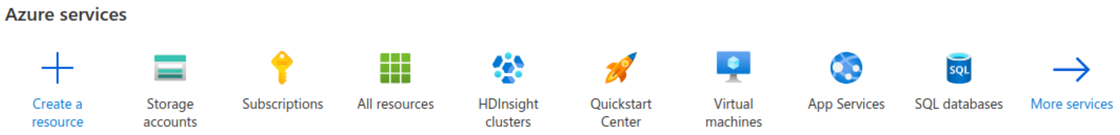




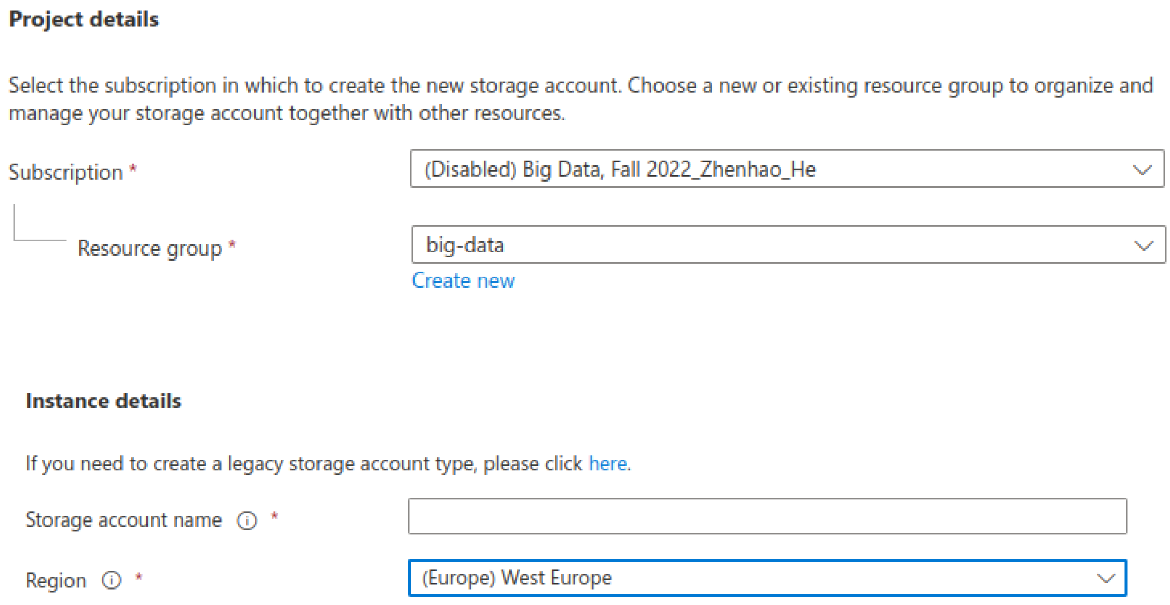
Subscription name	Subscription ID	My role	Current cost	Secure Score	Parent management gr...	Status
Big Data, Fall 2022_		Owner	0.00	-	Tenant Root Group	Active

- ## Create a storage account

You need to first create an Azure storage account to accommodate the dataset that you use for the tasks. To create a storage account, click the icon of Storage accounts below.



Please make sure you choose the subscription that matches your Azure lab subscription. And please make sure that you choose West Europe for your storage region. For the rest of the configurations, you can leave it to default settings.



Project details

Select the subscription in which to create the new storage account. Choose a new or existing resource group to organize and manage your storage account together with other resources.

Subscription * : (Disabled) Big Data, Fall 2022_Zhenhao_He

Resource group * : big-data

Instance details

If you need to create a legacy storage account type, please click here.

Storage account name * :

Region * : (Europe) West Europe

- ## Upload the dataset to the storage account

Once you have created your storage account, you could upload the following dataset in your account:

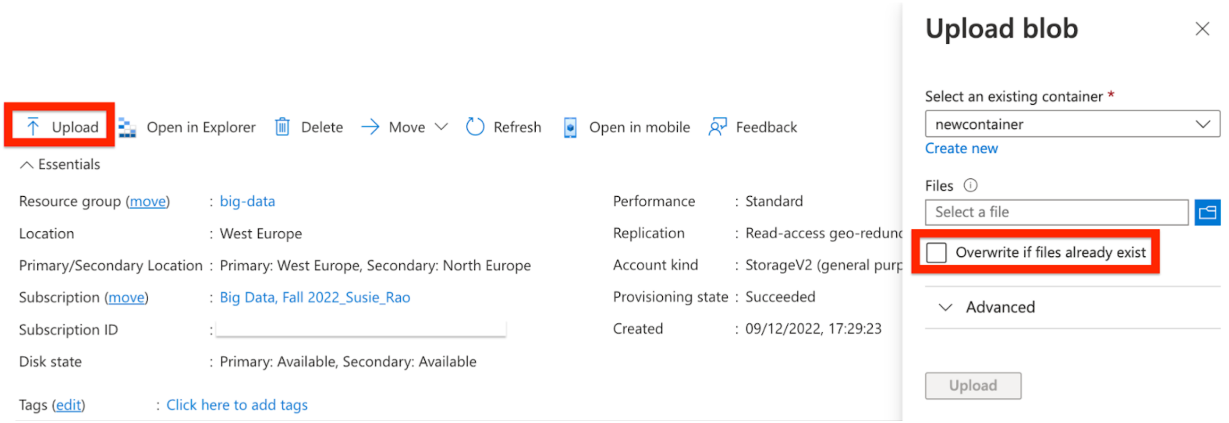
Small dataset: https://www.rumbledb.org/samples/git-archive.json
Larger dataset: https://www.rumbledb.org/samples/git-archive-big.json
Huge dataset: https://cloud.inf.ethz.ch/s/Ss5L7ASD2KKdrCx

Note that the huge dataset listed above is in the order of tens of gigabytes. You can create your own git archive dataset that is even larger using the following command.

```
wget https://data.gharchive.org/2022-10-{1..31}-{0..23}.json.gz -O
git-archive-extreme.json.gz
```

The command above takes the git archive data ranging from 1st Oct 2022 to 31th Oct 2022 and you can tune it yourself.

You could update your datasets to the storage account using the upload button in the storage account:



Upload | Open in Explorer | Delete | Move | Refresh | Open in mobile | Feedback

Essentials

Resource group (move)	: big-data	Performance	: Standard
Location	: West Europe	Replication	: Read-access geo-redunc
Primary/Secondary Location	: Primary: West Europe, Secondary: North Europe	Account kind	: StorageV2 (general purp
Subscription (move)	: Big Data, Fall 2022_Susie_Rao	Provisioning state	: Succeeded
Subscription ID	:	Created	: 09/12/2022, 17:29:23
Disk state	: Primary: Available, Secondary: Available		

Tags (edit) : Click here to add tags

Upload blob

Select an existing container *

newcontainer

Create new

Files

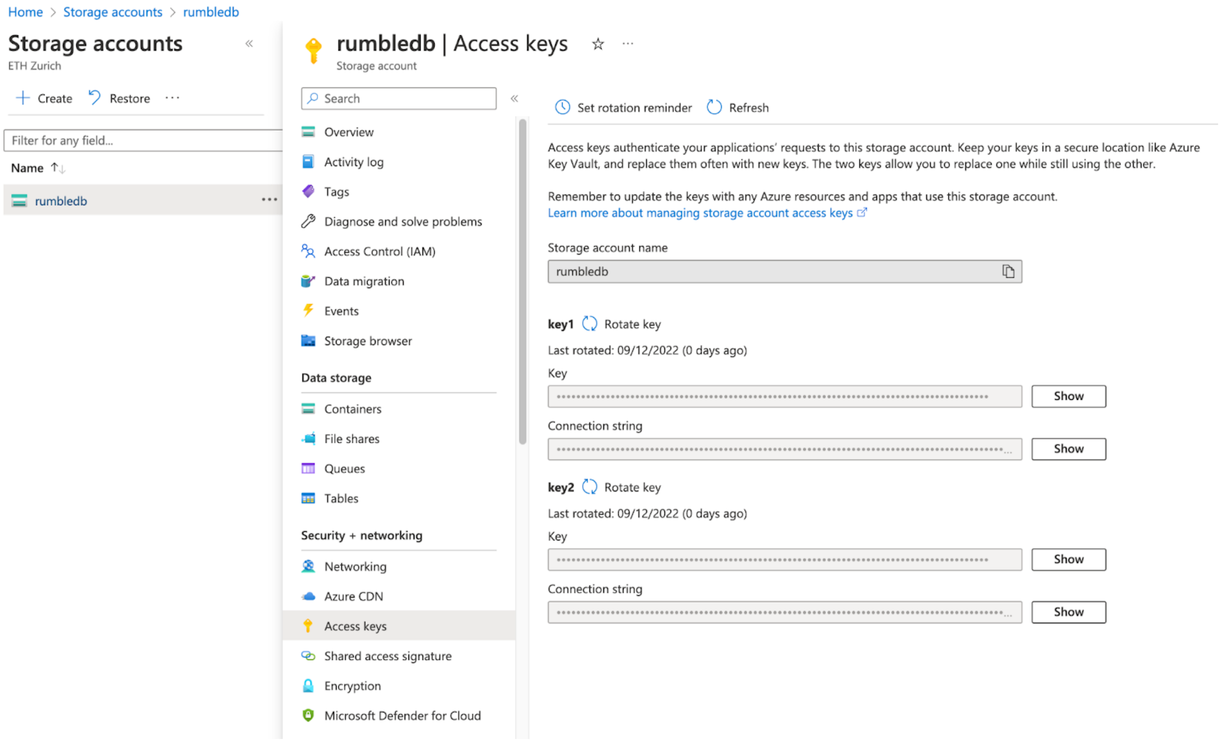
Select a file

□ Overwrite if files already exist

Advanced

Upload

Note it could take a while to upload the huge dataset (or an even bigger dataset you want to test). For large datasets, it is recommended to use a script to do so. The access keys (account name, account key can be acquired from this page). There might also be ways to extract compressed files on blob, free free to explore.



Home > Storage accounts > rumbledb

Storage accounts

ETH Zurich

Create | Restore

Filter for any field...

Name

rumbledb

rumbledb | Access keys

Storage account

Search

Overview
Activity log
Tags
Diagnose and solve problems
Access Control (IAM)
Data migration
Events
Storage browser

Data storage

Containers
File shares
Queues
Tables

Security + networking

Networking
Azure CDN
Access keys
Shared access signature
Encryption
Microsoft Defender for Cloud

Set rotation reminder | Refresh

Access keys authenticate your applications' requests to this storage account. Keep your keys in a secure location like Azure Key Vault, and replace them often with new keys. The two keys allow you to replace one while still using the other.

Remember to update the keys with any Azure resources and apps that use this storage account.
Learn more about managing storage account access keys

Storage account name

rumbledb

key1 Rotate key

Last rotated: 09/12/2022 (0 days ago)

Key

•• Show

Connection string

•••... Show

key2 Rotate key

Last rotated: 09/12/2022 (0 days ago)

Key

•• Show

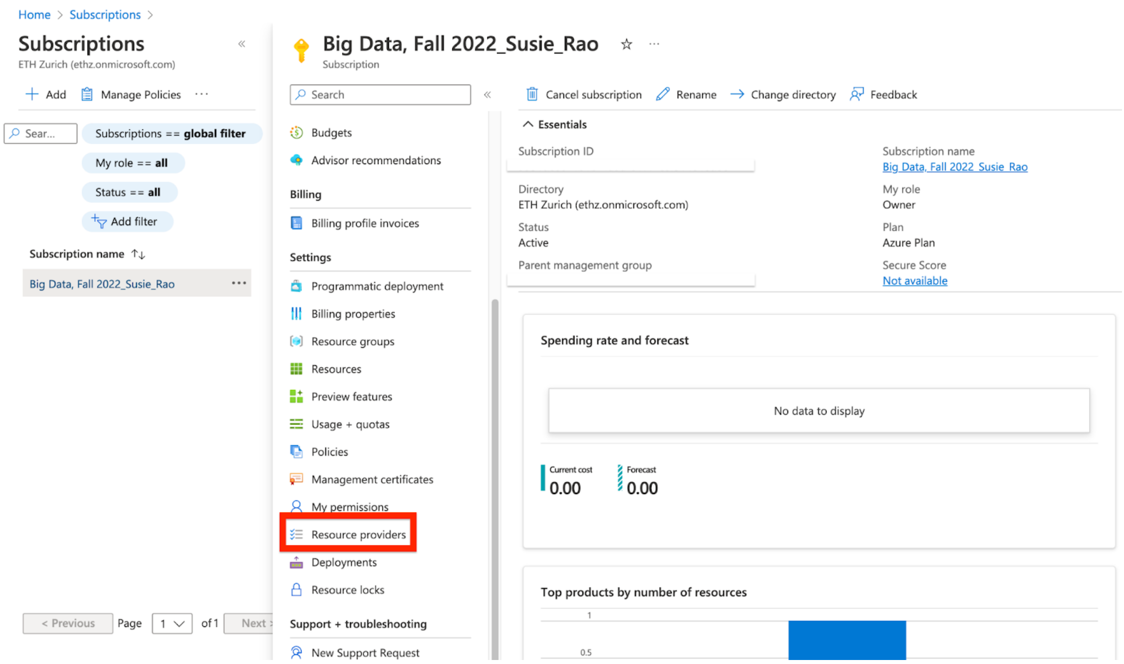
Connection string

•••... Show

- ## Create HDInsight cluster

In this assignment, you will use the HDInsight cluster (https://learn.microsoft.com/en-us/azure/hdinsight/hdinsight-overview). To create a HDInsight cluster, you need to do the following steps.

- ○ The first step is to register the service provider of HDInsight. To do so, you need to first go into “Subscriptions”. You could find the tab of “Resource Provider” on the left hand side of the “Setting” panel and then search “HDInsight” for registration. After you click on the “Register” tab, it takes only a few seconds to register the resources. Then you should be able to see the status of “Microsoft.HDInsight” is changed to “Registered”.



Subscription ID

Directory
ETH Zurich (ethz.onmicrosoft.com)

Status
Active

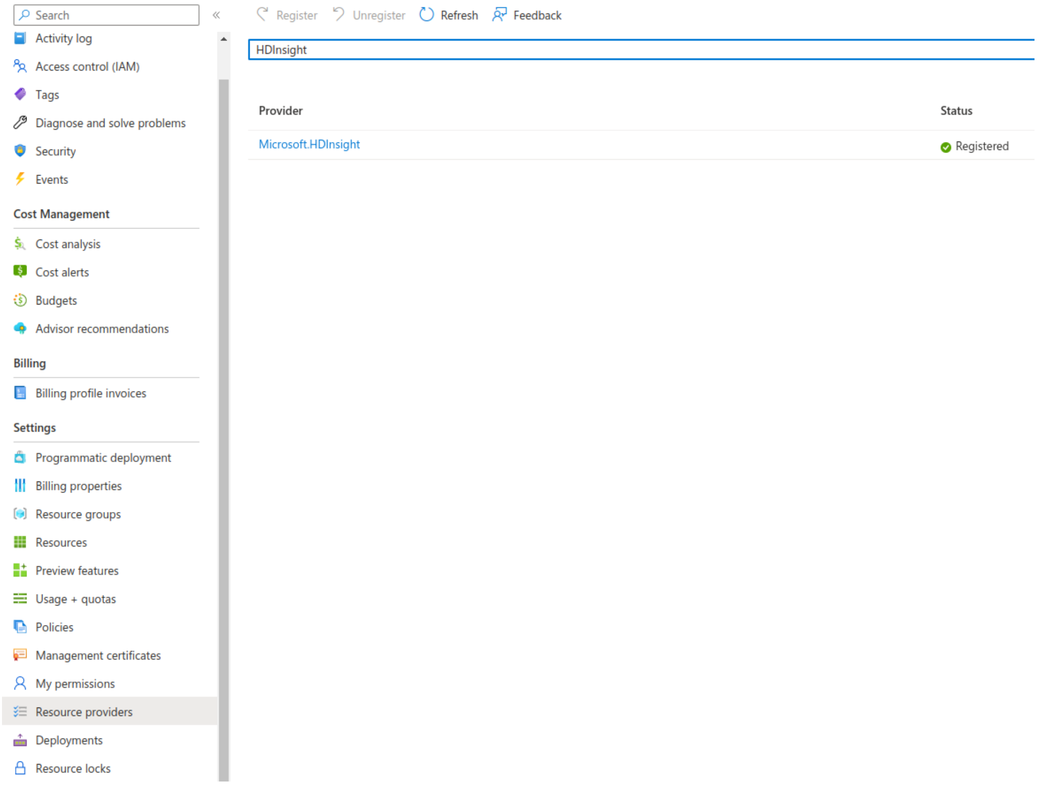
Parent management group

Subscription name
Big Data, Fall 2022 Susie Rao

My role
Owner

Plan
Azure Plan

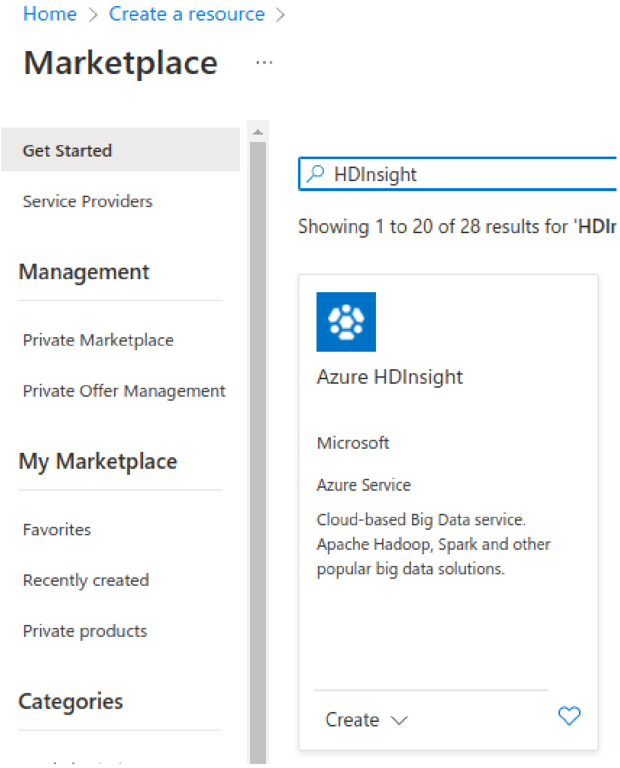
Secure Score
Not available



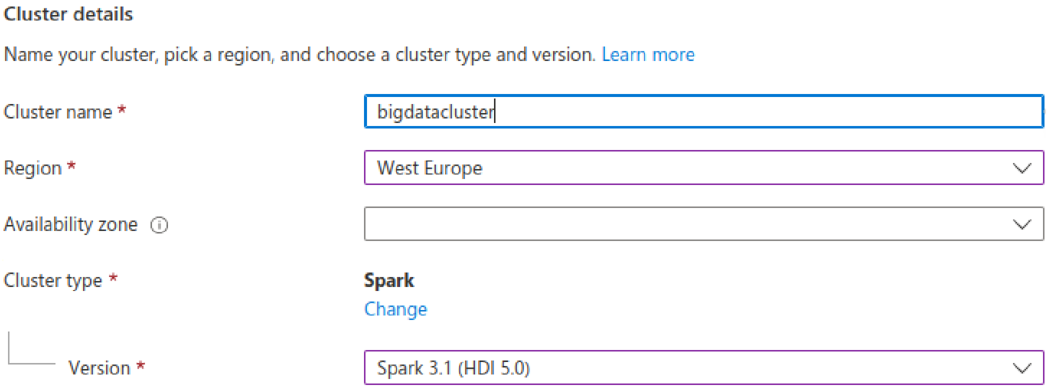
HDInsight

Provider	Status
Microsoft.HDInsight	Registered

- Then you could create the resource of HDInsight. You could search for the resources in the "Marketplace".



- During the basic configuration of the HDInsight cluster, please make sure that you are using the proper big data Azure subscription and the region is **West Europe**. And please choose cluster type as **Spark with version 3.1**.

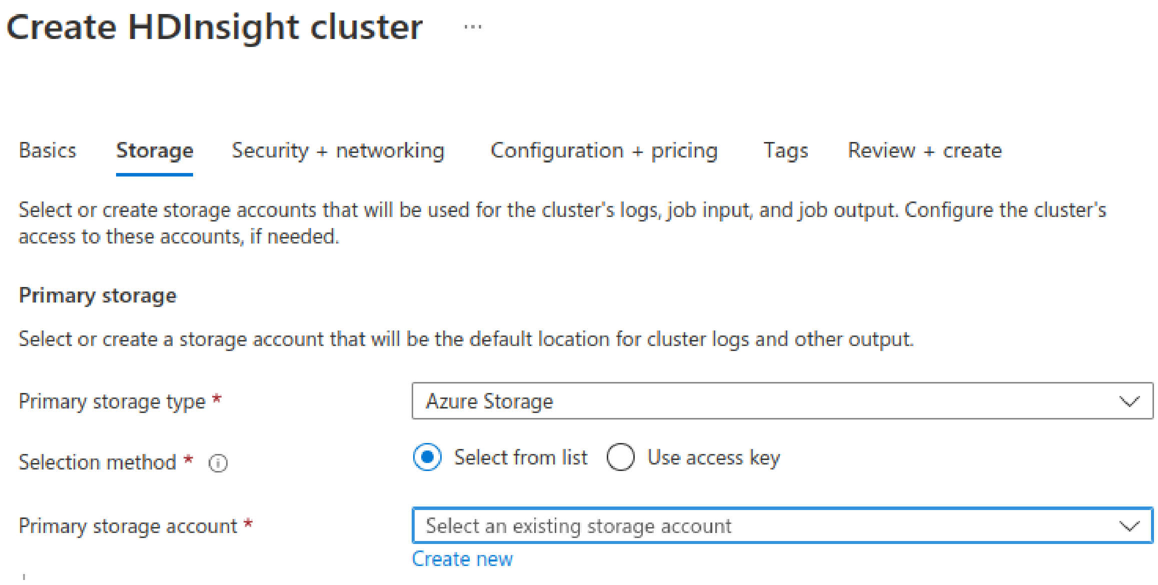


Cluster details

Name your cluster, pick a region, and choose a cluster type and version. Learn more

Cluster name *	bigdatacluster
Region *	West Europe
Availability zone ⓘ	
Cluster type *	Spark Change
Version *	Spark 3.1 (HDI 5.0)

- Please also make sure that when you configure the storage, choose the Azure Storage as your primary storage source and link it to the storage account that you have just created.



Create HDInsight cluster ···

Basics | **Storage** | Security + networking | Configuration + pricing | Tags | Review + create

Select or create storage accounts that will be used for the cluster's logs, job input, and job output. Configure the cluster's access to these accounts, if needed.

Primary storage

Select or create a storage account that will be the default location for cluster logs and other output.

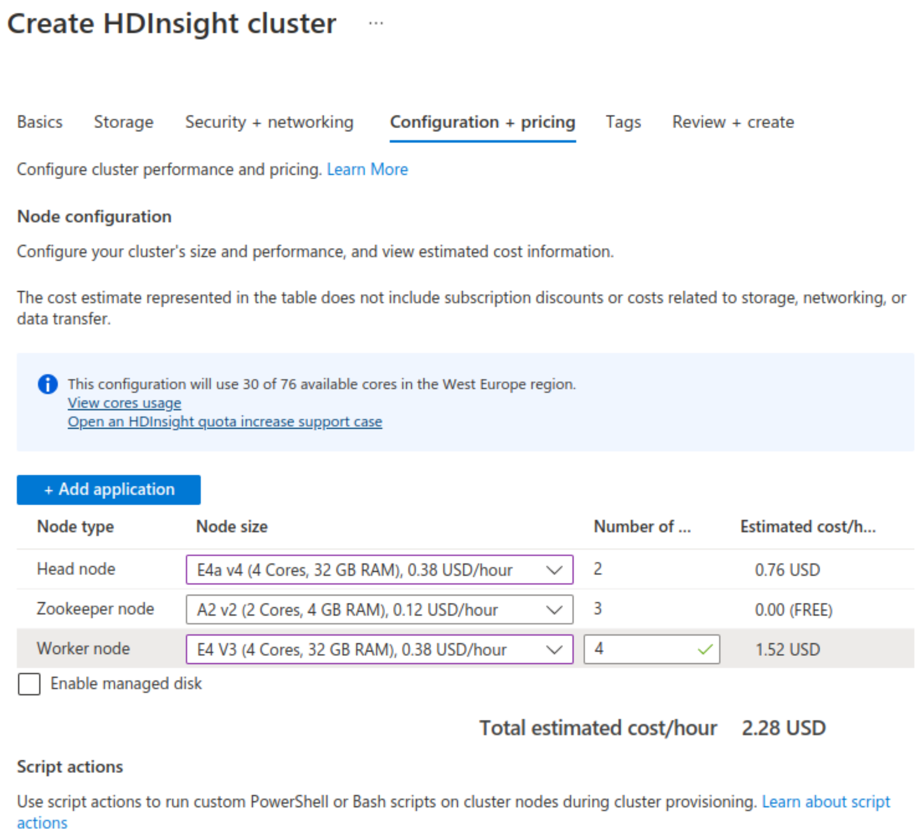
Primary storage type * : Azure Storage

Selection method * ⓘ : ● Select from list ○ Use access key

Primary storage account * : Select an existing storage account

Create new

- We recommend you to create the cluster with **the following options**. The number of nodes can be chosen by you, as it is within a reasonable amount of cost (say 2-3 USD per hour).



Create HDInsight cluster ···

Basics | Storage | Security + networking | **Configuration + pricing** | Tags | Review + create

Configure cluster performance and pricing. Learn More

Node configuration

Configure your cluster's size and performance, and view estimated cost information.

The cost estimate represented in the table does not include subscription discounts or costs related to storage, networking, or data transfer.

ⓘ This configuration will use 30 of 76 available cores in the West Europe region.
View cores usage
Open an HDInsight quota increase support case

+ Add application

Node type	Node size	Number of ...	Estimated cost/h...
Head node	E4a v4 (4 Cores, 32 GB RAM), 0.38 USD/hour	2	0.76 USD
Zookeeper node	A2 v2 (2 Cores, 4 GB RAM), 0.12 USD/hour	3	0.00 (FREE)
Worker node	E4 V3 (4 Cores, 32 GB RAM), 0.38 USD/hour	4 ✓	1.52 USD

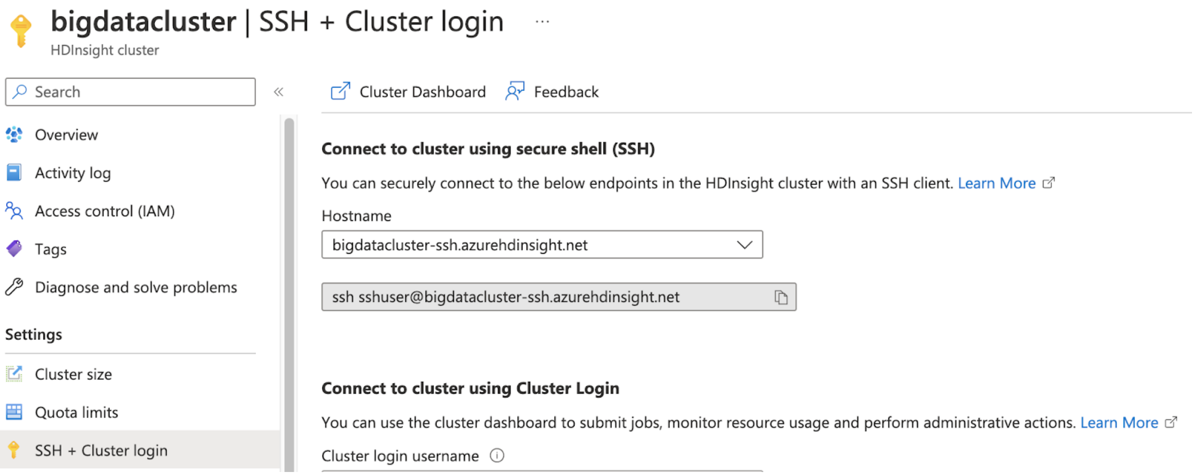
□ Enable managed disk

Total estimated cost/hour 2.28 USD

Script actions

Use script actions to run custom PowerShell or Bash scripts on cluster nodes during cluster provisioning. Learn about script actions

- It takes about 10-15 minutes to create the cluster. Once you have created your HDInsight cluster, you can access it using SSH.



bigdatacluster | SSH + Cluster login

HDInsight cluster

Connect to cluster using secure shell (SSH)

You can securely connect to the below endpoints in the HDInsight cluster with an SSH client. Learn More

Hostname: bigdatacluster-ssh.azurehdinsight.net

```
ssh sshuser@bigdatacluster-ssh.azurehdinsight.net
```

Connect to cluster using Cluster Login

You can use the cluster dashboard to submit jobs, monitor resource usage and perform administrative actions. Learn More

Cluster login username

- Access your cluster.
  Make sure you can access your cluster (the NameNode) via SSH:
  $ ssh <ssh_user_name>@<cluster_name>-ssh.azurehdinsight.net

  E.g., *ssh sshuser@bigdatacluster-ssh.azurehdinsight.net*
  The password is the one you specified when you created the cluster.

Quick test of the cluster

- On the cluster (via ssh): Download RumbleDB (to the local disk of the remote machine on the head node e.g., sshuser@hn0-bigdat):
  wget https://github.com/RumbleDB/rumble/releases/download/v1.20.0/rumbledb-1.20.0-for-spark-3.1.jar

- Run the shell:
  spark-submit rumbledb-1.20.0-for-spark-3.1.jar repl

- In the shell, you could run the following command to read the json file that is in your storage account.

  This is how you access the azure blob storage (https://learn.microsoft.com/en-us/azure/hdinsight/hdinsight-hadoop-use-blob-storage): *wasbs://<containername>@<accountname>.blob.core.windows.net/<file.path>/*

  Example code to read the json file (you need to change the container name and account name) :

json-file("wasbs://big-data-2022-11-07t16-17-03-407z@bigdatablobstorage.blob.core.windows.net/.json")*

json-file("wasbs://big-data-2022-11-07t16-17-03-407z@bigdatablobstorage.blob.core.windows.net/git-archive.json").type=>distinct-values()

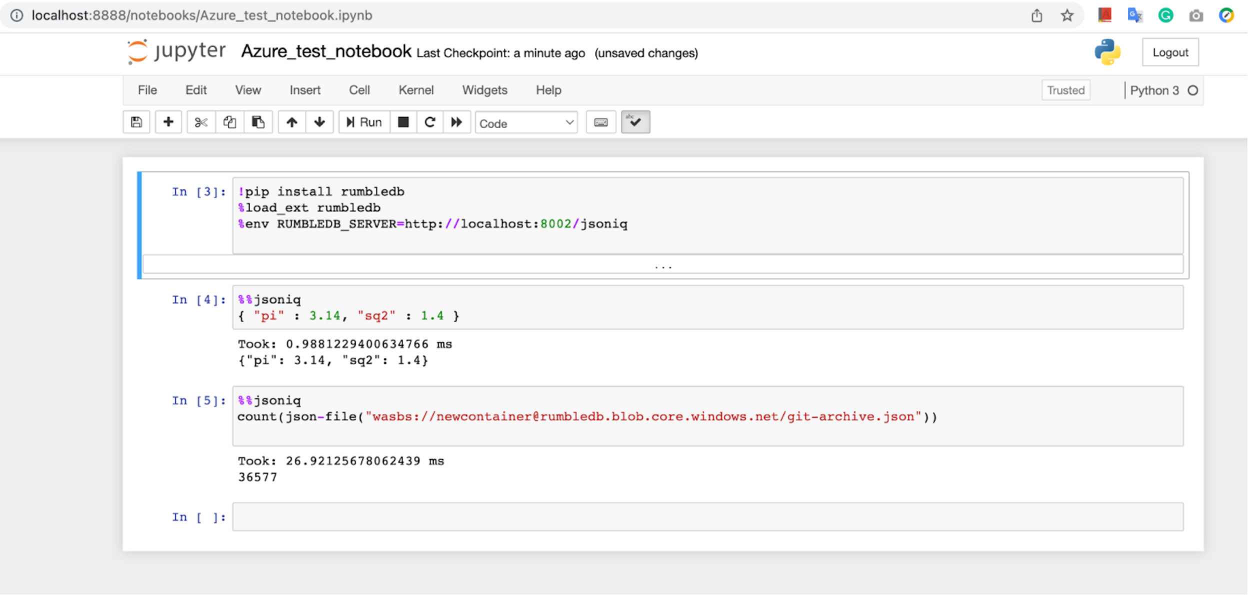
- You can also run the RumbleDB as a server:
  spark-submit rumbledb-1.20.0-for-spark-3.1.jar --server yes --port 9090

- SSH forwarding
  After running RumbleDB as a server, we can use a juypter notebook to interact with it. We recommend using SSH forwarding. For that, make sure you have run:
  spark-submit rumbledb-1.20.0-for-spark-3.1.jar --server yes --port 8002

  and then on your local machine forward 8002 => localhost:8002
  ssh -N -L 8002*:localhost:*8002 *sshuser@[servername]-ssh.azurehdinsight.net*
  E.g.,
  ssh -N -L 8002*:localhost:*8002 *sshuser@bigdatacluster-ssh.azurehdinsight.net*

  See an example of running a local notebook interacting with RumbleDB hosted

  on Azure

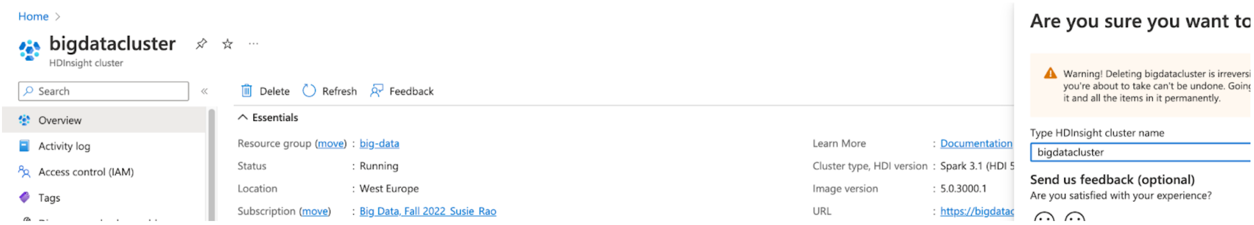

localhost:8888/notebooks/Azure_test_notebook.ipynb
jupyter
Azure_test_notebook Last Checkpoint: a minute ago (unsaved changes)
Logout
File
Edit
View
Insert
Cell
Kernel
Widgets
Help
Trusted
Python 3
Run
Code

```
In [3]: !pip install rumbledb
        %load_ext rumbledb
        %env RUMBLEDB_SERVER=http://localhost:8002/jsoniq

In [4]: %%jsoniq
        { "pi" : 3.14, "sq2" : 1.4 }

        Took: 0.9881229400634766 ms
        {"pi": 3.14, "sq2": 1.4}

In [5]: %%jsoniq
        count(json-file("wasbs://newcontainer@rumbledb.blob.core.windows.net/git-archive.json"))

        Took: 26.92125678062439 ms
        36577

In [ ]:
```

You can now try out various queries on different datasets we have on this week's exercise sheet from (1) the RumbleDB shell on Azure and (2) your notebook on the cluster and evaluate the speed difference.

- ## Delete / down size the cluster

Important: Remember to **delete** the cluster once you are done. If you want to stop doing the assignments at any point, delete it and recreate it using the same container name as you used the first time, so that the resources are still there. It is very important that you remember to delete the cluster if you don't plan to use it as this is costly and soon you will use up all your credits.



Resource group (move) : big-data
Status : Running
Location : West Europe
Subscription (move) : Big Data, Fall 2022 Susie Rao

Learn More : Documentation
Cluster type, HDI version : Spark 3.1 (HDI 5
Image version : 5.0.3000.1
URL : https://bigdatac

Are you sure you want to

Warning! Deleting bigdatacluster is irreversi
you're about to take can't be undone. Goinç
it and all the items in it permanently.

Type HDInsight cluster name
bigdatacluster

Send us feedback (optional)
Are you satisfied with your experience?

If you don't want to delete your cluster, note that cluster cannot be shut down, but it's possible to scale down the worker nodes to minimize cost when you do not use it (https://learn.microsoft.com/en-us/azure/hdinsight/hdinsight-scaling-best-practices) . The storage is relatively cheap compared to the cluster so you can keep your storage account for a longer period of time. But please do remember to delete your storage once you don't need it anymore.