

# Submit Apache Spark Applications Lab



Estimated time needed: 20 minutes

In this lab, you will learn how to submit Apache Spark applications from a python script. This exercise is straightforward thanks to Docker Compose.

## Learning Objectives

In this lab, you will:

- Install a Spark Master and Worker using Docker Compose
- Create a python script containing a spark job
- Submit the job to the cluster directly from python (Note: you'll learn how to submit a job from the command line in the Kubernetes Lab)

## Prerequisites

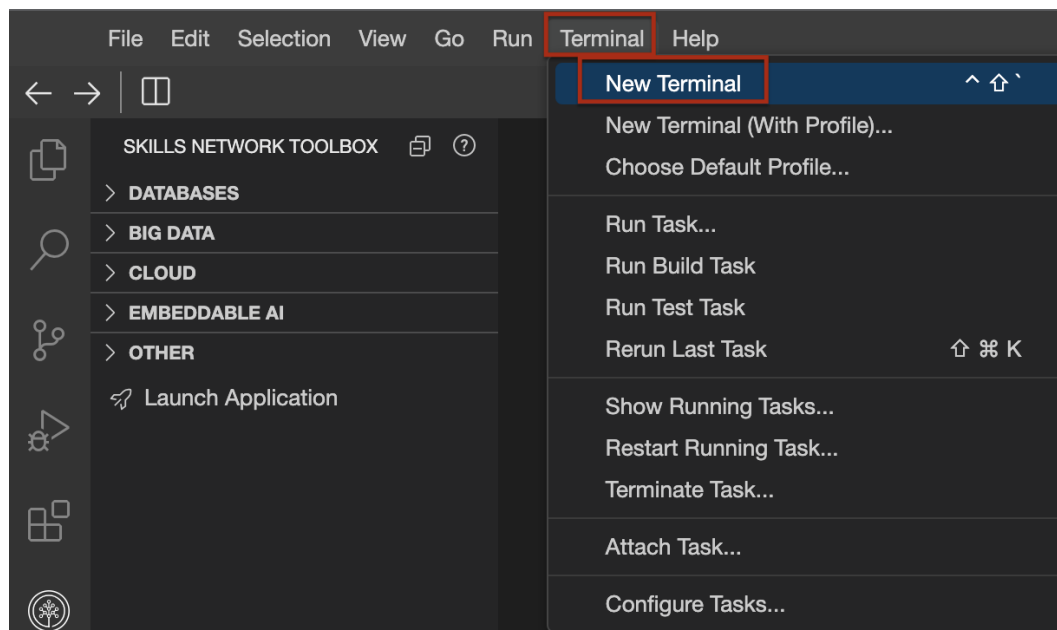
Note: If you are running this lab within the Skillsnetwork Lab environment, all prerequisites are already installed for you

The only pre-requisites to this lab are:

- A working *docker* installation
- Docker Compose
- The *git* command line tool
- A python development environment

## Install a Apache Spark cluster using Docker Compose

On the right hand side to this instructions you'll see the Cloud IDE. Select the *Lab* tab. On the menu bar select *Terminal*>*New Terminal*.



Get the latest code:

```
1. 1
1. git clone https://github.com/big-data-europe/docker-spark.git
```

Copied! Executed!

Change the directory to the downloaded code:

```
1. 1
1. cd docker-spark
```

Copied! Executed!

Start the cluster

```
1. 1
1. docker-compose up
```

Copied! Executed!

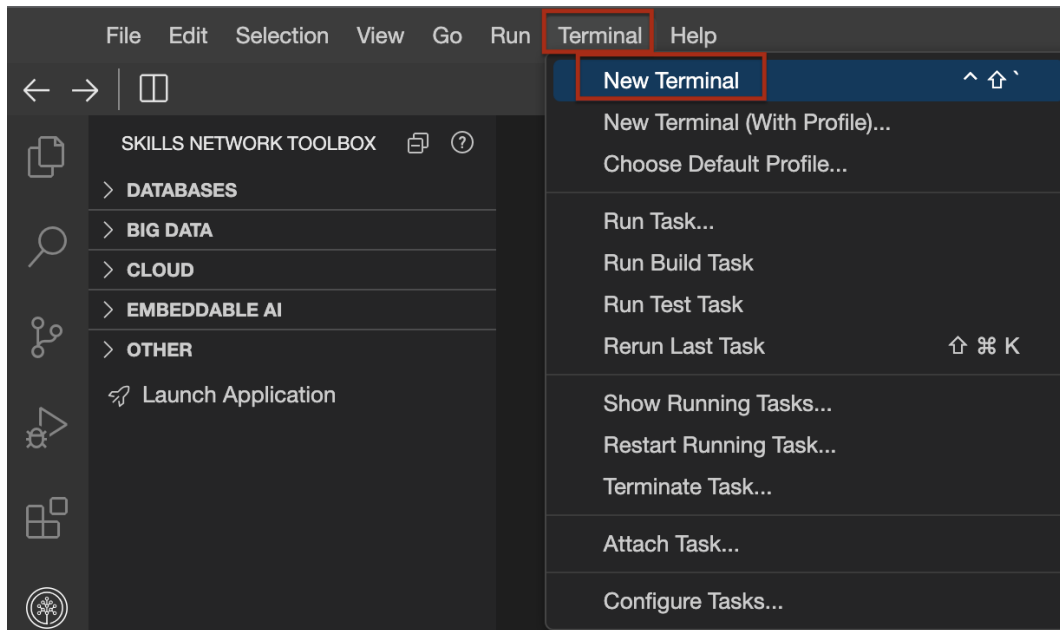
After quite some time you should see the following message:  
*Successfully registered with master spark://<server address>:7077*

```
spark-worker-1 | 22/01/14 05:39:36 INFO Worker: Successfully registered with
master spark://50bfae057469:7077
```

**NOTE:** Please keep this terminal running and do not close it, as it is essential for further steps in the lab to run correctly.

## Create code

1. Click Terminal from the menu, and click New Terminal to open a new terminal window.



2. Once the terminal opens up at the bottom of the window, please type in the following command in the terminal to create the Python script.

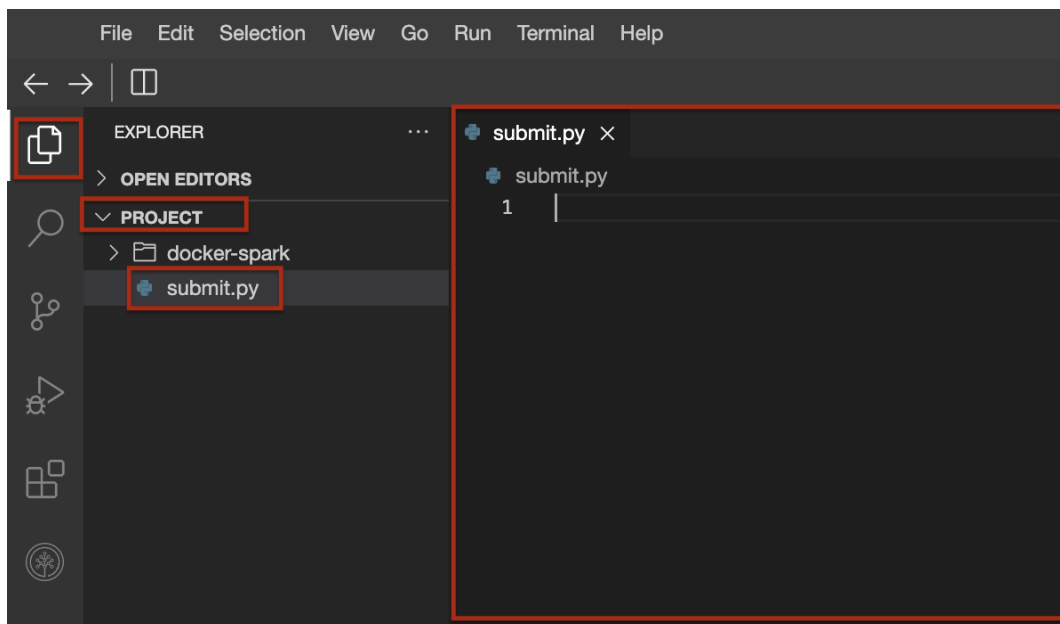
1. 1

1. touch submit.py

Copied! Executed!

A new python file called submit.py is created.

3. Open the file in the file editor.



4. Paste the following code to the file and save.

1. 1  
2. 2  
3. 3  
4. 4

```

5. 5
6. 6
7. 7
8. 8
9. 9
10. 10
11. 11
12. 12
13. 13
14. 14
15. 15
16. 16
17. 17
18. 18
19. 19
20. 20
21. 21
22. 22
23. 23
24. 24
25. 25
26. 26

1. import findspark
2. findspark.init()
3. from pyspark import SparkContext, SparkConf
4. from pyspark.sql import SparkSession
5. from pyspark.sql.types import StructField, StructType, IntegerType, StringType
6.
7. sc = SparkContext.getOrCreate(SparkConf().setMaster('spark://localhost:7077'))
8. sc.setLogLevel("INFO")
9.
10. spark = SparkSession.builder.getOrCreate()
11.
12. spark = SparkSession.builder.getOrCreate()
13. df = spark.createDataFrame(
14.     [
15.         (1, "foo"),
16.         (2, "bar"),
17.     ],
18.     StructType(
19.         [
20.             StructField("id", IntegerType(), False),
21.             StructField("txt", StringType(), False),
22.         ]
23.     ),
24. )
25. print(df.dtypes)
26. df.show()

```

Copied!

## Execute code / submit Spark job

Now we execute the python file we saved earlier.

1. In the terminal, run the following commands to upgrade the pip installer to ensure you have the latest version by running the following commands.

```

1. 1
2. 2
3. 3

1. rm -r ~/.cache/pip/selfcheck/
2. pip3 install --upgrade pip
3. pip install --upgrade distro-info

```

Copied! Executed!

`rm -r ~/.cache/pip/selfcheck/` removes any previously cached version of pip and allows to install the latest one.

2. Please enter the following commands in the terminal to download the spark environment.

```

1. 1

1. wget https://archive.apache.org/dist/spark/spark-3.3.3/spark-3.3.3-bin-hadoop3.tgz && tar xf spark-3.3.3-bin-hadoop3.tgz && rm -rf spark-3.3.3-b

```

Copied! Executed!

This takes a while. This downloads the spark as a zipped archive and unzips it in the current directory.

3. Run the following commands to set up the `JAVA_HOME` which is preinstalled in the environment and `SPARK_HOME` which you just downloaded.

```

1. 1
2. 2

1. export JAVA_HOME=/usr/lib/jvm/java-1.11.0-openjdk-amd64
2. export SPARK_HOME=/home/project/spark-3.3.3-bin-hadoop3

```

Copied! Executed!

4. Install the required packages to set up the spark environment.

```

1. 1

1. pip install pyspark

```

Copied! Executed!

```

1. 1

```

```
1. python3 -m pip install findspark
```

Copied!

Executed!

5. Type in the following command in the terminal to execute the Python script.

```
1. 1
```

```
1. python3 submit.py
```

Copied!

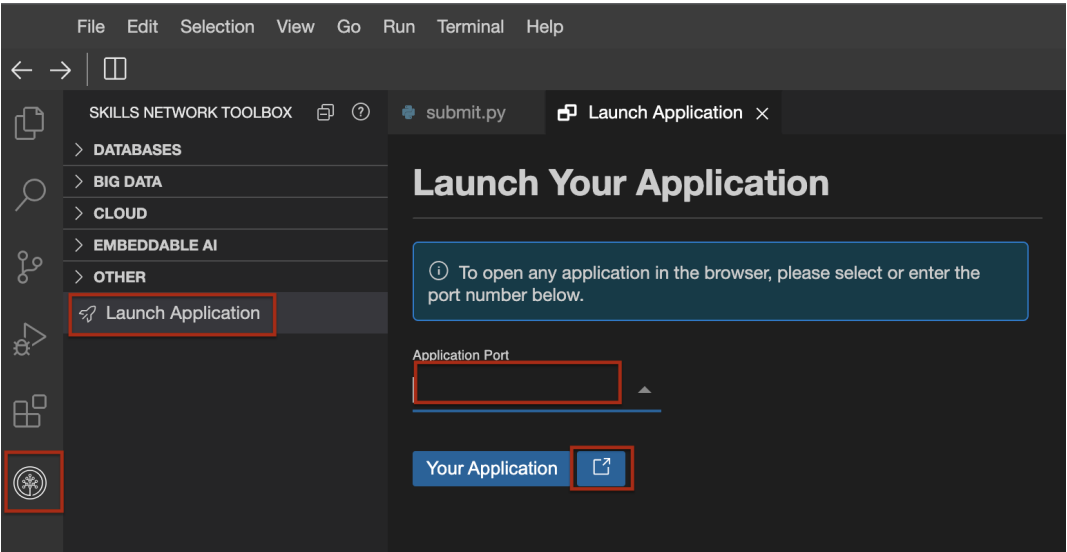
Executed!

# Experiment yourself

Please have a look at the UI of the Apache Spark master and worker.

1. Click on the button below to launch the Spark Master. Alternatively, click on the Skills Network button on the left, it will open the “Skills Network Toolbox”. Then click the other, then Launch Application. From there you should be able to enter the port number as 8080 and launch.

Spark Master




2. This will take you to the admin UI of the Spark master (if your popup blocker doesn’t prevent it).

← → ↻

https://romeokienzl1-8080.theiadocker-2-labs-prod-theiak8s-3-tor01.proxy

Getting Started Registration Whitelisting Workday ibm w3 Developer w3 Travel@IBM Launch Page Dev

 3.1.1

Spark Master at spark://8626fea4cc2a:7077

URL: spark://8626fea4cc2a:7077

Alive Workers: 1

Cores in use: 16 Total, 16 Used

Memory in use: 61.9 GiB Total, 1024.0 MiB Used

Resources in use:

Applications: 1 Running, 0 Completed

Drivers: 0 Running, 0 Completed

Status: ALIVE

▼ Workers (1)

| Worker Id                              | Address          | State | Cores   |
|--|------------------|-------|---------|
| worker-20211002084753-172.18.0.3-33501 | 172.18.0.3:33501 | ALIVE | 16 (16) |

▼ Running Applications (1)

| Application ID          | Name                 | Cores | Memory per Executor | Resources Per |
|-------------------------|----------------------|-------|---------------------|---------------|
| app-20211002090124-0000 | (kill) pyspark-shell | 16    | 1024.0 MiB          |               |

▼ Completed Applications (0)

| Application ID | Name | Cores | Memory per Executor | Resources Per Executor |
|----------------|------|-------|---------------------|------------------------|
|----------------|------|-------|---------------------|------------------------|

3. Please notice that you can see all registered workers (one in this case) and submitted jobs (also one in this case)

Note: The way how the lab environment works you can't click on links in the UI - in a real installation, this of course is possible.

4. Click the button below to open the Spark Worker on 8081. Alternatively, click on the Skills Network button on the left, it will open the "Skills Network Toolbox". Then click the Other, then Launch Application. From there, you should be able to enter the port number as 8081 and launch.

Spark Worker

You should find your currently running job here as well.

# Summary

In this lab you've learned how to setup an experimental Apache Spark cluster on top of Docker Compose. You are now able to submit a Spark job directly from python code. In the Kubernetes lab you'll learn how to submit Spark jobs from command line as well.

## Author(s)

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## Changelog

| Date         | Version | Changed by     | Change Description  |
|--------------|---------|----------------|---|
| October 2021 | 1.0     | Romeo Kienzler | Initial version   |
| 01-09-2022   | 1.1     | K Sundararajan | Updated instructions for Launch Application as per new Theia IDE & the format for Changelog |
| 30-12-2022   | 1.2     | K Sundararajan | Updated pyspark installation command  |
| 16-10-2023   | 1.3     | Lavanya T S    | Updated and restructured the lab  |
| 17-10-2023   | 1.4     | K Sundararajan | Made few more updates based on Beta testing observations                                    |