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BIG DATA – 07 Spark Docker

Interaksi dengan Spark di Lingkungan Windows Menggunakan Docker

Prasyarat

1. Windows 10/11 (64-bit) dengan versi Pro, Enterprise, atau Education
2. Docker Desktop untuk Windows diinstal dan berjalan
3. WSL 2 (Windows Subsystem for Linux versi 2) diaktifkan

Langkah - langkah

1. Pull Image Spark Resmi

docker pull apache/spark:latest

```
D:\POLINEMA\SEMESTER 6\Big Data>docker pull apache/spark:latest
latest: Pulling from apache/spark
391ef20df327: Pull complete
d9802f032d67: Pull complete
5762a181dda2: Pull complete
f937e0a2086c: Pull complete
d3c7b6bd77aa: Pull complete
0f3083818c14: Pull complete
b072aa17899d: Pull complete
4f4fb700ef54: Pull complete
1ba3910f6ba2: Pull complete
4d9bb71a5e54: Pull complete
3058f73b8f49: Pull complete
Digest: sha256:39321d67b23e2e0953f81b60778f74bf40c40a18dfb0e881e6a38593af60afa1
Status: Downloaded newer image for apache/spark:latest
docker.io/apache/spark:latest
```

2. Menjalankan Spark Master

Sebelumnya buat docker network sebagai berikut

```
PS C:\Users\sukma bagus> docker network create spark-net
```

Kemudian jalankan spark-master dalam network tersebut

```
PS C:\Users\sukma bagus> docker run -d -p 8080:8080 -p 7077:7077 --name spark-master --network spark-net -m 2g --cpus=2 apache
/spark:latest /opt/spark/bin/spark-class org.apache.spark.deploy.master.Master
cf40a98f79ba4419a89be84c27d99a13aaee6a9b587da40db20c9b09d93f1b1f
PS C:\Users\sukma bagus>
```

3. Menjalankan Spark Worker

```
PS C:\Users\sukma bagus> docker run -d --name spark-worker3 --network spark-net -m 2g --cpus=2 apache/spark:latest /opt/spark/bin/spark-class or
g.apache.spark.deploy.worker.Worker spark://spark-master:7077 --memory 1g --cores 1
d2994679fada4fcccf506965f37bf2b41b675dbdc771c62e0de587289b19c751
PS C:\Users\sukma bagus>
```

jalankan perintah di atas beberapa kali dengan nama yang berbeda untuk membuat beberapa worker. Misalnya spark-worker1, spark-worker2, dan seterusnya

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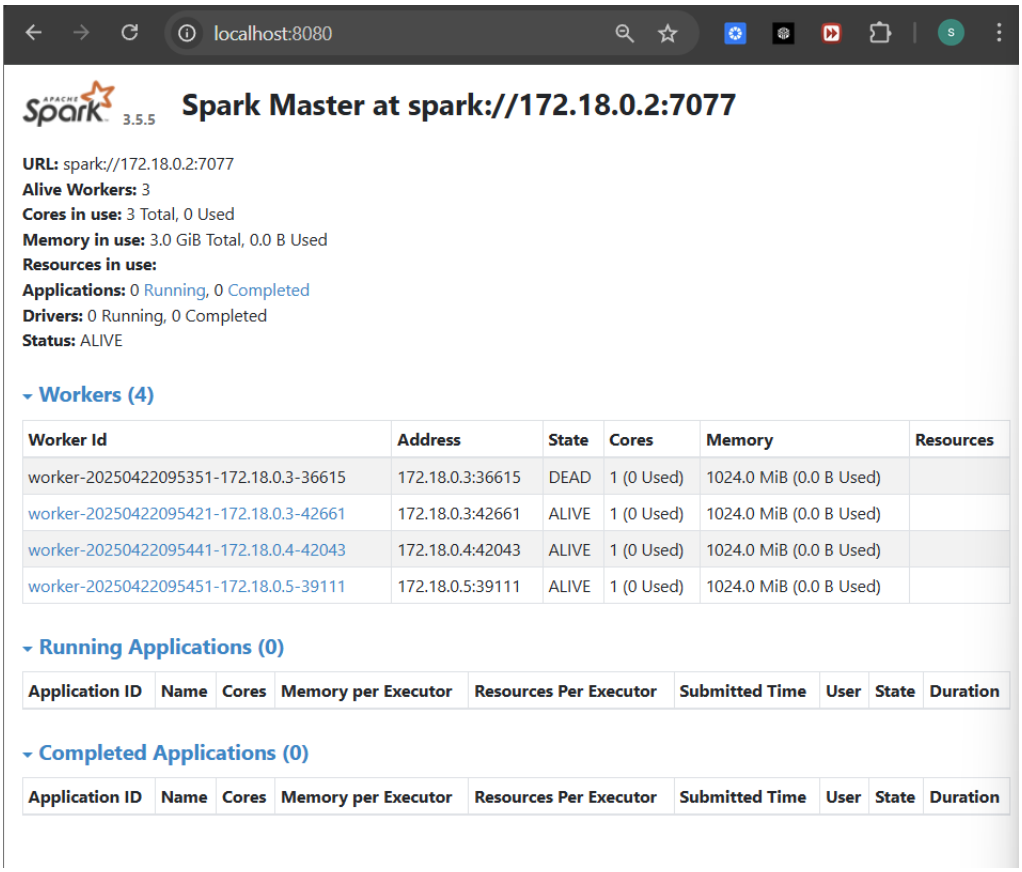
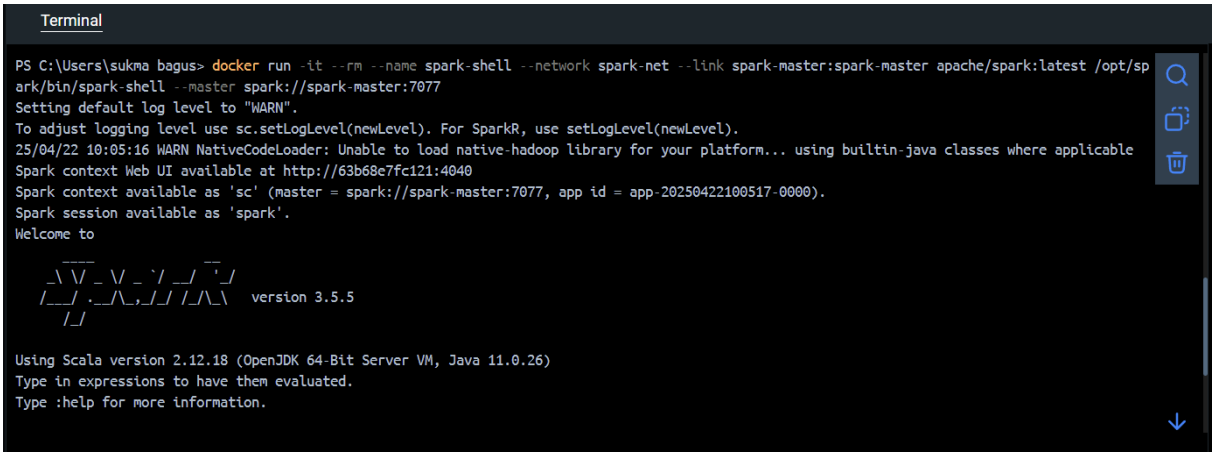
4. Mengakses Spark Web UI



5. Menjalankan Spark Shell



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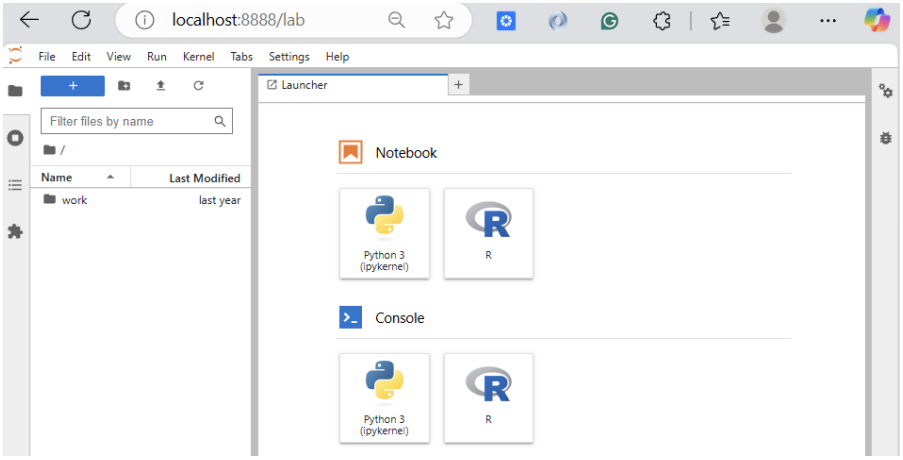
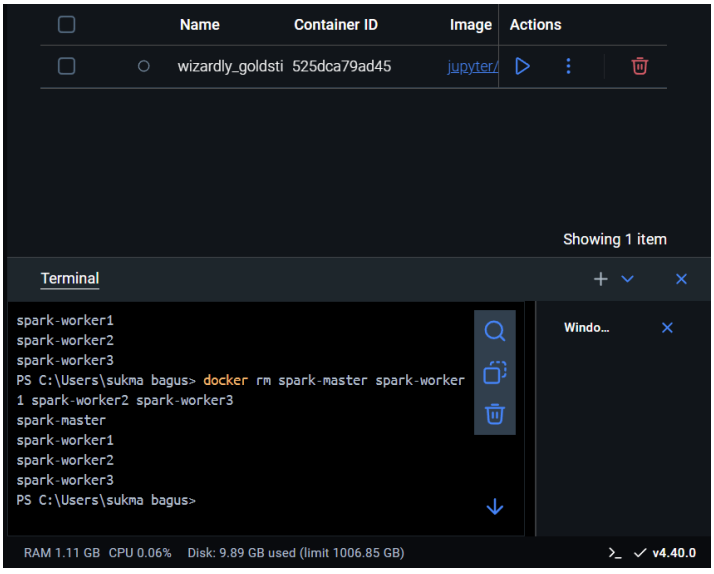
6. Menggunakan Jupyter Notebook dengan Spark

```
PS C:\Users\sukma bagus> docker run -it -p 8888:8888 -p 4040
:4040 --network spark-net jupyter/all-spark-notebook
```

Setelah itu, akses Jupyter Notebook di http://localhost:8888



Menghentikan container



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docker stop spark-master spark-worker
docker rm spark-master spark-worker

Contoh Program Word Count dengan Spark di Docker

Cara 1 : Menggunakan Spark Shell

1. Menjalankan spark-shell

```
Terminal
PS C:\Users\sukma bagus> docker run -it --rm --name spark-shell --network spark-net --link spark-master:spark-master apache/spark:latest /opt/spark/bin/spark-shell --master spark://spark-master:7077
Setting default log level to "WARN".
To adjust logging level use sc.setLogLevel(newLevel). For SparkR, use setLogLevel(newLevel).
25/04/22 10:05:16 WARN NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
Spark context Web UI available at http://63b68e7fc121:4040
Spark context available as 'sc' (master = spark://spark-master:7077, app id = app-20250422100517-0000).
Spark session available as 'spark'.
Welcome to
      ____              __
     / __/__  ___ _____/ /__
    _\ \/ _ \/ _ `/ __/  '_/
   /___/ .__/\_,_/_/ /_/\_\   version 3.5.5
      /_/

Using Scala version 2.12.18 (OpenJDK 64-Bit Server VM, Java 11.0.26)
Type in expressions to have them evaluated.
Type :help for more information.
```

2. Ketikan kode di spark shell:

```
Terminal
scala> val textData = List("Hello Spark", "Hello Docker", "Spark is awesome", "Docker makes Spark easy")
val rdd = sc.parallelize(textData)
val wordCounts = rdd.flatMap(line => line.split(" "))
  .map(word => (word, 1))
  .reduceByKey(_ + _)
wordCounts.collect().foreach(println)
textData: List[String] = List(Hello Spark, Hello Docker, Spark is awesome, Docker makes Spark easy)

scala> rdd: org.apache.spark.rdd.RDD[String] = ParallelCollectionRDD[0] at parallelize at <console>:24

scala> wordCounts: org.apache.spark.rdd.RDD[String] = MapPartitionsRDD[1] at flatMap at <console>:23
Docker
Spark
is
awesome
Docker
makes
Spark
easy
```

Untuk keluar dari spark-shell

```
scala> System.exit(0)
PS C:\Users\sukma bagus>
```

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Cara 2 : Menggunakan PySpark (Python)

1. Jalankan PySpark Shell di Docker

```
PS C:\Users\sukma bagus> docker run -it --rm --name pyspark-shell --network spark-net --link spark-master:spark-master apache/
formation.
Setting default log level to "WARN".
To adjust logging level use sc.setLogLevel(newLevel). For SparkR, use setLogLevel(newLevel).
25/04/23 09:45:49 WARN NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes
where applicable
Welcome to
      ____              __
     / __/__  ___ _____/ /__
    _\ \/ _ \/ _ `/ __/  '_/
   /__ / .__/\_,_/_/ /_/\_\   version 3.5.5
      /_/

Using Python version 3.8.10 (default, Feb  4 2025 15:02:54)
Spark context Web UI available at http://2972282ec293:4040
Spark context available as 'sc' (master = spark://spark-master:7077, app id = app-20250423094550-0002).
SparkSession available as 'spark'.
>>>

RAM 3.02 GB  CPU 0.25%    Disk: 9.89 GB used (limit 1006.85 GB)
```

2. Ketikkan kode Python berikut:

```
>>> from pyspark.sql import SparkSession
>>> spark = SparkSession.builder.appName("WordCount").getOrCreate()
25/04/23 09:59:19 WARN SparkSession: Using an existing Spark session; only runtime SQL configurations will take effect.
>>> data = ["Hello Spark", "Hello Docker", "Spark is awesome", "Docker makes Spark easy"]
>>> rdd = spark.sparkContext.parallelize(data)
>>> word_counts = rdd.flatMap(lambda line: line.split(" ")) \
... .map(lambda word: (word, 1)) \
... .reduceByKey(lambda a, b: a + b)
>>> word_counts.collect()
[Stage 0:>                                                                                                  [('Docker', 2), ('Spark'
, 3), ('awesome', 1), ('easy', 1), ('Hello', 2), ('is', 1), ('makes', 1)]
>>>
```

Untuk keluar dari pyspark-shell megunakan : **exit()**

Cara 3 : Menggunakan Jupyter Notebook

1. Menggunakan Jupyter Notebook (seperti di container jupyter/all-spark-notebook)

```
PS C:\Users\sukma bagus> docker run -it -p 8888:8888 -p 4040
:4040 --network spark-net jupyter/all-spark-notebook
```

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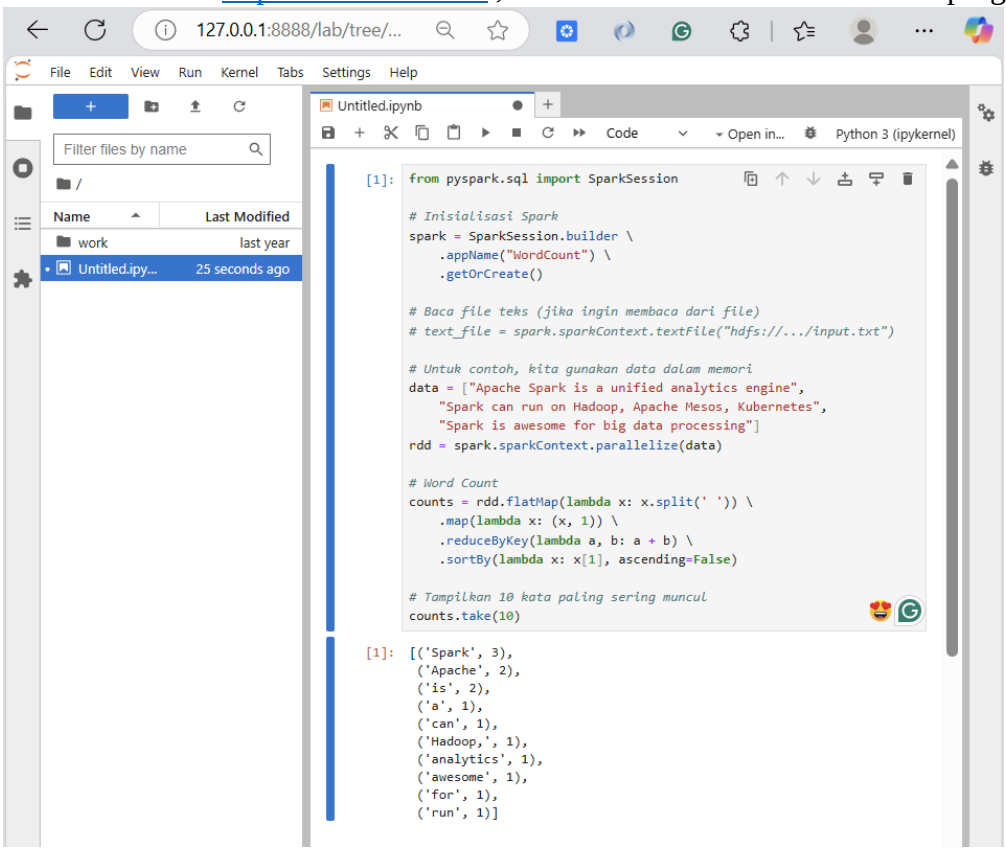
Buka browser di http://localhost:8888 , kemudian buat file dan tulis kode program



Menjalankan Program sebagai Script

1. Buat file wordcount.py :

wordcount.py > ...

```python
from pyspark.sql import SparkSession

if __name__ == "__main__":
    spark = SparkSession.builder.appName("WordCount").getOrCreate()

    # Untuk versi membaca file
    # lines = spark.read.text("input.txt").rdd.map(lambda r: r[0])

    # Untuk versi data contoh
    data = ["Hello Spark", "Hello Docker", "Spark is awesome"]
    lines = spark.sparkContext.parallelize(data)

    counts = lines.flatMap(lambda x: x.split(' ')) \
        .map(lambda x: (x, 1)) \
        .reduceByKey(lambda a, b: a + b)

    output = counts.collect()
    for (word, count) in output:
        print("%s: %i" % (word, count))

    spark.stop()
```

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2. Jalankan script, jangan lupa juga mendifinisikan network spark-net

```
PS C:\Users\sukma bagus\script> cd ..                    PS C:\Users\sukma bagus> cd app                    PS C:\
Users\sukma bagus\app> docker run --rm --network spark-net -v ${PWD}:/app --link spark-master:spark-master apache/spark:latest
 /opt/spark/bin/spark-submit --master spark://spark-master:7077 /app/wordcount.py
25/04/28 09:44:16 INFO SparkContext: Running Spark version 3.5.5
25/04/28 09:44:16 INFO SparkContext: OS info Linux, 5.15.167.4-microsoft-standard-WSL2, amd64
25/04/28 09:44:16 INFO SparkContext: Java version 11.0.26
25/04/28 09:44:16 WARN NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes
```

Output program:

```
25/04/28 09:44:23 INFO DAGScheduler: Job 0 finished: collect
 at /app/wordcount.py:17, took 4.903890 s
Hello: 2
Spark: 2
is: 1
awesome: 1
Docker: 1
25/04/28 09:44:23 INFO SparkContext: SparkContext is stoppin
g with exitCode 0.
```