DIGITAL TALENT SCHOLARSHIP 2019

Big Data Analytics

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Apache Spark

Instalasi Apache Spark Standalone dan Case Study

Requirement

- EC2 Instance
- Akses ke EC2 Instance.
  - (SSH Client, Putty, WinSCP, dll)
- Anaconda

Instalasi Apache Spark Standalone

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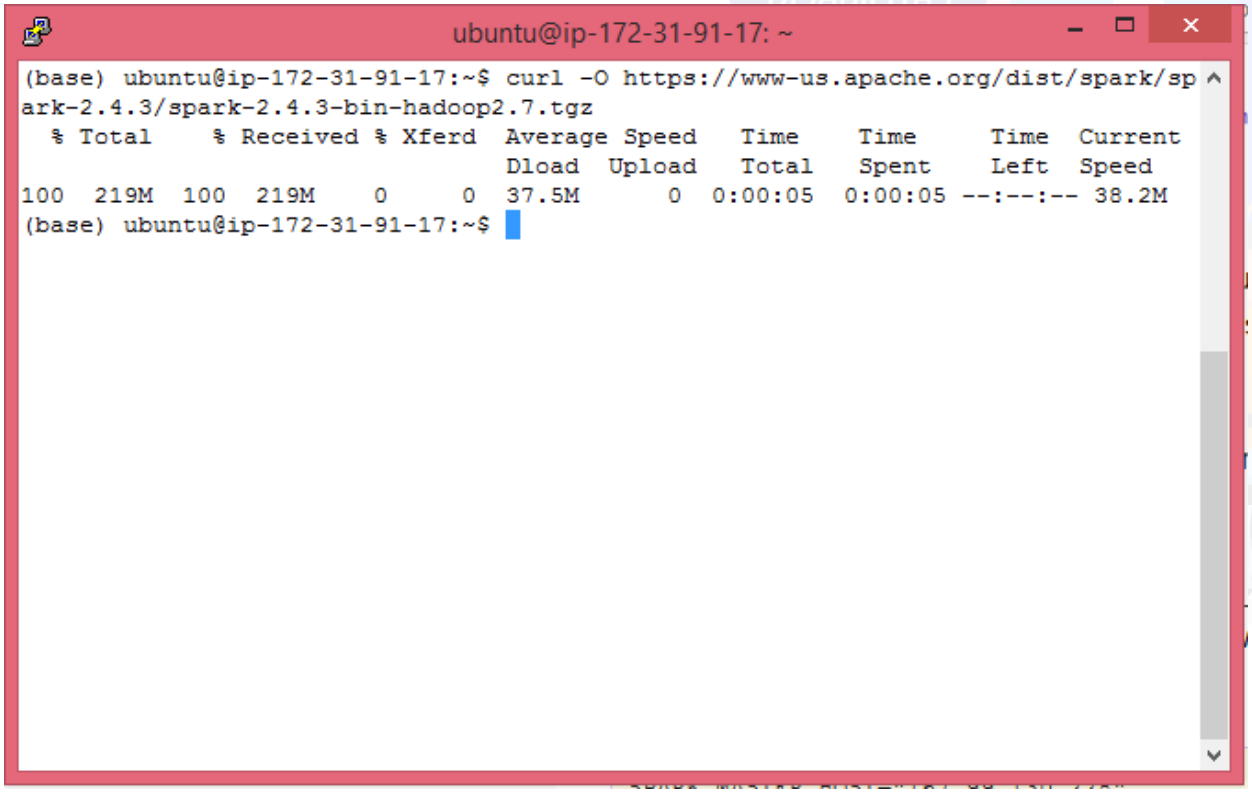
Apache Spark

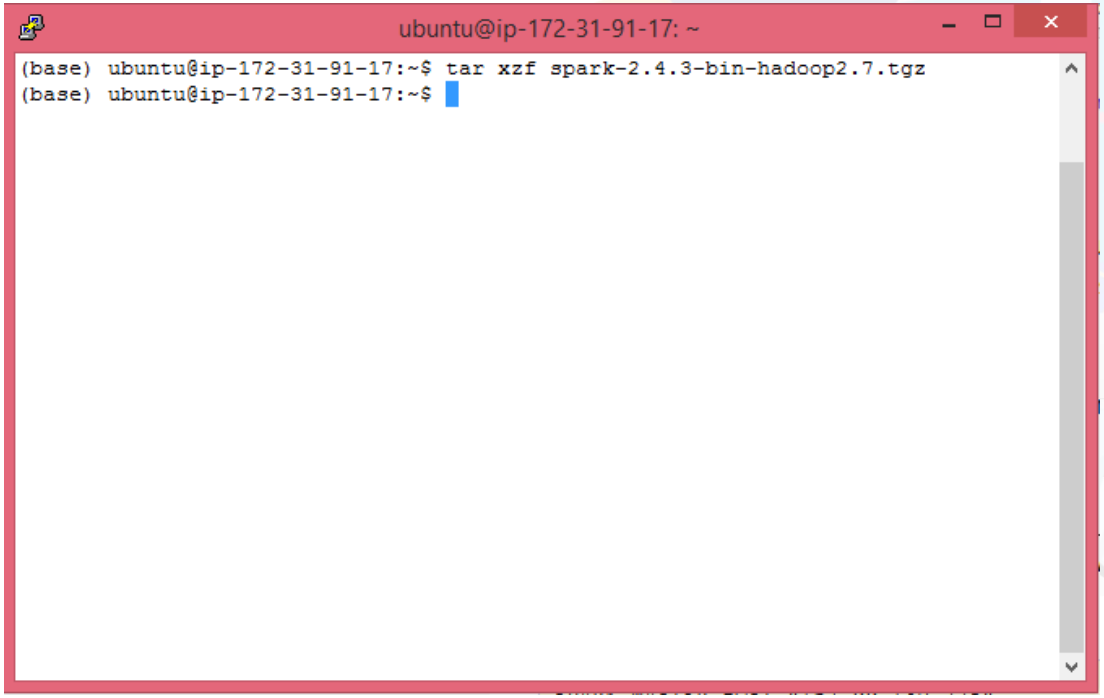
Download Apache Spark

$ curl –O https://www-us.apache.org/dist/spark/spark-2.4.3/spark-2.4.3-bin-hadoop2.7.tgz



Extract Apache Spark

```
$ tar xzf spark-2.4.3-bin-hadoop2.7.tgz
```



Variabel SPARK_HOME

Buka file `.bashrc` atau `.profile` dan tambahkan string berikut.

```
export SPARK_HOME=/home/ubuntu/spark-2.4.3-bin-hadoop2.7

export PATH=$PATH:$SPARK_HOME/bin:$SPARK_HOME/sbin
```

Variabel SPARK_HOME (cont)

/home/ubuntu/.bashrc - master - Editor - WinSCP

```
  elif [ -f /etc/bash_completion ]; then
    . /etc/bash_completion
  fi
fi

export JAVA_HOME=/usr/lib/jvm/java-8-openjdk-amd64
PATH=$PATH:$JAVA_HOME:$JAVA_HOME/jre/bin


# >>> conda initialize >>>
# !! Contents within this block are managed by 'conda init' !!
__conda_setup="$('/home/ubuntu/anaconda3/bin/conda' 'shell.bash' 'hook' 2> /dev/null)"
if [ $? -eq 0 ]; then
    eval "$__conda_setup"
else
    if [ -f "/home/ubuntu/anaconda3/etc/profile.d/conda.sh" ]; then
        . "/home/ubuntu/anaconda3/etc/profile.d/conda.sh"
    else
        export PATH="/home/ubuntu/anaconda3/bin:$PATH"
    fi
fi
unset __conda_setup
# <<< conda initialize <<<

export HADOOP_HOME=/home/ubuntu/hadoop-2.8.5
export LD_LIBRARY_PATH=$HADOOP_HOME/lib/native/:$LD_LIBRARY_PATH
export HADOOP_JAR=$HADOOP_HOME/share/hadoop/mapreduce
PATH=$PATH:$HADOOP_HOME/bin:$HADOOP_HOME/sbin:$HADOOP_JAR

export SPARK_HOME=/home/ubuntu/spark-2.4.3-bin-hadoop2.7
export PATH=$PATH:$SPARK_HOME/bin
```

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Variabel SPARK_HOME (cont)

```
$ source ~/.bashrc
```

Atau..

```
$ source ~/.profile
```

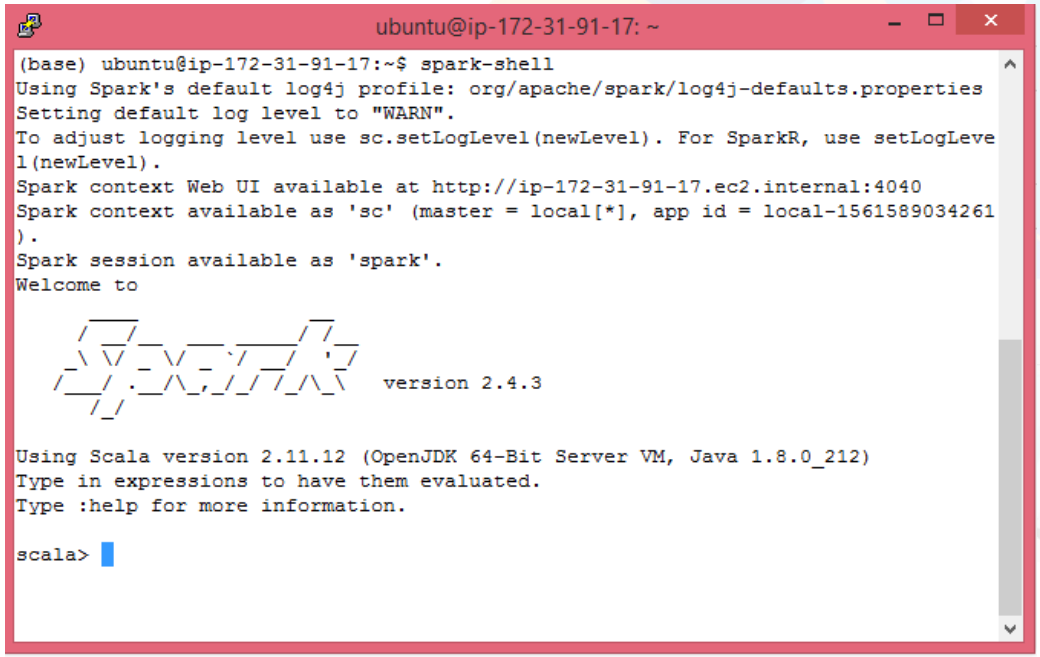
Variabel SPARK_HOME (cont)

ubuntu@ip-172-31-91-17: ~

```
(base) ubuntu@ip-172-31-91-17:~$ source ~/.bashrc
(base) ubuntu@ip-172-31-91-17:~$
```

Periksa instalasi Spark

```
$ spark-shell
```

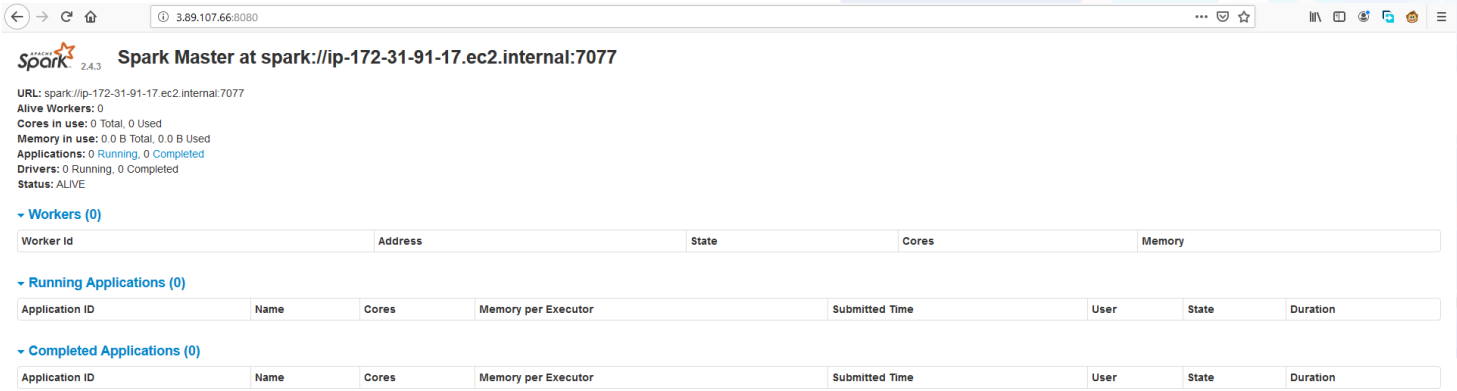


Spark WebUI

Jalankan perintah berikut dan buka EC2 instance anda di browser dengan port 8080

```
$ start-master.sh --webui-port 8080
```

Spark WebUI


3.89.107.66:8080
Spark 2.4.3
Spark Master at spark://ip-172-31-91-17.ec2.internal:7077
URL: spark://ip-172-31-91-17.ec2.internal:7077
Alive Workers: 0
Cores in use: 0 Total, 0 Used
Memory in use: 0.0 B Total, 0.0 B Used
Applications: 0 Running, 0 Completed
Drivers: 0 Running, 0 Completed
Status: ALIVE
Workers (0)
Worker Id | Address | State | Cores | Memory
Running Applications (0)
Application ID | Name | Cores | Memory per Executor | Submitted Time | User | State | Duration
Completed Applications (0)
Application ID | Name | Cores | Memory per Executor | Submitted Time | User | State | Duration

Konfigurasi Hosts

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Apache Spark

Konfigurasi Hosts

- Lewati bagian ini apabila anda sudah mengkonfigurasi cluster pada hadoop multi node cluster

Konfigurasi Hostname

- Buka file /etc/hosts dan tambahkan konfigurasi berikut. (sesuaikan dengan IP instance EC2 anda)

```
3.89.107.66 master
54.167.237.4 slave1
3.81.150.127 slave2
```

Konfigurasi Hostname

ubuntu@ip-172-31-91-17: ~

```
  GNU nano 2.5.3              File: /etc/hosts

127.0.0.1 localhost
3.89.107.66 master
54.167.237.4 slave1
3.81.150.127 slave2


# The following lines are desirable for IPv6 capable hosts
::1 ip6-localhost ip6-loopback
fe00::0 ip6-localnet
ff00::0 ip6-mcastprefix
ff02::1 ip6-allnodes
ff02::2 ip6-allrouters
ff02::3 ip6-allhosts

                              [ Read 13 lines ]
^G Get Help  ^O Write Out ^W Where Is  ^K Cut Text  ^J Justify   ^C Cur Pos
^X Exit      ^R Read File ^\ Replace  ^U Uncut Text^T To Spell  ^_ Go To Line
```

Konfigurasi SSH

- Buka file /.ssh/config dan tambahkan konfigurasi berikut.

```
Host master
        HostName master
        User ubuntu
        IdentityFile ~/.ssh/digitalent.pem

Host slave1
        HostName slave1
        User ubuntu
        IdentityFile ~/.ssh/digitalent.pem
```

Konfigurasi SSH (cont)

```
Host slave2
      HostName slave2
      User ubuntu
      IdentityFile ~/.ssh/digitalent.pem
```

Konfigurasi SSH

- Coba login ke instance slave1 dan slave2 dari master.

```
$ssh slave1
```

```
$ssh slave2
```

ubuntu@ip-172-31-32-94: ~

```
(base) ubuntu@ip-172-31-91-17:~$ ssh slave1
The authenticity of host 'slave1 (54.167.237.4)' can't be established.
ECDSA key fingerprint is SHA256:MH8Hm3PI0UccNcv0OpEwE9uZ4ovyOUjkHwpl4ZuEYWY.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added 'slave1,54.167.237.4' (ECDSA) to the list of known ho
sts.
Welcome to Ubuntu 16.04.6 LTS (GNU/Linux 4.4.0-1083-aws x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/advantage

57 packages can be updated.
32 updates are security updates.

New release '18.04.2 LTS' available.
Run 'do-release-upgrade' to upgrade to it.


Last login: Wed Jun 26 22:12:31 2019 from 103.119.66.36
(base) ubuntu@ip-172-31-32-94:~$
```

ubuntu@ip-172-31-47-60: ~

```
(base) ubuntu@ip-172-31-91-17:~$ ssh slave2
The authenticity of host 'slave2 (3.81.150.127)' can't be established.
ECDSA key fingerprint is SHA256:ItpHb1V+Gly0qFvS4lCdcx6Eit+S6rsHj70g3r9KrwI.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added 'slave2,3.81.150.127' (ECDSA) to the list of known ho
sts.
Welcome to Ubuntu 16.04.6 LTS (GNU/Linux 4.4.0-1083-aws x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/advantage

57 packages can be updated.
32 updates are security updates.

New release '18.04.2 LTS' available.
Run 'do-release-upgrade' to upgrade to it.


Last login: Wed Jun 26 22:12:31 2019 from 103.119.66.36
(base) ubuntu@ip-172-31-47-60:~$
```

Konfigurasi Cluster

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Konfigurasi Cluster

- Lakukan konfigurasi seperti yang sudah anda lakukan ke masing-masing slave

Konfigurasi Master Node

- Salin file /home/ubuntu/spark-2.4.3-bin-hadoop2.7/conf/slaves.template pada master node (sesuaikan dengan ip anda).
- Rubah Namanya menjadi slaves
- kemudian tambahkan string berikut(gunakan WinSCP)

```
Slave1

slave2
```

Konfigurasi Master Node

/home/ubuntu/spark-2.4.3-bin-hadoop2.7/conf/slaves - master - Editor - WinSCP

```
#
# Licensed to the Apache Software Foundation (ASF) under one or more
# contributor license agreements.  See the NOTICE file distributed with
# this work for additional information regarding copyright ownership.
# The ASF licenses this file to You under the Apache License, Version 2.0
# (the "License"); you may not use this file except in compliance with
# the License.  You may obtain a copy of the License at
#
#    http://www.apache.org/licenses/LICENSE-2.0
#
# Unless required by applicable law or agreed to in writing, software
# distributed under the License is distributed on an "AS IS" BASIS,
# WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
# See the License for the specific language governing permissions and
# limitations under the License.
#

# A Spark Worker will be started on each of the machines listed below.
localhost
slave1
slave2
```

Line: 1/21 | Column: 1 | Character: 35 (0x23) | Encoding: 1252 (ANSI - La

Konfigurasi Slave Node

- Salin file /home/ubuntu/spark-2.4.3-bin-hadoop2.7/conf/spark-env.sh.template pada master node (sesuaikan dengan ip anda).
- Rubah Namanya menjadi spark-env.sh
- kemudian tambahkan string berikut(gunakan WinSCP)

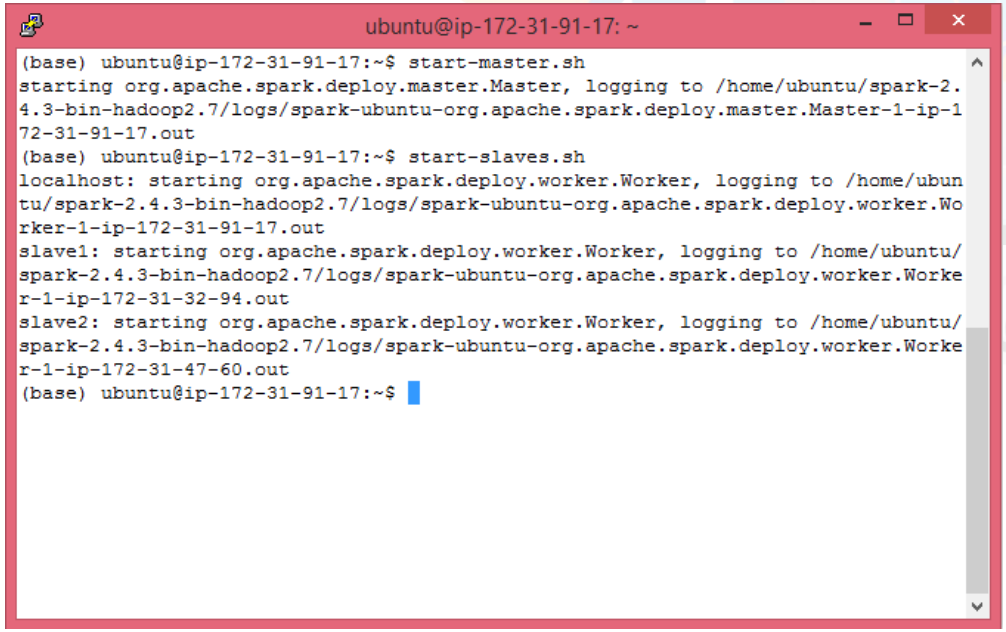
```
SPARK_MASTER_HOST="3.89.107.66"

SPARK_MASTER_PORT=7077
```

Start Cluster

- Jalankan 2 perintah berikut pada master untuk mulai menjalankan Cluster.

```
$ start-master.sh
$ start-slaves.sh
```



PySpark Wordcount (Python)

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PySpark Wordcount

- Buat sebuah file dengan nama `wordcount.py` kemudian isi dengan string berikut. (ganti master dengan hdfs site)

```
from pyspark import SparkContext
sc = SparkContext(appName = "worcount")
text_file = sc.textFile("hdfs://master/user/ubuntu/input/file01")
counts = text_file.flatMap(lambda line: line.split(" ")) \
             .map(lambda word: (word, 1)) \
             .reduceByKey(lambda a, b: a + b)
counts.saveAsTextFile("hdfs://master/user/ubuntu/output/file01/pyspark")
```

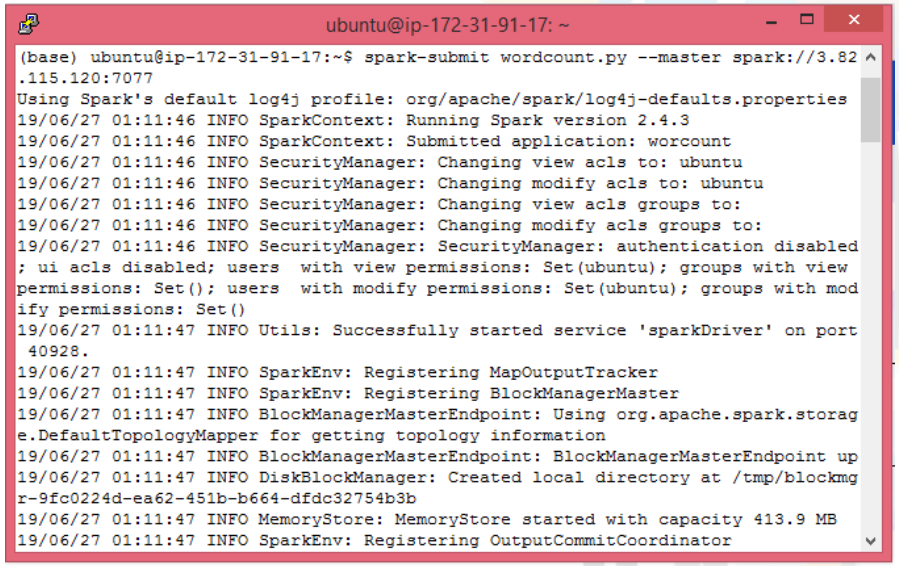
PySpark Wordcount

- Pastikan Hadoop Cluster anda aktif sehingga dapat mengakses hdfs
- Pastikan hdfs anda terdapat file `input/file01` yang digunakan pada bagian sebelumnya (instalasi hadoop single node)

PySpark Wordcount

- Jalankan perintah berikut untuk menjalankan wordcount pada cluster spark. (ganti ip dengan ip master anda)

```
$ spark-submit wordcount.py --master
spark://3.82.115.120:7077
```



PySpark Wordcount

- Jalankan perintah berikut untuk mencetak luaran program

```
$ hdfs dfs -cat output/file01/pyspark/*
```

ubuntu@ip-172-31-91-17: ~

```
19/06/27 01:16:14 INFO BlockManager: BlockManager stopped
19/06/27 01:16:14 INFO BlockManagerMaster: BlockManagerMaster stopped
19/06/27 01:16:14 INFO OutputCommitCoordinator$OutputCommitCoordinatorEndpoint:
OutputCommitCoordinator stopped!
19/06/27 01:16:14 INFO SparkContext: Successfully stopped SparkContext
19/06/27 01:16:14 INFO ShutdownHookManager: Shutdown hook called
19/06/27 01:16:14 INFO ShutdownHookManager: Deleting directory /tmp/spark-d8b06d
f1-6dff-4038-8fde-3e80bc565331/pyspark-ee9daa6c-8e74-4c2b-a44f-b3e91430baa4
19/06/27 01:16:14 INFO ShutdownHookManager: Deleting directory /tmp/spark-8857ff
67-65b3-4cd4-b50d-b65285142791
19/06/27 01:16:14 INFO ShutdownHookManager: Deleting directory /tmp/spark-d8b06d
f1-6dff-4038-8fde-3e80bc565331
(base) ubuntu@ip-172-31-91-17:~$ hdfs dfs -cat output/file01/pyspark/*
('Hello', 1)
('World', 2)
('Goodbye', 1)
('Big', 1)
('Data', 1)
('Analytics', 1)
('Digitalent', 1)
('2019', 1)
('Universitas', 1)
('Brawijaya', 1)
(base) ubuntu@ip-172-31-91-17:~$
```

Case Study

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Apache Spark

Case Study

- Implementasikan case study pada instalasi hadop single node (penjumlahan ganjil genap) menggunakan PySpark

Pertanyaan

Big Data

Hadoop

Pertanyaan

IKUTI KAMI

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