

# TP Spark scalability

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The goal of this labwork is to experiment with Spark in cluster mode and to evaluate its scalability.

## 1. Installation

- pre-requisite
  - you should have Java installed and the JAVA\_HOME variable defined
  - you should have your ssh keys configured to allow ssh to localhost
- install Hadoop
  - untar the hadoop-2.7.1.tar.gz archive
  - define environment variables

```
export HADOOP_HOME=<path>/hadoop-2.7.1
export PATH=$HADOOP_HOME/bin:$HADOOP_HOME/sbin:$PATH
```
- install Spark
  - untar the spark-2.4.3-bin-hadoop2.7.tgz archive
  - define environment variables

```
export SPARK_HOME=<path>/spark-2.4.3-bin-hadoop2.7
export PATH=$PATH:$SPARK_HOME/bin:$SPARK_HOME/sbin
```

hadoop-2.7.1/etc/hadoop/hadoop-env.sh

-----  
update the JAVA\_HOME variable :  
export JAVA\_HOME=<path-to-java>

hadoop-2.7.1/etc/hadoop/core-site.xml

-----  
<configuration>  
<property>  
 <name>hadoop.tmp.dir</name>  
 <value>/tmp/hadoop</value>  
 <description>A base for other temporary directories.</description>  
</property>  
<property>  
 <name>fs.defaultFS</name>  
 <value>hdfs://master:54310</value>  
</property>  
</configuration>

**HERE UPDATE THE MASTER NODE NAME**

hadoop-2.7.1/etc/hadoop/hdfs-site.xml

```
-----
<configuration>
<property>
  <name>dfs.replication</name>
  <value>1</value>
</property>
<property>
  <name>dfs.block.size</name>
  <value>67108864</value>
</property>
</configuration>
```

hadoop-2.7.1/etc/hadoop/slaves

```
-----
slave1
slave2
```

**HERE UPDATE THE SLAVES' NODE NAMES**

spark-2.4.3-bin-hadoop2.7/conf/slaves.template

```
-----
cp slaves.template slaves
add in this file :
slave1
slave2
```

**HERE UPDATE THE SLAVES' NODE NAMES**

spark-2.4.3-bin-hadoop2.7/conf/spark-env.sh.template

```
-----
cp spark-env.sh.template spark-env.sh
add in this file :
export SPARK_MASTER_HOST=master
# sometimes I had to add an "export JAVA_HOME=...." in this file
```

**HERE UPDATE THE MASTER NODE NAME**

## 2. Execution

You also have to replace the master node name in the URL of the file in the WordCount application.

**HERE UPDATE THE MASTER NODE NAME**

You are given a set of scripts which help starting everything :

comp.sh

-----

compile the WordCount.java application

generate.sh

-----

```
# generate a file data.txt of size 2^x
source generate.sh filesample.txt x
# for example a file of size 8 Gb
source generate.sh filesample.txt 23
# the file "data.txt" is generated in /tmp
```

start.sh

-----

**you have to edit the script to update the name of the 2 slaves**

starts the overall hadoop cluster (hdfs + spark)

verify with jps that you have

- on slave nodes : one DataNode daemon (hdfs) and one Worker daemon (spark)
- on the master node : one NameNode, one SecondaryNameNode daemon (hdfs) and one Master daemon (spark)

If everything went right, you should be able to observe the datanodes on <http://master:50070> and the workers on <http://master:8080>

copy.sh

-----

store the generated file "/tmp/data.txt" in hdfs in /input (/tmp/data.txt)  
you can observe the creation of blocks on <http://master:50070>

run.sh

-----

**you have to edit the script to update the name of the master**

Then, run the script to execute the application

stop.sh

-----

stop all the daemons

### 3. Evaluation

You can manage to produce a file of 8 Gb.

You can evaluate the performance of the WordCount application for 1 slave, 2 slaves, 3 slaves

You can compare with the performance of an iterative version (Count.java).

You can evaluate the performance for 1 slave with 1 code (you must start one slave with "start-slave.sh <url of master> -c 1" on the slave node, instead of using my start.sh script)

You can also experiment with larger files and more slaves.

I obtained : sequential (115s), 1 core (261s), 1 node (83s), 2 nodes (47s)