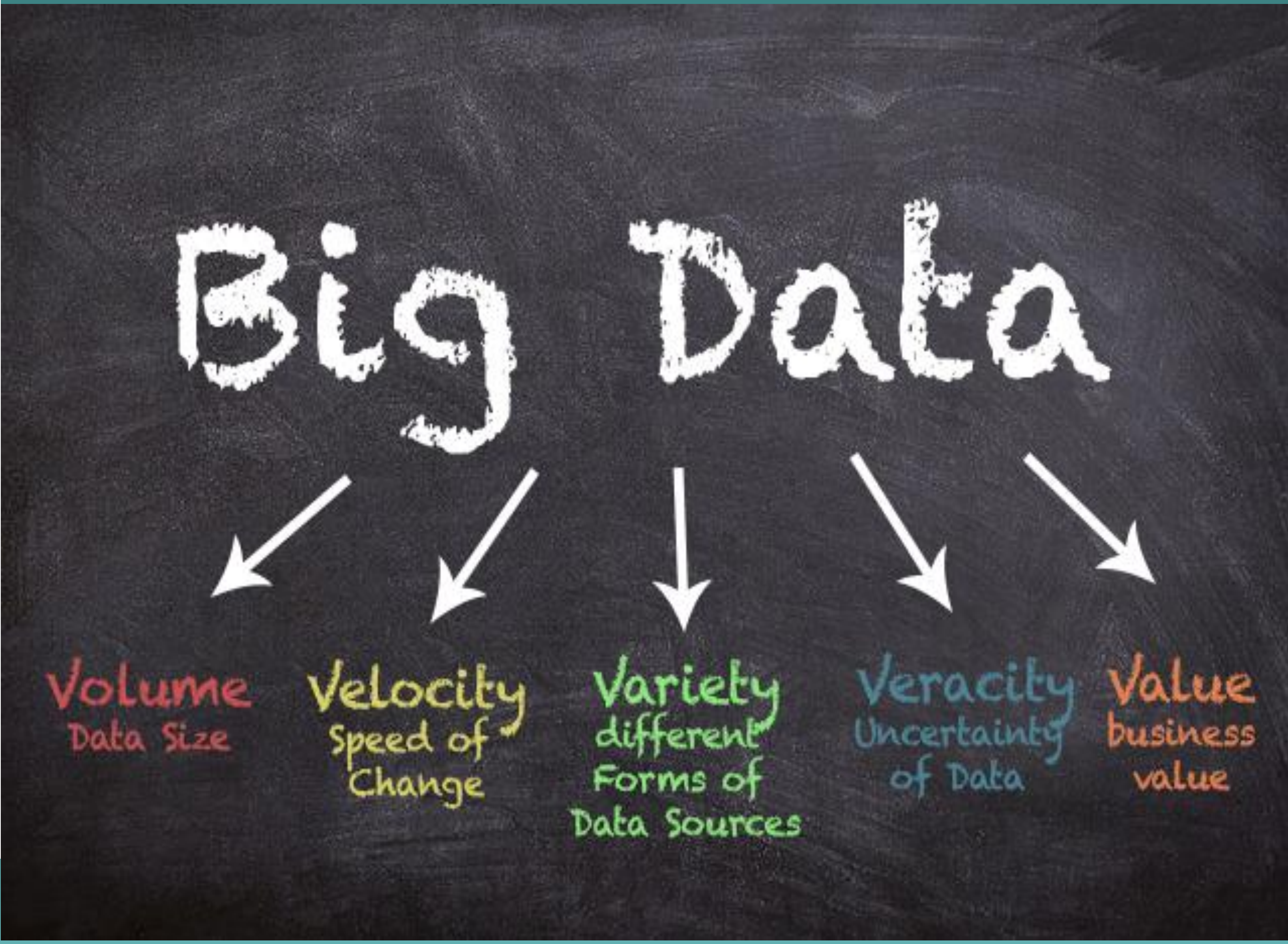
10/09/2018 | By: Ajit K Prasad



Big Data Engineering with Hadoop & Spark

Spark Streaming Case Study IV

Case Study IV: Spark Streaming

This Case Study assignment is aimed at consolidating the concepts that was learnt during the Apache Spark Streaming session of the course.

Objectives:

There are two parts this case study:

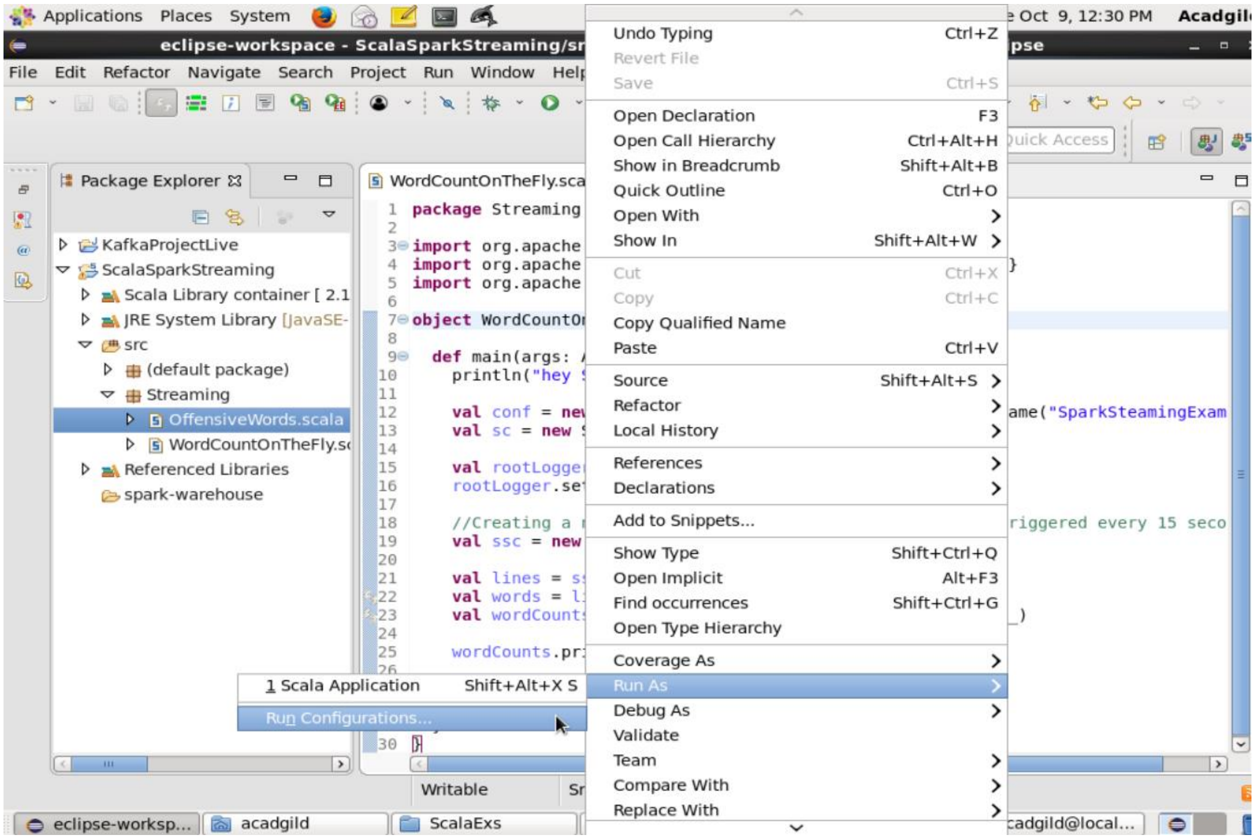
1. You need to create a Spark Application which streams data from a file on local directory on your machine and does the word count on the fly. The word count should be done by the spark application in such a way that as soon as you drop the file in your local directory, your spark application should immediately do the word count for you.

Solution:

Note: Source code file is provided along with this assignment report.

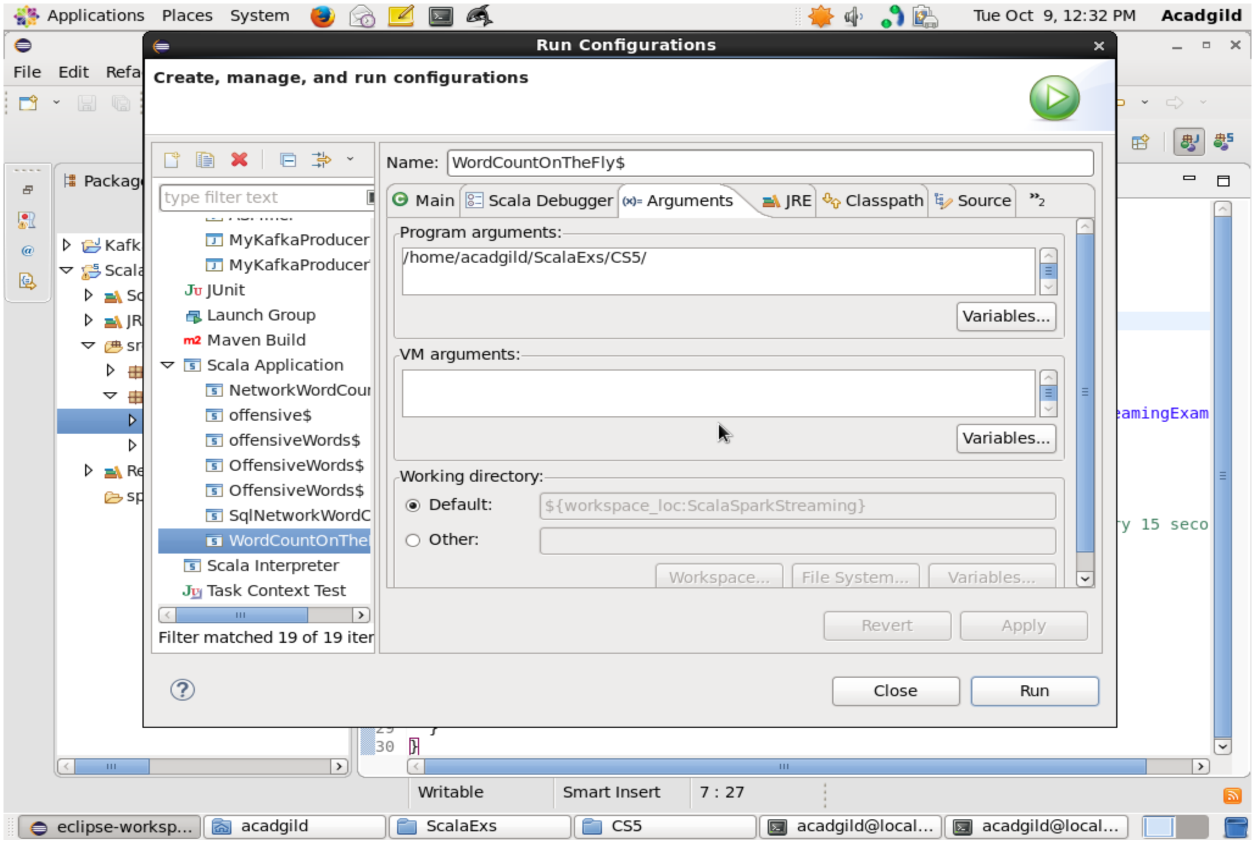
Output:

- Go to "Run Configurations" of the program



```
package Streaming

import org.apache
import org.apache
import org.apache

object WordCountOn
  def main(args: 
    println("hey 

    val conf = new                                     ame("SparkSteamingExam
    val sc = new 

    val rootLogge
    rootLogger.se

    //Creating a                                       riggered every 15 seco
    val ssc = new

    val lines = s
    val words = l
    val wordCount

    wordCounts.pr
```

- On the “Arguments” tab Pass the arguments and click on “Run” as shown below



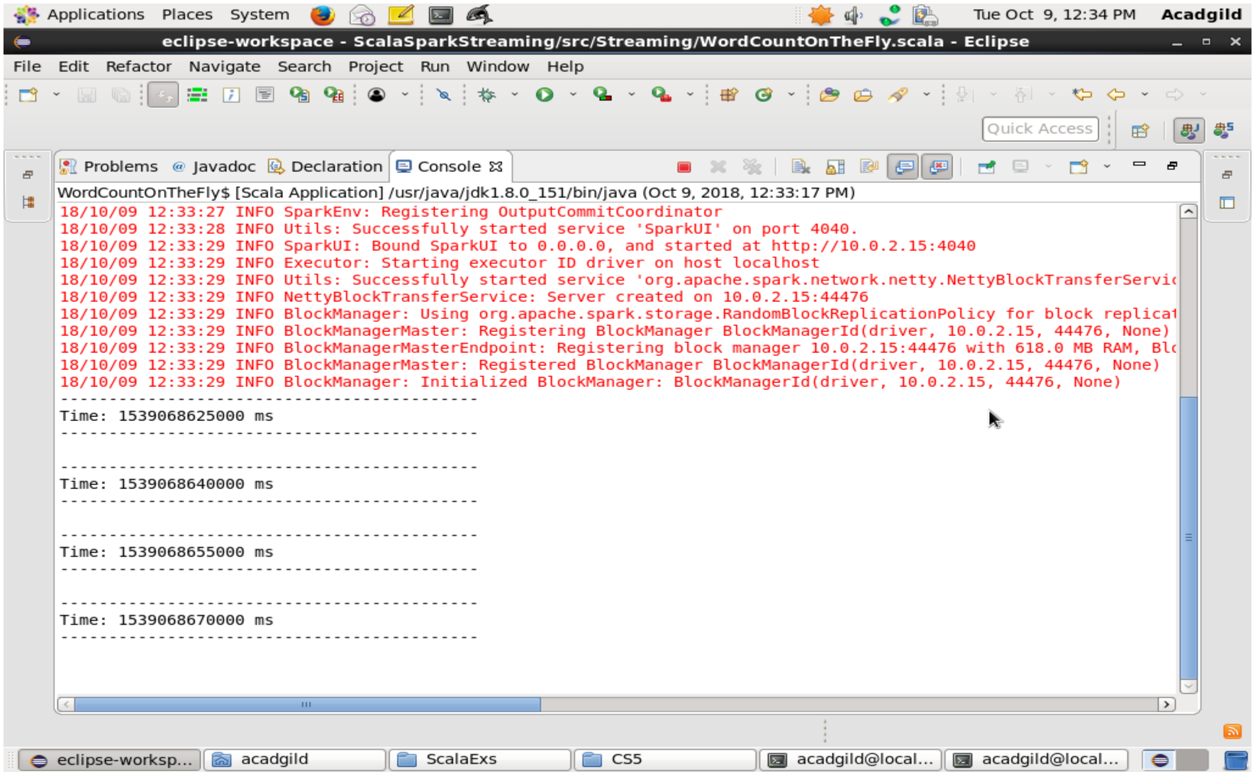
Name: WordCountOnTheFly$

Program arguments:
/home/acadgild/ScalaExs/CS5/

VM arguments:

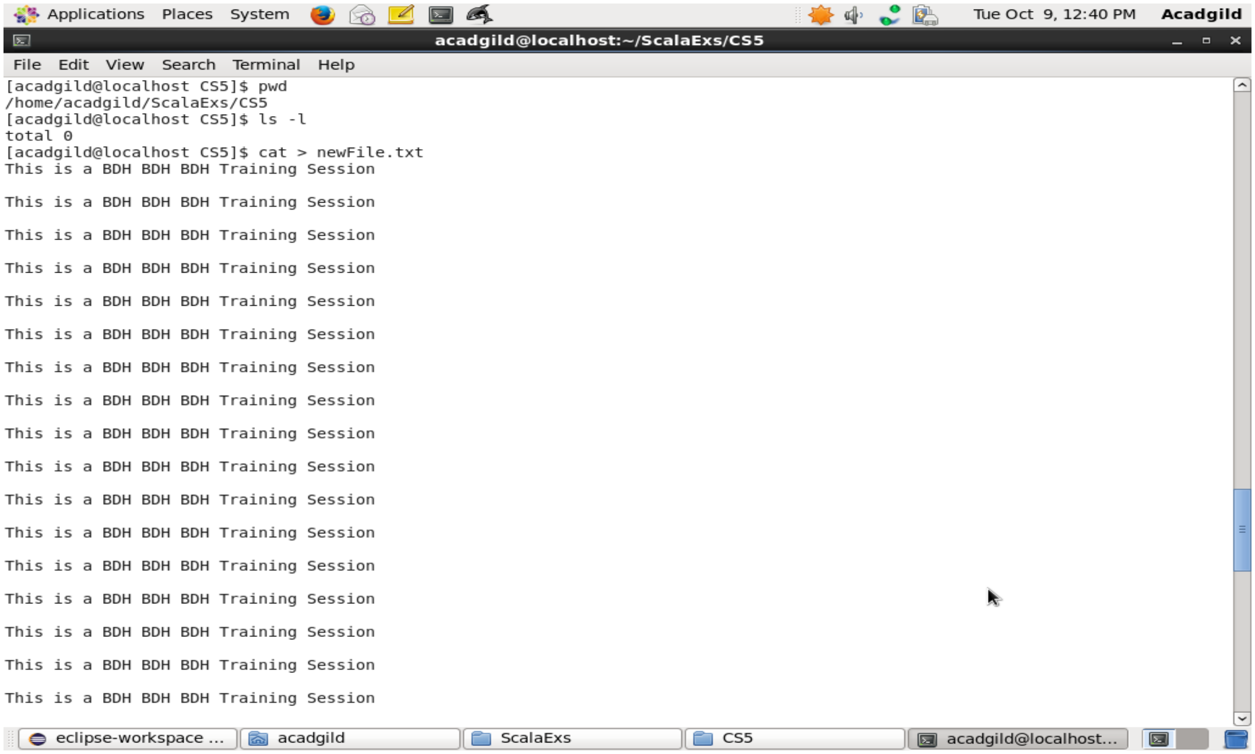
Working directory:
● Default: ${workspace_loc:ScalaSparkStreaming}
○ Other:

- The application is streaming now



```
WordCountOnTheFly$ [Scala Application] /usr/java/jdk1.8.0_151/bin/java (Oct 9, 2018, 12:33:17 PM)
18/10/09 12:33:27 INFO SparkEnv: Registering OutputCommitCoordinator
18/10/09 12:33:28 INFO Utils: Successfully started service 'SparkUI' on port 4040.
18/10/09 12:33:29 INFO SparkUI: Bound SparkUI to 0.0.0.0, and started at http://10.0.2.15:4040
18/10/09 12:33:29 INFO Executor: Starting executor ID driver on host localhost
18/10/09 12:33:29 INFO Utils: Successfully started service 'org.apache.spark.network.netty.NettyBlockTransferServic
18/10/09 12:33:29 INFO NettyBlockTransferService: Server created on 10.0.2.15:44476
18/10/09 12:33:29 INFO BlockManager: Using org.apache.spark.storage.RandomBlockReplicationPolicy for block replicat
18/10/09 12:33:29 INFO BlockManagerMaster: Registering BlockManager BlockManagerId(driver, 10.0.2.15, 44476, None)
18/10/09 12:33:29 INFO BlockManagerMasterEndpoint: Registering block manager 10.0.2.15:44476 with 618.0 MB RAM, Blo
18/10/09 12:33:29 INFO BlockManagerMaster: Registered BlockManager BlockManagerId(driver, 10.0.2.15, 44476, None)
18/10/09 12:33:29 INFO BlockManager: Initialized BlockManager: BlockManagerId(driver, 10.0.2.15, 44476, None)
-------------------------------------------
Time: 1539068625000 ms
-------------------------------------------

-------------------------------------------
Time: 1539068640000 ms
-------------------------------------------

-------------------------------------------
Time: 1539068655000 ms
-------------------------------------------

-------------------------------------------
Time: 1539068670000 ms
-------------------------------------------
```

– Now create a file within the input directory and input some text in it


Applications Places System
Tue Oct 9, 12:40 PM Acadgild
acadgild@localhost:~/ScalaExs/CS5
File Edit View Search Terminal Help
eclipse-workspace ...
acadgild
ScalaExs
CS5
acadgild@localhost...

```
[acadgild@localhost CS5]$ pwd
/home/acadgild/ScalaExs/CS5
[acadgild@localhost CS5]$ ls -l
total 0
[acadgild@localhost CS5]$ cat > newFile.txt
This is a BDH BDH BDH Training Session

This is a BDH BDH BDH Training Session

This is a BDH BDH BDH Training Session

This is a BDH BDH BDH Training Session

This is a BDH BDH BDH Training Session

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This is a BDH BDH BDH Training Session

This is a BDH BDH BDH Training Session

This is a BDH BDH BDH Training Session

This is a BDH BDH BDH Training Session

This is a BDH BDH BDH Training Session
```
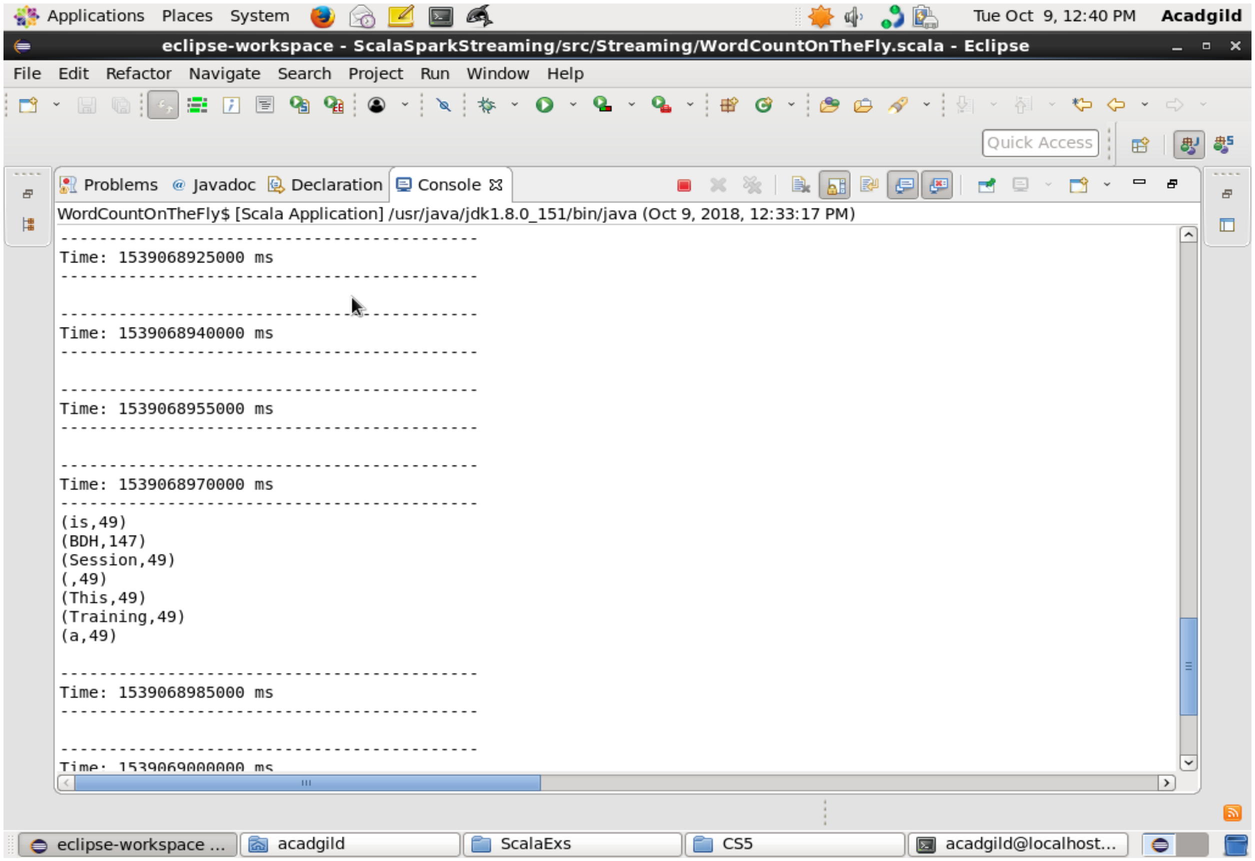

– The contents of newFile.txt are being read by Spark Streaming application & is computing word count on the fly


Applications Places System
Tue Oct 9, 12:40 PM Acadgild
eclipse-workspace - ScalaSparkStreaming/src/Streaming/WordCountOnTheFly.scala - Eclipse
File Edit Refactor Navigate Search Project Run Window Help
Quick Access
Problems Javadoc Declaration Console
eclipse-workspace ...
acadgild
ScalaExs
CS5
acadgild@localhost...

```
WordCountOnTheFly$ [Scala Application] /usr/java/jdk1.8.0_151/bin/java (Oct 9, 2018, 12:33:17 PM)
-------------------------------------------
Time: 1539068925000 ms
-------------------------------------------

-------------------------------------------
Time: 1539068940000 ms
-------------------------------------------

-------------------------------------------
Time: 1539068955000 ms
-------------------------------------------

-------------------------------------------
Time: 1539068970000 ms
-------------------------------------------
(is,49)
(BDH,147)
(Session,49)
(,49)
(This,49)
(Training,49)
(a,49)

-------------------------------------------
Time: 1539068985000 ms
-------------------------------------------

-------------------------------------------
Time: 1539069000000 ms
```

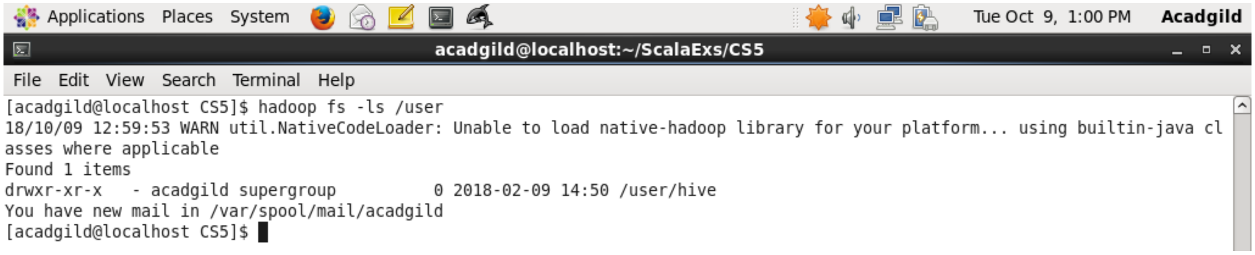
2. In this part, you will have to create a Spark Application which should do the following:
   i. Pick up a file from the local directory and do the word count
   ii. 2. Then in the same Spark Application, write the code to put the same file on HDFS.
   iii. 3. Then in same Spark Application, do the word count of the file copied on HDFS in step 2
   iv. 4. Lastly, compare the word count of step 1 and 2. Both should match, other throw an error

Solution:

Note: Source code file is provided along with this assignment report.

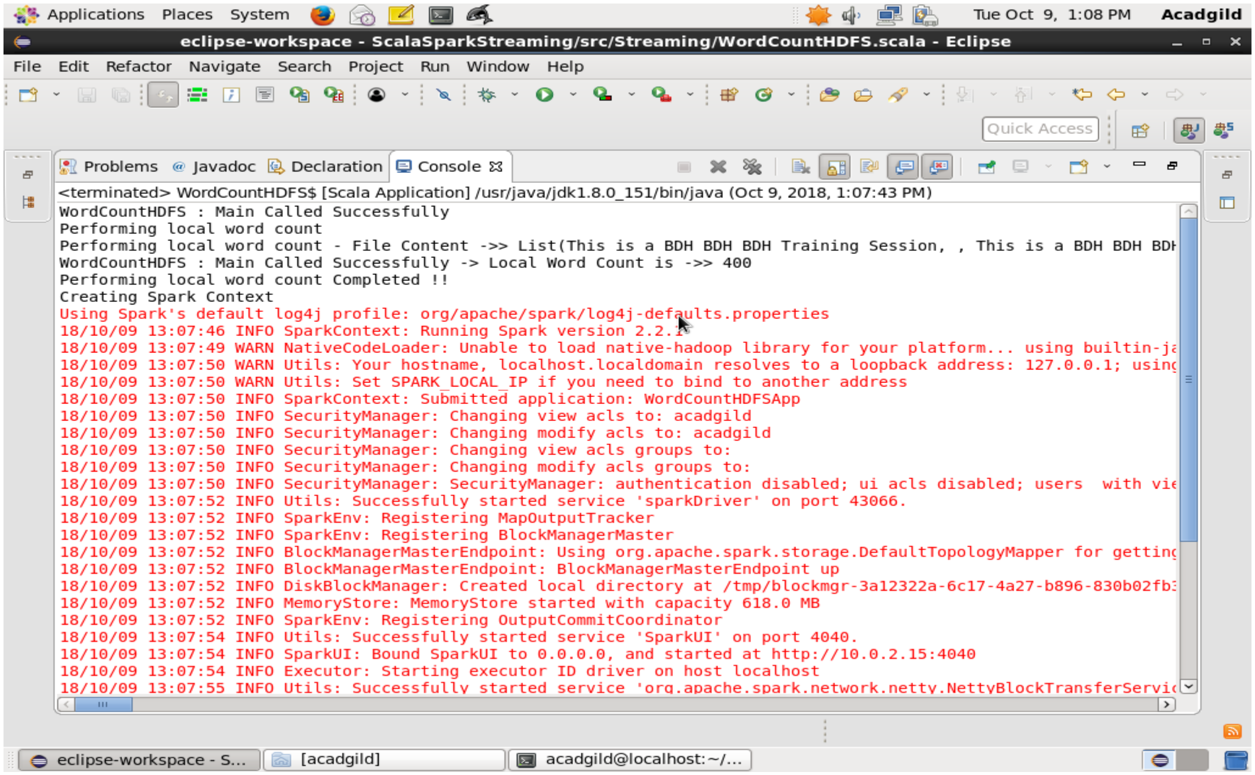
Output:

– HDFS does not contain and streaming directory before the application is run


Applications Places System
Tue Oct 9, 1:00 PM Acadgild
acadgild@localhost:~/ScalaExs/CS5
File Edit View Search Terminal Help

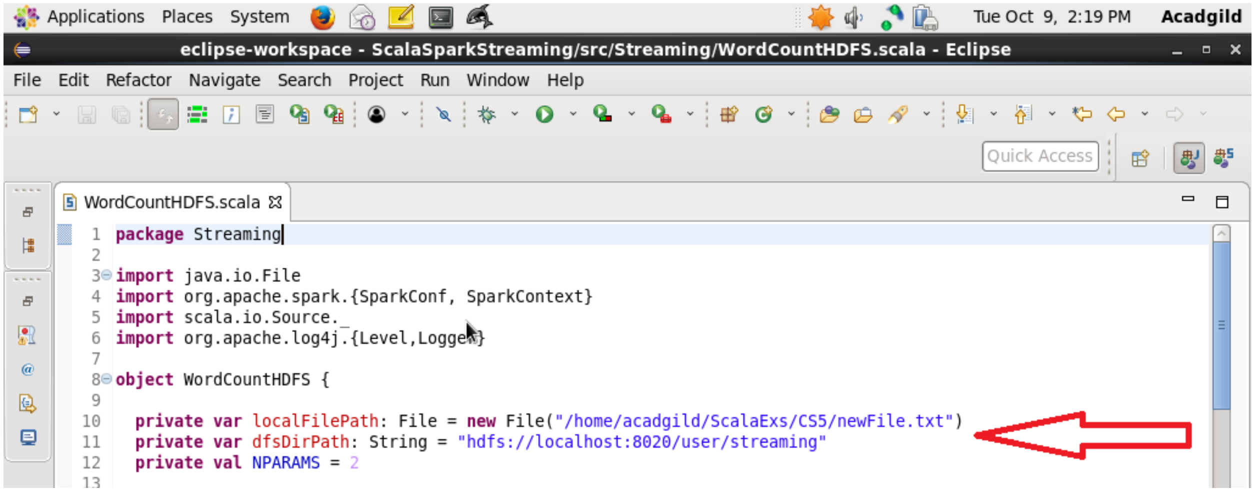
```
[acadgild@localhost CS5]$ hadoop fs -ls /user
18/10/09 12:59:53 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java cl
asses where applicable
Found 1 items
drwxr-xr-x   - acadgild supergroup          0 2018-02-09 14:50 /user/hive
You have new mail in /var/spool/mail/acadgild
[acadgild@localhost CS5]$ 
```

– **Step 1**: Use newFile.txt from the local directory and do the word count


Applications Places System
Tue Oct 9, 1:08 PM Acadgild
eclipse-workspace - ScalaSparkStreaming/src/Streaming/WordCountHDFS.scala - Eclipse
File Edit Refactor Navigate Search Project Run Window Help
Quick Access
Problems Javadoc Declaration Console
eclipse-workspace - S... [acadgild] acadgild@localhost:~/...

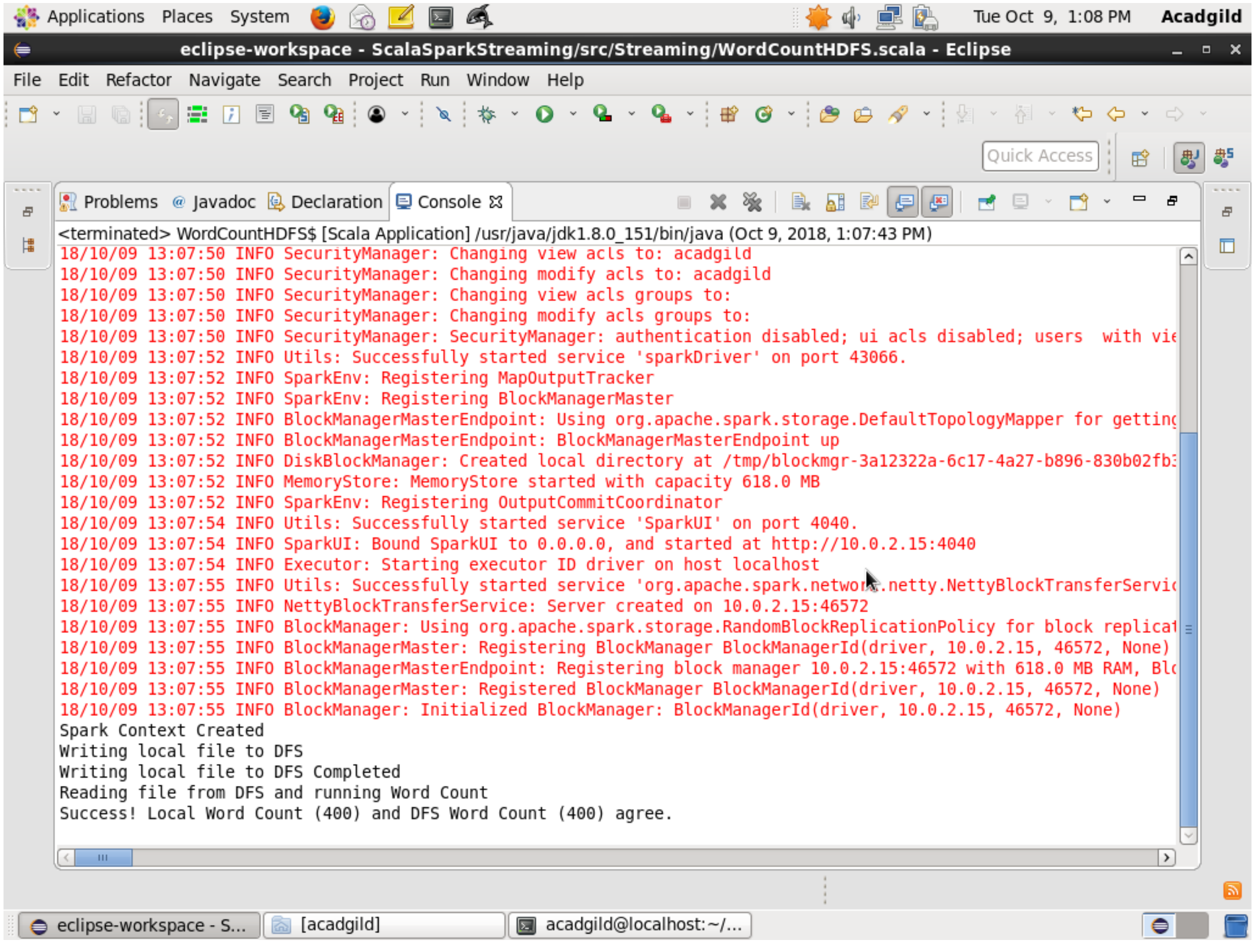
```
<terminated> WordCountHDFS$ [Scala Application] /usr/java/jdk1.8.0_151/bin/java (Oct 9, 2018, 1:07:43 PM)
WordCountHDFS : Main Called Successfully
Performing local word count
Performing local word count - File Content ->> List(This is a BDH BDH BDH Training Session, , This is a BDH BDH BDH
WordCountHDFS : Main Called Successfully -> Local Word Count is ->> 400
Performing local word count Completed !!
Creating Spark Context
Using Spark's default log4j profile: org/apache/spark/log4j-defaults.properties
18/10/09 13:07:46 INFO SparkContext: Running Spark version 2.2.1
18/10/09 13:07:49 WARN NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-ja
18/10/09 13:07:50 WARN Utils: Your hostname, localhost.localdomain resolves to a loopback address: 127.0.0.1; using
18/10/09 13:07:50 WARN Utils: Set SPARK_LOCAL_IP if you need to bind to another address
18/10/09 13:07:50 INFO SparkContext: Submitted application: WordCountHDFSApp
18/10/09 13:07:50 INFO SecurityManager: Changing view acls to: acadgild
18/10/09 13:07:50 INFO SecurityManager: Changing modify acls to: acadgild
18/10/09 13:07:50 INFO SecurityManager: Changing view acls groups to:
18/10/09 13:07:50 INFO SecurityManager: Changing modify acls groups to:
18/10/09 13:07:50 INFO SecurityManager: SecurityManager: authentication disabled; ui acls disabled; users  with vie
18/10/09 13:07:52 INFO Utils: Successfully started service 'sparkDriver' on port 43066.
18/10/09 13:07:52 INFO SparkEnv: Registering MapOutputTracker
18/10/09 13:07:52 INFO SparkEnv: Registering BlockManagerMaster
18/10/09 13:07:52 INFO BlockManagerMasterEndpoint: Using org.apache.spark.storage.DefaultTopologyMapper for getting
18/10/09 13:07:52 INFO BlockManagerMasterEndpoint: BlockManagerMasterEndpoint up
18/10/09 13:07:52 INFO DiskBlockManager: Created local directory at /tmp/blockmgr-3a12322a-6c17-4a27-b896-830b02fb3
18/10/09 13:07:52 INFO MemoryStore: MemoryStore started with capacity 618.0 MB
18/10/09 13:07:52 INFO SparkEnv: Registering OutputCommitCoordinator
18/10/09 13:07:54 INFO Utils: Successfully started service 'SparkUI' on port 4040.
18/10/09 13:07:54 INFO SparkUI: Bound SparkUI to 0.0.0.0, and started at http://10.0.2.15:4040
18/10/09 13:07:54 INFO Executor: Starting executor ID driver on host localhost
18/10/09 13:07:55 INFO Utils: Successfully started service 'org.apache.spark.network.netty.NettyBlockTransferServic
```

- **Step 2**: Then in the same Spark Application, write the code to put the same file on HDFS


Applications Places System
Tue Oct 9, 2:19 PM Acadgild
eclipse-workspace - ScalaSparkStreaming/src/Streaming/WordCountHDFS.scala - Eclipse
File Edit Refactor Navigate Search Project Run Window Help
Quick Access
WordCountHDFS.scala

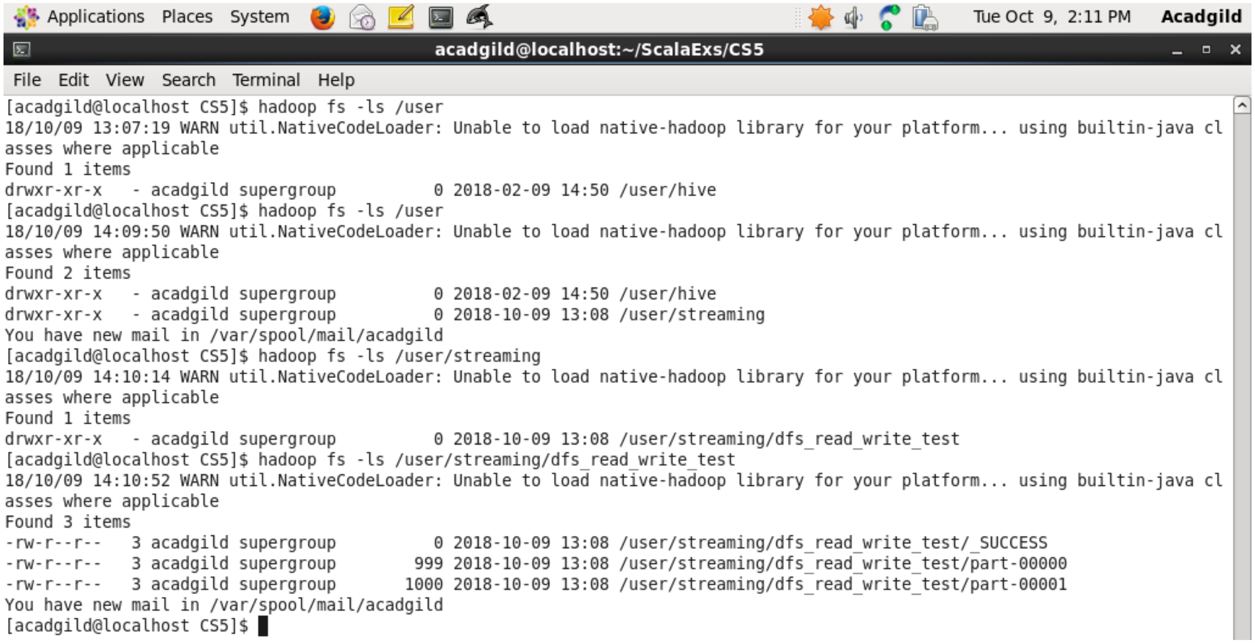
```
package Streaming

import java.io.File
import org.apache.spark.{SparkConf, SparkContext}
import scala.io.Source._
import org.apache.log4j.{Level,Logger}

object WordCountHDFS {

  private var localFilePath: File = new File("/home/acadgild/ScalaExs/CS5/newFile.txt")
  private var dfsDirPath: String = "hdfs://localhost:8020/user/streaming"
  private val NPARAMS = 2

```

- Then in same Spark Application, do the word count of the file copied on HDFS in step 2
- Lastly, compare the word count of step 1 and 2. Both should match, other throw an error


Applications Places System
Tue Oct 9, 1:08 PM Acadgild
eclipse-workspace - ScalaSparkStreaming/src/Streaming/WordCountHDFS.scala - Eclipse
File Edit Refactor Navigate Search Project Run Window Help
Quick Access
Problems Javadoc Declaration Console
eclipse-workspace - S...
[acadgild]
acadgild@localhost:~/...

```
<terminated> WordCountHDFS$ [Scala Application] /usr/java/jdk1.8.0_151/bin/java (Oct 9, 2018, 1:07:43 PM)
18/10/09 13:07:50 INFO SecurityManager: Changing view acls to: acadgild
18/10/09 13:07:50 INFO SecurityManager: Changing modify acls to: acadgild
18/10/09 13:07:50 INFO SecurityManager: Changing view acls groups to:
18/10/09 13:07:50 INFO SecurityManager: Changing modify acls groups to:
18/10/09 13:07:50 INFO SecurityManager: SecurityManager: authentication disabled; ui acls disabled; users  with vie
18/10/09 13:07:52 INFO Utils: Successfully started service 'sparkDriver' on port 43066.
18/10/09 13:07:52 INFO SparkEnv: Registering MapOutputTracker
18/10/09 13:07:52 INFO SparkEnv: Registering BlockManagerMaster
18/10/09 13:07:52 INFO BlockManagerMasterEndpoint: Using org.apache.spark.storage.DefaultTopologyMapper for gettin
18/10/09 13:07:52 INFO BlockManagerMasterEndpoint: BlockManagerMasterEndpoint up
18/10/09 13:07:52 INFO DiskBlockManager: Created local directory at /tmp/blockmgr-3a12322a-6c17-4a27-b896-830b02fb
18/10/09 13:07:52 INFO MemoryStore: MemoryStore started with capacity 618.0 MB
18/10/09 13:07:52 INFO SparkEnv: Registering OutputCommitCoordinator
18/10/09 13:07:54 INFO Utils: Successfully started service 'SparkUI' on port 4040.
18/10/09 13:07:54 INFO SparkUI: Bound SparkUI to 0.0.0.0, and started at http://10.0.2.15:4040
18/10/09 13:07:54 INFO Executor: Starting executor ID driver on host localhost
18/10/09 13:07:55 INFO Utils: Successfully started service 'org.apache.spark.network.netty.NettyBlockTransferServi
18/10/09 13:07:55 INFO NettyBlockTransferService: Server created on 10.0.2.15:46572
18/10/09 13:07:55 INFO BlockManager: Using org.apache.spark.storage.RandomBlockReplicationPolicy for block replica
18/10/09 13:07:55 INFO BlockManagerMaster: Registering BlockManager BlockManagerId(driver, 10.0.2.15, 46572, None)
18/10/09 13:07:55 INFO BlockManagerMasterEndpoint: Registering block manager 10.0.2.15:46572 with 618.0 MB RAM, Bl
18/10/09 13:07:55 INFO BlockManagerMaster: Registered BlockManager BlockManagerId(driver, 10.0.2.15, 46572, None)
18/10/09 13:07:55 INFO BlockManager: Initialized BlockManager: BlockManagerId(driver, 10.0.2.15, 46572, None)
Spark Context Created
Writing local file to DFS
Writing local file to DFS Completed
Reading file from DFS and running Word Count
Success! Local Word Count (400) and DFS Word Count (400) agree.
```

- Here we see that a directory **“Streaming”** was created in HDFS, which contains another directory **“dsf_read_write_test”** which contains 2 files as a result of the job performed by Spark Streaming program


Applications Places System
Tue Oct 9, 2:11 PM
Acadgild
acadgild@localhost:~/ScalaExs/CS5
File Edit View Search Terminal Help

```
[acadgild@localhost CS5]$ hadoop fs -ls /user
18/10/09 13:07:19 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java cl
asses where applicable
Found 1 items
drwxr-xr-x   - acadgild supergroup          0 2018-02-09 14:50 /user/hive
[acadgild@localhost CS5]$ hadoop fs -ls /user
18/10/09 14:09:50 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java cl
asses where applicable
Found 2 items
drwxr-xr-x   - acadgild supergroup          0 2018-02-09 14:50 /user/hive
drwxr-xr-x   - acadgild supergroup          0 2018-10-09 13:08 /user/streaming
You have new mail in /var/spool/mail/acadgild
[acadgild@localhost CS5]$ hadoop fs -ls /user/streaming
18/10/09 14:10:14 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java cl
asses where applicable
Found 1 items
drwxr-xr-x   - acadgild supergroup          0 2018-10-09 13:08 /user/streaming/dfs_read_write_test
[acadgild@localhost CS5]$ hadoop fs -ls /user/streaming/dfs_read_write_test
18/10/09 14:10:52 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java cl
asses where applicable
Found 3 items
-rw-r--r--   3 acadgild supergroup          0 2018-10-09 13:08 /user/streaming/dfs_read_write_test/_SUCCESS
-rw-r--r--   3 acadgild supergroup        999 2018-10-09 13:08 /user/streaming/dfs_read_write_test/part-00000
-rw-r--r--   3 acadgild supergroup       1000 2018-10-09 13:08 /user/streaming/dfs_read_write_test/part-00001
You have new mail in /var/spool/mail/acadgild
[acadgild@localhost CS5]$ 
```