



# Session 20: SPARK STREAMING

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## Assignment 20.1

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Assignment 20.1– Introduction to Spark Streaming.

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## Introduction

In this assignment, we are going to perform read a stream of Strings using Spark Streaming.

## Problem Statement

**Read a stream of Strings, fetch the words which can be converted to numbers. Filter out the rows, where the sum of numbers in that line is odd.**

**Provide the sum of all the remaining numbers in that batch.**



## Pre requisite

In this assignment we are going to read the strings which is captured in a port using **netcat** and hence we are installing the **netcat** in our server,

Command,

```
 sudo yum install nc
```

The below screen shot shows the successful installation of **netcat** using **yum**.

```
[acadgild@localhost ~]$ sudo yum install nc
Loaded plugins: fastestmirror, refresh-packagekit, security
Setting up Install Process
Loading mirror speeds from cached hostfile
 * base: ftp.iitm.ac.in
 * extras: ftp.iitm.ac.in
 * updates: ftp.iitm.ac.in
Resolving Dependencies
--> Running transaction check
--> Package nc.i686 0:1.84-24.el6 will be installed
--> Finished Dependency Resolution

Dependencies Resolved

=====================================================================================================================================
 Package                               Arch                               Version                               Repository                           Size
=====================================================================================================================================
Installing:
 nc                                   i686                               1.84-24.el6                           base                                  57 k
Transaction Summary
-----
Install      1 Package(s)


Total download size: 57 k
Installed size: 107 k
Is this ok [y/N]: y
Downloading Packages:
nc-1.84-24.el6.i686.rpm                               | 57 kB    00:00
Running rpm_check_debug
Running Transaction Test
Transaction Test Succeeded
Running Transaction
  Installing : nc-1.84-24.el6.i686                               1/1
  Verifying  : nc-1.84-24.el6.i686                               1/1

Installed:
 nc.i686 0:1.84-24.el6

Complete!
[acadgild@localhost ~]$ nc -lk 9999
```

Start listening the port **9999** using the below command,

Command,

```
 nc -lk 9999
```

```
[acadgild@localhost ~]$ nc -lk 9999
HT
```

Start Spark shell with multi threads, in this case we are taking 4 multi threads.

Command,

```
 /home/acadgild/spark-2.2.1-bin-hadoop2.7/bin/spark-shell --master local[4]
```



## Read a stream of Strings, convert it to numbers, sum of Numbers - operations

Step – 1 - Import all the spark streaming packages

```
import org.apache.spark._
import org.apache.spark.streaming._
import org.apache.spark.streaming.StreamingContext._
```

```
scala> import org.apache.spark._
import org.apache.spark._

scala> import org.apache.spark.streaming._
import org.apache.spark.streaming._

scala> import org.apache.spark.streaming.StreamingContext._
import org.apache.spark.streaming.StreamingContext._
```

Step – 2 - Define an Accumulator

Defining an accumulator “EvenLines” which will keep track of sum of number of word numbers in lines so far,

```
val EvenLines = sc.accumulator(0)
```

```
scala> val EvenLines = sc.accumulator(0)
warning: there were two deprecation warnings; re-run with -deprecation for details
EvenLines: org.apache.spark.Accumulator[Int] = 0
```

Step – 3 - convert words to numbers

We are creating a RDD which maps the strings into the corresponding numbers, if we provide any word in the port 9999 which is not mapped, the numerical 0 will be returned.

Broadcast the newly created map,

```
val wordstonumbers = map("Hi"->1, "This"->2, "is"->3, "Assignment"->4, "number"->5,
    "Twenty"->6,"it"->7, "about"->8, "spark"->9, "Streaming"->10)
val wordstonumbersbroadcast = sc.broadcast(wordstonumbers)
```

```
scala> val wordstonumbers = Map("Hi" -> 1, "This" -> 2, "is" -> 3, "Assignment" -> 4, "number" -> 5, "Twenty" -> 6, "it" -> 7, "about" -> 8, "spark" -> 9, "Streaming" -> 10)
wordstonumbers: scala.collection.immutable.Map[String,Int] = Map(number -> 5, is -> 3, This -> 2, Streaming -> 10, it -> 7, Twenty -> 6, spark -> 9, Hi -> 1, Assignment -> 4, about -> 8)

scala> val wordstonumbersbroadcast = sc.broadcast(wordstonumbers)
18/01/15 12:54:49 WARN SizeEstimator: Failed to check whether UseCompressedOops is set; assuming yes
wordstonumbersbroadcast: org.apache.spark.broadcast.Broadcast[scala.collection.immutable.Map[String,Int]] = Broadcast(0)
```

Step – 4 - create a function to return sum of word converted to number in a line

Create a function “lineWordNumberSum” where we are splitting a line based on blank space to get all the words in next. In the lookup value, we are determining corresponding numbers for a word in the wordstonumbersbroadcast and we adding the all the numbers.

Please see the code below,



```
def lineWordNumberSum(line:String):Int = {
    var sum:Int = 0
    var words = line.split(" ")
    for (word <- words) sum += wordstonumbersbroadcast.value.get(word).getOrElse(0)
    sum
}
```

```
scala> def lineWordNumberSum(line:String):Int = {
    |   var sum:Int = 0
    |   var words = line.split(" ")
    |   for (word <- words) sum += wordstonumbersbroadcast.value.get(word).getOrElse(0)
    |   sum
    | }
lineWordNumberSum: (line: String)Int
```

### Step – 5 - Text Streaming

In this step, we are streaming the data as a string in a 5 seconds interval and return the stream. The streams are reading in a port 9999 which is listened

```
val ssc = new StreamingContext(sc, Seconds(5))
```

```
val stream = ssc.socketTextStream("localhost", 9999)
```

```
scala> val ssc = new StreamingContext(sc, Seconds(5))
ssc: org.apache.spark.streaming.StreamingContext = org.apache.spark.streaming.StreamingContext@a1ce8
scala> val stream = ssc.socketTextStream("localhost", 9999)
stream: org.apache.spark.streaming.dstream.ReceiverInputDStream[String] = org.apache.spark.streaming.dstream.SocketInputDStream@93161a
```

### Step – 6 - Processing the each RDD

Process each RDD in stream, we are converting the RDD to string. Consider the below scenarios,

If it is not blank calculate corresponding word's number and sum them using the function **lineWordNumberSum** and put as variable **numTotal**.

If **numTotal** is odd, print the provided line in the output, else add **numTotal** to accumulator **EvenLines** and print the sum.

Code,

```
stream.foreachRDD(line => {val lineStr = line.collect().toList.mkString("")
    if (lineStr != "") {var numTotal = lineWordNumberSum(lineStr) if (numTotal % 2 == 1) println(lineStr)
    else
    {EvenLines += numTotal
    println("Sum of lines with even word number so far =" + EvenLines.value.toInt)}}
})
```



```
scala> stream.foreachRDD(line => {  
    |   val lineStr = line.collect().toList.mkString("")  
    |   if (lineStr != "") {  
    |       var numTotal = lineWordNumberSum(lineStr)  
    |       if (numTotal % 2 == 1) println(lineStr)  
    |       else {  
    |           EvenLines += numTotal  
    |           println("Sum of lines with even word number so far =" + EvenLines.value.toInt)  
    |       }  
    |   }  
    | })
```

### Step – 7 - Spark Streaming

Now, Start the streams and wait till its termination

 `ssc.start()`

 `ssc.awaitTermination()`

Start **netcat** in the Linux terminal, provide the texts which we determined in the map.

```
[acadgild@localhost ~]$ nc -lk 9999  
HI  
This is  
Assignment number twenty  
This is about Spark  
Streaming  
Assignment  
This is  
This Assignment  
Hi  
about spark streaming
```

1. We know that the string “Hi” has a number 1, when we type “Hi” in the port which is ODD, hence it will be displayed.
2. Same as, “Assignment number twenty” which has value of 15 which is again ODD and hence it is displayed,
3. For lines with even numbered word number, the **summation done so far** will be displayed. Please see the below screen shot,

### Expected Output



```
scala> ssc.start()

scala> ssc.awaitTermination()
18/01/15 13:09:30 WARN RandomBlockReplicationPolicy: Expecting 1 replicas with only 0 peer/s.
18/01/15 13:09:30 WARN BlockManager: Block input-0-1516001969800 replicated to only 0 peer(s) instead of 1 peers
18/01/15 13:09:33 WARN RandomBlockReplicationPolicy: Expecting 1 replicas with only 0 peer/s.
18/01/15 13:09:33 WARN BlockManager: Block input-0-1516001973000 replicated to only 0 peer(s) instead of 1 peers
HIThis is 1
18/01/15 13:09:42 WARN RandomBlockReplicationPolicy: Expecting 1 replicas with only 0 peer/s.
18/01/15 13:09:42 WARN BlockManager: Block input-0-1516001982200 replicated to only 0 peer(s) instead of 1 peers
Assignment number twenty 2
18/01/15 13:09:52 WARN RandomBlockReplicationPolicy: Expecting 1 replicas with only 0 peer/s.
18/01/15 13:09:52 WARN BlockManager: Block input-0-1516001992600 replicated to only 0 peer(s) instead of 1 peers
This is about Spark
18/01/15 13:09:56 WARN RandomBlockReplicationPolicy: Expecting 1 replicas with only 0 peer/s.
18/01/15 13:09:56 WARN BlockManager: Block input-0-1516001996200 replicated to only 0 peer(s) instead of 1 peers
Sum of lines with even word number so far =10
18/01/15 13:10:20 WARN RandomBlockReplicationPolicy: Expecting 1 replicas with only 0 peer/s.
18/01/15 13:10:20 WARN BlockManager: Block input-0-1516002020600 replicated to only 0 peer(s) instead of 1 peers
Sum of lines with even word number so far =14
18/01/15 13:10:48 WARN RandomBlockReplicationPolicy: Expecting 1 replicas with only 0 peer/s.
18/01/15 13:10:48 WARN BlockManager: Block input-0-1516002047800 replicated to only 0 peer(s) instead of 1 peers
This is
18/01/15 13:11:26 WARN RandomBlockReplicationPolicy: Expecting 1 replicas with only 0 peer/s.
18/01/15 13:11:26 WARN BlockManager: Block input-0-1516002085800 replicated to only 0 peer(s) instead of 1 peers
Sum of lines with even word number so far =20
18/01/15 13:11:40 WARN RandomBlockReplicationPolicy: Expecting 1 replicas with only 0 peer/s.
18/01/15 13:11:40 WARN BlockManager: Block input-0-1516002100400 replicated to only 0 peer(s) instead of 1 peers
Hi
18/01/15 13:11:57 WARN RandomBlockReplicationPolicy: Expecting 1 replicas with only 0 peer/s.
18/01/15 13:11:57 WARN BlockManager: Block input-0-1516002116800 replicated to only 0 peer(s) instead of 1 peers
about spark streaming 3
```