CS 5433: Bigdata Management
Programming Assignment 1
PART 3 – Report on MapReduce Program for Hashtag Count using Partitioner
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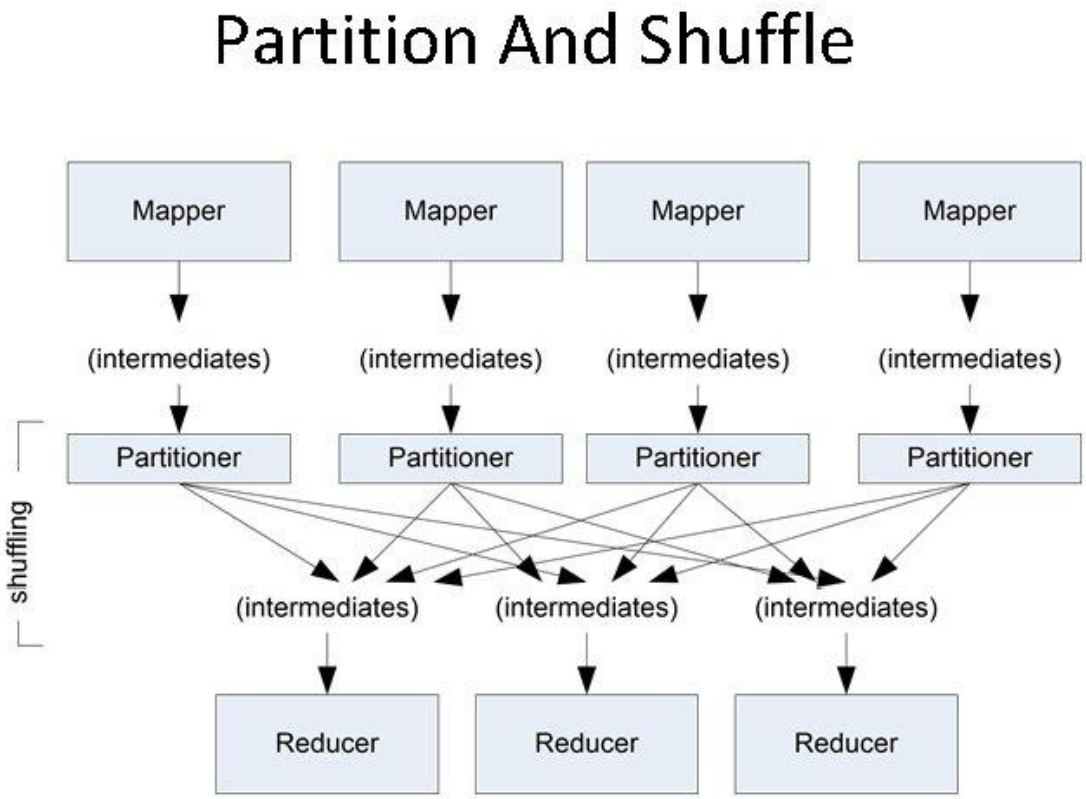
Partitioner: The key-value pairs of intermediate Map outputs are partitioned by a partitioner. This phase takes place before the reducer phase and after the map phase. It divides the data into parts based on a user-defined criterion that operates similarly to a hash function. Here, the total number of partitions for the job is the same as the number of Reducer jobs which means data passed from one partitioner is processed by one reducer.



Applying Hashtag Count MapReduce Program using Partitioner on downloaded Flume data:

Programming Language used: JAVA

Compiled and executed in: Hadoop Cluster

Data sets: NASA and SpaceX keywords data sets

Program Description: The main description of this program is to partition the tweets hashtag count on a max of 10 hashtags.

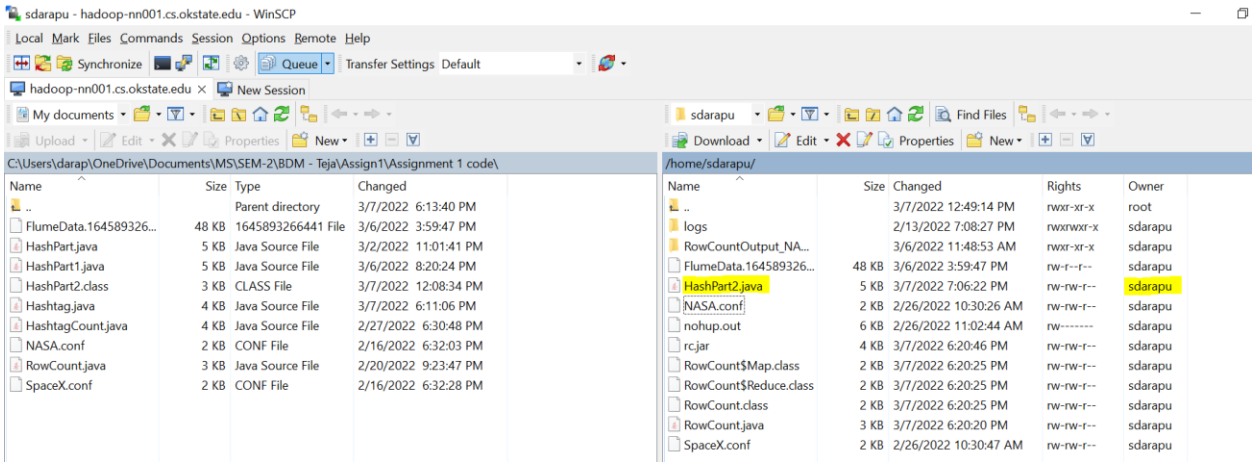
Followed Process:

- In Mapper class, I have parsed the dataset which is in json format and then I have extracted the "text" field from the json object as the actual tweet is present in the "text" field which converted to string.
- Later, I have created a configuration object through which I am accessing the keywords (like NASA or Spacex) dynamically from the driver code (main program) i.e; when code gets executed, we must give the keywords in the terminal when the input gets prompted.
- I have used regex to replace all the special characters except "#" with spaces and later used String Tokenizer to tokenize string into words. After that, retrieved the hashtags and appended it to keyword and returned the context object with parameters "hashtag+keyword" and "1" (key-value pairs) as output from mapper.
- In Partitioner class, I have divided the key from the mapper into string array and taken the index which contains the hashtag. Later, have converted the first letter in the hashtag which will be after "#" symbol to uppercase.
    - Partitioner Conditions:
        - Set the number of reducer tasks to "3".
        - If the first letter in the hashtag is in between ASCII value 65 to 71(letter from 'A' to 'G') then all the key-value pairs go to reducer "0".
        - If the first letter in the hashtag is in between ASCII value 72 to 85(letter from 'H' to 'U') then all the key-value pairs go to reducer "1".
        - If the first letter in the hashtag is in between ASCII value 86 to 90(letter from 'V' to 'Z') then all the key-value pairs go to reducer "2".
- In Reducer class, I have initialized a hashset which takes the key from key-value pairs. Whenever the hashset size is greater than 10 then it comes out of the reducer else it will sum the same hashtags.
- In the output, for each reducer, max of 10 hashtags will be displayed.
  Example: part-r-00000 contains max of 10 hashtags.

<u>Approach:</u>

Below are the steps I have followed to complete the PART 2 of the assignment,

1. I have created a java file for Hashtag count(HashPart2.java) using WinSCP instead of nano command as shown below.

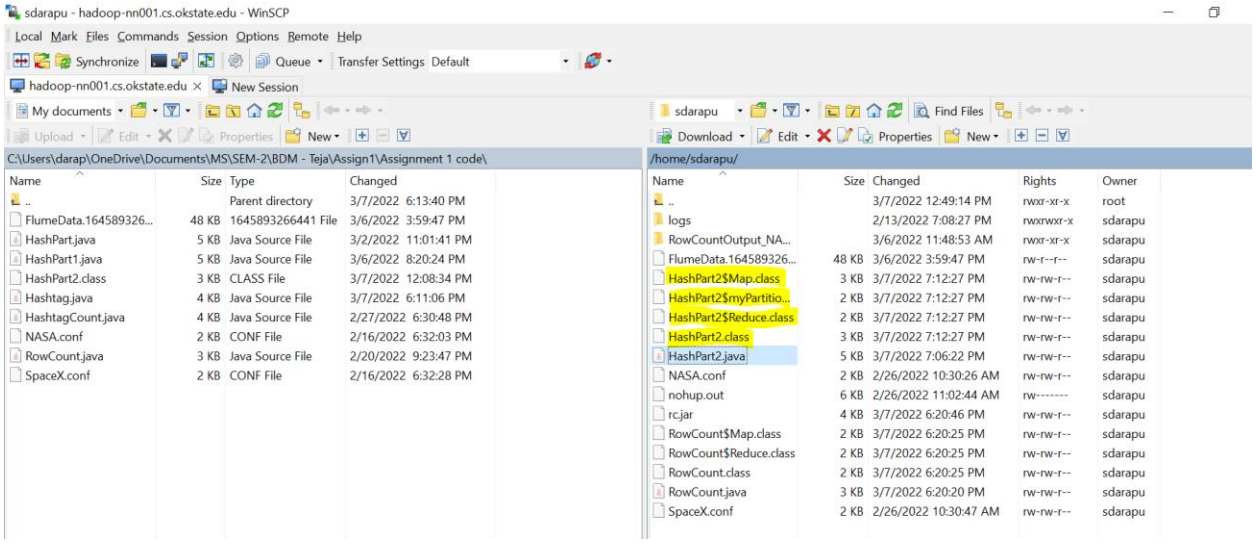


2. Once HashPart.java program is written, I have connected to the hadoop cluster and compiled the java program by using below command. (Refer the HashPart2.java code for SatyaRajyaSaiTejaswini_Darapureddy_Program_PA3)

```
sdarapu@hadoop-nn001:~$ hadoop com.sun.tools.javac.Main HashPart2.java
```

3. Once the program is compiled successfully, created a jar file for hashtag count called “hp.jar” by using the below command.

```
sdarapu@hadoop-nn001:~$ jar cf hp.jar HashPart2*.class
```



4. Now, running the jar file

For NASA data:

```
sdarapu@hadoop-nn001:~$ hadoop jar hp.jar HashPart2 /user/sdarapu/NASA_PA1data/2022/02/26/10/FlumeData.*
 /user/sdarapu/HashPartOutput_NASA
```

For SpaceX data:

```
sdarapu@hadoop-nn001:~$ hadoop jar hp.jar HashPart2 /user/sdarapu/SpaceX_PA1data/2022/02/26/11/FlumeData
.* /user/sdarapu/HashPartOutput_SpaceX
```

5. Now, System prompts for the input keyword to search in the tweet as shown below.

```
Enter a keyword to search in tweet:
```

For NASA data:

```
Enter a keyword to search in tweet:
NASA
```

For SpaceX data:

```
Enter a keyword to search in tweet:
SpaceX
```

6. Now, the program file gets executed.

For NASA data:

```
sdarapu@hadoop-nn001:~$ hadoop jar hp.jar HashPart2 /user/sdarapu/NASA_PA1data/2022/02/26/10/FlumeData.* /user/sdarapu/HashPartOutput_NASA
Enter a keyword to search in tweet:
NASA
2022-03-07 19:38:53,701 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes wher
2022-03-07 19:38:54,756 INFO client.DefaultNoHARMFailoverProxyProvider: Connecting to ResourceManager at hadoop-nn001.cs.okstate.edu/192.168.
2022-03-07 19:38:55,128 WARN mapreduce.JobResourceUploader: Hadoop command-line option parsing not performed. Implement the Tool interface ar
 ToolRunner to remedy this.
2022-03-07 19:38:55,145 INFO mapreduce.JobResourceUploader: Disabling Erasure Coding for path: /tmp/hadoop-yarn/staging/sdarapu/.staging/job_
2022-03-07 19:38:55,539 INFO input.FileInputFormat: Total input files to process : 73
2022-03-07 19:38:55,984 INFO mapreduce.JobSubmitter: number of splits:73
2022-03-07 19:38:56,193 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_1646249209374_1260
2022-03-07 19:38:56,194 INFO mapreduce.JobSubmitter: Executing with tokens: []
2022-03-07 19:38:56,375 INFO conf.Configuration: resource-types.xml not found
2022-03-07 19:38:56,376 INFO resource.ResourceUtils: Unable to find 'resource-types.xml'.
2022-03-07 19:38:56,444 INFO impl.YarnClientImpl: Submitted application application_1646249209374_1260
2022-03-07 19:38:56,487 INFO mapreduce.Job: The url to track the job: http://hadoop-nn001.cs.okstate.edu:8088/proxy/application_164624920937
2022-03-07 19:38:56,488 INFO mapreduce.Job: Running job: job_1646249209374_1260
2022-03-07 19:39:02,665 INFO mapreduce.Job: Job job_1646249209374_1260 running in uber mode : false
2022-03-07 19:39:02,667 INFO mapreduce.Job:  map 0% reduce 0%
2022-03-07 19:39:07,782 INFO mapreduce.Job:  map 23% reduce 0%
2022-03-07 19:39:08,793 INFO mapreduce.Job:  map 33% reduce 0%
2022-03-07 19:39:10,813 INFO mapreduce.Job:  map 34% reduce 0%
2022-03-07 19:39:11,824 INFO mapreduce.Job:  map 66% reduce 0%
2022-03-07 19:39:14,860 INFO mapreduce.Job:  map 67% reduce 0%
2022-03-07 19:39:15,870 INFO mapreduce.Job:  map 96% reduce 0%
2022-03-07 19:39:18,898 INFO mapreduce.Job:  map 97% reduce 0%
2022-03-07 19:39:19,909 INFO mapreduce.Job:  map 100% reduce 100%
2022-03-07 19:39:20,933 INFO mapreduce.Job: Job job_1646249209374_1260 completed successfully
2022-03-07 19:39:21,055 INFO mapreduce.Job: Counters: 55
        File System Counters
                FILE: Number of bytes read=2610
                FILE: Number of bytes written=19862914
                FILE: Number of read operations=0
                FILE: Number of large read operations=0
                FILE: Number of write operations=0
                HDFS: Number of bytes read=4179057
                HDFS: Number of bytes written=311
                HDFS: Number of read operations=229
                HDFS: Number of large read operations=0
                HDFS: Number of write operations=4
                HDFS: Number of bytes read erasure-coded=0
```

```
                Total vcore-milliseconds taken by all map tasks=215269
                Total vcore-milliseconds taken by all reduce tasks=16526
                Total megabyte-milliseconds taken by all map tasks=1102177280
                Total megabyte-milliseconds taken by all reduce tasks=84613120
        Map-Reduce Framework
                Map input records=728
                Map output records=136
                Map output bytes=2326
                Map output materialized bytes=3474
                Input split bytes=12268
                Combine input records=0
                Combine output records=0
                Reduce input groups=51
                Reduce shuffle bytes=3474
                Reduce input records=136
                Reduce output records=20
                Spilled Records=272
                Shuffled Maps =146
                Failed Shuffles=0
                Merged Map outputs=146
                GC time elapsed (ms)=1476
                CPU time spent (ms)=83760
                Physical memory (bytes) snapshot=27079897088
                Virtual memory (bytes) snapshot=479011594240
                Total committed heap usage (bytes)=59215183872
                Peak Map Physical memory (bytes)=373186560
                Peak Map Virtual memory (bytes)=6394925056
                Peak Reduce Physical memory (bytes)=270901248
                Peak Reduce Virtual memory (bytes)=6406447104
        Shuffle Errors
                BAD_ID=0
                CONNECTION=0
                IO_ERROR=0
                WRONG_LENGTH=0
                WRONG_MAP=0
                WRONG_REDUCE=0
        File Input Format Counters
                Bytes Read=4166789
        File Output Format Counters
                Bytes Written=311
sdarapu@hadoop-nn001:~$
```

For SpaceX data:

```
sdarapu@hadoop-nn001:~$ hadoop jar hp.jar HashPart2 /user/sdarapu/SpaceX_PA1data/2022/02/26/11/FlumeData.* /user/sdarapu/HashPartOutput_SpaceX
Enter a keyword to search in tweet:
SpaceX
2022-03-07 19:32:36,922 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicabl
2022-03-07 19:32:48,355 INFO client.DefaultNoHARMFailoverProxyProvider: Connecting to ResourceManager at hadoop-nn001.cs.okstate.edu/192.168.122.2:8032
2022-03-07 19:32:48,981 WARN mapreduce.JobResourceUploader: Hadoop command-line option parsing not performed. Implement the Tool interface and execute y
 ToolRunner to remedy this.
2022-03-07 19:32:49,016 INFO mapreduce.JobResourceUploader: Disabling Erasure Coding for path: /tmp/hadoop-yarn/staging/sdarapu/.staging/job_16462492093
2022-03-07 19:32:49,704 INFO input.FileInputFormat: Total input files to process : 74
2022-03-07 19:32:50,251 INFO mapreduce.JobSubmitter: number of splits:74
2022-03-07 19:32:50,430 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_1646249209374_1251
2022-03-07 19:32:50,430 INFO mapreduce.JobSubmitter: Executing with tokens: []
2022-03-07 19:32:50,627 INFO conf.Configuration: resource-types.xml not found
2022-03-07 19:32:50,627 INFO resource.ResourceUtils: Unable to find 'resource-types.xml'.
2022-03-07 19:32:50,701 INFO impl.YarnClientImpl: Submitted application application_1646249209374_1251
2022-03-07 19:32:50,745 INFO mapreduce.Job: The url to track the job: http://hadoop-nn001.cs.okstate.edu:8088/proxy/application_1646249209374_1251/
2022-03-07 19:32:50,746 INFO mapreduce.Job: Running job: job_1646249209374_1251
2022-03-07 19:32:55,863 INFO mapreduce.Job: Job job_1646249209374_1251 running in uber mode : false
2022-03-07 19:32:55,866 INFO mapreduce.Job:  map 0% reduce 0%
2022-03-07 19:33:00,964 INFO mapreduce.Job:  map 5% reduce 0%
2022-03-07 19:33:01,974 INFO mapreduce.Job:  map 32% reduce 0%
2022-03-07 19:33:05,006 INFO mapreduce.Job:  map 49% reduce 0%
2022-03-07 19:33:06,017 INFO mapreduce.Job:  map 65% reduce 0%
2022-03-07 19:33:08,035 INFO mapreduce.Job:  map 66% reduce 0%
2022-03-07 19:33:09,045 INFO mapreduce.Job:  map 80% reduce 0%
2022-03-07 19:33:10,055 INFO mapreduce.Job:  map 92% reduce 0%
2022-03-07 19:33:11,071 INFO mapreduce.Job:  map 95% reduce 0%
2022-03-07 19:33:12,082 INFO mapreduce.Job:  map 99% reduce 0%
2022-03-07 19:33:13,092 INFO mapreduce.Job:  map 100% reduce 50%
2022-03-07 19:33:14,101 INFO mapreduce.Job:  map 100% reduce 100%
2022-03-07 19:33:14,117 INFO mapreduce.Job: Job job_1646249209374_1251 completed successfully
2022-03-07 19:33:14,250 INFO mapreduce.Job: Counters: 57
        File System Counters
                FILE: Number of bytes read=13756
                FILE: Number of bytes written=20150434
                FILE: Number of read operations=0
                FILE: Number of large read operations=0
                FILE: Number of write operations=0
                HDFS: Number of bytes read=4013197
                HDFS: Number of bytes written=379
                HDFS: Number of read operations=232
```

```
                Total vcore-milliseconds taken by all map tasks=214746
                Total vcore-milliseconds taken by all reduce tasks=15458
                Total megabyte-milliseconds taken by all map tasks=1099499520
                Total megabyte-milliseconds taken by all reduce tasks=79144960
        Map-Reduce Framework
                Map input records=730
                Map output records=575
                Map output bytes=12594
                Map output materialized bytes=14632
                Input split bytes=12584
                Combine input records=0
                Combine output records=0
                Reduce input groups=74
                Reduce shuffle bytes=14632
                Reduce input records=575
                Reduce output records=20
                Spilled Records=1150
                Shuffled Maps =148
                Failed Shuffles=0
                Merged Map outputs=148
                GC time elapsed (ms)=1460
                CPU time spent (ms)=76070
                Physical memory (bytes) snapshot=27215712256
                Virtual memory (bytes) snapshot=485420630016
                Total committed heap usage (bytes)=59982741504
                Peak Map Physical memory (bytes)=374710272
                Peak Map Virtual memory (bytes)=6400778240
                Peak Reduce Physical memory (bytes)=271851520
                Peak Reduce Virtual memory (bytes)=6406524928
        Shuffle Errors
                BAD_ID=0
                CONNECTION=0
                IO_ERROR=0
                WRONG_LENGTH=0
                WRONG_MAP=0
                WRONG_REDUCE=0
        File Input Format Counters
                Bytes Read=4000613
        File Output Format Counters
                Bytes Written=379
sdarapu@hadoop-nn001:~$
```

7. Now, to view the output in all the reducers, executed the below command.
8. For NASA data:

```
sdarapu@hadoop-nn001:~$ hdfs dfs -cat /user/sdarapu/HashPartOutput_NASA/part*
2022-03-07 19:47:08,466 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-ja
#BBB22 NASA     2
#BandaiNamcoMM NASA     1
#CambioClim NASA        1
#Carnaval NASA  1
#Curiosity NASA 6
#CuriosityRover NASA    6
#Cygnus NASA    2
#EEUU NASA      1
#ESA NASA       1
#Ethereum NASA  1
#H2WO NASA      5
#Hubble30 NASA  1
#ICYMI NASA     5
#ISS NASA       3
#JPL NASA       6
#KENTIN NASA    1
#Mars NASA      19
#MarsMission NASA       6
#NASA NASA      10
#NFT NASA       1
#26Feb NASA     1
#8217 NASA      1
```

Total Hashtags = 22

For SpaceX data:

```
sdarapu@hadoop-nn001:~$ hdfs dfs -cat /user/sdarapu/HashPartOutput_SpaceX/part*
2022-03-07 19:59:21,997 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform.
#Bitcoin SpaceX 3
#BocaChicaToMars SpaceX 1
#Cryptocurrency SpaceX  1
#DefiSportsCoin SpaceX  1
#DidYouKnow SpaceX      2
#Doge SpaceX    1
#Dogecoin SpaceX        1
#ERC20 SpaceX   1
#ETH SpaceX     6
#ElonMusk SpaceX        17
#HeroFLoki SpaceX       1
#HeroFloki SpaceX       28
#Indigenous SpaceX      2
#MATIC SpaceX   6
#Metaverse SpaceX       1
#NASA SpaceX    4
#Raptors SpaceX 3
#Russia SpaceX  1
#SN20 SpaceX    2
#ShibaFloki SpaceX      1
#1000x SpaceX   1
#VOLT SpaceX    1
#VOLTARMY SpaceX        1
#YesPunjab SpaceX       1
```

Total Hashtags = 24

9. Below is the command the to view the part-r files

For NASA data:

```
sdarapu@hadoop-nn001:~$ hdfs dfs -ls /user/sdarapu/HashPartOutput_NASA/part*
2022-03-07 19:53:25,991 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using
-rw-r--r--   3 sdarapu sdarapu        170 2022-03-07 19:46 /user/sdarapu/HashPartOutput_NASA/part-r-00000
-rw-r--r--   3 sdarapu sdarapu        143 2022-03-07 19:46 /user/sdarapu/HashPartOutput_NASA/part-r-00001
-rw-r--r--   3 sdarapu sdarapu         27 2022-03-07 19:46 /user/sdarapu/HashPartOutput_NASA/part-r-00002
sdarapu@hadoop-nn001:~$
```

For SpaceX data:

```
sdarapu@hadoop-nn001:~$ hdfs dfs -ls /user/sdarapu/HashPartOutput_SpaceX/part*
2022-03-07 20:15:10,226 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... usi
-rw-r--r--   3 sdarapu sdarapu        199 2022-03-07 19:58 /user/sdarapu/HashPartOutput_SpaceX/part-r-00000
-rw-r--r--   3 sdarapu sdarapu        184 2022-03-07 19:58 /user/sdarapu/HashPartOutput_SpaceX/part-r-00001
-rw-r--r--   3 sdarapu sdarapu         70 2022-03-07 19:58 /user/sdarapu/HashPartOutput_SpaceX/part-r-00002
sdarapu@hadoop-nn001:~$
```

10. To view the data in each reducer individually.

For NASA data:

For reducer 0 (part-r-00000)

```
sdarapu@hadoop-nn001:~$ hdfs dfs -cat /user/sdarapu/HashPartOutput_NASA/part-r-00000
2022-03-07 19:53:55,084 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platf
#BBB22 NASA     2
#BandaiNamcoMM NASA     1
#CambioClim NASA        1
#Carnaval NASA  1
#Curiosity NASA 6
#CuriosityRover NASA    6
#Cygnus NASA    2
#EEUU NASA      1
#ESA NASA       1
#Ethereum NASA  1
sdarapu@hadoop-nn001:~$
```

Total Hashtags = 10

For reducer 1 (part-r-00001)

```
sdarapu@hadoop-nn001:~$ hdfs dfs -cat /user/sdarapu/HashPartOutput_NASA/part-r-00001
2022-03-07 19:54:21,491 WARN util.NativeCodeLoader: Unable to load native-hadoop library for y
#H2WO NASA      5
#Hubble30 NASA  1
#ICYMI NASA     5
#ISS NASA       3
#JPL NASA       6
#KENTIN NASA    1
#Mars NASA      19
#MarsMission NASA       6
#NASA NASA      10
#NFT NASA       1
sdarapu@hadoop-nn001:~$
```

Total Hashtags = 10

For reducer 2 (part-r-00002)

```
sdarapu@hadoop-nn001:~$ hdfs dfs -cat /user/sdarapu/HashPartOutput_NASA/part-r-00002
2022-03-07 19:54:36,441 WARN util.NativeCodeLoader: Unable to load native-hadoop librar
#26Feb NASA     1
#8217 NASA      1
sdarapu@hadoop-nn001:~$
```

Total Hashtags = 2

For SpaceX data:

For reducer 0 (part-r-00000)

```
sdarapu@hadoop-nn001:~$ hdfs dfs -cat /user/sdarapu/HashPartOutput_SpaceX/part-r-00000
2022-03-07 20:00:06,784 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your
#Bitcoin SpaceX 3
#BocaChicaToMars SpaceX 1
#Cryptocurrency SpaceX  1
#DefiSportsCoin SpaceX  1
#DidYouKnow SpaceX      2
#Doge SpaceX    1
#Dogecoin SpaceX        1
#ERC20 SpaceX   1
#ETH SpaceX     6
#ElonMusk SpaceX        17
sdarapu@hadoop-nn001:~$
```

Total Hashtags = 10

For reducer 1 (part-r-00001)

```
sdarapu@hadoop-nn001:~$ hdfs dfs -cat /user/sdarapu/HashPartOutput_SpaceX/part-r-00001
2022-03-07 20:00:23,510 WARN util.NativeCodeLoader: Unable to load native-hadoop library for you
#HeroFLoki SpaceX       1
#HeroFloki SpaceX       28
#Indigenous SpaceX      2
#MATIC SpaceX   6
#Metaverse SpaceX       1
#NASA SpaceX    4
#Raptors SpaceX 3
#Russia SpaceX  1
#SN20 SpaceX    2
#ShibaFloki SpaceX      1
sdarapu@hadoop-nn001:~$
```

Total Hashtags = 10

For reducer 2 (part-r-00002)

```
sdarapu@hadoop-nn001:~$ hdfs dfs -cat /user/sdarapu/HashPartOutput_SpaceX/part-r-00002
2022-03-07 20:00:51,154 WARN util.NativeCodeLoader: Unable to load native-hadoop librar
#1000x SpaceX   1
#VOLT SpaceX    1
#VOLTARMY SpaceX        1
#YesPunjab SpaceX       1
sdarapu@hadoop-nn001:~$
```

Total Hashtags = 4

11. Now, copied the output file to Hadoop local by using the below command

For NASA data:

```
sdarapu@hadoop-nn001:~$ hadoop fs -get /user/sdarapu/HashPartOutput_NASA  /home/sdarapu
```

For SpaceX data:

```
sdarapu@hadoop-nn001:~$ hadoop fs -get /user/sdarapu/HashPartOutput_SpaceX  /home/sdarapu
```