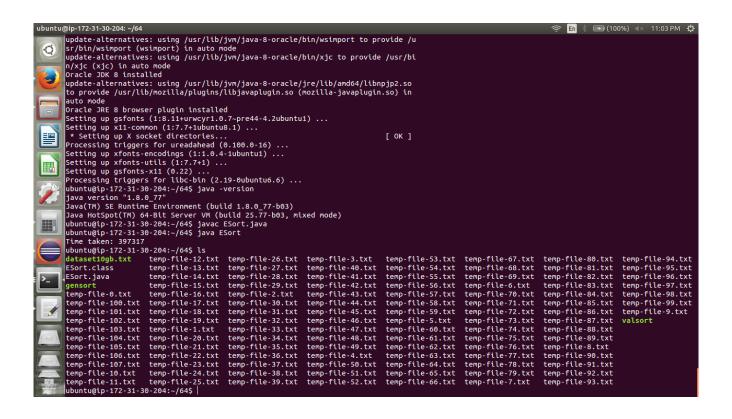
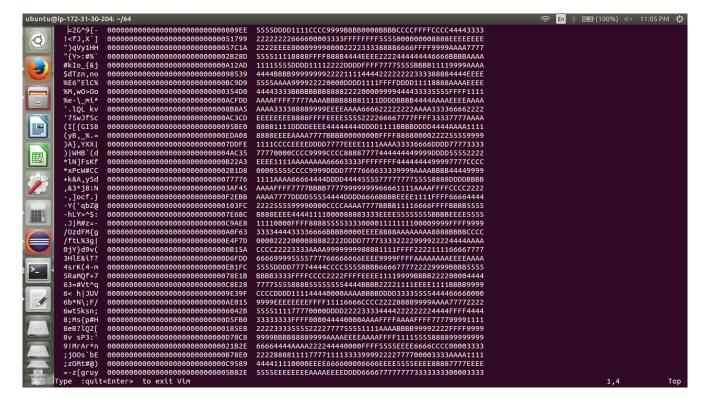
#### **Shared-Memory Output:**

```
Length: unspecified [application/octet-stream]
Saving to: 'gensort-linux-1.5.tar.gz'
                                               226,665
                                                              184KB/s
                                                                         in 1.2s
    [
2016-03-30 03:23:02 (184 KB/s) - 'gensort-linux-1.5.tar.gz' saved [226665]
ubuntu@ip-172-31-30-204:~$ tar -xvf gensort-linux-1.5.tar.gz
gpl-2.0.txt
32/
32/valsort
32/gensort
64/
64/valsort
64/gensort
ubuntu@ip-172-31-30-204:~$ ls
                                    gpl-2.0.txt
32 64
ubuntu@ip-172-31-30-204:~$ cd 64
ubuntu@ip-172-31-30-204:~/64$ ls
gensort valsort
ubuntu@ip-172-31-30-204:~/64$ ./gensort -a 107374182 dataset10gb.txt
ubuntu@ip-172-31-30-204:~/64$ ls
dataset10gb.txt gensort valsort
ubuntu@ip-172-31-30-204:~/64$ ls
dataset10gb.txt ESort.java gensort valsort
ubuntu@ip-172-31-30-204:~/64$ javac ESort.java
```

```
update-alternatives: using /usr/lib/jvm/java-8-oracle/bin/serialver to provide /
usr/bin/serialver (serialver) in auto mode
update-alternatives: using /usr/lib/jvm/java-8-oracle/bin/wsgen to provide /usr/
bin/wsgen (wsgen) in auto mode
update-alternatives: using /usr/lib/jvm/java-8-oracle/bin/wsimport to provide /usr/
bin/wsimport (wsimport) in auto mode
update-alternatives: using /usr/lib/jvm/java-8-oracle/bin/wsimport to provide /usr/bin/wsimport (sign yusr/lib/jvm/java-8-oracle/bin/xjc to provide /usr/bin/xjc (xjc) in auto mode
update-alternatives: using /usr/lib/jvm/java-8-oracle/pire/lib/amd64/libnpjp2.so
to provide /usr/lib/mozilla/plugins/libjavaplugin.so (mozilla-javaplugin.so) in
auto mode
Oracle JDK 8 browser plugin installed
Setting up gsfonts (1:8.11+urwcyr1.0.7-pre44-4.2ubuntu1) ...
Setting up xforts-virugers for ureadahead (0.100.0-16) ...
Setting up x xforts-encodings (1:1.0.4-1ubuntu1) ...
Setting up xfonts-utils (1:7.7+1) ...
Setting up xfonts-utils (1:7.7+1) ...
Setting up xfonts-virugers for libc-bin (2.19-0ubuntu6.6) ...
ubuntugip-172-31-30-204:-/64$ java -version
java version "1.8.0_77"
Java(TM) SE Runtime Environment (build 1.8.0_77-b03)
Java HotSpot(TM) 64-Bit Server VM (build 25.77-b03, mixed mode)
ubuntugip-172-31-30-204:-/64$ java ESort
I/me taken: 397317
ubuntugip-172-31-30-204:-/64$
```





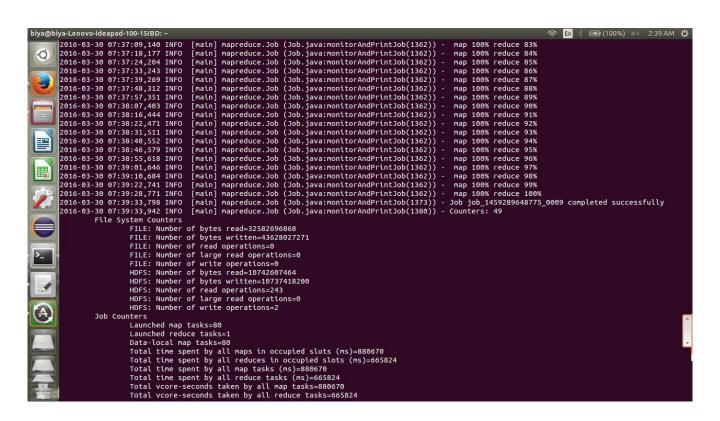
### **Hadoop 1 Node Output:**

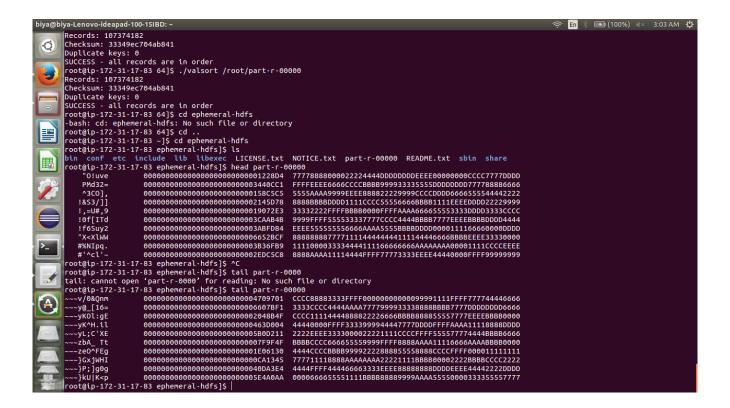
## **Browse Directory**

/user/biya/Input							Go!
Permission	Owner	Group	Size	Replication	Block Size	Name	
-rw-rr	root	supergroup	10 GB	3	128 MB	dataset10gb.txt	
-rw-rr	root	supergroup	953.67 MB	3	128 MB	dataset1gb.txt	

```
at org.apache.hadoop.napreduce.JobSubnitter.writeNewSplits(JobSubnitter.java:493)
at org.apache.hadoop.napreduce.JobSubnitter.writeSplits(JobSubnitter.java:516)
at org.apache.hadoop.napreduce.JobSubnitter.subnitJobInternal(JobSubnitter.java:394)
at org.apache.hadoop.napreduce.JobSubnitter.subnitJobInternal(JobSubnitter.java:394)
at org.apache.hadoop.napreduce.JobSiD.run(Job.java:1282)
at org.apache.hadoop.napreduce.JobSiD.run(Job.java:1282)
at org.apache.hadoop.napreduce.JobSiD.run(Job.java:1282)
at org.apache.hadoop.napreduce.JobSiD.run(Job.java:1282)
at org.apache.hadoop.napreduce.JobSiD.run(Job.java:1282)
at org.apache.hadoop.napreduce.JobSiD.run(Job.java:1282)
at org.apache.hadoop.napreduce.Job.woll.forCompletion(Job.java:1303)
at org.apache.hadoop.napreduce.Job.woll.forCompletion(Job.java:1303)
at org.apache.hadoop.napreduce.Job.woll.forCompletion(Job.java:1303)
at sun.reflect.NativeNetehodAccessorInpl.invoke(NativeNethodAccessorInpl.java:57)
at sun.reflect.NativeNetehodAccessorInpl.invoke(NativeNethodAccessorInpl.java:43)
at java.lang.reflect.Nethod.invoke(NativeNethodAccessorInpl.java:43)
at org.apache.hadoop.utll.RunJar.natin(RunJar.java:212)
root@pl-172-31-783 epheneral-hdfs/Shin/hadops jar/root/HadoopSort.jar HadoopSort /user/biya/Input/datasetl@b.txt /user/biya/Output/output/
xt · Dappreduce.job.reduces-40
ponDNG 64-814 Server W warning: You have loaded library /root/epheneral-hdfs/lib/native/libhadoop.so.1.0.0 which might have disabled stack gua
rd. The W will be reflect have sack guard now.
rd. The W will be reflect.Native for the sack guard now.
rd. The W will be reflect.Native for the sack
```

```
2016-03-30 07:23:25,300 INFO
2016-03-30 07:23:35,363 INFO
                                                                                                                                                                                    (Job.java:monitorAndPrintJob(1362)
                                                                                                                                    mapreduce.Job
                                                                                                                                                                                                                                                                                                                                             70% reduce
                                                                                                                                 mapreduce.Job (Job.java:monitorAndPrintJob(1302))
mapreduce.Job (Job.java:monitorAndPrintJob(1362))
                                                                                                                                                                                                                                                                                                                                            71% reduce
                                                                                                                                                                                                                                                                                                                              тар
2016-03-30 07:23:47,420 INFO
2016-03-30 07:23:49,430 INFO
                                                                                                             mainl
                                                                                                                                                                                                                                                                                                                             map 72% reduce 0%
                                                                                                                                                                                                                                                                                                                                            73% reduce 0%
                                                                                                            [main]
                                                                                                                                                                                                                                                                                                                             map
 2016-03-30 07:24:01,489 INFO
2016-03-30 07:24:12,543 INFO
2016-03-30 07:24:25,606 INFO
                                                                                                                                                                                                                                                                                                                             map 74% reduce 0%
                                                                                                            [main]
                                                                                                            [main] mapreduce.Job
[main] mapreduce.Job
                                                                                                                                                                                                                                                                                                                             map 75% reduce 0% map 76% reduce 0%
2016-03-30 07:24:25,000 INFO
2016-03-30 07:24:50,729 INFO
2016-03-30 07:24:51,734 INFO
2016-03-30 07:25:02,790 INFO
2016-03-30 07:25:14,849 INFO
                                                                                                                                                                                    (Job. java:monitorAndPrintJob(1362))
(Job. java:monitorAndPrintJob(1362))
(Job. java:monitorAndPrintJob(1362))
                                                                                                                                                                                                                                                                                                                             map 77% reduce 0% map 78% reduce 0%
                                                                                                             [main]
                                                                                                                                  mapreduce.Job
                                                                                                            [main]
[main]
                                                                                                                                  mapreduce.Job
                                                                                                                                  mapreduce.Job
                                                                                                                                                                                                                                                                                                                             map 79% reduce
                                                                                                                                 mapreduce.Job (Job.java:monitorAndPrintJob(1362))
mapreduce.Job (Job.java:monitorAndPrintJob(1362))
mapreduce.Job (Job.java:monitorAndPrintJob(1362))
mapreduce.Job (Job.java:monitorAndPrintJob(1362))
                                                                                                                                                                                                                                                                                                                             map 80% reduce 0% map 81% reduce 0%
                                                                                                            [main]
                                                                                                            [main]
                                                                                                                                                                                  (Job. java:monitorAndPrintJob(1362))
 2016-03-30 07:25:26,922 INFO
2016-03-30 07:25:39,993 INFO
2016-03-30 07:25:40,997 INFO
                                                                                                                                                                                                                                                                                                                             map 82% reduce 0%
map 83% reduce 0%
                                                                                                             [main]
                                                                                                            [main]
                                                                                                                                  mapreduce.Job
                                                                                                            [main]
                                                                                                                                  mapreduce.Job
                                                                                                                                                                                                                                                                                                                              map 84% reduce 0%
  2016-03-30 07:25:55,067 INFO
                                                                                                                                                                                                                                                                                                                             map 85% reduce 0% map 86% reduce 0%
                                                                                                            [main]
                                                                                                                                  mapreduce.Job
   2016-03-30 07:26:05,124 INFO
                                                                                                                                  mapreduce.Job
                                                                                                            [main]
 2016-03-30 07:26:17,181 INFO
2016-03-30 07:26:20,195 INFO
2016-03-30 07:26:31,249 INFO
                                                                                                                                                                                                                                                                                                                             map 87% reduce 0%
map 88% reduce 0%
map 89% reduce 0%
                                                                                                            [main]
                                                                                                                                  mapreduce.Job
                                                                                                            [main] mapreduce.Job
[main] mapreduce.Job
                                                                                                                                  mapreduce.Job
2016-03-30 07:20:42,301 INFO
2016-03-30 07:20:55,368 INFO
2016-03-30 07:27:07,426 INFO
2016-03-30 07:27:09,435 INFO
2016-03-30 07:27:21,492 INFO
                                                                                                                                 mapreduce.Job (Job.java:monitorAndPrintJob(1362))
mapreduce.Job (Job.java:monitorAndPrintJob(1362))
mapreduce.Job (Job.java:monitorAndPrintJob(1362))
                                                                                                            [main]
                                                                                                                                                                                                                                                                                                                             map 90% reduce 0% map 91% reduce 0%
                                                                                                            [main]
                                                                                                        [main] mapreduce.Job (Job.java:monitorAndPrintJob(1362))
                                                                                                                                                                                                                                                                                                                             map 92% reduce
                                                                                                             [main]
                                                                                                                                                                                                                                                                                                                             map 93% reduce 0%
                                                                                                                                                                                                                                                                                                                             map 94% reduce 0%
2016-03-30 07:27:27,492 INFO 2016-03-30 07:27:35,561 INFO 2016-03-30 07:27:45,612 INFO 2016-03-30 07:27:57,669 INFO 2016-03-30 07:27:59,680 INFO 2016-03-30 07:28:12,739 INFO 2016-03-30 07:28:22,788 INFO 2016-03-30 07:28:41,880 INFO
                                                                                                                                                                                                                                                                                                                             map 95% reduce 0% map 96% reduce 0%
                                                                                                                                                                                                                                                                                                                              map 97% reduce
                                                                                                                                                                                                                                                                                                                             map 98% reduce 0% map 99% reduce 0%
                                                                                                                                                                                                                                                                                                                             map 100% reduce 0%
                                                                                                                                                                                                                                                                                                                             map 100% reduce 1%
                                                                                                                                                                                                                                                                                                                              map 100% reduce
2016-03-30 07:28:41,889 INFO
2016-03-30 07:28:56,919 INFO
2016-03-30 07:28:56,944 INFO
2016-03-30 07:28:56,944 INFO
2016-03-30 07:29:02,970 INFO
2016-03-30 07:29:08,996 INFO
2016-03-30 07:29:15,022 INFO
2016-03-30 07:29:24,061 INFO
                                                                                                                                                                                                                                                                                                                             map 100% reduce 3% map 100% reduce 4%
                                                                                                                                                                                                                                                                                                                              map 100% reduce
                                                                                                                                                                                                                                                                                                                             map 100% reduce 6% map 100% reduce 7%
                                                                                                                                                                                                                                                                                                                             map 100% reduce 8% map 100% reduce 9%
```



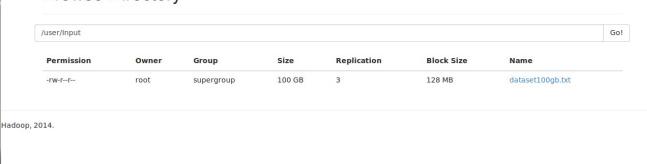


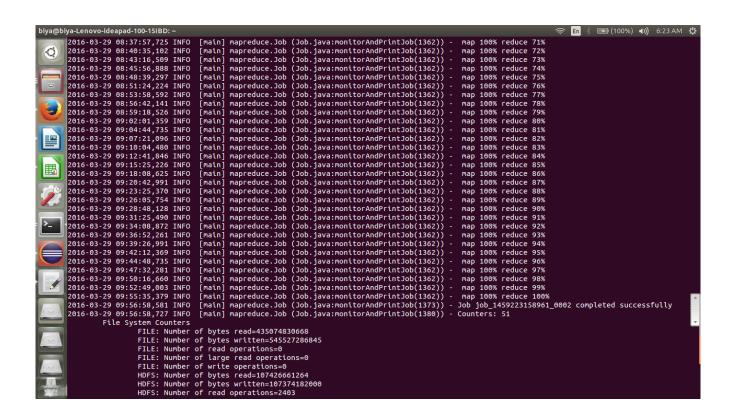
# **Browse Directory**

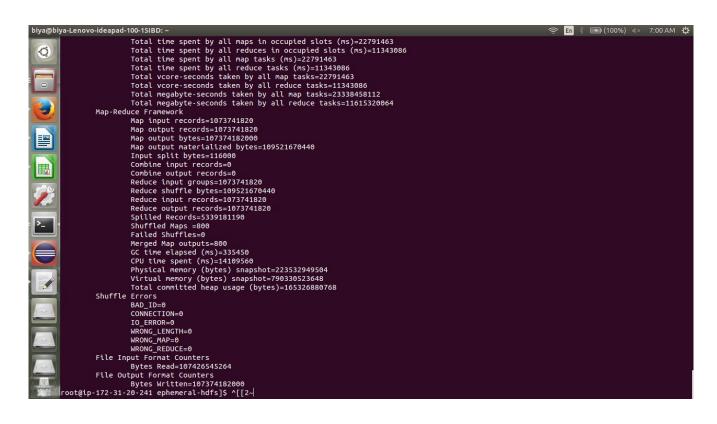
/user/biya/Output/output1.txt						Go!	
Permission	Owner	Group	Size	Replication	Block Size	Name	
-rw-rr	root	supergroup	0 B	3	128 MB	_SUCCESS	
-rw-rr	root	supergroup	10 GB	3	128 MB	part-r-00000	

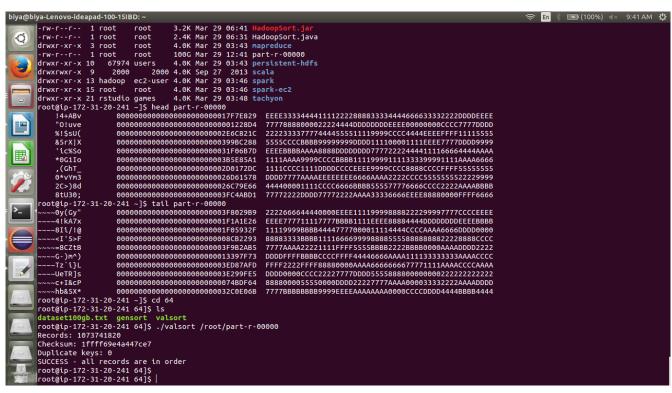
### **Hadoop 16 Node Output:**

# **Browse Directory**









# **Browse Directory**



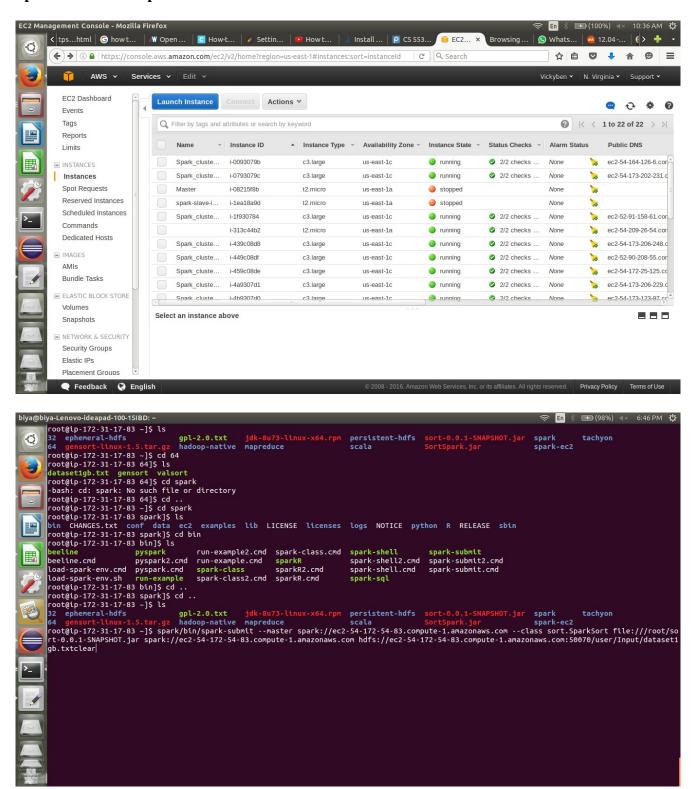
### **Spark 1 Node Output:**

## **Browse Directory**

/user/biya/Input							Go!
Permission	Owner	Group	Size	Replication	Block Size	Name	
-rw-rr	root	supergroup	10 GB	3	128 MB	dataset10gb.txt	
-rw-rr	root	supergroup	953.67 MB	3	128 MB	dataset1gb.txt	

```
root@ip-172-31-17-83 64]$ ./valsort /root/part-r-00000
Records: 107374182
Checksum: 33349ec704ab841
Duplicate keys: 0
SUCCESS - all records are in order
root@ip-172-31-17-83 64]$ cd ..
root@ip-172-31-17-83 ~]$ head part-r-00000
                  0000000000000000000000000001228D4
                                                     77778888000022224444DDDDDDDDDEEEE00000000CCCC7777DDDD
    "0!uve
   PMd32=
                  0000000000000000000000003440CC1
                                                     FFFFEEEE6666CCCCBBBB999933335555DDDDDDD777788886666
    ^3CO],
                  0000000000000000000000000158C5C5
                                                     5555AAAA9999EEEE888822229999CCCCDDDD6666555544442222
   !&S3/]]
                  00000000000000000000000002145D78
                                                     8888BBBDDDD1111CCCC55556666BBBB1111EEEEDDDD22229999
   !,=U#,9
                  000000000000000000000000019072E3
                                                     33332222FFFFBBBB0000FFFFAAAA666655553333DDDD33333CCCC
   !Of[ITd
                  00000000000000000000000003CAAB4B
                                                     9999FFFF555533337777CCCC4444BBBB7777EEEEBBBBDDDD4444
                  0000000000000000000000000003ABFD84
                                                     EEEE55555556666AAAA5555BBBBDDDD0000111166660000DDD
   !f6Suv2
   "X<XlWW
                  00000000000000000000000006652BCF
                                                     88888887777111144444444111144446666BBBBEEEE33330000
  #%NIpq.
                  00000000000000000000000003B36FB9
                                                     1111000033334444111166666666AAAAAAAAA00001111CCCCEEEE
   #'^cl'~
                  000000000000000000000000002EDC5C8
                                                     8888AAAA11114444FFFF77773333EEEE44440000FFFF99999999
oot@ip-172-31-17-83 ~]$ tail part-r-00000
  ~v/0&Qnm
                  00000000000000000000000004709701
                                                     CCCC88883333FFFF00000000000099991111FFFF777744446666
  -y@_[16=
                  000000000000000000000000006607BF1
                                                     3333CCCC4444AAAA777799993333888BBBB7777DDDDDDDDD6666
  -yKOl:gE
                  00000000000000000000000002048B4F
                                                     CCCC11114444888822226666BBBB888855557777EEEEBBBB0000
  yK^H.il
                  0000000000000000000000000463D004
                                                     44440000FFFF3333999944447777DDDDFFFFAAAA11118888DDDD
  ~yL;C'XE
~zbA_ Tt
                  00000000000000000000000005B0D211
                                                     2222EEEE3333000022221111CCCCFFFF555577774444BBBB6666
                  00000000000000000000000007F9F4F
                                                     BBBBCCCC666655559999FFFF8888AAAA11116666AAAABBBB0000
  ~ze0^FEg
                  0000000000000000000000001E06130
                                                     4444CCCCBBBB99992222888855558888CCCCFFFF000011111111
  -}GxjWHI
                  0000000000000000000000000000000A1345
                                                     777711118888AAAAAAAA22221111BBBB00002222BBBBCCCC2222
                  0000000000000000000000000040DA3E4
  ·}P;]g0g
                                                     4444FFFF444466663333EEEE8888888DDDDEEEE44442222DDDD
                  0000000000000000000000005E4A0AA
                                                     0000666655551111BBBB88889999AAAA55550000333355557777
  -}kU|K<p
oot@ip-172-31-17-83 ~]$ ^C
```

### **Spark 16 Node Output:**



```
oot@ip-172-31-20-241 ~]$ head part-r-00000
                       000000000000000000000017F7E829
                                                                  EEEE3333444411112222888833334444666633332222DDDDEEEE
      !4+ABv
      "0!uve
                       000000000000000000000000001228D4
                                                                   77778888000022224444DDDDDDDDEEEE00000000CCCC7777DDDD
     %!$sU(
                       000000000000000000000000002F6C821C
                                                                  2222333377774444555511119999CCCC4444EEEEFFFF11115555
     &5rX|X
                       0000000000000000000000399BC288
                                                                   5555CCCCBBBB9999999DDD1111100001111EEEE7777DDDD9999
     'ic%So
*0G1Io
                       0000000000000000000000031F06B7D
                                                                  EEEEBBBBAAAA8888DDDDDDD777722224444111166664444AAAA 1111AAAA9999CCCCBBBB111199991111333399991111AAAA6666
                       0000000000000000000000003B5E85A1
     ,(GhT_
0*vYm3
2C>)8d
                       1111CCCC1111DDDDCCCCEEEE9999CCCC8888CCCCFFFF5555555
                                                                  DDDD7777AAAAEEEEEEE6666AAAA2222CCCC5555555522229999
                       00000000000000000000000026D61578
                       00000000000000000000000026C79E66
                                                                   444400001111CCCC6666BBBB555577776666CCCC2222AAAABBBB
     8tU30;
                       000000000000000000000003FC4ABD1
                                                                   77772222DDDD77772222AAAA33336666EEEE88880000FFFF6666
 2222666644440000EEEE111199998888222299997777CCCCEEEE
                                                                  EEEE777711117777BBBB1111EEEE88884444DDDDDDDDEEEEBBBB 11119999BBBB44447777000011114444CCCCAAAA6666DDDD0000
   ~~8Ii/!@
~~<I'5>F
                                                                  88883333BBBB111166669999888555588888888822228888CCC 7777AAAA22221111FFFF5555BBB2222BBB0000AAAADDDD2222 DDDDFFFFBBBBCCCCFFFF44446666AAAA111133333333AAAACCCC
                       000000000000000000000000008CB2293
                       00000000000000000000000003F9B2AB5
     ~=8CZtB
    ~G-)m^)
~Tz`i}L
                       0000000000000000000000013397F73
                       0000000000000000000000003ED87AFD
00000000000000000000000003E299FE5
                                                                  FFFF2222FFFF88880000AAAA666666677771111AAAACCCCAAAA
                                                                  DDDD0000CCCC22227777DDDD555588880000000022222222222
  ~~UeTR]s
                                                                  8888000055550000DDD22227777AAAA000033332222AAAADDDD
7777BBBBBBBB9999EEEAAAAAAAA0000CCCCDDD14444BBB84444
                       00000000000000000000000074BDF64
    ~hb&5X*
                       00000000000000000000000032C0E06B
root@ip-172-31-20-241 ~]$ cd 64
root@ip-172-31-20-241 64]$ ls
dataset100gb.txt gensort valsort
root@ip-172-31-20-241 64]$ ./valsort /root/part-r-00000
Records: 1073741820
Checksum: 1ffff69e4a447ce7
Duplicate keys: 0
SUCCESS: all records are in order
root@ip-172-31-20-241 64]$
root@ip-172-31-20-241 64]$
```