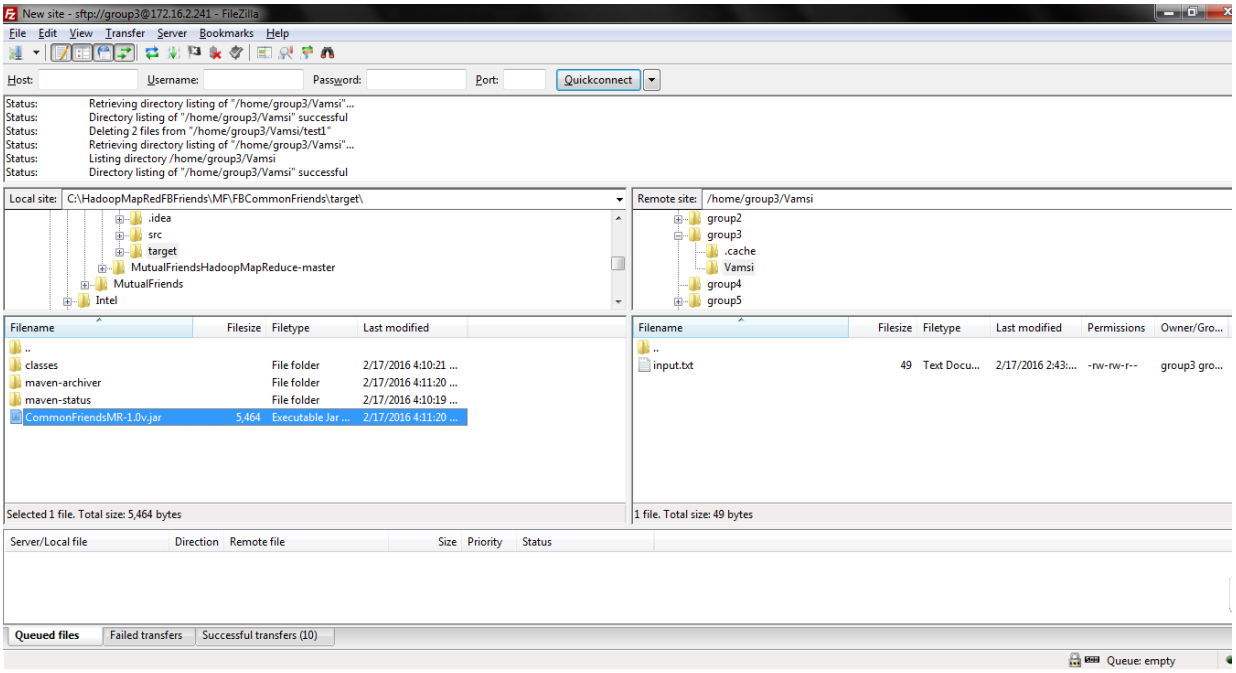
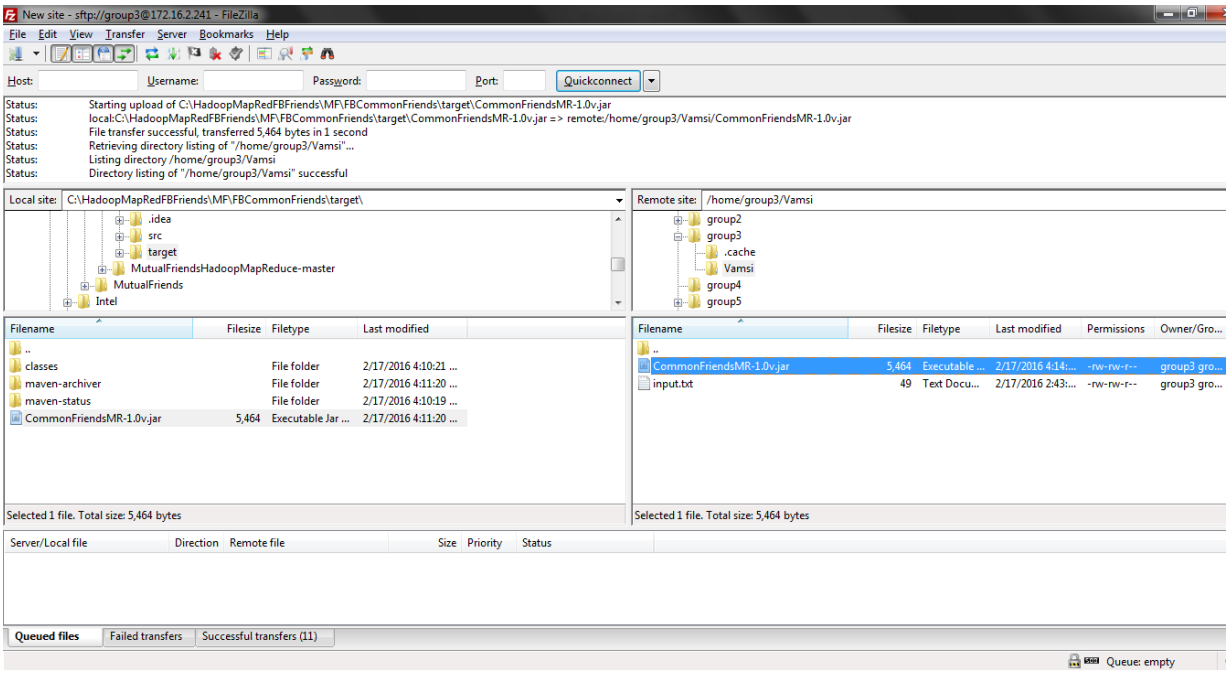
Algorithm:

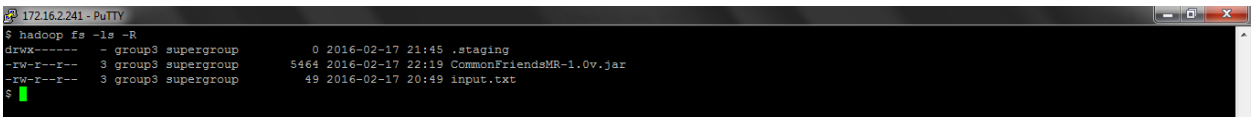
```
/**
 * Created by Vamsi on 2/17/2016.
 */
/**/


/*Creating Mapping Function*/

    public static class FriendsMapper
            extends Mapper<Object, Text, Text, Text> {
/*Create ids for maps*/
        private Text m_id = new Text();
        private Text m_others = new Text();

        public void map(Object key, Text value, Context context)
                throws IOException, InterruptedException {
/* In our case, the key is null and the value is one line of our input file.
Split by space to separate the user and its friends list.*/
            String line = value.toString();
            String[] split = line.split(" ");
            String subject = split[0];
            String[] friends = Arrays.copyOfRange(split, 1, split.length);

/*For each friend in the list, output the (UserFriend, ListOfFriends) pair*/
            for(String friend : friends) {
                String others = line.replace(subject, "").replace(" ", "");
                String id = subject.compareTo(friend) < 0 ? subject+friend :
friend+subject;
                m_id.set(id);
                m_others.set(others);
                context.write(m_id, m_others);
            }
        }
    }
```

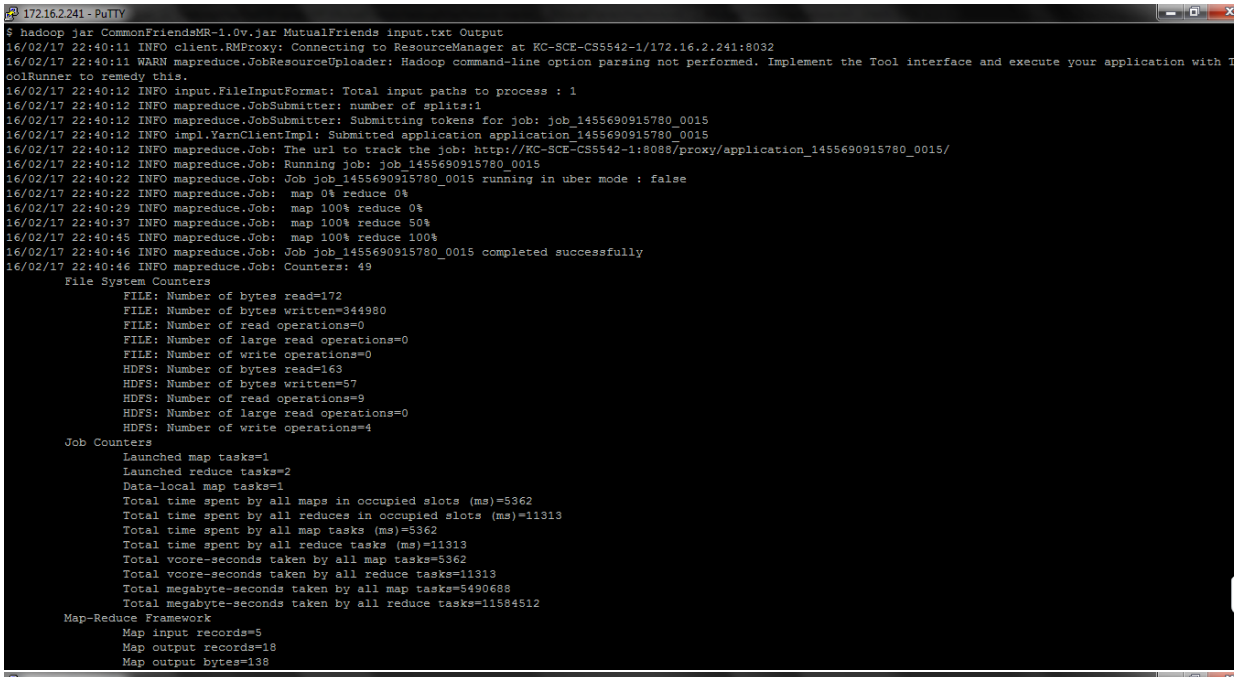
```
/*Creating Reduce Function*/

    public static class FriendsReducer
            extends Reducer<Text, Text, Text, Text> {
        private Text m_result = new Text();

/*Calculates intersection of two given Strings, i.e. friends lists*/
        private String intersection(String s1, String s2) {
            HashSet<Character> h1 = new HashSet<Character>();
            HashSet<Character> h2 = new HashSet<Character>();

            for(int i = 0; i < s1.length(); i++) {
                h1.add(s1.charAt(i));
            }
            for(int i = 0; i < s2.length(); i++) {
                h2.add(s2.charAt(i));
            }

            h1.retainAll(h2);
            Character[] res = h1.toArray(new Character[0]);
            String intersect = new String();
            for (int i = 0; i < res.length; i++) {
                intersect += res[i];
            }

            char[] letters = intersect.toCharArray();
            Arrays.sort(letters);
            String sortedIntersect = new String(letters);
            return sortedIntersect;
        }

        public void reduce(Text key, Iterable<Text> values, Context context)
                throws IOException, InterruptedException {
/*Prepare a 2-String-Array to hold the values, i.e. the friends lists of our current
friends pair.*/

            String[] combined = new String[2];
            int cur = 0;
            for(Text value : values) {
                combined[cur++] = value.toString();
            }

/*Calculate the intersection of these lists and write result in the form (UserAUserB,
CommonFriendsMR).*/
            m_result.set(intersection(combined[0], combined[1]));
            context.write(key, m_result);
        }
    }
```

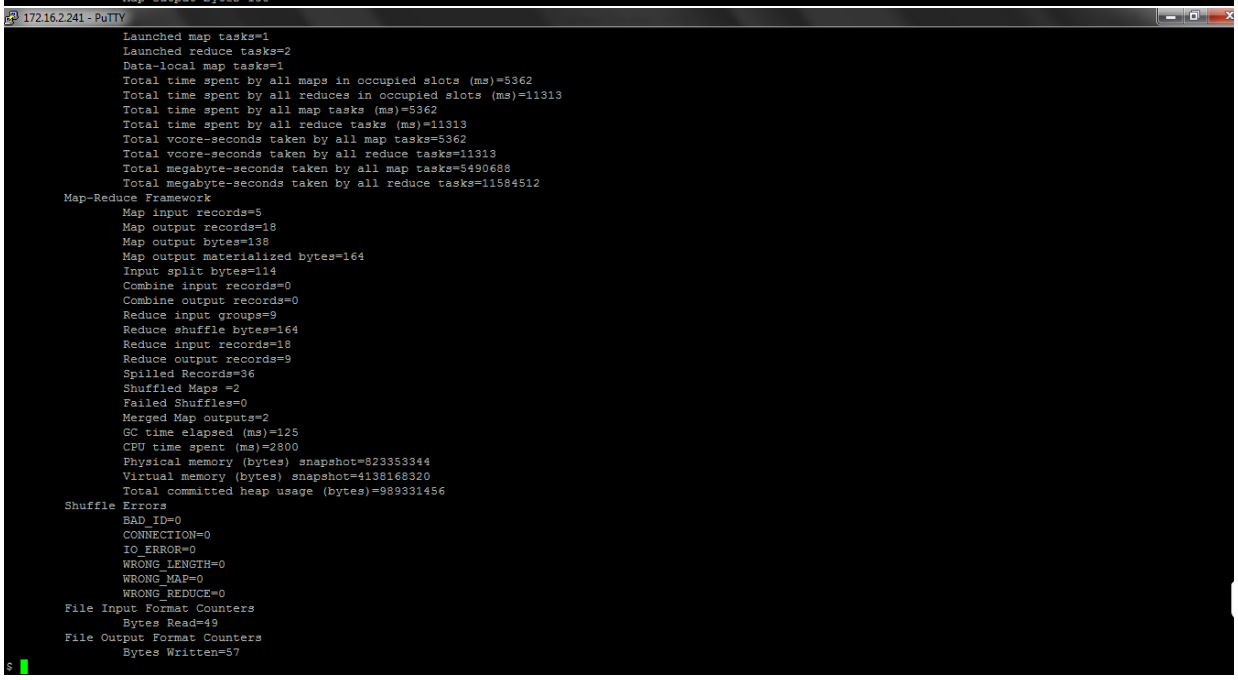

New site - sftp://group3@172.16.2.241 - FileZilla
File Edit View Transfer Server Bookmarks Help
Host: Username: Password: Port: Quickconnect
Status: Retrieving directory listing of "/home/group3/Vamsi"...
Status: Directory listing of "/home/group3/Vamsi" successful
Status: Deleting 2 files from "/home/group3/Vamsi/test1"
Status: Retrieving directory listing of "/home/group3/Vamsi"...
Status: Listing directory /home/group3/Vamsi
Status: Directory listing of "/home/group3/Vamsi" successful
Local site: C:\HadoopMapRedFBFriends\MF\FBCommonFriends\target\
.idea
src
target
MutualFriendsHadoopMapReduce-master
MutualFriends
Intel
Remote site: /home/group3/Vamsi
group2
group3
.cache
Vamsi
group4
group5
Filename Filesize Filetype Last modified
classes File folder 2/17/2016 4:10:21 ...
maven-archiver File folder 2/17/2016 4:11:20 ...
maven-status File folder 2/17/2016 4:10:19 ...
CommonFriendsMR-1.0v.jar 5,464 Executable Jar ... 2/17/2016 4:11:20 ...
Filename Filesize Filetype Last modified Permissions Owner/Gro...
input.txt 49 Text Docu... 2/17/2016 2:43:... -rw-rw-r-- group3 gro...
Selected 1 file. Total size: 5,464 bytes
1 file. Total size: 49 bytes
Server/Local file Direction Remote file Size Priority Status
Queued files Failed transfers Successful transfers (10)
Queue: empty

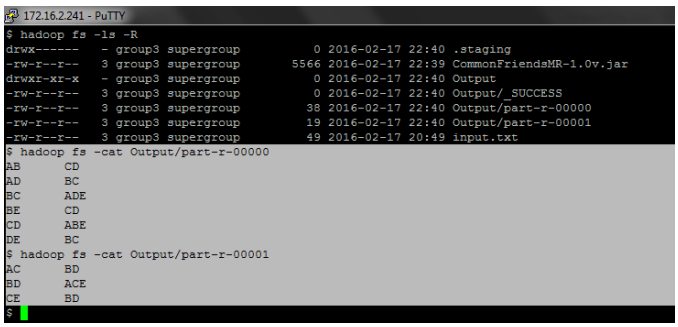

New site - sftp://group3@172.16.2.241 - FileZilla
File Edit View Transfer Server Bookmarks Help
Host: Username: Password: Port: Quickconnect
Status: Starting upload of C:\HadoopMapRedFBFriends\MF\FBCommonFriends\target\CommonFriendsMR-1.0v.jar
Status: local:C:\HadoopMapRedFBFriends\MF\FBCommonFriends\target\CommonFriendsMR-1.0v.jar => remote:/home/group3/Vamsi/CommonFriendsMR-1.0v.jar
Status: File transfer successful, transferred 5,464 bytes in 1 second
Status: Retrieving directory listing of "/home/group3/Vamsi"...
Status: Listing directory /home/group3/Vamsi
Status: Directory listing of "/home/group3/Vamsi" successful
Local site: C:\HadoopMapRedFBFriends\MF\FBCommonFriends\target\
Remote site: /home/group3/Vamsi
Filename Filesize Filetype Last modified
classes File folder 2/17/2016 4:10:21 ...
maven-archiver File folder 2/17/2016 4:11:20 ...
maven-status File folder 2/17/2016 4:10:19 ...
CommonFriendsMR-1.0v.jar 5,464 Executable Jar ... 2/17/2016 4:11:20 ...
Filename Filesize Filetype Last modified Permissions Owner/Gro...
CommonFriendsMR-1.0v.jar 5,464 Executable ... 2/17/2016 4:14:... -rw-rw-r-- group3 gro...
input.txt 49 Text Docu... 2/17/2016 2:43:... -rw-rw-r-- group3 gro...
Selected 1 file. Total size: 5,464 bytes
Server/Local file Direction Remote file Size Priority Status
Queued files Failed transfers Successful transfers (11)
Queue: empty


172.16.2.241 - PuTTY
$ ls
CommonFriendsMR-1.0v.jar input.txt
$ hadoop fs -put CommonFriendsMR-1.0v.jar CommonFriendsMR-1.0v.jar
$ hadoop fs -ls -R


172.16.2.241 - PuTTY
$ hadoop fs -ls -R
drwx------ - group3 supergroup 0 2016-02-17 21:45 .staging
-rw-r--r-- 3 group3 supergroup 5464 2016-02-17 22:19 CommonFriendsMR-1.0v.jar
-rw-r--r-- 3 group3 supergroup 49 2016-02-17 20:49 input.txt
$


172.16.2.241 - PuTTY
$ hadoop jar CommonFriendsMR-1.0v.jar MutualFriends input.txt Output
16/02/17 22:40:11 INFO client.RMProxy: Connecting to ResourceManager at KC-SCE-CS5542-1/172.16.2.241:8032
16/02/17 22:40:11 WARN mapreduce.JobResourceUploader: Hadoop command-line option parsing not performed. Implement the Tool interface and execute your application with T
oolRunner to remedy this.
16/02/17 22:40:12 INFO input.FileInputFormat: Total input paths to process : 1
16/02/17 22:40:12 INFO mapreduce.JobSubmitter: number of splits:1
16/02/17 22:40:12 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_1455690915780_0015
16/02/17 22:40:12 INFO impl.YarnClientImpl: Submitted application application_1455690915780_0015
16/02/17 22:40:12 INFO mapreduce.Job: The url to track the job: http://KC-SCE-CS5542-1:8088/proxy/application_1455690915780_0015/
16/02/17 22:40:12 INFO mapreduce.Job: Running job: job_1455690915780_0015
16/02/17 22:40:22 INFO mapreduce.Job: Job job_1455690915780_0015 running in uber mode : false
16/02/17 22:40:22 INFO mapreduce.Job: map 0% reduce 0%
16/02/17 22:40:29 INFO mapreduce.Job: map 100% reduce 0%
16/02/17 22:40:37 INFO mapreduce.Job: map 100% reduce 50%
16/02/17 22:40:45 INFO mapreduce.Job: map 100% reduce 100%
16/02/17 22:40:46 INFO mapreduce.Job: Job job_1455690915780_0015 completed successfully
16/02/17 22:40:46 INFO mapreduce.Job: Counters: 49
File System Counters
FILE: Number of bytes read=172
FILE: Number of bytes written=344980
FILE: Number of read operations=0
FILE: Number of large read operations=0
FILE: Number of write operations=0
HDFS: Number of bytes read=163
HDFS: Number of bytes written=57
HDFS: Number of read operations=9
HDFS: Number of large read operations=0
HDFS: Number of write operations=4
Job Counters
Launched map tasks=1
Launched reduce tasks=2
Data-local map tasks=1
Total time spent by all maps in occupied slots (ms)=5362
Total time spent by all reduces in occupied slots (ms)=11313
Total time spent by all map tasks (ms)=5362
Total time spent by all reduce tasks (ms)=11313
Total vcore-seconds taken by all map tasks=5362
Total vcore-seconds taken by all reduce tasks=11313
Total megabyte-seconds taken by all map tasks=5490688
Total megabyte-seconds taken by all reduce tasks=11584512
Map-Reduce Framework
Map input records=5
Map output records=18
Map output bytes=138


172.16.2.241 - PuTTY
Launched map tasks=1
Launched reduce tasks=2
Data-local map tasks=1
Total time spent by all maps in occupied slots (ms)=5362
Total time spent by all reduces in occupied slots (ms)=11313
Total time spent by all map tasks (ms)=5362
Total time spent by all reduce tasks (ms)=11313
Total vcore-seconds taken by all map tasks=5362
Total vcore-seconds taken by all reduce tasks=11313
Total megabyte-seconds taken by all map tasks=5490688
Total megabyte-seconds taken by all reduce tasks=11584512
Map-Reduce Framework
Map input records=5
Map output records=18
Map output bytes=138
Map output materialized bytes=164
Input split bytes=114
Combine input records=0
Combine output records=0
Reduce input groups=9
Reduce shuffle bytes=164
Reduce input records=18
Reduce output records=9
Spilled Records=36
Shuffled Maps =2
Failed Shuffles=0
Merged Map outputs=2
GC time elapsed (ms)=125
CPU time spent (ms)=2800
Physical memory (bytes) snapshot=823353344
Virtual memory (bytes) snapshot=4138168320
Total committed heap usage (bytes)=989331456
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=49
File Output Format Counters
Bytes Written=57
$


172.16.2.241 - PuTTY
$ hadoop fs -ls -R
drwx------   - group3 supergroup   0 2016-02-17 22:40 .staging
-rw-r--r--   3 group3 supergroup   5566 2016-02-17 22:39 CommonFriendsMR-1.0v.jar
drwxr-xr-x   - group3 supergroup   0 2016-02-17 22:40 Output
-rw-r--r--   3 group3 supergroup   0 2016-02-17 22:40 Output/_SUCCESS
-rw-r--r--   3 group3 supergroup   38 2016-02-17 22:40 Output/part-r-00000
-rw-r--r--   3 group3 supergroup   19 2016-02-17 22:40 Output/part-r-00001
-rw-r--r--   3 group3 supergroup   49 2016-02-17 20:49 input.txt
$ hadoop fs -cat Output/part-r-00000
AB   CD
AD   BC
BC   ADE
BE   CD
CD   ABE
DE   BC
$ hadoop fs -cat Output/part-r-00001
AC   BD
BD   ACE
CE   BD
$