Ayoola Nurudeen Etiko, CS4545, 3598133

21/02/22 09:20:21 WARN mapreduce.JobResourceUploader: Hadoop command-line option parsing not performed. Implement the Tool interface and execute your application with ToolRunner to remedy this.
21/02/22 09:20:22 INFO input.FileInputFormat: Total input paths to process : 1
21/02/22 09:20:22 INFO mapreduce.JobSubmitter: number of splits:1
21/02/22 09:20:23 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_1613994457525_0005
21/02/22 09:20:23 INFO impl.YarnClientImpl: Submitted application application_1613994457525_0005
21/02/22 09:20:23 INFO mapreduce.Job: The url to track the job: http://bigdatamaster:8088/proxy/application_1613994457525_0005/
21/02/22 09:20:23 INFO mapreduce.Job: Running job: job_1613994457525_0005
21/02/22 09:20:28 INFO mapreduce.Job: Job job_1613994457525_0005 running in uber mode : false
21/02/22 09:20:28 INFO mapreduce.Job: map 0% reduce 0%
21/02/22 09:20:33 INFO mapreduce.Job: map 100% reduce 0%
21/02/22 09:20:39 INFO mapreduce.Job: map 100% reduce 100%
21/02/22 09:20:39 INFO mapreduce.Job: Job job_1613994457525_0005 completed successfully
21/02/22 09:20:39 INFO mapreduce.Job: Counters: 49
        File System Counters
                FILE: Number of bytes read=721632
                FILE: Number of bytes written=1673533
                FILE: Number of read operations=0
                FILE: Number of large read operations=0
                FILE: Number of write operations=0
                HDFS: Number of bytes read=2859418
                HDFS: Number of bytes written=10954
                HDFS: Number of read operations=6
                HDFS: Number of large read operations=0
                HDFS: Number of write operations=2
        Job Counters
                Launched map tasks=1
                Launched reduce tasks=1
                Data-local map tasks=1
                Total time spent by all maps in occupied slots (ms)=2677
                Total time spent by all reduces in occupied slots (ms)=2723
                Total time spent by all map tasks (ms)=2677
                Total time spent by all reduce tasks (ms)=2723
                Total vcore-seconds taken by all map tasks=2677
                Total vcore-seconds taken by all reduce tasks=2723
                Total megabyte-seconds taken by all map tasks=2741248
                Total megabyte-seconds taken by all reduce tasks=2788352
        Map-Reduce Framework
                Map input records=26570
                Map output records=25347
                Map output bytes=670932
                Map output materialized bytes=721632
                Input split bytes=107
                Combine input records=0

lsr: DEPRECATED: Please use 'ls -R' instead.
21/02/22 09:21:30 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
-rw-r--r--   2 bigdata supergroup   0 2021-02-22 09:20 /output/_SUCCESS
-rw-r--r--   2 bigdata supergroup   10954 2021-02-22 09:20 /output/part-r-00000
bigdata@bigdatamaster:~/eclipse/java-mars/eclipse/workspace/Handson3/bin$ hadoop dfs -cat /output/part-r-00000
DEPRECATED: Use of this script to execute hdfs command is deprecated.
Instead use the hdfs command for it.

ScreenShots
output-r-00000

Afghanistan Aībak   4938
Afghanistan Kabul   3678034
Albania Pukë   3607
Albania Tirana 418495
Algeria I-n-Amenas   216
Algeria Algiers   3415811
American Samoa Pago Pago   12576
American Samoa Pago Pago   12576
Andorra Andorra la Vella   22151
Andorra Andorra la Vella   22151
Angola Mucusso   100
Angola Luanda   8417000
Antigua And Barbuda Saint John's   21926
Antigua And Barbuda Saint John's   21926
Argentina Comandante Luis Piedra Buena   410
Argentina Córdoba   1329604
Armenia Noyemberyan   5310
Armenia Yerevan   1075800
Aruba Oranjestad   34980
Aruba Oranjestad   34980
Australia Kingoonya   13
Australia Sydney   5312163

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```
Austria Grieskirchen   5002
Austria Vienna         1840573
Azerbaijan Ağdam       0
Azerbaijan Baku        2181800
Bahrain Madīnat 'Īsá   40000
Bahrain Manama         157474
Bangladesh Pābna       137888
Bangladesh Dhaka       15443000
Barbados Bridgetown 110000
Barbados Bridgetown 110000
Belarus Davyd-Haradok        5800
Belarus Minsk 2020600
Belgium Chiny          5175
Belgium Antwerp        529247
Belize Punta Gorda     5026
Belize Belize City     57169
Benin Savé     31444
Benin Cotonou          762000
Bermuda Hamilton       52320
Bermuda Hamilton       52320
Bhutan Wangdue Phodrang    5000
Bhutan Thimphu         104000
Bolivia Villa Martín Colchak  10
Bolivia Santa Cruz     3151676
Botswana Muhembo   757
Botswana Gaborone   231626
Brazil Príncipe da Beira        956
Brazil São Paulo       22046000
Brunei Seria    21082
Brunei Bandar Seri Begawan 50000
Bulgaria Bozhurishte  5047
Bulgaria Sofia 1355142
Burkina Faso Sebba    3273
Burkina Faso Ouagadougou    1626950
Burma Labutta          1667
Burma Rangoon          5430000
Burundi Cankuzo        3624
Burundi Bujumbura    658859
Cabo Verde Cidade Velha        2148
Cabo Verde Praia       127832
Cambodia Sen Monorom        7500
Cambodia Phnom Penh         2129371
Cameroon Mbé       3950
Cameroon Douala      2446945
Canada Antigonish    5002
Canada Toronto         5429524
Cayman Islands George Town          27704
```

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Cayman Islands George Town   27704
Central African Republic Yakossi   500
Central African Republic Bangui   734350
Chad Fada   448
Chad N'Djamena   1092066
Chile Lagunas 10
Chile Santiago 7007000
China Nichicun   100
China Shanghai   22120000
Colombia San Vicente del Caguán   1500
Colombia Bogotá   9464000
Comoros Mitsamiouli 7235
Comoros Moroni   111329
Congo (Brazzaville) Ewo   9062
Congo (Brazzaville) Brazzaville   1827000
Congo (Kinshasa) Bafwasende   149
Congo (Kinshasa) Kinshasa   13528000
Cook Islands Avarua   5445
Cook Islands Avarua   5445
Costa Rica Ciudad Cortés   3850
Costa Rica San José   288054
Croatia Ilok   5072
Croatia Split   178102
Cuba Caimanera   8790
Cuba Havana   2141652
Curaçao Willemstad   150000
Curaçao Willemstad   150000
Cyprus Kyrenia   33207
Cyprus Nicosia   330000
Czechia Bechyně   5016
Czechia Brno 381346
Côte D'Ivoire Touba   31844
Côte D'Ivoire Abidjan   4980000
Denmark Sorø 7167
Denmark Copenhagen 1085000
Djibouti Tadjourah   14820
Djibouti Djibouti   562000
Dominica Roseau   16582
Dominica Roseau   16582
Dominican Republic Bávaro   795
Dominican Republic Santo Domingo 2581827
Ecuador Yaupi 293
Ecuador Guayaquil   2723665
Egypt Barnīs   10
Egypt Cairo   19372000
El Salvador San Francisco   16152
El Salvador San Salvador   567698

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Equatorial Guinea Calatrava   628
Equatorial Guinea Bata   250770
Eritrea Teseney   3753
Eritrea Asmara   963000
Estonia Kärdla3230
Estonia Tallinn   434562
Ethiopia Gewanē   8408
Ethiopia Addis Ababa 3041002
Falkland Islands (Islas Malvinas) Stanley   2213
Falkland Islands (Islas Malvinas) Stanley   2213
Faroe Islands Klaksvík   4664
Faroe Islands Tórshavn   13326
Fiji Sigatoka   9622
Fiji Suva   88271
Finland Pyhäjärvi   5505
Finland Helsinki   642045
France Wervicq-Sud   5413
France Paris   11020000
French Guiana Iracoubo   1536
French Guiana Cayenne   61550
French Polynesia Papeete   131695
French Polynesia Papeete   131695
Gabon Bifoun 134
Gabon Libreville   797003
Georgia Ambrolauri   2047
Georgia Tbilisi   1118035
Germany Unkel   5021
Germany Berlin   3644826
Ghana Yendi   42972
Ghana Accra   2291352
Gibraltar Gibraltar   187083
Gibraltar Gibraltar   187083
Greece Gargaliánoi   5007
Greece Athens 664046
Greenland Nord   10
Greenland Nuuk   18326
Grenada Saint George's   4315
Grenada Saint George's   4315
Guadeloupe Lasserre 307
Guadeloupe Pointe-à-Pitre   145511
Guam Hagåtña   1051
Guam Maina   122411
Guatemala La Libertad   8646
Guatemala Guatemala City   2450212
Guinea Boffa 2332
Guinea Conakry   1667864
Guinea-Bissau Fulacunda   1311

Guinea-Bissau Bissau 395954
Guyana Ituni   100
Guyana Georgetown   200500
Haiti Fort Liberté   11465
Haiti Port-au-Prince   987310
Honduras Brus Laguna   4067
Honduras Comayagüela   1250000
Hong Kong Hong Kong   7347000
Hong Kong Hong Kong   7347000
Hungary Balatonlelle 5223
Hungary Budapest   1752286
Iceland Borgarnes   1962
Iceland Reykjavík   128793
India Lansdowne   5667
India Delhi   29617000
Indonesia Buton   140
Indonesia Jakarta   34540000
Iran Abūzeydābād   5160
Iran Tehran   13633000
Iraq Al ʻAmādīyah   11000
Iraq Baghdad   5796000
Ireland Donegal   2513
Ireland Dublin 1173179
Isle Of Man Douglas   25000
Isle Of Man Douglas   25000
Israel Qatsrin 6913
Israel Jerusalem   919438
Italy Montecastrilli   5037
Italy Rome   2872800
Jamaica Black River   4261
Jamaica Kingston   580000
Japan Takko   5008
Japan Tokyo   37977000
Jersey Saint Helier   33522
Jersey Saint Helier   33522
Jordan Sākib   11586
Jordan Amman   4007526
Kazakhstan Burubaytal   100
Kazakhstan Almaty   1806833
Kenya Tsavo   414
Kenya Nairobi 5545000
Kiribati Teaoraereke   5105
Kiribati Tarawa   28802
Kosovo Gllogovc   369
Kosovo Pristina   204725
Kuwait Al Aḥmadī   68763
Kuwait Kuwait City   637411

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```
Kyrgyzstan Shopokov      8749
Kyrgyzstan Bishkek       1027200
Laos Louang Namtha       3225
Laos Vientiane           760000
Latvia Ape               876
Latvia Riga              698529
Lebanon Baabda           9000
Lebanon Tripoli          530000
Lesotho Thaba-Tseka      5423
Lesotho Maseru           330790
Liberia Cestos City      2578
Liberia Monrovia         1021762
Libya Zillah             10
Libya Tripoli            1126000
Liechtenstein Mauren     4268
Liechtenstein Vaduz      36281
Lithuania Nida           2385
Lithuania Vilnius        574147
Luxembourg Remich        3732
Luxembourg Luxembourg    122273
Macau Macau              568700
Macau Macau              568700
Macedonia Demir Kapija   2547
Macedonia Skopje         640000
Madagascar Androka       174
Madagascar Antananarivo  2610000
Malawi Machinga          1418
Malawi Blantyre          1895973
Malaysia Kuala Lipis     15448
Malaysia Kuala Lumpur    8285000
Maldives Male            133019
Maldives Male            133019
Mali Satadougou          706
Mali Bamako              2009109
Malta Valletta           6444
Malta Birkirkara         24356
Marshall Islands Majuro  25400
Marshall Islands Majuro  25400
Martinique Fort-de-France 253995
Martinique Fort-de-France 253995
Mauritania Chegga        10
Mauritania Nouakchott    1077169
Mauritius Cap Malheureux 5070
Mauritius Curepipe       299975
Mayotte Mamoudzou        32057
Mayotte Mamoudzou        32057
Mexico Ciudad Guzmán     97
```

```
Mexico Mexico City    20996000
Moldova Cantemir      3429
Moldova Chisinau      685900
Monaco Monaco         36371
Monaco Monaco         36371
Mongolia Hödrögö      10
Mongolia Ulaanbaatar  1396288
Montenegro Rožaje     9422
Montenegro Podgorica          174515
Morocco Ajdir 5314
Morocco Casablanca    4370000
Mozambique Vilankulo          177
Mozambique Maputo     1191613
Namibia Maltahöhe     2329
Namibia Windhoek      322500
Nepal Charīkoṭ        7349
Nepal Kathmandu       975453
Netherlands Kralendijk        12531
Netherlands The Hague         1406000
New Caledonia Nouméa          93060
New Caledonia Nouméa          93060
New Zealand Kairaki   225
New Zealand Auckland          1467800
Nicaragua Greytown    275
Nicaragua Managua     1028808
Niger Djado   10
Niger Niamey  1026848
Nigeria Orlu  9351
Nigeria Lagos 15279000
Northern Mariana Islands Capitol Hill       2500
Northern Mariana Islands Capitol Hill       2500
Norway Kaupanger      1965
Norway Oslo   693494
Oman Mirbāṭ   1120
Oman Muscat   1421409
Pakistan Gilgit 8851
Pakistan Karachi      14835000
Palau Melekeok        7026
Palau Koror   8744
Panama Gaigirgordub 10
Panama Panama City    880691
Papua New Guinea Amau         230
Papua New Guinea Port Moresby        364125
Paraguay Puerto Pinasco       500
Paraguay Asunción     1870000
Peru Güeppí   10
Peru Lima     9848000
```

Philippines Magugpo Poblacion   6726
Philippines Manila   23088000
Poland Bierutów   5065
Poland Warsaw   1790658
Portugal Sousel   5074
Portugal Lisbon   506654
Puerto Rico Naguabo 5220
Puerto Rico San Juan 331165
Qatar Doha   1312947
Qatar Doha   1312947
Reunion Saint-Benoît 35310
Reunion Saint-Denis 190047
Romania Milişăuţi   5005
Romania Bucharest   1883425
Russia Nordvik   0
Russia Moscow   17125000
Rwanda Kibungo   11537
Rwanda Kigali   745261
Saint Kitts And Nevis Basseterre   13220
Saint Kitts And Nevis Basseterre   13220
Saint Lucia Gros Islet 21660
Saint Lucia Castries   70000
Saint Vincent And The Grenadines Kingstown   25418
Saint Vincent And The Grenadines Kingstown   25418
Samoa Apia   37708
Samoa Apia   37708
San Marino San Marino   4040
San Marino San Marino   4040
Sao Tome And Principe Trindade   6636
Sao Tome And Principe São Tomé   56166
Saudi Arabia Al Qunfudhah   157
Saudi Arabia Riyadh   6881000
Senegal Kanel 12975
Senegal Dakar 1146053
Serbia Alibunar   3431
Serbia Belgrade   1378682
Seychelles Victoria   26450
Seychelles Victoria   26450
Sierra Leone Koidu-Bulma   87539
Sierra Leone Freetown   951000
Singapore Singapore 5745000
Singapore Singapore 5745000
Slovakia Gbely   5155
Slovakia Bratislava   429564
Slovenia Naklo   1776
Slovenia Ljubljana   284355
Solomon Islands Lata 553

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Solomon Islands Honiara   84520
Somalia Hurdiyo   176
Somalia Mogadishu   2120000
South Africa Ubombo 564
South Africa Johannesburg   4434827
South Georgia And South Sandwich Islands Grytviken   99
South Georgia And South Sandwich Islands Grytviken   99
South Sudan Nimule   242
South Sudan Juba   372410
Spain La Herradura   5133
Spain Barcelona   4588000
Sri Lanka Hambantota   11213
Sri Lanka Colombo   752993
Sudan Karmah an Nuzul   3928
Sudan Khartoum   7282000
Suriname Totness   1685
Suriname Paramaribo 223757
Swaziland Hlatikulu   2748
Swaziland Manzini   110508
Sweden Hjärup   5607
Sweden Stockholm   972647
Switzerland Sevelen   5103
Switzerland Zürich   434008
Syria 'Ayn 'Īsá   6730
Syria Aleppo   1834093
Taiwan Nangan   7382
Taiwan Taichung   2803894
Tajikistan Ishqoshim 6567
Tajikistan Dushanbe   780000
Tanzania Kanyato   232
Tanzania Dar es Salaam   6698000
Thailand Bueng Kan   4494
Thailand Bangkok   17066000
Timor-Leste Same   2100
Timor-Leste Dili   222323
Togo Sotouboua   21054
Togo Lomé   837437
Tonga Neiafu   7391
Tonga Nuku'alofa   24571
Trinidad And Tobago San Juan   13797
Trinidad And Tobago Chaguanas   83489
Tunisia Dehiba   4295
Tunisia Tunis 1200000
Turkey Çıralı 6000
Turkey Istanbul   15154000
Turkmenistan Çeleken   1206
Turkmenistan Ashgabat   1031992

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Turks And Caicos Islands Grand Turk	5801
Turks And Caicos Islands Grand Turk	5801
Tuvalu Funafuti	6025
Tuvalu Funafuti	6025
Uganda Moroto	371
Uganda Kampala	1659600
Ukraine Cheremoshna0
Ukraine Kharkiv	1446107
United Arab Emirates Madīnat Zāyid	29095
United Arab Emirates Dubai	2502715
United Kingdom Cambridge	66
United Kingdom Birmingham	2897303
United States Hartford	3354
United States New York	18713220
Uruguay José Batlle y Ordóñez	2438
Uruguay Montevideo	1319108
Uzbekistan Bo'ston	8488
Uzbekistan Tashkent	2424100
Vanuatu Lakatoro	705
Vanuatu Port-Vila	51437
Vatican City Vatican City	825
Vatican City Vatican City	825
Venezuela La Esmeralda	150
Venezuela Caracas	1943901
Vietnam Luân Châu	7335
Vietnam Ho Chi Minh City	13312000
Yemen Sayḥūt189
Yemen Sanaa	2957000
Zambia Nyimba	1336
Zambia Lusaka	1742979
Zimbabwe Plumtree	2148
Zimbabwe Harare	1606000

Code mapper:

```java
import java.io.IOException;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.LongWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Mapper;


public class Handson3Mapper extends Mapper<LongWritable, Text, Text, Text> {

    private static final int MISSING = 9999;

    @Override

    public void map(LongWritable key, Text value, Context context) throws
```

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```java
IOException, InterruptedException {

        int populationVal;
        String line = value.toString();
        String field[] = line.split(",");
        String country = field[4].substring(1, field[4].length() - 1);
//        String newString = country.concat(field[0].substring(1,
field[0].length() - 1));

        String population = field[9].substring(1, field[9].length() - 1);
        String city = field[0].substring(1, field[0].length() - 1);


        if (!population.matches(".*\\d.*") || population.equals("") ||
                population.matches("([0-9].*)\\.([0-9].*)")) {
            return;
        } else {
            populationVal = Integer.parseInt(population);
            context.write(new Text(country), new Text(city + "," +
populationVal));
        }
    }

}
```
code Reducer:

```java
import java.io.IOException;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Reducer;

public class Handson3Reducer extends Reducer<Text, Text, Text, IntWritable> {

    @Override

    public void reduce(Text key, Iterable<Text> values, Context context) throws
IOException, InterruptedException {
        String maxPopulationCityName = "";
        String minPopulationCityName = "";
        int maxValue = Integer.MIN_VALUE;
        int minValue = Integer.MAX_VALUE;
        for (Text value : values) {
            String[] array = value.toString().split(",");
            int population = Integer.valueOf(array[1]);
            if (population > maxValue) {
                maxPopulationCityName = array[0];
                maxValue = population;
            }
            if (population < minValue) {
                minPopulationCityName = array[0];
                minValue = population;
            }

        }
        context.write(new Text(key + " " + minPopulationCityName), new
```

```
IntWritable(minValue));
        context.write(new Text(key + " " + maxPopulationCityName), new
IntWritable(maxValue));
    }

}
```

Runner:

```java
import org.apache.hadoop.conf.Configuration;
import org.apache.hadoop.conf.Configured;
import org.apache.hadoop.fs.FileSystem;
import org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapred.JobConf;
import org.apache.hadoop.mapreduce.Job;
import org.apache.hadoop.mapreduce.lib.input.FileInputFormat;
import org.apache.hadoop.mapreduce.lib.input.KeyValueTextInputFormat;
import org.apache.hadoop.mapreduce.lib.output.FileOutputFormat;
import org.apache.hadoop.util.Tool;
import org.apache.hadoop.util.ToolRunner;

public class handsonJobRunner {
      public int run(String[] args) throws Exception  {

            if(args.length !=2) {

                  System.err.println("Usage: Handson3 <input path> <outputpath>");
            // example: hadoop jar ./maxt.jar MaxTemperatureJobRunner /input
/output
                  System.exit(-1);

            }
//            Job job = new Job();
//
//            job.setJarByClass(handsonJobRunner.class);
//
//            job.setJobName("Handson 3");
//
//

job.getConfiguration().set("mapreduce.input.keyvaluelinerecordreader.key.value.sep
erator", ",");
//
//            job.setInputFormatClass(KeyValueTextInputFormat.class);
//
//            KeyValueTextInputFormat.addInputPath(job, new Path(args[0]));
//
//            FileOutputFormat.setOutputPath(job,new Path(args[1]));
//
//            job.setMapperClass(handson3Mapper.class);
//
//            job.setReducerClass(Handson3Reducer.class);
```

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```java
//
//          job.setOutputKeyClass(Text.class);
//
//          job.setOutputValueClass(IntWritable.class);
//
//          System.exit(job.waitForCompletion(true) ? 0:1);
//
//
//
//          boolean success = job.waitForCompletion(true);
//
//          return success ? 0 : 1;

Job job = new Job();

        job.setJarByClass(handsonJobRunner.class);

        job.setJobName("Handson 3");

        FileInputFormat.addInputPath(job, new Path(args[0]));

        FileOutputFormat.setOutputPath(job,new Path(args[1]));

        job.setMapperClass(Handson3Mapper.class);

        job.setReducerClass(Handson3Reducer.class);


        job.setOutputKeyClass(Text.class);

        job.setOutputValueClass(Text.class);

        System.exit(job.waitForCompletion(true) ? 0:1);


        boolean success = job.waitForCompletion(true);

        return success ? 0 : 1;

    }

    public static void main(String[] args) throws Exception {
        handsonJobRunner driver = new handsonJobRunner();
        driver.run(args);


    }

}
```