

BIG DATA SYSTEMS

Assignment 2

GROUP 22

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STEP 1. Hadoop cluster Setup :

Setup using docker container : In the command prompt :

1. `sudo docker pull kiwenlau/hadoop:1.0`
2. `git clone https://github.com/kiwenlau/hadoop-cluster-docker`
3. `sudo docker network create --driver=bridge hadoop`
4. `cd hadoop-cluster-docker`
5. `sudo ./start-container.sh`
6. `./start-hadoop.sh`
 - Sample o/p

```
(base) mahesh@LAP575051:/opt/hadoop-cluster-docker$ ./start-container.sh
[sudo] password for mahesh:
start hadoop-master container...
start hadoop-slave1 container...
start hadoop-slave2 container...
root@hadoop-master:~# ./start-hadoop.sh

Starting namenodes on [hadoop-master]
hadoop-master: Warning: Permanently added 'hadoop-master,172.22.0.2' (ECDSA) to the list of known hosts.
hadoop-master: starting namenode, logging to /usr/local/hadoop/logs/hadoop-root-namenode-hadoop-master.out
hadoop-slave1: Warning: Permanently added 'hadoop-slave1,172.22.0.3' (ECDSA) to the list of known hosts.
hadoop-slave1: starting datanode, logging to /usr/local/hadoop/logs/hadoop-root-datanode-hadoop-slave1.out
Starting secondary namenodes [0.0.0.0]
0.0.0.0: Warning: Permanently added '0.0.0.0' (ECDSA) to the list of known hosts.
0.0.0.0: starting secondarynamenode, logging to /usr/local/hadoop/logs/hadoop-root-secondarynamenode-hadoop-master.out

starting yarn daemons
starting resourcemanager, logging to /usr/local/hadoop/logs/yarn--resourcemanager-hadoop-master.out
hadoop-slave1: Warning: Permanently added 'hadoop-slave1,172.22.0.3' (ECDSA) to the list of known hosts.
hadoop-slave1: starting nodemanager, logging to /usr/local/hadoop/logs/yarn-root-nodemanager-hadoop-slave1.out

root@hadoop-master:~#
```

Overview 'hadoop-master:9000' (active)

Started:	Sat Jul 24 17:15:27 UTC 2021
Version:	2.7.2, rUnknown
Compiled:	2016-05-27T18:05Z by root from Unknown
Cluster ID:	CID-223f942f-5124-4df6-a763-67d8a648393e
Block Pool ID:	BP-1851185740-172.17.0.2-1626958925634

Summary

Security is off.

Safemode is off.

16 files and directories, 6 blocks = 22 total filesystem object(s).

Heap Memory used 72.01 MB of 301 MB Heap Memory. Max Heap Memory is 889 MB.

Non Heap Memory used 34.31 MB of 35.44 MB Committed Non Heap Memory. Max Non Heap Memory is 214 MB.

Configured Capacity:	233.24 GB
DFS Used:	440 KB (0%)
Non DFS Used:	211.73 GB
DFS Remaining:	21.51 GB (9.22%)
Block Pool Used:	440 KB (0%)
DataNodes usages% (Min/Median/Max/stdDev):	0.00% / 0.00% / 0.00% / 0.00%
Live Nodes	1 (Decommissioned: 0)

STEP 2. Updating respective files in the Hadoop:

Now add input geosales.csv in to the hadoop filesystem

1. Create a temporary *input* folder with *geosales.csv* file in it (Remove the column names in the csv file)
2. Create *input* folder in hdfs file system (`hadoop fs -mkdir -p input`)
3. Put the file in current input folder to hdfs file system input folder (`hdfs dfs -put ./input/* input`)
4. Create mapper.py and reducer.py for respective operations
5. Use the following command to run python mapper and reducer files to get the necessary output
 1. `hadoop jar /usr/local/hadoop/share/hadoop/tools/lib/hadoop-streaming-2.7.2.jar -Dmapred.reduce.tasks=1 -file mapper.py reducer.py -mapper "python3 mapper.py" -reducer "python3 reduce.py" -input input -output output`

1. Average unit_price by country for a given item type in a certain year

```
que1_avg_unit_price_mapper.py X
1 #!/usr/bin/env python
2 """mapper.py"""
3
4 #Importing necessary libraries
5 import sys
6 import pandas as pd
7
8
9 # Operations for every line in the stdin
10 for line in sys.stdin:
11
12     #using the column name
13     columns = ["index","region","country","item_type","sales_channel",
14               'order_priority','order_date', 'order_id', 'ship_date',
15               'units_sold','unit_price', 'unit_cost', 'total_revenue',
16               'total_cost', 'total_profit']
17
18     #removing trailing spaces
19     line = line.strip()
20
21     colvalues = line
22
23     #splitting input line to column values
24     cols = colvalues.split(',')
25     rowJson = dict()
26
27     #mapping input line to column names using dict for easier access
28     for i in range(0,len(columns)):
29         rowJson[columns[i]] = cols[i]
30
31     #accessing required data
32     order_date = pd.to_datetime(rowJson['order_date'])
33     ship_date = pd.to_datetime(rowJson['ship_date'])
34     year = order_date.year
35
36     #creating the tab '\t' seperated key,value pair and prting - in
37     #order to stdin of reducer to pick
38     key = (rowJson['country'],rowJson['item_type'],year)
39     value = rowJson['unit_price']
40     print('%s\t%s' % (key,value))
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```
que1_avg_unit_price_reducer.py X
1 #!/usr/lib/python
2 """reducer.py"""
3
4 import sys
5
6 unit_price = {}
7
8 #Partitioner
9 for line in sys.stdin:
10     line = line.strip()
11     key, price = line.split('\t')
12
13     if key in unit_price:
14         unit_price[key].append(float(price))
15     else:
16         unit_price[key] = []
17         unit_price[key].append(float(price))
18
19 #Reducer
20 for key in unit_price.keys():
21     avg_price = sum(unit_price[key]) / len(unit_price[key])
22     print('%s\t%s' % (key, avg_price))
```

Sample Output

Format: (Country, Item_type, Year) Average Unit Price

```
question1_ans.txt
1 ('Tonga', 'Snacks', 2017) 152.58
2 ('Czech Republic', 'Baby Food', 2015) 255.28
3 ('Ukraine', 'Baby Food', 2018) 255.28000000000003
4 ('Romania', 'Personal Care', 2018) 81.73
5 ('Tanzania', 'Personal Care', 2020) 81.73
6 ('France', 'Beverages', 2017) 47.449999999999996
7 ('Senegal', 'Clothes', 2017) 109.27999999999999
8 ('Sudan', 'Household', 2020) 668.27
9 ('Papua New Guinea', 'Meat', 2020) 421.88999999999993
10 ('Liechtenstein', 'Cereal', 2017) 205.70000000000002
11 ('Belize', 'Cereal', 2016) 205.70000000000002
12 ('Cambodia', 'Household', 2016) 668.27
13 ('United States of America', 'Personal Care', 2020) 81.73
14 ('North Korea', 'Cosmetics', 2016) 437.19999999999999
15 ('Niger', 'Fruits', 2016) 9.33
16 ('Cambodia', 'Snacks', 2016) 152.58
17 ('Angola', 'Beverages', 2016) 47.449999999999996
```

2. Total units_sold by year for a given country and a given item type

```
que2_total_unit_sold_mapper.py x
1 #!/usr/bin/env python
2 """mapper.py"""
3
4 #Importing necessary libraries
5 import sys
6 import pandas as pd
7
8
9 # Operations for every line in the stdin
10 for line in sys.stdin:
11
12     #using the column name
13     columns = ["index", 'region', 'country', 'item_type', 'sales_channel',
14               'order_priority', 'order_date', 'order_id', 'ship_date',
15               'units_sold', 'unit_price', 'unit_cost', 'total_revenue',
16               'total_cost', 'total_profit']
17
18     #removing trailing spaces
19     line = line.strip()
20
21     colvalues = line
22
23     #splitting input line to column values
24     cols = colvalues.split(',')
25     rowJson = dict()
26
27     #mapping input line to column names using dict for easier access
28     for i in range(0, len(columns)):
29         rowJson[columns[i]] = cols[i]
30
31     #accessing required data
32     country = rowJson['country']
33     order_date = pd.to_datetime(rowJson['order_date'])
34     year = order_date.year
35     item_type = rowJson['item_type']
36
37     #creating the tab '\t' seperated key,value pair and prting - in
38     #order to stdin of reducer to pick
39     key = (country, item_type, year)
40     value = rowJson['units_sold']
41     print('%s\t%s' % (key, value))
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```

```
que2_total_unit_sold_reducer.py x
1 #!/usr/lib/python
2 """reducer.py"""
3
4 import sys
5
6 unit_sold = {}
7
8 #Partitioner
9 for line in sys.stdin:
10     line = line.strip()
11     key, value = line.split('\t')
12
13     if key in unit_sold:
14         unit_sold[key].append(float(value))
15     else:
16         unit_sold[key] = []
17         unit_sold[key].append(float(value))
18
19 #Reducer
20 for key in unit_sold.keys():
21     total = sum(unit_sold[key])
22     print('%s\t%s' % (key, total))
```

Sample Output

Format: (Country, Item_type, Year) Units Sold

```
question2_ans.txt
1 ('Tonga', 'Snacks', 2017) 30518.0
2 ('Czech Republic', 'Baby Food', 2015) 33437.0
3 ('Ukraine', 'Baby Food', 2018) 17614.0
4 ('Romania', 'Personal Care', 2018) 22494.0
5 ('Tanzania', 'Personal Care', 2020) 39001.0
6 ('France', 'Beverages', 2017) 32949.0
7 ('Senegal', 'Clothes', 2017) 19564.0
8 ('Sudan', 'Household', 2020) 31315.0
9 ('Papua New Guinea', 'Meat', 2020) 41451.0
10 ('Liechtenstein', 'Cereal', 2017) 36851.0
11 ('Belize', 'Cereal', 2016) 33411.0
12 ('Cambodia', 'Household', 2016) 20508.0
13 ('United States of America', 'Personal Care', 2020) 48754.0
14 ('North Korea', 'Cosmetics', 2016) 54378.0
15 ('Niger', 'Fruits', 2016) 45530.0
```

3. Find the max and min units_sold in any order for each year by country for a given item type

```
que3_min_max_units_sold_mapper.py
1 #!/usr/bin/env python
2 """mapper.py"""
3
4 #Importing necessary libraries
5 import sys
6 import pandas as pd
7
8 # Operations for every line in the stdin
9 for line in sys.stdin:
10
11     #using the column name
12     columns = ['index','region','country','item_type','sales_channel',
13               'order_priority','order_date', 'order_id', 'ship_date',
14               'units_sold','unit_price', 'unit_cost', 'total_revenue',
15               'total_cost', 'total_profit']
16
17     #removing trailing spaces
18     line = line.strip()
19
20     colvalues = line
21
22     #splitting input line to column values
23     cols = colvalues.split(',')
24     rowJson = dict()
25
26     #mapping input line to column names using dict for easier access
27     for i in range(0,len(columns)):
28         rowJson[columns[i]] = cols[i]
29
30     #accessing required data
31     country = rowJson['country']
32     item_type = rowJson['item_type']
33     order_date = pd.to_datetime(rowJson['order_date'])
34     year = order_date.year
35     unit_sold = rowJson['units_sold']
36
37     #creating the tab '\t' seperated key,value pair and prting - in
38     #order to stdin of reducer to pick
39     key = (country,item_type,year)
40     value = unit_sold
41     print('%s\t%s' % (key,value))
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3. What are the top 10 order id for a given year by the total_profit

```
que4_top_order_id_mapper.py x
1 #!/usr/bin/env python
2 """mapper.py"""
3
4 #Importing necessary libraries
5 import sys
6 import pandas as pd
7
8 # Operations for every line in the stdin
9 for line in sys.stdin:
10
11     #using the column name
12     columns = ["index","region","country","item_type","sales_channel",
13               "order_priority","order_date","order_id","ship_date",
14               "units_sold","unit_price","unit_cost","total_revenue",
15               "total_cost","total_profit"]
16
17     #removing trailing spaces
18     line = line.strip()
19
20     colvalues = line
21
22     #splitting input line to column values
23     cols = colvalues.split(',')
24     rowJson = dict()
25
26     #mapping input line to column names using dict for easier access
27     for i in range(0,len(columns)):
28         rowJson[columns[i]] = cols[i]
29
30     #accessing required data
31     order_id = rowJson['order_id']
32     order_date = pd.to_datetime(rowJson['order_date'])
33     year = order_date.year
34     total_profit = rowJson['total_profit']
35
36     #creating the tab '\t' seperated key,value pair and prting - in
37     #order to stdin of reducer to pick
38     print('%s\t%s' % (year,(float(total_profit),order_id )))
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