

## Hadoop Pig 練習

Pig 提供 Script 語言 Pig Latin，用來撰寫 MapReduce 程式。自動將腳本轉換成在 Hadoop 執行的 MapReduce Java 程式。使用者不懂 Java 也能撰寫 MapReduce。

一般透過 Pig 腳本程式轉換，會比直接用 Java 撰寫 MapReduce 效能降低 25%。

0. 安裝完成 Hadoop，執行 Hadoop

1. 下載 Pig

```
cd ~
```

```
cd Downloads
```

```
sudo wget http://ftp.mirror.tw/pub/apache/pig/pig-0.17.0/pig-0.17.0.tar.gz
```

2. 解壓縮

```
tar -zxf pig-0.17.0.tar.gz
```

```
sudo mv pig-0.17.0 /opt/pig
```

3. 新增環境變數

#將以下資料加到 profile 最下面並儲存，sudo gedit ~/.bashrc

```
export PATH=$PATH:/opt/pig/bin
```

```
export HADOOP_CLASSPATH=$HADOOP_CLASSPATH:/opt/pig/lib
```

```
export PIG_HOME=/opt/pig
```

```
export PIG_CONF_DIR=/opt/pig/conf
```

```
export PIG_CLASSPATH=/opt/hadoop/etc/Hadoop
```



The screenshot shows a text editor window with the title bar "profile /etc". The file contains environment variable definitions for Hadoop, Hive, Derby, and Pig. The code is as follows:

```
# 以下可有，也可沒有
export HADOOP_CONF_DIR="/opt/hadoop/conf"
export HADOOP_MAPRED_HOME="/opt/hadoop"
export HADOOP_COMMON_HOME="/opt/hadoop"
export HADOOP_HDFS_HOME="/opt/hadoop"
export HADOOP_LOCAL="/opt/hadoop"
export YARN_HOME="/opt/hadoop"

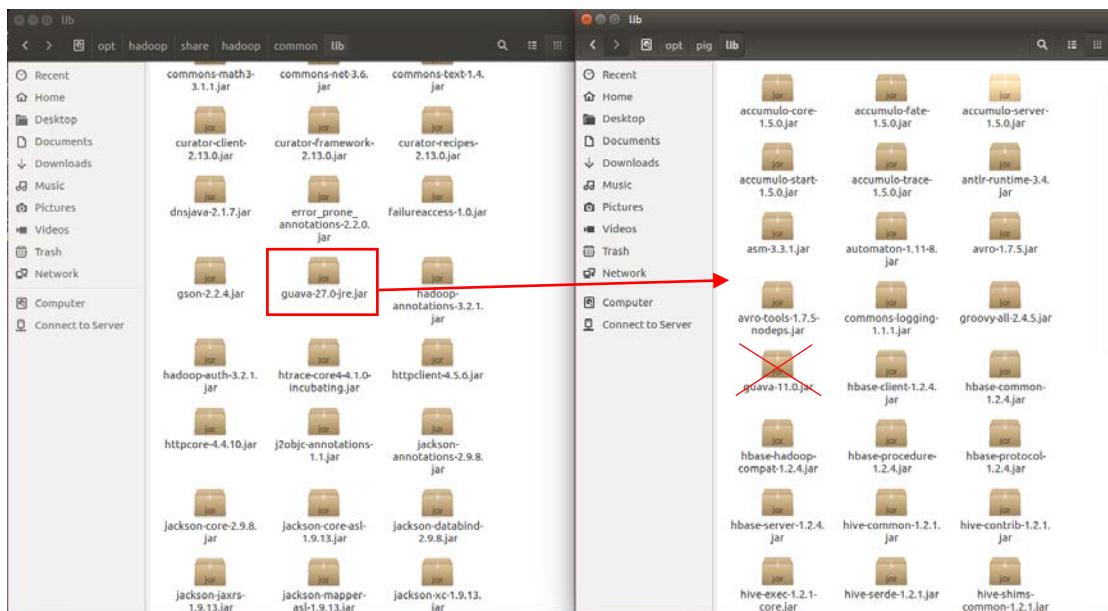
#Hive 3.1.2
export HIVE_HOME="/opt/hive"
export HIVE_CONF_DIR="/opt/hive/conf"
export HIVE_CLASS_PATH=$HIVE_CONF_DIR
export CLASSPATH=$CLASSPATH:/opt/hadoop/lib/*::
export CLASSPATH=$CLASSPATH:/opt/hive/lib/*::
export HADOOP_USER_CLASSPATH_FIRST=true

#Derby
export DERBY_HOME="/opt/derby"
export PATH=$PATH:$DERBY_HOME/bin
export CLASSPATH=$CLASSPATH:$DERBY_HOME/lib/derby.jar:$DERBY_HOME/lib/
derbytools.jar

#Pig
export PATH=$PATH:/opt/pig/bin
export HADOOP_CLASSPATH=$HADOOP_CLASSPATH:/opt/pig/lib
export PIG_HOME=/opt/pig
export PIG_CONF_DIR=/opt/pig/conf
export PIG_CLASSPATH=/opt/hadoop/etc/Hadoop
```

The bottom of the editor shows status bars for "Plain Text", "Tab Width: 8", "Ln 63, Col 1", and "INS".

- Pig要在MapReduce執行，要將相關的lib複製到Hadoop的lib底下  
`cp /opt/pig/lib/antlr-runtime-3.4.jar /opt/hadoop/share/hadoop/mapreduce`  
`cp /opt/pig/lib/automaton-1.11-8.jar /opt/hadoop/share/hadoop/mapreduce`  
`cp /opt/pig/lib/jline-2.11.jar /opt/hadoop/share/hadoop/mapreduce`  
`cp /opt/pig/lib/joda-time-2.9.3.jar /opt/hadoop/share/hadoop/mapreduce`
- pig與hadoop同步guava版本，刪除pig的guava並將hadoop的guava複製一份丟至pig的lib具體位置見下圖。  
`cp /opt/hadoop/share/hadoop/common/lib/guava-27.0-jre.jar /opt/pig/lib/.`  
`rm /opt/pig/lib/guava-11.0.jar`



## 6. 執行環境變數

`source /etc/profile`

`source ./bashrc`

#pig 範例，Aggregation (Local Mode):

### 1. 下載excite-small.log

`wget http://www.hadoop.tw/excite-small.log`

### 2. 在本機執行pig

`pig -x local`

### 3. Aggregation

```
log = LOAD 'excite-small.log' AS (user, timestamp, query);
grp = GROUP log BY user;
cntd = FOREACH grp GENERATE group, COUNT(log);
STORE cntd INTO 'lab8_out1';
```

```
bao@master:~  
Output(s):  
Successfully stored 891 records in: "file:///home/bao/lab8_out1"  
  
Counters:  
Total records written : 891  
Total bytes written : 0  
Spillable Memory Manager spill count : 0  
Total bags proactively spilled: 0  
Total records proactively spilled: 0  
  
Job DAG:  
job_local264255745_0001  
  
2020-02-27 18:37:41,906 [main] WARN org.apache.hadoop.metrics2.impl.MetricsSystemImpl - JobTracker metrics system already initialized!  
2020-02-27 18:37:41,908 [main] WARN org.apache.hadoop.metrics2.impl.MetricsSystemImpl - JobTracker metrics system already initialized!  
2020-02-27 18:37:41,909 [main] WARN org.apache.hadoop.metrics2.impl.MetricsSystemImpl - JobTracker metrics system already initialized!  
2020-02-27 18:37:41,918 [main] INFO org.apache.pig.backend.hadoop.executionengine.mapReduceLayer.MapReduceLauncher - Success!  
grunt> █
```

quit

- 利用 head 來查看結果(head 預設查看前面 10 筆資料)

head lab8\_out1/part-\*

```
bao@master:~  
2020-02-27 18:37:41,906 [main] WARN org.apache.hadoop.metrics2.impl.MetricsSystemImpl - JobTracker metrics system already initialized!  
2020-02-27 18:37:41,908 [main] WARN org.apache.hadoop.metrics2.impl.MetricsSystemImpl - JobTracker metrics system already initialized!  
2020-02-27 18:37:41,909 [main] WARN org.apache.hadoop.metrics2.impl.MetricsSystemImpl - JobTracker metrics system already initialized!  
2020-02-27 18:37:41,918 [main] INFO org.apache.pig.backend.hadoop.executionengine.mapReduceLayer.MapReduceLauncher - Success!  
grunt> quit  
2020-02-27 18:38:19,673 [main] INFO org.apache.pig.Main - Pig script completed  
in 2 minutes, 4 seconds and 356 milliseconds (124356 ms)  
bao@master:~$ head lab8_out1/part-*  
002BB5A52580A8ED      18  
005BD9CD3AC6BB38      18  
00A08A54CD03EB95      3  
011ACA65C2BF70B2      5  
01500FAFE317B7C0      15  
0158F8ACC570947D      3  
018FBF6BFB213E68      1  
019E9463F6695963      10  
01F6B9CA495576BA      7  
027DCCE98A4B6E84      11  
bao@master:~$ █
```

## #Filter (Local Mode)

- 在本機執行 pig

pig -x local

- Filter

log = LOAD 'excite-small.log' AS (user, timestamp, query);

grpd = GROUP log BY user;

```
cntd = FOREACH grpdt GENERATE group, COUNT(log) AS cnt;
fltrd = FILTER cntd BY cnt >50;
STORE fltrd INTO 'lab8_out2';
quit
```

3. 一樣利用 head 來查看結果(head 預設查看前面 10 筆資料)

```
head lab8_out2/part-*
```

```
bao@master:~$ Spillable Memory Manager spill count : 0
Total bags proactively spilled: 0
Total records proactively spilled: 0

Job DAG:
job_local1871386005_0001

2020-02-27 18:41:43,626 [main] WARN  org.apache.hadoop.metrics2.impl.MetricsSystemImpl - JobTracker metrics system already initialized!
2020-02-27 18:41:43,628 [main] WARN  org.apache.hadoop.metrics2.impl.MetricsSystemImpl - JobTracker metrics system already initialized!
2020-02-27 18:41:43,630 [main] WARN  org.apache.hadoop.metrics2.impl.MetricsSystemImpl - JobTracker metrics system already initialized!
2020-02-27 18:41:43,638 [main] INFO  org.apache.pig.backend.hadoop.executionengine.mapReduceLayer.MapReduceLauncher - Success!
grunt> quit
2020-02-27 18:41:53,304 [main] INFO  org.apache.pig.Main - Pig script completed
in 20 seconds and 369 milliseconds (20369 ms)
bao@master:~$ head lab8_out2/part-*
0B294E3062F036C3      61
128315306CE647F6      78
7D286B5592D83BBE      59
bao@master:~$
```

### #Sorting (Local Mode)

1. 在本機執行 pig

```
pig -x local
```

2. Sorting

```
log = LOAD 'excite-small.log' AS (user, timestamp, query);
grpdt = GROUP log BY user;
cntd = FOREACH grpdt GENERATE group, COUNT(log) AS cnt;
fltrd = FILTER cntd BY cnt > 50;
srtd = ORDER fltrd BY cnt ;
STORE srtd INTO 'lab8_out3' ;
quit
```

3. 一樣利用 head 來查看結果(head 預設查看前面 10 筆資料)

```
head lab8_out3/part-*
```

```

bao@master:~$ emImpl - JobTracker metrics system already initialized!
2020-02-27 18:46:34,361 [main] WARN org.apache.hadoop.metrics2.impl.MetricsSystemImpl - JobTracker metrics system already initialized!
2020-02-27 18:46:34,363 [main] WARN org.apache.hadoop.metrics2.impl.MetricsSystemImpl - JobTracker metrics system already initialized!
2020-02-27 18:46:34,365 [main] WARN org.apache.hadoop.metrics2.impl.MetricsSystemImpl - JobTracker metrics system already initialized!
2020-02-27 18:46:34,369 [main] WARN org.apache.hadoop.metrics2.impl.MetricsSystemImpl - JobTracker metrics system already initialized!
2020-02-27 18:46:34,370 [main] WARN org.apache.hadoop.metrics2.impl.MetricsSystemImpl - JobTracker metrics system already initialized!
2020-02-27 18:46:34,371 [main] WARN org.apache.hadoop.metrics2.impl.MetricsSystemImpl - JobTracker metrics system already initialized!
2020-02-27 18:46:34,374 [main] INFO org.apache.pig.backend.hadoop.executionengine.mapReduceLayer.MapReduceLauncher - Success!
grunt>
grunt> quit
2020-02-27 18:46:39,725 [main] INFO org.apache.pig.Main - Pig script completed
in 24 seconds and 341 milliseconds (24341 ms)
bao@master:~$ head lab8_out3/part-*
7D286B5592D83BBE      59
0B294E3062F036C3      61
128315306CE647F6      78
bao@master:~$ 

```

## hadoop+pig

- 首先先重開機,然後開啟 hadoop(為了讓 profile 檔生效),再啟動 hadoop

```
source /opt/hadoop/etc/hadoop/hadoop-env.sh  
start-all.sh
```

- 在 hdfs 上建一個資料夾為 pig

```
hadoop fs -mkdir /pig
```

- 將檔案傳到 hdfs 上

```
hadoop fs -put excite-small.log /pig
```

```

bao@master:~$ source /opt/hadoop/etc/hadoop/hadoop-env.sh
bao@master:~$ start-all.sh
WARNING: Attempting to start all Apache Hadoop daemons as bao in 10 seconds.
WARNING: This is not a recommended production deployment configuration.
WARNING: Use CTRL-C to abort.
Starting namenodes on [master]
Starting datanodes
Starting secondary namenodes [master]
Starting resourcemanager
Starting nodemanagers
bao@master:~$ hadoop fs -mkdir /pig
bao@master:~$ hadoop fs -put excite-small.log /pig
2020-02-27 18:54:54,773 INFO sasl.SaslDataTransferClient: SASL encryption trust
check: localHostTrusted = false, remoteHostTrusted = false
bao@master:~$ 

```

- 執行 pig

pig

```
log = LOAD '/pig/excite-small.log' AS (user, timestamp, query);
```

```
grpd = GROUP log BY user;
```

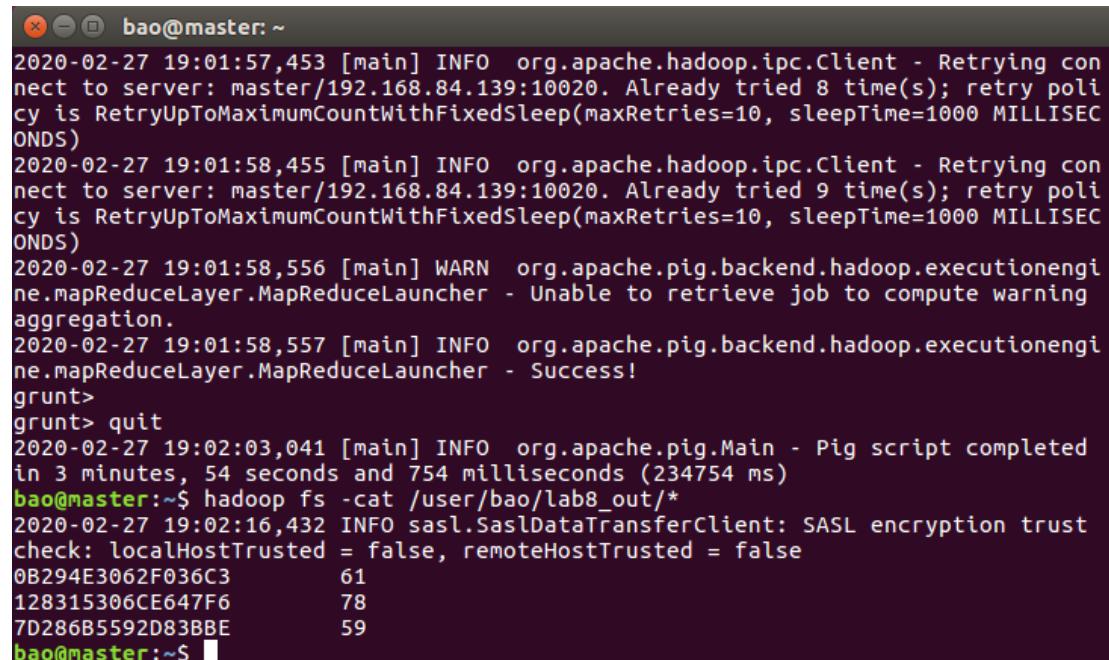
```
cnd = FOREACH grpd GENERATE group, COUNT(log) AS cnt;
```

```
fltrd = FILTER cntd BY cnt > 50;  
STORE fltrd INTO 'lab8_out';    (這步驟會有點久)  
quit
```

5. 查看結果:

```
hadoop fs -cat /user/XXXX/lab8_out/*
```

Note:XXXX 為學號



```
bao@master: ~  
2020-02-27 19:01:57,453 [main] INFO org.apache.hadoop.ipc.Client - Retrying connect to server: master/192.168.84.139:10020. Already tried 8 time(s); retry policy is RetryUpToMaximumCountWithFixedSleep(maxRetries=10, sleepTime=1000 MILLISECONDNS)  
2020-02-27 19:01:58,455 [main] INFO org.apache.hadoop.ipc.Client - Retrying connect to server: master/192.168.84.139:10020. Already tried 9 time(s); retry policy is RetryUpToMaximumCountWithFixedSleep(maxRetries=10, sleepTime=1000 MILLISECONDNS)  
2020-02-27 19:01:58,556 [main] WARN org.apache.pig.backend.hadoop.executionengine.mapReduceLayer.MapReduceLauncher - Unable to retrieve job to compute warning aggregation.  
2020-02-27 19:01:58,557 [main] INFO org.apache.pig.backend.hadoop.executionengine.mapReduceLayer.MapReduceLauncher - Success!  
grunt>  
grunt> quit  
2020-02-27 19:02:03,041 [main] INFO org.apache.pig.Main - Pig script completed in 3 minutes, 54 seconds and 754 milliseconds (234754 ms)  
bao@master:~$ hadoop fs -cat /user/bao/lab8_out/*  
2020-02-27 19:02:16,432 INFO sasl.SaslDataTransferClient: SASL encryption trust check: localHostTrusted = false, remoteHostTrusted = false  
0B294E3062F036C3      61  
128315306CE647F6      78  
7D286B5592D83BBE      59  
bao@master:~$
```

## # Batch 練習

The first column is name, the secord column is age, and the final one is location who lives.

1. Please Tell me after 20 years, who's age will be greater than 100.
2. Please (randomly) tell me any 3 records who live in Taipei.
3. Please give me a new table(relation) with additional column that describe whether this person is young or old.

Rule : if someones's age is less than 50, mark him as 'young', otherwise mark him as 'old'

The expected result is as followings:

---

Mar	18	Taipei	young
Jacky	72	Pingtung	old

下載資料檔案

```
wget http://www.cc.ntut.edu.tw/~jykuo/course/pig01\_source
```

```
#編輯 pig_0101.pig
gedit pig0101.pig
寫入
a = LOAD 'pig01_source' AS (name:chararray, age:int, location:chararray);
b = FILTER a BY (age + 20 > 100);
DUMP b;
輸出為
(Shawn,89,Tauchung)
(Kimi,98,Taipei)
```

執行 pig0101.pig  
pig -x local  
run pig0101.pig

```
#編輯 pig_0102.pig
gedit pig0102.pig
寫入
a = LOAD 'pig01_source' AS (name:chararray, age:int, location:chararray);
b = FILTER a BY LOWER(location) == 'taipei';
c = LIMIT b 3;
DUMP c;
輸出為
(Sam,32,Taipei)
(Tom,50,Taipei)
(Mary,18,Taipei)
```

```
#編輯 pig_0103.pig
gedit pig0103.pig
寫入
a = LOAD 'pig01_source' AS (name:chararray, age:int, location:chararray);
b = FOREACH a GENERATE *, (age < 50? 'young' : 'old') AS description;
DUMP b;
輸出為
(Mary,18,Taipei,young)
(John,42,Kaohsiung,young)
(Tom,50,Taipei,old)
(Rora,12,Pingtung,young)
(Jacky,72,Pingtung,old)
```

(Phoenix,28,Taichung,young)

(Shawn,89,Tauchung,old)

(Sam,32,Taipei,young)

(Ivy,57,Taipei,old)

(Kimi,98,Taipei,old)

執行 pig0103.pig

**pig -x local**

**run pig0103.pig**