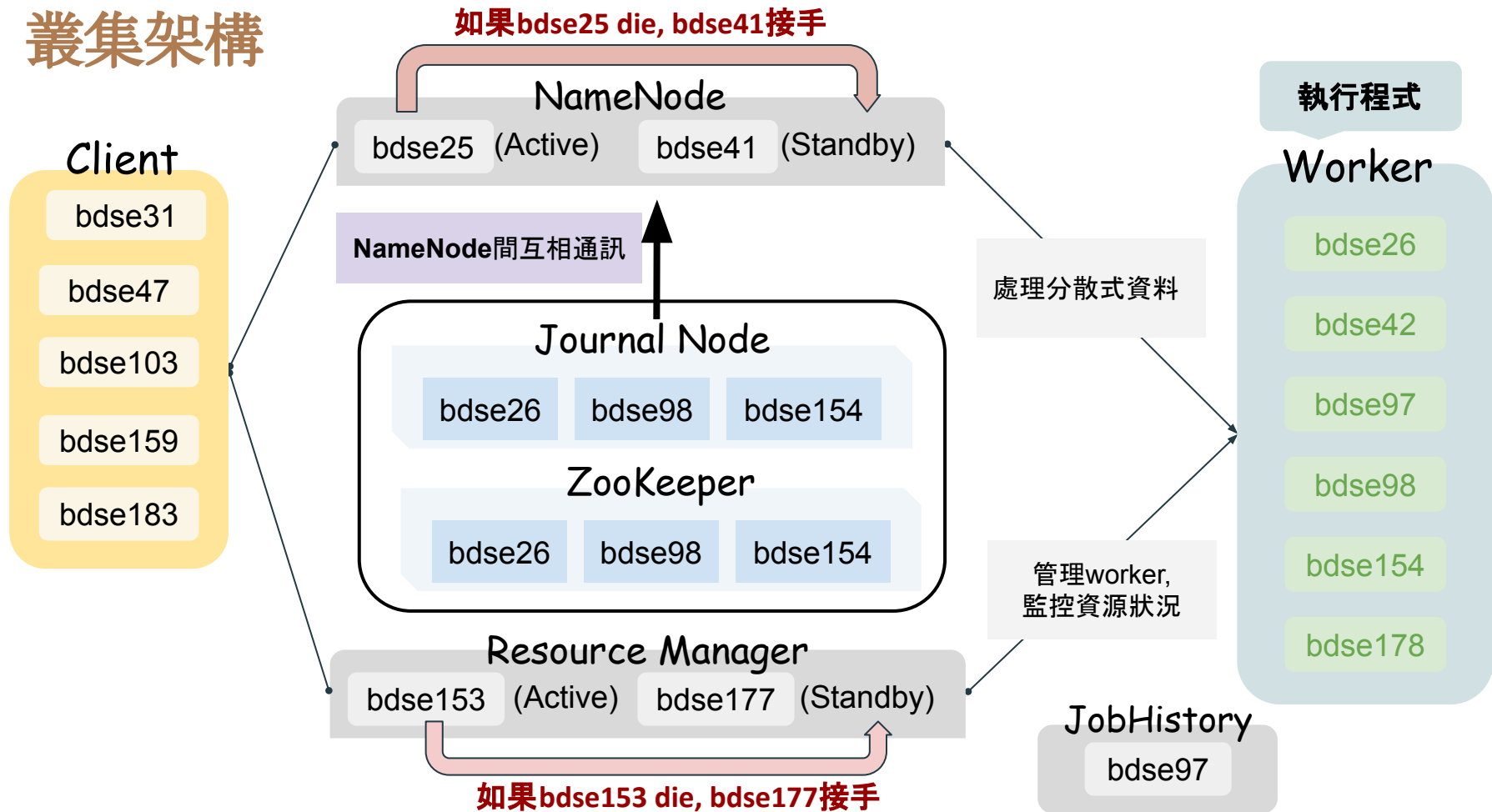


HADOOP叢集架設

第三組 秦忻榆 林循恩 魏辰儒 徐佳芸 游敏卉

叢集架構



Name Node

負責管理對用戶端的檔案存取、維護和管理 DataNodes 並分配任務於其以及儲存 metadata, 如檔案名稱、block 個數、block 位置、replica 個數等

Resource Manager

在 **YARN** 系統中所有應用程式之間決定資源如何分配

Job History Server

儲存 **ResourceManager** 分配資源的詳細資料 (ex: 啟動、完成時間), 使用者可查看過去 Hadoop 的使用訊息

Node Manager

管理每個 **Worker** 的運作, 與 **ResourceManager** 保持聯繫, 並監視資源使用狀況, 回報 (cpu、memory、disk、network 等) 情況

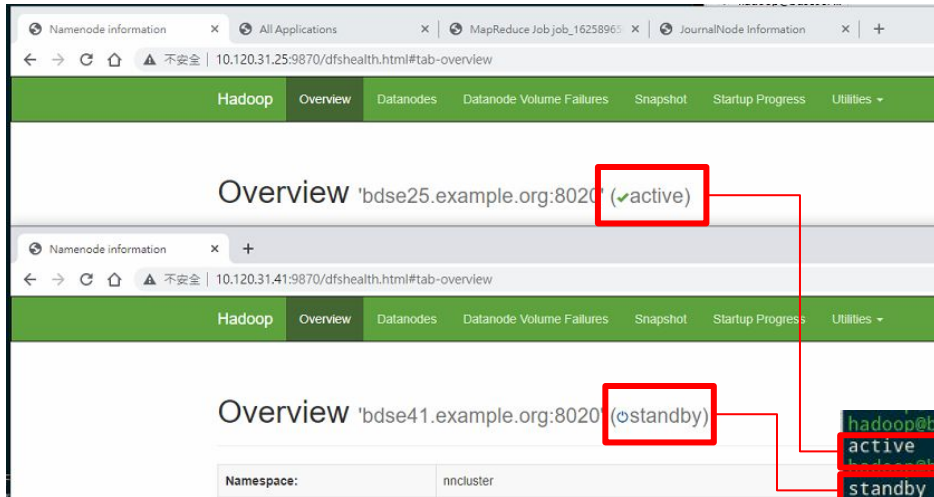
Data Node

執行 **MapReduce** (運算處理層) 所分配的任務。以及 HDFS (分散式檔案系統) 指揮, 完成檔案的建立、刪除、複製、存取等指令

Journal Node

同步 **Active NameNode** 與 **Standby NameNode** 的資料

Hadoop叢集架構(HA)



連接至9870確認, active及standby狀況

<http://10.120.31.25:9870/>

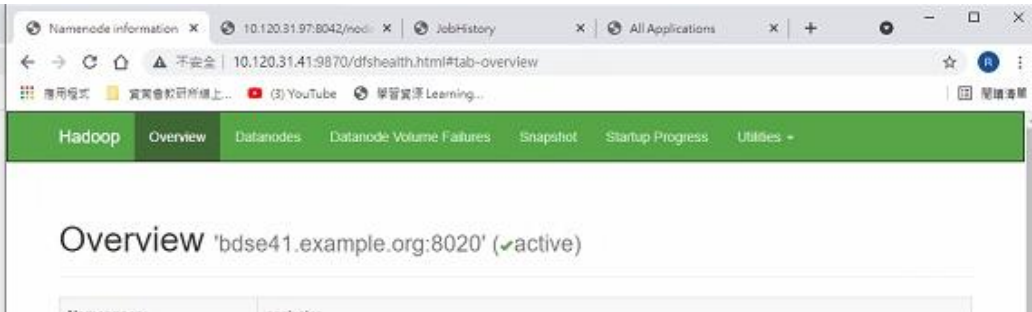
<http://10.120.31.41:9870/>

或者

下指令確認NameNode其中一個啟動

```
hadoop@bdse98:/usr/local/zookeeper/conf$ hdfs haadmin -getServiceState nn1
active
hadoop@bdse98:/usr/local/zookeeper/conf$ hdfs haadmin -getServiceState nn2
standby
hadoop@bdse98:/usr/local/zookeeper/conf$
```


當原本active的NameNode關閉時, 原本standby會轉為active繼續運作



Browser tabs: All Applications x All Applications x All Applications x +

Address bar: bdse177.example.org:8088/cluster

Navigation: 應用程式 實業會教研所線上...



Cluster

- About
- Nodes
- Node Labels
- Applications
- NEW
- NEW SAVING
- SUBMITTED
- ACCEPTED
- RUNNING
- FINISHED
- FAILED
- KILLED
- Scheduler

Tools

Cluster Metrics

Apps Submitted	Apps Pending	Apps Running	Apps Completed
10	0	10	0

Cluster Nodes Metrics

Active Nodes	Decommissioning Nodes
6	0

Scheduler Metrics

Scheduler Type	Scheduling Resource Type
Capacity Scheduler	[memory-mb (unit=Mi), vcores]

Show 20 entries

ID	User	Name	Application Type	Application Tags	Queue	Application Priority
application_1625983418295_0010	hadoop	QuasiMonteCarlo	MAPREDUCE		default	0
application_1625983418295_0009	hadoop	QuasiMonteCarlo	MAPREDUCE		default	0
application_1625983418295_0008	hadoop	QuasiMonteCarlo	MAPREDUCE		default	0
application_1625983418295_0007	hadoop	QuasiMonteCarlo	MAPREDUCE		default	0
application_1625983418295_0006	hadoop	QuasiMonteCarlo	MAPREDUCE		default	0
application_1625983418295_0005	hadoop	QuasiMonteCarlo	MAPREDUCE		default	0

有兩台Resource Manager,
分別為active(bdse177),
standby(bdse153)

開啟網頁bdse177(8088),
bdse153(8088), 其中
bdse153(8088)會自動
redirect到bdse177(8088)

bdse177: yarn --daemon
stop resourcemanager

自動跳轉到standby 的
RM(bdse153)

網頁bdse177將無法連線

網頁bdse153畫面將會出現


bdse177: yarn --daemon
start resourcemanager

bdse177則變為standby

Browser tabs: All Applications x All Applications x All Applications x +

Address bar: bdse177.example.org:8088/cluster

Navigation: 應用程式 實業會數研所線上...



Cluster

- About
- Nodes
- Node Labels
- Applications
- NEW
- NEW SAVING
- SUBMITTED
- ACCEPTED
- RUNNING
- FINISHED
- FAILED
- KILLED
- Scheduler

Tools

Cluster Metrics

Apps Submitted		Apps Pending		Apps Running		Apps Completed	
11	0	1	10	17			

Cluster Nodes Metrics

Active Nodes		Decommissioning Nodes	
6	0	0	0

Scheduler Metrics

Scheduler Type		Scheduling Resource Type	
Capacity Scheduler		[memory-mb (unit=Mi), vcores]	

Show 20 entries

ID	User	Name	Application Type	Application Tags	Queue	Application Priority	Status
application_1625983418295_0011	hadoop	QuasiMonteCarlo	MAPREDUCE		default	0	Success
application_1625983418295_0010	hadoop	QuasiMonteCarlo	MAPREDUCE		default	0	Success
application_1625983418295_0009	hadoop	QuasiMonteCarlo	MAPREDUCE		default	0	Success
application_1625983418295_0008	hadoop	QuasiMonteCarlo	MAPREDUCE		default	0	Success
application_1625983418295_0007	hadoop	QuasiMonteCarlo	MAPREDUCE		default	0	Success
application_1625983418295_0006	hadoop	QuasiMonteCarlo	MAPREDUCE		default	0	Success

有兩台Resource Manager,
分別為active(bdse177),
standby(bdse153)

開啟網頁bdse177(8088),
bdse153(8088), 其中
bdse153(8088)會自動
redirect到bdse177(8088)

bdse177: yarn --daemon
stop resourcemanager

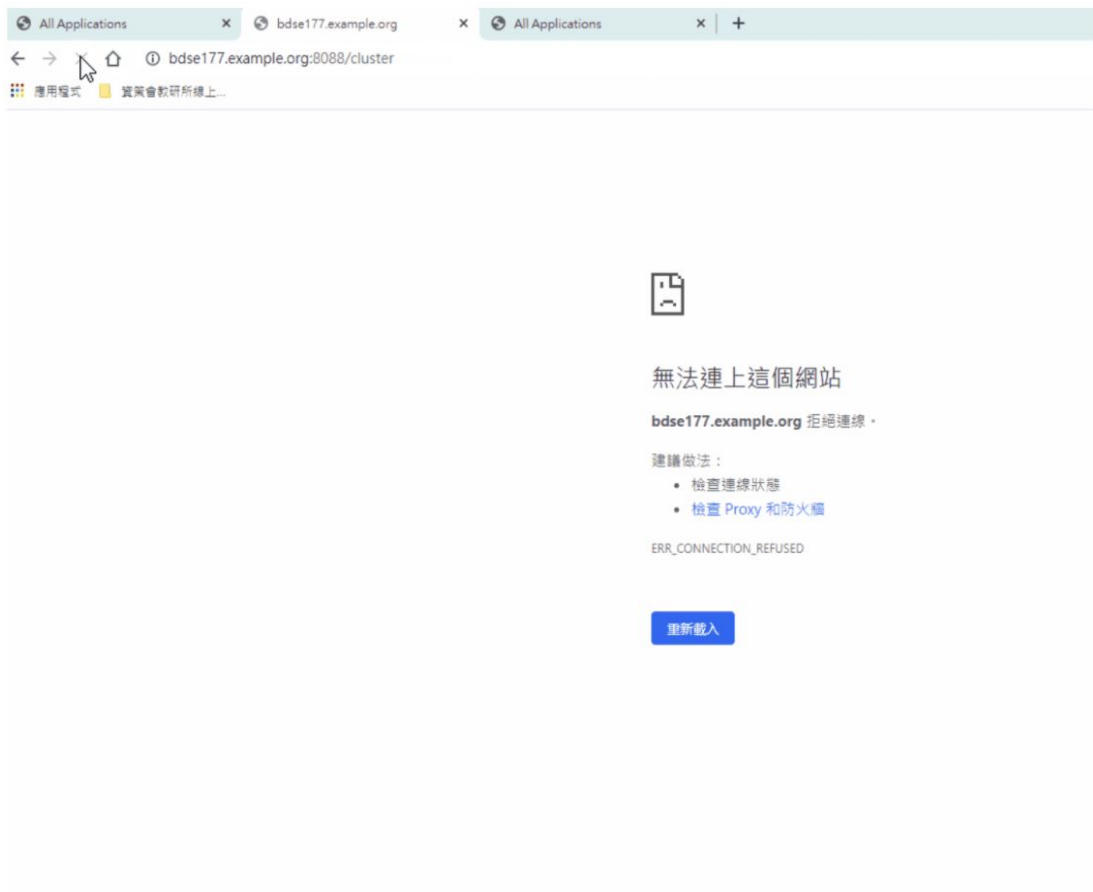
自動跳轉到standby 的
RM(bdse153)

網頁bdse177將無法連線

網頁bdse153畫面將會出現

bdse177: yarn --daemon
start resourcemanager

bdse177則變為standby



有兩台Resource Manager,
分別為active(bdse177),
standby(bdse153)

開啟網頁bdse177(8088),
bdse153(8088), 其中
bdse153(8088)會自動
redirect到bdse177(8088)

bdse177: yarn --daemon
stop resourcemanager

自動跳轉到standby 的
RM(bdse153)

網頁bdse177將無法連線

網頁bdse153畫面將會出現


bdse177: yarn --daemon
start resourcemanager

bdse177則變為standby

bdse177.example.org

bdse153.example.org:8088/cluster

應用程式 資源會就研所線上...



Cluster
About
Nodes
Node Labels
Applications
NEW
NEW SAVING
SUBMITTED
ACCEPTED
RUNNING
FINISHED
FAILED
KILLED
Scheduler
Tools

Cluster Metrics

Apps Submitted	Apps Pending	Apps Running	Apps Completed
1	0	1	0

Cluster Nodes Metrics

Active Nodes	Decommissioning Nodes
4	0

Scheduler Metrics

Scheduler Type	Scheduling Resource Type
Capacity Scheduler	[memory-mb (unit=Mi), vcores]

Show 20 entries

ID	User	Name	Application Type	Application Tags	Queue	Application Priority	Status
application_1625983418295_0011	hadoop	QuasiMonteCarlo	MAPREDUCE		default	0	Su 14 +0
application_1625983418295_0010	hadoop	QuasiMonteCarlo	MAPREDUCE		default	0	Su 14 +0
application_1625983418295_0009	hadoop	QuasiMonteCarlo	MAPREDUCE		default	0	Su 14 +0
application_1625983418295_0008	hadoop	QuasiMonteCarlo	MAPREDUCE		default	0	Su 14 +0
application_1625983418295_0007	hadoop	QuasiMonteCarlo	MAPREDUCE		default	0	Su 14 +0
application_1625983418295_0006	hadoop	QuasiMonteCarlo	MAPREDUCE		default	0	Su 14 +0

有兩台Resource Manager, 分別為active(bdse177), standby(bdse153)

開啟網頁bdse177(8088), bdse153(8088), 其中 bdse153(8088)會自動 redirect到bdse177(8088)

bdse177: yarn --daemon stop resourcemanager

自動跳轉到standby 的 RM(bdse153)

網頁bdse177將無法連線

網頁bdse153畫面將會出現

bdse177: yarn --daemon start resourcemanager

bdse177則變為standby

Hadoop叢集架構(HA)

```
hadoop@bdse98:~$ yarn rmadmin -getServiceState rm1  
standby
```

```
hadoop@bdse98:~$ yarn rmadmin -getServiceState rm2  
active
```

```
hadoop@bdse98:~$ yarn rmadmin -getServiceState rm1  
active
```

```
hadoop@bdse98:~$ yarn rmadmin -getServiceState rm2
```

```
2021-07-11 14:23:09,760 INFO ipc.Client: Retrying connect to server: bdse177.example.org/10.120.31.177:8033. Already tried 0 time(s); retry policy is RetryUpToMaximumCountWithFixedSleep(maxRetries=1, sleepTime=1000 MILLISECONDS)
```

```
Operation failed: Call From bdse98.example.org/10.120.31.98 to bdse177.example.org:8033 failed on connection exception: java.net.ConnectException: Connection refused; For more details see: http://wiki.apache.org/hadoop/ConnectionRefused
```

```
hadoop@bdse98:~$
```

```
/wiki.apache.org/hadoop/ConnectionRefused
```

```
hadoop@bdse98:~$ yarn rmadmin -getServiceState rm1  
active
```

```
hadoop@bdse98:~$ yarn rmadmin -getServiceState rm2  
standby
```

```
hadoop@bdse98:~$
```

錯誤發生

```
hadoop@bdse154:/usr/local/hive/data$ jps
1872 NodeManager
16613 Jps
16060 RunJar
1502 DataNode
hadoop@bdse154:/usr/local/hive/data$ jobs -l
[1]+ 16060 Running                  hiveserver2 &
hadoop@bdse154:/usr/local/hive/data$ kill 16060
hadoop@bdse154:/usr/local/hive/data$ jobs -l
[1]+ 16060 Exit 143                  hiveserver2
hadoop@bdse154:/usr/local/hive/data$ jps
1872 NodeManager
16644 Jps
1502 DataNode
hadoop@bdse154:/usr/local/hive/data$ stop-yarn.sh
Stopping nodemanagers
Stopping resourcemanager
hadoop@bdse154:/usr/local/hive/data$ ins
17029 Jps
1502 DataNode
hadoop@bdse154:/usr/local/hive/data$
```

```
hadoop@bdse154: ~/data
total 2201984
drwxrwxr-x 5 hadoop hadoop      4096 Jun  8 13:50 data
drwxrwxr-x 3 hadoop hadoop      4096 Jul 10 11:58 journalnode
-rw-rw-r-- 1 hadoop hadoop 2254818039 Jun  9 09:27 testdata.csv
hadoop@bdse154:~$ cd data
hadoop@bdse154:~/data$ hdfs haadmin -getServiceState nn1
active
hadoop@bdse154:~/data$ hdfs haadmin -getServiceState nn2
standby
hadoop@bdse154:~/data$ jps
17904 DataNode
18058 JournalNode
20552 Jps
hadoop@bdse154:~/data$ start-yarn.sh
Starting resourcemanager
Starting nodemanagers
hadoop@bdse154:~/data$ jps
17904 DataNode
20904 NodeManager
18058 JournalNode
21070 Jps
hadoop@bdse154:~/data$ hadoop jar /usr/local/hadoop/share/hadoop/mapreduce/hadoop-mapreduce-examples-3.3.0.jar pi 3 1000
```

```
[9]: %%timeit
# Read CVS file
df_train = ks.read_csv('/user/spark/share/performance_detail.csv')
```

14 s ± 246 ms per loop (mean ± std. dev. of 7 runs, 1 loop each)

```
[10]: # Read CVS file
df_train = ks.read_csv('/user/spark/share/performance_detail.csv')
```

```
[12]: %%timeit
# Read CVS file
sdf_train = spark.read.csv('/user/spark/share/performance_detail.csv',inferSchema=True, header=True)
```

13.9 s ± 202 ms per loop (mean ± std. dev. of 7 runs, 1 loop each)

```
[13]: %%timeit
df_train.shape
```

2.53 s ± 93.9 ms per loop (mean ± std. dev. of 7 runs, 1 loop each)

⚠ 不安全 | bdse153.example.org:8088/cluster

🔍 ⭐ 👤 ⋮

英語會教研所線上...

📖 閱讀清單

Logged in as: drwho



All Applications

Cluster Metrics

Apps Submitted	Apps Pending	Apps Running	Apps Completed	Containers Running	Memory Used	Memory Total	Memory Reserved	VCores Used	VCores Total	VCores Reserved
35	0	1	34	6	35 GB	42 GB	0 B	6	12	0

Cluster Nodes Metrics

Active Nodes	Decommissioning Nodes	Decommissioned Nodes	Lost Nodes	Unhealthy Nodes	Rebooted Nodes	Shutdown Nodes
0	0	0	0	0	0	0

Scheduler Metrics

Capacity Scheduler	memory-mb (unit=M), vcores	memory:1524, vCores:1>	memory:7168, vCores:2>	0
--------------------	----------------------------	------------------------	------------------------	---

ID	User	Name	Application Type	Application Tags	Queue	Application Priority	StartTime	LaunchTime	FinishTime	State	FinalStatus	Running Containers	Allocated CPU VCores	Allocated Memory MB	Reserved CPU VCores	Reserved Memory MB	% of Queue	% of Cluster	Progress	Tracking UI	Blacklisted Nodes
#application_1827594934014_0038	hadoop	PySparkShell	SPARK		default	0	Sat Jul 31 14:11:12 +0800 2021	Sat Jul 31 14:11:12 +0800 2021	N/A	RUNNING	UNDEFINED	6	6	36864	0	0	85.7	85.7	<div></div>	ApplicationMaster	0
#application_1827594934014_0035	hadoop	PySparkShell	SPARK		default	0	Sat Jul 31 14:03:15 +0800 2021	Sat Jul 31 14:03:15 +0800 2021	Sat Jul 31 14:09:52 +0800 2021	FINISHED	SUCCEEDED	N/A	N/A	N/A	N/A	N/A	0.0	0.0	<div></div>	History	0
#application_1827594934014_0034	hadoop	PySparkShell	SPARK		default	0	Sat Jul 31 14:00:52 +0800 2021	Sat Jul 31 14:01:19 +0800 2021	Sat Jul 31 14:03:10 +0800 2021	FINISHED	SUCCEEDED	N/A	N/A	N/A	N/A	N/A	0.0	0.0	<div></div>	History	0

```
from pyspark.ml import Pipeline
from pyspark.ml.regression import RandomForestRegressor
from pyspark.ml.feature import VectorAssembler
from pyspark.ml.linalg import Vector
from pyspark.ml.evaluation import RegressionEvaluator
import time
```

```
%%timeit
df = spark.read.csv('/user/spark/share/testData.csv', inferSchema=True, header=True)
```

497 ms ± 86.2 ms per loop (mean ± std. dev. of 7 runs, 1 loop each)

```
df = spark.read.csv('/user/spark/share/testData.csv', inferSchema=True, header=True)
```

```
feature_cols = df.columns[:-1]
assembler = VectorAssembler(inputCols=feature_cols, outputCol='features')
features_df = assembler.transform(df)
```

```
model_df = features_df.select('features', 'houseprice')
```

```
trainingData, testData = model_df.randomSplit([0.7, 0.3], seed=10)
```

```
%%time
```

```
rf = RandomForestRegressor(featuresCol='features',labelCol='houseprice', numTrees=200)
rf_model = rf.fit(trainingData)
train_pred = rf_model.transform(trainingData)
test_pred = rf_model.transform(testData)
```

```
regressionEvaluator = RegressionEvaluator(
    predictionCol="prediction",
    labelCol="houseprice",
    metricName="mse")
```

```
r2_train = regressionEvaluator.setMetricName("r2").evaluate(train_pred)
r2_test = regressionEvaluator.setMetricName("r2").evaluate(test_pred)
```

```
print(f"R2 train: {r2_train}")
```

```
print(f"R2 test: {r2_test}")
```

```
R2 train: 0.8047031370388252
```

```
R2 test: 0.5923063564072693
```

```
CPU times: user 24.3 ms, sys: 1.72 ms, total: 26 ms
```

```
Wall time: 9.5 s
```