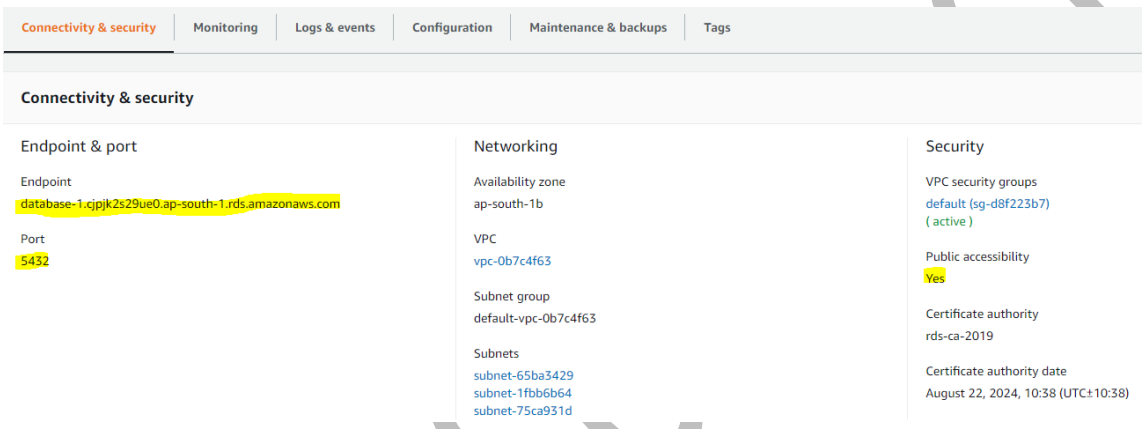
EDWA : Enterprise Data warehouse Analysis

1.Database Design

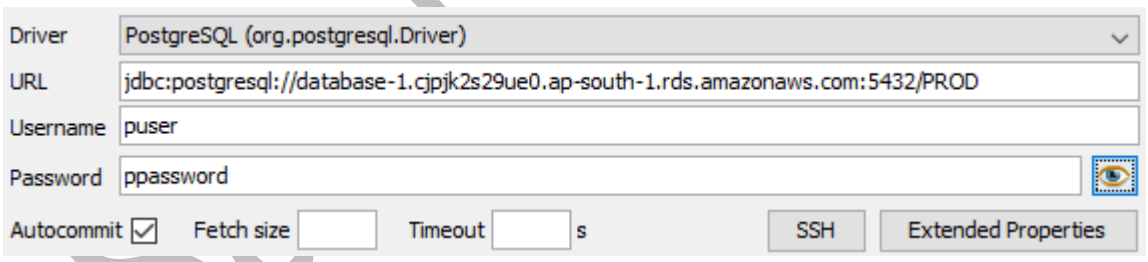
01.final_design.pdf

2. Create AWS RDS instance of Postgre (PostgreSQL 12.5-R1) type

Note : Make DB public , remember Port,Username,Password and Endpoint



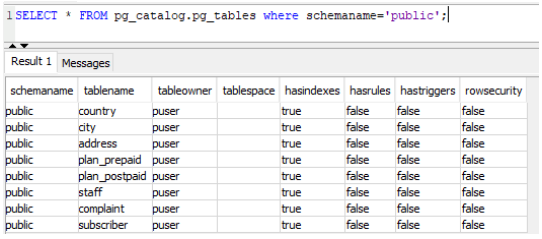
3. Connect That Created Postgre instance using workbench



Connect

4. Load Data to create all tables in Postgre

02.Postgre_DDL.sql



```
1 SELECT * FROM pg_catalog.pg_tables where schemaname='public';
```

Result 1 | Messages

schemaname	tablename	tableowner	tablespace	hasindexes	hasrules	hastriggers	rowsecurity
public	country	puser		true	false	false	false
public	city	puser		true	false	false	false
public	address	puser		true	false	false	false
public	plan_prepaid	puser		true	false	false	false
public	plan_postpaid	puser		true	false	false	false
public	staff	puser		true	false	false	false
public	complaint	puser		true	false	false	false
public	subscriber	puser		true	false	false	false

5.Initial Data load using

03.Initial_Dataload.sql

Check table structure and sample data

6. Create EMR (5.33) with Below Software's

- Hadoop
- Spark
- Hbase
- Zookeeper
- Hive
- Hue
- Phoenix

7. Copy All dependencies on EMR

/home/hadoop/dep/*

8. Create Hbase table using phoenix Script

04.Phoenix_DDL_Hbase_Table_Cre.txt

```
CREATE TABLE COUNTRY_HB (cn_id VARCHAR(10) PRIMARY KEY,cn_name VARCHAR(45));
CREATE TABLE CITY_HB (ct_id VARCHAR(10) PRIMARY KEY,ct_name VARCHAR(45),cn_id VARCHAR(10));
CREATE TABLE ADDRESS_HB (add_id VARCHAR(10) PRIMARY KEY,Street VARCHAR(45),ct_id VARCHAR(10));
```

Note : To run pyspark job on EMR cluster you can use below command :

/usr/bin/spark-submit --jars /home/hadoop/dep/postgresql-42.2.14.jar,/home/hadoop/dep/phoenix-4.14.3-HBase-1.4-client.jar,/home/hadoop/dep/phoenix-spark-4.14.3-HBase-1.4.jar --master yarn --deploy-mode client --driver-memory 3g --executor-memory 2g --num-executors 1 --executor-cores 1 /home/hadoop/05.RDS_to_HBASE_Ref_import.py

9. Import Ref data from RDBMS to Hbase using (Change the DB details in Script)

05.RDS_to_HBASE_Ref_import.py

```
from pyspark.sql import SparkSession

spark = SparkSession.builder.appName("RDStoHBASE_Ref_Table").master("local").getOrCreate()
host="jdbc:postgresql://database-1.cjpjk2s29ue0.ap-south-1.rds.amazonaws.com:5432/PROD"
user="puser"
pwd="ppassword"
driver="org.postgresql.Driver"
#dbtable="COUNTRY"

print("Data import for reference table is started....")
#Country Table
df_cn=spark.read.format("jdbc").option("url",host).option("user",user).option("password",pwd).option("driver"
,driver).option("dbtable","COUNTRY").load()
df_cn.write.format("org.apache.phoenix.spark").option("table","COUNTRY_HB").option("zkUrl","localhost:2181").
mode('overwrite').save()
print("Country Table Imported successfully")
```

Sample Data :

```
+---------+-----------------------------------------+
|  CN_ID  |                 CN_NAME                 |
+---------+-----------------------------------------+
| CN_90   | Sweden                                  |
| CN_91   | Switzerland                             |
| CN_92   | Taiwan                                  |
| CN_93   | Tanzania                                |
| CN_94   | Thailand                                |
| CN_95   | Tonga                                   |
| CN_96   | Tunisia                                 |
| CN_97   | Turkey                                  |
| CN_98   | Turkmenistan                            |
| CN_99   | Tuvalu                                  |
+---------+-----------------------------------------+
109 rows selected (0.042 seconds)
0: jdbc:phoenix:localhost>
```

10. Import Trans data from RDBMS to Hbase using (Change the DB details in Script)

    06.RDS_to_HBASE_Hist_Trans_import.py

```
from pyspark.sql import SparkSession

spark = SparkSession.builder.appName("RDStoHDFS_Trans_Table").master("local").getOrCreate()
host="jdbc:postgresql://database-1.cjpjk2s29ue0.ap-south-1.rds.amazonaws.com:5432/PROD"
user="puser"
pwd="ppassword"
driver="org.postgresql.Driver"
dbtable="COUNTRY"

print("Historical Data import for transactional table is started....")

#SUBSCRIBER Table
df_sb=spark.read.format("jdbc").option("url",host).option("user",user).option("password",pwd).option("driver"
,driver).option("dbtable","SUBSCRIBER").load()
df_sb.write.format("org.apache.phoenix.spark").option("table","SUBSCRIBER_HB").option("zkUrl",
"localhost:2181").mode('overwrite').save()
print("SUBSCRIBER Table Imported successfully")
```

Sample Data :

```
0: jdbc:phoenix:localhost> select * from staff_hb;
+-----------+-------+-------+----------+-------------------------+-------------------------+--------------+---------+--+
| STAFF_ID  | NAME  |  MOB  |  EMAIL   |       SYS_CRE_DATE      |       SYS_UPD_DATE      | ACTIVE_FLAG  | ADD_ID  | |
+-----------+-------+-------+----------+-------------------------+-------------------------+--------------+---------+--+
| 10001     | A     | 12345 | A@A.com  | 2021-01-01 00:00:00.000 | 2021-01-01 00:00:00.000 | A            | AD_101  | |
| 10002     | B     | 12346 | B@B.com  | 2021-01-01 00:00:00.000 | 2021-01-01 00:00:00.000 | A            | AD_102  | |
| 10003     | C     | 12347 | C@C.com  | 2021-01-01 00:00:00.000 | 2021-01-01 00:00:00.000 | A            | AD_103  | |
```

11. Create Hive tables deployment to transformed data using

07.hive_ddl.hql

```
create database prod;

use prod;

create table subscriber_details_staging (subscriberId integer,subscribername string,contactnumber
integer,emailId string,address string,city string,country string,create_date timestamp,update_date
timestamp,Active_flag char(1),prepaid_desc string,pre_amount integer,postpaid_desc string,pos_amount integer)
Row format delimited
fields terminated by ',';

create table subscriber_details (subscriberId integer,subscribername string,contactnumber integer,emailId
string,address string,city string,country string,create_date timestamp,update_date timestamp,Active_flag
char(1),prepaid_desc string,pre_amount integer,postpaid_desc string,pos_amount integer)
Row format delimited
fields terminated by ',';
```

Tables in Hive :

```
hive> show tables;
OK
complaint_details
complaint_details_staging
subscriber_details
subscriber_details_staging
Time taken: 0.026 seconds, Fetched: 4 row(s)
```

12. To process Subscriber details context using below script

08.Hb_to_hive_sub_details.py

```
#DSL
test=df_sb.join(df_ad,"add_id", how="left").join(df_ct,"ct_id", how="left").join(df_cn, "cn_id", how="left")
test1=test.join(df_ppr, df_ppr.PLAN_ID == test.PREPAID_PLAN_ID, how= "left").drop("ADD_ID").drop("CT_ID").
drop("CN_ID").drop("PLAN_ID").withColumnRenamed("PLAN_DESC","PRE_PLAN_DESC").withColumnRenamed("AMOUNT",
"PRE_AMOUNT")

test2=test1.join(df_ppo, df_ppo.PLAN_ID == test1.POSTPAID_PLAN_ID, how= "left").drop("PLAN_ID").
withColumnRenamed("PLAN_DESC","POS_PLAN_DESC").withColumnRenamed("AMOUNT","POS_AMOUNT")

#Give alias

res=test2.selectExpr("SID as subscriberId", "NAME as subscribername","MOB as contactnumber","EMAIL as
emailId","STREET as address","CT_NAME as city","CN_NAME as country","SYS_CRE_DATE as create_date",
"SYS_UPD_DATE as update_date","ACTIVE_FLAG as Active_flag","PRE_PLAN_DESC as prepaid_desc","PRE_AMOUNT as
pre_amount","POS_PLAN_DESC as postpaid_desc","POS_AMOUNT as pos_amount")

res.show(5)

#Write Data in Hive
res.write.mode('overwrite').saveAsTable("prod.subscriber_details_staging")

print("subscriber details data written successfully in hive staging")
```

Sample Data :

```
hive> select * from subscriber_details_staging limit 5;
OK
311     PAUL TROUT      54631   PAUL.TROUT@sakilacustomer.org   746 Joliet Lane Kursk   Russian Federation      2021-01-01
ULL
910     EASTER BEN      55230   EASTER.BEN@customer.org 746 Joliet Lane Kursk   Russian Federation      2021-01-01 00:00:0
49      NULL    NULL
220     CHARLENE ALVAREZ        54540   CHARLENE.ALVAREZ@sakilacustomer.org     1842 Luzinia Boulevard  Zanzibar        Ta
ULL     NULL    unlimited call 150 GB   1000 SMS        499
586     KIRK STCLAIR    54906   KIRK.STCLAIR@sakilacustomer.org 1923 Stara Zagora Lane  Tsaotun Taiwan  2021-01-01 00:00:0
49      NULL    NULL
819     CARBONE CHAD    55139   CARBONE.CHAD@customer.org       1842 Luzinia Boulevard  Zanzibar        Tanzania        20
nlimited call 100GB     399
Time taken: 0.122 seconds, Fetched: 5 row(s)
```

13. To process Complaint details context use below script

    09.Hb_to_hive_cmp_details.py

14. Remove duplicate data using

    10.dedup_Compaction.py

```
##################################Dedup Suncriber details#######################

print("Suncriber details de-duplication and compaction started")
sd_dff=spark.sql("select * from prod.subscriber_details")
sd_dfs=spark.sql("select * from prod.subscriber_details_staging")

un = sd_dff.union(sd_dfs)

res=un.withColumn("new_upd",F.when(un.update_date.isNull(),F.to_timestamp(F.lit("1970-01-01 00:00:00 "),
format="yyyy-MM-dd HH:mm:SS")).otherwise(un.update_date)).drop("update_date")


f=res.select("*").withColumnRenamed("new_upd","update_date")

res1=f.withColumn("rn", F.row_number().over(Window.partitionBy("subscriberId").orderBy(desc("update_date"))))

res2=res1.filter(res1.rn == 1).drop("rn")

res2.show(30)
```

15. To Process delta use below script

Copy data into Hbase at /data location

Run this script to process new delta

11.delta_processing_sb_cmp.py

Delta :

Address :

```
ADD_ID,STREET,CT_ID
AD_139,SB road Parbhani,CT_398
AD_1111,ABC chowk,CT_417
AD_1112,Shivaji nagar,CT_417
AD_1113,Kharadi,CT_417
```

Complaint :

```
CMP_ID,SID,REGARDING,DESCR,STATUS,STAFF_ID,SYS_CRE_DATE,SYS_UPD_DATE
11118,47,Recharge,Recharge Related Query,Closed,10004,2021-01-01,2021-01-01
11119,21,Recharge,Recharge Related Query,Closed,10005,2021-01-01,2021-01-01
11120,300,Balance,Balance related Query,Closed,10005,2021-01-01,2021-01-01
222222,111,Billing,Billing related query,Open,10001,2021-06-01,2021-06-01
222222,112,Billing,Billing related query,Open,10001,2021-06-01,2021-06-01
222222,112,Port,I want to port,Open,10001,2021-06-01,2021-06-01
```

Staff :

```
STAFF_ID,NAME,MOB,EMAIL,SYS_CRE_DATE,SYS_UPD_DATE,ACTIVE_FLAG,ADD_ID,PREPAID_PLAN_ID,POSTPAID_PLAN_ID
10001,A,12345,A@A.com,2021-01-01,2021-01-01,A,AD_101,PR_1,PO_1
```

Subscriber:

```
SID,NAME,MOB,EMAIL,ADD_ID,SYS_CRE_DATE,SYS_UPD_DATE,ACTIVE_FLAG,PREPAID_PLAN_ID,POSTPAID_PLAN_ID
135,JUANITA MASON,54455,JUANITA.MASON@sakilacustomer.org,AD_139,2021-01-01,2021-06-01,A,null,PO_3
734,MCWHORTER RAYMOND,55054,MCWHORTER.RAYMOND@customer.org,AD_139,2021-01-01,2021-06-01,A,null,PO_2
1111,Rahul Gupta,11111,rahul.gupta@customer.org,AD_1111,2021-06-01,2021-06-01,A,null,PO_5
1112,Rahul Sharma,11111,rahul.sharma@customer.org,AD_1112,2021-06-01,2021-06-01,A,null,PO_5
1113,Rahul Verma,11111,rahul.verma@customer.org,AD_1113,2021-06-01,2021-06-01,A,null,PO_5
```

Script to process delta :

```
sub_path="/data/subscriber/*"
add_path="/data/address/*"
cmp_path="/data/complaint/*"
staff_path="/data/staff/*"


#Storing data into Hbase
df_sb=spark.read.format("csv").option("header","true").option("inferschema","true").load(sub_path)
df_sb.write.format("org.apache.phoenix.spark").option("table","SUBSCRIBER_HB").option("zkUrl",
"localhost:2181").mode('overwrite').save()


df_result_sd=spark.sql("""SELECT
                    S.sid as subscriberId,
                    S.name as subscribername,
                    S.mob as contactnumber,
                    S.email as emailId,
                    Ad.street as address,
                    ct.ct_name as city,
                    cn.cn_name as country,
                    S.sys_cre_date as create_date,
                    S.sys_upd_date as update_date,
                    S.Active_flag as Active_flag,
                    ppr.plan_desc as prepaid_desc,
                    ppr.amount as pre_amount,
                    ppo.plan_desc as postpaid_desc,
                    ppo.amount as pos_amount
                    from Subscriber S
                    LEFT JOIN Address Ad on S.add_id=Ad.add_id
                    Left Join City ct on Ad.ct_id=ct.ct_id
                    Left join Country cn on ct.cn_id=cn.cn_id
                    Left join Plan_Prepaid ppr on S.prepaid_plan_id=ppr.plan_id
                    Left join Plan_Postpaid ppo on S.postpaid_plan_id=ppo.plan_id
""")

df_result_sd.show(10)

df_result_sd.write.mode('overwrite').saveAsTable("prod.subscriber_details_staging")
```

Note : You have successfully Processed Historical and Delta Data

Phase 2 :

Extraction :

```
revenue_report=spark.sql("""
                    SELECT
                    SD.country as Country,
                    count(SD.subscriberId) as Total_Subscriber,
                    sum(coalesce(pre_amount,pos_amount,0)) as total_revenue
                    FROM prod.subscriber_details SD
                    group by SD.country,Active_flag having SD.Active_flag='A'
                    """)

revenue_report.show()

revenue_report.coalesce(1).write.mode("append").format("CSV").option("header","true").option("delimiter","|").
save("s3://sagarinfin/revenue_report_"+currentdate)

print("Subscriber revenue extraction job finished sucessfully and data stored in s3")
```

Sample Data :

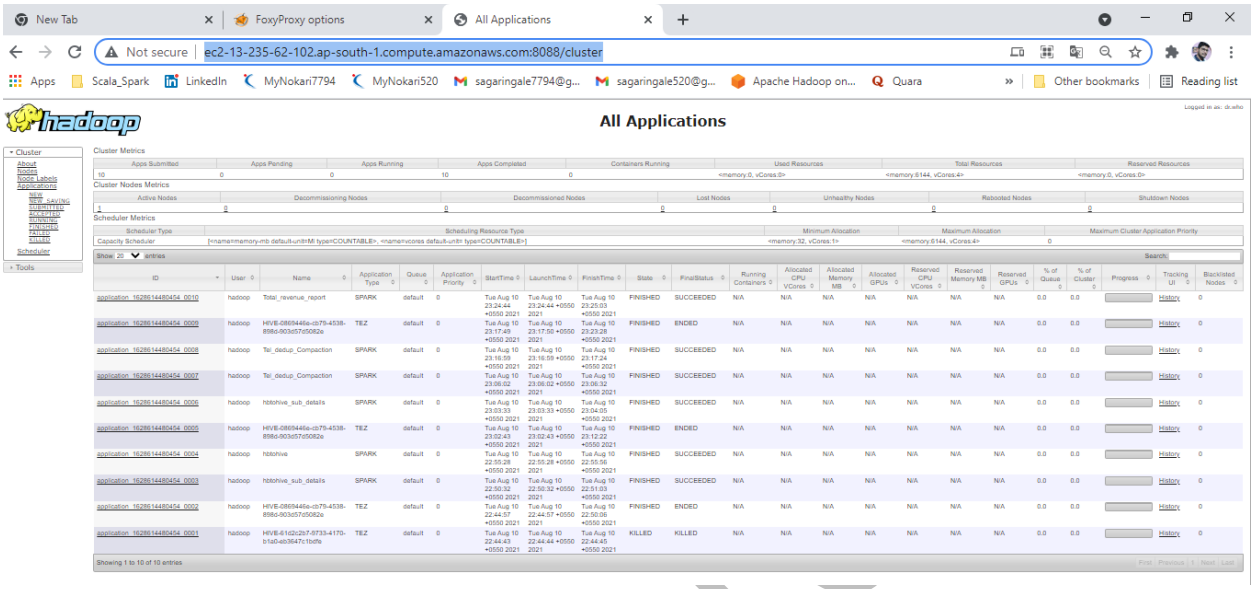
Now customer can extract report from S3 and can use for their further use like visualization etc.

```
Country|Total_Subscriber|total_revenue
Israel|7|3643
South Africa|18|4189
Cameroon|4|1097
Brazil|51|17206
Tuvalu|2|898
Finland|2|1248
Czech Republic|2|199
Ukraine|10|4041
Canada|6|2394
Liechtenstein|2|898
Senegal|1|0
Vietnam|8|3192
South Korea|9|4141
Saint Vincent and the Grenadines|2|498
Russian Federation|49|18208
Kenya|4|897
American Samoa|2|698
Germany|13|5439
Spain|8|4092
Iraq|1|399
Chad|1|299
```

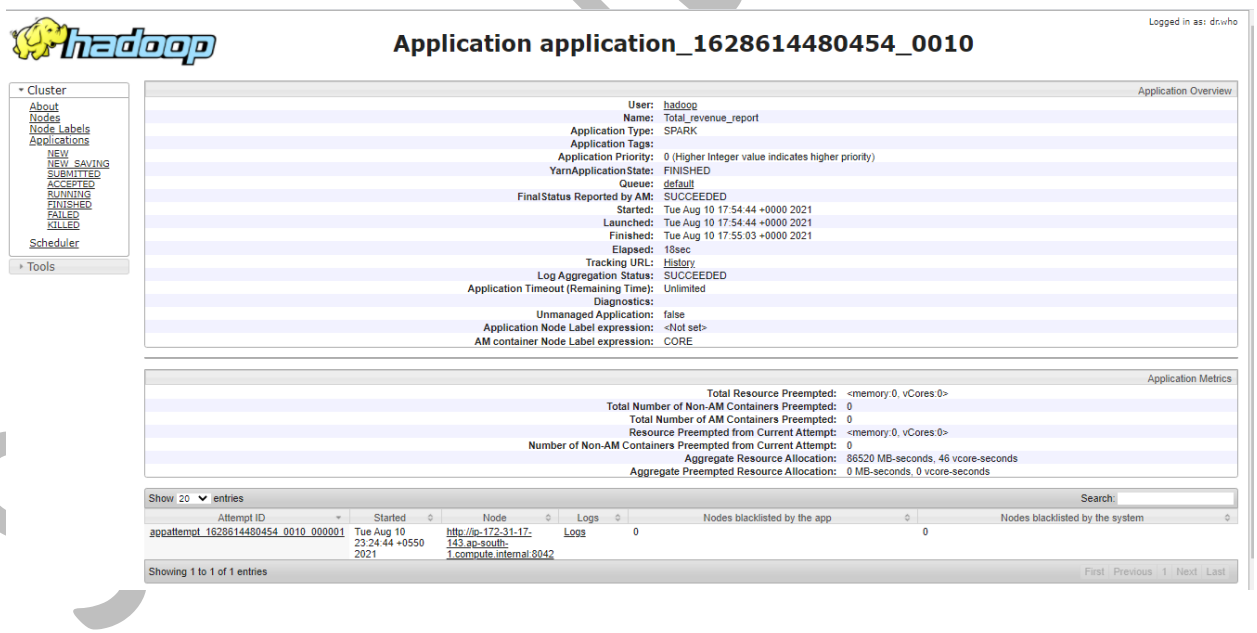
Job Monitoring on Resource Manager :

http://ec2-13-235-62-102.ap-south-1.compute.amazonaws.com:8088/cluster

All Applications :

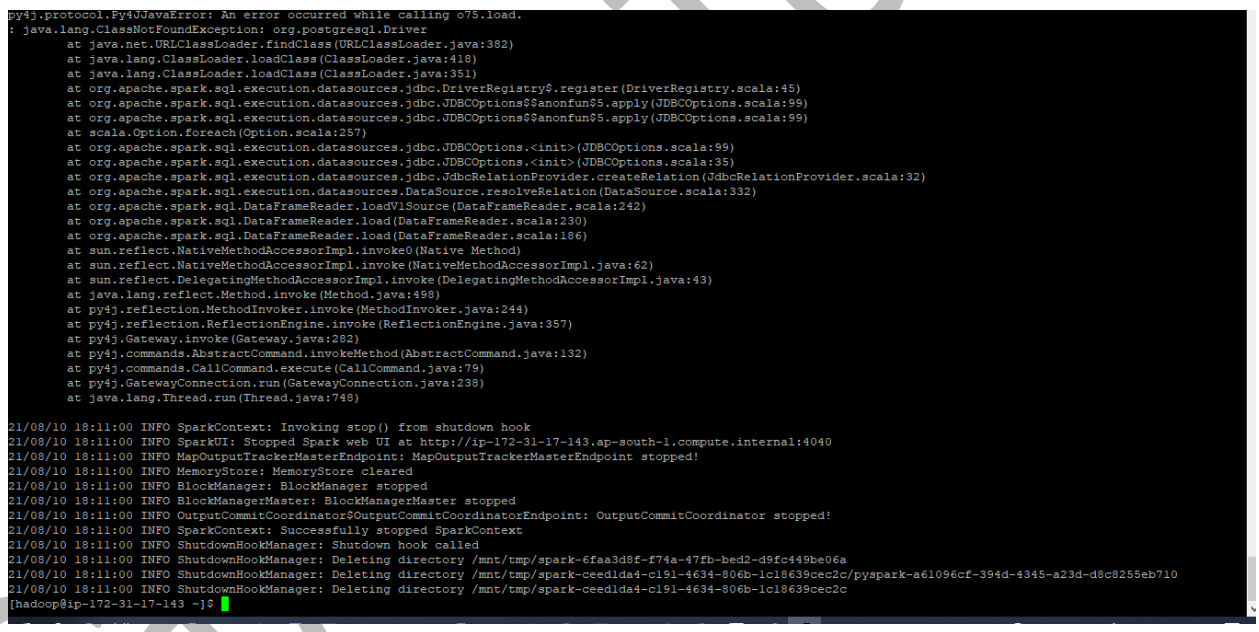


Application Logs :



Check Log on Terminal :

Error Occurred :



UI Port number :

https://docs.aws.amazon.com/emr/latest/ManagementGuide/emr-web-interfaces.html

Name of interface	URI
Flink history server (EMR version 5.33 and later)	http://*master-public-dns-name*:8082/
Ganglia	http://*master-public-dns-name*/ganglia/

Name of interface	URI
Hadoop HDFS NameNode (EMR version pre-6.x)	https://*master-public-dns-name*:50470/
Hadoop HDFS NameNode	http://*master-public-dns-name*:50070/
Hadoop HDFS DataNode	http://*coretask-public-dns-name*:50075/
Hadoop HDFS NameNode (EMR version 6.x)	https://*master-public-dns-name*:9871/
Hadoop HDFS DataNode (EMR version pre-6.x)	https://*coretask-public-dns-name*:50475/
Hadoop HDFS DataNode (EMR version 6.x)	https://*coretask-public-dns-name*:9865/
HBase	http://*master-public-dns-name*:16010/
Hue	http://*master-public-dns-name*:8888/
JupyterHub	https://*master-public-dns-name*:9443/
Livy	http://*master-public-dns-name*:8998/
Spark HistoryServer	http://*master-public-dns-name*:18080/
Tez	http://*master-public-dns-name*:8080/tez-ui
YARN NodeManager	http://*coretask-public-dns-name*:8042/
YARN ResourceManager	http://*master-public-dns-name*:8088/
Zeppelin	http://*master-public-dns-name*:8890/