Spark Type 2 and type 6 implementation

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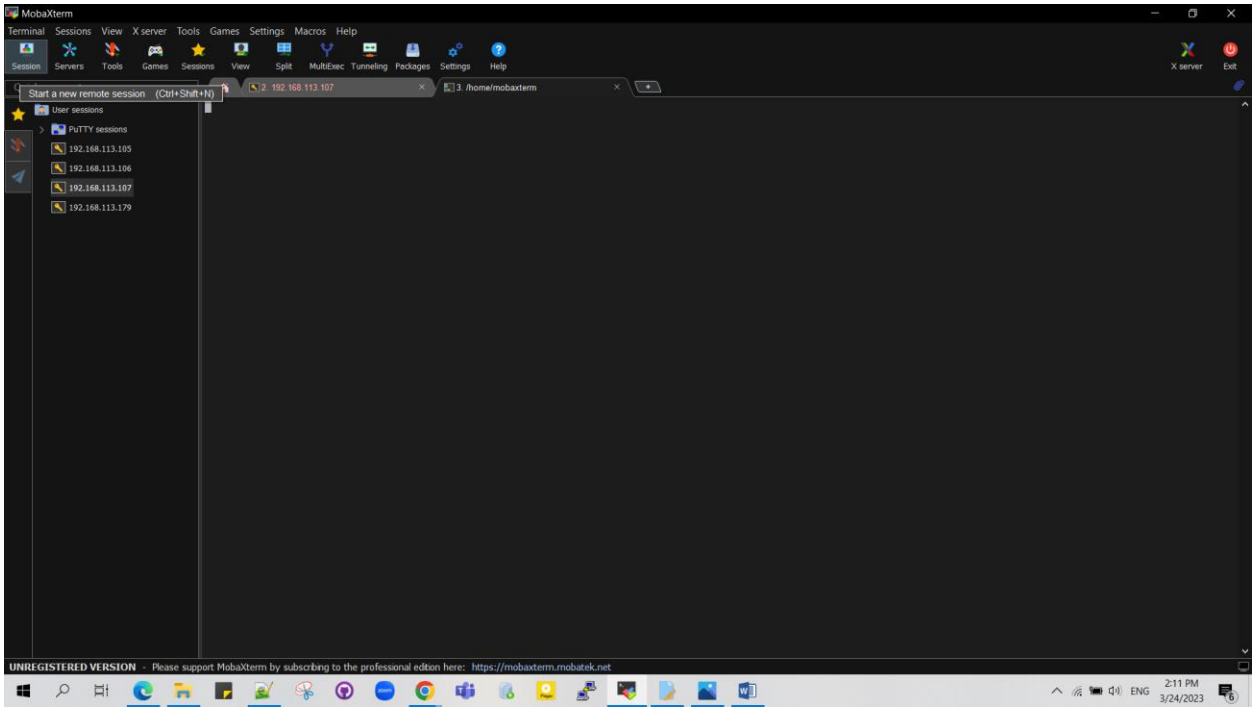
- ## Introduction

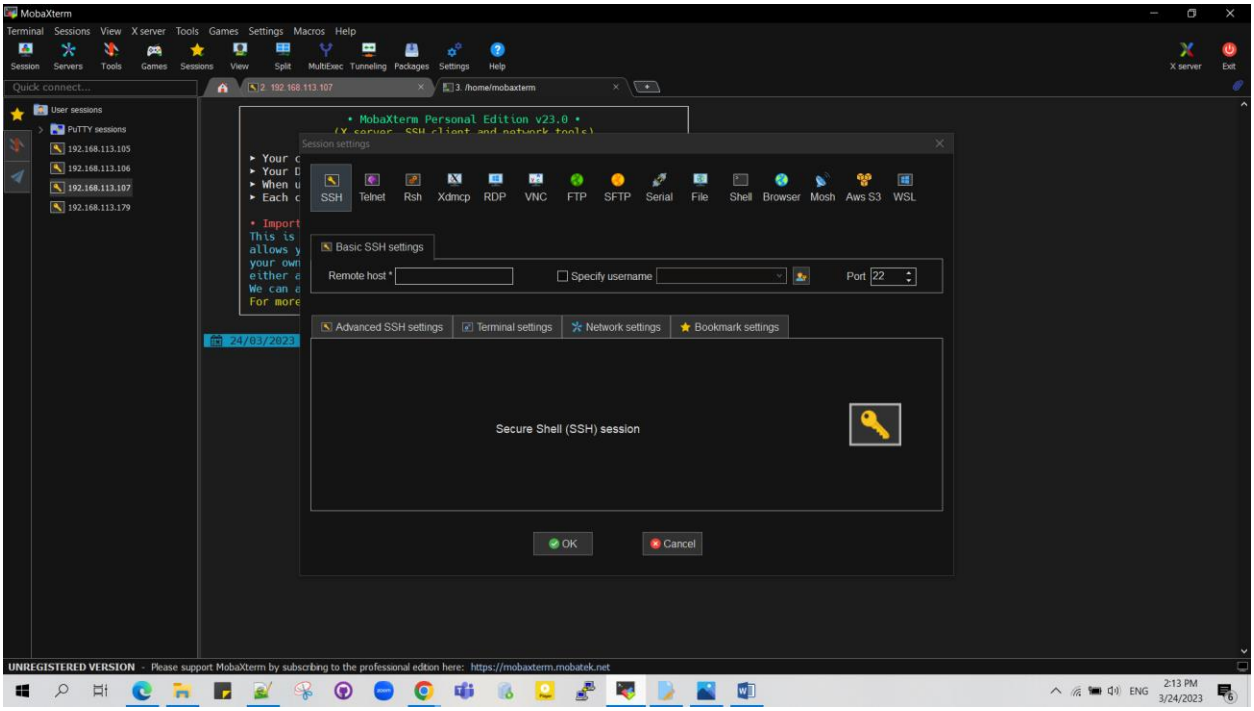
Slowly Changing Dimension (SCD) Type 6. This was an exciting project that allowed me to apply my knowledge of big data and Spark to a real-world problem.
SCD Type 6 is a complex data warehousing concept that tracks changes to data over time. In this type of dimension, the system keeps track of all the changes made to a record, even after it has been updated or deleted. This is useful in scenarios where historical data is important, such as in financial reporting or compliance.
To implement SCD Type 6 in Spark, I had to first identify the fields in the data that needed to be tracked for changes. I then designed a schema to store the historical data on a hive table, created a temporary table to hold the current data, and used Spark Python Dataframes to compare the two tables and identify any changes.

Connect to VM

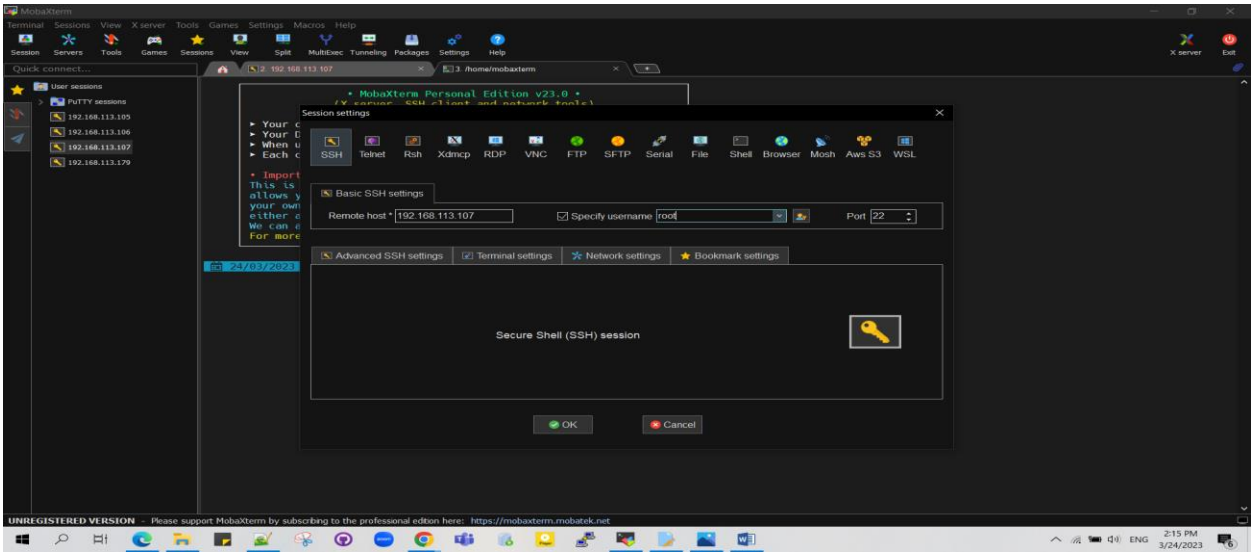
1. Open MobaXterm on your local machine.
2. Click on the "Session" button in the top left corner of the window.



3.In the "Session Settings" window, select "SSH" as the protocol.

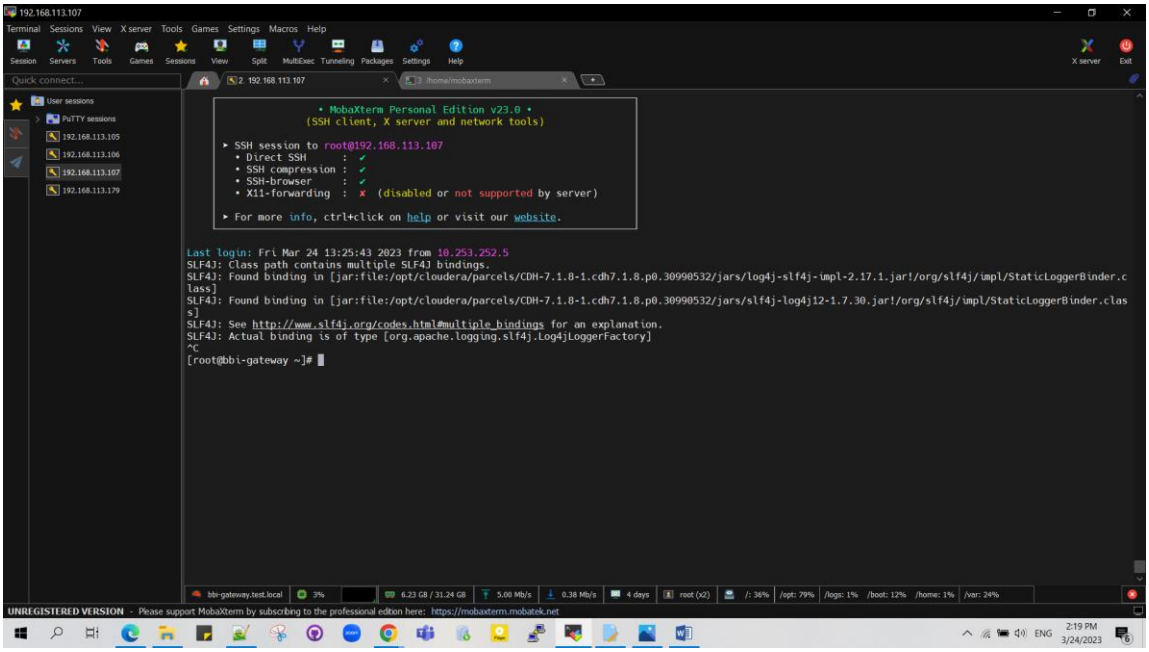


4.Enter the IP address of the VM in the "Remote host" field.



5.Double-click on the session in the "Sessions" tab to connect to the VM.

If the connection is successful, you will see a terminal window with a command prompt for the VM.



Authenticate Kerberos

Kerberos is a widely-used authentication protocol that can be used to secure distributed computing environments, such as Apache Hadoop and its related projects, including Spark and Hive. Kerberos provides a way for users to securely authenticate with a distributed system, and to access resources on that system based on their authenticated identity.

In the context of Spark and Hive, Kerberos authentication can be used to secure access to sensitive data and ensure that only authorized users are able to perform certain actions. For example, Kerberos can be used to authenticate users who want to access a Hive table or run a Spark job, and to ensure that only authorized users can read or modify that data.

To use Kerberos authentication with Spark and Hive, several configuration steps are required. These steps typically involve configuring Kerberos on the cluster, configuring Kerberos authentication for the Spark and Hive services, and configuring user accounts to use Kerberos authentication. Additionally, users may need to obtain Kerberos tickets and set up the appropriate environment variables in order to authenticate with the cluster.

Overall, Kerberos authentication provides an important layer of security for distributed computing environments like Spark and Hive, helping to ensure that sensitive data is only accessible by authorized users and reducing the risk of data breaches and unauthorized access.

1.Identify the Spark service principal name (SPN) that you want to use for Kerberos authentication. The SPN typically takes the form of "spark/[hostname]@REALM".

spark/bbi-gateway.test.local@TEST.LOCAL

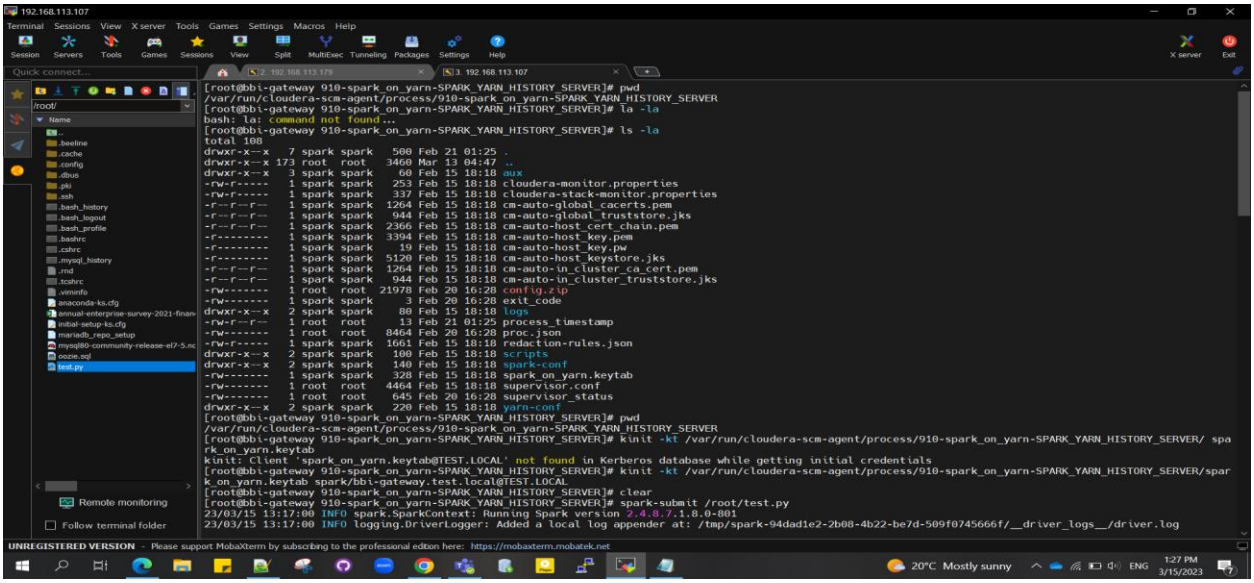
2. Generate a Kerberos keytab file for the SPN using the kadmin command. For example, the command "kadmin -q 'addprinc -randkey spark/[hostname]@REALM'" will generate a keytab file for the "spark/[hostname]@REALM" principal.

Kadmin -g ‘addprinc -randkey spark/bbi-gateway.test.local@TEST.LOCAL’

3.Save the keytab file in a secure location on the Spark server.

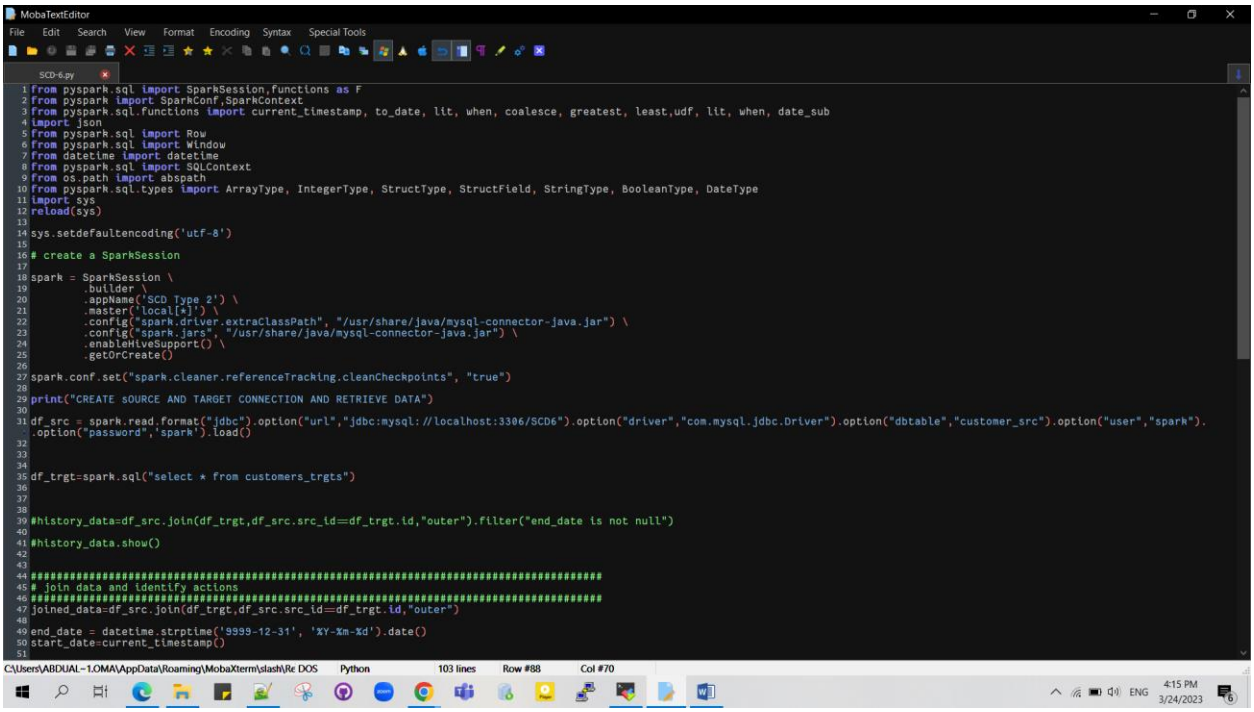
4.Configure the Spark service to use Kerberos authentication by setting the "spark.authenticate" configuration property to "true" in the Spark configuration file.

kinit -kt /var/run/cloudera-scm-agent/process/738-spark_on_yarn-SPARK_YARN_HISTORY_SERVER/spark_on_yarn.keytab spark/bbi-gateway.test.local@TEST.LOCAL



Developing SCD type 6 Script

1. Open mobaxtreme to write the python script



2. First thing before start write the ETL logic we must import all libraries we will use in our program

```
from pyspark.sql import SparkSession,functions as F
from pyspark import SparkConf,SparkContext
from pyspark.sql.functions import current_timestamp, to_date, lit, when, coalesce, greatest, least,udf, lit, when, date_sub
import json
from pyspark.sql import Row
from pyspark.sql import Window
from datetime import datetime
from pyspark.sql import SQLContext
from os.path import abspath
from pyspark.sql.types import ArrayType, IntegerType, StructType, StructField, StringType, BooleanType, DateType
import sys
reload(sys)

sys.setdefaultencoding('utf-8')
```

3. Create spark session with DB connector and hive context to connect to MySQL and hive table.

```
# create a SparkSession

spark = SparkSession \
        .builder \
        .appName('SCD Type 2') \
        .master('local[*]') \
        .config("spark.driver.extraClassPath", "/usr/share/java/mysql-connector-java.jar") \
        .config("spark.jars", "/usr/share/java/mysql-connector-java.jar") \
        .enableHiveSupport() \
        .getOrCreate()

spark.conf.set("spark.cleaner.referenceTracking.cleanCheckpoints", "true")
```

4. Start implement Type 6 logic

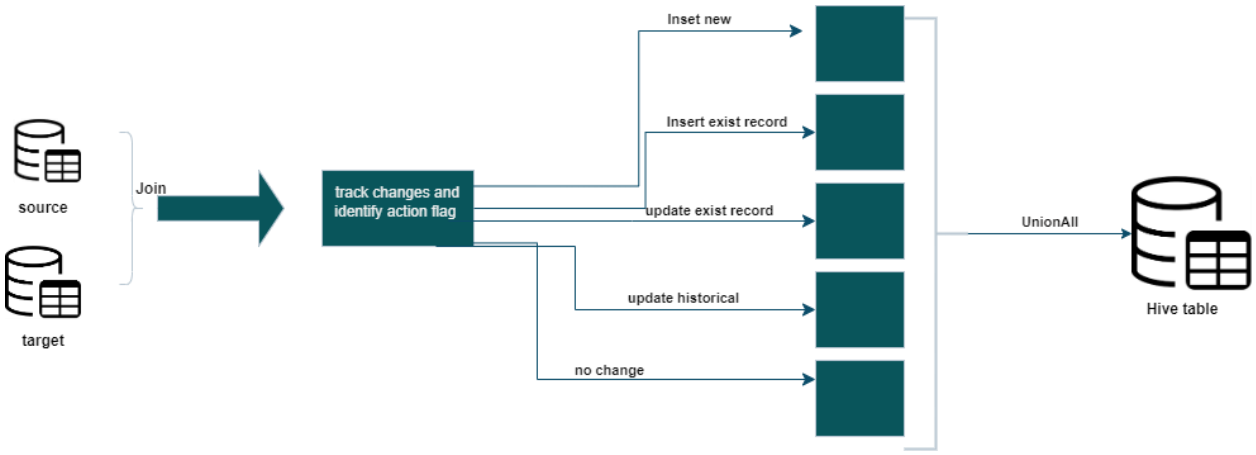
```
print("CREATE SOURCE AND TARGET CONNECTION AND RETRIEVE DATA")

df_src = spark.read.format("jdbc").option("url","jdbc:mysql://localhost:3306/SCD6").option("driver","com.mysql.jdbc.Driver").option("dbtable","customer_src").option("user","spark").
.option("password",'spark').load()


df_trgt=spark.sql("select * from customers_trgts")


#history_data=df_src.join(df_trgt,df_src.src_id==df_trgt.id,"outer").filter("end_date is not null")

#history_data.show()


################################################################################
# join data and identify actions
################################################################################
joined_data=df_src.join(df_trgt,df_src.src_id==df_trgt.id,"outer")

end_date = datetime.strptime('9999-12-31', '%Y-%m-%d').date()
start_date=current_timestamp()

joined_data = joined_data.withColumn('action',
 when(joined_data.key.isNull(), 'I')
.when((joined_data.src_address != joined_data.current_address) & (joined_data.end_date == '9999-12-31'), 'EI')
.when((joined_data.src_address != joined_data.current_address) & (joined_data.end_date != '9999-12-31'), 'U')
.otherwise('no_action')
)

joined_data.show()

df_insert=joined_data.filter(joined_data.action =="I").select(joined_data.src_id.alias("id"),joined_data.src_name.alias("name"),joined_data.src_address.alias("current_address"),
,joined_data.src_address.alias("prev_address")).withColumn("start_date",lit(start_date)).withColumn("end_date",lit(end_date))


df_ext_insert=joined_data.filter(joined_data.action == "EI").select(joined_data.src_id.alias("id"),joined_data.src_name.alias("name"),joined_data.src_address.alias("current_address"),
,joined_data.src_address.alias("prev_address")).withColumn("start_date",lit(start_date)).withColumn("end_date",lit(end_date))

df_ext_update=joined_data.filter(joined_data.action == "EI").select(joined_data.id,joined_data.name,joined_data.src_address.alias("current_address"),joined_data.prev_address,joined_dat
.start_date,joined_data.start_date.alias("end_date"))

df_update=joined_data.filter(joined_data.action == "U").select(joined_data.id,joined_data.name,joined_data.src_address.alias("start_date"),joined_data.prev_address,joined_data.
.start_date,joined_data.end_date)

df_no_action=joined_data.filter(joined_data.action == "no_action").select(joined_data.id,joined_data.name,joined_data.current_address,joined_data.prev_address,joined_data.start_date,
,joined_data.end_date)
```

5. Submit the script and start the ETL Job using “spark-submit” command

```
^C
[root@bbi-gateway ~]# spark-submit --jars /usr/share/java/mysql-connector-java.jar SCD-6.py
```

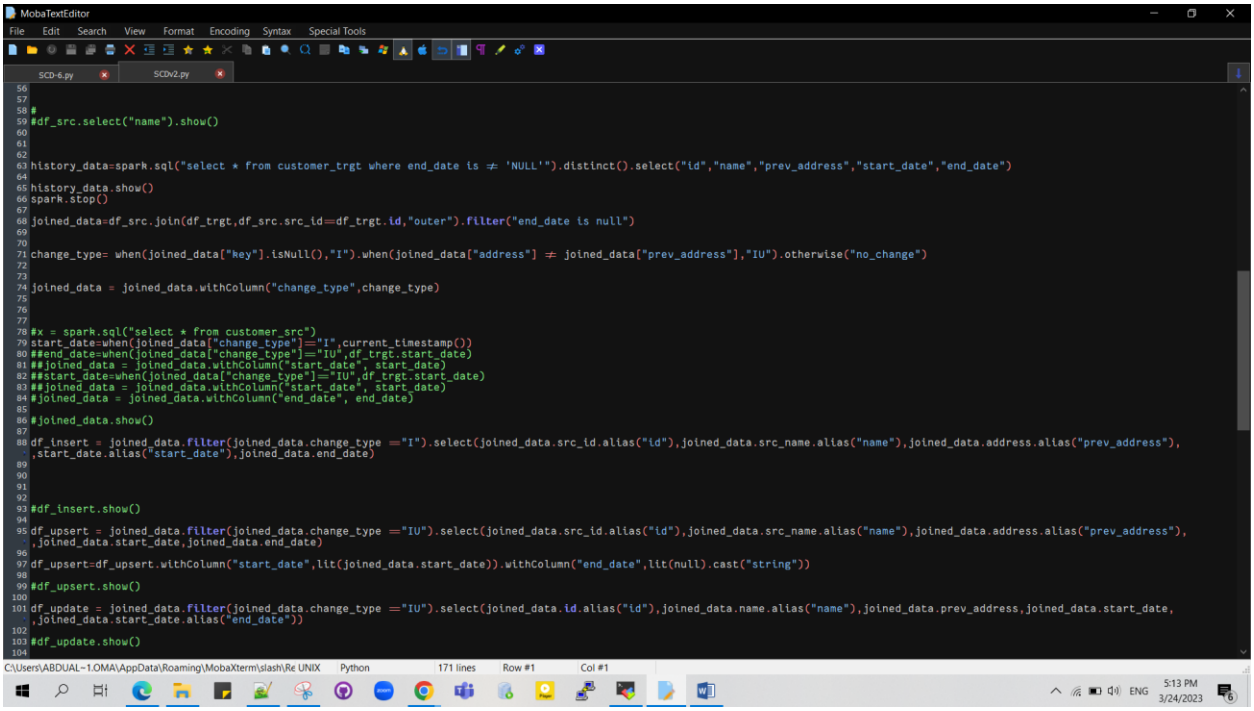
When submitting the script we must specify the directory of the MySQL connector using The argument –jars

Type 6 diagram



Developing Type 2 script

For developing Type 2 script it is the same steps as developing type 6 and this is the logic For the script


MobaTextEditor
File Edit Search View Format Encoding Syntax Special Tools
SCD-6.py
SCDv2.py
#
#df_src.select("name").show()
history_data=spark.sql("select * from customer_trgt where end_date is != 'NULL'").distinct().select("id","name","prev_address","start_date","end_date")
history_data.show()
spark.stop()
joined_data=df_src.join(df_trgt,df_src.src_id==df_trgt.id,"outer").filter("end_date is null")
change_type= when(joined_data["key"].isNull(),"I").when(joined_data["address"] != joined_data["prev_address"],"IU").otherwise("no_change")
joined_data = joined_data.withColumn("change_type",change_type)
#x = spark.sql("select * from customer_src")
start_date=when(joined_data["change_type"]=="I",current_timestamp())
##end_date=when(joined_data["change_type"]=="IU",df_trgt.start_date)
##joined_data = joined_data.withColumn("start_date", start_date)
##start_date=when(joined_data["change_type"]=="IU",df_trgt.start_date)
##joined_data = joined_data.withColumn("start_date", start_date)
#joined_data = joined_data.withColumn("end_date", end_date)
#joined_data.show()
df_insert = joined_data.filter(joined_data.change_type =="I").select(joined_data.src_id.alias("id"),joined_data.src_name.alias("name"),joined_data.address.alias("prev_address"),
,start_date.alias("start_date"),joined_data.end_date)
#df_insert.show()
df_upsert = joined_data.filter(joined_data.change_type =="IU").select(joined_data.src_id.alias("id"),joined_data.src_name.alias("name"),joined_data.address.alias("prev_address"),
,joined_data.start_date,joined_data.end_date)
df_upsert=df_upsert.withColumn("start_date",lit(joined_data.start_date)).withColumn("end_date",lit(null).cast("string"))
#df_upsert.show()
df_update = joined_data.filter(joined_data.change_type =="IU").select(joined_data.id.alias("id"),joined_data.name.alias("name"),joined_data.prev_address,joined_data.start_date,
,joined_data.start_date.alias("end_date"))
#df_update.show()
C:\Users\ABDUAL~1.OMA\AppData\Roaming\MobaXterm\slash\Re UNIX
Python
171 lines
Row #1
Col #1
ENG
5:13 PM
3/24/2023

Type 2 Diagram