Spark Cheat Sheet

Spark Initialization in Scala

SparkContext

```
import org.apache.spark.SparkContext

val sc = new SparkContext("local[*]","app1"
```

SparkSession

```
import org.apache.spark.SparkConf
import org.apache.spark.sql.SparkSession

val sparkConf = new SparkConf()
 sparkConf.set("spark.app.name","my first app")
 sparkConf.set("spark.master","local[2]")

 val spark=SparkSession.builder()
 .config(sparkConf)
 .getOrCreate()
```

Read files in Scala

```
 val ordersDf=spark.read
          .format("csv")
          .option("header",true)
          .option("inferSchema",true)
.option("path","C:/Users/Lenovo/Documents/BIG DATA/WEEK11/orders.csv")
           .load

      ordersDf.show()
```

Read files in Python

```
df=spark.read.format("csv") \
 .option"header",”true”) \
 .option("inferSchema",”true”)\
 .option("sep",",") \
 .option("path","/FileStore/tables/Employees-3.csv") \
 .load()

display(df)
```

Read Modes in Scala

```
 val ordersDf=spark.read
          .format("csv")
          .option("header",true)
           .option("mode", "FAILFAST")
          .option("inferSchema",true)
.option("path","C:/Users/Lenovo/Documents/BIG DATA/WEEK11/orders.csv")
           .load
```

PERMISSIVE
Sets all fields to null when it encounters a corrupted record and places all corrupted records in a string column called _corrupt_record
DROPMALFORMED
Drops the row that contains malformed records
FAILFAST
Fails immediately upon encountering malformed records
The default is permissive.

Read Modes in Python

```
df=spark.read.format("csv") \
 .option"header",”true”) \
 .option("inferSchema",”true”)\
 .option("mode", "FAILFAST") \
 .option("sep",",") \
 .option("path","/FileStore/tables/Employees-3.csv") \
 .load()

display(df)
```

Write to Sink in Scala

```
import org.apache.spark.sql.SaveMode

ordersDf.write
	.format("json")  //default format is parquet if
not specified
	.mode(SaveMode.Overwrite)   //4 modes:-
Append, overwrite, Errorifexists, ignore
.option("path","C:/Users/Lenovo/Documents/BIG
DATA/WEEK11/newfolder")
	.save()
```

Default is Errorifexists

Write to sink in Python

```
df.write.format("csv") \
  .mode("overwrite") \
  .csv('/FileStore/tables_output/data.csv')
```

Impose Schema in Scala(StructType)

```
import org.apache.spark.sql.types.IntegerType
import org.apache.spark.sql.types.StringType
import org.apache.spark.sql.types.StructType
import org.apache.spark.sql.types.StructField
import org.apache.spark.sql.types.TimestampType

val ordersSchema= StructType(List(
     StructField("orderid",IntegerType),
     StructField("orderdate",TimestampType),
     StructField("customerid",IntegerType),
     StructField("status",StringType)
     ))

val ordersDf=spark.read
		.format("csv")
		.schema(ordersSchema)
.option("path","C:/Users/Lenovo/Documents/BIG
DATA/WEEK11/orders.csv")
		.load

 ordersDf.show()
```

Impose Schema in Python

```
from pyspark.sql.types import
StructType,StructField,StringType,IntegerType


empSchema=StructType((
	StructField("empid",IntegerType()),
	StructField("empname",StringType()),
	StructField("city",StringType()),
	StructField("salary",IntegerType())
  ))

df = spark.read.format("csv") \
        .option("header","false") \
        .schema(empSchema) \

.option("path","/FileStore/tables/EmployeesN.csv") \
        .load()

df.printSchema()
df.show()
```

Impose Schema in Scala(DDL string)

```
val ordersSchema="orderid int, orderdate string,
custid int, orderstatus string"

  val ordersDf=spark.read
		.format("csv")
		.schema(ordersSchema)

.option("path","C:/Users/Lenovo/Documents/BIG
DATA/WEEK11/orders.csv")
		.load

 ordersDf.show()
```

Impose Schema in Scala(DDL string)

```
empschema="empid int,empname string,city
string,salary double"

df=spark.read.format("csv") \
         .option("header","false") \
         .schema(empschema) \
.option("path","/FileStore/tables/EmployeesN.cs
v") \
         .load()

df.printSchema()
df.show()
```

Rename columns in Scala

```
val newDf=
ordersDf.withColumnRenamed("order_customer_
id", "customer_id")
```

Rename columns in Pyspark

```
df=df.withColumnRenamed("id","id_new")
```

Rename Multiple columns in Scala	Rename Multiple columns in Pyspark

val newDf=
ordersDf.withColumnRenamed("order_id", "id")
.withColumnRenamed("order_date", "date")
.withColumnRenamed("order_customer_id",
customer_id")
.withColumnRenamed("order_status", "status")
	df=df.withColumnRenamed("id","id_new")
	.withColumnRenamed("name","name_New")
	.withColumnRenamed("City","City_New")

Rename Multiple columns in Scala(SelectExpr)	**Rename Multiple columns in Pyspark(SelectExpr)**
ordersDf.selectExpr("order_id as id","order_date as date")	df.selectExpr("id as NewId","Name as NewName")
Add columns in Scala	**Add columns in Pyspark**
ordersDf.withColumn("country", lit("india"))	df.withColumn("Country",lit("India"))
ordersDf.withColumn("dblid", col("order_id")*2)	df.withColumn("Incentive",col("salary")*0.2)
Drop column in Scala	**Drop column in Pyspark**
val newDf =countriesDf.drop("REGION")	newdf2=countriesDf2.drop("REGION")
val newDf =countriesDf.drop("ID","REGION")	newdf3=countriesDf2.drop("ID","REGION")
Select columns in Scala	**Select columns in Pyspark**

import org.apache.spark.sql.functions.{col,
column,expr}
 	
ordersDf.select("order_id”,” order_customer_id",
"order_status").show
	df.select("id","name","salary")

ordersDf.select(column("order_id"),col("order_da te") ,$"order_customer_id",'order_status).show	df.select(col("id"),col("name"))
ordersDf.select(column("order_id"), expr("concat(order_status,'_STATUS')")).show(fal se)	df.select(col("id"), expr("concat(name,'_STATUS')"))
ordersDf.selectExpr("order_id","order_date" ,"concat(order_status,'_STATUS')")	df.selectExpr("id","name" ,"concat(name,'_STATUS')")
Filter in Scala	**Filter in Pyspark**
ordersDf.filter("weeknum==50")	df.filter(df.id==1)
ordersDf.filter("weeknum>45")	df.filter(df.id>5)
ordersDf.filter("country=='India'")	df.filter(df.city=="PUNE")
ordersDf.filter("country='India' OR country='Italy'")	df.filter((df.id==1) | (df.id==3))
ordersDf.filter(ordersDf("country")==="India" && ordersDf("totalqty")>1000)	df.filter((df.city=="PUNE") & (df.salary>50000))
ordersDf.filter("weeknum!=50")	df.filter(df.id!=1)
ordersDf.filter("country!='India'")	df.filter(df.city!="PUNE")
df.filter(df("salary")>=30000 && df("salary")<=60000).show	df[df["salary"].between(30000,60000)].show()
Sort in Scala	**Sort in Pyspark**
ordersDf.sort("invoicevalue")	df.sort(df.salary)
ordersDf.sort(col("invoicevalue").desc)	df.sort(df.salary.desc())
ordersDf.sort("country","invoicevalue")	df.sort(df.city,df.salary)
ordersDf.sort(col("country").asc,col("invoicevalue ").desc)	df.sort(df.city,df.salary.desc())
Remove duplicates in Scala	**Remove duplicates in Pyspark**

ordersDf.distinct()	df.distinct()
ordersDf.dropDuplicates()	df.dropDuplicates()
ordersDf.dropDuplicates("city")	df.dropDuplicates(["city"])
ordersDf.dropDuplicates("name","city")	df.dropDuplicates(["city","salary"])
Union in Scala	**Union in Pyspark**
ordersDf.union(ordersDf)	df.union(df2)
When in Scala	**When in Pyspark**
ordersDf.withColumn("Tier", when(col("city")==="MUMBAI",1).when(col("city")==="PUNE",2).otherwise(0))	df3.withColumn("CityTier",when(col("city")=="Pu ne",3).when(col("city")=="Delhi",1). when(col("city")=="Mumbai",2).otherwise('na'))

ordersDf.select(col("*"),
when(col("city")==="MUMBAI",1).when(col("city"
)==="PUNE",2).otherwise(0).as("Tier"))
	df3.select(col("*"),when(col("city")=="Pune",3)
	.when(col("city")=="Delhi",1).
	when(col("city")=="Mumbai",2).
	otherwise('na').alias("CityTier"))

Contains in Scala	**Contains in Pyspark**

import org.apache.spark.sql.functions.col
 	
val filteredDf=
countriesDf.where(col("REGION").contains("ST"))
	from pyspark.sql.functions import col
	
	filteredDf2=countriesDf2.where(col("REGION").co
	ntains("ST"))

df.filter(col("empname").like("A%")).show df.filter(col("empname").like("%N")).show df.filter(col("empname").like("%A%")).show	df.filter(col("empname").like("A%")).show df.filter(col("empname").like("%N")).show df.filter(col("empname").like("%A%")).show
Summary in Scala	**Summary in Pyspark**
countriesDf2.describe().show()	countriesDf2.describe().show()
Case Conversion in Scala	**Case Conversion in Pyspark**

import
org.apache.spark.sql.functions.{initcap,upper,low
er,col}
 	
val df2=df.select(initcap(col("data")))
 	
val df2=df.select(upper(col("data")))
 	
val df2=df.select(lower(col("data")))
	from pyspark.sql.functions import initcap,col
	
	df4.select(initcap(col("data"))).show(truncate=0)
	
	df4.select(upper(col("data"))).show(truncate=0)
	
	df4.select(lower(col("data"))).show(truncate=0)

Trim in Scala	**Trim in Pyspark**
import org.apache.spark.sql.functions.{lit, ltrim, rtrim, rpad, lpad, trim} countriesDf.select(ltrim(lit(" HELLO ")).as("ltrim"), rtrim(lit(" HELLO ")).as("rtrim"), trim(lit(" HELLO ")).as("trim"), lpad(lit("HELLO"), 3, " ").as("lp"), rpad(lit("HELLO"), 10, " ").as("rp")).show(2) val df2=df.select(upper(col("data"))) val df2=df.select(lower(col("data")))	from pyspark.sql.functions import lit, ltrim, rtrim, rpad, lpad, trim countriesDf2.select(ltrim(lit(" HELLO ")).alias("ltrim"), rtrim(lit(" HELLO ")).alias("rtrim"), trim(lit(" HELLO ")).alias("trim"), lpad(lit("HELLO"), 3, " ").alias("lp"), rpad(lit("HELLO"), 10, " ").alias("rp")).show(2)

Round in Scala	**Round in Pyspark**
import org.apache.spark.sql.functions.{round, bround,col}	from pyspark.sql.functions import lit,round, bround
val roundedDf =countriesDf.select(round(col("SALES"), 1).alias("rounded"))	countriesDf2.select(round(lit("2.5")), bround(lit("2.5"))).show(2)
countriesDf.select(round(lit("2.5")), bround(lit("2.5"))).show(2)	
Split in Scala	**Split in Pyspark**
import org.apache.spark.sql.functions.{split,col}	from pyspark.sql.functions import split,col
newdf.select(split(col("data")," ").alias("words_array")).show	newdf2.select(split(col("data")," ").alias("words_array")).show()
splitnewdf.selectExpr("words_array[0]").show	splitnewdf.selectExpr("words_array[0]").show()
Size of array in Scala	**Size of array in Pyspark**
import org.apache.spark.sql.functions.{size,col}	from pyspark.sql.functions import size,col
splitnewdf.select(size(col("words_array"))).show	splitnewdf.select(size(col("words_array"))).show( )
Array contains in Scala	**Array contains in Pyspark**
import org.apache.spark.sql.functions.{array_contains,col }	from pyspark.sql.functions import array_contains,col
splitnewdf.select(array_contains(col("words_array"),"big")).show	splitnewdf.select(array_contains(col("words_array"),"big")).show()
Explode in Scala	**Explode in Pyspark**
import org.apache.spark.sql.functions.{explode,col}	from pyspark.sql.functions import explode,col
splitnewdf.withColumn("exploded_words",explode(col("words_array"))).show(false)	splitnewdf.withColumn("exploded_words",explode(col("words_array"))).show(truncate=0)
UDF in Scala	**UDF in Pyspark**
def power3(number:Double):Double = number * number * number	def power3(double_value): return double_value ** 3
spark.udf.register("power3", power3(_:Double):Double)	
udfExampleDF.selectExpr("power3(num)").show	
Joins in Scala	**Joins in Pyspark**
val joincondition = ordersDf.col("order_customer_id")===customersDf.col("customer_id")	df1.join(df2,df1.id==df2.id,"inner").show()
	df1.join(df2,df1.id==df2.id,"left").show()
	df1.join(df2,df1.id==df2.id,"right").show()
	df1.join(df2,df1.id==df2.id,"outer").show()

val joinedDf= ordersDf.join(customersDf,joincondition,"inner"). sort("order_customer_id")	
Collect set & list in Scala	**Collect set & list in Pyspark**

import org.apache.spark.sql.functions.{collect_set,
collect_list}
 	
selectDf.agg(collect_set("Country")).show(false)
 	
selectDf.agg(collect_list("Country")).show()
	from pyspark.sql.functions import collect_set,
	collect_list
	
	selectDf2.agg(collect_set("Country")).show()
	
	selectDf2.agg(collect_list("Country")).show()

Aggregate in Scala	**Aggregate in Pyspark**
ordersDf.select(count("*").as("Rowcount"), sum("Quantity").as("TotalQty"), avg("UnitPrice").as("AvgPrice"), countDistinct("InvoiceNo").as("DistinctInvoices") //method1:- column object expression).show	
ordersDf.selectExpr("count(*) as Rowcount", "sum(Quantity) as TotalQty", "avg(UnitPrice) as AvgPrice", "count(Distinct(InvoiceNo)) as DistinctInvoices" //method2:- string expression).show	ordersdf.selectExpr("count(*) as Rowcount", "sum(Quantity) as TotalQty", "avg(UnitPrice) as AvgPrice", "count(Distinct(InvoiceNo)) as DistinctInvoices").show()
ordersDf.createOrReplaceTempView("sales") //method 3:- spark sql spark.sql("select count(*) as Rowcount,sum(Quantity) as TotalQty,avg(UnitPrice) as AvgPrice,count(Distinct(InvoiceNo)) as DistinctInvoices from sales").show	ordersdf.createOrReplaceTempView("sales") \ spark.sql("select count(*) as Rowcount,sum(Quantity) as TotalQty,avg(UnitPrice) as AvgPrice,count(Distinct(InvoiceNo)) as DistinctInvoices from sales").show()
Grouping Aggregate in Scala	**Grouping Aggregate in Pyspark**
ordersDf.groupBy("country").sum("Quantity").sho w	df.groupby('city').sum('salary')
ordersDf.groupBy("country","InvoiceNo") .agg(sum("Quantity").as("TotalQty"), sum(expr("Quantity * UnitPrice")).as("InvoiceValue")).show //method1	df.groupby('city').agg(sum('salary').alias('TotalSal ary'), max('salary').alias('MaxSalary'),min('salary') ,min('salary').alias('MinSalary'), avg('salary').alias('AvgSalary'))
ordersDf.groupBy("country","InvoiceNo") .agg(expr("sum(Quantity) as TotalQty"), expr("sum(Quantity * UnitPrice") as InvoiceValue") //method2).show	

ordersDf.createOrReplaceTempView("sales") spark.sql("""select country,InvoiceNo,sum(Quantity) as TotalQty, sum(Quantity * UnitPrice) as InvoiceValue from sales group by country,InvoiceNo""").show //method3	
Window Aggregate in Scala	**Window Aggregate in Pyspark**
val RowWindow = Window.partitionBy().orderBy("TotalQty") ordersDf.withColumn("Rownum",row_number().over(RowWindow)).show	window = Window.partitionBy().orderBy("salary") df.withColumn("Rownum",row_number().over(window)).show()
val RowWindow2 = Window.partitionBy().orderBy(col("TotalQty").desc) ordersDf.withColumn("Rownum",row_number().over(RowWindow2)).show	window = Window.partitionBy().orderBy(col("salary").desc()) df.withColumn("Rownum",row_number().over(window)).show()
val RowWindow3 = Window.partitionBy("country").orderBy(col("TotalQty").desc) ordersDf.withColumn("Rownum",row_number().over(RowWindow3)).show	window = Window.partitionBy("city").orderBy(col("salary").desc()) df.withColumn("Rownum",row_number().over(window)).show()
val RowWindow4 = Window.partitionBy("country","weeknum").orderBy(col("TotalQty").desc) ordersDf.withColumn("Rownum",row_number().over(RowWindow4)).show(100)	window = Window.partitionBy(“state”,"city").orderBy(col("salary").desc()) df.withColumn("Rownum",row_number().over(window)).show()
Running Total in Scala	**Running Total in Pyspark**
val RunningWindow = Window.partitionBy().orderBy("country") .rowsBetween(Window.unboundedPreceding,Window.currentRow) ordersDf.withColumn("RunningTotal",sum("invoicevalue").over(RunningWindow)).show	RunningWindow = Window.partitionBy().orderBy("city") \ .rowsBetween(Window.unboundedPreceding,Window.currentRow) df.withColumn("RunningTotal",sum("salary").over(RunningWindow)).show()
val myWindow = Window.partitionBy("country") .orderBy("weeknum") .rowsBetween(Window.unboundedPreceding,Window.currentRow) val myDf = ordersDf.withColumn("RunningTotal",sum("invoicevalue").over(myWindow))	RunningWindow = Window.partitionBy("city").orderBy("city") \ .rowsBetween(Window.unboundedPreceding,Window.currentRow) df.withColumn("RunningTotal",sum("salary").over(RunningWindow)).show()
val myWindow2 = Window.partitionBy() .orderBy("weeknum")	RunningWindow = Window.partitionBy().orderBy("city") \

.rowsBetween(-2,Window.currentRow) ordersDf.withColumn("RunningTotal",sum("invoicevalue").over(myWindow2)).show	.rowsBetween(-2,Window.currentRow) df.withColumn("RunningTotal",sum("salary").over(RunningWindow)).show()
Rank in Scala	**Rank in Pyspark**
val RunningWindow = Window.partitionBy().orderBy("invoicevalue") ordersDf.withColumn("Ranks",rank().over(RunningWindow)).show	RunningWindow = Window.partitionBy().orderBy("salary") df.withColumn("Ranks",rank().over(RunningWindow)).show()
val RunningWindow2 = Window.partitionBy().orderBy(col("invoicevalue").desc) ordersDf.withColumn("Ranks",rank().over(RunningWindow2)).show	RunningWindow = Window.partitionBy().orderBy(col("salary").desc()) df.withColumn("Ranks",rank().over(RunningWindow)).show()
val RunningWindow3 = Window.partitionBy("country").orderBy(col("invoicevalue").desc) ordersDf.withColumn("Ranks",rank().over(RunningWindow3)).show	RunningWindow = Window.partitionBy("city").orderBy(col("salary").desc()) df.withColumn("Ranks",rank().over(RunningWindow)).show()
Dense Rank in Scala	**Dense Rank in Pyspark**
val RunningWindow = Window.partitionBy().orderBy("invoicevalue") ordersDf.withColumn("Ranks",dense_rank().over(RunningWindow)).show	RunningWindow = Window.partitionBy().orderBy("salary") df.withColumn("Ranks",dense_rank().over(RunningWindow)).show()
val RunningWindow2 = Window.partitionBy().orderBy(col("invoicevalue").desc) ordersDf.withColumn("Ranks", dense_rank ().over(RunningWindow2)).show	RunningWindow = Window.partitionBy().orderBy(col("salary").desc()) df.withColumn("Ranks", dense_rank().over(RunningWindow)).show()
val RunningWindow3 = Window.partitionBy("country").orderBy(col("invoicevalue").desc) ordersDf.withColumn("Ranks", dense_rank ().over(RunningWindow3)).show	RunningWindow = Window.partitionBy("city").orderBy(col("salary").desc()) df.withColumn("Ranks", dense_rank().over(RunningWindow)).show()
Repartition in Scala	**Repartition in Pyspark**
val newRdd=inputRDD.repartition(6)	df.repartition(6).write.format("parquet").mode("overwrite").save('/FileStore/tables/Repart')
Coalesce in Scala	**Coalesce in Pyspark**
val newRdd=inputRDD. Coalesce (6)	df. Coalesce (6).write.format("parquet").mode("overwrite").save('/FileStore/tables/Repart')
Partition in Scala	**Partition in Pyspark**
ordersDf.write .format("csv") .partitionBy("order_status") .mode(SaveMode.Overwrite)	df.write.option("header","true").partitionBy("COUNTRY").mode("overwrite").csv("/FileStore/tables/Sample_Partition_op")

.option("path","C:/Users/Lenovo/Documents/BIG DATA/WEEK11/newfolder")
.save()	

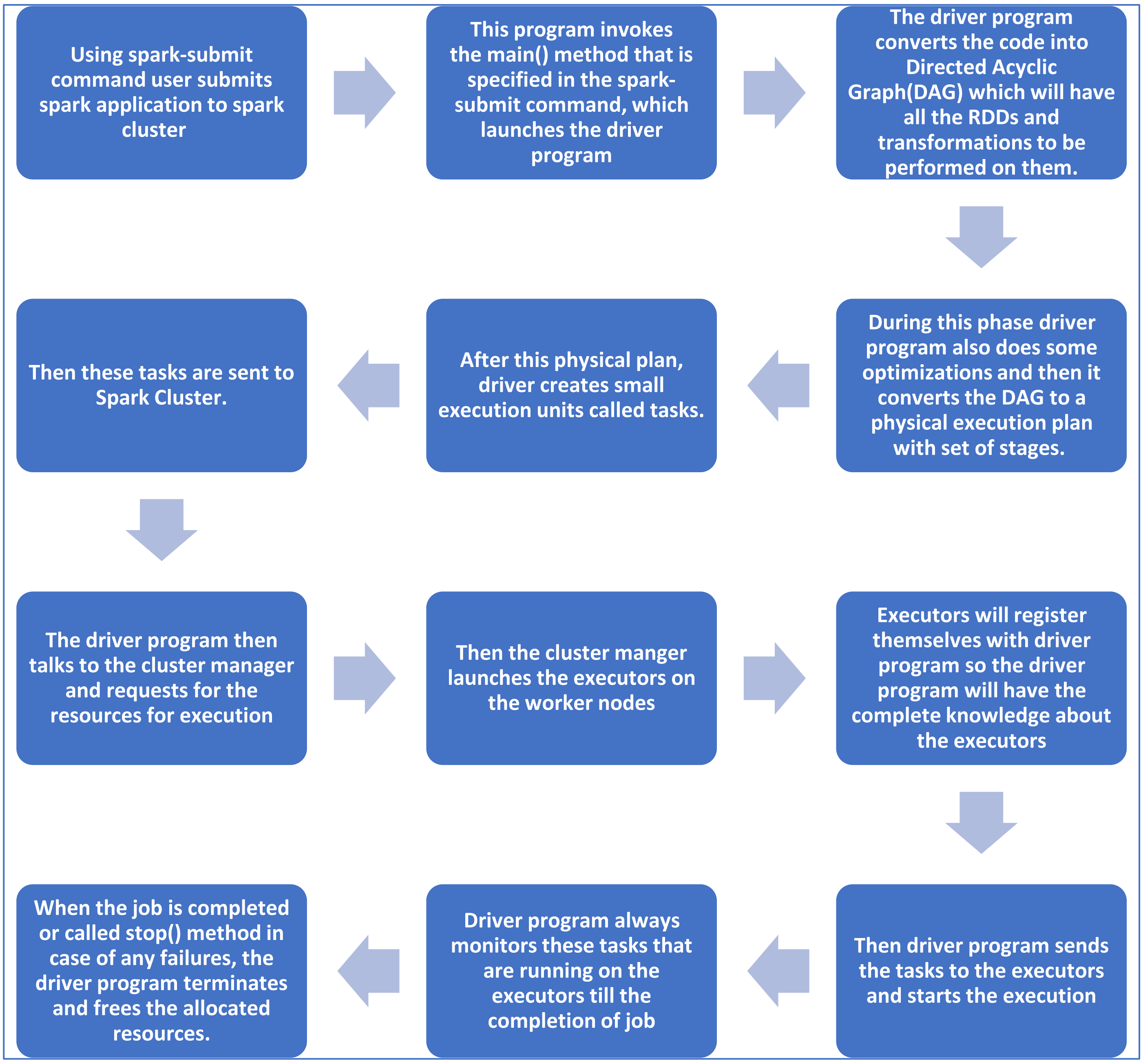
ordersDf.write
.format("csv")
.partitionBy(“country”,"order_status")
.mode(SaveMode.Overwrite)
 	
.option("path","C:/Users/Lenovo/Documents/BIG DATA/WEEK11/newfolder")
.save()
	df.write.option("header","true").partitionBy("COUNTRY" ,”CITY”).mode("overwrite").csv("/FileStore/tables/Sample_Partition_op")

Bucketing in Scala	**Bucketing in Pyspark**

ordersDf.write
.format("csv")
.mode(SaveMode.Overwrite)
.bucketBy(4, "order_customer_id")
.sortBy("order_customer_id")
.saveAsTable("orders")
	df.write.format("csv") \
	.mode("overwrite") \
	.bucketBy(4, "id") \
	.sortBy("id") \
	.saveAsTable("orders_bucketed")

Cast Column in Scala	**Cast Column in Pyspark**
val df= ordersDf.withColumn("id", ordersDf("id").cast(IntegerType))	df.withColumn("id",df.id.cast('integer')).withColumn("salary",df.salary.cast('integer'))
ordersDf.select(col("id").cast("int").as("id"),col("name").cast("string").as("name"))	df2.select(col("id").cast('int'),col("name"),col("salary").cast('int'))
ordersDf.selectExpr("cast(id as int)","name","cast(salary as int)")	df3.selectExpr('cast(id as int)','name','cast(salary as int)')
Fill nulls in Scala	**Fill nulls in Pyspark**
df.na.fill(0)	df.na.fill(0)
df.na.fill("none")	df.na.fill("none")
ordersDf.withColumn("order_id",expr("coalesce(order_id,-1)"))	df.withColumn("salary",expr("coalesce(salary,-1)"))
Read directly in Scala	**Read Directly in Pyspark**
spark.sql("select * from csv.`C:/Users/Lenovo/Documents/Employees.csv`")	spark.sql("SELECT * FROM csv.`/user/hive/warehouse/orders_bucketed/part-00000-tid-3984408860399578289-17a5aa99-d1f9-4500-88cf-1adde09ef7fb-19-1_00000.c000.csv`")
Literal in Scala	**Literal in Pyspark**

import org.apache.spark.sql.functions.{lit,expr}
 	
val limitCountriesDf=countriesDf.select(expr("*"), lit(1).as("Literalcol"))
 	
limitCountriesDf.show(10)
	from pyspark.sql.functions import lit,expr
	
	limitCountriesDf2=countriesDf2.select(expr("*"), lit(1).alias("Literalcol"))
	
	limitCountriesDf2.show(10)


Using spark-submit command user submits spark application to spark cluster
This program invokes the main() method that is specified in the spark-submit command, which launches the driver program
The driver program converts the code into Directed Acyclic Graph(DAG) which will have all the RDDs and transformations to be performed on them.
During this phase driver program also does some optimizations and then it converts the DAG to a physical execution plan with set of stages.
After this physical plan, driver creates small execution units called tasks.
Then these tasks are sent to Spark Cluster.
The driver program then talks to the cluster manager and requests for the resources for execution
Then the cluster manger launches the executors on the worker nodes
Executors will register themselves with driver program so the driver program will have the complete knowledge about the executors
Then driver program sends the tasks to the executors and starts the execution
Driver program always monitors these tasks that are running on the executors till the completion of job
When the job is completed or called stop() method in case of any failures, the driver program terminates and frees the allocated resources.

CDU

Cloud And Data Universe